RESPONSE ACTION CONTRACT
FOR REMEDIAL RESPONSE, ENFORCEMENT OVERSIGHT, CRITICAL REMOVAL ACTIVITIES AT SITES OF RELEASE OR THREATENED RELEASE OF HAZARDOUS SUBSTANCES IN EPA REGION II

FINAL WORK PLAN
VOLUME I

Lawrence Aviation Industries Superfund Site
Remedial Investigations/Feasibility Study
Port Jefferson Station, Suffolk County, New York
Work Assignment No.047-RICO-02PF

U.S. EPA CONTRACT NO. 68-W-98-210
Document Control No.: 3220-047-PP-WKPN-03959
April 22, 2003

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PROJECT: RAC II Contract No.: 68-W-98-210
Work Assignment No.: 047-RICO-02HJ

DOC. CONTROL NO.: 3220-047-PP-WKPN-03959

SUBJECT: Final Work Plan, Volume I
Lawrence Aviation Industries Site
Remedial Investigations/Feasibility Study
Port Jefferson Station, Suffolk County, New York

Dear Mr. Rosado and Mr. Hamblin:

CDM Federal Programs Corporation (CDM), on behalf of our entire RAC II Team, is pleased to submit this Final Work Plan, Volume I, for the Remedial Investigation/Feasibility Study at the Lawrence Aviation Industries Site in Port Jefferson Station, Suffolk County, New York.

If you have any questions regarding this work plan, please contact me at your earliest convenience at (212) 785-9123.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Robert D. Goltz, P.E.
RAC II Program Manager

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Enclosure

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Section 1 Introduction

CDM Federal Programs Corporation (CDM) received work assignment number 047-RICO-02PF under the United States Environmental Protection Agency (EPA) Response Action Contract (RAC II) program to perform a Remedial Investigation/Feasibility Study (RI/FS) for the Lawrence Aviation Industries, Inc. (LAI) Superfund Site in Port Jefferson Station, Town of Brookhaven, Suffolk County, New York. The overall purpose of this work assignment is to investigate the nature and extent of contamination of site-related contamination and develop and evaluate remedial alternatives.

1.1 Overview of the Problem

LAI, an active manufacturer of titanium sheeting for the aeronautics industry, is located on Sheep Pasture Road in Port Jefferson Station, Town of Brookhaven, Suffolk County, New York. Figures 1-1 and 1-2 provide site location and site maps, respectively. The LAI site is a 126-acre site composed of the LAI industrial facility, which occupies approximately 41 acres, and the Outlying Parcels and is located near residential areas consisting of single family houses and an apartment complex.

The wastes generated from LAI's operations include fluoride compounds, sludges, caustic acids, halogenated solvents, and spent lubricating oils. Past disposal practices and releases at the LAI facility from leaking drums have resulted in numerous violations cited by both the Suffolk County Department of Health Services (SCDHS) and the New York State Department of Environmental Conservation (NYSDEC). Past site inspections also have identified leaking transformers. Numerous discharges from various plant activities to the ground's surface along with two unlined lagoons also were observed by SCDHS.

Investigations began in 1970 when the SCDHS received a complaint from a local property owner that overflow from the LAI sump was harming neighboring plant vegetation. Upon sampling the overflow material, it was determined that the sump contents exceeded permissible discharge limits for pH, hexavalent chromium, and nitrates. Upon further investigation, it was determined that residential wells adjacent to the facility were contaminated with fluoride, nitrates, trichloroethylene (TCE), 1,1-dichloroethylene, cis-1,2-dichloroethylene (DCE), tetrachloroethylene (PCE), and heavy metals.

In 1980, LAI, in an effort to clean up the facility, crushed more than 1,600 drums that were located on their property. As the drums were crushed, the liquid contents were allowed to spill onto unprotected soil. The drums contained TCE, PCE, spent acid sump sludges, salt wastes, hydraulic oils, hydrofluoric acid, nitric acids, and other plant wastes.

In February 1987, SCDHS requested that Federal Superfund emergency provisions be made to supply safe drinking water to the residents downgradient from the facility due to the presence of TCE, PCE, and DCE within their private well water. The request was approved and immediately implemented. In 1998 and 1999, the NYSDEC contracted with the Suffolk County Water Authority (SCWA) to extend the water main on Sheep Pasture Road and on Bayview Avenue. Homes on or near Sheep Pasture Road also were connected to the municipal water supply. In March 2000, the site was placed on the Federal National Priorities List (NPL) and EPA assumed the role of lead agency for site remediation of LAI.

Additional details of the site history and previous investigations are included in Section 2 of this work plan.

1.2 Approach to the Development of the Work Plan

CDM has reviewed all available information on the site (provided by EPA) prior to formulating the scope of work presented in this work plan. Section 9.0 provides a list of all documents reviewed and referenced in the development of this work plan. The RI/FS for LAI will be completed in three phases: a remedial investigation (RI); a risk assessment (RA); and a feasibility study (FS).

The RI will focus on collecting adequate soil, groundwater, surface water, and sediment data to fully characterize the nature and extent of site-related contamination and to identify potential areas of contamination. The sampling approach is discussed in Section 5.0. A Quality Assurance Project Plan (QAPP) detailing sample and analysis requirements for the field investigation program and a Health and Safety Plan will be submitted separately. The RI report will provide a complete evaluation of sampling results.

The risk assessments for the Site will evaluate the public health and ecological risk from exposure to contaminated groundwater, surface water, sediment, and soil. A human health risk assessment (HHRA) will be conducted according to EPA's "Risk Assessment Guidance for Superfund" (Part A 1989a and Part D 1998) or according to the most recent EPA guidance and requirements. An ecological risk assessment will be conducted according to the EPA's "Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Risk Assessments" (ERAGS), (EPA 1997), or according to the most current EPA guidance and requirements. The RAs will include a list of contaminants of potential concern (COPC); toxicology of COPCs; transport, degradation, and fate analysis of COPCs; comparison of COPCs found in the various media to Applicable or Relevant and Appropriate Requirements (ARARs); and determination of risk.

An FS will be completed in accordance with EPA guidance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) "Interim Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988), or the most recent EPA FS guidance document. The FS will develop and screen remedial alternatives and provide detailed analysis of selected alternatives, including the "No Action" alternative. The remedial alternatives will be evaluated against the nine criteria required by EPA guidance documents: (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short term effectiveness; (6) implementability; (7) cost; (8) state acceptance; and (9) community acceptance.

CDM has reviewed and evaluated the quality and completeness of the existing data and intends to use these data where appropriate. Data collection activities identified in this work plan are directed toward verification of existing data (when necessary), collection of new data to fill gaps in the existing data, and collection of data of sufficient quality and quantity to support Human Health and Ecological Risk Assessments and the FS.

1.3 Work Plan Content

This work plan contains ten sections:

- Section1.0 provides an introduction to the site.
- Section 2.0 describes the site background including the current understanding of the location, history, and existing conditions of the site.
- Section 3.0 presents the initial evaluation of existing data and includes a description of the types and quantities of waste present, site hydrogeology, contaminant migration and exposure pathways, a preliminary assessment of public health and environmental impacts, and a preliminary identification of ARARs and remedial action objectives.
- Section 4.0 presents the work plan rationale including the Data Quality Objectives (DQOs) for RI sampling activities and the approach for preparing the work plan. The work plan approach also describes how RI activities will satisfy data needs.
- Section 5.0 provides a discussion of each task of the RI/FS in accordance with the Lawrence Aviation Industries Site RAC II Statement of Work and the "Interim Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA," (EPA, 1988).
- Section 6.0 presents costs and key assumptions.
- Section 7.0 presents the anticipated schedule for the RI/FS tasks.
- Section 8.0 presents project management considerations that define relationships and responsibilities for selected tasks and project management teams.
- Section 9.0 provides a list of references used to develop the material presented in this work plan.

- Section 10.0 provides a glossary of acronyms and abbreviations used in this work plan.

For presentation purposes, work plan figures and tables are presented at the end of the document.

Section 2
Site Background and Setting

This section describes the site location and setting and summarizes the site history, including facility activities and historical investigations. This section also describes the site conditions as of the site visit conducted by CDM on October 18, 2001.

2.1 Site Location

The LAI facility, approximately 41 acres in size, is an active titanium sheeting manufacturer located in Port Jefferson Station. The LAI facility consists of about 10 buildings on the southern portion of the 41-acre property. Figures 1-1 and 1-2 show the site location and site plan, respectively. The Long Island Railroad and Sheep Pasture Road form the northern border of the site, to the east and west are various residential single family houses, and to the south is a wooded area beyond which is an apartment complex. The Village of Port Jefferson and Port Jefferson Harbor, an embayment of the Long Island Sound, lie approximately one mile to the north.

The northeastern and eastern portions of the property, hereafter referred to as the "Outlying Parcels", are included in this RI at the request of EPA. The Outlying Parcels are mostly vacant wooded areas with a few small residential single family houses, three access roads, and an unnamed pond.

2.2 Site History

The section of the property currently occupied by LAI was previously a turkey farm owned by LAI's corporate predecessor, Ledkote Products Co. of New York. Ledkote was originally located in Brooklyn, New York and produced items that included lead gutters and spouts for roof drains. When the company moved to Port Jefferson Station in 1951, all the existing material from the original manufacturing process was transferred to the new location. In 1959, Ledkote Products Co. of New York changed names to Lawrence Aviation Industries, Inc. From approximately 1959 to the present, the LAI facility has manufactured products from titanium sheet metal, including golf clubs and products for the aeronautics industry. Historical aerial photographs taken above the site between 1955 and 1982 show disturbed ground on several of the Outlying Parcels.

Investigations of the LAI site began in 1970 when SCDHS received a complaint from an adjacent residential property owner. The owner indicated that his property was being affected by occasional sump overflows derived from LAI. The overflowing liquid did not freeze in the winter months and impacted surrounding vegetation. SCDHS sampled the Lawrence Aviation sump and determined that the contents exceeded permissible discharge limits for pH, hexavalent chromium ($Cr+6$) and nitrates. During the remainder of the 1970s, inspections and sampling conducted by SCDHS and the Brookhaven Department of Environmental Protection identified adjacent residential wells contaminated with fluoride, nitrates, TCE, 1,1-dichloroethylene, DCE, PCE, and heavy metals.

On May 13, 1980, the SCDHS performed an investigation of the LAI site. The initial investigation was followed by aerial photography taken on May 22, 1980. Subsequent investigations were performed on June 25 and July 30, 1980. The results of these investigations were documented in an affidavit (SCDHS 1981), which identified the following areas of environmental concern:

- Drums were noted in various areas of the site. The drums, exposed to the elements and improperly stored on the ground surface, were damaged and leaking their liquid contents onto the ground surface. Stained ground surfaces and potentially buried drums also were identified in these areas. Reportedly, the drums contained acid sump sludges, salt waste, PCE, hydraulic oil, zyglo penetrant, solvents, whitish rectangular crystals, hydrofluoric acid, and TCE.
- The manual pump out of drum resulted in contents being discharged directly to the ground surface.
- The facility's evaporation system was surrounded by liquid waste from an overflowing holding tank.
- Areas where various process related effluents, including quench water from titanium cutting operations, flush water from a smelter cooling system, and oily water from rolling mills, presses and fork lift maintenance areas, were discharged directly to the ground surface.
- The facility's unlined earthen lagoons used to store liquid waste.
- A pile of old transformers with visible leaking fluids.
- A leaking underground acid rinse waste tank. Bluish-green liquids, with measured pH of 1, were noted leaking from discarded tanks.

In September, October, and November 1980, various "clean-up" activities were observed at the site (SCDHS 1981). Drums were gathered into piles on a built up earthen area. As the drums were gathered, liquid contents leaked onto the ground surface. Once piled, the drums were crushed and their liquid contents were allowed to run off the built up earthen area. The crushed drums and remaining sludges were subsequently disposed of at an out-of-state landfill. It was reported that 7,500 gallons of waste oils, 1,000 tons of sludge, and some contaminated soil were removed from the site. Section 3.1.6.2 describes the analytical results of waste sampling conducted by SCDHS personnel who witnessed the drum crushing activities in 1980.

In conjunction with the SCDHS, the NYSDEC also investigated the site during the 1980s. Investigations included the preparation of a Phase I Environmental Assessment in January 1986. As documented from the SCDHS findings, the NYSDEC also identified numerous un-permitted discharges at the site, including the release of carbon disulfide, phenols, fluoride, iron, 1,1,1 trichloroethane, toluene, and sludges.

During investigations between 1982-1985, SCDHS took a variety of surface samples. Samples from sumps, puddles, lab pools, and runoffs were found to contain high levels of fluoride, toluene, carbon tetrachloride, and heavy metals. A composite sample of fluid-filled drums had a pH greater than twelve.

In February 1987, SCDHS requested that Federal Superfund emergency provisions be implemented to supply four residences north (downgradient) of the site with safe drinking water due to the presence of TCE, PCE, and DCE in their private well water. The emergency plan, which included temporary bottled water provisions and the extension of a nearby water main, was implemented.

Additional SCDHS and NYSDEC site visits documented other potential environmental concerns at the LAI site. These included a battery storage pile, a construction and demolition debris landfill, and pits used for the routine disposal of degreasing solvents, lube oils, and heavy equipment insulating oils.

The disposal pits were six to eight feet deep and often were covered with soil to hide their contents. In addition, it was reported that approximately 100 drums were buried about 15 feet deep at the northeast section of the plant. Another dump potentially exists on the east side of the facility buildings.

In 1991, the NYSDEC Region 1 Resource Conservation and Recovery Act (RCRA) Hazardous Substance Group oversaw a major drum removal action. Between July 1991 and March 1992, nine test wells were installed downgradient of the LAI site and five wells were installed crossgradient (northwest) of the site by the SCDHS. Some of the downgradient wells, and a stream and pond located in the Village of Port Jefferson, were sampled and found to be contaminated with TCE and PCE. NYSDEC reclassified the site in 1991 as a significant threat to the public due to the contamination of downgradient wells, pond, and stream.

Additional sampling performed by SCDHS confirmed the presence of chlorinated solvents and fluoride in surface waters of the downgradient pond and stream, locally known as Old Mill Pond and Old Mill Creek, respectively. The highest level of TCE found in the pond and stream was 1,700 parts per billion (ppb), which significantly exceeded the compound's current NYSDEC Ambient Water Quality Standard (Human Health) of 5 ppb. EPA's National Water Quality guidance value is 30 ppb. The fluoride levels documented in the pond and stream were not high enough to be violations, but served as a tracer chemical for an LAI-derived source; no other industries in the area were known to use hydrofluoric acid. Section 3.1.6.4 provides a detailed summary of existing surface water sampling results.

According to SCDHS storage tank registration records, 10 above ground and 21 below ground storage tanks were indicated, containing various acids, caustic compounds and rinse water used in site processes. Three above ground and one below ground storage tanks contained No. 2 fuel oil. Approximately 18 of these tanks, which contained industrial waste, waste oil, gasoline, and diesel fuel, were removed from 1992 through 1995.

In October 1997, SCDHS identified 10 additional residential wells downgradient of the site that were impacted or potentially could be impacted by PCE, TCE, and DCE in groundwater. These homes were connected to the Suffolk County Water Authority distribution system between 1997 and 1999 (Weston 1999).

2.2.1 Previous Investigations

Due to the high levels of contamination found at the site during the preliminary testing performed by SCDHS and NYSDEC, further investigations were necessary. In 1997, NYSDEC decided that a Remedial Investigation should be conducted at the LAI site to determine the nature and distribution of the constituents identified as compounds of concern. CDM was contracted by NYSDEC to perform the RI.

A variety of sampling activities were planned by CDM, including a geophysical investigation for buried drums, 12 shallow soil borings, 25 geoprobe borings, and installation of 7 shallow monitoring wells.

On-site access restrictions imposed by the owner of LAI resulted in reduction of many of the planned activities, which were limited to an on-site area along a New York State Highway easement cross-cutting the southeast corner of the property, and off-site areas. The investigation included a geophysical investigation on the New York State Highway easement, one deep soil boring, and three shallow geoprobe borings. Section 3.1.6 provides a detailed description of previous onsite soil boring sampling results.

The geophysical investigation performed at the site in August 1997 consisted of four types of tests: a magnetic survey, two types of terrain conductivity tests, and seven ground penetrating radar profiles. The results of the magnetic test was erratic due to the large amount of metal debris located in the shallow subsurface. The conductivity tests confirmed that metal debris was buried in the area but did not confirm that it was buried drums suspected to be in that area. The ground penetrating radar surveys performed along several lines within the area provided no evidence indicative of buried drums.

Three monitoring wells were installed to determine the direction of contaminant movement. Monitoring well MW-1 was installed upgradient of the site in order to serve as a background point. MW-5 was placed on the northwest side of the LAI facility to determine if contamination was moving in that direction. Monitoring well MW-4 was installed directly west of the former lagoon area. These wells were sampled along with two previously-installed SCDHS wells, PJ-6 and PJ-11, and a hydropunch BS-3. A second round of groundwater sampling from the monitoring wells was conducted in 2000. Figure 3-16 shows monitoring well locations. Section 3.1.6 provides detailed descriptions of previous sample results.

2.3 Current Conditions

LAI is an active facility, currently engaged in the manufacture of titanium sheeting for the aeronautics industry. LAI has implemented changes in it's waste disposal practices and no longer discharges wastes to the on-site lagoons. Currently, wastewater from the site is treated in an evaporation unit and the resulting sludge is reportedly disposed of at an off site facility.

Past disposal practices have resulted in release of a variety of contaminants including TCE, PCE, acid wastes, oils, sludge, and other plant wastes. Previous investigations in the site vicinity suggest that releases of hazardous substances from the facility have affected soils at the site and groundwater. EPA prepared a Hazard Ranking System (HRS) report and proposed the site for inclusion on the National Priorities List (NPL) on October 22, 1999. The site was listed on the NPL on March 6, 2000.

EPA, NYSDEC, SCDHS, and CDM personnel visited the site on October 18, 2001 to observe current conditions at the site and in the surrounding area. During the site visit, evidence of poor waste management practices were observed including stained soil and improperly stored drums. In addition, it appears site operations have been scaled down and the facility is currently operating well below its full capacity.

CDM is conducting the RI/FS to investigate the nature and extent of contamination at the site. Potential remedial alternatives for the site will be developed in the FS. The RI will be conducted in two field activities and will focus on soil, groundwater, surface water, and sediment contamination on the site and surrounding areas.

Section 3
Initial Evaluation

This chapter presents an initial evaluation of site conditions, and is based largely on previous site investigation reports, published geological research documents, personal communication with research staff at the State University of New York (SUNY) Stony Brook and local drillers, proceedings and guidebooks of local geological associations, and data publically available on the internet. All literature sources used to prepare this section are presented in Section 9.0, References.

3.1 Review of Existing Data

This section contains the physical characteristics and uses of the site and its vicinity and a summary of the findings of previous investigations. The physical characteristics of the site including the site topography, drainage and surface water characteristics, regional geology and hydrogeology, site hydrogeology, climate, population, and land use are discussed to give a framework for the site conceptual model. The historical data discussed in this section are taken directly from the historical site documents and the validity of these data have not been confirmed by CDM.

3.1.1 Topography

Long Island forms the northern extension of the Atlantic Coastal Plain physiographic province of North America. Two lines of morainic hills of glacial till exist along the northern and central part of Long Island (Figure 3-1). The northern moraine is the Harbor Hill moraine and the central moraine is the Ronkonkoma moraine. These moraines converge in western Long Island. The topography between these two moraines is relatively flat (Franke and McClymonds 1972). Figure 3-2 provides topographic features of the Port Jefferson Station area.

The LAI site lies on the Harbor Hill moraine, on a localized plateau. A high point immediately north of the site reaches an elevation of 271 feet above mean sea level (amsl). From this location northwards, topography drops over 200 feet within one mile and then quickly transitions to sea level 500 feet further north at Port Jefferson Harbor (as illustrated on the topographic profile in Figure 3-2).

The site area is relatively hilly, with rolling hills and valleys, compared with the topography to the west and south, which is predominately flat. Ground surface elevations on-site range from approximately 190 feet amsl in the northwest corner of the property to 250 feet amsl on the north central portion of the property (the Outlying Parcels). The LAI facility buildings at the southern end of the property are at approximately 230 feet amsl.

3.1.2 Drainage and Surface Water

Stormwater from building roofs and parking areas is either diverted to a number of on-site storm drains or is allowed to discharge directly to the ground surface. Site drainage from the eastern portion of the site, including the truck scale area, is piped to the extreme eastern portion of the site where it is discharged to the ground.

Several small surface water bodies on the LAI Site are less than one acre in size, including a small recharge basin in the southwest corner of the site and a small unnamed pond located approximately 2,000 feet north of the LAI facility. No streams cross the property. The closest flowing surface waters, located less than one mile north, downgradient of the LAI Site, are a small pond and an associated creek which flow into the Port Jefferson Harbor; these water bodies are locally known as Old Mill Pond and Old Mill Creek, respectively. According to Jim Beech (Engineering Technician, Division of Water for NYSDEC; *pers. comm.* 3/26/03, J.P. Bass), the unnamed pond is classified as Class C, "Fresh surface waters". Class C waters are suitable for fish propagation and survival and primary and secondary contact recreation, although other factors may limit the use for these purposes. Old Mill Creek and Old Mill Pond are classified as Class D, "Fresh surface waters". Class D waters are suitable for fish survival and can be used for fishing and primary and secondary contact recreation, although other factors may limit the use for these purposes (http://www.dec.state.ny.us./website/regs/701.htm 2000).

3.1.3 Geological and Hydrogeological Characteristics

The following sections describe the regional geology and hydrogeology and the site specific hydrogeology. The regional geology and hydrogeology sections describe in detail the formations that comprise the geology of Long Island, including the depositional and erosional sequences that formed the aquifer complex below the site.

3.1.3.1 Regional Geology

The site is located within the Atlantic Coastal Plain Physiographic Province. A history of coastal submergence and emergence spanning the Cretaceous Period, significant differential erosion during the Cenozoic, and glaciation during the Quaternary is reflected in the present day geology of Long Island (Lubke 1964). The geology of Long Island is characterized by a southeastward-thickening wedge of unconsolidated sediments unconformably overlying a gently-dipping basement bedrock surface (Figure 3-3). The wedge ranges in thickness from zero feet beneath Long Island Sound to the north, on the submerged western margin of the Coastal Plain, to more than 2,000 feet under the southern shores of Long Island.

The unconsolidated sedimentary wedge in the Port Jefferson area, northwest Suffolk County, thickens from about 400 to 1,300 feet southwards from the northern shore. Basement is composed of Precambrian to Early Paleozoic igneous or metamorphic consolidated bedrock. Unconformably overlying the basement is a thick succession of Late Cretaceous deposits: the Raritan and overlying Magothy formations, both of fluvio-deltaic depositional origin. The Upper Cretaceous deposits are unconformably overlain by a veneer of Pliocene(?) and Pleistocene deposits, chiefly of glacial origin (Franke and McClymonds 1972). A generalized regional stratigraphy for northern Long Island is presented in Figure 3-4 and is described in detail below.

Cretaceous

Raritan Formation: The Raritan Formation is divided into the basal Lloyd Sand Member and the overlying Raritan Clay Member. The Lloyd sand rests unconformably on bedrock and is 200-265 feet thick in the Port Jefferson area (Lubke 1964). A deep test well drilled at Port Jefferson Harbor approximately 1.5 miles north of the site (well number S-5901) was completed in bedrock encountered at 813 feet below mean sea level (msl); the top of the Lloyd sand was found at 595 feet below msl (Buxton *et al.* 1989). The Lloyd sand is composed of white and grey fine to coarse sand and gravel, commonly with a clayey matrix. The contact with the overlying clay member is gradational. The Lloyd Member's updip erosional pinchout is located a few miles north of the Port Jefferson area, under the Long Island Sound (Smolensky, *et al.* 1989).

The Raritan Clay member is composed chiefly of bedded variegated clay and silt, locally containing interbedded sands. Lignite fragments and iron and pyrite nodules are common. The clay member ranges in thickness from zero to 188 feet, but is about 100 feet in the Port Jefferson area (Lubke 1964). The Raritan Clay is the most widespread hydrologic confining layer on Long Island. Figure 3-5 is a subcrop map of the top-Raritan Clay Member in the Port Jefferson area, from Smolensky, *et al.* (1989). The map indicates the Raritan's updip erosional pinchout generally is located subparallel to the northern coast of Suffolk County. Deep test well number S-5901, located immediately south of Port Jefferson Harbor (Figure 3-5), encountered the top of the clay unit at 498 feet below msl (Buxton *et al.* 1989).

Magothy Formation: The Magothy unconformably overlies the Raritan; the contact is commonly marked by a change from the solid clays of the Raritan Clay member to coarse sands and gravels of the basal unit of the Magothy. The dominant Magothy lithology generally is fine to medium quartz sand, interbedded clayey sand with silt, clay, and gravel interbeds or lenses. Interbedded clay is more common towards the top of the formation. The thickness of the Magothy in the Port Jefferson area varies between 100 feet and greater than 900 feet (Koszalka 1984); the Magothy is 473 feet thick in nearby test well S-5901, the top of which is encountered at about 25 feet below msl. Figure 3-6 is a subcrop map of the top-Magothy Formation in the Port Jefferson area, again from Smolensky, *et al.* (1989). The map indicates the updip erosional pinchout of the Magothy is located subparallel to the northern coast. The subcrop (buried) surface of the Magothy is not planar or uniformly sloping as are the underlying stratigraphic units. Significantly, Smolensky, *et al.* (1989) indicate that the Magothy has been omitted due to erosion west of the Site in Smithtown (four miles to the west) which exposes top-Raritan Clay(?) erosion surface subcrop. Approximately one mile east of the Site, the Magothy's subcrop surface dips steeply eastwards into another area in which a significant portion of the Magothy has been removed by erosion. Test hole data indicate a channel, more than 600 feet below sea level, southeast of the LAI Site extends north to the limit of the Magothy sequence subcrop.

Cenozoic-Quaternary

After the Cretaceous, deep erosion of the land surface took place as a response to fluctuations in sea level. Sedimentological evidence indicates that sea level falls exposed the entire Atlantic continental margin during the Miocene epoch, which would have promoted rejuvenation and deep incision of rivers and streams across the

Coastal Plain (Fulthorpe, *et al.* 1999). Later deposition of abundant fluvial and glacial clastic deposits during the Pliocene(?) and Quaternary in-filled these incised buried valleys. The top of the Cretaceous sequence is marked by a highly irregular erosion surface upon which rests deposits of Pleistocene and, in some places, Pliocene (?) age. Structural contours of the top-Cretaceous for the Port Jefferson area were constructed from a database of well information obtained from the United States Geological Survey (USGS), SCDHS, and Suffolk County Water Authority, published by Buxton *et al.* (1989). The site is located northwest of a roughly west southwest-east northeast ridge on the top-Cretaceous unconformity surface located at approximately sea level (up to approximately 200 feet below ground surface [bgs]). About one mile southeast from the LAI site, the unconformity surface dips steeply to towards the east or southeast; northwest of the Site, the surface is almost planar (Koszalka 1984). The site appears to be located near the crest of the subcropping top-Cretaceous ridge (Figure 3-7). The unconformity surface is at an elevation of approximately 25 feet below msl in Port Jefferson Harbor (at well S-5901), but is more than 600 feet below msl within the area southeast of the site (at well S-24663).

Published Suffolk County well data (Buxton *et al.* 1989) show that changes in altitude of the top-Magothy can be dramatic over short distances in the LAI site's vicinity. The east-northeast - west-southwest trending top-Cretaceous ridge may be a paleo-interfluve preserved during Cenozoic fluvial erosion of the adjacent areas; the regional structural trend of the Cretaceous succession may have controlled the location of the deeply-incised drainage system to the southeast (Figure 3-7). Figure 3-8 is a south-north geologic section across the northern Brookhaven just east of the LAI site showing the interpreted elevations of the top-Magothy Formation.

Potential permeability contrasts between the Magothy and the overlying post-Cretaceous deposits may influence vertical groundwater flow and/or contamination associated with the site. The presence of the virtually impermeable Raritan Clay directly underlying the Magothy and post-Cretaceous aquifer deposits would define a lower limit of deep contaminant migration.

<u>Manetto Gravel</u>: The Pliocene(?) Manetto Gravel deposits identified in Nassau County, further to the west of the Site, are interpreted to be of fluvial origin, deposited in deeply incised valleys prior to the Pleistocene glaciation, and subsequently buried beneath thick glacial deposits (Lubke 1964). The Manetto Gravel, which is frequently included with the Upper Glacial Aquifer unit, is composed of gravel, fine to coarse sand, and scattered clay lenses (Franke and McClymonds 1972). Remnant subcrops of this deposit may exist within buried valleys and other deeply eroded sub-Cenozoic surfaces.

<u>Pleistocene Deposits</u>: Deposits of Pleistocene age mantle the Cretaceous and Pliocene(?) formations. Within the study area, the Pleistocene deposits include three depositional sequences: the fluvial Jameco Gravel and marine Gardiners Clay (both of which are of post-Mannetto age); and the Late Pleistocene glacial deposits of the Wisconsin glacial stage. Undifferentiated gravels and clays described in buried

valleys within northern Long Island have been attributed to the Jameco Gravel and Gardiners Clay units. The Jameco Gravel and Gardiners Clay formations are well-defined, mappable stratigraphic units beneath the southern margin of Long Island where they are of hydrogeological significance; these lithological units have not been defined within the Port Jefferson area; however, Lubke (1964) collectively refers to these deposits as Undifferentiated Pleistocene Deposits. The remainder of the Pleistocene succession belongs to the Wisconsin glacial stage: the Upper Glacial Deposits.

The total thickness of the Pleistocene deposits in northwestern Suffolk County ranges from zero to more than 650 feet, but averages 200 feet, as illustrated in Figure 3-8. The thickness and distribution of the Pleistocene Upper Glacial Deposits were controlled by the older, now buried paleotopography discussed above. The pattern of stream and river valleys that dissected the surface of Long Island during the Cenozoic likely was later modified by Pleistocene overriding ice sheets and meltwater erosion and deposition. Although the main buried valleys generally slope northward, major tributaries are oriented east-west, presumably along softer, less resistant beds in the Magothy.

The Pleistocene Upper Glacial Deposits in the Port Jefferson area include (Lubke 1964):

1) At least one and possibly two sheets of glacial till deposited as ground moraine by continental ice

2) Ice contact deposits within the Harbor Hill terminal moraine

3) A considerable thickness of glaciofluvial deposits laid down by meltwater streams on outwash plains and spillways during the advance, stagnation, and recession of the ice

4) Discontinuous bodies of silt and clay deposited in glacial lakes

The Upper Pleistocene deposits predominantly are composed of brown or grey stratified sand and gravel, although thick layers of non-marine silt and clay occur in buried valleys, and a thin surficial mantle of unstratified glacial till is common on the upland area terminal moraines. The sands and gravels are quartz-rich but also contain igneous and metamorphic lithoclasts and heavy minerals.

<u>Smithtown Clay Unit:</u> The Smithtown Clay Unit (informal usage) is an extensive clay unit identified in several wells in northwestern Suffolk County (Lubke 1964; Krulikas and Koszalka 1983; Koszalka 1984). The Smithtown Clay Unit was first thought to be an equivalent of the Gardiners clay (H.R. Blank, USGS, written commun. 1928), but has more recently been described as a glaciolacustrine deposit of the later Wisconsin glacial stage (e.g., Lubke 1964; Krulikas and Koszalka 1983; Koszalka 1984). They suggest that the clay unit was deposited in a large post glacial lake or series of lakes in

the intermorainal area during the Upper Pleistocene, during wasting of the Ronkonkoma ice sheet.

The Smithtown Clay Unit predominantly is of brown or grey variegated clay, but locally lenses of sand and sandy gravel are found. The thickness is variable and ranges from a few tens of feet to 200 feet. The clay unit generally is over 50 feet thick over a relatively large part of northern Suffolk County, but is over 100 feet just north of the Ronkonkoma moraine and just south of the Harbor Hill moraine in the town of Brookhaven, and over 150 feet thick in northern Smithtown. Krulikas and Koszalka (1983) prepared a map showing the approximate areal extent and thickness of the clay layer which may underlie the LAI site; however, geologic data to define its northern extent and thickness are lacking. The known extent of the Smithtown Clay Unit south of the LAI site is shown on Figure 3-9 (Krulikas and Koszalka 1983). Existing well data suggests the surface of the clay unit dips gradually to the north or northwest.

The Harbor Hill terminal moraine, running through the LAI site's vicinity (Figure 3-10), is mantled with a less than 10 foot thick sheet of glacial till which represents the ground moraine of the Harbor Hill ice deposited during glacial readvance. A second, older till sheet associated with the Ronkonkoma ice may be found below glacial outwash sands and gravels, beneath the Harbor Hill till deposits.

3.1.3.2 Regional Hydrogeology

As implied above, the geometry of sedimentary units within the Coastal Plain varies greatly, and has significant hydrogeologic implications. For example, Upper Cretaceous sands may occur as fan-shaped deposits laid down in a fluvial setting; as elongate, sinuous, "shoe string" channels in deltaic settings; as coarse, thick, well-sorted linear accumulations in coastal dune complexes; or as thin, sheet-like bodies in shelf environments. These sandy deposits act as regionally or locally important water bearing zones, or aquifers. In contrast, the deposition of clay in the marine or glaciolacustrine environment (such as the Raritan Clay Member or the Smithtown Clay Unit, respectively) typically occurs in low energy, protected sedimentary environments. Thus, clay beds are generally laterally continuous, and may drape over sand sheets and channel deposits and act as aquicludes. Along the fringes of clay beds, however, the clay may intermix with the surrounding coarser deposits.

The unconsolidated depositional units of Late Cretaceous to Pleistocene age which overlie the virtually impermeable basement bedrock constitute the wedge-shaped aquifer system underlying the Long Island Coastal Plain. The hydrogeologic nature of the sedimentary units primarily is determined by their texture and degree of sorting. Unconfined aquifers are recharged by infiltration in outcrop areas; confined aquifers are recharged by vertical leakage through overlying "leaky" confining units. Regional discharge is typically into streams and rivers (via upward leakage through confining units or confined aquifers), and ultimately to the Long Island Sound. In areas where confining units are regionally extensive, vertical components of flow are superimposed on horizontal components, thereby steepening hydraulic gradients. Confining units of small aerial extent do not significantly affect the regional flow.

Eight major hydrogeologic units have been identified beneath Long Island, from oldest to youngest: consolidated bedrock, the Lloyd aquifer, the Raritan confining unit, the Magothy aquifer, the Monmouth greensand, the Jameco aquifer, the Gardiners Clay, the upper glacial aquifer, and the Smithtown Clay Unit. Neither the Monmouth greensand, Jameco aquifer, nor the Gardiners Clay have been identified within the Port Jefferson area. The Lloyd aquifer unit is a confined aquifer underlying the entire island. The Magothy and Upper Glacial aquifers units overlie the Raritan confining unit are found across most of Long Island and can be confined, semi-confined, and unconfined aquifers; combined, they are the most productive and heavily utilized groundwater resource on Long Island.

McClymonds and Franke (1972) compiled all available well data for the principal aquifer units (Lloyd, Magothy, and Upper Glacial) on Long Island to compare the average water-transmitting properties of the aquifers. The results of the study indicate that average transmissivities are highest for the Magothy aquifer (240,000 gallons per day per foot [gpd/ft]), 200,000 gpd/ft in the Upper Glacial aquifer, and lowest in the Lloyd (90,000 gpd/ft). Average hydraulic conductivities are highest in the Upper Glacial (1,700 gallons per day per square foot [gpd/ft^2]), 1,300 gpd/ft^2 in the Magothy, and lowest in the Lloyd (360 gpd/ft^2).

The shallow unconfined watertable aquifer over most of Long Island is within the Upper Glacial aquifer unit. Groundwater movement can be deduced from water table contour maps, such as that by Hibberd *et al.* (1993). In general, water north of the regional groundwater divide, which trends east-west along the island, moves northward towards Long Island Sound, and water south of the divide flows southward toward the Atlantic Ocean (Figure 3-11). The rate of horizontal flow in the Upper Glacial aquifer is controlled by the hydraulic gradient of the water table and by the water-transmitting characteristics of the aquifer material. Horizontal velocity in the upper glacial aquifer generally ranges from 1 to 2 feet/day; vertical flow is much slower, especially where confining layers restrict the upward or downward movement of water. Residence times in the Upper Glacial aquifer generally are less than 30 years (Franke and Cohen 1972). In general, groundwater flow in deeper aquifers is controlled by regional-scale flow systems.

Depth to groundwater on Long Island is less than 150 feet in most areas, ranging from zero feet along the shores and stream channels to greater than 250 feet in the extreme northwestern part of Suffolk County. The depth to groundwater primarily is determined by the island's glacial geology and associated topographic features, but also is affected by local and temporal variations in precipitation and groundwater withdrawals.

The water table is a subdued expression of the island's topography; thus, the depth to water generally is greater in the topographically high areas, such as those near the north shore and east-west trending glacial moraines that form the "spine" of the island, than in low-lying areas, such as stream valleys and most of the southern half of the island. Figure 3-12 depicts the regional depth to water (Simmons 1989). Of note, the map does not include local variations in water table depth caused by perched groundwater conditions.

3.1.3.3 Site-Specific Hydrogeology

Within the LAI site vicinity, discrete aquifers or water-bearing units have been recognized (Lubke 1964). Each unit may comprise parts of one or more of the lithostratigraphic formations described above. In addition, locally-occurring perched water bodies have been recognized at several localities in the area. The aquifers have been defined on the basis of their hydraulic continuity, deduced from the behavior of water levels in wells, and by the degree of confinement of the water in the aquifer indicated by the presence or absence of extensive confining beds or aquicludes. Lubke (1964) separated the groundwater reservoir into three mappable units: shallow (Upper Glacial), intermediate (predominantly the Magothy), and deep (Lloyd) aquifers. The shallow and intermediate aquifers are separated only imperfectly by discontinuous silt and clay bodies. The intermediate and deep aquifers are separated much more effectively by a silt and clay aquiclude, which is thick and aerially extensive. Consequently, water is interchanged much more readily between the shallow and intermediate aquifers than between the intermediate and deep aquifers. The characteristics and limits of the perched groundwater bodies, the three aquifers, their related water table and piezometric surfaces, and the nature of water level fluctuations in wells tapping these aquifers are described in the following sections.

Perched Groundwater Bodies

Lenses of perched groundwater are common in the Smithtown area, where they occur above relatively thick layers of impermeable glacial till, on clay of Pleistocene age, or on the top-Magothy unconformity where it occurs above the water table (note, the Magothy is not found above the water table in the Smithtown Site area). Perched water bodies have been tapped as much as 200 feet above the main water table; however, they commonly occur at shallow depths where yields are low and undependable.

Upper Glacial (Shallow) Aquifer

The shallow aquifer frequently includes saturated coarse outwash sands and gravels of the Upper Pleistocene glacial deposits, and also may include the upper part of the Magothy formation. Locally, saturated Mannetto gravel also may form part of the shallow aquifer. The aquifer extends as far north as the shores of Long Island Sound; the water table generally occurs at elevations at approximately 30 feet amsl at the site (Figure 3-11). Generally, the aquifer is under unconfined conditions and the upper limit of the aquifer is the water table. Water levels in shallow wells tapping the shallow aquifer fluctuate seasonably as much as eight feet, but the average range is between one and four feet. Average hydraulic conductivity within the Upper Glacial Deposits is 4.62×10^{-2} centimeters/second (cm/sec) (McClymonds and Franke 1972). Regionally, the lower boundary of the aquifer is marked, in places, by discontinuous clay beds or lenses, commonly within the upper Pleistocene deposits.

Two prominent mounds on the main water table divide of Long Island are present in the area. The western mound is located in the town of Huntington to the west of Smithtown; part of the eastern mound, marked by the 70 foot contour above msl, is found in southwest of Port Jefferson (Figure 3-11). Between these two mounds is a pronounced low or trough in the water table which coincides with the valley of the Nissequogue River. The groundwater mound to the southwest of the site is thought to be related to a low permeability deposit in the Magothy Formation, which constitutes the shallow aquifer in that area. Generally, between the eastern and western mounds, the water table slopes towards the Nissequogue River at 20 to 30 feet per mile. North of the eastern mound, the water table also slopes north towards the Sound.

Magothy (Intermediate) Aquifer

The underlying Magothy aquifer consists of Upper Cretaceous Magothy (and locally also may include Plio-Pleistocene) deposits down to the top of the confining clay unit of the Raritan Formation. Average hydraulic conductivity within the Magothy Formation is 1.85×10^{-2} cm/sec (McClymonds and Franke 1972). The aquifer occurs beneath the entire land area and possibly beneath the southern margin of the sound. The aquifer is wedge shaped, and thickens progressively towards the south and southeast. The top of the aquifer is irregular and may be marked by discontinuous clay bodies within the deposits of the Plio(?)-Pleistocene succession, Smithtown Clay Unit, or Magothy Formation. In the Port Jefferson area, the depth to the top of the Magothy intermediate aquifer varies between about 60 feet to almost 200 feet below msl. The lower limit of the aquifer, which coincides with the top of the underlying clay member of the Raritan Formation, ranges from 100 feet to more than 700 feet below msl. The depth of the lower surface of this aquifer at the LAI Site is more than 500 feet below msl. Water in the aquifer commonly is confined which is more pronounced in its deeper parts.

The morphology of the piezometric surface of the Magothy aquifer is a somewhat subdued expression of the water table (Lubke 1964). The aquifer's piezometric surface is commonly 5 to 25 feet lower than the water table. This relationship is reversed towards the north shore where the piezometric surface is from 5 to 10 feet higher than the water table (Lubke 1964; Koszalka 1984).

The Smithtown Clay unit acts as an effective aquiclude between the shallow and intermediate aquifers where it exists, causing pronounced differences in head observed in wells. An example, is well S41050 and well S40331 in Selden, three miles south of the LAI Site (Koszalka 1984). In 1980, the water level in S41050, screened above the clay layer, was at about 72 feet above msl; the water level in well S40331 screened below the clay was 62 feet above msl. The 10-foot difference is due to the perching effect of the clay, which in that area is 90 feet thick. Within the areas of the Site in which the Smithtown Clay may be absent, the outwash sands and gravels of the intermediate aquifer are likely to be unconfined and therefore possess similar hydraulic head as the overlying outwash sands and gravels of the shallow aquifer.

Seasonal fluctuations in the water levels noted within the intermediate aquifer due to seasonal changes commonly exhibit a lag of several months behind the water level changes recorded in the shallow unconfined aquifer.

Lloyd (Deep) Aquifer

The deep aquifer, which is coincident with the Lloyd sand member of the Raritan Formation, lies beneath the entire Site area. Locally, the overlying Raritan Clay member may have been removed by post-Cretaceous erosion, such that the sands and gravels of Pleistocene age are in direct hydraulic continuity with the Lloyd sands. Where the Raritan Clay member overlies the Lloyd, it acts as an extensive aquiclude which retards the vertical movement of water in and out of the deep aquifer. Where the Raritan is missing, clay bodies in the lower part of the Pleistocene sequence act as aquicludes, confining water in the deeper Pleistocene sand and gravel and hydraulically contiguous Lloyd. Of the three aquifers in the Port Jefferson area, the deep aquifer is hydraulically the most perfectly confined.

Owing to the sparsity of deep well data, piezometric surface contouring has not been possible in the Site's vicinity; however, mapping of the surface in the town of Huntington to the west shows that it slopes northwards and southwards from a maximum elevation of ±50 feet above msl. Comparison of this piezometric surface with that of the intermediate aquifer suggests that the piezometric divide of the deep aquifer lies about 2 to 2½ miles north of the piezometric divide of the intermediate aquifer. This condition apparently is a function of the asymmetry in cross-sectional profile of Long Island's groundwater reservoir. The elevation of the deep aquifer's head is below the intermediate aquifer in southern Huntington (approximately 10 miles west of Port Jefferson), but above it near the north shore. Fluctuation in artesian pressure in the deep aquifer generally follows the seasonal trends of the water table, particularly where the aquifer is more than 100 feet below the land surface.

Groundwater Recharge

All of the groundwater on Long Island is derived from precipitation. The volume of water that percolates down to the water table and recharges the aquifer reservoir is the residual of the total precipitation not returned to the atmosphere by evapotranspiration or lost to the sea by runoff. Owing to the permeable nature of the local surface soils and substrata and the generally gentle slope of the land surface, infiltration is high. In areas that are covered by impervious surfaces such as buildings and roads, surface runoff is directed to storm water recharge basins. The rate of natural recharge varies greatly from season to season and from year to year, depending on such factors as evapotranspiration, air and soil temperatures, soil-moisture conditions, and the nature and seasonal distribution of precipitation.

Natural replenishment of the intermediate and deeper aquifers is achieved by downward movement of water from the shallow aquifer through discontinuities in clayey and silty beds and by the slow movement of water through the aquicludes.

Where a downward head differential exists between the shallow and intermediate aquifers, generally delineated by the 60 foot above msl water table contour (Figure 3-11), downward movement of water from the shallow to the intermediate aquifer takes place (Lubke 1964). The area defined by the 60 foot water table contour is located about three miles south of the Site, and defines an area where the intermediate aquifer is being recharged.

Groundwater Flow

Groundwater moves both horizontally and vertically in the water table and Magothy aquifers from areas of high head to areas of low head along flow lines whose direction is normal to the contour lines (as presented in Figures 3-13 and 3-14, respectively). Shallow aquifer groundwater flows away from the major mound at the groundwater divide located approximately five miles south of Port Jefferson. In general, groundwater flows to the north towards Long Island Sound. In addition, the Port Jefferson Harbor surface waters cause groundwater to deviate from its northward flow path; locally, groundwater flows towards these areas of low topography and zero head. Figure 3-15 shows the predicted long term average flow field for the LAI site and vicinity within the shallow aquifer. The groundwater flow data were generated with CDM's DYNFLOW™ groundwater modeling software. The model predicts that groundwater flows generally in a north-northwest direction; however, strong local influences of flow direction towards the Port Jefferson Harbor are clearly indicated. As one might expect, the predicted flowpaths appear to be aligned normal to the topographic contours within the Site's vicinity (compare with Figure 3-2). Section 3.1.6.3 includes a detailed explanation of the CDM's groundwater modeling effort.

Groundwater flow in the intermediate aquifer generally is horizontal, as with the shallow aquifer; however, north of the 30 foot above msl piezometric contour north of the LAI site, there is commonly an upward head differential between the two aquifers causing an upward movement of groundwater, especially along the shores of the sound and its contiguous estuaries and inlets (i.e., the Port Jefferson Harbor).

Little data exist for the flow characteristics in the deep aquifer, although to the west of Port Jefferson there is a downward head differential between the intermediate and deep aquifers over much of the area south of the coast, with an upward head differential for the coastal margin and beneath southern Long Island Sound.

Calculations of the flow velocity within the groundwater reservoir were presented by Lubke (1964) and Franke and Cohen (1972). Typical natural flow velocities were calculated using representative values for permeability, natural hydraulic gradient, and porosity, and were as follows for each of the major water-bearing units, in feet per day:

Pleistocene deposits	0.8 - 1.1
Magothy Formation	0.4 - 0.6
Lloyd Sand member	0.3 - 0.5

Of note, pumping from wells can create cones of depression in which hydraulic gradients are substantial higher than the representative values shown above.

Groundwater Discharge
Groundwater discharges naturally from coastal springs and submarine seepage to the Sound. Discharging groundwater can also be lost through evapotranspiration in the vadose zone. Evapotranspiration and submarine seep discharges are substantial on Long Island; however, in the context of this investigation, the nature of springs that may discharge to the surface water bodies across the Site are of more significance with regard to potential impact to the population. In Old Mill Pond and Old Mill Creek the flow of individual springs has been observed generally to be less than 10 gallons per minute (gpm); however, aggregate discharge from such springs may amount to several million gallons a day for the area of the Site.

3.1.4 Climate

The Village of Port Jefferson Station is located on the northern coast of Long Island in southeastern New York, where the climate is temperate maritime. Climate is more influenced by the ocean than by the adjacent mainland. It is characterized by mild winters and relatively cool summers, and is free from sudden or extreme changes in temperature (Warren *et al.* 1968). The average annual temperature is about 51° F, the average January temperature is about 30° F, and the average July temperature is about 70° F. The maximum annual temperature is 95° F, and the minimum annual temperature is 0° F. The maximum and minimum observed temperatures are 102° F and -20° F. The growing season on Long Island is about 180-200 days, from the end of April to the end of October. During an average year, the percentage of possible sunshine ranges from about 50 percent in January to 65 percent in July and averages 62 percent during the growing season. The prevailing winds are from the west, shifting from the southwest in summer to the northwest in winter. Average wind speed is about 12 miles per hour.

Precipitation is the only source of freshwater for streams and groundwater in the Port Jefferson Station area. Average precipitation is about 45 inches per year (in/yr); included within this value is an average annual snowfall of 25-30 inches, most of which falls between December and March. The greatest number of snow storms occur during February.

CDM will obtain both historical and current climate data, including, but not limited to, temperature, precipitation, and wind speed and direction, from local meteorological stations. Climatic data will be collected during the course of the field investigation and will be incorporated in the RI report.

3.1.5 Population and Land Use

Based on the estimates of the resident population which was calculated during the 2000 Census, the population of the Village of Port Jefferson is estimated to be approximately 7,837. The LAI Site and its surrounding area is zoned industrial and residential. Immediately west of the LAI facility is a mulch manufacturing operation, "Chip-it-All". The areas to the north, northwest, and west of the site are zoned for residential and contain single family houses, vacant wooded area, and an apartment complex. The areas to the northeast and east of the site are zoned for industrial use but are currently vacant. The closest residence to the site is located approximately 1,000 feet north of the LAI facility.

The entire area is currently supplied with potable water from the Suffolk County Water Authority public water supply, which is derived from groundwater from the Magothy aquifer that is treated before use. The area previously relied on private wells as the primary water supply but the wells were abandoned when the SCDHS became aware the local groundwater contamination.

CDM will obtain additional up-to-date demographic data during the course of the investigation and will incorporate that data in the RI report.

3.1.6 Characteristics of Chemical Contaminants

During the early 1990s, SCDHS collected groundwater samples from newly-installed monitoring wells and surface water samples in areas downgradient of the LAI Site. These sampling activities were conducted to determine impacts to water quality as a result of documented releases of contaminants at the LAI facility.

As part of a Preliminary RI Report (CDM 2000), CDM collected limited subsurface soil and groundwater samples for analysis and compared these results with state regulatory cleanup guidelines. Access to the LAI Site was not provided during the CDM preliminary RI; no investigative samples were collected on the LAI Site, except for those collected along the New York State Highway Right-of-Way that cross-cuts the southeast corner of the property.

CDM (2000) presented analytical results for surface water samples collected by SCDHS from Old Mill Creek and Old Mill Pond located approximately one mile north (and hydraulically downgradient) of the LAI Site, in the of Village Port Jefferson. In 1999, groundwater samples were collected from three monitoring wells and one boring installed by CDM near the site. CDM also sampled two existing SCDHS wells hydraulically downgradient from the suspected source areas at the LAI Site (Figure 3-16). This limited investigation revealed that groundwater and surface water have been impacted by elevated concentrations of Volatile Organic Compounds (VOC); principally TCE, PCE, and/or their associated daughter products such as DCE. The following subsections summarize the data collected from the previous sampling events conducted by the SCDHS (Tables 3-1 and 3-2) and CDM during the Preliminary RI sampling activities (Tables 3-3 and 3-4).

3.1.6.1 Sources and Distribution of Contamination

The LAI site includes all areas hydraulically downgradient of the LAI facility that have been affected by contaminated groundwater and surface waters. The source of contamination at the LAI site is suspected to be derived from past improper waste handling and disposal activities at the Lawrence Aviation Industries property (Section

2-2). Documented releases of hazardous materials and wastes to onsite soils occurred during the 1970s and 1980s. Onsite source areas included a southwestern area previously-devoted to perforating liquid waste-containing drums, causing impact to bare soils; an uncontained leaching pool in the vicinity of the southwestern melt shop where chlorinate solvent-containing parts cleaning liquid wastes were routinely discharged; and an abandoned unlined earthen lagoon (the "North Lagoon") which received liquid wastes (Figure 3-17). Other potential contaminant sources identified onsite included piles of old (potentially PCB-containing) transformers that leaked to bare soils and a leaking underground acid rinse waste tank that contained liquid with a pH of 1.

Contaminants routinely released to the surface at the LAI facility impacted surface and subsurface soils; some contamination also likely migrated vertically down through the vadose zone until it intercepted groundwater at the water table, at an estimated depth of approximately 140-190 feet bgs. The predominant north-northwest groundwater flow would have promoted the migration of dissolved VOCs beyond the LAI Site into an area served by a number of residential supply wells and areas where surface water bodies received recharge from the water table aquifer.

The depth to which the underlying aquifer system has been affected from site contaminants currently is unknown and is dependent upon the quantities and concentrations of released VOCs as well as the characteristics of the underlying stratigraphy. Contamination has been detected in groundwater to depths of approximately 80 feet below the water table at PJ-7, located 2,000 feet northwest of the site, and to over 100 feet below the watertable in PJ-10, located in the vicinity of Old Mill Pond. It is possible that chlorinated solvents migrated down to the water table at concentrations exceeding one percent of their aqueous solubility (e.g., 1.1 grams/liter (g/L) for TCE). If the quantity of solvent reaching the water table was sufficient, some of the solvent would remain in an undissolved state as a dense non-aqueous phase liquid (DNAPL) and, since chlorinated solvents are denser than water, they would continue to move downward under the influence of gravity. DNAPL would continue to sink until it encountered a lower permeability zone which would retard or stop the downward migration. DNAPL could pool or accumulate on top of a lower permeability zone and remain stationary or move in the down-slope direction on top of the lower permeability zone. If sufficient DNAPL was pooled or trapped in the aquifer, it would act as a continual source of dissolved groundwater contamination. Movement of DNAPL in the saturated zone can be very complex, with movement controlled by the permeability of subsurface stratigraphic units, the shape and configuration of lower permeability zones, and/or the dip of bedding planes. None of the available groundwater data have indicated the presence of DNAPL; however, none of the CDM monitoring wells or SCDHS wells sampled were installed within the suspected source area(s).

3.1.6.2 Chemical Characteristics of Soil

SCDHS site inspections during the 1970s and 1980s observed the discharge of liquid wastes directly onto soils or into unlined lagoons (Figure 3-17). Samples of impacted soils were not collected by SCDHS for laboratory analysis; however, the concentrations of contaminants in the liquid waste samples analyzed suggest soils were significantly impacted. In 1980, for example, discharge to soil of TCE from perforated drums ranged from 1,600,000 micrograms/liter (ug/L) to pure TCE. SCDHS collected samples of liquids discharged to the leaching pool area (near the melt shop) that contained copper (up to 1.3 milligrams/liter [mg/L]), fluoride (up to 10 mg/L), lead (up to 0.4 mg/L), PCE (at up to 96,000 ug/L), TCE (up to 22,000 ug/L), and xylene (up to 15 ug/L). Between 1970 to 1972, discharges to the former onsite surface impoundments contained up to 0.46 mg/L of hexavalent chromium, 36.3 mg/L of fluoride (as fluorine), 52 mg/L of nitrates, and 8 ug/L of TCE.

With the exception of limited soil sampling conducted by CDM in 1999, soil samples have not been collected onsite due to access restrictions; therefore, current soil conditions in the potential source areas have not been characterized.

CDM gained access to the LAI Site along a New York State Right of Way on the southeastern portion of the property (Figure 1-2). Subsurface soil samples were collected and analyzed from two shallow (geoprobe) boring locations: GP23D and GP24D; and one deep soil boring: B-3 (CDM 2000). The two geoprobe borings were completed in the vicinity of deep boring B-3, in an area where drum crushing was previously documented. Soil samples for laboratory analysis were collected from three to four feet bgs in GP23D and GP24D; samples also were collected from four to six and 188-190 feet bgs at soil boring B-3. The analytical results of these samples are summarized in Table 3-3.

Very few detectable organic compound concentrations were above method detection limits for any location or depth. Small concentrations of acetone were detected but may have been associated with laboratory procedures. Concentrations of DCE and 1,2-dichloroethene in GP23D were well below the NYSDEC Recommended Soil Cleanup Guidelines. Trace concentrations of Target Compound List (TCL) pesticides were detected in the three shallow samples, but none were above the state cleanup criteria. Metals commonly were detected in the samples but were below state soil cleanup criteria.

3.1.6.3 Chemical Characteristics of Groundwater

SCDHS Groundwater Investigation

During the 1970s, 1980s, and 1990s, Brookhaven Department of Environmental Protection, SCDHS, and NYSDEC collected potable water samples from residential supply wells downgradient of the LAI Site. Approximately 20 contained chlorinated solvents with concentrations of TCE ranging from less than 1 ug/L to 910 ug/L and PCE at concentrations from 0.6 ug/L to 6 ug/L (EPA 1999). Breakdown products of TCE also were detected in the samples. All private wells affected by VOC contamination were replaced by public water supply. In 1998, the New York State Department of Health Services (NYSDOH) indicated the suspected source of the VOC contamination was the LAI facility.

In response to the detection of elevated chlorinated solvents in residential well water, SCDHS installed 12 monitoring wells downgradient of the LAI facility during the early 1990s (Figure 3-16). At each well location (named PJ-1 through PJ-12), prior to installing the well screen, discrete vertical profile screening samples were collected at regular intervals from approximately every 10 feet below the water table to the bottom of each boring. Screening samples were collected at depths ranging down to 22 feet below the water table at PJ-6 and to 103 feet below the water table at PJ-10. Groundwater samples were analyzed for TCE by a laboratory. PJ-6, located immediately north of the LAI facility, is the deepest of the 12 wells (210 feet bgs) but is located at the highest elevation (210 feet amsl). PJ-10 is located near Old Mill Pond, at the lowest elevation (10 feet amsl). Generally, owing to the limitations on drilling through the glacial deposits, more samples were collected from wells located at lower elevations, where the water table is shallower (in the Village of Port Jefferson) compared with those located nearer the LAI facility. The results of the vertical profile screening sampling are presented in Table 3-1 and are discussed below.

Screening samples collected from PJ-1, PJ-2, PJ-3, and PJ-4, all located more than 2,000 feet west northwest from the LAI facility, were sampled down to approximately 65 feet below the water table and did not contain detectable levels of TCE. None of the groundwater samples collected from PJ-5, located about 1,000 feet northwest of the LAI facility, had detections of TCE; four screening samples were collected at depths down to 67 feet below the water table. PJ-7, located about 2,000 feet northwest of the LAI facility, contained 130 ug/L of TCE, 3 ug/L of PCE, 5 ug/L of DCE, and 4.8 mg/L of fluoride at 64 feet below the water table (26 feet below msl). PJ-11, located a further 2,000 feet northwest of PJ-7, was contaminated with low concentrations of TCE (less than 6 ug/L) down to 42 feet below the water table (15 feet below msl). The remaining well located nearest the LAI facility, PJ-6, did not contain TCE in samples collected down to 22 feet below the static water level. This well is located approximately 500 feet north of LAI.

With the exception of PJ-12 (located midway between LAI and Old Mill Pond), the remainder of the vertical screening samples collected from PJ-8, PJ-9, and PJ-10 (all located near Old Mill Pond) were impacted with elevated concentrations of TCE (Table 3-1). The highest TCE concentrations were found in PJ-8, located immediately upgradient of Old Mill Pond; 2,600 ug/L of TCE were detected from a sample collected at 89 feet below the water table (an elevation of 75 feet below msl). PJ-10, located immediately downgradient of PJ-8, also was significantly contaminated with TCE with concentrations above 1,000 ug/L at depths between 63 and 95 feet below the water table (58 - 90 feet below msl). In general, concentrations of TCE increased with depth. Samples collected from PJ-12, located midway between PJ-11 and the Old Mill Pond, did not contain TCE; however, samples were collected only down to 29 feet below the water table (5 feet below msl).

The SCDHS PJ-well results suggest that TCE contamination is found within the upper portion of the Upper Glacial aquifer immediately downgradient of the LAI facility in the vicinity of PJ-7 and between PJ-5 and PJ-6. The geometry(width, depth, concentration profile) of the VOC plume cannot be assessed with only one data point, well PJ-7. TCE concentrations at PJ-7 appeared to increase with depth, suggesting the full profile of the plume had not been penetrated during sampling. In samples further downgradient (e.g., PJ-11, PJ-8, PJ-9, and PJ-10) the TCE contamination detected along with other marker compounds such as fluoride, indicate the LAI facility is likely the source. In the Village of Port Jefferson, significant groundwater contamination was detected at almost all sampling depths from the water table down to almost 100 feet below the top of the aquifer. This could suggest:

- There is a vertical component of groundwater flow in the harbor area carrying the contaminant plume upwards towards the water table (discharging to surface waters).

- A low permeability zone that subcrops the site controls the horizontal gravity-driven (down-dip) movement of TCE DNAPL from the LAI source to the harbor area where Quaternary coastal erosion had brought the low permeability zone closer to ground surface (as discussed in Section 3.1.6.1).

- The distribution of observed site-derived contamination is a combination of both of the above groundwater contaminant movement scenarios.

CDM Groundwater Investigation

From 1997 to 2000, CDM conducted two rounds of groundwater sampling from the newly-installed groundwater wells (MW-1, MW-4, and MW-5), and one round of sampling from SCDHS monitoring wells (PJ-6 and PJ-11) and hydro punch groundwater sampling from boring B-3 (CDM 2000; Figure 3-16 and Figure 3-17). CDM compared the groundwater sample results with the NYSDEC Recommended Cleanup Guidelines, Standard for Groundwater, dated 1998 (Table 3-4).

Analysis of the groundwater samples collected from the background monitoring well (MW-1) did not reveal detectable concentrations of organic compounds. MW-1, located immediately upgradient (south) of the LAI facility, was screened at 131 to 146 feet bgs; depth to water was reported to be approximately 139 feet bgs. Sporadic metals (iron, manganese, and sodium) were detected at concentrations above the NYSDEC Recommended Cleanup Guidelines, Standard for Groundwater.

MW-4, located immediately west of the LAI facility, was screened between 163 and 178 feet bgs; the depth to water was approximately 163 feet bgs. Groundwater samples collected from MW-4 in 1997 and 2000 contained elevated levels of TCE (280 ug/L and 794 ug/L, respectively); PCE (27 ug/L and 132 ug/L, respectively); DCE (13 ug/L in 2000 only); and xylenes (total) (10 ug/L in 2000 only). This well is located immediately offsite and directly downgradient (north) of the former lagoons and drum storage area on the LAI Site.

The hydropunch groundwater sample collected from boring B-3, located in the New York State Right of Way on the southeastern portion of the property, was from 188 to 190 feet bgs; the water table was encountered at approximately 140 feet bgs. This sample indicated the presence of TCE (200 ug/L) and PCE (10 ug/L) at levels that exceeded the State screening criterion.

MW-5 and PJ-6 are located close to the northwest perimeter of the LAI Site. PJ-11 is located approximately 2,000 feet further downgradient (north) of the LAI Site. MW-5 was screened between 180 and 195 feet bgs, the depth to water was approximately 180 feet bgs; PJ-6 was screened between 205 and 210 feet bgs, the depth to water was approximately 187 feet bgs; and PJ-11 was screened between 151 and 156 feet bgs, the depth to water was approximately 143 feet bgs.

VOCs were not detected within wells MW-5, PJ-6, and PJ-11. Semivolatile organic compounds (SVOCs) and PCBs were not detected in the groundwater samples; the only pesticide detected in groundwater samples was beta-BHC in well PJ-6, slightly above the state screening criteria.

Target Analyte List (TAL) metals were detected above the State screening criteria in all wells except MW-4. Iron and manganese exceeded the screening criteria in background well MW-1. Samples from MW-5 and B-3 showed slightly elevated concentrations of iron. The highest inorganic exceedances were observed in downgradient wells PJ-6 and PJ-11; iron was detected at 170 and 550 times above the screening criterion, respectively; and 6 and 19 times above the screening criterion for zinc, respectively. PJ-6 also contained elevated concentrations of copper, lead, and manganese; PJ-11 contained elevated concentrations of cadmium, chromium, lead (each at 25 times above the screening criteria); manganese and thallium (at 12 times above the screening criteria).

Other inorganic groundwater quality parameters were analyzed in a 1997 sampling event, including hexavalent chromium, fluoride, and nitrate (Table 3-4-e). The results of these analyses indicated no exceedances in the background well MW-1; however, MW-4 had elevated concentrations of fluoride and nitrate. In 2000, all six groundwater locations were sampled for fluoride only. These results indicated that only MW-4 was impacted by elevated levels of fluoride at 15 mg/L; almost 4 times the screening criterion of 4 mg/L.

Fluoride may have been discharged to groundwater from the LAI facility (as hydrofluoric acid) and may act as a tracer or marker contaminant linking downgradient groundwater contamination to the LAI facility. LAI is the only major industrial facility in the area that uses fluoride (in the form of hydrofluoric acid) To establish whether the LAI site can be linked directly to the observed downgradient groundwater plume, further groundwater analyses for fluoride will be necessary to support a groundwater contaminant source evaluation.

CDM Groundwater Modeling

The areal extent of groundwater contamination in wells across the site suggests that the LAI facility is the hydraulically upgradient source for the discharge of VOCs to the subsurface. CDM's DYNPLOT™ groundwater modeling software was utilized to

determine the potential origin of observed contamination in downgradient wells (CDM 2000). Modeled groundwater forward particle tracking of contaminants detected in well samples with VOC detections are shown on Figure 3-18.

Particle forward tracking is performed to identify potential migration pathways of contamination. Particles are entered into the system at known locations, such as potential onsite source areas, and run forwards in time. The particles are advected through the system without dispersion until a boundary node is encountered, or the particle reaches the phreatic surface. Using DYNPLOT, the particle "tracks" can be plotted, showing the location at the start of simulation (denoted by a square), the path and time of travel for a defined period, and ending location of the particle (denoted by an asterisk). Particle tracks are simulated using advection. They do not account for dispersion, retardation, or decay.

The simulated particle tracks shown in Figure 3-18 suggest that groundwater contamination observed in downgradient wells may have separate sources, originating from at least four hydraulically upgradient locations on the LAI Site. Using available local pumping and recharge (precipitation) data, each simulation was run in series to develop a transient contaminant transport model for the period 1963 through 1996. The year 1963 was estimated as the earliest potential source release and was used as the starting date for the four contaminant simulations.

Figure 3-18a presents a simulated release of contaminants within the southwest corner of the LAI Site, an area that includes a majority of the facility's operations areas and likely would account for a number of potential sources (CDM 2000). SCDHS monitoring wells are included; those with historical detections of VOCs (labeled in red) and those with no evidence of contamination (labeled in blue). A north-south cross section was constructed as a result of CDM's investigation showing the possible vertical distribution of the modeled plume (Figure 3-19). This plume simulation coincides with all of the monitoring wells showing evidence of VOC contamination. In addition, this plume simulation discharges to Old Mill Pond (east of PJ-10) where significant surface water contamination was measured (as described below). The plume does not appear to intersect any wells found to be free of VOCs. For example, well S-44309, is a "clean" well that is screened just above the simulated plume depth.

As part of the CDM plume simulation, particles migrate along the top of the Smithtown Clay in the Upper Glacial aquifer. Particles also appear to migrate vertically downward through the clay and then horizontally across the top of the Magothy formation before discharging to Old Mill Pond, Old Mill Creek, and the harbor. The equipotential lines shown in Figure 3-19 illustrate the downward gradient that exists at, and south of well S-44309, and the change to an upward gradient approaching the harbor.

A second potential source area was investigated by CDM by simulating a source area at the southeast corner of the LAI Site (Figure 3-18b). Under this scenario, the resultant plume does not account for VOC detections at wells PJ-7, PJ-11, PVWS (private well supply) 5-7, and PVWS 1-4. The plume also passes through PJ-6, a well that has not shown evidence of VOC contamination. An evaluation of a plume migrating from a potential source located at the northeast corner of the LAI Site, shown in Figure 3-18c, shows no correlation with downgradient impacted wells.

The likelihood of contaminants originating from the drum staging area was investigated (Figure 3-18d). It is located immediately southeast of the facility buildings. Simulated particles were released to the subsurface beginning in 1980, the year it is thought that this area was first used for drum handling, and allowed to migrate through simulated time to 1996. Contamination originating from this location would not account for detections in wells PJ-7, PJ-11, or PVWS 5-7, but could account for VOC impacts to PVWS 1-4, PJ-8, PJ-9, and PJ-10.

Based on the results of these simulations, CDM concluded that the southwest corner of the site is the likely source area for groundwater contamination observed in downgradient monitoring wells. The model predicted contaminant migration occurs in the Upper Glacial and Magothy aquifers to depths as much as 190 feet below the water table.

3.1.6.4 Chemical Characteristics of Surface Water

Surface water samples were collected by the SCDHS from Old Mill Pond and Old Mill Creek directly downgradient from the LAI site during 1991, 1992, and 1998. Surface water samples were collected at six locations during the 1991/92 sampling event (Figure 3-20) and two locations in 1998. The 1991/1992 locations included one from the pond and five along the stream; one of the 1998 samples was collected east of Brook Road (near the pond) and the other 1998 sample was collected from the stream west of Barnum Road. Samples were analyzed for VOCs and other water quality parameters including pH, fluoride, and nitrates.

TCE was present in all samples collected from the stream (Table 3-2). TCE was detected from 310 to 1,200 ug/L. At sampling location SPJ-1, the most upstream sampling point, and SPJ-3, located at the pond spillway, TCE was detected at 1,200 ug/L in 1992. Concentrations of TCE in 1998 were still as high as 550 ug/L near the pond. The NYSDEC Ambient Water Quality Standards for Human Health for surface waters for TCE is 5 ug/L. PCE, DCE, and several other VOCs were also detected, although at lower concentrations.

Fluoride also was detected within the pond and stream, with concentrations less than 1 mg/L in all samples. Fluoride could act as a tracer for contamination from the LAI site since it is the only major industrial user of fluoride in the area. CDM (2000) recommended that future sampling efforts within the tidal portion of the stream should occur during low tide to ensure recharge from groundwater is greatest (refer to Section 5.3.5 for the planned RI sampling activities with the pond and stream).

3.1.6.5 Summary Of Sources and Chemical Characteristics

Poor waste management practices and the disposal of chlorinated solvents and other chemicals at a number of suspected contaminant source areas on the LAI Site between approximately 1963 and the present likely were responsible for introducing contamination to the subsurface and Upper Glacial aquifer downgradient (north-northwest) of the LAI facility. High levels of contamination have been detected within the discharged wastes at the LAI facility, particularly chlorinate solvents.

Potable well sampling carried out from the 1970s to 1990s showed that a number of residential water wells had been impacted by elevated concentrations of TCE. In addition, the discharge of contaminated groundwater to downgradient surface water bodies is indicated from highly contaminated water samples collected from an unnamed downgradient stream and pond within the Village of Port Jefferson. Contaminated groundwater also likely discharges to Port Jefferson Harbor. The impact to groundwater is a site-wide phenomenon. The hydraulic properties of the Upper Glacial aquifer are known to promote rapid migration of contaminants.

3.1.7 Site Conceptual Model

Physical Setting with Respect to Groundwater Movement

The LAI site is located within the Atlantic Coastal Plain Physiographic Province. The geology of Long Island is characterized by a southeastward-thickening wedge of unconsolidated sediments unconformably overlying a gently-dipping basement bedrock surface. The sedimentary wedge in the vicinity of the LAI site thickens from about 800 feet in Port Jefferson Harbor at the northern edge of the site to approximately 1,000 feet thick just south of the LAI Site. Major sedimentary units include, from oldest to youngest, the Raritan Formation (which includes the Lloyd aquifer and overlying Raritan Clay), the Magothy Formation, and glacial deposits. Locally, five major hydrogeologic units have been identified beneath the Site, from oldest to youngest: consolidated bedrock, the Lloyd aquifer, the Raritan confining unit, the Magothy aquifer, and the Upper Glacial aquifer.

At the LAI site, all water supply wells downgradient of LAI are screened in either the Upper Glacial or Magothy aquifers. The Magothy (confined) aquifer is approximately 500 feet thick and consists of interbedded sands, clayey sands, sandy clay, silts, and gravel. The Upper Glacial (water table) aquifer unconformably overlies the Magothy and consists of a complex succession of glacial outwash deposits, glacio-lacustrine clays, at least one and possibly two sheets of glacial till, possibly reworked Magothy deposits, and other ice contact deposits within the Harbor Hill moraine. The water table ranges from less than five feet bgs at Old Mill Pond in the Village of Port Jefferson to 180 feet bgs (40 feet amsl) beneath the LAI Site.

Groundwater flow is to the north-northwest, toward the north shore of Long Island. Horizontal flow velocities in the unconfined water table aquifer are about 1.0 ft/d (McClymonds and Franke 1972). The potentiometric surface of the Magothy aquifer in the site's vicinity is similar to that of the water table in the Upper Glacial aquifer when pumping wells are off, but heads in the Magothy are generally several feet lower than the water table. Groundwater flow in the Magothy aquifer generally is horizontal, as with the shallow aquifer. Although north of the 30 foot amsl piezometric contour there is commonly an upward head differential between the two aquifers causing an upward movement of groundwater, especially along the shores of the sound and its contiguous estuaries and inlets (i.e., the Port Jefferson Harbor). Average horizontal flow rates for the Magothy are about 0.3 ft/d (Eckhardt and Pearsall 1989).

All of the groundwater on Long Island is derived from precipitation. The volume of water that percolates down to the water table and recharges the reservoir is the residual of the total precipitation not returned to the atmosphere by evapotranspiration or lost to the sea by runoff. The sandy nature of the surface and subsurface soils results in a high rate of infiltration. At the LAI facility, which is mostly covered by impervious surfaces such as buildings, paved parking lots, and roads, surface runoff is directed to dry wells or the nearby recharge basins. Natural replenishment of the Magothy aquifer is achieved by downward movement of water from the shallow aquifer through the sandy layers.

Potential Contaminant Sources to Groundwater
From 1951, the Lawrence Aviation Industries, Inc. facility's main product has been titanium sheet metal for use in the aviation industry; the facility comprises a number of buildings housing manufacturing/process areas and maintenance and repair shops. The wastes generated from these operations include fluoride compounds, sludges, caustic acids, halogenated solvents, and spent lubricating oils. Past disposal practices and releases at the LAI facility from leaking drums have resulted in numerous violations cited by both the SCDHS and the NYSDEC. Numerous discharges from various plant activities to the ground's surface and two unlined lagoons also were observed by SCDHS. In 1980, LAI, in an effort to clean up the facility, crushed more than 1,600 drums that were located on their property. As the drums were crushed, their liquid contents were allowed to spill onto unprotected soil. The drums contained TCE, PCE, spent acid sump sludges, salt wastes, hydraulic oils, hydrofluoric acid, nitric acids, and other plant wastes.

Expected Transport and Fate of Site Contaminants
Liquid chlorinated solvents discharged directly to the ground surface would be expected to migrate downward through the unsaturated zone in a relatively linear pattern, with minimal dispersion from the discharge location (Figure 3-21). The unsaturated zone at the LAI site is primarily sandy material, so complex migration pathways along lower permeability zones is not expected. The unsaturated zone is approximately 140-190 feet thick across the site source area.

Once liquid chlorinated solvent (TCE and PCE) encounters the water table, some of the solvent will become dissolved in the groundwater and begin to move in the direction of groundwater flow. If the quantity of solvent reaching the water table is sufficient, some of the solvent will remain in an undissolved state as a DNAPL and, since TCE and PCE are denser than water, the solvent will continue to move downward under the influence of gravity. DNAPL will continue to sink until it encounters a lower permeability zone, which would slow or stop the downward migration. DNAPL could pool or accumulate on top of a lower permeability zone and remain stationary or move in the down-slope direction of the lower permeability zone. If sufficient DNAPL is pooled or trapped in the aquifer, it will act as a continual source of dissolved groundwater contamination. Movement of DNAPL in the saturated zone can be very complex, with movement controlled by the permeability of subsurface stratigraphic units, the shape and configuration of lower permeability zones, and/or the dip of bedding planes.

Chlorinated solvents such as TCE and PCE in a dissolved phase move with the groundwater flow, but generally at a slower rate than groundwater. If disposal of TCE and/or PCE at the LAI facility is assumed to have begun in 1963, at an estimated flow rate of 1 ft/d for the Upper Glacial and 0.3 ft/d for the Magothy, in 38 years contaminated groundwater would have migrated about 14,000 feet or 2.5 miles in the Upper Glacial and about 4,200 feet or about 0.8 mile in the Magothy. However, pumping of the public supply wells located one mile north of LAI probably accelerated the movement of contaminants by altering the natural movement of groundwater.

Natural attenuation of chlorinated solvents is a documented process, with PCE and TCE breaking down through a known decay chain of compounds. Some of these daughter compounds (e.g., DCE) have been detected within the LAI Site plume, so natural attenuation processes appear to be occurring in the groundwater. An assessment of natural attenuation potential will be conducted as part of the RI/FS.

Past disposal of strong acids likely would have mobilized metals released to the surface soil at the LAI facility, accelerating their downwards migration towards the water table. However, the great depth of the water table beneath the property and the flushing action of rainwater infiltration likely would dilute the acidic solutes and immobilize most of the metal salts within the vadose zone. The depth at which metal salts have been precipitated beneath the source areas is unknown.

3.2 Preliminary Identification of Applicable or Relevant and Appropriate Requirements

This section provides a preliminary determination of the regulations that are applicable or relevant and appropriate to remediation of the various media at the site. Both federal and state environmental and public health requirements are considered. In addition, this section presents an identification of federal and state criteria, advisories, and guidance that could be used for evaluating remedial alternatives. Only those regulations that are considered to be relevant to the site are presented.

3.2.1 Definition of ARARs

The legal requirements that are relevant to the remediation of the Site are identified and discussed using the framework and terminology of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). These acts specify that Superfund remedial actions must comply with the requirements and standards of both federal and state environmental laws.

The EPA defines applicable requirements as "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site". An applicable requirement must directly and fully address the situation at the Site.

The EPA defines relevant and appropriate requirements as "those cleanup standards, standards of control, or other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site".

Remedial actions must comply with state ARARs that are more stringent than federal ARARs. State ARARs are also used in the absence of a federal ARAR, or where a state ARAR is broader in scope than the federal ARAR. In order to qualify as an ARAR, state requirements must be promulgated and identified in a timely manner. Furthermore, for a state requirement to be a potential ARAR it must be applicable to all remedial situations described in the requirement, not just CERCLA sites.

ARARs are not currently available for every chemical, location, or action that may be encountered. For example, there are currently no ARARs which specify clean-up levels for sediments. When ARARs are not available, remediation goals may be based upon other federal or state criteria, advisories and guidance, or local ordinances. In the development of remedial action alternatives the information derived from these sources is termed "To Be Considered" and the resulting requirements are referred to as TBCs. EPA guidance allows clean-up goals to be based upon non-promulgated criteria and advisories such as reference doses when ARARs do not exist, or when an ARAR alone would not be sufficiently protective in the given circumstance.

By contrast, there are six conditions under which compliance with ARARs may be waived. Remedial actions performed under Superfund authority must comply with ARARS except in the following circumstances: (1) the remedial action is an interim measure or a portion of the total remedy which will attain the standard upon completion; (2) compliance with the requirement could result in greater risk to human health and the environment than alternative options; (3) compliance is technically impractical from an engineering perspective; (4) the remedial action will attain an equivalent standard of performance; (5) the requirement has been promulgated by the state, but has not been consistently applied in similar circumstances; or (6) the remedial action would disrupt fund balancing.

ARARs and TBCs are classified as chemical, action, or location specific. Descriptions of these classifications are provided below:

- Chemical-specific ARARs or TBCs are usually health or risk-based numerical values, or methodologies which when applied to site specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

- Location-specific ARARs or TBCs generally are restrictions imposed when remedial activities are performed in an environmentally sensitive area or special location. Some examples of special locations include flood plains, wetlands, historic places, and sensitive ecosystems or habitats.

- Action-specific ARARs or TBCs are restrictions placed on particular treatment or disposal technologies. Examples of action-specific ARARs are effluent discharge limits and hazardous waste manifest requirements.

3.2.2 Preliminary Identification of ARARs and TBCs

The identification of ARARs occurs at various points during the RI/FS and throughout the remedial process. ARARs are used to determine the extent of cleanup, to scope and formulate remedial action alternatives, and to govern the implementation of the selected alternative.

The following are preliminary ARARs that may impact the selection of remedial alternatives for various environmental media at the Site. This preliminary list of ARARs is based on current site knowledge and will be reviewed and updated during the RI/FS processes. Periodic review of the preliminary list of ARARs will assure that the ARARs remain applicable, as more site-specific information becomes available, and as new or revised ARARs are established.

3.2.2.1 Chemical-Specific ARARs

The determination of potential chemical-specific ARARs and TBCs for a site typically follows an examination of the nature and extent of contamination, potential migration pathways and release mechanisms for site contaminants, the presence of human receptor populations, and the likelihood that exposure to site contaminants will occur. Previous investigations have identified contamination of groundwater, soil, sediment, and surface water with mercury and contamination of soil and sediment with PCBs. The potential chemical-specific Federal and state ARARs for the Site are as follows:

Federal:

- Resource Conservation and Recovery Act (RCRA) Groundwater Protection Standards and Maximum Concentration Limits (40 CFR 264, Subpart F)

- Clean Water Act, Water Quality Criteria (Section 304) (May 1, 1987 - Gold Book)

- Safe Drinking Water Act, Maximum Contaminant Levels (MCLs) (40 CFR 141.11-.16)

New York:
- New York Ground Water Quality Regulations (6 NYCRR Part 703)

- New York State Department of Health, State Sanitary Code, Drinking Water Supply (10 NYCRR Part 5.1)

- New York Surface Water Quality Standards (6 NYCRR Part 702)

- New York Water Supply Sources (10 NYCRR Part 170)

- New York Pollution Discharge Elimination Systems (6 NYCRR Part 750-758)

- NYSDOH, Criteria for the development of health advisories for sport fish consumption

- New York Technical and Operations Guidance Series (TOGS), Ambient Water Quality Standards and Guidance Values (April 1, 1987)

3.2.2.2 Location-Specific ARARs

The location of the Site is a fundamental determinant of its impact of human health and the environment. Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in a specific location (EPA 1988). Some examples of these unique locations include: flood plains, wetlands, historic places, and sensitive ecosystems or habitats. The potentially applicable Federal and state location-specific ARARs for the Site are as follows:

Federal:
(Generally, 50 CFR Parts and 402)
- Executive Order on Wetlands Protection (CERCLA Wetlands Assessments) No. 11990.

- National Historic Preservation Act (16 USC 470) Section 106 *et seq*. (36 CFR 800)

- RCRA Location Requirements for 100-year Flood plains (40 CFR 264.18(b)).

- Fish and Wildlife Coordination Act (16 USC 661 *et seq*.)

- Wetlands Construction and Management Procedures (40 CFR 6, Appendix A)

- The Coastal Zone Management Act

- Executive Order 11988, "Floodplain Management"

- Executive Order 11990, "Protection of Wetlands"
- 1985 Statement of Policy on Floodplains/Wetlands Assessments for CERCLA Actions
- National Historic Preservation Act

New York:
- New York Use and Protection of Waters (6 NYCRR Part 608)
- Freshwater Wetlands (6 NYCRR Part 662-665)
- Endangered and Threatened Species of Fish and Wildlife (6 NYCRR Part 182)
- Freshwater Wetlands Act (ECL article 24 and 71, Title 23)
- Flood Plain Management Regulations - development permits (6 NYCRR 500 ECL article 36)

3.2.2.3 Action-Specific ARARs
Based on the identification of remedial response objectives and applicable general response actions, numerous federally promulgated action-specific ARARs and TBCs will affect the implementation of remedial measures and include administrative requirements related to treatment, storage and disposal actions.

The primary federal requirements which guide remediation are those established under CERCLA, as amended by SARA. The National Contingency Plan (NCP) incorporates the SARA Title III requirement that alternatives must satisfy ARARs and utilize technologies that will provide a permanent reduction in the toxicity, mobility or volume of wastes, to the extent practicable.

RCRA establishes both administrative (e.g., permitting, manifesting) requirements and substantive (i.e., design and operation) requirements for remedial actions. For all CERCLA actions conducted entirely onsite, only the substantive requirements apply. NYSDEC has promulgated several regulations relating to alternatives which involve the treatment, storage, disposal, or transportation of hazardous wastes including the NYSDEC Hazardous Waste Management and Facility Regulations. Portions of the NYSDEC hazardous waste regulations are more stringent than the federal counterparts. The potentially applicable Federal and state Action-Specific ARARs are as follows:

Federal:
- RCRA Subtitle C Hazardous Waste Treatment Facility Design and Operating Standards for Treatment and Disposal Systems, (i.e., landfill, incinerators, tanks, containers, etc.)(40 CFR 264 and 265) (Minimum Technology Requirements)

- RCRA Subtitle C Closure and Post-Closure Standards (40 CFR 264, Subpart G)
- RCRA Ground Water Monitoring and Protection Standards (40 CFR 264, Subpart F)
- RCRA Manifesting, Transport and Recordkeeping Requirements (40 CFR 262)
- RCRA Wastewater Treatment System Standards (40 CFR 264, Subpart X)
- RCRA Storage Requirements (40 CFR 264; 40 CFR 265, Subparts I and J)
- RCRA Subtitle D Nonhazardous Waste Management Standards (40 CFR 257)
- Off-Site Transport of Hazardous Waste (EPA OSWER Directive 9834.11)
- RCRA Excavation and Fugitive Dust Requirements (40 CFR 264.251 and 264.254)
- RCRA Land Disposal Restrictions (40 CFR 268) (On- and off-site disposal of excavated soil)
- Toxic Substances Control Act (TSCA)(40 CFR 761)
- Clean Water Act - NPDES Permitting Requirements for Discharge of Treatment System Effluent (40 CFR 122-125)
- Clean Water Act Discharge to Publicly Owned Treatment Works (POTW) (40 CFR 403)
- National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR 61)
- DOT Rules for Hazardous Materials Transport (49 CFR 107,171.1-171.500)
- Occupational Safety and Health Standards for Hazardous Responses and General Construction Activities (29 CFR 1904,1910,1926)
- Fish and Wildlife Coordination Act (16 UC 661 et seq.). (Requires actions to protect fish or wildlife when diverting, channeling or modifying a stream).
- National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50)

New York:

- New York State Solid Waste Management Facilities (6 NYCRR Part 360)

- New York State Waste Transporter Permits (6 NYCRR Part 364)
- New York State Hazardous Waste Management System (6 NYCRR Part 370)
- New York State Identification and Listing of Hazardous Wastes (6 NYCRR Part 371)
- New York State Hazardous Waste Manifest System and related Standards for Generators, Transporters and Facilities (6 NYCRR Part 372)
- New York State Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements (6 NYCRR Part 373-1)
- New York State Final Status Standard for Owners and Operators of Hazardous Waste TSD Facilities (6 NYCRR Part 373-2)
- New York State Interim Status Standards for Owners and Operators of Hazardous Waste Facilities (6 NYCRR Part 373-3)
- New York State Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Management Facilities (6 NYCRR Part 374)
- New York State Inactive Hazardous Waste Disposal Sites (6 NYCRR Part 375)
- New York State Uniform Procedures (6 NYCRR Part 621)
- Implementation of NPDES Program in NYS (6 NYCRR Part 750-757)
- Division of Air, General Provisions (6 NYCRR Part 200)
- Air Permits and Certifications (6 NYCRR Part 201)
- General Prohibitions (6 NYCRR Part 211)
- General Process Emission Sources (6 NYCRR Part 212)
- New York Water Pollution Control Regulations (6 NYCRR Parts 608,610-614).

3.2.2.4 To Be Considered (TBCs)

When ARARs do not exist for a particular chemical or remedial activity, other criteria, advisories and guidance (TBCs) may be useful in designing and selecting a remedial alternative. The following criteria, advisories and guidance were developed by EPA, other federal agencies and state agencies. The potentially applicable Federal and state TBCs are as follows:

Federal TBCs (Action, Location, and Chemical-Specific):

- Safe Drinking Water Act National Primary Drinking Water Regulations, Maximum Contaminant Level Goals (MCLGs)
- National Recommended Water Quality Criteria, EPA 1999
- Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario (D. Persaud *et al.*, August 1993)
- Ontario Ministry of the Environment and Energy - Lowest Effect Level (LEL) and Severe Effects Level (SEL)
- EPA Region 9 Preliminary Remediation Goals (PRGs), (EPA, 1999a)
- EPA Soil Screening Guidance: Technical Background Document, (EPA 1996)
- EPA Drinking Water Health Advisories
- TSCA Health Data
- Policy for the Development of Water-Quality-Based Permit Limitations for Toxic Pollutants (49 Federal Register 8711)
- Ground Water Classification Guidelines
- Ground Water Protection Strategy
- Waste Load Allocation Procedures
- Fish and Wildlife Coordination Act Advisories.
- Control of Air Emissions from Superfund Air Stripper at Superfund Groundwater Sites (OSWER Directive 9355.0-28)

New York TBCs (Action, Location, and Chemical-Specific):

- NYSDEC Soil Cleanup Objectives and Cleanup Levels, TAGM No. 4046, January1994
- NYSDEC Technical Guidance for Screening Contaminated Sediments, July 1999
- Technical and Operations Guidance Series (TOGS)
  - Analytical Detectability for Toxic Pollutants, July 12, 1985
  - Ambient Water Quality Standards and Guidance Values, April 1, 1987
  - Toxicity Testing in the SPDES Permit Program, April 1, 1987
  - BPJ Methodologies, April 1, 1987

- Regional Authorization for Temporary Discharges, April 1, 1987
- Industrial SPDES Permit Drafting Strategy for Surface Waters, May 19, 1987.

- Guidelines for the Control of Toxic Ambient Air Contaminants (NYSDEC DAR-1)

3.3 Preliminary Human Health Risk Assessment

The Preliminary Human Health Risk Assessment for the LAI site, presented below, is based on historical site information and available analytical results for groundwater, surface water, and soil.

Chemicals of potential concern (COPCs), source areas and release mechanisms, receptors, exposure pathways, and additional data needs are discussed in the following subsections.

3.3.1 Chemicals of Potential Concern

As discussed in Section 3.1.6, groundwater, residential well water, and surface water have been impacted by elevated concentrations of VOCs. In particular TCE, PCE, and DCE have been detected in these media at concentrations exceeding state and federal drinking water and surface water standards. In addition, fluoride and heavy metals were detected in residential wells adjacent to the facility. Fluoride levels documented in Old Mill Pond and Old Mill Creek downgradient of the site were not high enough to be violations, but serve as a fingerprint for the source of contamination. A full screening of the RI data to select COPCs will be conducted as part of the Human Health Risk Assessment using criteria outlined in Section 5.7.

3.3.2 Potential Source Areas and Exposure Pathways

Several source areas at the LAI Site may have contributed to the contamination observed in groundwater, residential well water, and off-site surface water. Onsite source areas may include a southwestern area previously devoted to perforating liquid waste-containing drums; an unlined leaching pool in the vicinity of the southwestern melt shop where chlorinated solvent wastes were routinely discharged; and an abandoned unlined earthen lagoon into which liquid wastes were discharged. Other potential contaminant sources include piles of old (potentially PCB-containing) transformers with associated oily liquid leaks to bare soils and a leaking underground acid rinse waste tank.

Several potential receptors are associated with the LAI Site. As discussed previously, the 126-acre LAI Site currently includes an active industrial facility (on approximately 41 acres) as well as Outlying Parcels that are currently residential or undeveloped. The land surrounding the LAI Site is residential and commercial, consisting of single family houses,an apartment complex, and a mulch manufacturing operation. The Town of Port Jefferson and the Port Jefferson Harbor are located about one mile downgradient of the Site; groundwater from the Site may discharge to Old Mill Pond and Old Mill Creek located in the Town of Port Jefferson. Based on these land uses, the most likely current and future receptors for site-related contamination are site workers, construction workers, on-site and off-site residents, and recreational users of the off-site pond and stream.

Pathways of potential concern at the site have been identified and are presented below.

3.3.2.1 Surface and Subsurface Soil Pathways

Only very limited soil sampling has been conducted at the site, from three borings within the New York State Right of Way on the southeastern portion of the property. Although significant contamination was not found in the samples from these borings, many of the potential source areas on-site have not been sampled. Past disposal practices, including the discharge of liquid wastes directly onto bare soils or into unlined lagoons make it likely that soil contamination is present. Access to the LAI Site has not been made available to collect soil samples to assess current surface and subsurface soil conditions in most of the potential source areas.

Surface and subsurface soil sampling will be performed at the LAI site during the RI, both in the industrial facility and in areas that are currently residential or undeveloped. If this sampling reveals surface soil contamination, current and future workers and/or residents may be exposed to contaminated surface soil via ingestion, dermal contact, and inhalation of suspended soil. If this sampling reveals subsurface soil contamination (within 15 feet of the ground surface), current and future construction workers may be exposed to contaminated subsurface soil during excavation (e.g., during any redevelopment activities) via ingestion, dermal contact, and inhalation of suspended soil.

3.3.2.2 Groundwater Pathway

Groundwater associated with the site is of concern because available analytical data indicate that several volatile organic compounds, including TCE, PCE and DCE, are present at concentrations above state and federal drinking water standards. Exposure to contaminants in groundwater could occur either through direct use of the groundwater or through migration of contaminants from the groundwater to air that is then inhaled.

Groundwater is derived from a sole-source aquifer in Suffolk County and shall be evaluated as a potable water supply. Direct use of the groundwater is possible. Many residences in the vicinity of the site previously relied on private wells as their primary water supply. Residential potable well sampling carried out from the 1970s to the 1990s showed that the water supplies of a number of homes downgradient of the site had been impacted by elevated concentrations of TCE and other contaminants. Wells found to be impacted were abandoned when the SCDHS became aware of the local groundwater contamination; those houses were connected to the Suffolk County Water Authority (SCWA) distribution system. Although the SCWA water supply is available to the entire area, there may be houses in the area that are still served by private wells.

Even if no private wells currently draw on the contaminated groundwater, NYSDEC classifies groundwater in the area as 'Class GA fresh groundwater', for which the assigned best usage is a potable water supply source. NYSDEC groundwater standards for Class GA fresh groundwater are based on residential use. Because of the potential for private wells to draw on the contaminated groundwater, and because of the NYSDEC groundwater classification, the risk assessment will evaluate potential current and future exposures to groundwater used as drinking water by residents. Residents with wells in the plume may be exposed to contaminants in groundwater via ingestion and during showering via dermal contact and inhalation of volatile compounds.

Migration of VOCs from groundwater through the soil column (in soil gas) and into ambient or indoor air is possible where the groundwater table is close to the surface. The LAI Site is located on a hill and the water table at the property itself is fairly deep (i.e., 140 to 190 feet below the ground surface). Therefore, soil gas migration into indoor air is expected to be negligible at and immediately around the site. However, the water table is much closer to the surface downgradient of the site toward Port Jefferson Harbor. If the site-related contaminated groundwater plume extends to that area, then migration of VOCs into indoor air is possible and residents may be exposed to contaminants via inhalation.

3.3.2.3 Surface Water and Sediment Pathway

Surface water is of concern because analytical results during VOC sampling from Old Mill Pond and Old Mill Creek in the Village of Port Jefferson showed elevated concentrations of TCE in all samples, at concentrations up to 240-fold higher than the NYSDEC surface water standard of 5 ug/L. DCE was also detected at concentrations greater than the NYSDEC surface water standard. Contaminated groundwater from the site may be the source of the elevated concentrations observed in the pond and stream. Surface water sampling will be performed during the RI. If this sampling reveals that the pond and stream are still contaminated, current and future recreational users of the pond and stream may be exposed to contaminated surface water via incidental ingestion and dermal contact while wading.

Sediment samples have not been collected from the pond or stream. While sediment may become contaminated from chemicals present in surface water, the chemicals detected to date in the surface water are VOCs and therefore more likely to volatilize than to bind to sediment. Sediment sampling will be performed during the RI. If this sampling reveals sediment contamination, current and future recreational users of the pond and stream may be exposed to contaminated sediment via incidental ingestion and dermal contact while wading.

3.3.3 Summary of Additional Data Needs

Previous investigations of the site have not provided sufficient environmental sampling data to characterize the potential risks to human receptors. Surface and subsurface soil contamination associated with potential onsite source areas has not been characterized. While groundwater contamination has been found, the extent of the plume has not been determined. The extent of contamination in the Old Mill Pond and Creek should also be investigated further. Additional data will be collected during the RI for use in the Baseline Human Health Risk Assessment.

3.4 Preliminary Ecological Assessment

Based on initial assessment activities, historical information, and previous analytical data, presumed ecological exposure scenarios were identified. The presumed ecological exposure scenarios that will be considered as part of the site ecological risk assessment are: terrestrial receptors being exposed to contaminants in LAI Site surface soil and aquatic and semi-aquatic receptors being exposed to contaminants in the groundwater as these contaminants have been transferred to the surface water and sediments of the surface water drainages/ponds in the vicinity of the LAI site. These are preliminary scenarios only and are subject to change as the RI produces a more complete view of the contaminant transfer pathways and the limits of contamination.

3.5 Preliminary Identification of Remedial Action Alternatives

The groundwater at the site is a source of drinking water, with contamination from chlorinated solvents. However, the nature and extent of contamination have not been fully characterized. Preliminary remedial action objectives for the site are:

- Prevent ingestion and direct contact with groundwater which has contaminants of potential concern concentrations greater than preliminary remediation goals (PRGs) to be determined during the Feasibility Study.

- Minimize the potential for additional migration of groundwater with contaminants of potential concern concentrations which exceed the PRGs to local supply wells, especially if a source or sources of high levels of contamination is discovered.

3.6 Need for Treatability Studies

At this time, treatability studies are not anticipated for this RI/FS. Any treatability studies that might be required by EPA will be identified and conducted at a later date when available data will allow characterization and delineation of the plume. However, CDM will research viable technologies that will be applicable to the contaminants of concern and the site conditions and will provide a technical memorandum to EPA summarizing the results of this literature research.

Section 4
Work Plan Rationale

4.1 Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements which specify the quality of data required to support decisions regarding remedial response activities. DQOs are based on the end uses of the data collected. The data quality and level of analytical documentation necessary for a given set of samples will vary, depending on the intended use of the data.

As part of the work plan scoping effort, site-specific remedial action objectives were developed. Sampling data will be required to evaluate whether or not remedial alternatives can meet the objectives. The intended uses of these data dictate the data confidence levels. The guidance document *Guidance for Data Quality Objectives Process, EPA/600/R-96/055,* (EPA 2000) was used to determine the appropriate analytical levels necessary to obtain the required confidence levels. The three levels are screening data with definitive level data confirmation, definitive level data and measurement-specific DQO requirements (Table 4-1).

The applicability of these levels of data will be defined in the project-specific QAPP. Sampling and analytical DQOs such as precision, accuracy, representativeness, comparability, completeness, and sensitivity, will be defined in the QAPP.

The quality of the analytical data gathered during previous investigations of the Site is variable. Data that has had appropriate QA/QC verification are considered to be definitive level data. Data that do not have appropriate QA/QC verification are assumed to be non-definitive data. These data will be used to guide development of field data collection activities but can not be used to support activities, such as HHRA, that require definitive level data.

4.2 Work Plan Approach

The objectives of the RI/FS include identification of the nature and extent of contamination related to the site in surface and subsurface soil, groundwater, surface water, and sediment; preparation of human health and ecological risk assessments; and development of remedial alternatives to address contaminated media at the site. It is anticipated that the field investigation activities described in this Work Plan will generate data to support these objectives. Both screening level and definitive level data will be required to support these RI activities.

The overall objectives to be achieved during this RI/FS are as follows:

- Define the nature and extent of contamination in surface and subsurface soil, groundwater, surface water, and sediment related to the site. The sampling program to achieve this goal is described in Section 5.3, Field Investigations.

- Identify and quantify potential human health and ecological risks, if any, posed by the exposure to site contaminants.
- Develop and screen remedial alternatives, discussed in Section 5.10, Remedial Alternatives Screening.
- Conduct detailed analysis of appropriate remedial alternatives, discussed in Section 5.11, Remedial Alternatives Evaluation.

The RAC II field team will collect environmental samples in accordance with the EPA-approved project-specific QAPP, which presents rationale, procedures, and protocols for the field operation. The following samples will be analyzed for Routine Analytical Services (RAS) through EPA's Contract Laboratory Program (CLP) to meet the DQO requirements:

<u>Groundwater Samples from Newly-Installed Monitoring Wells</u> - TCL organic compounds (including low-detection level VOCs) and TAL inorganic analytes

<u>Groundwater Samples from Existing Monitoring Wells, Residential Wells, and Supply Wells</u> - Low-detection level VOCs and TAL metals

<u>Surface Soil Samples</u> - TCL organic compounds and TAL metals

<u>Soil Boring Samples</u> - TCL organic compounds and TAL metals

<u>DNAPL Boring Samples</u> - TCL organic compounds

<u>Surface Water Samples</u> - TCL organic compounds and TAL metals

<u>Sediment Samples</u> - TCL organic compounds and TAL metals

Soil and sediment samples for VOC analysis will be collected using EnCore samplers and analyzed through the CLP. All standard EPA sample preparation, collection, and shipment techniques related to this method will be employed. Following the sample preparation, subsequent analysis of the VOC soil samples will use an EPA-approved method. The RAS analytical results will be validated by technical personnel within the EPA's Region II.

The following non-RAS parameters will be analyzed:

<u>Groundwater Samples from Newly-Installed Monitoring Wells</u> - Total dissolved solids (TDS), alkalinity, total suspended solids (TSS), total Kjeldahl nitrogen (TKN), ammonia, nitrate-nitrite, total organic carbon(TOC), hardness, sulfate/sulfide, chloride, fluoride, methane, ethane, and ethene and ferrous iron.

Groundwater Samples from Existing Monitoring Wells, Residential Wells, and Supply Wells - Fluoride

Surface Soil Samples - TOC, pH, grain size distribution

Subsurface Soil Samples - TOC, pH, grain size distribution

Surface Water Samples - Hardness, alkalinity, TKN, ammonia, nitrate/nitrite, fluoride, sulfate/sulfide, chloride, methane, ethane, ethene, TSS, TDS, TOC, pH, and ferrous iron.

Sediment Samples - TOC, pH, grain size distribution, TCLP

Groundwater and surface water samples also will be collected for field parameters: dissolved oxygen, oxidation-reduction potential, turbidity, temperature, salinity, and conductivity.

As fluoride may have been discharged to groundwater from the LAI facility (as hydrofluoric acid), this analysis will support a groundwater contaminant source evaluation for the site for presentation in the RI; to establish whether the LAI site can be linked directly to the observed downgradient groundwater plume. Fluoride will be analyzed in all aqueous samples. Nitrate-nitrite, total organic carbon (TOC), sulfate/sulfide, chloride, methane, ethane, ethene, and ferrous iron will be analyzed to support a natural attenuation evaluation. As prescribed in EPA's *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater*, EPA/600/R-98/128, dated September 1998.

The non-RAS parameters will be analyzed by a laboratory under subcontract to CDM or by EPA's Division of Environmental Science and Assessment (DESA) laboratory in Edison, New Jersey,if the DESA laboratory has sufficient capacity at the time of the sampling. Ferrous iron will be analyzed using a field test kit. CDM will validate all non-RAS data analyzed by the subcontract laboratory using the protocols specified in the EPA- and NYSDEC-approved methods.

Section 5
Task Plans

The tasks identified in this section correspond directly to those in EPA's Statement of Work (SOW) dated February 16, 2000. The order in which these tasks are presented and the task numbering scheme correspond to the work breakdown structure provided in the SOW. This Work Plan addresses only those elements of the Work Assignment that are pertinent to conducting the RI/FS.

5.1 Task 1 - Project Planning and Support

The project planning task generally involves several subtasks that must be performed in order to develop the plans and the corresponding schedule necessary to execute the RI/FS. These subtasks include project administration, conducting a site visit, performing a review and detailed analysis of existing data, attending technical scoping meetings with EPA and other support agencies, preparing this RI/FS Work Plan, preparing the QAPP and Health and Safety Plan (HSP), and procuring and managing subcontractors.

5.1.1 Project Administration

The project administration activity involves regular duties performed by the CDM site manager (SM) and the Program Support Office throughout the duration of this work assignment. CDM will provide the following project administration support in the performance of this work assignment:

The Site Manager will:

- Prepare the technical monthly report
- Review weekly financial reports
- Review and update the project schedule
- Attend quarterly internal RAC II meetings
- Communicate regularly (at least weekly) with the EPA Remedial Project Manager (RPM)
- Prepare staffing plans

The Program Support Office personnel will:

- Review the Work Assignment technical and financial status
- Prepare reports for the Monthly Progress Report
- Provide technical resource management
- Review the work assignment budget
- Respond to questions from the EPA project officer and contracting officer
- Prepare and submit invoices

Based on the projected schedule for the RI/FS, CDM will estimate the project administration costs for the RI/FS and include those costs in the RI/FS Volume II Work Plan.

5.1.2 Attend Scoping Meeting

Following the receipt of this work assignment on July 26,2001 the CDM SM, the CDM RAC II technical operations manager (TOM), the project geologist, and the project risk assessor attended a project scoping meeting on August 7, 2001 with the EPA contracting officer, the EPA project officer, and the EPA RPM at the EPA offices in New York, New York to outline and discuss the project scope.

On November 20, 2001, the RAC II program manager, CDM SM, FS task leader, RI task leader, project geologist, project hydrogeologist, ecological risk assessor, and the human health risk assessor attended a technical scoping meeting to present the RI field sampling program approach and rationale. Among those attending the presentation were the EPA section chief, NYSDEC project manager, the EPA risk assessor, and the EPA RPM. The meeting was held at the EPA offices in New York, New York.

5.1.3 Conduct Site Visit

The CDM SM, RI task leader, FS task leader, ecological risk assessor, human health risk assessor, and project hydrogeologist conducted a site visit on October 18, 2001 with the EPA RPM and representatives of EPA Region II, NYSDEC, SCDHS, and the National Oceanic and Atmospheric Administration (NOAA) to view the site and surrounding area to gain a better understanding of the overall environmental setting, and current site conditions, and to assess logistical and site access issues. During the site visit the group performed a site walkover, viewed the Old Mill Pond and Old Mill Creek, and performed a windshield survey of the surrounding area.

5.1.4 Develop Draft Work Plan and Associated Cost Estimate

CDM has prepared this RI/FS Work Plan in accordance with the contract terms and conditions. CDM used information from EPA guidance documents (as appropriate) and technical direction provided by the EPA RPM as the basis for preparing this RI/FS Work Plan.

This Work Plan includes a comprehensive description of project tasks, project documentation, and project schedule. CDM uses internal QA/QC systems and procedures to assure that this Work Plan and other deliverables are of professional quality requiring only minor revisions (to the extent that the scope is defined and is not modified). Specifically, the Work Plan includes the following:

- Identification of RI/FS project elements including planning and activity reporting documentation. A detailed work breakdown structure of the RI/FS that corresponds to the work breakdown structure provided in the EPA SOW dated July 26, 2001.

- CDM's approach for each task to be performed, including a detailed description of each task; the assumptions used; any information to be produced during and at the conclusion of each task; and a description of the work products that will be submitted to EPA. Issues relating to management responsibilities, site access, site security, contingency procedures and storage and disposal of investigation derived wastes will also be addressed.

- A schedule with dates for completion of each required activity, critical path milestones and submission of each deliverable required by the SOW and the anticipated review time for EPA (Section 7).

- A list of key CDM personnel that will support the project (Section 8) and the subcontractor services required to complete the work assignment (Section 5.1.11).

5.1.5 Negotiate and Revise Draft Work Plan/Budget

CDM personnel will attend a Work Plan negotiation meeting at the specified EPA Region II office in person or via teleconference. EPA and CDM personnel will discuss and agree upon the final technical approach and costs required to accomplish the tasks detailed in this Work Plan. CDM will submit a Final Negotiated Work Plan and budget that incorporates the agreements made in the negotiation meeting. The Final Work Plan budget will include a summary of the negotiations. CDM will submit the Final Work Plan and budget in both hard copy and electronic formats.

5.1.6 Evaluate Existing Data and Documents

As part of the preparation of this Work Plan, CDM obtained information from the EPA RPM, SCDHS, USGS, and CDM personnel who conducted work at the site for NYSDEC. The background documents were copied for internal use, reviewed, organized, and incorporated, where applicable, in this planning document. CDM has prepared data summary tables for use in this Work Plan.

5.1.7 Quality Assurance Project Plan

CDM will prepare a QAPP in accordance with the current revision of EPA/QA/R-5 and the approved EPA Region II QAPP guidance or procedures. The QAPP will document the planning, implementation, and evaluation of all activities associated with the RI. The QAPP will describe the project objectives and organization, functional activities, and QA/QC protocols that will be used to achieve the required DQOs. The DQOs will, at a minimum, reflect the use of analytical methods for identifying and addressing contamination consistent with the levels for remedial action objectives identified in the National Contingency Plan.

The QAPP will include sample locations and frequency; a list of sampling equipment; personnel and equipment decontamination procedures; sample handling and analysis; and a breakdown of samples to be analyzed through the CLP and through other sources. Technical Standard Operating Procedures will be included in the QAPP. All protocols will be prepared in accordance with EPA Region II guidelines and the site specific health and safety plan.

The QAPP will also consist of sections addressing site management, including site control and site operations. The site control section describes how approval to enter the areas of investigation will be obtained, along with the site security control measures, and the field office/command post for the field investigation. The logistics of all field investigation activities will also be described.

The site operations section includes a project organization chart and delineates the responsibilities of key field and office team members. A schedule will be included that shows the proposed scheduling of each major field activity.

Quality assurance activities to be performed during this project will include one internal office and one field technical systems audit. Field planning meetings, quality assurance reviews of all project plans, measurement reports and subcontractor procurement packages will also be preformed. The quality assurance requirements are further discussed in Section 8.2 of this Work Plan.

5.1.8 Health and Safety Plan

CDM will prepare a HSP for the field activities that will be conducted during the RI/FS in accordance with 40 CFR 300.150 of the NCP and 29 CFR 1910.120 (1)(1) and (1)(2). The HSP includes the following site-specific information:

- A hazard assessment
- Training requirements
- Definition of exclusion, contaminant reduction, and other work zones
- Monitoring procedures for site operations
- Safety procedures
- Personal protective clothing and equipment requirements for various field operations
- Disposal and decontamination procedures
- Other sections required by EPA
- Contingency plan which addresses site specific conditions which may be encountered

In addition to the preparation of the HSP, health and safety activities will be monitored throughout the field investigation. The CDM regional health and safety coordinator, or designated representative, will attend the initial field planning meeting and may perform a site visit to ensure that all health and safety requirements are being adhered to. CDM will designate a member of the field team to serve as the on-site health and safety coordinator throughout the field program. During the CDM field investigation, this person will report directly to both the field team leader and the regional health and safety coordinator. The HSP will be subject to revision as necessary based on new information that is discovered during the field investigation.

5.1.9 Non-RAS Analyses

All non-RAS parameters will be analyzed by EPA's DESA laboratory in Edison, New Jersey. If DESA does not have sufficient laboratory capacity at the time of sampling, then the non-RAS parameters will be submitted to the analytical laboratory under subcontract to CDM. The numbers of samples for the various media and analysis parameters are defined in Table 5-1.

5.1.10 Meetings

CDM will participate in various meetings with EPA during the course of the work assignment. For budgeting purposes, CDM has assumed 10 meetings, with two people in attendance, for four hours per meeting. Anticipated meeting dates are shown in the project schedule which is included in Section 7 of Volume I of this work plan.

5.1.11 Subcontract Procurement

This subtask will include the procurement of all subcontractors to complete the field investigation. Procurement activities include: preparation of the technical statement of work; preparation of Information For Bidders (IFB) or Request For Proposals (RFP) packages; conducting a pre-bid site visit (when necessary); answering technical and administrative questions from prospective bidders; performing technical and administrative evaluations of received bids; performing the necessary background, reference, financial and insurance checks; preparation of consent packages for approval by the EPA contracting officer (when necessary); and awarding the subcontract.

To support the proposed field activities, the following subcontractors will be procured:

- A New York licensed surveyor to map the locations and elevations of all new and existing monitoring well(s) and soil and groundwater screening, soil boring, surface soil, surface water, sediment sample locations, and to subsequently locate all sampling points on the site base map and study area location map. The surveyor will also develop a site topographic map covering the facility and Outlying Parcels, and a study area topographic map covering the area from the site north to Port Jefferson Harbor.

- A New York licensed driller to perform soil borings, collect subsurface soil samples, and install and packer test groundwater monitoring wells.

- A subcontractor to build and install a new multiport monitoring well at each monitoring well boring location, and provide technical support for groundwater sampling.

- A subcontractor to perform subsurface soil and groundwater screening using direct push technology (DPT) equipped with a membrane interface probe (MIP).

- A subcontractor to perform a surface geophysical survey for selected areas of the site.

- An analytical laboratory subcontractor to perform the non-RAS sample analysis if DESA can not perform the analysis.

- A cultural resources specialist to evaluate cultural resources in the area of the site.

- A subcontractor to haul and dispose of investigation derived waste. This subcontractor will be responsible for the removal and proper disposal of drums and storage tanks containing RI generated waste soils, liquids, and solids. It has been assumed for this Work Plan that all groundwater extracted during well development and well purging will be contained and disposed of by the subcontractor.

All subcontractor procurement packages will be subject to CDM's technical and quality assurance reviews.

5.1.12 Perform Subcontract Management

The CDM SM and the CDM subcontracts manager will perform the necessary management and oversight of the subcontractors needed for the performance of this RI/FS investigation. CDM will institute procedures to monitor progress, and maintain systems and records to ensure that the work proceeds according to subcontract and RAC II contract requirements. CDM will review and approve subcontractor invoices and issue any necessary subcontract modifications.

5.1.13 Pathway Analysis Report

In accordance with OSWER Publication 9285.7-47 dated December 2001, entitled *Risk Assessment Guidelines for Superfund - Part D*, CDM will provide EPA with standard tables, worksheets, and supporting information for the risk assessment as interim deliverables prior to preparation of the full Baseline Risk Assessment Report. CDM will prepare a Pathways Analysis Report (PAR) that consists of RAGS Part D Standard Tables 1 through 6 and supporting text. The PAR will summarize the key assumptions regarding potential receptors, exposure pathways, exposure variables, chemical distribution, and chemical toxicity that will be used to estimate risk in the Baseline Risk Assessment. Because RAGS Part D Tables 2 and 3 summarize site data, these tables of the PAR will be prepared once analytical data collected during the RI site investigation are available. Preparation of the PAR initiates the risk assessment process, whose components are described in greater detail in Section 5.7.1.

CDM will coordinate with EPA to define potential exposure pathways and human receptors. To accomplish this, CDM will review all available information obtained from EPA pertaining to the Lawrence Aviation Site, including data generated during previous investigations. CDM will integrate this information with site data generated during the RI site investigation. Background information on the site will be summarized, and samples collected and the chemicals analyzed for in various media will be discussed. The treatment of data sets (e.g., duplicates, splits, blanks [trip, field, and laboratory], multiple rounds, and qualified and rejected data) will be discussed, and chemical-specific exposure point concentrations for each exposure scenario will be estimated. Based on current knowledge, potential receptors include current and future site workers, construction workers, on-site and off-site residents, and recreational users of the off-site pond and stream. Exposure variables to be used for the calculation of daily intakes will be presented. Carcinogenic and non-carcinogenic toxicity values for contaminants of concern and the sources of these values will be presented in the PAR. As noted above, the selection of chemicals of potential concern, exposure pathways and receptors, exposure concentrations, exposure variables, and toxicity values will be summarized in tabular form in accordance with the Standard Tables of RAGS Part D.

Upon EPA's approval of the Pathways Analysis Report, CDM will estimate potential exposures and risks associated with the site and initiate preparation of the draft Baseline Risk Assessment Report as described in Section 5.7.

5.2 Task 2 - Community Relations

CDM will provide technical support to EPA during the performance of the following community relations activities throughout the RI/FS in accordance with *"Community Relations in Superfund-A Handbook"*, (June 1988).

5.2.1 Community Interviews

- Community Interviews Preparation - CDM will review relevant background documents as provided by the EPA RPM or public affairs specialist. CDM will then prepare a list of potential interviewees for EPA's review and final selection. CDM assumes that 10 to 12 interviews will be required to provide a sufficient range of views within the affected community and to help prepare the Community Relations Plan (CRP). CDM will provide community interview support at EPA request. CDM will conduct interviews with the appropriate government officials (federal, state, county, borough), environmental groups, local broadcast and print media and any other relevant individuals or groups, either in person or via a telephone call. CDM will accompany the EPA RPM and public affairs specialist on the interviews and will provide logistical support and function as directed by the EPA RPM.

- Community Interviews Questions - CDM will prepare draft interview questions for EPA's review and approval. CDM will then prepare final interview questions incorporating all EPA comments.

5.2.2 Community Relations Plan

CDM will prepare a draft and final CRP as described below:

- CDM will develop a draft CRP which presents an overview of the community's concerns and includes the following elements:
  - Site background including site location, site description and site history
  - Community overview including a community profile, community concerns and community involvement

- Community involvement objectives and planned activities with a schedule to accomplish those objectives
- Mailing list of contacts and interested parties
- Name and address of the information repositories and public meeting facility locations
- List of acronyms
- A glossary

■ CDM will prepare and submit the final CRP after incorporating comments from EPA.

5.2.3 Public Meeting Support

CDM will make all the necessary logistical arrangements for public meetings and site tours, including the selection and reservation of a meeting space (as directed by the EPA RPM or public affairs specialist). CDM assumes that there will be a total of three public meetings/site tours.

CDM will perform the following activities in support of public meetings:

■ Attend public meetings or availability sessions, provide recording and/or stenographic support, prepare draft and final meeting summaries, and prepare presentation materials/handouts.

■ Prepare draft and final visual aids at EPA request. CDM will develop draft visual aids (i.e., transparencies, slides, and handouts) as instructed by EPA. CDM will develop final visual aids incorporating all EPA comments. For budgeting purposes, CDM will assume 15 overhead transparencies, 10 slides, and 150 handouts for each public meeting.

■ CDM will arrange for site tours and meetings including the selection and reservation of a meeting space as directed by the EPA. For budgeting purposes, CDM will assume three site tours/meetings.

■ CDM will reserve a court reporter for one of the public meetings as directed by the EPA RPM. A full-page original of the transcripts (along with a 3.5 inch diskette in Word Perfect 8.0 format) will be provided to EPA, with additional copies placed in the information repositories as required.

5.2.4 Fact Sheet Preparation

Per EPA direction, CDM will not perform this activity.

5.2.5 Proposed Plan Support

Per EPA direction, CDM will not perform this activity.

5.2.6 Public Notices

CDM will prepare newspaper announcement(s)/public notice(s) for the various public meetings/site tours. CDM will assume the development of three newspaper advertisements in the most widely-read local newspaper(s). For budgeting purposes, CDM will assume that half the advertisements are placed in a large newspaper and the other half are placed in a small town newspaper.

Per EPA direction, this subtask is an optional activity.

5.2.7 Information Repositories

Per EPA direction, CDM will not perform this activity.

5.2.8 Site Mailing List

Initially, CDM will be provided with the most current site mailing list by the EPA RPM or the public affairs specialist. CDM will update the site mailing list up to 2 times during the course of this RI/FS. Each mailing list will be assumed to have approximately 200 entries. CDM will provide EPA with a copy of the mailing list on diskette. Mailing labels will also be provided to EPA upon request. EPA will do the actual mailing of any information to the community.

5.2.9 Responsiveness Summary Support

Per EPA direction, CDM will not perform this activity.

5.3 Task 3 - Field Investigation

This task includes all activities related to implementing the RI/FS field investigation at the LAI site. The task descriptions have been developed after review and evaluation of all site background data currently available to CDM. In addition, discussions with representatives of EPA and NYSDEC were instrumental in developing this work plan.

The overall objective of the RI/FS is to define contamination in potential source areas within the boundaries of the LAI Site; to define the nature and extent of soil, groundwater, surface water, and sediment contamination from sources related to the LAI site; and provide the data necessary to prepare human health and ecological risk assessments and develop remedial alternatives for the site. This task includes all activities related to implementing the field investigation at the site.

In addition, CDM will define the nature and extent of soil, groundwater, surface water, and sediment contamination from sources related to the LAI Site within the adjacent Outlying Parcels immediately north of the LAI facility.

CDM has developed this work plan to meet the objectives of the RI/FS described above. Since there is a lack of existing data for source area contaminant distribution, especially on the LAI Site, and the area potentially impacted is large, the field program will be executed as Field Screening Activities (FSA) and Field Data Collection Activities (FDCA) to effectively focus the field investigation program. The FSA consists of collecting preliminary data (screening data and limited sampling) to identify source areas and define the spatial limits of the soil, groundwater, and surface water/sediment investigations. Data collected during the FSA will be evaluated and used to define and focus the FDCA. The following activities will be conducted during the FSA:

- Conduct a well survey within a two-mile radius of the site to identify residential or public supply wells that may be impacted by site-related contamination
- Identify and sample selected residential and public supply wells
- Inspect, develop, and sample existing monitoring wells
- Perform deep stratigraphic soil borings and downhole gamma logging to better define the geology in the vicinity of the site, especially below the depth of the current monitoring wells
- Perform a surface geophysical survey in the drum perforation and drum disposal areas
- Perform surface and subsurface soil screening on the LAI Site using DPT equipped with a MIP to screen for VOC contamination
- Perform groundwater screening downgradient of the LAI Site using DPT equipped with a MIP to provide a vertical profile of groundwater contamination and define monitoring well screen intervals
- Review aerial photography and conduct a systematic site reconnaissance of the Outlying Parcels to identify potential surface and subsurface soil sampling locations
- Perform surface water and sediment sampling in drainage pathways potentially leading from the site, on-site cess pools, Old Mill Creek, Old Mill Pond, Port Jefferson Harbor, and in the unnamed pond north of the LAI facility.

At the conclusion of the FSA, CDM will organize and evaluate the data collected during the FSA and prepare a technical memorandum summarizing the data, providing the rationale and recommendations for the FDCA. The technical memorandum, as described in Section 5.6.4 of this Work Plan, will be submitted to EPA for review and approval.

As part of the data evaluation, CDM will develop a Geographic Information System (GIS), as described in Section 5.6.2 of this Work Plan, that incorporates existing data, soil screening data, groundwater sampling data, and stratigraphic data collected during the FSA. Evaluation of the relationships among the data will be used to provide a rational basis to focus the FDCA field program.

The FDCA will include the following activities:

- Perform soil borings to provide definitive-level data for contaminated subsurface soil areas identified during FSA. Define the vertical extent of subsurface soil contamination. Perform surface and subsurface soil sampling on the LAI Site and Outlying Parcels.

- Install multi-port monitoring wells at locations and depths defined by the FSA groundwater screening and the stratigraphic boring information.

- Packer testing of three intervals in three multiport wells for a total of nine intervals.

- Perform two rounds of groundwater sampling in the existing and newly-installed wells.

If the results from the onsite soil boring and monitoring well sampling programs indicate that DNAPL exists beneath the site, with approval from EPA, CDM will perform additional deep borings and sampling to define the extent of DNAPL contamination.

Information from the FDCA investigation will be incorporated into the GIS, as described in Section 5.6.2 of this Work Plan. These tools will be used to evaluate the spatial distribution of contamination in the various site media and to develop graphical representations of the of the data for use in the RI report, risk assessments, and feasibility study.

5.3.1 Site Reconnaissance

To complete this RI/FS work plan, CDM conducted an initial site visit to become familiar with local and site-specific conditions. CDM's SM and RI task leader conducted a walk-through and a vehicular reconnaissance of the site and surrounding area to evaluate logistical problems relevant to the implementation of the on-site and off-site soil, sediment, surface water and groundwater investigations.

CDM will conduct additional site reconnaissance activities to establish the exact locations of proposed drilling and sampling locations. Specifically, sampling locations to be staked, labeled, or otherwise marked will include: onsite soil screening borings; offsite groundwater screening borings; offsite surface water and sediment sampling locations; onsite soil borings and soil borings installed in the Outlying Parcels; and monitoring wells. These activities also will include identifying all cesspools at the LAI facility from studying site plans, gathering information provided by the facility owner/employees, and visual evidence during the site walk through. Discharge of waste effluent from the facility to the subsurface may have occurred via dry wells and cesspools. If identified, some of the proposed drilling and sampling locations will be placed adjacent to dry wells and cesspools and five surface water/sediment sampling locations will be identified.

A visual inspection of the facility's interior will be conducted to identify proposed building interior boring locations. The reconnaissance will focus primarily on chemical processing and chemical waste handling areas including, but not limited to: the Hazardous Materials Building; the Regency Building; and the Recycling Area Building (Figure 1-2).

CDM will identify property boundaries and utility rights-of-way; conduct utility mark outs; provide photographic documentation of site conditions, and assist with private and public property access. Site reconnaissance activities also will be performed, as necessary, to support mobilization and site preparation activities.

CDM will review the historical aerial photo interpretation of the site to determine if obvious sources of contamination (i.e., excavations, drums, lagoons) are identifiable. Final locations for proposed onsite and Outlying Parcels drilling and monitoring well locations will be determined after review of the historical records and the FSA data have been completed (described under Subtask 5.3.3).

During the site reconnaissance, CDM will also conduct oversight of the Cultural Resources Subcontactor. CDM will also conduct ecological reconnaissance of the LAI Site and surface water drainage pathways from the site to Port Jefferson Harbor to support subsequent ecological characterization activities described under Section 5.3.6 of this Work Plan.

5.3.1.1 Well Inventory

In order to identify well locations in the LAI site vicinity, CDM will perform a comprehensive survey of the available well records in the NYSDEC, SCDHS, and the SCWA databases. The well record search will identify wells within a 180° arc having a focus at the center of the site buildings extending 1.5 miles to the north. Figure 5-1 shows the well record search area. The well record search also will identify wells within a one-mile radius of the center of the site buildings. CDM will identify the location of residential, industrial, commercial, irrigation and community supply wells within the search area described above. If available, information such as lithology logs, geophysical logs, pumping rates, and well construction details for representative wells also will be obtained.

5.3.1.2 Existing Well Assessment

As part of the proposed groundwater sampling program, CDM will be collecting samples from up to 10 existing SCDHS monitoring wells ("PJ" wells) located hydraulically downgradient from the LAI facility. The monitoring wells will be redeveloped and subsequently resampled two weeks after redevelopment. Redevelopment procedures will be fully detailed in the QAPP.

5.3.1.3 Topographic Survey

Prior to initiating field activities, the site will be surveyed by a licensed New York State surveyor. A topographic site base map will be created for the site, including the Outlying Parcels (Figure 5-2). The site base map will be at a scale of one-inch equals 100 feet with a 1-foot contour interval. Each 5-foot contour interval will be indicated with a bold line. The locations and elevations of all existing monitoring wells will be surveyed and identified on this map. Property boundaries from tax maps and all physical features such as buildings, driveways, roads, railroads, woodlands, creeks, etc. will be identified on the map.

A site location map will be generated that illustrates both the site, including the Outlying Parcels, and the area within a 180° arc having a focus at the center of the site buildings extending 1.5 miles to the north and within a 180° arc having a focus at the center of the site buildings extending one mile to the south (as shown in Figure 5-2). The site location map will have a horizontal scale of 1 inch equals 500 feet with a 5-foot contour interval; every fifth contour (25-foot elevation difference) will be indicated in bold. Property boundaries from tax maps and all physical features such as buildings, driveways, roads, railroads, woodlands, and creeks will be identified on the map.

Following the field activities, the locations and elevations of all new monitoring wells and sampling points will be surveyed and identified on the site base map and site location map, respectively. The horizontal extent of wetlands, as delineated by the RAC II team, also will be indicated on the maps.

5.3.1.4 Geophysical Survey/Drum Investigation

In order to identify locations of possible residual subsurface sources, CDM will conduct a surface geophysical investigation to locate buried objects that may be a source of soil and groundwater contamination at the LAI facility. The survey will be performed by a geophysics subcontractor at three areas at the LAI site and on sections of the Outlying Parcels (Figure 5-2). Section 5.3.7 describes these activities.

5.3.2 Mobilization and Demobilization

This subtask will consist of property access assistance, field personnel orientation, field office and equipment mobilization, and demobilization. Prior to RI field activities, each field team member will review all project plans and participate in a field planning meeting conducted by the CDM SM and RI task leader, to become familiar with the history of the site, health and safety requirements, field procedures, and related QC requirements. All new field personnel will receive a comparable briefing if they do not attend the initial field planning meeting and/or the tailgate kick-off meeting. Supplemental meetings may be conducted as required by any changes in site conditions or to review field operation procedures.

5.3.2.1 Mobilization and Demobilization

Equipment mobilization will entail the ordering, renting, and purchasing of all equipment needed for each part of the RI field investigation. Measurement and Test

Equipment Forms will be completed for rental or purchase of equipment (instruments) that will be utilized to collect field measurements. The field equipment will be inspected for acceptability, and instruments calibrated as required prior to use. This task also involves the construction of a decontamination area for sampling equipment and personnel. A separate decontamination pad will be constructed by the drilling subcontractor for drilling equipment.

Arrangements for the lease of a field trailer, a secure storage area for investigation derived waste, and associated utilities and services will be made. Health and safety work zones including personnel decontamination areas will be established. Local authorities such as the police and fire departments will be notified prior to the start of field activities. Equipment will be demobilized at the completion of each field event, as necessary. Demobilized equipment will include sampling equipment, drilling subcontractor equipment, health and safety equipment, and decontamination equipment.

For costing purposes, CDM will assume that one major mobilization event will be required at the initiation of the RI field activities and one major demobilization event will be required at the conclusion of the RI field activities. It is anticipated that a minor demobilization event will occur at the conclusion of the FSA and that a second significant mobilization event will be required to prepare for the FDCA.

Site Preparation
CDM will conduct ground truthing for overhead utilities and surface features around intrusive subsurface sampling locations. The driller will still be responsible for contacting an appropriate utility location service to locate and mark out underground utilities. Actual field conditions may impact the final locations selected by CDM.

CDM plans to use existing roadway rights-of-way, railroad rights-of-way, open space and clearings to the maximum extent possible to access sampling locations. However, it may be necessary to clear some areas of vegetation and trees in order to access sampling locations. The drilling subcontractor will be responsible for clearing vegetation to provide access to sampling locations. The surface geophysics surveying subcontractor will be responsible for clearing vegetation for the geophysical survey on the LAI property and the Outlying Parcels. Once sampling locations have been identified and cleared of obstructions, CDM will mark or stake each location. CDM will direct and oversee the land clearing activities of the drilling subcontractor and surface geophysics subcontractor.

Site Restoration
Portions of the LAI site field activities are expected to occur on private and public properties. In the event that landscaping or paving on and around these properties is damaged as a result of the proper performance of field investigation activities, such damages will be repaired and restored, as near as practicable, to the conditions existing immediately prior to such activities. CDM will maintain photographic

documentation of site conditions prior to commencement of and after completion of RI field activities.

At the completion of the field activities, decontamination pad materials will be decontaminated and removed from the command post area, unless otherwise instructed by EPA. The decontamination and command post area will be restored, as near as practicable, to its original condition.

CDM personnel will perform field oversight and health and safety monitoring during all site restoration field activities.

5.3.3 Hydrogeological Assessment

During the previous investigations, groundwater samples collected from residential supply wells and monitoring wells downgradient of the LAI facility contained elevated concentrations of chlorinated solvents. To carry out preliminary characterization of VOC contamination in groundwater, CDM will conduct a DPT groundwater screening investigation.

As part of RI field activities, CDM will evaluate the current nature and extent of VOC contamination through a vertical profile groundwater screening program during the FCA. The results of the screening program will aid in selecting screen intervals for the permanent multi-port monitoring wells that will be installed during the FDCA.

5.3.3.1 Groundwater Screening

As part of the FSA, CDM will conduct DPT/MIP groundwater screening downgradient of the site, in the area near Old Mill Pond. This will provide vertical groundwater contaminant profiles that will be compared with historical groundwater profile data. Results from the DPT/MIP sampling will be used to determine the locations and screened intervals of permanent multi-port monitoring wells in this area. The DPT/MIP investigation will use a MIP to obtain qualitative, depth-continuous VOC data in groundwater. The MIP utilizes a truck-mounted gas chromatograph (GC) with a photo- ionization detector (PID), a flame-ionization detector (FID), and an electron-capture detector (ECD). The ECD is most sensitive to chlorinated hydrocarbons such as TCE. In addition, the subsurface lithology will be surveyed simultaneously using a electrical conductivity (EC) probe.

The DPT/MIP technology has a number of advantages over traditional soil boring programs. Large areas can be screened relatively quickly, very little waste is produced which lowers waste disposal costs, and the data can be used to focus more costly confirmation activities.

At 15 locations, MIP probes will be advanced to provide a vertical profile of VOC groundwater contamination. MIP groundwater screening will only be performed in downgradient areas where permanent multi-port monitoring wells are expected to be screened at depths less than 100 feet, the approximate practical depth limit of the DPT technology.

The 1.5-inch diameter MIP will be pushed into the subsurface at a penetration rate of approximately 1-foot per minute. The tip of the probe contains a thermister, which provides a heat source to volatilize VOCs. The gasses that are produced pass into the probe through a permeable membrane and enter a sampling loop. The gasses then are transported to the surface and pass through the PID, FID, and ECD. The detectors analyze the gas and provide an immediate qualitative readout of volatile organic content.

During the groundwater screening activity, depth-continuous PID, FID, and ECD data will be evaluated in real time to determine the depths at which VOC contamination is elevated. Depth-continuous EC data will be evaluated to assess the subsurface lithology and its relationship with contamination. If groundwater contaminant concentrations drop below the ECD's detection limit, CDM will use the EC probe to determine suitable sand-rich intervals where monitoring well screens could be placed. The data will be captured electronically for more detailed analyses and graphical presentation.

As shown in Figure 5-3, the groundwater screening points will be located along two east-west transects oriented perpendicular to the estimated groundwater flow direction, which is approximately to the north-northwest with respect to the site. Approximately half of the screening point locations will be along a transect (Transect A) upgradient of Old Mill Pond and Old Mill Brook (to assess groundwater that discharges to these surface waters) and the remaining locations will be placed along a transect (Transect B) further downgradient, immediately south of the harbor, along West Broadway (to evaluate groundwater discharging to Port Jefferson Harbor).

The spacing of the MIP screening points will provide a sufficiently detailed evaluation of the horizontal and vertical extent of groundwater contamination in the aquifer and provide a rational basis for placement of permanent multi-port monitoring wells.

The approach to the DPT/MIP groundwater screening program will be to complete Transect A prior to starting Transect B. The first sampling location on Transect A will be placed at the expected midpoint of the contaminant plume, as inferred from historical SCDHS groundwater screening data and modeling. Subsequent sampling locations will be placed at 500-foot intervals to the east and west of the initial location until samples are "clean", which for purposes of this investigation is defined when VOCs are not detected above the ECD's detection limit. If, for example, VOCs are detected above the ECD detection limit at the MIP west of the first location, CDM will proceed westward to the next location and complete a profile at that location. On each transect line, once the "clean" sampling location has been established, an interval equal to one-half the distance from the "clean" location toward the last "contaminated" location will establish the next sampling location. For sample locations at 500 foot intervals, a sample will be located a distance of 250 feet from the both the "clean" and "contaminated" sample locations. On both transects, the sample location process described above will be repeated to define the plume edge to within 125 feet. As Transect A is completed, the plume's location will be evaluated and the center point for Transect B will be estimated. Sampling on Transect B will begin at this mid-plume location. The estimated location and rationale for placement of the sampling points is provided in Table 5-2.

CDM will participate in daily conference calls with EPA to discuss drilling progress and MIP screening sample results. The CDM senior hydrogeologist, SM, and FTL will participate in the daily conference calls. Any change to the sampling plan, including the addition or deletion of sampling points or depths, will be discussed with EPA during these conference calls and be agreed upon prior to implementation.

CDM will monitor and direct the MIP screening point sampling performed by a subcontractor to CDM. CDM personnel also will perform field oversight of health and safety monitoring during all DPT/MIP field screening activities. At the completion of the groundwater screening activities, the locations will be surveyed and located on the site location map.

For budgeting purposes, it is assumed that a total of 1,500 feet of MIP profiles will be completed, 100 feet at each of 15 locations. Procedures will be fully detailed in the QAPP.

5.3.3.2 Multi-Port Monitoring Well Installation

Available groundwater quality data indicate that groundwater contamination is present beneath the LAI facility and hydraulically downgradient to the north of the property. However, these historical data are incomplete because the vertical or lateral extent of groundwater contamination was not clearly defined.

As part of the FDCA of the RI field program, CDM will install a network of 10 multi-port monitoring wells to define the vertical and lateral extent of groundwater contamination and to provide a means for long term monitoring of groundwater quality. These wells also will provide water level data to characterize the hydrogeologic framework and groundwater flow system at the site. The depths of the wells will vary based on their location. CDM proposes the following distribution of well depths:

- Five multiport wells installed to 250 feet;
- Three multiport wells installed to 200 feet; and
- Two multiport wells installed to 150 feet.

The MIP system and the stratigraphic boring program results will be evaluated and presented in a technical memorandum after completion of the FSA. CDM will recommend locations of screen intervals, and construction details for the monitoring wells installed during the FDCA. The memorandum will present a summary of the data collected during the field screening activities and a data interpretation summary of the groundwater sampling data. A summary of the usability of the data also will be included.

The proposed groundwater monitoring well network will consist of 10 multi-port monitoring wells at the locations shown on Figure 5-4. Five wells will be arranged on and around the LAI site to define groundwater contamination beneath the site. Three of the wells will be installed about mid-way between the LAI site and the area of the Old Mill Pond, along an east to west transect line (perpendicular to groundwater flow) to define the width and depth of groundwater contamination. The remaining two wells will be installed in the vicinity of the Old Mill Pond. These two wells also will be arranged on an east to west transect line to define the width and depth of groundwater contamination. The locations for the monitoring wells will be finalized based on the FSA results of the field screening program conducted using the MIP system and the stratigraphic boring program. A summary of the locations and rationale for placement of the monitoring wells is provided in Table 5-2.

Each monitoring well borehole will be advanced using rotasonic drilling techniques. This method advances a drill pipe into the subsurface using vibratory energy. As the drill pipe is advanced, sediment inside the pipe is brought up to the surface in a core barrel either 10 or 20 feet in length. The core barrel fits inside the drill pipe. The core is typically extruded into a plastic sleeve after which it is logged and may be sampled. This method uses some bentonite drilling mud to lubricate and cool the casing but uses much less drilling fluid than mud rotary drilling. Another advantage of this method is that it advances a casing as the hole is advanced. This keeps the borehole open as it is advanced and allows precise placement of well backfill materials as the drill pipe is withdrawn.

As the borehole is advanced below the water table, groundwater screening samples will be collected for analysis of VOCs including TCE. The samples will be collected at 10- to 20-foot intervals. These samples will be analyzed at a local laboratory with a 12-hour turn around time. The laboratory must be local to the site to achieve the 12-hour turn around time. The results of the screening will be used to decide when to terminate the boring. The goal at each boring will be to advance the borehole below the bottom of groundwater contamination plume. Once the borehole is completed, the boring log, groundwater screening data (if available), stratigraphic boring data, and historical data will be analyzed to select monitoring zones for each monitoring well.

Available groundwater quality data indicate that the hydrogeologic system is large and complex and that there are significant vertical changes in VOC concentrations; consequently, the aquifer will be monitored at multiple levels. To accomplish this, CDM proposes to install multi-level groundwater sampling systems in each of the wells.

For estimating purposes, CDM assumes that five monitoring zones will be installed in each well. Each well will be developed by pumping water from the well using a submersible pump. Development will remove fine-grained sediment from the well and help to set the sand pack around each well. All water generated during development will be contained and stored in a 20,000 gallon Baker Tank at a central project support location. Monitoring well installation will not be considered complete until the wells have been fully developed. Well development procedures will be described in the QAPP.

Cuttings and water will be collected and contained at each drilling location. The cuttings will be transported to a central project support area where they will be stored in a bulk container such as a 20- yard roll off. Any cuttings that appear to be contaminated with DNAPL will be segregated from the other cuttings and stored either in 55-gallon drums or in a separate 20-yard roll off. Similarly, any water that appears to be contaminated with DNAPL will be segregated from the other water and stored in 55-gallon drums. All roll-offs will be equipped with plastic liners and waterproof covers.

5.3.3.3 Subsurface Soil Screening

Historical information indicates a number of VOC-contaminated source areas may be present beneath the LAI Site boundaries. The unsaturated/vadose zone beneath the LAI site is very thick at up to approximately 200 feet thick. Currently, there are very little data on the distribution of surface and subsurface soil contamination associated with source areas on the LAI property.

In order to provide a preliminary characterization of VOC contamination in subsurface soil, CDM will conduct a DPT soil screening investigation during the FSA. The DPT investigation will utilize a MIP to obtain qualitative, depth-continuous, VOC data in unsaturated subsurface soil. In addition, the EC of the subsurface lithology also will be surveyed simultaneously. VOC profile data will be correlated with the EC lithology information to identify lithologic features such as clay layers which may control contaminant movement in the unsaturated zone. The DPT/MIP technology is well suited to the LAI site as the area to be surveyed is relatively large and space to manoeuver and operate a DPT rig is good. All of the data will be displayed on a monitor and downloaded.

The MIP will be used to investigate the 15 potential source areas that were identified during the previous investigation conducted by NYSDEC. However, these previously-identified potential source areas are not well defined. The purpose of the MIP investigation will be to define the horizontal extent of VOC contamination by advancing relatively shallow (15 feet bgs) DPT pushes. This maximum depth was selected since it will allow for the rapid collection of soil screening data across the site.

For budgeting purposes, it is assumed that a maximum of 113 shallow DPT pushes will be completed, as shown on Figure 5-5. Ten of the proposed locations are contingency, which will be used, if directed by EPA, to characterize areas that need to be better defined.

Upon completion of the shallow DPT pushes, the MIP data will be evaluated in the field and locations will be selected for deep characterization. Deep pushes will be located in those source areas where significant VOC contamination was noted, especially at the base of the shallow MIP profiles. Deep DPT boring will be advanced to approximately 100 feet bgs, the depth limit of the DPT technology. An additional deep DPT push will be located where shallow soil contamination was not detected. The soil profiling results from this deep MIP boring will serve as background subsurface data against which the source area deep MIP profiles will be compared.

Deep DPT borings in the source areas will be terminated when the MIP profile no longer shows evidence of VOC contamination (in comparison with the background deep MIP values) or at approximately 100 feet bgs. The data will be used to assess the horizontal and vertical distribution and relative magnitude of VOC soil contamination in the source areas. The relationship between VOC contaminant distribution and the lithology also will be evaluated based on the EC log.

For budgeting purposes it is assumed that 15 deep pushes up to 100 feet deep will be performed at locations identified during the shallow DPT screening investigation. Of these, one deep push location will be selected to characterize background subsurface soil VOC concentrations. Four of the proposed pushes are considered contingency locations that may be used, if directed by EPA, to further define the vertical extent of VOC contamination in selected areas.

To correlate the qualitative EC results with observed lithology; one deep MIP push will be located adjacent to the location where continuous soil core will be collected during advance of the onsite deep stratigraphic boring (Section 5.3.4.2). Continuous soil samples will be collected from the ground surface to a depth of approximately 100 feet and screened with a hand-held PID to corroborate results obtained from the MIP's PID, FID, and ECD detectors.

5.3.3.4 Packer Testing

Packer testing will be conducted as part of the FDCA. The potential occurrence of clay confining layers within the aquifer system may influence vertical and horizontal flow of contaminated groundwater. CDM will perform packer testing within the multi-screened monitoring wells to identify vertical variations in hydraulic conductivity. After the monitoring wells are installed and developed but before the multi-port well systems are installed, a packer testing program will be conducted to determine the hydraulic conductivity of up to three screened intervals in three of the ten monitoring wells. It is anticipated that packer testing will be performed for one well on the site, one well midway between the site and Port Jefferson Harbor, and one well located near Port Jefferson Harbor to obtain aquifer characteristics along a line parallel to the expected plume and to groundwater flow. A straddle packer system will be used to isolate the five-foot screened interval. Pressure transducers will be used to monitor water levels above, between, and below the packer system before, during, and after pumping. After the packers are inflated and prior to conducting a pump-out test, the subcontractor will evaluate the packer seal by conducting a slug test. If leakage occurs around the packers, the contractor will try to improve the seal. CDM expects that good seals will be achieved since the packer testing will be conducted in the completed 4-inch diameter monitoring wells thereby allowing the packers to seat against the pipe wall.

After the seal quality is checked, a suitable pump will be used to pump water out of the isolated interval at a constant rate while the water level changes above, between, and beneath the packers is monitored using pressure transducers. Water quality parameters such as pH, temperature, conductivity, and dissolved oxygen will be monitored at the beginning, middle, and end of the pumping phase. Packer testing will be conducted as the packers are moved up the borehole. Packer testing is estimated to require two to three days per well.

The pump-out test will be conducted according to the CDM Site Specific Operating Procedure "Packer Testing Using the "Pump Out" Method". Water level data will be analyzed after field work is completed to determine the hydraulic conductivity of the isolated interval. The data will be analyzed using the method described in *Design of Small Dams*, U.S. Department of Interior, Bureau of Reclamation (1960). This method assumes that the conductivity is evenly distributed over the length of the test interval. This is a reasonable assumption since the screened intervals are completed in unconsolidated sediments.

All water pumped from the well during packer testing will be contained and transported to a central storage tank. Water from this storage tank will be sampled for characterization, and the water will then be properly disposed of in accordance with applicable regulations.

5.3.4 Soil Boring, Drilling, and Testing

The objectives of the proposed two-part soil boring, drilling, and testing program are to characterize the subsurface soils associated with the LAI site and conduct a preliminary characterization of the geology of the area from the LAI facility to Port Jefferson Harbor.

The FSA will include an onsite subsurface soil screening program and a deep stratigraphic soil boring investigation. The FDCA will include a subsurface soil boring program designed to characterize the underlying vadose zone. During the FDCA, subsurface soil samples will be collected from locations on the LAI Site, in LAI facility buildings, and from the adjacent Outlying Parcels.

5.3.4.1 Stratigraphic Borings

During the FSA, CDM will install three soil borings to obtain detailed lithologic information at the site and hydraulically downgradient of the site (Figure 5-4). The data from the borings will be used to improve our understanding of the hydrogeologic framework of the site. These results will be used to guide the soil boring and groundwater screening programs and finalize design of monitoring wells. One objective will be to determine if the Smithtown Clay is present beneath the site. These stratigraphic data will be supplemented by available lithologic and geophysical log data from other wells in the vicinity of the site and Port Jefferson. The stratigraphic borings will be completed early so that the gathered can be used to direct and focus subsequent field work.

The three stratigraphic borings will be arranged in a line trending south to north (Figure 5-4). One will be located on the southern portion of the site and the estimated depth of completion is 350 feet. The second boring will be located about mid-way between the site and the village of Port Jefferson. This boring will be advanced to 250 feet below ground surface. The third boring will be located in the vicinity of the Old Mill Pond in Port Jefferson and will be advanced to an estimated depth of 150 feet. The borings will be advanced using the mud rotary drilling method, which will allow CDM to run a full suite of geophysical logs on the borehole after it is completed. The initial borehole diameter will be 10- or 12- inches to allow installation of a 6- or 8-inch casing to case off a significant clay unit if encountered. The casing would be installed, and grouted in place, to prevent vertical contaminant migration before the borehole is advanced. If a second significant clay layer is encountered, the boring will be terminated.

Lithologic soil samples will be collected at 5- to 10-foot intervals using a split spoon sampler as the borehole is advanced; if a clay layer is encountered during drilling, continuous soil sampling will be conducted to establish the thickness of the clay. Once the borehole is completed to the planned depth, or before a casing is installed to case off overlying units, the geophysical logs will be run on the borehole. The geophysical logs will include:

- Natural gamma
- Borehole caliper
- Spontaneous potential
- Single point resistance
- Normal resistivity with 8-, 16-, 32-, and 64-inch electrode spacing

The geophysical data will be used, in conjunction with the soil samples, to describe the lithology and stratigraphy of each borehole and to correlate stratigraphy between these three boreholes and existing lithologic and geophysical log data from other MIP logs, soil borings, and wells in the vicinity of the site and Port Jefferson. After the geophysical logs are complete the boreholes will be backfilled with cement bentonite grout.

5.3.4.2 Subsurface Soil Borings

A subsurface soil boring program will be conducted during the FDCA to characterize the underlying vadose zone. The locations of the FDCA borings will be based on the FSA MIP results. Both shallow and deep borings will be installed to determine the nature and extent of subsurface soil contamination and to obtain a greater understanding of the geologic stratigraphy that may affect contaminant migration in the thick vadose zone beneath each area of investigation. A total of 120 soil borings will be installed at locations on site, in facility buildings, and within the boundaries of the Outlying Parcels. Table 5-3 provides the rationale for the proposed soil borings.

To break the large onsite area into more manageable units and to support the human health risk assessment portion of the RI/FS investigation, CDM has divided the site into three Areas of Concern (AOC). Each AOC was delineated into common functional areas of the site or in which poor waste disposal practices have been recorded:

<u>AOC-1 Abandoned Lagoon Area</u>

- Historical records and aerial photographs indicate this AOC includes, but is not limited to, a former outside drum storage area, an area of process waste dumping, a leaking transformer storage area, and where a release of pure TCE was documented.

<u>AOC-2 1980 Drum Crushing Area</u>

- This AOC includes, but is not limited to, the area where historical records and visual observations by regulatory officials documented drum spearing and crushing operations.

<u>AOC-3 Building F and Building 4 Area</u>

- This AOC includes, but is not limited to, the area where historical records indicate this is an area of soil contamination at a former outside drum storage area. In addition, aerial photos delineate drainage scars on unpaved areas east of the site buildings. This area may have received contaminated run-off from paved areas and from the facility's subsurface drainage system.

Shallow soil borings will be completed to a depth of 40 feet bgs, via the DPT method. Continuous core samples will be collected from four-foot intervals in advance of the push rods. Each plastic core sleeve immediately will be screened with a PID, upon being opened, and will be logged by the CDM field geologist.

Deep soil borings will be completed to a total depth of 200 feet bgs or the water table, which ever is encountered first. Deep soil borings will be installed using the sonic drilling method. Continuous core samples will be collected from the ten-foot interval in advance of the casing to the boring's total depth. Each plastic core sleeve will be screened immediately with a PID, upon being opened, and will be logged by the CDM field geologist.

All subsurface soil samples will be collected following EPA-approved methodologies that will be fully detailed in the QAPP. All samples will be analyzed using the most current EPA-approved methods that will be detailed in the QAPP. The analytical parameters and numbers of samples to be collected during the soil sampling program are presented in Table 5-1.

Onsite Exterior Shallow Soil Borings

At the LAI facility, 45 shallow soil borings will be advanced outside the facility buildings. The soil boring samples will be collected in areas where past improper waste disposal and poor chemical handling activities are suspected to have occurred and areas of contamination defined during the FSA DPT soil screening activities. Figure 5-6 presents the proposed onsite exterior soil boring locations. Thirty shallow borings are located on this figure. The locations of the remaining 15 borings will be determined after site reconnaissance activities and after the on-site MIP screening survey has been completed and evaluated. These borings may be used to characterize areas including dry wells, drains, and sumps that were used as part of site operations. CDM will collect 60 samples from 20 subsurface soil borings in AOC-1, 45 samples from 15 subsurface soil borings in AOC-2, and 30 samples from 10 subsurface soil borings in AOC-3.

At 30 of the soil borings, three soil samples will be collected from each boring location. Depth intervals of subsurface sample locations will be 10-12 feet and 38-40 feet bgs. A third sample may be collected based on visual contamination or when elevated organic vapors are noted on the PID. At the remaining 15 sampling locations surface soil samples will also be collected to support the Human Health Risk Assessment. At 7 locations surface soil will be collected from 0-2 inches and at eight locations surface soil will be collected from 0-12 inches. These locations will be evenly distributed among the AOCs and two of the fifteen surface soil samples will be collected from the background deep soil boring to compare background surface soil conditions with those onsite

A maximum of 150 soil samples will be collected from the onsite exterior borings. Soil samples will be analyzed for TCL/TAL parameters through the EPA CLP. In addition, all of the soil samples will be analyzed for TOC, grain size, and pH through EPA's DESA laboratory (if available) or CDM's laboratory subcontractor.

Onsite Exterior Deep Soil Borings

Figure 5-6 presents the proposed locations for the deep soil onsite exterior soil borings to be advanced outside the facility buildings. A total of 15 deep soil borings (up to 200 feet bgs) will be installed onsite to determine the nature and vertical extent of deep soil contamination beneath the site. Lithologic samples will be collected to aid in an understanding of the geologic stratigraphy that may effect contaminate migration at depth, such as clay layers. The deep borings will be advanced in locations within each AOC where MIP locations indicated deeper soil contamination. A maximum of four surface and subsurface samples will be collected from each boring location. In each of the borings surface soil samples will be collected, 8 from 0-2 inches and 7 from 0-12 inches. Subsurface samples will be collected in each boring from 10-12 feet bgs, 50-52 feet bgs, and from the two-foot interval immediately above the terminal depth of the borehole. A maximum of 60 soil samples will be collected from the deep exterior soil borings. All surface and subsurface soil samples will be analyzed for TCL/TAL parameters through the EPA CLP. In addition, all of the soil samples will be analyzed for TOC, grain size, and pH through EPA's DESA laboratory (if available) or CDM's laboratory subcontractor.

Onsite Building Interior Subsurface Soil Borings

Figure 5-7 presents the proposed onsite interior soil boring locations. The interior boring investigation will be conducted inside selected areas of the facility buildings to confirm that process wastes or chemicals routinely handled inside the facility did not impact soils beneath the buildings' concrete slab floors. Interior boring locations will be determined during site reconnaissance inside the facility buildings and review of the FSA DPT soil screening results, but are likely to be placed in former process areas, such as the plating shop, where wastes were generated or store. Borings will be located in areas showing evidence of cracking or chemical deterioration of the concrete slab floor and next to floor drains. Upon completion, the interior soil borings will be tremie grouted with cement-bentonite grout.

A total of 15 shallow soil borings will be installed inside the LAI site buildings to define the nature and extent of soil contamination underneath the concrete slab floor. These borings will be drilled to approximately 40 feet in depth via DPT. A maximum of 45 samples will be collected from the 15 interior soil borings. Depth intervals of subsurface sample locations will be the one foot interval directly below the slab floor and 38-40 feet bgs. A third sample may be collected based on visual contamination or when elevated organic vapors are noted on the PID. All subsurface soil samples will be analyzed for TCL/TAL parameters through the EPA CLP. In addition, all of the soil samples will be analyzed for TOC, grain size, and pH through EPA's DESA laboratory (if available) or CDM's laboratory subcontractor.

DNAPL Investigation
Upon completion of the FDCA drilling effort, CDM will review all the soil borings logs to determine locations of known areas of DNAPL. Cross sections and fence diagrams will be constructed to show locations of known DNAPL. Summarized data will be presented to EPA in the form of a technical memorandum, which will be prepared as described in Section 5.6.4. of this Work Plan.

DNAPL would most likely be encountered just above any low permeability zones in both the unsaturated and saturated zones of the Upper Glacial and Magothy Aquifers. During all drilling activities, the CDM field geologist will perform a visual examination of soil cores. If cores are found to contain DNAPL, the field geologist will note its thickness and estimate a percentage of DNAPL in the pore spaces of the soil. In addition, up to two soil samples per boring will be collected for confirmatory laboratory analysis. Confirmatory soil samples will be analyzed for TCL VOCs, TCL SVOCs, and TCL pesticides/PCBs through the EPA CLP.

For cost estimating purposes, CDM will collect 10 analytical samples from a total of 5 borings, estimated at this time to be advanced to maximum depths of 250 feet bgs. The analytical parameters and numbers of samples to be collected during the DNAPL soil boring sampling program also are presented in Table 5-1.

Outlying Parcels Subsurface Soil Borings
CDM will advance a total of 25 shallow soil borings (15 feet bgs) and 15 deep soil borings (40 feet bgs) throughout the Outlying Parcels to determine if improper disposal of chemical waste was conducted on these parcels. Figure 5-8 presents the

proposed Outlying Parcels soil boring locations. A total of three soil samples, including one surface soil sample and one at the terminal depth interval, will be collected from each of the 15-foot borings. Half of the surface soil samples will be collected from 0-2 inches and half from 0-12 inches. The remaining sample will be collected based on visual contamination or when elevated organic vapors are noted. A total of four soil samples, including one surface soil sample and one at the terminal depth interval, will be collected from the 40-foot soil borings. Half of the surface soil samples will be collected from 0-2 inches and half from 0-12 inches. The remaining two samples will be collected based on visual contamination or when elevated organic vapors are noted. The soil borings will be advanced via DPT methods and sampled continuously. The locations of the soil borings will be determined based on review of the geophysical survey results, the on-site reconnaissance results, and review of historical aerial photographs.

It is anticipated that a significant amount of clearing of brush and trees will be necessary to access the sampling locations. The FTL will direct and oversee clearing of brush and trees to access the sampling locations. It is assumed that brush and trees felled during the clearing process will not be removed from the site.

For cost estimation purposes, it has been determined that a total of 135 subsurface soil samples will be collected from the 40 soil borings locations from the Outlying Parcels. Surface and subsurface soil samples will be analyzed for TCL/TAL parameters through the EPA CLP. In addition, all of the soil samples will be analyzed for TOC, grain size, and pH through EPA's DESA laboratory (if available) or CDM's laboratory subcontractor.

5.3.5 Environmental Sampling

Table 5-1 summarizes the number of environmental samples and associated analytical parameters for the various sampling events during the RI. Unless otherwise specified, analysis for TCL and TAL parameters through the CLP will be performed in accordance with the most current EPA CLP statements of work for multi-media, multi-concentration analyses for organics and inorganics. Non-RAS parameters will be analyzed by EPA's DESA laboratory in Edison, New Jersey or CDM's analytical laboratory subcontractor. Quality control samples will be collected in addition to the environmental samples discussed below. The number and type of quality control samples will be in accordance with the EPA CLP Guidance for Field Samplers, Draft-Final (EPA 2001B) and Region II CERCLA QA Manual (1989).

5.3.5.1 Groundwater Sampling

Groundwater will be sampled from existing monitoring wells, public supply wells, residential wells, and the newly installed multi-port monitoring wells. The proposed multi-port monitoring well locations are presented on Figure 5-4. Groundwater sampling will be conducted during both the FSA and the FDCA of the investigation.

All groundwater samples will be used to support the RI/FS and the Human Health and Ecological Risk Assessments. Groundwater samples collected during the FSA also will be used to assess current levels of groundwater contamination in the aquifer; assist in focusing the locations and depths of the multi-port monitoring wells; and evaluate potential contamination of the residential and public supply wells.

Existing Monitoring Well, Public Supply Well, and Residential Well Sampling
As per EPA direction during the Work Plan negotiation meeting (in March 2003), access coordination and scheduling for existing monitoring well, public supply well, and residential well sampling will be conducted by EPA.

Existing Monitoring Well Sampling
An assessment of existing monitoring wells will be performed under Subtask 5.3.1. CDM assumes that 10 existing SCDHS "PJ" monitoring wells and/or CDM MWs will be sampled during 1 round of sampling during the FSA and 5 existing wells will be sampled during 2 rounds of sampling during the FDCA; therefore, it is anticipated that a total of 20 groundwater samples will be collected during 3 rounds of sampling: 10 samples during the FSA and 10 samples during the FDCA. Existing monitoring wells will be sampled using the EPA Region II Low-Flow method. The existing wells are equipped with 15 foot screens.

For budgeting purposes, CDM will assume that 3 rounds of sampling will be conducted for a total of 20 samples collected.

Public Supply Well Sampling
Of active public supply wells within the vicinity of the LAI site, CDM estimates that three will be available for sampling during the FSA and three will be available for sampling during the FDCA. Grab samples from these wells will be collected from taps located closest to the well head and will not have been filtered or subject to treatment. One round of sampling will be conducted for the FSA and two rounds of groundwater sampling will be conducted for the FDCA.

For budgeting purposes, CDM will assume that 1 round of samples will be collected at 3 wells and 2 rounds of sampling will be conducted at the 3 wells for a total of 11 samples collected.

Residential Well Sampling
Of residential wells within the vicinity of the LAI site, CDM estimates up to five will be available for sampling during the FSA and two will be available for sampling during the FDCA. Samples from these wells will be collected from taps located closest to the well head and will not have been filtered or undergone treatment. Residential wells will be purged until the pump switches on (until the water in the holding tank is replaced with fresh formation water), after which the sample will be collected. One round of sampling will be conducted for the FSA and two rounds of groundwater sampling will be conducted for the FDCA.

For budgeting purposes, CDM will assume that one round of five samples and two rounds of two samples will be conducted for a total of nine samples collected.

A total of 38 groundwater samples collected from existing monitoring wells, selected public supply wells, and selected residential wells will be analyzed for low detection limit VOCs and full TAL metals through the CLP. In addition, all of the samples also will be analyzed for fluoride by EPA's DESA laboratory or by a laboratory under subcontract to CDM. The DO, pH, temperature, conductivity, turbidity, and Eh of the water samples will be measured in the field. All samples will be analyzed using the most current EPA-approved methods. Sampling procedures, analytical methods, detection limits, and QA/QC procedures for the analysis of groundwater samples will be fully detailed in the QAPP.

Multi-Port Monitoring Well Sampling
Each of the 10 multi-port monitoring wells will consist of 5 sampling ports. Five groundwater samples will be collected from each well during each sampling round during the FDCA for a total of 50 samples per sampling round. Samples can be collected using a modified low-flow technique using the pumping port installed in each interval. Sampling procedures, analytical methods, and detection limits, and QA/QC procedures for the analysis of groundwater screening samples will be fully detailed in the QAPP.

Multiport groundwater samples will be analyzed for low detection limit VOCs and full TCL SVOCs, pesticides/PCBs and TAL metals through the CLP. During Round 1 all 50 samples to be analyzed for alkalinity, hardness, ammonia, TKN, TSS, TDS, TOC, nitrate-nitrite, methane, ethane, ethene, sulfate/sulfide, fluoride, pH and chloride by EPA's DESA laboratory or by a laboratory under subcontract to CDM; ferrous iron will be analyzed for in the field.

CDM will review Round 1 groundwater sampling results and, with approval from EPA, will request limiting the Round 2 sampling parameters to low detection limit VOCs and full TCL SVOCs, pesticides/PCBs and TAL metals.

The DO, pH, temperature, conductivity, turbidity, and Eh of the water samples will be measured in the field. All samples will be analyzed using the most current EPA-approved methods. Sampling procedures, analytical methods, detection limits, and QA/QC procedures for the analysis of groundwater samples will be fully detailed in the QAPP.

5.3.5.2 Surface Water and Sediment Sampling
As part of the FSA, one round of surface water/sediment sampling will be conducted in five onsite cess pools, the unnamed pond (located 2,000 feet north of the LAI facility), Old Mill Pond, its associated seeps and stream (Old Mill Creek), and Port Jefferson Harbor. Figures 5-9, 5-10, and 5-11 illustrate the sampling locations.

There is the potential for contaminated surface water runoff to discharge to the surface waters of the unnamed pond. The bottom of the pond is over 150 feet above the water table and is not fed by groundwater. Currently, no surface water or sediment data are available to determine if the pond has been impacted by site-derived contamination.

Groundwater flow direction from the site is northward toward Old Mill Pond, the stream, and the harbor. The potential exists for contaminated groundwater to discharge as surface water at these locations. Previous surface water and sediment sampling efforts indicate that contamination has been detected in the seeps, Old Mill Pond and in Old Mill Creek, upstream of the Pond and downstream to Port Jefferson Harbor. The stream sediment and surface water sampling program is designed to support a preliminary evaluation of the nature and extent of contamination resulting from contaminated groundwater discharge to these surface waters.

Discharge of waste effluent from the facility to the subsurface may have occurred via dry wells and cesspools. CDM will target five onsite dry wells or cesspools identified during the site reconnaissance for surface water/sediment sampling. The results of this sampling effort will aid placement of the proposed onsite drilling locations.

Sediment and surface water samples will be collocated and collected from 24 proposed sampling locations. One of the 24 sample locations will be the harbor. Sediment samples, which will provide data for the human health and ecological risk assessments, will be collected at 0 to 6 inch depths. One additional composite sediment sample will be collected from four locations in the Old Mill Pond for waste characterization purposes. This sample will be collected at a depth of 0 to 24 inches (or less if sediment is shallower). It is anticipated that the sediment will be sampled using a push core sediment sampler. Sediment and surface water samples will be collected following EPA-approved methodologies which will be fully detailed in the QAPP.

A description of the surface water and sediment sample pairs is presented in Table 5-4. Specific locations of these samples in the field will be based on actual field conditions and biased towards sedimentation locations (such as the slower flowing portions or the inside of the creek bend where lower stream flow velocities promote sediment fall out from suspension).

As the downstream portion of Old Mill Creek is tidally influenced, sample pairs only will be collected at dead low tide to maximize the proportion of groundwater discharged to the surface water. It may be necessary to adjust sampling locations based on the amount of sediment available in the creek and pond. Samples will not be collected after a significant rainfall event, so as to minimize the dilution effect from overland flow. For waste characterization purposes, in the event that contaminated Old Mill Pond sediments will require excavation, one composite sediment sample will be collected from four locations in the Old Mill Pond and composited into one sample. The four samples will be collected from the edge of the Pond. The sediment collection locations will be spaced out evenly around the Pond's edge. It is anticipated that there will be two collection locations from the longest side of the Pond and one collection location each from the two other sides of the Pond.

Sediment samples will be analyzed through the CLP for TCL/TAL parameters and by the DESA laboratory, or by the CDM analytical laboratory subcontractor for pH, TOC, and grain size. The composite sediment sample collected for waste characterization purposes will be analyzed by the CDM analytical laboratory subcontractor for RCRA characteristics after Toxicity Characteristic Leachate Procedure (TCLP). Samples will be analyzed using the most current EPA-approved methods. Sample collection and laboratory analytical methods for sediment samples will be fully described in the QAPP.

Stream/pond/harbor surface water samples will be analyzed through the CLP for full TCL/TAL parameters. Surface water samples also will be analyzed for hardness, alkalinity, TKN, ammonia, nitrate-nitrite, fluoride, sulfate/sulfide, chloride, methane, ethane, ethene, TSS, TDS, TOC, and pH by the DESA laboratory or CDM analytical laboratory subcontractor. Surface water samples will be analyzed for ferrous iron (Fe^{+2}) in the field. All samples will be analyzed using the most current EPA-approved methods. In addition, CDM will collect field measurements of the following surface water quality parameters: DO, Eh, turbidity, pH, temperature, salinity, and conductivity at each surface water sampling location.

Table 5-1 provides a summary of laboratory analytical parameters for the surface water/sediment samples. CDM assumes that a total of 25 sediment samples and 24 surface water samples will be collected.

5.3.6 Ecological Characterization

An ecological characterization of the site will be conducted to describe existing conditions relative to vegetation community structure, wildlife utilization and sensitive resources such as surface waters and wetlands. This assessment will provide sufficient information to characterize ecological conditions of the Lawrence Aviation Inc. property, the Outlying Parcels, and the contaminant migration pathway(s) from the site to support the RI and screening level ecological risk assessment. The ecological characterization will consist of a review of existing information, an ecological field investigation, and identification of threatened /endangered species and critical habitats.

5.3.6.1 Ecological Field Investigation

The ecological field investigation will characterize the terrestrial and aquatic communities associated with the Lawrence Aviation Inc. property, the Outlying Parcels, and surrounding areas. Habitat conditions will be visually inspected by walking the site and recording observations of composition and relative diversity and abundance, habitat association, and channel conditions. Field observations will be recorded in field logbooks and photographs will be taken to record both representative and unusual site conditions that would influence conclusions regarding potential contamination pathways, food chain effects, receptor identification, and risks to floral and faunal communities. Field survey activities will produce the following kinds of ecological information:

- General aquatic habitat conditions (for example, water velocity, bottom substrate, channel width, channel depth, and extent of bank vegetative cover) within the property boundaries, downstream of the site to the furthest planned stream sampling location, and in the area of the upstream sample location(s). The aquatic surveys will include examination and documentation of the features of the habitat(s). Appropriate field survey forms, available from EPA's *Rapid Bioassessment Protocols* and including the Physical Characterization/Water Quality Field Data Sheet and the Habitat Assessment Field Data Sheet, may be used as tools in completing the characterization of the aquatic habitats.

- Vegetation community/cover types and observed vegetative species makeup of each community, including dominant species and general observations of abundance and diversity within each cover type, at and in areas related to the site

- Wildlife use observations including wildlife habitats, species, wildlife concentration areas, habitat use activities

- Location, size, and existing conditions of on site areas of environmental stress/disturbance

- General surficial soil conditions

- Indications of environmental stress that could be related to site contaminants

An ecological description will be prepared to discuss the site's vegetative communities, wildlife habitats, suspected surface water drainage pathways, and observed areas of environmental stress/disturbance. The following information will also be prepared and presented: observed potential surficial migration pathways (surficial drainage ways); onsite vegetation communities and composition; observed onsite terrestrial and aquatic wildlife habitats; observed and expected wildlife utilization of the site; potential occurrence of state and federal threatened, endangered, or rare species and critical habitats; and, observed ecological impairment.

5.3.6.2 Identification of Endangered and Special Concern Species

The Endangered Species Act endeavors to conserve ecosystems which endangered or threatened species inhabit, and to protect the species themselves. The presence of any state or federal threatened or endangered wildlife or plant species or significant habitats at the site or surrounding area will be determined. The appropriate offices of New York Department of Environmental Conservation and U.S. Fish and Wildlife Service will be consulted to aid in this determination. Written communication from appropriate agencies will be presented in the ecological risk assessment report.

Habitats essential to the growth and survival of rare plants and animals are considered critical habitats. Site walks conducted during the ecological characterization will identify critical habitats and the presence of these habitats will be noted in field logbooks. In addition, impairment (stressed vegetation, single species habitat) of critical habitats will be noted in field logbooks.

5.3.7 Geophysical Survey/Drum Investigation

As part of initial site reconnaissance activities, CDM will conduct a surface geophysical investigation to locate buried objects that may act as sources of soil and groundwater contamination. The survey will be performed by a geophysics subcontractor at three areas on-site or immediately adjacent, with the total area to cover approximately seven acres. Survey areas (shown in Figure 5-2) include:

- The 1980 drum storage and crushing area. Aerial photos, historical records and visual observations by regulatory personnel indicate a large number of drums were stored in this area. Examination of aerial photos also show clearing and excavation of soil in this area beginning about 1966.

- Both the north and south lagoons. Aerial photos indicate both lagoons were filled between the years 1976 to 1984.

- Site run-off drainage scars east of Building 9 and Building F. Aerial photos show clearing and excavation of soil between 1966 and 1976.

Each area to be surveyed will be marked out using a ten foot grid spacing system. The geophysical survey data will be collected in two separate events. A terrain conductivity survey will be conducted first using a Geonics EM-31 ground conductivity meter, or equivalent. Any geophysical abnormalities (subsurface metal objects) found with the EM-31 will be further investigated using ground penetrating radar (GPR) to aid in determination of fill depth and limits. The EM -31 survey will not be conducted in areas where large quantities of metallic objects are known to have been buried ,such as the 1980 drum storage and crushing area.

5.3.7.1 Outlying Parcel Geophysical Survey

During the FSA, CDM will perform a geophysical survey to identify possible waste source and drum burial areas within the boundaries of the Outlying Parcels. The surface geophysical survey will be conducted prior to performing any subsurface activities. It is anticipated that an electromagnetic conductivity survey and a ground penetrating radar survey will be performed; however, other geophysical survey methods may be used depending on survey location conditions. The geophysical survey will be performed by a subcontractor under contract to CDM. It is assumed that a total of 20 acres will be surveyed within the Outlying Parcels. CDM will direct and oversee the activities of the geophysical survey subcontractor.

The survey transects will be completed over the areas of interest on the Outlying Parcels (20 acres) on a 10-foot grid spacing. This spacing will provide sufficient resolution to detect a subsurface target the size of a 55-gallon drum. Clearing of brush and small trees along transects spaced approximately 10-feet apart will be performed by the subcontractor. It is assumed that felled tress and brush will not be removed from the site. CDM will identify the locations of the transect lines and will oversee and approve the clearing once it is completed.

5.3.8 Disposal of Field Generated Waste

A subcontractor will be procured that will be responsible for the removal and proper disposal of all investigation-derived waste (IDW), including waste soils, liquids, solids, and personal protective equipment. Representative waste samples will be collected and analyzed by a laboratory to characterize the waste. A technical statement of work will be prepared for the procurement of the waste hauling and disposal subcontractor under Subtask 5.1.11. Field oversight and health and safety monitoring will be conducted during all waste disposal field activities.

5.4 Task 4 - Sample Analysis

Table 5-1 specifies the analyses for each type of environmental sample collected during the field program. RAS samples will be analyzed through the EPA CLP and all non-RAS samples will be analyzed by the DESA laboratory or CDM analytical laboratory subcontractor.

5.4.1 Innovative Methods/Field Screening Sample Analysis

CDM will conduct MIP groundwater and soil screening as part of the RI investigation; these innovative methods of sampling are described fully in sections 5.3.3.1 and 5.3.4.1, respectively. During FDCA activities, groundwater samples will be collected from multiple aquifer zones within the multi-port monitoring wells.

5.4.2 Analytical Services Provided via CLP or DESA

All RAS samples will be analyzed through the EPA CLP and all non-RAS samples will be analyzed by the DESA laboratory or CDM analytical laboratory subcontractor. Table 5-1 specifies the analyses for each type of environmental sample collected during the field program.

5.4.3 Subcontractor Laboratory for Non-RAS Analyses

CDM will procure a subcontract laboratory for analysis of non-RAS samples. If DESA does not have capacity to analyze the non-RAS parameters listed in Table 5-1, the samples will be analyzed by the subcontract laboratory.

The laboratory subcontractor will be selected by EPA-approved criteria and will follow the most current EPA protocols and Region II QA requirements. The RAC II Regional Quality Assurance Coordinator (RQAC) will ensure that the laboratory meets all EPA requirements for laboratory services. The number of samples and analytical parameters are defined on Table 5-1. The analytical test methods, levels of detection, holding times, parameters, field sample preservation and QC samples will be provided in the QAPP.

5.5 Task 5 - Analytical Support and Data Validation

CDM will validate the non-RAS environmental samples collected under Task 3; EPA will validate all RAS analytical data for the RI investigation.

5.5.1 Collect, Prepare and Ship Samples
Sample preparation and shipment is included under Task 3.

5.5.2 Sample Management
The CDM Analytical Services Coordinator (ASC) will be responsible for all RAS CLP laboratory bookings and coordination with the Sample Management Office (SMO), the Regional Sample Control Center (RSCC), the DESA, and/or other EPA sample management offices for sample tracking prior to and after sampling events.

For all RAS activities, CDM will notify the Contract Laboratory Analytical Support Services (CLASS) to enable them to track the shipment of samples from the field to the laboratories and to ensure timely laboratory receipt of samples. Sampling trip reports will be sent directly to the RSCC and the EPA RPM within ten working days of final sample shipment, with a copy sent to the CDM ASC.

The CLP laboratories will be responsible for providing organic and inorganic analytical data packages to the Region II shipping coordinator for data validation by EPA.

Samples analyzed by the DESA laboratory and/or the subcontract laboratory will be coordinated by the ASC. All analytical data packages from the subcontract laboratory will be sent directly to CDM for data validation. The ASC will provide a non-RAS tracking form to EPA each month. If requested, CDM will send these validated data packages to EPA for QA review purposes. The data will be delivered in a format conducive for database input. CDM will provide the subcontract laboratory with a format for the electronic data deliverable.

5.5.3 Data Validation
All RAS samples will be analyzed by a laboratory participating in the CLP and all analytical data will be validated by EPA. The non-RAS data will be validated by CDM validators, who will use the requirements and the quality control procedures outlined in the associated methods and as per the analytical statement of work for the laboratory subcontractor. The validation will determine the usability of the data. All validated data results will be presented in an appendix to the RI report. A data validation report summarizing the results of data validation will be submitted to EPA after all data have been validated.

Data validation will verify that the analytical results were obtained following the protocols specified in the CLP SOW, and are of sufficient quality to be relied upon to prepare a human health risk assessment, to prepare an RI report, and to support a Record of Decision (ROD).

5.6 Task 6 - Data Evaluation
This task includes efforts related to the compilation of analytical and field data. All validated and unvalidated data will be entered into a relational database that will

serve as a repository for data analysis, risk assessment, GIS, and data visualization. Environmental Quality Information Systems (EQuIS) will be used as the database. Tables, figures, and maps will be generated from the data to support preparation of the data evaluation report, the RI report, the human health RA report, the ecological RS report, and the FS report. The data from this investigation will be reviewed and carefully evaluated to identify the nature and extent of site-related contamination.

5.6.1 Data Usability Evaluation

CDM will evaluate the usability of the data, including any uncertainties associated with the data. The data will be checked against the DQOs identified in the QAPP. Any qualifications to the data usability will be discussed in the quality assurance section of any reports presenting data.

5.6.2 Data Reduction, Tabulation and Evaluation

CDM will evaluate, interpret, and tabulate data in an appropriate presentation format for final data tables. The following will be used as general guidelines in the preparation of data for use in the various reports.

- Tables of analytical results will be organized in a logical manner such as by sample location number, sampling zone, or some other logical format.
- Analytical results will not be organized by laboratory identification numbers because these numbers do not correspond to those used on sample location maps. The sample location/well identification number will always be used as the primary reference for the analytical results. The sample location number will also be indicated if the laboratory sample identification number is used.
- Analytical tables will indicate the sample collection dates.
- The detection limit will be indicated in instances where a parameter was not detected.
- Analytical results will be reported in the text, tables and figures using a consistent and conventional unit of measurement such as µg/L for groundwater analyses and milligrams/kilogram (mg/kg) for soil analyses.
- EPA's protocol for eliminating field sample analytical results based on laboratory/field blank contamination results will be clearly explained.
- If the reported result has passed established data validation procedures, it will be considered valid.
- Field equipment rinsate blank analytical results will be discussed in detail if decontamination solvents are believed to have contaminated field samples.

Detailed information concerning the hydrogeological and physical characteristics of the site and the surrounding area will be gathered, reviewed, and evaluated for inclusion in the data evaluation report, the RI report, the RA reports, and the FS report. The purpose of these activities will be to provide a detailed understanding of the site physical features and to assess how these features may affect contaminant source areas, potential migration pathways, and potential remedial alternatives.

Database Management

CDM will use a relational environmental database and standard industry spreadsheet software programs for managing all data related to the sampling program. The system will provide data storage, retrieval, and analysis capabilities, and be able to interface with a variety of spreadsheet, word processing, statistical, GIS, and graphics software packages to meet the full range of site and media sampling requirements necessary for this work assignment.

Data collected during the RI will be organized, formatted, and input into the database for use in the data evaluation phase. All data entry will be checked for quality control throughout the multiple phases of the project. Data tables comparing the results of the various sampling efforts will be prepared and evaluated. Data tables will also be prepared that compare analytical results with both state and federal ARARs.

Data Mapping

A GIS will be developed for the site and study area in order to facilitate spatial analysis of the data and to generate figures for reports and presentations. The GIS will have geographic base layers consisting of various kinds of maps that depict regional and local physiographic features such as roads, buildings, water bodies, railroads, and topography. Site-specific features derived from the site and study area survey results will be added to complete the base layers. As samples are collected and wells are installed, the locations will be registered in the GIS. Historical and current analytical results for each sample location will be added, creating the capability to conduct functional spatial queries of the data to show where parameters of interest are sampled, detected, and exceed regulatory standards or criteria, by date and depth. This functionality will be used to support data interpretation for preparation of the remedial investigation report.

The GIS will also serve as the primary platform for figure and map generation to support both the RI and FS reports and presentations such as public meetings. Figures will be generated in plan view and cross section to show the extent of groundwater contamination. Graphic illustrations in the data evaluation report and/or the RI report will include geological profiles, cross-sections, water table maps, contaminant isoconcentration maps, and longitudinal and cross-sectional profiles of groundwater contamination. Plan view maps and figures will be generated using GIS to facilitate plan-view spatial data analysis. Figures will be generated to illustrate site features, historical sample locations, historical sampling results, current sample locations, current sampling results, locations where groundwater quality exceeds regulatory standards and criteria, and monitored natural attenuation (MNA) parameter concentrations relative to contaminant concentrations.

5.6.3 Modeling

After completion of the field activity and during the preparation of the RI technical memorandum, the initial assessment of the need for ground water modeling at the LAI Site will be conducted. The assessment will result in recommendations to be submitted to EPA for review and consideration.

For the initial modeling assessment, all relevant and available data will be reviewed, including technical documents/reports and raw data from adjacent (and offsite) areas that may be within the anticipated model domain. Some of the analytical work required to make the assessment will already have been carried out during the RI. The initial modeling assessment will include the following activities:

- Review of:
  Regional hydrogeological setting of the site
  Site-specific data:
    - Nature and extent of contamination
    - Hydraulic properties of the aquifer (s)
    - Geometry and lithology of the aquifer(s)

  Potential model boundaries and boundary conditions
  Data accuracy and adequacy

- Preparation of recommendations section

Until the initial data review and modeling assessment is carried out, definition of a technical approach for site modeling is considered to be premature. If EPA concurs with any recommendations for modeling, then a detailed work plan and an associated modeling budget will be prepared for EPA's review. This work plan would detail the technical approach and outline specific tasks to be carried out. It would also provide a preliminary conceptual model of the site that would serve as the basis for model development.

5.6.4 Technical Memoranda

Results of Field Screening Activities/Recommendations for Field Data Collection Activities

CDM will prepare a technical memorandum containing the data results of the FSA investigations. The memorandum will make recommendations for the proposed FDCA investigations based on the screening results. The technical memorandum will be reviewed and approved by EPA.

Data Evaluation Report

Upon completion and evaluation of the FDCA sampling results, CDM will prepare and submit a Data Evaluation Report for review and approval by the EPA RPM.

Outlying Parcels Report
CDM will prepare a technical memorandum that summarizes the finding of the Outlying Parcels Investigations.

5.7 Task 7 - Assessment of Risk

CDM will conduct a HHRA and Ecological Risk Assessment for the LAI site. The objective of the risk assessments is to provide a quantitative assessment of the potential for adverse health and environmental effects to occur as a result of exposure to chemical contaminants at the site.

The HHRA will determine whether site contaminants pose a current or potential risk to human health in the absence of any remedial action, and will be used to determine whether remediation is necessary at the site and to focus remediation on those media/exposure pathways that pose the greatest risk. Furthermore, the HHRA can provide a method for comparing the potential health impacts of various remedial alternatives.

For the HHRA, CDM will use EPA's standardized planning and reporting methods as outlined in EPA's Risk Assessment Guidance for Superfund (RAGS Part D). RAGS Part D provides guidance on standardized risk assessment planning, reporting, and review throughout the CERCLA remedial process, from scoping through remedy selection and completion and periodic review of the remedial action.

The ecological risk assessment will identify the potential current and future environmental risks associated with LAI that would exist if no action is taken. This assessment will be used to determine if remediation is necessary and where to focus remediation efforts, if necessary.

5.7.1 Baseline Risk Assessment (Human Health)

The HHRA will be performed in accordance with EPA guidance set forth in the following documents:

- *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part A* (EPA 1989a)
- *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part B, Development of Risk Based Preliminary Remediation Goals* (EPA 1991a)
- *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments* (EPA 2001a)
- *Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment* (EPA 2001b)

- *Exposure Factors Handbook, Vol I, II and III* (EPA 1997b)
- *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors* (EPA 1991b)
- *Final Guidance for Data Usability in Risk Assessment* (EPA 1992a)
- *Dermal Exposure Assessment: Principals and Applications* (EPA 1992b)
- *Health Effects Assessment Summary Tables FY-1997 Annual* (EPA 1997)
- *Integrated Risk Information System (on-line data base of toxicity measures)* (EPA 2003, or most current version available after RI data is collected)
- *EPA Region IX Preliminary Remediation Goals* (EPA 2002, or most current version available after RI data is collected)

Additional guidance which addresses site-specific issues and chemical contaminants will also be consulted.

CDM will prepare a HHRA that accurately establishes the site characteristics of the contaminated media, extent of contamination, and the physical boundaries of the contamination. Key contaminants will be selected based on persistence and mobility in the environment and the degree of hazard. CDM will evaluate key contaminants identified in the HHRA for receptor exposure and perform an estimate of the level of key contaminants reaching human receptors.

CDM will evaluate and assess the risk to humans posed by exposure to site contaminants. CDM will perform the following activities under this subtask, which will form the basis for the HHRA.

5.7.1.1 Draft Human Health Risk Assessment Report

The draft risk assessment report will be submitted after EPA has approved the PAR, described in Section 5.1.13. The draft risk assessment report will cover the following:

- **Hazard Identification (sources)** - CDM will review all available sample information on the hazardous substances present at the site, and identify the major contaminants of concern. The final set of chemicals of potential concern to be used in the risk assessment will be selected in accordance with EPA Region II procedures as presented in RAGS Part A. Additional selection criteria that will be used to identify the COPCs at the site include the following:
  - Frequency of detection in analyzed medium (e.g., groundwater)
  - Historical site information/activities (i.e., site-related)

- Sample chemical detections relative to blank chemical detections

- Chemical toxicity (potential carcinogenic and non-carcinogenic effects, weight of evidence for potential carcinogenicity)

- Chemical properties (i.e., mobility, persistence and bioaccumulation)

- Significant exposure routes

- Risk-based concentration screen using EPA Region IX Risk Based Concentrations and media specific chemical concentrations (i.e., maximum concentrations)

In general, nutrients such as calcium, magnesium, potassium, and sodium are not quantitatively evaluated in the risk assessment as the potential toxicity of these minerals is significantly lower than other inorganics detected at the site and more data are available with respect to identifying dietary intake rather than toxicity.

Statistical analysis of the data will be performed (i.e., tests for normal distribution, calculation of upper confidence levels [UCLs]).

- **Dose-Response Assessment** - The dose-response assessment will present the general toxicological properties of the selected COPCs using the most current toxicological human health effects data. Those chemicals which cannot be quantitatively evaluated due to a lack of toxicity factors will not be eliminated as COPCs on this basis. These chemicals will instead be qualitatively addressed for consideration in risk management decisions for the site.

  Toxicological values and information regarding the potential for carcinogens and non-carcinogens to cause adverse health effects in humans will be obtained from a hierarchy of EPA sources. The primary source will be EPA's Integrated Risk Information System (IRIS) on-line data base. IRIS, which is updated regularly, provides chemical-specific toxicological values and information that have undergone peer review and represent an EPA scientific consensus. If toxicity values are not available from IRIS, the most recent Health Effects Assessment Summary Tables (HEAST) will be used to select toxicity values. EPA's National Center for Environmental Assessment (NCEA) may also be contacted to provide toxicity information if no data are available from IRIS or HEAST.

  A slope factor is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime and is usually the upper 95 percent confidence limit of the slope of the dose-response curve expressed in $(mg/kg/day)^{-1}$. In risk assessment, a slope factor is used to estimate an upper-bound probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of a potential carcinogen.

For the evaluation of non-cancer effects in the risk assessment, chronic and subchronic reference doses (RfDs) are used. A chronic reference dose is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without appreciable risk of deleterious effects during a lifetime. Chronic reference doses are generally used to evaluate the potential non-cancer effects associated with exposure periods between six years and a lifetime. Subchronic reference doses aid in the characterization of potential non-cancer effects associated with shorter-term exposure (i.e., less than six years).

Toxicity endpoints/target organs for non-carcinogenic COPCs will be presented for those chemicals showing hazard quotients greater than one. If the hazard index is greater than one due to the summing of hazard quotients, segregation of the hazard index by critical effect and mechanism of action will be performed as appropriate.

- **Site Conceptual Model** - CDM will develop a conceptual model for the site. The model will be used to identify potential or suspected sources of contamination, types and concentrations of contaminants detected at the site, potentially contaminated media, release mechanisms, and potential exposure pathways, including receptors.

  When preparing the site conceptual model, the following factors will be considered:

  - sensitive populations, including but not limited to the elderly, pregnant or nursing women, infants and children, and people suffering from chronic illness
  - people exposed to particularly high levels of contaminants
  - circumstances where a disadvantaged population is exposed to hazardous materials (i.e., Environmental Justice situations)
  - significant contamination sources
  - potential contaminant release mechanisms (e.g., volatilization, fugitive dust emissions, surface runoff/overland flow, tracking by humans, animals, soil gas generation, and biodegradation)
  - contaminant transport pathways such as direct air transport downwind, soil gas migration, and biomagnification in the food chain
  - cross media transfer effects, such as volatilization to air, wet deposition, dry deposition, and bioaccumulation in home grown vegetables

- **Exposure Assessment** - Exposure assessment involves the identification of the potential human exposure pathways at the site for present and potential future-use scenarios. Potential release and transport mechanisms will be identified for contaminated source media. Exposure pathways will be identified that link the sources, locations, types of environmental releases, and environmental fate with receptor locations and activity patterns. Generally, an exposure pathway is considered complete if it consists of the following elements:

- a source and mechanism of release
- a transport medium
- an exposure point (i.e., point of potential contact with a contaminated medium)
- an exposure route (e.g., ingestion) at the exposure point

All present and future-use scenario exposure pathways considered will be presented; however, only some may be selected for quantitative analysis. Justifications will be provided for those exposure pathways retained and for those eliminated.

Based on the initial site visit and information regarding current and future land use, the potentially complete exposure pathways include:

PRESENT AND FUTURE USE

- Site Workers *(Adults)*
  - Surface Soil
  - incidental ingestion
  - inhalation of fugitive dust (wind blown)
  - dermal
  - inhalation of volatiles migrating from the groundwater table into site buildings

- Construction Worker ***(Adults)***
  - Surface Soil/Subsurface Soil
    - incidental ingestion
    - inhalation of fugitive dust and vapor (construction related)
    - dermal

- Residents ***(Adults and Children)***
  - Surface Soil
    - incidental ingestion
    - inhalation of fugitive dust (wind blown)
    - dermal
  - Groundwater
    - ingestion
    - dermal
    - inhalation of volatiles while showering

- inhalation of volatiles migrating from the groundwater table into residences (for residences located where groundwater is close to the surface)

- Offsite Pond/Creek Recreational Users ***(Adolescents and Adults)***
  - Sediment
    - incidental ingestion
    - dermal
  - Surface Water
    - incidental ingestion
    - dermal

Exposure point concentrations will be developed for each COPC in the risk assessment for use in the calculation of daily intakes. The concentration is the 95 percent UCL on the arithmetic mean, or the maximum detected value (whichever is lower). Exposure point concentrations for air will be estimated from measured concentrations in soil and groundwater using models recommended in EPA guidance documents.

Daily intakes will be calculated for both chronic and subchronic exposures. These daily intakes will be used in conjunction with toxicity data to provide quantitative estimates of carcinogenic risk and non-cancer effects. Exposure assumptions used in daily intake calculations will be based on information contained in EPA guidance, site-specific information, and professional judgement. These assumptions are generally 90th and 95th percentile parameters, which represent the reasonable maximum exposure (RME). The RME is the highest exposure that is reasonably expected to occur at a site. If potential risks and hazards exceed EPA target levels then Central Tendency Exposures (CTE) will be evaluated using 50th percentile exposure variables.

The exposure assessment will identify the magnitude of actual or potential human exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The assumptions will include information from the Standard Default Assumptions Guidance and the updated Exposure Factors Handbook. Site specific information will be used where appropriate to verify or refine these assumptions. In developing the exposure assessment, CDM will develop reasonable maximum estimates of exposure for both current land use conditions and potential land use conditions at the site.

- **Risk Characterization** - In this section of the risk assessment, toxicity and exposure assessments will be integrated into quantitative and qualitative expressions of carcinogenic risk and non-cancer hazards. The estimates of risk and hazard will be presented numerically in spreadsheets contained in an appendix.

Carcinogenic risks are estimated as the incremental probability of an individual developing cancer over a life time as a result of exposure to a potential carcinogen. Per RAGS, the slope factor converts estimated daily intakes averaged over a lifetime directly to incremental risk of an individual developing cancer. This carcinogenic risk estimate is generally an upper-bound value since the slope factor is often an upper 95th percentile confidence limit of probability of response based on experimental animal data used in the multistage model

The potential for non-cancer effects will be evaluated by comparing an exposure level over a specified time period with a reference dose derived for a similar exposure period. This ratio of exposure to toxicity is referred to as a hazard quotient. This hazard quotient assumes that there is a level of exposure below which it is unlikely even for sensitive populations to experience adverse health effects; however, this value should not be interpreted as a probability. Generally, the greater the hazard quotient is above unity, the greater the level of concern.

Carcinogenic risks and non-cancer hazard index (HI) values will be combined across chemicals and exposure pathways as appropriate. In general, EPA recommends a target value or risk range (i.e., HI = 1 for non-cancer effects or cancer risk = $1x10^{-4}$ to $1x10^{-6}$) as threshold values for potential human health impacts. The results presented in the spreadsheet calculations will be compared to these target levels and discussed. Characterization of the potential risks associated with the site provides the EPA risk manager with a basis for determining whether additional response action is necessary at the site and a basis for determining residual chemical levels that are adequately protective of human health.

- **Identification of Limitations/Uncertainties** - In any risk assessment, estimates of potential carcinogenic risk and non-cancer health effects have numerous associated uncertainties. The primary areas of uncertainty and limitations will be qualitatively discussed. Quantitative measures of uncertainty will involve the calculation of central tendencies. Central tendency evaluation involves the use of 50th percentile input parameters in risk and hazard estimates as opposed to 90th percentile parameters used in the RME calculations. The 50th percentile parameters are considered representative of the general receptor population, but may underestimate the true health risk to sensitive receptors. The chemicals driving the risk assessment will be evaluated using these average exposure assumptions and the 95 percent UCL concentration to derive risk. The central tendency risks will be discussed in relation to RME risks. Central tendency analyses will only be calculated for pathways in which RME risks are considered above *de minimis* levels (carcinogenic risk above $1x10^{-6}$ and/or HI above 1.0).

The CDM site manager will coordinate with the EPA RPM and submit draft/interim deliverables as outlined in the Risk Assessment Guidance for Superfund - Part D. All data will be presented in RAGS Part D Format. The risk assessment will provide adequate details of the activities and be presented so that individuals not familiar with risk assessment can easily follow the procedures.

5.7.1.2 Final Human Health Risk Assessment Report

CDM will submit the final HHRA Assessment Report, incorporating EPA review comments.

5.7.2 Ecological Risk Assessment

The ecological risk assessment will be prepared in accordance with the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (Interim Final)* (ERAGS) (EPA, 1997a). The ecological risk assessment begins with a screening level ecological risk assessment (SLERA), which includes Steps 1 and 2 of the ERAGS guidance and is further described in the next subsection. Further ecological risk assessment may be required, depending upon the results of the SLERA and associated EPA management decisions. If the ecological risk assessment is to be continued, as in instances where the SLERA indicates that the potential for adverse effects exists or that information is not adequate to make a decision at this point, the baseline ecological risk assessment (BERA) will be conducted, beginning with Step 3 of ERAGS.

5.7.2.1 Screening Level Ecological Risk Assessment

A SLERA will be conducted utilizing the data generated from the RI and data from previous investigations of the site, as applicable. The SLERA will address the potential risks to ecological receptors from site contaminants in soils, sediments, surface water within the vicinity of the site.

A four-step process is utilized for assessing site-related ecological risks for a reasonable maximum exposure scenario. The screening ecological risk assessment is composed of these four components as listed in order:

- Problem Formulation—a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study

- Exposure Assessment—a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations

- Ecological Effects Assessment—literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors

- Risk Characterization—measurement or estimation of both current and future adverse effects

A draft report will be generated that will be finalized after EPA comment and resolution.

Problem Formulation
The problem formulation section will define the objectives and scope of the ecological risk assessment. Descriptions of site history, environmental setting, nature and extent of contamination, habitat characterization, and potential ecological receptors will be included.

A selection of chemical contaminants of concern will be performed. This selection process is used to narrow the focus of the ecological risk assessment and serves to identify dominant site risk and to guide future remediation decisions. The selection process for each contaminant of concern (COC) will take into consideration the following:

- Environmental concentration
- Physical/chemical properties, including bioavailability or presence of chemical form that can affect organisms
- Potential for bioaccumulation or bioconcentration
- Toxicity characteristics and potency (amount of toxicant capable of producing adverse effects)
- Comparison to appropriate conservative screening values (e.g., NYSDEC Ambient Water Quality Standards, National Recommended Water Quality Criteria, and NYSDEC Sediment Quality Guidelines)

Chemicals cannot be eliminated as COCs due to the chemical's frequency of occurrence or by comparison to background reference condition concentrations; therefore, frequency of detection and reference condition levels will not be factors in the selection of COCs for this ecological risk assessment.

Site-related receptor species will be chosen as ecological representatives of the trophic levels and habitats on and surrounding the site. Selection will be based on an integration of the types and distribution of COCs, habitats, range and feeding habits of the potential ecological receptors, and relationships between the observed/expected species in the areas of concern. Other considerations include species that are Trustee or regulatory concerns.

The assessment endpoint for the ecological risk assessment is the disruption of ecological community structure via reduction of an ecological population. It will be assumed that a reduction of an ecological population may occur through the loss of normally-functioning individuals of the population. In this ecological risk assessment, the assessment endpoint is evaluated through wildlife measurement endpoints. The measurement endpoints to be used to evaluate potential ecological impacts are benchmark toxicity endpoints from the literature. Individual toxicity endpoints such as survival, reproductive effects, and growth impacts will be considered.

Exposure Assessment
The purpose of the exposure assessment section is to evaluate the potential for receptor exposure to chemical constituents at the site. This evaluation involves identification of contaminant exposure pathways that may be of concern for ecological receptors and determination of the magnitude of exposure to the selected ecological receptors. A conceptual site model (simplified food web noting expected contaminant transfer pathways) will be included.

Ecological Effects Assessment
The toxicity assessment will link potential contaminant exposure point concentrations to adverse effects in the selected ecological receptors. The goal of the toxicity assessment is to allow for the determination of the toxic effects of site COCs on selected receptors.

Benchmark toxicity values will be sought and utilized in this assessment. A database search will be performed to identify benchmark toxicity values for COCs. Data sources will be reviewed and may include:

- ECOTOXicology Database System (ECOTOX)
- Registry of Toxic Effects of Chemical Substances (RTECS)
- Hazardous Substance Database (HSDB)
- Integrated Risk Information System (IRIS)

Benchmark toxicity values will also be obtained from open literature sources.

Risk Characterization
Risk characterization will evaluate the evidence linking site contamination with adverse ecological effects. Risk characterization will integrate the exposure assessment with the toxicity assessment. Characterization of risk to site ecological receptors will be determined on the basis of comparison of ecotoxicological benchmark values from the literature with exposure doses (hazard index approach).

Uncertainties and Limitations
In producing any risk assessment, it is necessary to make assumptions. Assumptions carry with them associated uncertainties which must be identified so that risk estimates can be put into perspective. Uncertainties and limitations associated with the ecological risk assessment will be discussed.

5.7.2.2 Baseline Ecological Risk Assessment

EPA will determine whether a baseline ecological risk assessment is required after reviewing and approving the SLERA. If a baseline ecological assessment risk assessment is required, it will be performed according to the ERAGS guidance, beginning with Step 3 (Baseline Assessment Problem Formulation), and include all required Scientific Management Decision Points (SMDPs). This step refines the screening-level problem formulation based on the input from agency stakeholders. This step results in the development of the assessment endpoints, the exposure pathways, the risk questions that will be answered by the ecological assessment and the site conceptual model. The SMDP at the completion of this phase will document these developments and seek agency concurrence before proceeding to the next ERAGS step.

After agreement on the baseline problem formulation SMDP, Step 4 of the ERAGS will proceed. This Step will include the establishment of the measurement endpoints, study design, and data quality objectives. Based on these endpoints the ecological risk assessment work plan, sampling plan and quality assurance project plan will be developed. These site specific plans will be prepared and distributed to EPA for approval as the next SMDP of ERAGS. Sampling and assessment requirements for the BERA may include wetland delineation, assessment of wetland functions and values, benthic reconnaissance/community characterization, biota sampling, and sediment toxicity testing.

The next steps of the ERAGS process (i.e., Steps 5 and 6) include the field verification and implementation of the sampling design.

The final step of ERAGS, Step 7 is the Risk Characterization which includes the risk estimation, risk description and uncertainty analysis. In this final step, the draft baseline ecological risk assessment report will be developed to include the integration of the data on exposure and effects into a statement about the risk to the assessment endpoints established during the problem formulation phase. A weight-of-evidence approach will be used to interpret the implications of the studies and tests conducted for the assessment endpoints. A draft BERA Report will be submitted to EPA for review. A final BERA Report will be submitted to EPA after addressing the EPA review comments.

For costing purposes, CDM has assumed that a BERA will be required for this site, and has included in the cost proposal for effort associated with Step 3, the problem formulation step of the BERA.

Ecological Activities for the Baseline Ecological Risk Assessment

The following activities may be required to provide information for the BERA. Results of the SLERA and subsequent management decisions will determine the need to implement these activities. The following is a preliminary estimate of the activities that may be required to support a BERA; however, actual activities may vary widely from the list provided. The activities are not planned to occur immediately but are contingent upon the outcome of the SLERA and subsequent management decisions. Sample collection, preparation, analysis, and QA/QC procedures will be described in the BERA Work Plan and QAPP documentation.

Wetland Delineation
Wetland systems associated with the site will be delineated according to the routine methods outlined in the US Army Corps of Engineers Wetland Delineation Manual (USACE 1987). This effort will be refined as the extent of contamination becomes known. The wetland boundaries, as established during the delineation, will be surveyed in the field by a licensed land surveyor and will be presented on a site base map. Documents to be reviewed include U.S. Geological Survey mapping, U.S. Department of the Interior National Wetland Inventory mapping, Soil Survey of Suffolk County, New York, and available aerial photographs of site. It is not expected that wetland conditions exist at the site itself. The area to be delineated will include the site property and the drainage pathway north along the Old Mill Creek to the last sediment/surface water sampling location before Port Jefferson Harbor, areas expected to receive contaminant discharge from the site. It is anticipated that wetlands delineation will not be necessary for the LAI site.

Assessment of Wetland Functions and Values
If determined necessary by EPA, an assessment of wetland functions and values will be conducted for any wetlands determined by the wetland delineation. This assessment will be performed in accordance with Executive Order 11990 and EPA's 1985 Statement of Policy on Flood Plains and Wetland Assessments for CERCLA Actions. The assessment will include a brief discussion of the impacts of any selected remedial alternative as compared with other options, a functional assessment of wetland resources (including characterization of existing flora and fauna) the effects of contaminants on wetland resources, measures to minimize potential adverse impacts that cannot be avoided, replacement of wetland losses (mitigation), and a post-mitigation monitoring plan. The assessment of the wetlands functions and values may follow the methodology provided in the U.S. Army Corps of Engineers' Wetland Evaluation Technique (WET) Volume II: Methodology (Adamus, et al. 1987).

Benthic Reconnaissance/Community Characterization
The need for benthic macro invertebrate community characterization would be determined during the Problem Formulation step of the BERA. If such characterization is judged to be necessary, a benthic macro invertebrate community survey would be conducted for the aquatic areas associated with the site.

Additionally, samples would be collected from reference locations to allow for comparison with the site-related samples. Reference locations will be selected from areas that are ecologically comparable to the site-related areas sampled, but are not expected to be impacted by site contaminants.

Benthic invertebrate samples will be collected for identification and data analysis based on metrics (standards of measurement used to characterize benthic invertebrate community samples) used in EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers* (EPA, 1999c). The metrics calculated for each benthic macro invertebrate sample included:

- Taxa or species richness - the number of taxa at the lowest identifiable level
- Ephemeroptera, Plecoptera and Trichoptera (EPT) index - the number of distinct taxa within the insect orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)
- Ratio of EPT to Chironomid abundances - Intended to measure shift in organism dominance as a response to toxicants or other pollutants
- Functional feeding group ratios - Scrapers/Filterers (ratio of scrapers functional feeding group to filtering collectors feeding group)
- Percent contribution of dominant taxon - intended as a simple measure of evenness of taxa distribution
- Modified Hilsenhoff biotic index - a tolerance index that integrates pollution tolerance with organism abundance
- Community loss index - an index of community similarity which measures the loss of benthic species between a reference location and the sampling location

To support the conclusions derived by the benthic invertebrate community analysis, sediment samples will be collected from each benthic invertebrate collection location and analyzed for TCL organic compounds and TAL inorganic analytes, TOC, pH, and grain size using EPA-approved methods.

Biota Sampling
Biota sampling may be required for input into the BERA. Sampling within terrestrial environments will not likely be required, as there is expected to be limited access for wildlife to contaminated soil. Sampling may be required for aquatic environments. Wildlife tissue samples can assist in providing the BERA with data for site-specific estimations of food web contaminant exposures.

Sediment Toxicity Testing
The need for sediment toxicity testing would be determined during the Problem Formulation step of the BERA. If such testing is judged to be necessary, sediment toxicity testing would be conducted to obtain site-specific data concerning the toxicity of the aquatic environments associated with the site. Sediment toxicity testing can assist in the evaluation of direct and indirect (i.e., food web) risks to aquatic, semi-aquatic, terrestrial, and avian receptors from site contaminants. Use of toxicity testing provides the added benefit of indicating adverse ecological effects from mixtures of contaminants, rather than solely for single contaminants. Sediment toxicity testing

can also help evaluate contaminant bioavailability, which may vary from one location to another. Finally, it is important to obtain more than one line of evidence to reasonably demonstrate that site contaminants are (or are not) likely to cause adverse ecological effects. Toxicity testing provides this additional line of evidence.

Reference locations will also be sampled and included in the analysis. Reference locations will be selected from areas where stream and pond habitat are ecologically similar to site-associated areas and are not expected to be impacted by site contaminants.

Existing sediment sampling data, and other information, such as the location of runoff paths and historical site information, will be reviewed and evaluated to assist in the selection of toxicity test sampling locations. To support the conclusions derived by the sediment toxicity testing, sediment samples will likely be collected at each of the sampling locations at a depth of zero to six inches analyzed for TCL organic compounds and TAL inorganic analytes, TOC, pH, and grain size.

5.8 Task 8 - Treatability Studies/Pilot Testing

Applicable treatment technologies that may be suitable for the LAI site will be identified to determine if there is a need to conduct treatability studies. These studies will be used to better estimate the remediation cost and performance capabilities of the individual technology based on site conditions and problems. The three levels of treatability studies that may be conducted are laboratory screening, bench-scale testing, and pilot-scale testing. The laboratory screening is used to establish the validity of a technology to treat waste. Bench-scale testing is used to identify the performance of the technology specific to a type of waste. Pilot-scale testing is used to provide quantitative performance, cost, and design information for remediation. The work will be in general accordance with the fact sheet, *Guide for Conducting Treatability Studies Under CERCLA* (EPA 1993).

5.8.1 Literature Search

CDM will research viable technologies that may be applicable to the COCs and the site conditions encountered. Upon completion of the literature search, CDM will provide a technical memorandum to the EPA RPM that summarizes the results. As part of this document, CDM will submit a plan that recommends performance of a treatability study at one of the above levels and identifies the types and specific goals of the study. The treatability study will be designed to determine the suitability of remedial technologies to site conditions and addressing the type of contamination that exists at the site. CDM will prepare an addendum to the RI/FS work plan for the treatability study in accordance with the requirements described in Section 5.8.2.

5.8.2 Treatability Study Work Plan (Optional)

If requested by the EPA, CDM will perform the following:

- prepare a draft addendum to the RI/FS work plan that describes the approach for performance of the treatability study

- participate in negotiations to discuss the final technical approach and costs required to accomplish the treatability study requirements

- prepare a final work plan addendum and supplemental budget that incorporates the agreements reached during the negotiations

The treatability study work plan addendum will describe the technology to be tested, test objectives, test equipment or systems, experimental procedures, treatability conditions to be tested, measurements of performance, analytical methods, data management and analysis, health and safety procedures, and residual waste management. The DQOs for the treatability study will also be documented. If pilot-scale treatability studies are to be done, the treatability study work plan addendum will also describe pilot plant installation and startup, pilot plant operation and maintenance procedures, and operating conditions to be tested. If testing is to be performed off-site, permitting requirements will be addressed. A schedule for performing the treatability study will be included with specific durations and dates, when available, for each task and subtask, including anticipated EPA review periods. The schedule will also include key milestones for which completion dates should be specified. Such milestones are procurement of subcontractors, sample collection, sample analysis and preparation of the treatability study report.

The treatability study work plan addendum will describe in detail the treatment process and how the proposed technology or vendor (if the technology is proprietary) will meet the performance standards for the site. The treatability study work plan addendum will address how the proposed technology or vendor of the technology will meet all discharge or disposal requirements for any and all treated material, air, water, and expected effluents. In addition, the work plan addendum will explain the proposed final treatment and disposal of all material generated by the proposed treatment system.

5.8.3 Conduct Treatability Studies (Optional)

CDM will conduct the treatability study in accordance with the approved treatability study addendum to the RI/FS work plan, QAPP, and HSP, to determine whether the remediation technology or vendor of the technology can achieve the performance standards.

The following activities are to be performed, when applicable, as part of the performance of the treatability study and pilot testing:

- Procurement of Test Facility and Equipment. CDM will procure the test facility and equipment necessary to execute the tests.

- Procurement of Subcontractors. CDM will procure subcontractors as necessary for test/study performance.

- Test and Operate Equipment. CDM will test the equipment to ensure proper operation, and operate or oversee operation of the equipment during the testing.

- Retrieve Samples for Testing. CDM will obtain samples for testing as specified in the treatability study work plan.

- Perform Laboratory Analysis. CDM will establish a field laboratory to facilitate fast-turnaround analysis of test samples, if economically and technically feasible.

- Characterize and dispose of residual wastes.

- Evaluate the test results.

5.8.4 Treatability Study Report (Optional)

CDM will prepare and submit the treatability study evaluation report for the LAI site that describes the performance of the technology. The study results will clearly indicate the performance of the technology or vendor compared with the performance standards established for the site. The report will also evaluate the treatment technology's effectiveness, implementability, cost and final results compared with the predicted results. In addition, the report will evaluate full-scale application of the technology, including a sensitivity analysis that identifies the key parameters affecting full-scale operation.

CDM will develop and submit a remedial investigation report that accurately establishes site characteristics including the identification of contaminated media, definition of the extent of contamination in groundwater, and delineation of the physical boundaries of contamination. CDM will obtain detailed sampling data to identify key contaminants and determine the movement and extent of contamination in the environment. Key contaminants will be identified in the report and will be selected based on toxicity, persistence, and mobility in the environment.

5.9 Task 9 - Remedial Investigation Report

CDM will develop and submit a remedial investigation report that accurately establishes site characteristics including the identification of contaminated media, definition of the extent of contamination in groundwater, and delineation of the physical boundaries of contamination. CDM will obtain detailed sampling data to identify key contaminants and determine the movement and extent of contamination in the environment. Key contaminants will be identified in the report and will be selected based on toxicity, persistence, and mobility in the environment.

5.9.1 Draft Remedial Investigation Report

A draft RI report will be prepared in accordance with the format described in EPA guidance documents such as the "*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*". A draft outline of the report, adapted from the 1988 guidance, is shown in Table 5-5. This outline should be considered a draft and subject to revision, based on the data obtained. EPA's SOW for this work assignment has provided a detailed description of the types of information, maps, and figures to be included in the RI report. CDM will incorporate such information to the fullest extent practicable.

Upon completion, the draft RI report will be submitted for review by a CDM Technical Review Committee (TRC), followed by a quality assurance review. It will then be submitted to EPA for formal review and comment.

5.9.2 Final Remedial Investigation Report

Upon receipt of all EPA, other federal and state agency written comments, CDM will revise the report and submit the amended report to EPA. When EPA determines that the report is acceptable, the report will be deemed the final RI report

5.10 Task 10 - Remedial Alternatives Screening

This task covers activities for the development of appropriate remedial alternatives that will undergo full evaluation. A range of alternatives will be considered, including innovative treatment technologies, consistent with regulations outlined in the National Contingency Plan (NCP), 40 CFR part 300, the *"Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA' (OSWER Directive 9355.3-01 October 1998)* or the latest version, and other OSWER directives including 9355.4-03, October 18, 1989, and 9283.1-06 May 27, 1992, *"Considerations in Ground Water Remediation at Superfund Sites"*, as well as other applicable policies and guidance (Table 5-6).

CDM will investigate only those hazardous waste management alternatives that will remediate or control contaminated media (soil, sediment, surface water, and groundwater) related to the Site, as defined in the RI, to provide adequate protection of human health and the environment. The potential alternatives will encompass, as appropriate, a range of alternatives in which treatment is used to reduce the toxicity, mobility, or volume of wastes but vary in the degree to which long-term management of residuals or untreated waste is required, and will include one or more alternatives involving containment with little or no treatment, as well as a no-action alternative.

The following remedial alternatives, consisting of treatment technologies that are likely to be deemed appropriate for soil and/or sediment contamination with VOCs and metals, are anticipated:

- No Action
- Excavation and off-site treatment (e.g., incineration)
- Excavation and on-site treatment (e.g., low temperature thermal desorption)

- Consolidation and containment (e.g., RCRA cap)
- In situ treatment (e.g., soil vapor extraction)

The following remedial alternatives, consisting of treatment technologies that are likely to be deemed appropriate for groundwater contamination with VOCs and metals, are anticipated:

- No Action
- In situ treatment (e.g., air sparging with soil vapor extraction)
- Pumping and treatment (e.g., air stripping and/or activated carbon)

Based on the established remedial response objectives and the results of the risk assessment (Task 7), the initial screening of remedial alternatives will be performed according to the procedures recommended in "*Interim Final Guidance for Conducting RI/FS under CERCLA*" (EPA 1988). A range of alternatives will be developed, which consider both standard and innovative remedial technologies.

The alternatives will be screened qualitatively against three criteria: effectiveness, implementability, and relative cost. A brief description of the application of these criteria is as follows:

- Effectiveness - The evaluation focuses on the potential effectiveness of technologies in meeting the remedial action goals; the potential impacts to human health and the environment during construction and implementation; and how proven and reliable the process is with respect to the contaminants and conditions at the Site.

- Implementability - This evaluation encompasses both the technical and administrative feasibility of the technology. It includes an evaluation of treatment requirements, waste management, and relative ease or difficulty in achieving the operation and maintenance requirements. Technologies that are clearly unworkable at the Site are eliminated.

- Relative Cost - Both capital cost and operation and maintenance cost are considered. The cost analysis is based upon engineering judgement, and each technology is evaluated as to whether costs are high, moderate, or low relative to other options within the same category.

The screening evaluation will generally focus on the effectiveness criterion, with less emphasis on the implementability and relative cost criteria. Technologies surviving the screening process are those that are expected to achieve the remedial action objectives for the Site, either alone or in combination with others.

5.10.1 Technical Memorandum

CDM will prepare a draft remedial alternatives screening memorandum for the FS that will document all of the analyses and evaluations described above. In addition, that will document all of the analyses and evaluations described above. In addition, Section 1 of the FS will summarize the RI/FS field activities and evaluate the nature and extent of soil, groundwater, sediment, and surface water contamination at the site. The draft memorandum will be submitted to EPA for review and comment.

The draft Technical Memorandum will include the following information:

- Establish Remedial Action Objectives - Based on existing information, CDM will identify site-specific remedial action objectives which should be developed to protect human health and the environment. The objectives will specify the contaminant(s) and media of concern, the exposure route(s) and receptor(s), and an acceptable contaminant level or range of levels for each exposure route (i.e., preliminary remediation goals).

- Establish General Response Actions - CDM will develop general response actions for protecting the residential wells by defining contaminant, treatment, pumping, or other actions, singly or in combination, to satisfy remedial action objectives. The response actions will take into account requirements for protectiveness as identified in the remedial action objectives, as well as the chemical and physical characteristics of the Site.

- Identify and Screen Applicable Remedial Technologies - CDM will identify and screen technologies based on the developed general response actions. Hazardous waste treatment technologies will be identified and screened to ensure that only those technologies applicable to the protection of nearby residential wells, contaminants present, their physical matrix, and other site characteristics will be considered. This screening will be based primarily on a technology's ability to effectively address the contaminants at the Site, but will also take into account a technology's implementability and cost. CDM will select representative process options, as appropriate, to carry forward into alternative development. In addition, CDM will identify the need for treatability testing for those technologies that are probable candidates for consideration during the detailed analysis.

- Develop Remedial Alternatives in accordance with the NCP.

- Screen Remedial Alternatives for Effectiveness, Implementability, and Cost - CDM will screen alternatives to identify the potential technologies or process options that will be combined into media-specific or site-wide alternatives. The developed alternatives will be defined with respect to size and configuration of the representative process options; rates of flow or treatment; spatial requirements; distances for disposal; and required permits, imposed limitations, and other factors necessary to evaluate the alternatives. If many distinct, viable options are available and developed, CDM will screen the alternatives that undergo the detailed analysis to provide the most promising process options. The alternatives will be screened on a general basis with respect to their effectiveness, implementability, and cost.

5.10.2 Final Technical Memorandum

After EPA's review of the draft Technical Memorandum, CDM will incorporate EPA's comments and submit the final Technical Memorandum.

5.11 Task 11 - Remedial Alternatives Evaluation

Remedial technologies passing the initial screening process will be grouped into remedial alternatives. These remedial alternatives will be subjected to a detailed evaluation, which will be consistent with the NCP (40 CFR Part 300) and shall consider the "*Guidance for Conducting RI/FS under CERCLA*" (OSWER directive 9355.3-0) and other pertinent OSWER guidance. In the guidance, a set of nine evaluation criteria have been developed that are to be applied in the evaluation of each remedial alternative. A brief description of each criterion is provided:

- Overall Protection of Human Health and the Environment - This criterion provides a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under the evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

- Compliance with ARARs - This criterion is used to determine how each alternative complies with applicable or relevant and appropriate Federal and State requirements, as defined in CERCLA (42 USC Section 9621).

- Long-Term Effectiveness - This criterion addresses the results of a remedial action in terms of the risk remaining at the Site after the response objectives have been met. The primary focus of this evaluation is to determine the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. The factors to be evaluated include the magnitude of remaining risk (measured by numerical standards such as cancer risk levels), and the adequacy, suitability and long-term reliability of management controls for providing continued protection from residuals (i.e., assessment of potential failure of the technical components).

- Reduction of Toxicity, Mobility, or Volume - This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume of the contaminants. The factors to be evaluated include the treatment process employed, the amount of hazardous material destroyed or treated, the degree of reduction expected in toxicity, mobility or volume, and the type and quantity of treatment residuals.

- Short-Term Effectiveness - This criterion addresses the effects of the alternative during the construction and implementation phase until the remedial actions have been completed and the selected level of protection has been achieved. Each alternative is evaluated with respect to its effects on the community and on-site workers during the remedial action, environmental impacts resulting from implementation, and the amount of time until protection is achieved.

- Implementability - This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. Technical feasibility considers construction and operational difficulties, reliability, ease of undertaking additional remedial action (if required), and the ability to monitor its effectiveness. Administrative feasibility considers activities needed to coordinate with other agencies (e.g., state and local) in regard to obtaining permits or approvals for implementing remedial actions.

- Cost - This criterion addresses the capital costs, annual operation and maintenance costs, and present worth analysis. Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor and material necessary to perform remedial actions. Indirect costs include expenditures for engineering, financial and other services that are not part of actual installation activities but are required to complete the installation of remedial alternatives. Annual operation and maintenance costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. These costs will be estimated to provide an accuracy of +50 percent to -30 percent. A present worth analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year, usually the current year. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover all costs associated with the remedial action over its planned life.

- State Acceptance - This criterion evaluates the technical and administrative issues and concerns the state may have regarding each of the alternatives. The factors to be evaluated include those features of alternatives that the state supports, reservations of the state, and opposition of the state.

- Community Acceptance - This criterion incorporates public concerns into the evaluation of the remedial alternatives. Often, community (and also state) acceptance cannot be determined during development of the FS. Evaluation of these criteria is postponed until the FS report has been released for state and public review. These criteria are then addressed in the ROD and the responsiveness summary.

Each remedial alternative will be subject to a detailed analysis according to the above evaluation criteria. A comparative analysis of all alternatives will then be performed to evaluate the relative benefits and drawbacks of each according to the same criteria. EPA will make the determination regarding final selection of the remedial alternative.

5.11.1 Draft Technical Memorandum

CDM will prepare a draft technical memorandum that addresses the following:

- A technical description of each alternative that outlines the waste management strategy involved and identifies the key ARARs associated with each alternative.

- A discussion that profiles the performance of that alternative with respect to each of the evaluation criteria. CDM will also provide a table summarizing the results of this analysis.

The draft memorandum will be submitted to EPA for formal review and comment.

5.11.2 Final Technical Memorandum

Based on discussions with EPA at the work plan negotiation meeting, CDM will not prepare a final technical memorandum for the draft technical memorandum submitted under subtask 5.11.1. EPA's comments on the draft technical memorandum will be incorporated into the Draft FS report prepared under subtask 5.12.1.

5.12 Task 12 - FS Report

CDM will develop an FS Report consisting of a detailed analysis of alternatives and a cost-effectiveness analysis, in accordance with the NCP, 40 CFR Part 300, as well as the most recent guidance.

5.12.1 Draft FS Report

CDM will prepare the Draft FS Report according to the schedule in the RI/FS Work Plan. To expedite the development of the FS Report, CDM will maintain close contact with the EPA RPM.

The FS Report will contain the following:

- Summary of feasibility study objectives
- Summary of remedial objectives
- Identification of general response actions
- Identification and screening of remedial technologies
- Detailed analysis of alternatives
- Comparative analysis of alternatives
- Summary and conclusions

The technical feasibility considerations will include the careful study of any problems that may prevent a remedial alternative from mitigating site problems. Therefore, the site characteristics from the RI will be kept in mind as the technical feasibility of the alternative is studied. Specific items to be addressed will be reliability (operation over time), safety, operation and maintenance, ease with which the alternative can be implemented, and time needed for implementation.

The Draft FS report will be prepared to: summarize the activities performed and to present the results and associated conclusions for Tasks 1 through 11. The report will include a summary of a description of the initial screening study process and the detailed evaluations of the remedial action alternatives studied. The FS report format is shown on Table 5-7 and will consist of an executive summary and five sections. The executive summary will be a brief overview of the FS and the analysis underlying the remedial actions that were evaluated.

The FS report will be reviewed by a CDM TRC. TRC comments will be addressed prior to submittal to EPA for review.

5.12.2 Final FS Report

Upon receipt of all EPA and other Federal and State agency written comments, CDM will revise the Final FS Report and submit the amended report to EPA. When the EPA determines that the report is acceptable, the report will be deemed the Final FS Report.

5.13 Task 13 - Post RI/FS Support

CDM will provide technical support required for the preparation of the ROD for the site, excluding community relations activities already addressed under Task 2. CDM's support activities include:

- Attendance at public meetings, briefings, and technical meetings to provide site updates
- Review of presentation materials
- Technical support for the preparation of the draft and final Responsiveness Summary, Proposed Plan, and Record of Decision

In addition, CDM may be required to prepare draft and final addenda to the FS based upon the final ROD adopted for this site.

5.14 Task 14 - Negotiation Support

In accordance with the SOW, this task is currently not applicable to this work assignment.

5.15 Task 15 - Administrative Record

In accordance with the SOW, this task is currently not applicable to this work assignment.

5.16 Task 16 - Project Closeout

Upon notification from EPA that the technical work is complete, CDM will close-out the work assignment in accordance with the requirements of the contract.

5.16.1 Work Assignment Closeout Report

CDM will prepare a Work Assignment Closeout Report (WACR). The WACR will include a breakdown of professional level of effort hours by P-level and costs.

5.16.2 Document Indexing

CDM will organize the work assignment files in its possession in accordance with the currently approved file index structure.

5.16.3 Document Retention/Conversion

CDM will convert all pertinent paper files into an appropriate long-term storage form such as microfiche. If it is determined that microfiche will be used for the long term storage, then the following distribution will be adhered to:

Silver Halide Original Set- EPA Region II
Diazo Duplicate - EPA Region II
Hard Copies - EPA Region II
Silver Halide Original Set - CDM

Section 6
Costs and Key Assumptions

The estimated costs for the RI/FS are shown separately in Volume II of the Work Plan.

CDM has made the following assumptions in estimating the costs of this project:

- It has been assumed that there will be no significant delays due to severe weather conditions.
- It has been assumed that all field activities will be performed in modified Level D or Level C health and safety protection.

Section 7
Schedule

A project schedule for the RI/FS is presented on Figure 7-1. The project schedule is based on assumptions for durations and conditions of key events occurring on the critical and non-critical path. These assumptions are as follows:

- The schedule for the field activities is dependent on access to all properties being obtained by EPA without difficulty.
- Field activities will not be significantly delayed due to severe weather conditions (snow and icing conditions, extreme heat).
- The schedule for the field activities is dependent on timely review and approval of the Work Plan and QAPP and the provision of adequate funding by EPA.
- The schedule for the field investigation is dependent all field activities being performed in Level D or Level C health and safety protection.
- CDM will receive validated data for analyses performed by the EPA's Contract Laboratory Program 10 weeks after sample collection.

Section 8
Project Management Approach

This section presents CDM's organizational approach to this RI/FS including lines of communication and roles and responsibilities. The section also includes specific quality assurance and document control procedures.

8.1 Organization and Approach

The proposed project organization is presented on Figure 8-1.

The SM, Ms. Pamela Philip, has primary responsibility for plan development and implementation of the Remedial Investigation and Feasibility Study, including coordination with the Task Managers, and support staff, development of bid packages for subcontractor services, acquisition of engineering or specialized technical support, and all other aspects of the day-to-day activities associated with the project. The SM identifies staff requirements, directs and monitors site progress, ensures implementation of quality procedures and adherence to applicable codes and regulations, and is responsible for performance within the established budget and schedule.

Mr. Joseph Mayo, will serve as the RI task leader and will be responsible for the technical support during the field investigation, coordination with the CDM drilling subcontractor, the analysis, interpretation and presentation of data acquired relative to the LAI site, and will be responsible for the preparation of the RI report.

The FS Task Manager, Mr. Demetrios Klerides, P.E., will work closely with the SM to ensure that the field investigation generates the proper type and quantity of data for use in the initial screening of remedial technologies/alternatives, detailed evaluation of remedial alternatives, development of requirements for and evaluation of treatability study/pilot testing, if required, and associated cost analysis. The FS Report will be developed by the FS technical group.

Ms. Seth Richardson, the Field Team Leader, will be responsible for the activities conducted during the field investigation such as equipment mobilization, sampling, and the work performed by subcontractors such as surveying and drilling.

The RQAC is Ms. Jeniffer Oxford. The RQAC is responsible for overall project quality including development of the QAPP, review of specific task QA/QC procedures, and auditing of specific tasks. The RQAC reports to the CDM Quality Assurance Director (QAD). The RQAC will review and approve the Work Plan and QAPP.

The CDM QAD, Mr. George Delullo, is responsible for overall project quality, and will have approved Quality Assurance Coordinators (QACs) perform the required elements of the RAC II QA program of specific task QA/QC procedures, and auditing of specific tasks at established intervals. These QACs report to CDM's Corporate QA Director and are independent of the SM's reporting structure.

The ASC, Mr. Scott Kirchner, will ensure that the analytical laboratories will perform analyses as described in the QAPP. The ASC provides assistance with meeting EPA sample management and paperwork requirements.

8.2 Quality Assurance and Document Control

All work by CDM on this work assignment will be performed in accordance with the following guidance documents or subsequent revisions:

- CDM RAC II Quality Management Plan (QMP), December, 2002.

The RQAC will maintain QA oversight of the project for the duration of the work assignment and has reviewed this Work Plan for QA requirements. The RQAC will participate in the field planning meeting process. It has been determined that a QAPP that governs field sampling and analysis is required. It will be submitted to an approved QAC for review and approval before submittal to EPA. Any reports for this work assignment which present measurement data generated during the work assignment will include a QA section addressing the quality of the data and its limitations. Such reports are subject to QA review following technical review. Statements of work for subcontractor services, purchase requisitions for measurement and testing items, and subcontractor bids and proposals will receive technical and QA review.

The CDM SM is responsible for implementing appropriate QC measures on this work assignment. Such QC responsibilities include:

- Implementing the QC requirements referenced or defined in this work plan and in the QAPP.
- Adhering to the CDM RAC Management Information System (RACMIS) document control system.
- Organizing and maintaining work assignment files.
- Conducting field planning meetings, as needed, in accordance with the RAC II QMP.
- Completing measurement and test equipment forms that specify equipment requirements.

Technical and QA review requirements as stated in the QMP will be followed on this work assignment.

Document control aspects of the program pertain to controlling and filing documents. CDM has developed a program filing system that conforms to the requirements of the EPA to ensure that the documents are properly stored and filed. This guideline will be implemented to control and file all documents associated with this work assignment. The system includes document receipt control procedures, a file review, an inspection system, and file security measures.

The RAC II QA program includes both self-assessments and independent assessments as checks on quality of data generated on this work assessment. Self assessments include management system audits, trend analyses, calculation checking, data validation, and technical reviews. Independent assessments include office, field and laboratory audits and the submittal of performance evaluation samples to laboratories.

A QA internal system audit, field technical system audit, and/or laboratory technical system audit may be conducted by the CDM QA staff in accordance with the QMP. Performance audits (i.e., performance evaluation samples) may be administered by CDM as required for any analytical parameters. An audit report will be prepared and distributed to the audited group, to CDM management, and to EPA. EPA may conduct or arrange a system or performance audit.

8.3 Project Coordination

The SM will coordinate all project activities with the EPA RPM. Regular telephone contact will be maintained to provide updates on project status. Field activities at the LAI Site will require coordination among federal, commonwealth, and local agencies and coordination with involved private organizations. Coordination of activities with these agencies is described below.

EPA is responsible for overall direction and approval of all activities for the LAI Site. EPA may designate technical advisors and experts from academia or its technical support branches to assist on the site. Agency advisors could provide important sources of technical information and review, which the CDM team will use from initiation of RI/FS activities through final reporting.

Sources of technical information include EPA, NYSDEC, SCDHS and USGS. These sources can be used for background information on the SRI Site and surrounding areas.

NYSDEC may provide review, direction, and input during the RI/FS. EPA's RPM will coordinate contact with NYSDEC personnel.

Local agencies that may be involved include departments such as planning boards, zoning and building commissions, police, fire, and health department, and utilities. Contacts with these local agencies will be coordinated through EPA.

Private organizations requiring coordination during the RI/FS include concerned residents in the area, and public interest groups such as environmental organizations and the press. CDM will require access to private properties in the vicinity of the site to install some of the monitoring wells. EPA will be responsible for obtaining access to these properties. Coordination with other organizations and interested parties will be performed through EPA.

The task numbering system for the RI/FS effort is described in Section 5 of this Work Plan. Each of these tasks have been scheduled and will be tracked separately during the course of the RI/FS work. For the RAC II contract, the key elements of the Monthly Progress Report will be submitted within 20 calendar days after the end of each reporting period and will consist of a summary of work completed during that period and associated costs.

Project progress meetings will be held, as needed, to evaluate project status, discuss current items of interest, and review major deliverables such as the work plan, QAPP, RI and FS reports.

Section 9
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Section 10
Glossary of Abbreviations

amsl	Above mean sea level
AOC	Area of Concern
ARARs	Applicable or Relevant and Appropriate Requirements
ASC	Analytical Services Coordinator
BERA	Baseline Ecological Risk Assessment
CDM	Camp Dresser & McKee/CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CLASS	Contract Laboratory Analytical Support Services
CLP	Contract Laboratory Program
cm/sec.	Centimeters per Second
COC	Contaminant of concern
COPC	Chemicals of Potential Concern
CRP	Community Relations Plan
CTE	Central Tendency Exposure
DCE	*cis*-1,1-Dichloroethylene
DESA	Division of Environmental Science and Assessment
DNAPL	Dense Non-Aqueous Phase Liquid
DPT	Direct Push Technology
DQO	Data Quality Objectives
EC	Electrical Conductivity
ECD	Electron Capture Detector
ECOTOX	Ecotoxicology Database System
EPA	United States Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera and Trichoptera
EQuIS	Environmental Quality Information System
ERAGS	Ecological Risk Assessment Guidance for Superfund
FDCA	Field Data Collection Activities
FE^{2+}	Ferrous Iron
FID	Flame-ionization Detector
FS	Feasibility Study
FSA	Field Screening Activities
g/L	Grams per Liter
GC	Gas Chromatograph
GIS	Geographic Information System
gpd/ft.	Gallons per Day per Foot
gpm	Gallons per Minute
GPR	Ground Penetrating Radar
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HRS	Hazard Ranking System
HSDB	Hazardous Substance Database
HSP	Health and Safety Plan

IDW	Investigation Derived Waste
IFB	Invitation for Bid
in/yr	Inches per Year
IRIS	Integrated Risk Information System
LAI	Lawrence Aviation Industries
LEL	Lowest Effect Level
MCL	Maximum Contaminant Levels
MCLG	Maximum Contaminant Level Goals
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MIP	Membrane Interface Probe
MNA	Monitored Natural Attenuation
MSL	Mean Sea Level
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAR	Pathway Analysis Report
PAR	Pathways Analysis Report
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethylene
PID	Photo-ionization Detector
POTW	Publically Owned Treatment Works
ppb	Parts per Billion
PRG	Preliminary Remediation Goals
QA/QC	Quality Assurance/Quality Control
QA	Quality Assurance
QAC	Quality Assurance Coordinator
QAD	Quality Assurance Director
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
RA	Risk Assessment
RAC	Response Action Contract
RACMIS	RAC Management Information System
RAGS	Risk Assessment Guidance for Superfund
RAS	Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RFP	Request for Proposal
RI/FS	Remedial Investigation/Feasibility Study
RI	Remedial Investigation
RME	Reasonable Maximum Exposure

ROD	Record of Decision
RPM	Remedial Project Manager
RQAC	Regional Quality Assurance Coordinator
RSCC	Regional Sample Control Center
RTECS	Registry of Toxic Effects of Chemical Substances
SARA	Superfund Amendments and Reauthorization Act
SCDHS	Suffolk County Department of Health Services
SCWA	Suffolk County Water Authority
SEL	Severe Effects Level
SLERA	Screening Level Ecological Risk Assessment
SM	Site Manager
SMDP	Scientific Management Decision Points
SMO	Sample Management Office
SOW	Statement of Work
SUNY	State University of New York
SVOC	Semivolatile Organic Compounds
TAL	Target Analyte List
TBC	To be Considered
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leachate Procedure
TDS	Total Dissolved Solids
TKN	Total Kjeldal Nitrogen
TOC	Total Organic Carbon
TOGS	Technical and Operations Guidance Series
TOM	Technical Operations Manager
TSCA	Toxic Substances Control Act
TSS	Total Suspended Solids
UCL	Upper Confidence Limit
ug/L	Micrograms per Liter
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WACR	Work Assignment Closeout Report
WET	Wetland Evaluation Technology

Table 3-1
SCDHS (PJ Well) Historical Data
Vertical Profile Groundwater Screening Results
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Well #	Address	Elevation (ft. amsl)	Screen Depth (ft. bgs)*	Screen Elevation (ft. amsl)	Depth to Watertable (ft. bgs)	Static Water Elevation (ft. amsl)	Screening Sample Depth Below Watertable (ft.)	ANALYTICAL RESULTS (ug/l)			
								TCE	PCE	DCE	Fluoride (Mg/l)
PJ-1	Hulse Rd & Comsequage Rd (SCHD)	170	147-149	23-21	140	30	-7 - -9				
PJ-1		170	149	25	140	30	-5	ND	NA	NA	NA
PJ-1		170	170	0	140	30	-30	ND	NA	NA	NA
PJ-1		170	191	-21	140	30	-51	ND	NA	NA	NA
PJ-1		170	204	-34	140	30	-64	ND	NA	NA	NA
PJ-2	Comsequage Rd (SCHD)	170	144-146	26-24	138	32	-6 - -8		NA	NA	
PJ-2		170	146	24	138	32	-8	ND	NA	NA	NA
PJ-2		170	167	3	138	32	-29	ND	NA	NA	NA
PJ-2		170	188	-18	138	32	-50	ND	NA	NA	NA
PJ-2		170	203	-33	138	32	-65	ND	NA	NA	NA
PJ-3	Comsequage Rd (SCHD)	170	150-155	20-15	139	31	-11 - -16				
PJ-3		170	155	15	139	31	-16	ND	NA	NA	NA
PJ-3		170	173	-3	139	31	-34	ND	NA	NA	NA
PJ-3		170	194	-24	139	31	-55	ND	NA	NA	NA
PJ-3		170	204	-34	139	31	-65	ND	NA	NA	NA
PJ-4	Comsequage Rd (SCHD)	170	147-152	23-18	139	31	-8 - -13				
PJ-4		170	152	18	139	31	-13	ND	NA	NA	NA
PJ-4		170	173	-3	139	31	-34	ND	NA	NA	NA
PJ-4		170	188	-18	139	31	-49	ND	NA	NA	NA
PJ-5	SP Rd (SCHD)	170	147-152	23-18	137	33	-10 - -15				
PJ-5		170	155	15	137	33	-18	ND	NA	NA	NA
PJ-5		170	173	-3	137	33	-36	ND	NA	NA	NA
PJ-5		170	194	-14	137	33	-47	ND	NA	NA	NA
PJ-5		170	204	-34	137	33	-67	ND	NA	NA	NA
PJ-6**	Bayview St (SCHD)	210	?-210	0	187	23	-23	ND	ND	ND	ND
PJ-6		210	187	23	187	23	0	ND	NA	NA	NA
PJ-6		210	195	15	187	23	-8	ND	NA	NA	NA
PJ-6		210	210	0	187	23	-23	ND	NA	NA	NA
PJ-7	Harbor View Ave (SCHD)	180	148-153	32-27	142	38	-6 - -11				
PJ-7		180	153	27	142	38	-11	**7**	NA	NA	<0.5
PJ-7		180	164	16	142	38	-22	**9**	NA	NA	<0.5
PJ-7		180	174	6	142	38	-32	**34**	NA	NA	0.9
PJ-7		180	185	-5	142	38	-43	**20**	NA	NA	1.1
PJ-7		180	195	-15	142	38	-53	**13**	NA	NA	0.6
PJ-7		180	206	-26	142	38	-64	**130**	3	5	4.8
PJ-7		180	221	-41	142	38	-79	**31**	NA	NA	1
PJ-8	Caroline Ave (SCDH)	25	21-25	4-0	11	14	-10 - -14				
PJ-8		25	15	10	11	14	-4	2	NA	NA	<0.5
PJ-8		25	25	0	11	14	-14	7	NA	NA	<0.5
PJ-8		25	47	-22	11	14	-36	**170**	NA	NA	<0.5
PJ-8		25	68	-43	11	14	-57	**150**	NA	NA	<0.5
PJ-8		25	89	-64	11	14	-78	**740**	NA	NA	<0.5
PJ-8		25	100	-75	11	14	-89	**2600**	NA	NA	<0.5
PJ-9	Brook Rd (SCHD	14			1	13	NA				
PJ-9	ABANDONED	14	5	5	1	13	-8	**870**	NA	NA	<0.5
PJ-9		14	15	15	1	13	2	**220**	NA	NA	<0.5
PJ-9		14	25	25	1	13	12	**160**	NA	NA	<0.5
PJ-10	Brook Rd (SCHD)	10	102-107	-92 - -97	5	5	NA				
PJ-10	ABANDONED	10	37	-27	5	5	-32	**190**	NA	NA	<0.5
PJ-10		10	47	-37	5	5	-42	**650**	NA	NA	<0.5
PJ-10		10	58	-48	5	5	-53	**610**	NA	NA	<0.5
PJ-10		10	68	-58	5	5	-63	**1500**	NA	NA	<0.5
PJ-10		10	79	-69	5	5	-74	**1100**	NA	NA	<0.5
PJ-10		10	90	-80	5	5	-85	**190**	NA	NA	<0.5
PJ-10		10	100	-90	5	5	-95	**1100**	NA	NA	<0.5
PJ-10		10	107	-97	5	5	-102	**410**	NA	NA	<0.5
PJ-11**	Rosevelt Ave (SCHD)	170	151-156	19-16	143	27	-8 - -11	ND	ND	ND	ND
PJ-11		170	152	18	143	27	-9	ND	NA	NA	<0.5
PJ-11		170	162	8	143	27	-19	0.7	NA	NA	<0.5
PJ-11		170	175	-5	143	27	-32	5	NA	NA	<0.5
PJ-11		170	185	-15	143	27	-42	0.7	NA	NA	<0.5
PJ-12	Lincoln Ave - 54' S/Old Post Rd (SCHD)	170	150-155	20-15	146	24	-4 - -9				
PJ-12		170	155	15	146	24	-9	ND	NA	NA	<0.5
PJ-12		170	162	8	146	24	-16	ND	NA	NA	<0.5
PJ-12		170	175	-5	146	24	-29	ND	NA	NA	<0.5

Notes:
* Indicates depth at which vertical profile screening sample was collected
** Indicates well sampling results presented by CDM (CDM,2000).
ND - Not Detected
NA - Not Analyzed
***Bold** - Above Federal MCL*

TCE - Trichloroethene
PCE - Tetrachloroethene
DCE - 1,2-Dichloroethene

TABLE 3-2
Historical Data
Volatile Organic Compounds In Old Mill Creek and Old Mill Pond, Village of Port Jefferson
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

	Sample Code Sample Date	SPJ-1[A] 10/24/1991	SPJ-1 3/5/1992	SPJ-1A 3/5/1992	SPJ-2[B] 10/24/1991	SPJ-2 12/9/1991	SPJ-2 4/28/1992	SPJ-3[C] 10/24/1991	SPJ-3 12/9/1991	SPJ-3 1/13/1992	SPJ-3 4/28/1992	SPJ-3 5/14/1992	SPJ-3 5/14/1992
Volatile Organic Compounds	**Units**												
Vinyl Chloride	ug/l	0.8	ND	ND	3	ND	ND	1	ND	ND	0.6	3	ND
1,1 Dichloroethane	ug/l	ND	ND	ND	0.7	ND	ND	ND	0.6	ND	0.5	0.8	ND
trans 1,2 Dichloroethene	ug/l					ND	ND	ND	ND	ND	ND	0.5	ND
Chloroform	ug/l	ND	ND	ND	ND	<1	ND	ND	ND	ND	ND	<1	ND
Trichloroethene	ug/l	1000	1300	1200	1100	550	410	450	1200	1200	ND	1700	900
Fluoride	ug/l	<0.5	<0.05	<0.05	NA	NA	NA	NA	<0.5	<0.5	NA	NA	NA
1,1,1- Trichloroethane	ug/l	ND	0.9	0.9	1	ND	ND	ND	0.7	ND	0.9	2	1
Tetrachloroethene	ug/l	2	3	3	4	4	2	3	3	ND	3	4	3
cis-1,2-Dichloroethene	ug/l	17	16	16	39	16	21	19	14	ND	18	42	13
Toulene	ug/l	ND	ND	ND	ND	ND	12	ND	ND	ND	ND	ND	ND

	Sample Code Sample Date	SPJ-4[D] 12/9/1991	SPJ-4 4/28/1992	SPJ-4 5/14/1992	SPJ-4 11/15/1993	SPJ-5[E] 4/28/1992	SPJ-5 5/14/1992	SPJ-5 11/15/1993	SPJ-6[F] 4/28/1992	SPJ-6 5/14/1992	SPJ-6 11/15/1993	SPJ-7[G] 11/19/1991	SPJ-7 4/28/1992
Volatile Organic Compounds	**Units**												
Vinyl Chloride	ug/l	0.7	ND	1	ND	ND	0.6	ND	ND	NA	ND	ND	ND
1,1 Dichloroethane	ug/l	ND	ND	0.7	ND	ND	ND	ND	ND	NA	ND	ND	ND
trans 1,2 Dichloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
Chloroform	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
Trichloroethene	ug/l	900	ND	1200	660	96	730	520	110	NA	34	10	60
Fluoride	ug/l	<0.5	NA	0.06	NA	NA	0.05	NA	NA	0.22	NA	NA	NA
1,1,1- Trichloroethane	ug/l	ND	0.5	1	0.7	ND	0.6	ND	ND	NA	ND	0.5	ND
Tetrachloroethene	ug/l	2	2	3	2	ND	2	1	ND	NA	ND	ND	ND
cis-1,2-Dichloroethene	ug/l	15	18	28	15	2	22	20	3	NA	1	ND	2

	Sample Code Sample Date	SPJ-7 5/14/1992	SPJ-8[H] 5/14/1992	SPJ-9[I] 5/14/1992
Volatile Organic Compounds	**Units**			
Vinyl Chloride	ug/l	NA	NA	NA
1,1 Dichloroethane	ug/l	NA	NA	NA
trans 1,2 Dichloroethene	ug/l	NA	NA	NA
Chloroform	ug/l	NA	NA	NA
Trichloroethene	ug/l	NA	NA	NA
Fluoride	ug/l	0.15	0.58	0.66
1,1,1- Trichloroethane	ug/l	NA	NA	NA
Tetrachloroethene	ug/l	NA	NA	NA
cis-1,2-Dichloroethene	ug/l	NA	NA	NA

Notes:
All units are in micrograms per liter
ND: Not Detected
NA: Not Analyzed
[A] : Sample taken near the headwater of the stream.
[B] : Sample taken at entrance to small pond near Brook Road.
[C] : Sample taken at the spillway.
[D] : Sample taken near Barnum Avenue.
[E] : Sample taken near Barnum Avenue.
[F] : Sample taken on south side of Route 25A..
[H] : Sample taken at Harbor Outlet.
[I] : Sample taken in the Harbor.

Table 3-3a
Historical Data
Volatile Organic Compounds in Soil
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Chemical Name	Sample Code Sample Date Sample Matrix Unit \\ Depth	NYSDEC Recommended Cleanup Guideline Standard for Soil*	GP23D 09/24/97 SED 3-4 ft		GP24D 09/24/97 SED 3-4 ft		B-3 12/01/97 SED 4-6 ft		B-3 12/03/97 SED 188-190 ft	
Volatile Organic Compounds										
Chloromethane	ug/kg	NS	12	U	11	U	11	U	11	U
Bromomethane	ug/kg	NS	12	U	11	U	11	U	11	U
Vinyl chloride	ug/kg	200	12	U	11	U	11	U	11	U
Chloroethane	ug/kg	1900	12	U	11	U	11	U	11	U
Methylene chloride	ug/kg	100	12	U	11	U	10	U	10	U
Acetone	ug/kg	200	70		57		40	U	10	U
Carbon Disulfide	ug/kg	2700	12	U	11	U	10	U	11	U
1,1-Dichloroethene	ug/kg	NS	12	U	11	U	11	U	11	U
1,1-Dichloroethane	ug/kg	200	12	U	11	U	11	U	11	U
1,2-Dichloroethene (Total)	ug/kg	NS	8	J	11	U	11	U	11	U
2-Butanone	ug/kg	300	12	U	26		5	J	11	U
Chloroform	ug/kg	300	12	U	11	U	11	U	11	U
1,2-Dichloroethane	ug/kg	100	19		11	U	11	U	11	U
1,1,1-Trichloroethane	ug/kg	800	12	U	11	U	11	U	11	U
Carbon tetrachloride	ug/kg	600	12	U	11	U	11	U	11	U
Bromodichloromethane	ug/kg	NS	12	U	11	U	11	U	11	U
1,2-Dichloropropane	ug/kg	NS	12	U	11	U	11	U	11	U
cis-1,3-Dichloropropene	ug/kg	NS	12	U	11	U	11	U	11	U
Trichloroethene	ug/kg	700	12	U	11	U	11	U	11	U
Benzene	ug/kg	60	12	U	11	U	11	U	11	U
Dibromochloromethane	ug/kg	NS	12	U	11	U	11	U	11	U
trans-1,3-Dichloropropene	ug/kg	NS	12	U	11	U	11	U	11	U
1,1,2-Trichloroethane	ug/kg	NS	12	U	11	U	11	U	11	U
Bromoform	ug/kg	NS	12	U	11	U	11	U	11	U
4-Methyl-2-pentanone	ug/kg	1000	12	U	11	U	11	U	11	U
2-Hexanone	ug/kg	NS	12	U	11	U	11	U	11	U
Tetrachloroethene	ug/kg	1400	12	U	11	U	11	U	11	U
1,1,2,2-Tetrachloroethane	ug/kg	600	12	U	11	U	11	U	11	U
Toluene	ug/kg	1500	12	U	11	U	11	U	11	U
Chlorobenzene	ug/kg	1700	12	U	11	U	11	U	11	U
Ethylbenzene	ug/kg	5500	2	J	11	U	11	U	11	U
Styrene	ug/kg	NS	12	U	11	U	11	U	11	U
Xylenes (total)	ug/kg	1200	4	J	11	U	11	U	11	U

* New York State Soil Cleanup Objectives (TAGM #4046, January 1994)
U- Indicates that the compound was analyzed for, but not detected at or above the Contract Required Quantitation Limit(CRQL), or the compound is not detected due to qualification through the method or field blank.
J- The associated numerical value is an estimated quantity.
JN- Tentatively identified with approximated concentrations (Volatile and Semi Volatile Organics).
Presumptively present at an approximated quantity (Pesticides/PCB's)
UJ- This compound was analyzed for, but not detected. The sample quantitation limit is an estimated quantity due to variance from quality control limits.
C- Applies to pesticide results where the identification has been confirmed by GC/MS.
E- Reported value is estimated due to quantitation above the calibration range.
D- Reported result taken from diluted sample analysis.
A- Aldol condensation product
R- Reported value is unusable and rejected due to variance from quality control limits.
NA- Not analyzed

Table 3-3b
Historical Data
Semi-Volatile Organic Compounds in Soil
Lawrence Aviation Industeries Superfund Site
Port Jefferson Station, New York

Chemical Name	Sample Code / Sample Date / Sample Matrix / Unit \\ Depth	NYSDEC Recommended Cleanup Guideline Standard for Soil*	GP23D 09/24/97 SED 3-4 ft		GP24D 09/24/97 SED 3-4 ft		B-3 12/01/97 SED 4-6 ft		B-3 12/03/97 SED 188-190 ft	
Semi-Volatile Organic Compounds										
1,2,4-Trichlorobenzene	ug/kg	3,400	390	U	380	U	360	U	370	U
1,2-Dichlorobenzene	ug/kg	7,900	390	U	380	U	360	U	370	U
1,3-Dichlorobenzene	ug/kg	1,600	390	U	380	U	360	U	370	U
1,4-Dichlorobenzene	ug/kg	8,500	390	U	380	U	360	U	370	U
2,2'-oxybis(1-Chloropropane)	ug/kg	NS	390	U	380	U	360	U	370	U
2,4,5-Trichlorophenol	ug/kg	100	970	U	950	U	910	U	940	U
2,4,6-Trichlorophenol	ug/kg	NS	390	U	380	U	360	U	370	U
2,4-Dichlorophenol	ug/kg	400	390	U	380	U	360	U	370	U
2,4-Dimethylphenol	ug/kg	NS	390	U	380	U	360	U	370	U
2,4-Dinitrophenol	ug/kg	200 or MDL	970	U	950	U	910	U	940	U
2,4-Dinitrotoluene	ug/kg	NS	390	U	380	U	360	U	370	U
2,6-Dinitrotoluene	ug/kg	1,000	390	U	380	U	360	U	370	U
2-Chloronaphthalene	ug/kg	NS	390	U	380	U	360	U	370	U
2-Chlorophenol	ug/kg	800	390	U	380	U	360	U	370	U
2-Methylnaphthalene	ug/kg	36,400	390	U	380	U	360	U	370	U
2-Methylphenol	ug/kg	100 or MDL	390	U	380	U	360	U	370	U
2-Nitroaniline	ug/kg	430 or MDL	970	U	950	U	910	U	940	U
2-Nitrophenol	ug/kg	330 or MDL	390	U	380	U	360	U	370	U
3,3'-Dichlorobenzidine	ug/kg	NS	390	U	380	U	360	U	370	U
3-Nitroaniline	ug/kg	500 or MDL	970	U	950	U	910	U	940	U
4,6-Dinitro-2-methylphenol	ug/kg	NS	970	U	950	U	910	U	940	U
4-Bromophenyl-phenylether	ug/kg	NS	390	U	380	U	360	U	370	U
4-Chloro-3-methylphenol	ug/kg	240 or MDL	390	U	380	U	360	U	370	U
4-Chloroaniline	ug/kg	220 or MDL	390	U	380	U	360	UJ	370	UJ
4-Chlorophenyl-phenylether	ug/kg	NS	390	U	380	U	360	U	370	U
4-Methylphenol	ug/kg	900	390	U	380	U	360	U	370	U
4-Nitroaniline	ug/kg	NS	970	U	950	U	910	U	940	U
4-Nitrophenol	ug/kg	100 or MDL	390	U	380	U	360	U	370	U
Acenaphthene	ug/kg	50,000***	390	U	380	U	360	U	370	U
Acenaphthylene	ug/kg	41,000	390	U	380	U	360	U	370	U
Anthracene	ug/kg	50,000***	390	U	380	U	360	U	370	U
Benzo[a]anthracene	ug/kg	224 or MDL	390	U	380	U	360	U	370	U
Benzo[a]pyrene	ug/kg	61 or MDL	390	U	380	U	360	U	370	U
Benzo[b]fluoranthene	ug/kg	224 or MDL	390	U	380	U	360	U	370	U
Benzo[g,h,i]perylene	ug/kg	50,000***	390	U	380	U	360	U	370	U
Benzo[k]fluoranthene	ug/kg	224 or MDL	390	U	380	U	360	U	370	U
bis(2-Chloroethoxy)methane	ug/kg	NS	390	U	380	U	360	U	370	U
bis(2-Chloroethyl)ether	ug/kg	NS	390	U	380	U	360	U	370	U
bis(2-Ethylhexyl)phthalate	ug/kg	50,000***	390	U	380	U	140	J	370	U
Butylbenzylphthalate	ug/kg	50,000***	390	U	380	U	360	U	370	U
Carbazole	ug/kg	NS	390	U	380	U	360	U	370	U
Chrysene	ug/kg	400	390	U	380	U	360	U	370	U
Dibenz[a,h]anthracene	ug/kg	14 or MDL	390	U	380	U	360	U	370	U
Dibenzofuran	ug/kg	6,200	390	U	380	U	360	U	370	U
Diethylphthalate	ug/kg	7,100	390	U	380	U	360	U	370	U
Dimethylphthalate	ug/kg	2,000	390	U	380	U	360	U	370	U
Di-n-butylphthalate	ug/kg	8,100	390	U	380	U	360	U	370	U
Di-n-octylphthalate	ug/kg	50,000***	390	U	380	U	360	U	370	U
Fluoranthene	ug/kg	50,000***	390	U	380	U	360	U	370	U
Fluorene	ug/kg	50,000***	390	U	380	U	360	U	370	U
Hexachlorobenzene	ug/kg	410	390	U	380	U	360	U	370	U
Hexachlorobutadiene	ug/kg	NS	390	U	380	U	360	U	370	U
Hexachlorocyclopentadiene	ug/kg	NS	390	U	380	U	360	U	370	U
Hexachloroethane	ug/kg	NS	390	U	380	U	360	U	370	U
Indeno[1,2,3-cd]pyrene	ug/kg	3,200	390	U	380	U	360	U	370	U
Isophorone	ug/kg	4,400	390	U	380	U	360	U	370	U
Naphthalene	ug/kg	13,000	390	U	380	U	360	U	370	U
Nitrobenzene	ug/kg	200	390	U	380	U	360	U	370	U
N-Nitroso-di-n-propylamine	ug/kg	NS	390	U	380	U	360	U	370	U

Table 3-3b
Historical Data
Semi-Volatile Organic Compounds in Soil
Lawrence Aviation Industeries Superfund Site
Port Jefferson Station, New York

Chemical Name	Sample Code / Sample Date / Sample Matrix / Unit \\ Depth	NYSDEC Recommended Cleanup Guideline Standard for Soil*	GP23D 09/24/97 SED 3-4 ft	GP24D 09/24/97 SED 3-4 ft	B-3 12/01/97 SED 4-6 ft	B-3 12/03/97 SED 188-190 ft
N-Nitrosodiphenylamine	ug/kg	NS	390 U	380 U	360 U	370 U
Pentachlorophenol	ug/kg	1,000	970 U	950 U	910 U	940 U
Phenanthrene	ug/kg	50,000***	390 U	380 U	360 U	370 U
Phenol	ug/kg	30 or MDL	390 U	380 U	360 U	370 U
Pyrene	ug/kg	50,000***	390 U	380 U	360 U	370 U

Notes:

* New York State Soil Cleanup Objectives (TAGM #4046, January 1994)
BOLD: Exceeds NYSDEC recommended soil cleanup standard.
U- Indicates that the compound was analyzed for, but not detected at or above the
Contract Required Quantitation Limit(CRQL), or the compound
is not detected due to qualification through the method or field blank.
J- The associated numerical value is an estimated quantity.
JN- Tentatively identified with approximated concentrations (Volatile and Semi Volatile Organics).
UJ- This compound was analyzed for, but not detected.
The sample quantitation limit is an estimated quantity due to variance from quality control limits.
E- Reported value is estimated due to quantitation above the calibration range.
D- Reported result taken from diluted sample analysis.
R- Reported value is unusable and rejected due to variance from quality control limits.
*** = Total VOCs < 10 ppm,Total non-carcinogenic Semi-VOCs<500 ppm, Individual non-carcinogenic Semi-VOCs<50 ppm
and Total carcinogenic Semi-VOCs<10 ppm.
NS = No standard provided

Table 3-3c
Historical Data
TCL Pesticides in Soil
Lawrence Aviation Industerles Superfund Site
Port Jefferson Station, New York

Chemical Name	Sample Code / Sample Date / Sample Matrix / Unit \\ Depth	NYSDEC Recommended Cleanup Guideline Standard for Soil*	GP23D 09/24/97 3-4 ft	GP24D 09/24/97 3-4 ft	GP24D-DL 09/24/97 SED 3-4 ft	B-3 12/01/97 SED 4-6 ft	B-3 12/04/97 SED 188-190 ft
Pesticides							
alpha-BHC	ug/kg	110	2 UJ	1.9 UJ	3.9 UJ	1.2 JP	1.9 U
beta-BHC	ug/kg	200	2 UJ	1.9 UJ	3.9 UJ	1.8 U	1.9 U
delta-BHC	ug/kg	300	2 UJ	1.9 UJ	3.9 UJ	1.8 U	1.9 U
gamma-BHC (Lindane)	ug/kg	60	2 UJ	1.9 UJ	3.9 UJ	1.8 U	1.9 U
Heptachlor	ug/kg	100	2 UJ	1.9 UJ	3.9 UJ	1.8 U	1.9 U
Aldrin	ug/kg	41	2 UJ	1.9 UJ	3.9 UJ	1.8 U	1.9 U
Heptachlor epoxide	ug/kg	20	2 UJ	1.9 UJ	3.9 UJ	1.8 U	1.9 U
Endosulfan I	ug/kg	900	2 UJ	1.9 UJ	3.9 UJ	1.8 U	1.9 U
Dieldrin	ug/kg	44	5.6 XJ	7.6 PXJ	7.1 JDPX	3.6 U	3.7 U
4,4'-DDE	ug/kg	2100	14.1 PXJ	25 PXJ	27 DPJ	3.6 U	3.7 U
Endrin	ug/kg	100	8.4 PXJ	5.4 PXJ	5 DPJ	3.6 U	3.7 U
Endosulfan II	ug/kg	900	3.8 UJ	3.8 UJ	7.5 UJ	3.6 U	3.7 U
4,4'-DDD	ug/kg	2900	28.0 XJ	27 PXJ	28 DPXJ	3.3 J	3.7 U
Endosulfan sulfate	ug/kg	1000	3.8 UJ	3.8 UJ	7.5 UJ	3.6 U	3.7 U
4,4'-DDT	ug/kg	2100	6.7 PXJ	9.1 PXJ	16 DPXJ	3.6 U	3.7 U
Methoxychlor	ug/kg	***	20.0 UJ	19 UJ	39 UJ	18 U	19 U
Endrin ketone	ug/kg	NS	3.8 UJ	3.8 UJ	7.5 UJ	3.6 U	3.7 U
Endrin aldehyde	ug/kg	NS	5.0 PXJ	9.1 PXJ	13 DPJ	2.6 JPX	3.7 U
alpha-chlordane	ug/kg	540	2.0 UJ	5.6 PJ	6.6 DPJ	1.8 U	1.9 U
gamma-chlordane	ug/kg	540	2.0 UJ	5.4 PJ	5.9 DPJ	1.8 U	1.9 U
Toxaphene	ug/kg	NS	197.0 UJ	194 UJ	387 UJ	185 U	191 U
Aroclor-1016	ug/kg	NS	38 UJ	38 UJ	75 UJ	36 U	37 U
Aroclor-1221	ug/kg	NS	78 UJ	76 UJ	153 UJ	73 U	75 U
Aroclor-1232	ug/kg	NS	38 UJ	38 UJ	75 UJ	36 U	37 U
Aroclor-1242	ug/kg	NS	38 UJ	38 UJ	75 UJ	36 U	37 U
Aroclor-1248	ug/kg	NS	38 UJ	38 UJ	75 UJ	36 U	37 U
Aroclor-1254	ug/kg	NS	490 J	600 EJ	710 DJ	32 J	37 U
Aroclor-1260	ug/kg	NS	130 PJ	230 PJ	210 DPJ	36 U	37 U

Notes:

* New York State Soil Cleanup Objectives (TAGM #4046, January 1994)

BOLD: Exceeds NYSDEC recommended soil cleanup criteria

U- Indicates that the compound was analyzed for, but not detected at or above the Contract Required Quantitation Limit(CRQL), or the compound is not detected due to qualification through the method or field blank.

J- The associated numerical value is an estimated quantity.

JN- Tentatively identified with approximated concentrations (Volatile and Semi Volatile Organics). Presumptively present at an approximated quantity (Pesticides/PCB's)

UJ- This compound was analyzed for, but not detected. The sample quantitation limit is an estimated quantity due to variance from quality control limits.

C- Applies to pesticide results where the identification has been confirmed by GC/MS.

E- Reported value is estimated due to quantitation above the calibration range.

D- Reported result taken from diluted sample analysis.

A- Aldol condensation product

R- Reported value is unusable and rejected due to variance from quality control limits.

NA- Not analyzed

*** = Total pesticides <10,000 ug/kg

Table 3-3d
Historical Data
TAL Metals in Soil
Lawrence Aviation Industeries Superfund Site
Port Jefferson Station, New York

Chemical Name	Sample Code Sample Date Sample Matrix Unit \\ Depth	NYSDEC Recommended Cleanup Guideline Standard for Soil*	GP23D 09/24/97 SED 3-4 ft	GP24D 09/24/97 SED 3-4 ft	B-3 12/01/97 SED 4-6 ft	B-3 12/04/97 SED 188-190 ft
Metals						
Aluminum	ug/kg	33,000,000**	6930	6449	6545.3	725.1
Antimony	ug/kg	NA	0.7 U	3.8 BJ	6.1 B	0.7 U
Arsenic	ug/kg	7500.0	2.1 B	3.1	2.5	0.5 B
Barium	ug/kg	300,000	19.9 B	29.3 B	19.5 B	4.1 B
Beryllium	ug/kg	160	0.24 B	0.3 B	0.2 B	0.1 B
Cadmium	ug/kg	10,000	0.07 U	2.4	1.3	0.04 U
Calcium	ug/kg	130,000 - 35,000,000**	539 B	700.2 B	513.0 B	142.7 B
Chromium	ug/kg	50,000	19.8 R	124.0 R	25.8	3.4
Cobalt	ug/kg	30,000	2.5 B	5.1 B	4.1 B	0.9 B
Copper	ug/kg	25,000	5.4 B	28.8	7.6	2.0 B
Iron	ug/kg	2,000,000	7460	10416.9	8294.4	2029.4
Lead	ug/kg	400,000***	15.8	188.1 J	173.1	1.5
Magnesium	ug/kg	100,000 - 5,000,000**	780 B	994 B	928.7 B	306.7 B
Manganese	ug/kg	50,000 - 5,000,000**	64	131.6	106.9	36.1
Mercury	ug/kg	100	0.05 U	0.05 U	NA	NA
Nickel	ug/kg	13,000	11.7 R	95.6 R	19.0	1.4 B
Potassium	ug/kg	8,500,000 - 43,000,000**	368 B	440.6 B	1042.5 B	132.1 B
Selenium	ug/kg	2,000	0.65 U	0.6 U	0.6 B	0.5 U
Silver	ug/kg	NA	0.21 U	0.2 U	0.2 U	0.2 U
Sodium	ug/kg	6,000,000 - 8,000,000	36.9 BE	44.9 BEJ	353 B	19.0 B
Thallium	ug/kg	NA	0.60 U	0.73 B	0.4 U	0.43 U
Vanadium	ug/kg	150,000	12.5	17.2	13.6	3.1 B
Zinc	ug/kg	20,000	33.3 R	179.7	45.2	6.2
Titanium	ug/kg	NA	227	434.9 J	0.6 U	0.66 U

Notes:

U- Indicates analyte not detected at or above the Contract Required Quantitation Limit(CRQL), or the compound is not detected due to qualification through the method or field blank.
B- indicates analyte result is between Instrument Detection Level (IDL), CRDL.
J- The reported value is estimated due to variance to quality control limits.
UJ- The element was analyzed for, but not detected. The sample quantitation limit is an estimate due to variance from quality control limits.
E- Reported value is estimated because of the presence of interference.
R- Reported value is unusable and rejected due to variance from quality control limits.
FB - Aqueous Field blank obtained from Geoprobe equipment
* New York State Soil Cleanup Objectives (TAGM #4046, January 1994)
**Natural range of soils for eastern United States, McGovern, NYSDEC, 1984 as given in TAGM #4046.
***USEPA's Interim Lead Hazard Guidance for residential screening levels.

Table 3-4a
Historical Data
Volatile Organic Compounds in Groundwater
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, NewYork

	Sample Code	NYSDEC Recommended Cleanup Guideline Standard for Groundwater*	MW-1			MW-4					MW-5		PJ-6	PJ-11	B-3 (HP)	
	Sample Round		Round 1	Round 2	Round 2	Round 1	Round 1	Round 1	Round 2	Round 2	Round 1	Round 2	Round 2	Round 2	-	-
	Sample Name		MW-1	MW-1	MW-1DUP	MW-4 (HP)	MW-4	MW-4DL	MW-4	MW-4DL	MW-5	MW-5	PJ-6	PJ-11	B-3 (HP)	B-3(HP)DL
	Sample Date		12/03/97	03/23/00	03/23/00	11/12/97	12/03/97	12/03/97	03/24/00	03/24/00	12/03/97	03/24/00	03/24/00	03/24/00	12/03/97	12/03/97
	Sample Matrix		GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Volatile Organic Compounds	Unit															
Chloromethane	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 U	10 U	10 U	10 U	10 U	10 U	25 UJ
Bromomethane	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 U	10 U	10 U	10 U	10 U	10 U	25 UJ
Vinyl chloride	ug/l	2	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 U	10 U	10 U	10 U	10 U	10 U	25 UJ
Chloroethane	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 U	10 U	10 U	10 U	10 U	10 U	25 UJ
Methylene chloride	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 U	10 U	10 U	10 U	10 U	10 U	25 UJ
Acetone	ug/l	50	10 U	10 U	10 U	2 J	10 U	25 UJ	10 U	50 U	10 U	10 U	1.7 J	2.1 J	10 U	25 UJ
Carbon disulfide	ug/l	50	1 J	10 U	10 U	10 U	8 J	7 JD	10 U	50 U	10 U	10 U	10 U	10 U	10 U	25 UJ
1,1-Dichloroethene	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 U	10 U	10 U	10 U	10 U	10 U	25 UJ
1,1-Dichloroethane	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
1,2-Dichloroethene (Total)	ug/l	10	10 U	10 U	10 U	4 J	9 J	9 JD	10 U	13 JD	10 U	10 U	10 U	10 U	7 J	6 JD
2-Butanone	ug/l	50	10 U	10 U	10 U	10 U	10 U	25 JD	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Chloroform	ug/l	7	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
1,2-Dichloroethane	ug/l	0.6	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
1,1,1-Trichloroethane	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Carbon tetrachloride	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Bromodichloromethane	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
1,2-Dichloropropane	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
cis-1,3-Dichloropropene	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Trichloroethene	ug/l	5	2 J	10 U	10 U	100	280 EJ	280 D	706 EJ	794 DJ	10 U	10 U	10 U	10 U	220 E	202 D
Benzene	ug/l	1	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Dibromochloromethane	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
trans-1,3-Dichloropropene	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
1,1,2-Trichloroethane	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Bromoform	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
4-Methyl-2-pentanone	ug/l	50	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
2-Hexanone	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Tetrachloroethene	ug/l	5	10 U	10 U	10 U	6 J	28	27 DJ	121	132 DJ	10 U	10 U	10 U	10 U	10	9 JD
1,1,2,2-Tetrachloroethane	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Toluene	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Chlorobenzene	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Ethylbenzene	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Styrene	ug/l	NS	10 U	10 U	10 U	10 U	10 U	25 UJ	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ
Xylenes (total)	ug/l	5	10 U	10 U	10 U	10 U	10 U	25 UJ	9.65 J	50 UJ	10 U	10 U	10 U	10 U	10 U	25 UJ

Notes:
* New York Ambient Water Quality Standards and Guidance Values, August 4, 1999
U- Indicates that the compound was analyzed for, but not detected at or above the Contract Required Quantitation Limit(CRQL), or the compound is not detected due to qualification through the method or field blank.
J- The associated numerical value is an estimated quantity.
JN- Tentatively identified with approximated concentrations (Volatile and Semi Volatile Organics).
Presumptively present at an approximated quantity (Pesticides/PCB's)
UJ- This compound was analyzed for, but not detected. The sample quantitation limit is an estimated quantity due to variance from quality control limits.
C- Applies to pesticide results where the identification has been confirmed by GC/MS.
E- Reported value is estimated due to quantitation above the calibration range.
D- Reported result taken from diluted sample analysis.
A- Aldol condensation product
R- Reported value is unusable and rejected due to variance from quality control limits.
NA- Not analyzed
NS = No standard provided

Table 3-4b
Historical Data
Semi-Volatile Organic Compounds in Groundwater
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Chemical Name	Sample Code Sample Date Sample Matrix Unit	NYSDEC Recommended Cleanup Guideline Standard for Groundwater*	MW-1 03/23/00 GW	MW-1 DUP 03/23/00 GW	MW-4 03/23/00 GW	MW-5 03/23/00 GW	PJ-6 03/24/00 GW	PJ-11 03/24/00 GW
Semi-Volatile Organic Compounds								
1,2,4-Trichlorobenzene	ug/l	5	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
1,2-Dichlorobenzene	ug/l	3	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
1,3-Dichlorobenzene	ug/l	3	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
1,4-Dichlorobenzene	ug/l	3	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2,2'-oxybis(1-Chloropropane)	ug/l	NS	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2,4,5-Trichlorophenol	ug/l	1	25.0 UJ	25.0 U	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ
2,4,6-Trichlorophenol	ug/l	NS	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2,4-Dichlorophenol	ug/l	1	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2,4-Dimethylphenol	ug/l	NS	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2,4-Dinitrophenol	ug/l	5	25.0 UJ	25.0 U	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ
2,4-Dinitrotoluene	ug/l	5	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2,6-Dinitrotoluene	ug/l	5	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2-Chloronaphthalene	ug/l	NS	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2-Chlorophenol	ug/l	50	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2-Methylnaphthalene	ug/l	50	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2-Methylphenol	ug/l	5	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
2-Nitroaniline	ug/l	5	25.0 UJ	25.0 U	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ
2-Nitrophenol	ug/l	5	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
3,3'-Dichlorobenzidine	ug/l	NS	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
3-Nitroaniline	ug/l	5	25.0 UJ	25.0 U	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ
4,6-Dinitro-2-methylphenol	ug/l	NS	25.0 UJ	25.0 U	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ
4-Bromophenyl-phenylether	ug/l	NS	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
4-Chloro-3-methylphenol	ug/l	5	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
4-Chloroaniline	ug/l	5	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
4-Chlorophenyl-phenylether	ug/l	NS	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
4-Methylphenol	ug/l	50	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
4-Nitroaniline	ug/l	NS	25.0 UJ	25.0 U	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ
4-Nitrophenol	ug/l	5	25.0 UJ	25.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
Acenaphthene	ug/l	20	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
Acenaphthylene	ug/l	20	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
Anthracene	ug/l	50	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
Benzo[a]anthracene	ug/l	0.002	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
Benzo[a]pyrene	ug/l	0.002	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
Benzo[b]fluoranthene	ug/l	0.002	10.0 UJ	10.0 U	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ
Benzo[g,h,i]perylene	ug/l	5	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Benzo[k]fluoranthene	ug/l	0.002	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ

Table 3-4b
Historical Data
Semi-Volatile Organic Compounds in Groundwater
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Chemical Name	Sample Code Sample Date Sample Matrix Unit	NYSDEC Recommended Cleanup Guideline Standard for Groundwater*	MW-1 03/23/00 GW	MW-1 DUP 03/23/00 GW	MW-4 03/23/00 GW	MW-5 03/23/00 GW	PJ-6 03/24/00 GW	PJ-11 03/24/00 GW
Semi-Volatile Organic Compounds								
bis(2-Chloroethoxy)methane	ug/l	NS	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
bis(2-Chloroethyl)ether	ug/l	NS	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
bis(2-Ethylhexyl)phthalate	ug/l	5	1.0 J	3.0 J	10.0 UJ	10.0 UJ	10.0 UJ	1.0 J
Butylbenzylphthalate	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	1.0 J
Carbazole	ug/l	NS	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Chrysene	ug/l	0.002	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Dibenz[a,h]anthracene	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Dibenzofuran	ug/l	5	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Diethylphthalate	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Dimethylphthalate	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Di-n-butylphthalate	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Di-n-octylphthalate	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Fluoranthene	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Fluorene	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Hexachlorobenzene	ug/l	0.04	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Hexachlorobutadiene	ug/l	NS	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Hexachlorocyclopentadiene	ug/l	NS	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Hexachloroethane	ug/l	NS	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Indeno[1,2,3-cd]pyrene	ug/l	0.002	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Isophorone	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Naphthalene	ug/l	10	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Nitrobenzene	ug/l	0.4	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
N-Nitroso-di-n-propylamine	ug/l	NS	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
N-Nitrosodiphenylamine	ug/l	NS	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Pentachlorophenol	ug/l	1	25.0 UJ	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ	25.0 UJ
Phenanthrene	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Phenol	ug/l	1	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
Pyrene	ug/l	50	10.0 UJ	10.0 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ

Notes:

BOLD: Exceeds NYSDEC recommended soil cleanup standard.
U- Indicates that the compound was analyzed for, but not detected at or above the Contract Required Quantitation Limit(CRQL), or the compound is not detected due to qualification through the method or field blank.
J- The associated numerical value is an estimated quantity.
JN- Tentatively identified with approximated concentrations (Volatile and Semi Volatile Organics).
UJ- This compound was analyzed for, but not detected.
The sample quantitation limit is an estimated quantity due to variance from quality control limits.

E- Reported value is estimated due to quantitation above the calibration range.
D- Reported result taken from diluted sample analysis.
R- Reported value is unusable and rejected due to variance from quality control limits.
NS = No standard provided
* New York Ambient Water Quality Standards and Guidance Values, August 4, 1999

Table 3-4c
Historical Data
Pesticides Groundwater Sample Analysis
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Compounds	Sample Code / Sample Round / Sample Name / Sample Date / Sample Matrix	NYSDEC Recommended Cleanup Guideline Standard for Groundwater*	MW-1		MW-4	MW-5	PJ-6	PJ-11
			Round 2		Round 2	Round 2	Round 2	Round 2
			MW1	MW1-DUP	MW4	MW5	PJ-6	PJ-11
			03/23/00	03/23/00	03/23/00	03/23/00	03/24/00	03/24/00
			GW	GW	GW	GW	GW	GW
Pesticides	Unit							
alpha-BHC	ug/l	0.01	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 UJ
beta-BHC	ug/l	0.04	0.05 U	0.05 U	0.05 U	0.05 U	0.065 J	0.05 UJ
delta-BHC	ug/l	0.04	0.05 UJ	0.05 U	0.05 UJ	0.05 UJ	0.05 UJ	0.05 UJ
gamma-BHC (Lindane)	ug/l	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 UJ
Heptachlor	ug/l	0.04	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 UJ
Aldrin	ug/l	ND	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 UJ
Heptachlor epoxide	ug/l	0.03	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 UJ
Endosulfan I	ug/l	No standard	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 UJ
Dieldrin	ug/l	0.00	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
4,4'-DDE	ug/l	0.20	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
Endrin	ug/l	ND	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
Endosulfan II	ug/l	No standard	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
4,4'-DDD	ug/l	0.30	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
Endosulfan sulfate	ug/l	No standard	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
4,4'-DDT	ug/l	0.20	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
Methoxychlor	ug/l	35.0	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 UJ
Endrin ketone	ug/l	5.0	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
Endrin aldehyde	ug/l	5.0	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 UJ
alpha-chlordane	ug/l	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 UJ
gamma-chlordane	ug/l	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 UJ
Toxaphene	ug/l	0.06	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 UJ
Aroclor-1016	ug/l	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ
Aroclor-1221	ug/l	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 UJ	2.0 UJ
Aroclor-1232	ug/l	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ
Aroclor-1242	ug/l	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ
Aroclor-1248	ug/l	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 Uj	1.0 UJ
Aroclor-1254	ug/l	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ
Aroclor-1260	ug/l	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ

Notes:
* New York Ambient Water Quality Standards and Guidance Values, August 4, 1999
U- Indicates that the compound was analyzed for, but not detected at or above the Contract Required Quantitation Limit(CRQL), or the compound is not detected due to qualification through the method or field blank.
J- The associated numerical value is an estimated quantity.
JN- Tentatively identified with approximated concentrations (Volatile and Semi Volatile Organics). Presumptively present at an approximated quantity (Pesticides/PCB's)
UJ- This compound was analyzed for, but not detected. The sample quantitation limit is an estimated quantity due to variance from quality control limits.
C- Applies to pesticide results where the identification has been confirmed by GC/MS.
E- Reported value is estimated due to quantitation above the calibration range.
D- Reported result taken from diluted sample analysis.
A- Aldol condensation product
R- Reported value is unusable and rejected due to variance from quality control limits.
P - Target analyte is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on Form I and flagged with a P.
ND = Non detect
NA = Not analyzed

Table 3-4d
Historical Data
TAL Metals in Groundwater
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Chemical Name	Sample Code / Sample Date / Sample Matrix / Unit	NYSDEC Recommended Cleanup Guideline Standard for Groundwater*	MW-1 03/23/00 GW	MW-1Dup 03/23/00 GW	MW-4 03/23/00 GW	MW-5 03/23/00 GW	PJ-6 03/24/00 GW	PJ-11 03/24/00 GW	B-3 12/04/97 GW
Metals									
Aluminum	ug/l	NS	925.1	1,600	6,312	180.8 B	1811	9,125	725
Antimony	ug/l	3	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	0.56 U
Arsenic	ug/l	25	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	5.7 B	0.51 B
Barium	ug/l	1,000	45.7 B	53.8 B	78.2 B	24.8 B	147.2 B	125.9 B	4.1 B
Beryllium	ug/l	3	0.5 B	0.41 B	1.10 B	0.20 U	0.3 B	2.30 B	0.07 B
Cadmium	ug/l	5	1.30 B	1.10 B	0.4 U	0.40 U	4.30 B	**18.6**	0.04 U
Calcium	ug/l	NS	9,154	9,070	12,450	8,382	15350	7,889	143 B
Chromium	ug/l	50	4.5 B	7.3 B	8.6 B	2.9 B	20.9	**422.8**	3.4
Cobalt	ug/l	NS	2.8 B	3.8 B	2.0 U	2.0 U	24.6 B	33.0 B	0.92 B
Copper	ug/l	200	3.8 B	7.3 B	1.5 U	1.5 U	**202.4**	**457.7**	2.0 B
Iron	ug/l	300	**1,734**	**3,770**	93.1 B	**475.9**	**50,430**	**159,100**	2030
Lead	ug/l	25	5.1	8.6	1.6 U	1.6 U	**171.9**	**616.5**	1.5
Magnesium	ug/l	35,000	4,645 B	4,500 B	6,893	4,171 B	6063	4,728 B	307 B
Manganese	ug/l	300	276	**378**	4.9 B	25	**1379**	**1,463**	36.1
Mercury	ug/l	0.7	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.39	NA
Nickel	ug/l	100	4.6 B	5.7 B	2.0 U	2.0 U	35.2 B	**120.3**	1.4 B
Potassium	ug/l	NS	2,323 BEJ	2,180 B	56,440 EJ	1,100 BEJ	2,132 BEJ	961.1 BEJ	132 B
Selenium	ug/l	10	2.70 U	2.70 U	2.70 U	2.70 U	2.70 U	2.70 U	0.54 U
Silver	ug/l	50	0.69 U	0.69 U	0.69 U	0.69 U	0.76 B	0.69 U	0.18 U
Sodium	ug/l	20,000	**22,960**	**21,400**	19,120	7,217	10,600	**27,860**	19 B
Thallium	ug/l	0.5	4.00 U	4.00 U	4.00 U	4.00 U	4.0 U	**6.14** B	0.43 U
Vanadium	ug/l	NS	2.6 B	4.7 B	1.8 B	1.3 U	4.4 B	59.5	3.1 B
Zinc	ug/l	2,000	22.5 R	31.4	3.2 R	21.3 R	**12,400**	**38,890**	6.2
Titanium	ug/l	NS	11.3 B	38.7 B	2.2 B	7.60 B	16.90 B	38.0 B	0.56 U

Notes:
* New York Ambient Water Quality Standards and Guidance Values, August 4, 1999
U- Indicates analyte not detected at or above the Contract Required Quantitation Limit(CRQL), or the compound is not detected due to qualification through the method or field blank.
B- indicates analyte result is between Instrument Detection Level (IDL), CRDL.
J- The reported value is estimated due to variance to quality control limits.
UJ- The element was analyzed for, but not detected. The sample quantitation limit is an estimate due to variance from quality control limits.
E- Reported value is estimated because of the presence of interference.
R- Reported value is unusable and rejected due to variance from quality control limits.
NA- Not analyzed
NS = No standard provided

Table 3-4e
Inorganic Groundwater Sample Analysis
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

	Sample Code	NYSDEC Recommended	MW-1			MW-4			MW-5		PJ-6	PJ-11	B-3 (HP)
	Sample Round	Cleanup Guideline	Round 1	Round 2		Round 1	Round 1	Round 2	Round 1	Round 2	Round 1	Round 1	
	Sample Name	Standard for Groundwater*	MW1	MW-1	MW-1Dup	MW-4 (HP)	MW-4	MW-4	MW-5	MW-5	PJ-6	PJ-11	
	Sample Date		12/03/97	03/23/00	03/23/00	11/12/97	12/03/97	03/24/00	12/03/97	03/24/00	03/24/00	03/24/00	12/03/97
Compounds	Sample Matrix		GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Inorganics	Unit												
Chloride	mg/l	250	50.4			20.0	19.6		8.9				10.4
Hexavalent Chromium	mg/l	0.05	0.02 U			0.02 U	0.02 U		0.02 U				0.02 U
Fluoride	mg/l	4.0	0.1 U	0.1 U	0.1 U	**12**	**13**	**15**	0.10 U	0.10 U	0.10 U	0.10 U	1.3
Nitrite (as N)	mg/l	1	0.1 U			0.12	0.10 U		0.10 U				0.10 U
Nitrate (as N)	mg/l	10	2.5			3.5	**10.3**		1.7				5
Total Alkalinity	mg/l	NS	7.4			222	125		21.7				103
Total Dissolved Solids	mg/l	500	160			410	357		110				243
Total Hardness	mg/l	NS	72			1200	100		58				300

Notes:
* New York Ambient Water Quality Standards and Guidance Values, August 4, 1999
U- Indicates analyte not detected at or above the Contract Required Quantitation Limit(CRQL),
or the compound is not detected due to qualification through the method or field blank.
B- indicates analyte result is between Instrument Detection Level (IDL), CRDL.
J- The reported value is estimated due to variance to quality control limits.
UJ- The element was analyzed for, but not detected. The sample quantitation limit is an estimate due to variance from quality control limits.
E- Reported value is estimated because of the presence of interference.
R- Reported value is unusable and rejected due to variance from quality control limits.
NA- Not analyzed
NS = No standard provided

Table 4-1
Summary of Data Quality Levels
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

DATA USES	ANALYTICAL LEVEL	TYPE OF ANALYSIS
Site Characterization Monitoring During Implementation	SCREENING LEVEL WITH DEFINITIVE LEVEL CONFIRMATION	Total organic vapor using portable instruments Water quality field measurements using portable instruments
Risk Assessment Site Characterization Monitoring During Implementation	DEFINITIVE LEVEL	Organics/Inorganics using EPA-approved methods Includes CLP SOWs in addition to standard water analyses Analyses performed by laboratory
Site Characterization	DQO LEVEL Field Instrument (see Note 1)	Measurements from field equipment Qualitative measurements

Note 1: DQO = Measurement-specific Data Quality Objective requirements will be defined in the QAPP and technical specifications.

TABLE 5-1
SAMPLING ACTIVITIES
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

SAMPLE TYPE/ LOCATION	SAMPLE MEDIA	CLP ANALYTICAL PARAMETERS	NO. OF SAMPLES	NON-RAS ANALYTICAL PARAMETERS	NO. OF SAMPLES	SAMPLING FREQUENCY
GROUNDWATER SAMPLING						
Existing Monitoring Well, Residential Well, and Public Supply Well Sampling 1 event, 18 locations; 2 events, 10 locations	Groundwater	Low Detection Limit VOCs, TAL	38	Fluoride [1]	38	One per location
Newly-Installed Multi-Port Monitoring Well Sampling 2 events, 10 locations, 5 zones per location	Groundwater	Low Detection Limit VOCs, TCL/ TAL	100	TDS, Alkalinity, TSS, TKN, Ammonia, Nitrate/Nitrite, TOC, Hardness, Sulfate/Sulfide, Chloride, Fluoride, Methane, Ethane, Ethene and Ferrous Iron[1]	100	5 monitoring zones per well per sampling round, natural attenuation and water quality parameters sampled in round 1 only
SURFACE WATER AND SEDIMENT SAMPLING						
Surface Water Sampling 1 event, 24 locations in Old Mill Pond, Old Mill Creek, Port Jefferson Harbor, Unnamed Pond, and on-site cess pools	Surface Water	TCL/TAL	24	Hardness, Alkalinity, TKN, Ammonia, Nitrate/Nitrite, Fluoride, Sulfate/Sulfide, Chloride, Methane, Ethane, Ethene, TSS, TDS, TOC, pH, Ferrous Iron	24	One per location

TABLE 5-1
SAMPLING ACTIVITIES
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

SAMPLE TYPE/ LOCATION	SAMPLE MEDIA	CLP ANALYTICAL PARAMETERS	NO. OF SAMPLES	NON-RAS ANALYTICAL PARAMETERS	NO. OF SAMPLES	SAMPLING FREQUENCY
Sediment Sampling 1 event, 24 locations in Old Mill Pond, Old Mill Creek, Port Jefferson Harbor, Unnamed Pond, and on-site cess pools	Sediment	TCL/TAL	24	pH, TOC, Grain Size	24	One per location, 0-6 inches
Composite Sediment Sampling 1 event, 4 locations in the Old Mill Pond	Sediment	N/A		TCLP	1	one sample composited from 4 locations, 0-24 inches
SOIL INVESTIGATION						
Onsite Exterior Shallow Borings 1 event; 45 shallow boring locations	Soil	TCL/TAL	150	pH, TOC, Grain Size	150	4 samples per boring in 15 borings-includes a surface soil sample; 3 samples per boring in 30 borings
Onsite Exterior Deep Borings 1 event; 15 deep boring locations	Soil	TCL/TAL	60	pH, TOC, Grain Size	60	4 samples per boring in 15 borings
Onsite Building Interior Shallow Borings 1 event; 15 shallow boring locations	Soil	TCL/TAL	45	pH, TOC, Grain Size	45	3 samples per boring in 15 borings
Onsite DNAPL Borings 1 event; 5 deep boring locations	Soil	Full TCL	10		0	2 samples per boring in 5 borings

TABLE 5-1
SAMPLING ACTIVITIES
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

SAMPLE TYPE/ LOCATION	SAMPLE MEDIA	CLP ANALYTICAL PARAMETERS	NO. OF SAMPLES	NON-RAS ANALYTICAL PARAMETERS	NO. OF SAMPLES	SAMPLING FREQUENCY
Outlying Parcel Borings 1 event, 15 40-foot boring locations and 25 15-foot boring locations	Soil	TCL/TAL	135	pH, TOC, Grain Size	135	3 samples per boring in 15 foot borings and 4 samples per boring in 40 foot borings-including surface soil samples in all borings

Notes:

(1) Groundwater and surface water samples also will be collected for Field Parameters: Dissolved Oxygen, Oxidation-Reduction Potential, Turbidity, Temperature, and Conductivity

TAL Target analyte list
TCL Target Compound List
TCLP Toxicity Characteristic Leachate Procedure
TDS Total Dissolved Solids
TKN Total Kjeldahl Nitrogen
TOC Total Organic Carbon
TSS Total Suspended Solids

Table 5-2
Proposed DPT/MIP Groundwater Screening Points
and Multi-Port Monitoring Well Locations
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

LOCATION	RATIONALE FOR SAMPLING LOCATION
DPT/MIP GROUNDWATER SCREENING POINTS	
TRANSECT A - Upgradient/south of Old Mill Pond	
GSP-1 through GSP-8	Historical groundwater data indicate groundwater discharging to Old Mill Pond & Old Mill Brook was contaminated with VOCs to at least 100 feet bgs. MIP results will be used to assess the nature & extent of the contaminant plume & select MW screen depths.
TRANSECT B - Between Old Mill Pond and Port Jefferson Harbor	
GSP-9 through GSP-15	Existing data suggest VOC-contaminated groundwater discharging to Old Mill Pond and Old Mill Brook may also have been discharging to the harbor. MIP results will be used to assess the nature & extent of the contaminant plume & select MW screen depths.
MULTI-PORT MONITORING WELLS	
MW-6, MW-7, MW-8, MW-9, MW-10	Five wells will be arranged on and around the LAI site to define groundwater contamination beneath the site. One of the wells will be placed upgradient of the LAI property to monitor background conditions.
MW-11, MW-12, MW-13	Three of the wells will be installed about mid-way between the LAI site and the area of the Old Mill Pond, along an east to west transect line (perpendicular to groundwater flow) to define the width and depth of groundwater contamination.
MW-14, MW-15	Three wells will be installed in the vicinity of the Old Mill Pond. These three wells also will be arranged on an east to west transect line to define the width and depth of groundwater contamination.

Table 5-3
Proposed Subsurface Soil Boring Locations
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

LOCATION	RATIONALE FOR SAMPLING LOCATION
Onsite Subsurface Soil Borings	
	A0C-1 Abandoned Lagoon Area
Shallow Borings:	
S-1	Historical records and aerial photographs indicate area of soil contamination at a former outside drum storage area. This boring will determine the nature of the contamination.
S-2	Historical records indicate area of soil contamination at a suspected dumping area. The purpose of this boring is to determine if soil contamination exist at this location.
S-3	Historical records indicate soil contamination at a leaking transformer storage area. This boring is to determine nature of the contamination.
S-4	Historical records document release of pure TCE. This boring is to determine nature and extent of spill area and confirm presence of DNAPL in the soil.
S-5	Historical records document release of pure TCE. This boring is to determine nature and extent of spill area and to confirm presence of DNAPL in the soil.
S-6	Historical records document release of pure TCE. This boring is to determine nature and extent of spill area and to confirm presence of DNAPL in the soil.
S-7	Investigate/sample soil adjacent to acid dump storage tank.
S-8	Investigate/sample soil adjacent to the acid neutralization and evaporation facility
S-9	Historical records indicate soil contamination at a leaking transformer storage area. This boring is to determine nature of the contamination.
S-10	Aerial photos indicate area of possible soil removal. The purpose of this boring is to investigate area of suspected soil removal and filling.
S-11	Investigate/sample soil adjacent to the waste storage facility.
Deep Borings:	
D-1	Location of eastern portion former north lagoon. Area heavily contaminated with TCE and acids. This portion of the north lagoon was filled with C & D material. The purpose of this boring is to confirm presence and depth of contamination.
D-2	Location of former north lagoon. Boring is adjacent to discharge pipe suspected of discharging liquids heavily contaminated with TCE and acid. The purpose of this boring is to confirm presence and depth of contamination.
D-3	Location of western portion former north lagoon. The purpose of this boring is to confirm presence and depth of contamination.
D-4	Location of former southern lagoon. Historical records indicate discharge of unknown chemicals. The purpose of this boring is to confirm presence and depth of soil contamination at south lagoon.
D-5	Location of former southern lagoon. Historical records indicate discharge of unknown chemicals. The purpose of this boring is to confirm presence and depth of soil contamination at south lagoon.
D-6	Historical records document release of pure TCE. This boring is to determine nature and extent of spill area and to confirm presence of contaminants in the soil.
D-7	Historical records document release of pure TCE. This boring is to determine nature and extent of spill area and to confirm presence of contaminants in the soil.
D-8	Historical records document recurring spillage of acid waste waters. This boring is to determine nature and extent of spill area.
D-9	Historical records indicate area of drum crushing and associated stained soil. This boring is to determine nature and extent of the spill area.
	AOC-2 1980 Drum Crushing Area
Shallow Borings:	
S-12	Historical records and visual observations by regulatory officials documented drum spearing and crushing operations in this area. This boring is to aid in determining the nature and extent of soil contamination.
S-13	Historical records and visual observations by regulatory officials documented drum spearing and crushing operations in this area. This boring is to aid in determining the nature and extent of soil contamination.
S-14	Historical records and visual observations by regulatory officials documented drum spearing and crushing operations in this area. This boring is to aid in determining nature and extent of soil contamination.

Table 5-3
Proposed Subsurface Soil Boring Locations
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

LOCATION	RATIONALE FOR SAMPLING LOCATION
S-15	Historical records and visual observations by regulatory officials documented drum spearing and crushing operations in this area. This boring is to aid in determining the nature and extent of soil contamination.
S-16	Historical records and visual observations by regulatory officials documented drum spearing and crushing operations in this area. This boring is to aid in determining the nature and extent of soil contamination and confirm presence of DNAPL in the soil.
S-17	Historical records and visual observations by regulatory officials documented drum spearing and crushing operations in this area. This boring is to aid in determining the nature and extent of soil contamination.
S-18	Investigate/sample soil adjacent to the hydrofluoric acid tank.
S-19	Investigate/sample soil adjacent to the emergency acid dump tank and to aid in determining the nature and extent of process waste water spill area.
S-20	Investigate/sample soil adjacent to the acid storage house and to aid in determining the nature and extent of process waste water spill area.
S-21	Aerial photos delineate drainage scars on unpaved areas east of the buildings. These drainage ditches may have received run-off from locations where dumping occurred. This boring is to aid in determining the nature and extent of soil contamination.
S-22	Aerial photos delineate drainage scars on unpaved areas east of the buildings. These drainage ditches may have received run-off from locations where dumping occurred. This boring is to aid in determining the nature and extent of soil contamination.
Deep Borings:	
D-10	Historical records and visual observations by regulatory officials documented drum spearing and crushing operations in this area. This boring is to aid in determining the nature and extent of soil contamination in the soil.
D-11	Historical records and visual observations by regulatory officials documented drum spearing and crushing operations in this area. This boring is to aid in determining the nature and extent of soil contamination in the soil.
D-12	Historical records document recurring spillage of process waste water . This boring is to determine nature and extent of spill area.
D-13	Aerial photos delineate drainage scars on unpaved areas east of the buildings. These drainage ditches may have received run-off from locations where dumping occurred. This boring is to aid in determining the nature and extent of soil contamination.
AOC-3 Building F and Building 4 Area	
Shallow Borings:	
S-23	Historical records indicate area of soil contamination at a former outside drum storage area. This boring will determine the nature and extent of the contamination.
S-24	Aerial photos delineate drainage scars on unpaved areas east of the buildings. These drainage ditches may have received run-off from locations where dumping occurred. This boring is to aid in determining the nature and extent of soil contamination.
S-25	Aerial photos delineate drainage scars on unpaved areas east of the buildings. These drainage ditches may have received run-off from locations where dumping occurred. This boring is to aid in determining the nature and extent of soil contamination.
S-26	Aerial photos delineate drainage scars on unpaved areas east of the buildings. These drainage ditches may have received run-off from locations where dumping occurred. This boring is to aid in determining the nature and extent of soil contamination.
S-27	Investigate/confirm presence of soil contamination at an area of suspected dumping.
S-28	Historical records indicate an area of soil contamination at a suspected dumping area. The purpose of this boring is to determine if soil contamination exist at this location.
S-29	Historical records indicate an area of soil contamination at a suspected dumping area. The purpose of this boring is to determine if soil contamination exist at this location.
S-30	Historical records indicate area of soil contamination at a suspected dumping area. The purpose of this boring is to determine if soil contamination exist at this location.
Deep Borings:	
D-14	Aerial photos delineate drainage scars on unpaved areas east of the buildings. These drainage ditches may have received run-off from locations where dumping occurred. This boring is to aid in determining the nature and extent of soil contamination.
D-15	The purpose of this boring is to confirm presence and track offsite migration of contaminants in conjunction with deep lithologic boring.

Table 5-3
Proposed Subsurface Soil Boring Locations
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

LOCATION	RATIONALE FOR SAMPLING LOCATION
Onsite Building Interior Subsurface Soil Borings	
Shallow Borings:	
B-1 to B-15	*15 soil borings will be installed on the LAI site to define the nature and extent of surface and subsurface soil contamination underneath the concrete slab floor of the building interior.
Outlying Parcel Subsurface Soil Borings	
Shallow Borings:	
OPSB-01 to OPSB-40	Boring locations will be based on site reconnaissance, surface geophysics, and aerial photography. Sample locations and rational will be submitted for EPA approval before beginning the soil boring activities.

Notes:
*Building boring locations will be determined during further site reconnaissance inside the facility buildings
**Residential Area boring locations will be determined during further site reconnaissance in the Residential Area

Table 5-4
Proposed Surface Water/Sediment Sampling Locations
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

LOCATION NAME	SAMPLING LOCATION
Old Mill Creek/Old Mill Pond & Port Jefferson Harbor	
SW/SD-1	Seep location at the headwaters of the Old Mill Creek (on the west side of Brook Road, upstream of Old Mill Pond)
SW/SD-2	Sedimentation location within concrete water retention area (on the west side of Brook Road, near the headwaters of the Old Mill Creek and upstream of the Pond)
SW/SD-3 & SW/SD-4	Seep locations near the headwaters of the Old Mill Creek (on the west side of Brook Road, across from the Mill Creek Pond)
SW/SD-5	Seep location at manhole at the Old Mill Creek on the east side of Brook Road, upstream of the Mill Creek Pond
SW/SD-6 thru SW/SD-8	In the Old Mill Pond (on the east side of Brook Road) in sedimentation locations. These samples will be collected by sampling personnel from the edge of the Pond)
SW/SD-9	In the Old Mill Creek at a sedimentation location at the spillway from the pond
SW/SD-10	In the Old Mill Creek at a sedimentation location just after the boat yard and upstream of Barnum Avenue
SW/SD-11	In the Old Mill Creek at a sedimentation location downstream of Barnum Avenue and the 2-foot inflow pipe and upstream of the foot bridge
SW/SD-12	In the Old Mill Creek at a sedimentation location downstream of the 6-foot inflow pipe and before the area of the bulkhead
SW/SD-13 & SW/SD-14	In the open Old Mill Creek channel in the area of the bulkhead on the south side of West Broadway (Route 25A) just upstream of the Harbor. The surface water samples will be collected twice: once at high tide and once at low tide.
SW/SD-15	In the Old Mill Creek drainage outlet to the Harbor. These samples will be collected at low tide
SW/SD-16	One sample couplet will be collected from the harbor outlet during low tide.
SD-17	For waste characterization purposes, in the event that contaminated Old Mill Pond sediments will require excavation, one composite sediment sample will be collected from four locations in the Old Mill Pond and composited into one sample. These samples will be collected by sampling personnel from the edge of the Pond.
Unnamed Pond	
SW/SD-18 and SW/SD-19	Five samples will be collected in areas of sedimentation by sampling personnel from the edge of the Pond.
Onsite Cess Pools	
SW/SD-19 thru SW/SD-24	Five samples will be collected in areas of sedimentation by sampling personnel from the edge of the Pond.
Old Mill Pond Sediment Core	
SW/SD-25	One sediment sample will be collected from 0-24 inches at four locations and composited for waste disposal characterization

Table 5-5
Proposed RI Report Format
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

1.0 Introduction
- 1.1 Purpose of Report
- 1.2 Site Background
  - 1.2.1 Site Description
  - 1.2.2 Site History
  - 1.2.3 Previous Investigations
- 1.3 Report Organization

2.0 Study Area Investigation
- 2.1 Surface Features (topographic mapping, etc.) (natural and manmade features)
- 2.2 Contaminant Source Investigations
- 2.3 Meteorological Investigations
- 2.4 Surface Water and Sediment Investigations
- 2.5 Geological Investigations
- 2.6 Soil and Vadose Zone Investigation
- 2.7 Groundwater Investigation
- 2.8 Human Population Surveys
- 2.9 Ecologic Investigation

3.0 Physical Characteristics of Site
- 3.1 Topography
- 3.2 Meteorology
- 3.3 Surface Water and Sediment
- 3.4 Geology
- 3.5 Hydrogeology
- 3.6 Soils
- 3.7 Air Quality
- 3.8 Demographics and Land Use

4.0 Nature and Extent of Contamination
- 4.1 Sources of Contamination
- 4.2 Soils
- 4.3 Groundwater
- 4.4 Surface Water and Sediments

Table 5-5
Proposed RI Report Format
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Table 5-6
Detailed Evaluation Criteria for Remedial Alternatives
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

- SHORT-TERM EFFECTIVENESS
  - Protection of community during remedial action
  - Protection of workers during remedial actions
  - Time until remedial response objectives are achieved
  - Environmental impacts

- LONG-TERM EFFECTIVENESS
  - Magnitude of risk remaining at the site after the response objectives have been met
  - Adequacy of controls
  - Reliability of controls

- REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT
  - Treatment process and remedy
  - Amount of hazardous material destroyed or treated
  - Reduction in toxicity, mobility or volume of the contaminants
  - Irreversibility of the treatment
  - Type and quantity of treatment residuals

- IMPLEMENTABILITY
  - Ability to construct technology
  - Reliability of technology
  - Ease of undertaking additional remedial action, if necessary
  - Monitoring considerations
  - Coordination with other agencies
  - Availability of treatment, storage capacity, and disposal services
  - Availability of necessary equipment and specialists
  - Availability of prospective technologies

- COST
  - Capital costs
  - Annual operating and maintenance costs
  - Present worth
  - Sensitivity Analysis

- COMPLIANCE WITH ARARs
  - Compliance with chemical-specific ARARs
  - Compliance with action-specific ARARs
  - Compliance with location-specific ARARs
  - Compliance with appropriate criteria, advisories and guidance

- OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT

- STATE ACCEPTANCE

- COMMUNITY ACCEPTANCE

Table 5-7
Proposed FS Report Format
Lawrence Aviation Industries Site
Port Jefferson Station, New York

1.0 Introduction
- 1.1 Purpose and Organization of Report
- 1.2 Site Description and History
- 1.3 Site
- 1.4 Source(s) of Contamination
- 1.5 Nature and Extent of Contamination
- 1.6 Contaminant Fate and Transport
- 1.7 Baseline Human Health Risk Assessment
- 1.8 Screening Level Ecological Risk Assessment

2.0 Identification and Screening of Technologies
- 2.1 Remedial Action Objectives for Each Medium
  - Contaminants of Interest
  - Allowable Exposure Based on Risk Assessment
  - Allowable Exposure Based on ARARs
  - Development of Remedial Action Objectives
- 2.2 General Response Actions for Each Medium
  - Areas of Volumes to Which Treatment
  - Containment
  - Technologies
- 2.3 Screening of Technology and Process Option for Each Medium
  - 2.3.1 Description of Technologies
  - 2.3.2 Evaluation of Technologies
  - 2.3.3 Screening of Alternatives
    - Effectiveness
    - Implementability
    - Cost

3.0 Development of Alternatives
- 3.1 Development of Alternatives for Each Medium
- 3.2 Screening of Alternatives
  - 3.2.1 Alternative 1
  - 3.2.2 Alternative 2
  - 3.2.3 Alternative 3

4.0 Detailed Analysis of Alternatives
- 4.1 Description of Evaluation Criteria
  - Short-Term Effectiveness
  - Long-Term Effectiveness and Permanence
  - Implementability
  - Reduction of Mobility, Toxicity, or Volume Through Treatment
  - Compliance with ARARs
  - Overall Protection
  - Cost
  - State Acceptance

Table 5-7
Proposed FS Report Format
Lawrence Aviation Industries Site
Port Jefferson Station, New York

4.2 Individual Analysis of Alternatives
4.2.1 Alternative 1
4.2.2 Alternative 2
4.2.3 Alternative 3
4.3 Summary

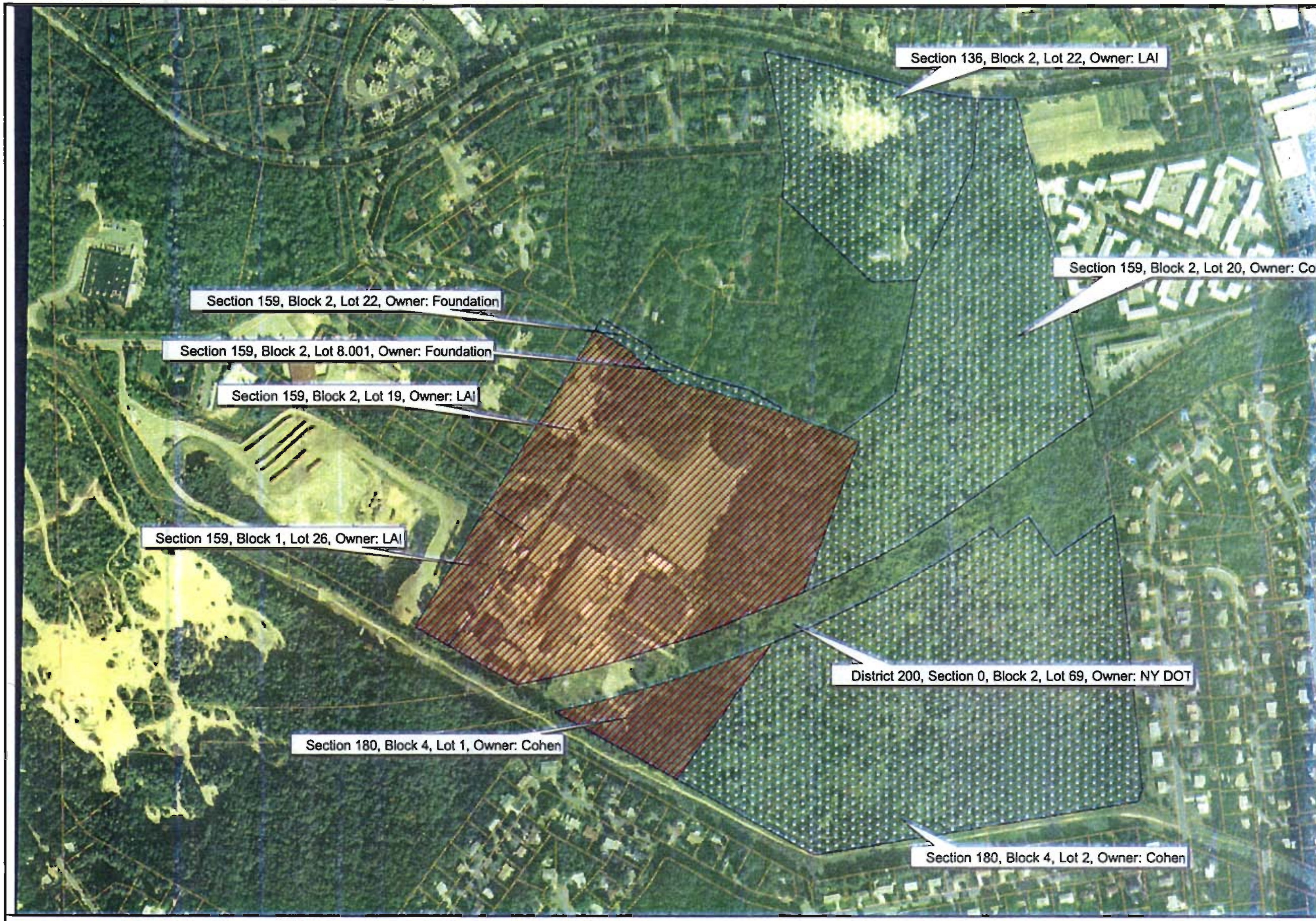
5.0 Comparative Analysis of Alternatives
5.1 Comparison Among Alternatives For Each Medium

CDM

A Subsidiary of Camp Dresser & McKee

Figure 1-1
Site Location Map
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

File Path: h:\projects\3220047 lawrence aviation\gis\epa_lawrence_aviation\lai_cdm.apr



LEGEND
LAI Facility
Outlying Parcel
Port Jefferson Parcels

N

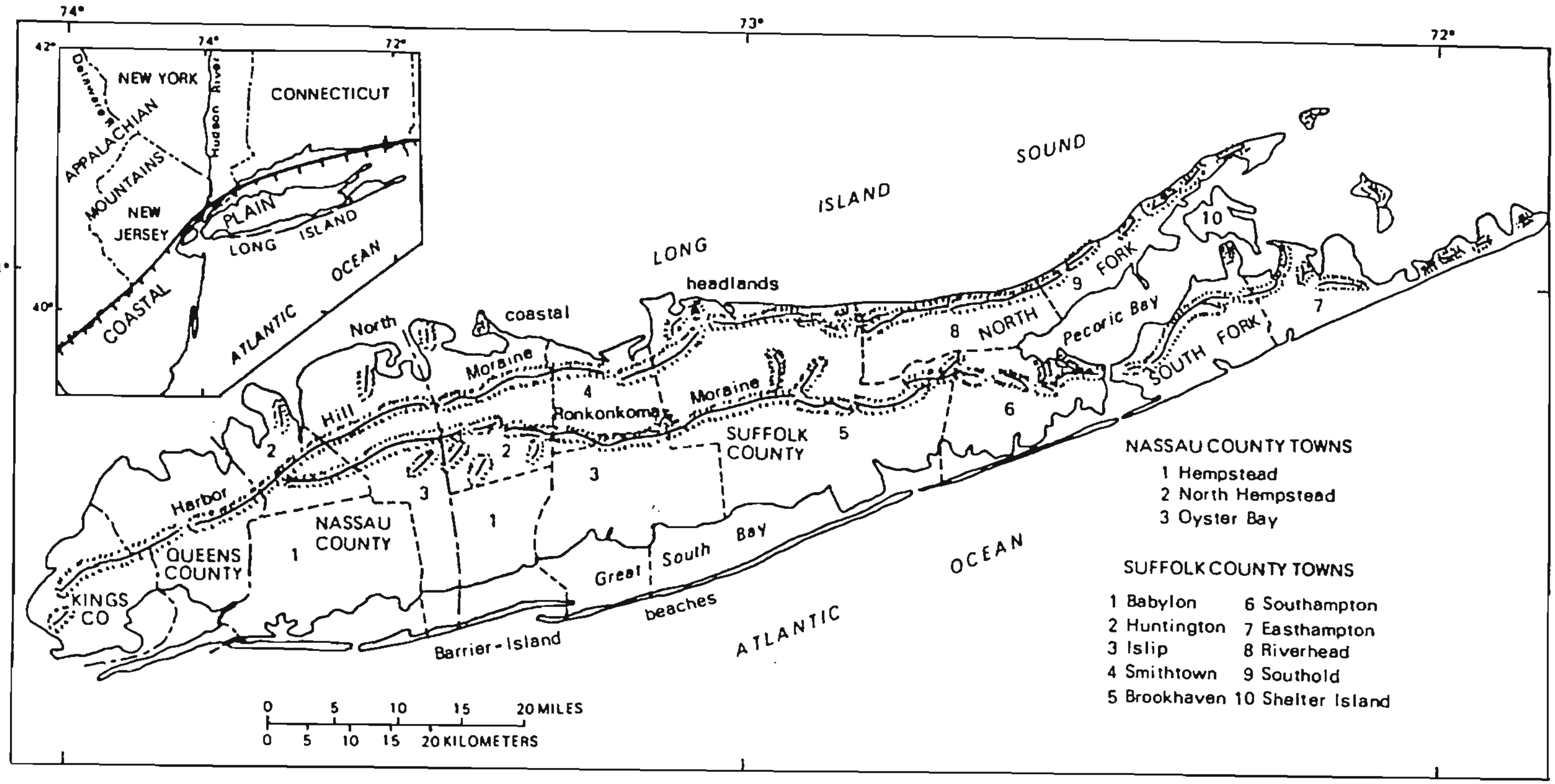
0 400 800 Feet

Data Sources: Parcel boundary information was supplied by Suffolk County, New York. Aerial Photography was originally acquired at a scale of 1:12,000 and scanned at a resolution of 1300 dots per inch (DPI).
Imagery provided to CDM by USEPA, image date 2001.

Projection : UTM, Zone 18 North
Datum: NAD83
Units: Meters

Figure 1-2
Lawrence Aviation Facility and Outlying Parcels
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

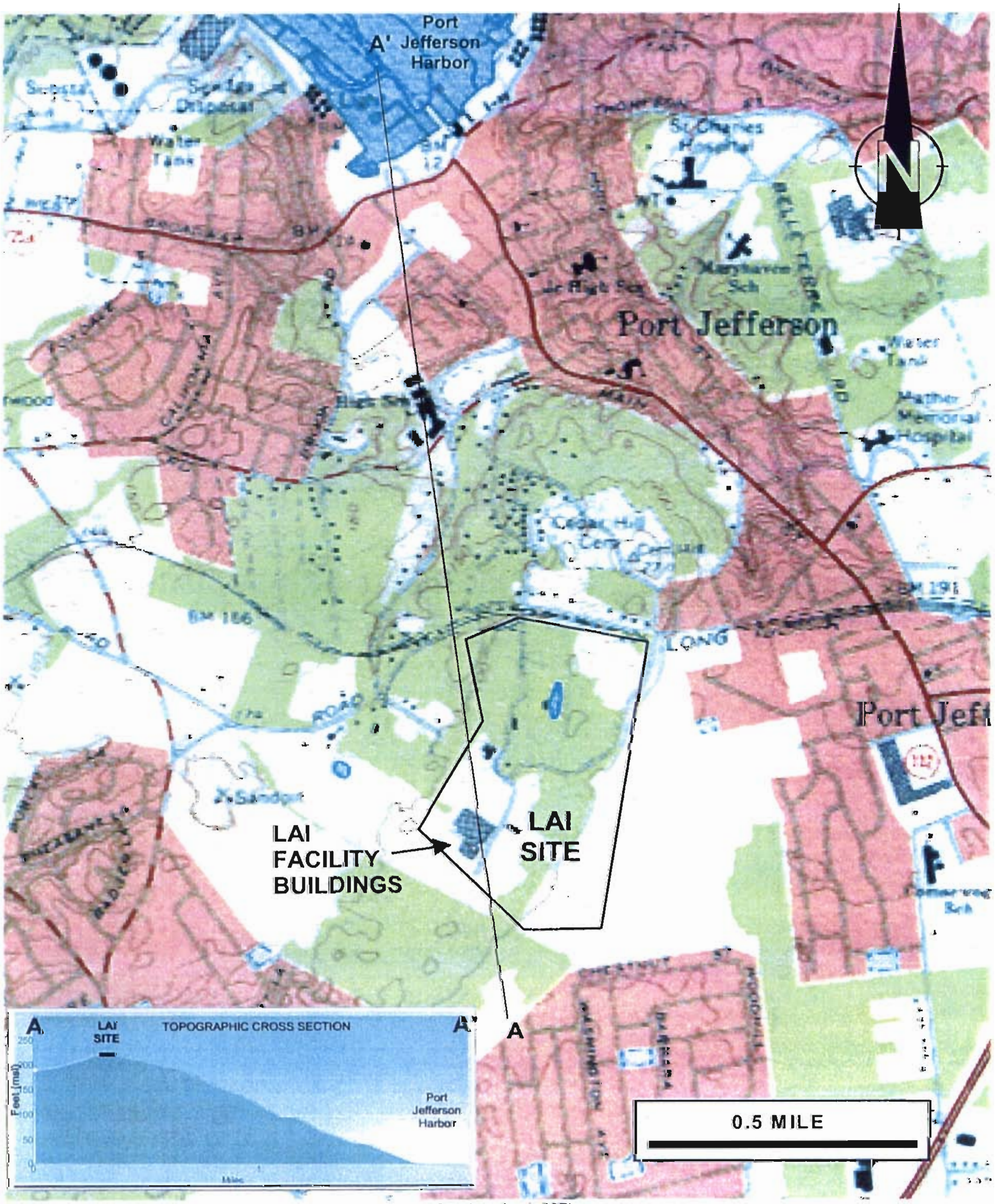


CDM

A Subsidiary of Camp Dresser &McKee

Figure 3-1
Major Physiographic Features of Long Island

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

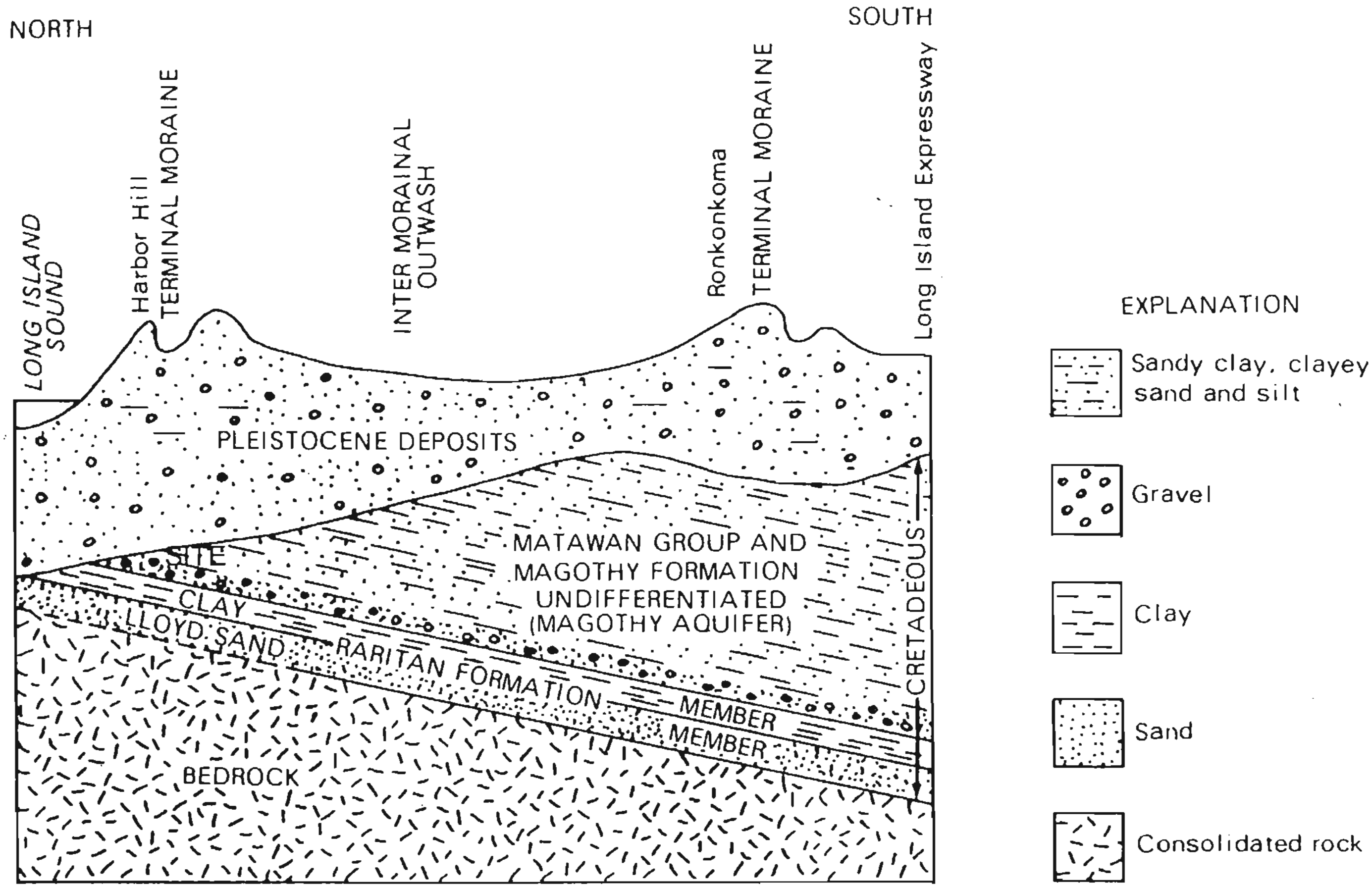


adapted from the USGS Port Jefferson 1:24,000 Topographic Quadrangles (1967)

CDM

A Subsidiary of Camp Dresser & McKee

Figure 3-2
Site Topographic Map
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



(from Cohen et al., 1968)

NOT TO SCALE

Figure 3-3
Generalized Geologic Sections in the Northern Part of the Town of Brookhaven, Suffolk County, Long Island

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A Subsidiary of Camp Dresser & McKee

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

System	Series	Stratigraphic unit	Thickness (feet)	Character of deposits	Water-bearing properties
Quaternary	Recent	Recent deposits Artificial fill, marsh deposits, beach deposits, and surficial soil.	0–20±	Sand, gravel, silt, and clay; organic mud, peat, loam, and shells. Colors are brown, yellow and gray.	Sandy and gravelly beach deposits may locally yield small supplies of fresh to brackish water to wells. Marine silt and clay in north-shore harbors retard salt-water encroachment and confine underlying aquifers.
Quaternary	Pleistocene	Upper Pleistocene deposits.	0–300±	Till composed of unassorted clay, sand, and boulders as ground moraine in area north of Harbor Hill terminal moraine and possibly as buried ground moraine of the Ronkonkoma ice. Outwash deposits of brown well-stratified sand and gravel—predominantly quartzose but containing biotite and other dark minerals and igneous and metamorphic rock fragments—including advance outwash, channel and valley-fill, and outwash-plain deposits. Ice-contact deposits of crudely stratified sand and gravel and isolated masses of till in the Ronkonkoma and Harbor Hill terminal moraines. Glaciolacustrine deposits of brown and gray silt and clay intercalated with outwash deposits in buried valleys.	Till, relatively impermeable; commonly causes perched-water bodies to form locally and impedes recharge from precipitation. Outwash and ice-contact deposits are moderately to highly permeable. Wells screened in outwash deposits generally at depths of less than 230 ft yield as much as 1,700 gpm. Specific capacities of public-supply wells range from 22 to 222 gpm per ft of drawdown. Water is generally fresh and unconfined. Chief source of water for domestic, public-supply, industrial, and irrigation wells in project area. Glaciolacustrine deposits of silt and clay are relatively impermeable and locally retard movement of water between adjacent water-bearing beds in Pleistocene and Cretaceous deposits.
		- - - -Unconformity?- - - -			
Quaternary	Pleistocene	Pleistocene deposits undifferentiated.	0–400±	Sand, gravel, clay, and silt. Lignite present in some silt or clay layers. Colors are brown and gray. These deposits are present in deep buried valleys and may include equivalents of the Gardiners clay and the Jameco gravel found elsewhere on Long Island. This unit may include some Pliocene(?) deposits, but evidence is scanty.	Coarser sand and gravel beds are permeable and would presumably yield moderate to large supplies to properly constructed wells. One well, S16,137, screened in these deposits yields 1,400 gpm, and has a specific capacity of 46 gpm per ft of drawdown. Silt and clay beds confine water in adjacent water-bearing beds.
		- - - -Unconformity?- - - -			
Tertiary(?)	Pliocene(?)	Mannetto gravel	0–300±	Stratified sand and gravel and scattered clay lenses; unit is predominantly quartzose; igneous and metamorphic rock fragments are scarce. Colors are pale to yellowish brown. Caps hills in western part of Huntington and locally present in buried valleys.	Deposits are moderately to highly permeable but generally lie above the zone of saturation. Locally, water supplies for domestic use are obtained from these deposits, such as at wells S4, S208 and S927. No large public-supply or industrial wells were screened in these deposits in 1960.
		- - - - Unconformity - - - -			
Cretaceous	Upper Cretaceous	Magothy(?) formation	0–800±	Sand, clayey, with silt, clay, and some gravel. Colors are white, gray, brown, yellow, and red. The upper part of the formation commonly includes interbedded clay, fine to medium sand, silt, and some lignite; the lower part is largely coarse sand, gravel, and some clay.	Generally ranges from moderately to highly permeable. The lower part of the formation is more permeable than the upper part. Several public-supply wells screened in the basal zone have yields ranging from 1,000 to 1,500 gpm and specific capacities from 30 to 90 gpm per ft of drawdown. Water is generally of excellent quality. Second most important source of water to wells. Unconfined conditions are common in uppermost part of formation, but confined conditions prevail in the lower part; some wells flow.
		- - - - Unconformity - - - -			
Cretaceous	Upper Cretaceous	Raritan formation: Clay member	0(?)–188±	Clay and silt, and a few layers of sand. Lignite and pyrite concretions are common. Colors are mostly gray, white, and red.	Relatively impermeable. Acts as a confining bed, which retards but does not prevent movement of water between the Magothy(?) formation and the Lloyd sand member.
Cretaceous	Upper Cretaceous	Raritan formation: Lloyd sand member	200–265±	Sand, fine to coarse, and gravel, mixed with some clay and some layers of silt and clay. Colors are white to pale yellow.	Moderately permeable. Not extensively developed. Several public-supply and industrial wells yield as much as 250 gpm in northern Huntington, but potential yields from properly constructed wells are much greater. Water is confined and some wells flow. Water is generally of excellent quality, but on Eaton Neck it is brackish.
		- - - - Unconformity - - - -			
Precambrian to lower Paleozoic		Bedrock		Crystalline metamorphic and igneous rocks.	Relatively impermeable. Forms the floor of the ground-water reservoir.

(adapted from Lubke, 1964)

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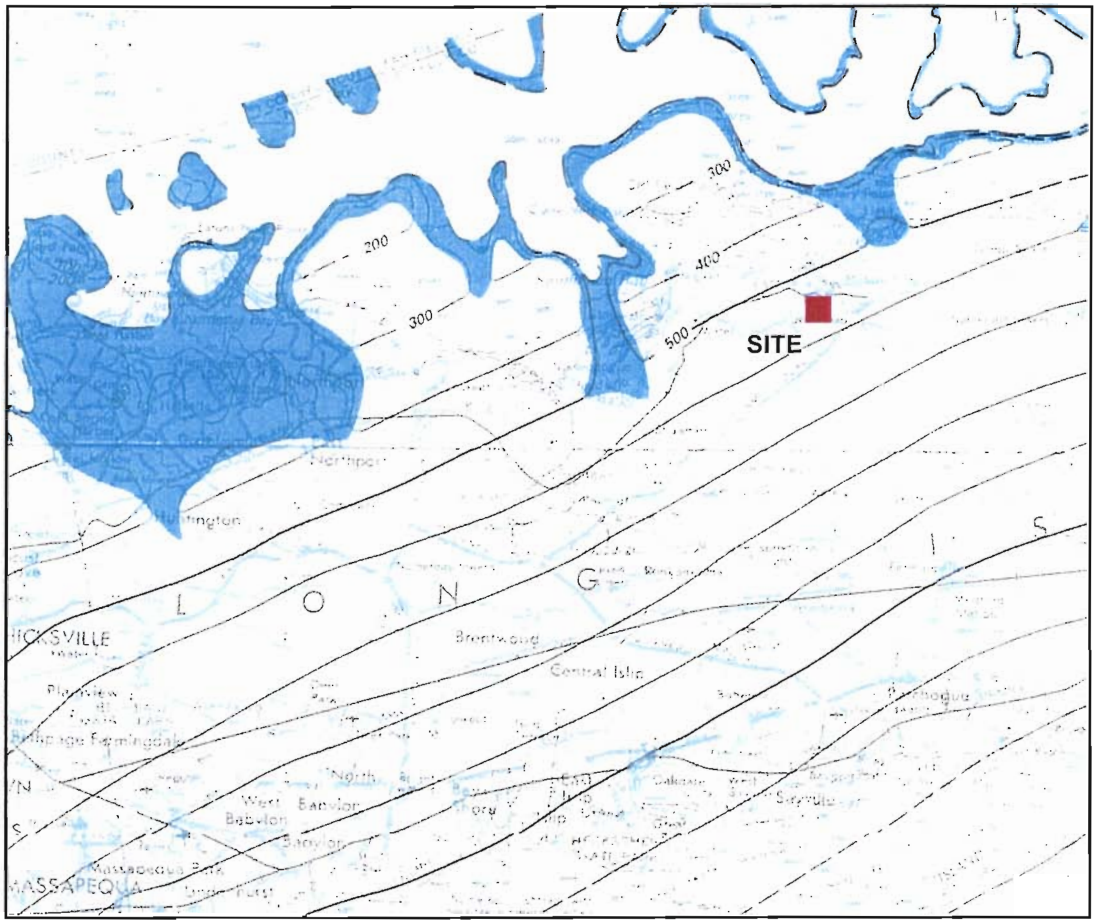
A Subsidiary of Camp Dresser & McKee

Figure 3-4
Generalized Regional Stratigraphy

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



SHADING INDICATES LOCATION OF SUBCROP OF THE RARITAN CONFINING UNIT

UPDIP LIMIT OF THE RARITAN CONFINING UNIT

0 STRUCTURE CONTOUR—Shows the upper surface of the Raritan confining unit. Dashed where approximately located. Contour interval 100 feet. National Geodetic Vertical Datum of 1929

Scale 1:250,000

(from Smolensky, et al. (1989)

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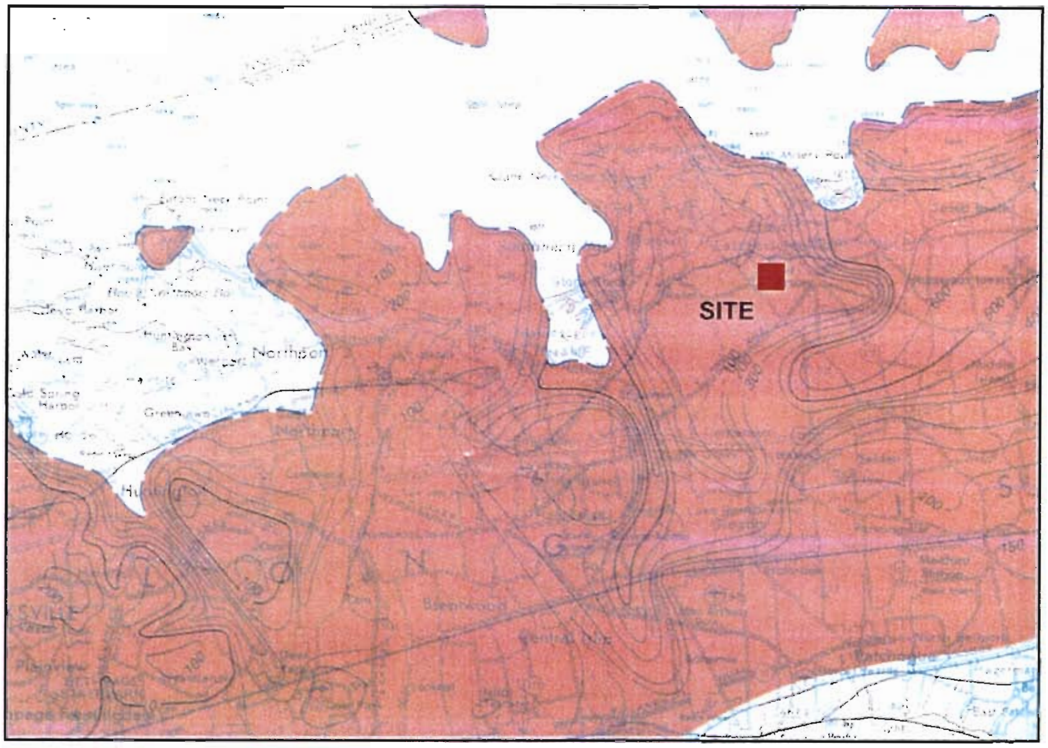
A Subsidiary of Camp Dresser & McKee

Figure 3-5

Subcrop Map of the Top-Raritan Clay Member

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



SHADING INDICATES LOCATION OF SUBCROP OF THE MAGOTHY AQUIFER

UPDIP LIMIT OF THE MAGOTHY AQUIFER

STRUCTURE CONTOUR—Shows the upper surface of the Magothy aquifer. Dashed where approximately located. Contour interval 50 and 100 feet. National Geodetic Vertical Datum of 1929

Scale 1:250,000

(from Smolensky, et al. (1989)

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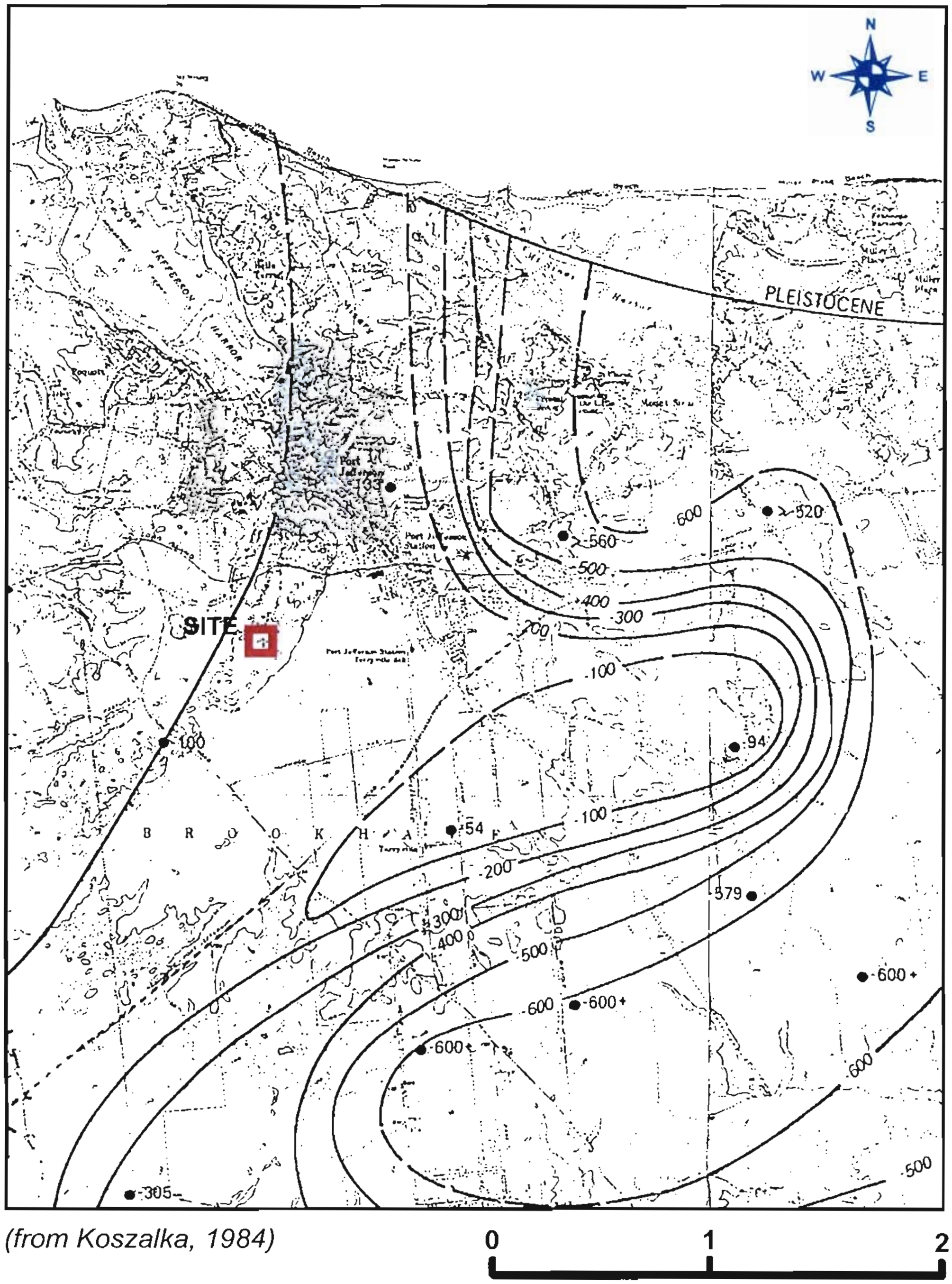
Figure 3-6
Elevation of the Top-Magothy Aquifer
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



(from Koszalka, 1984)

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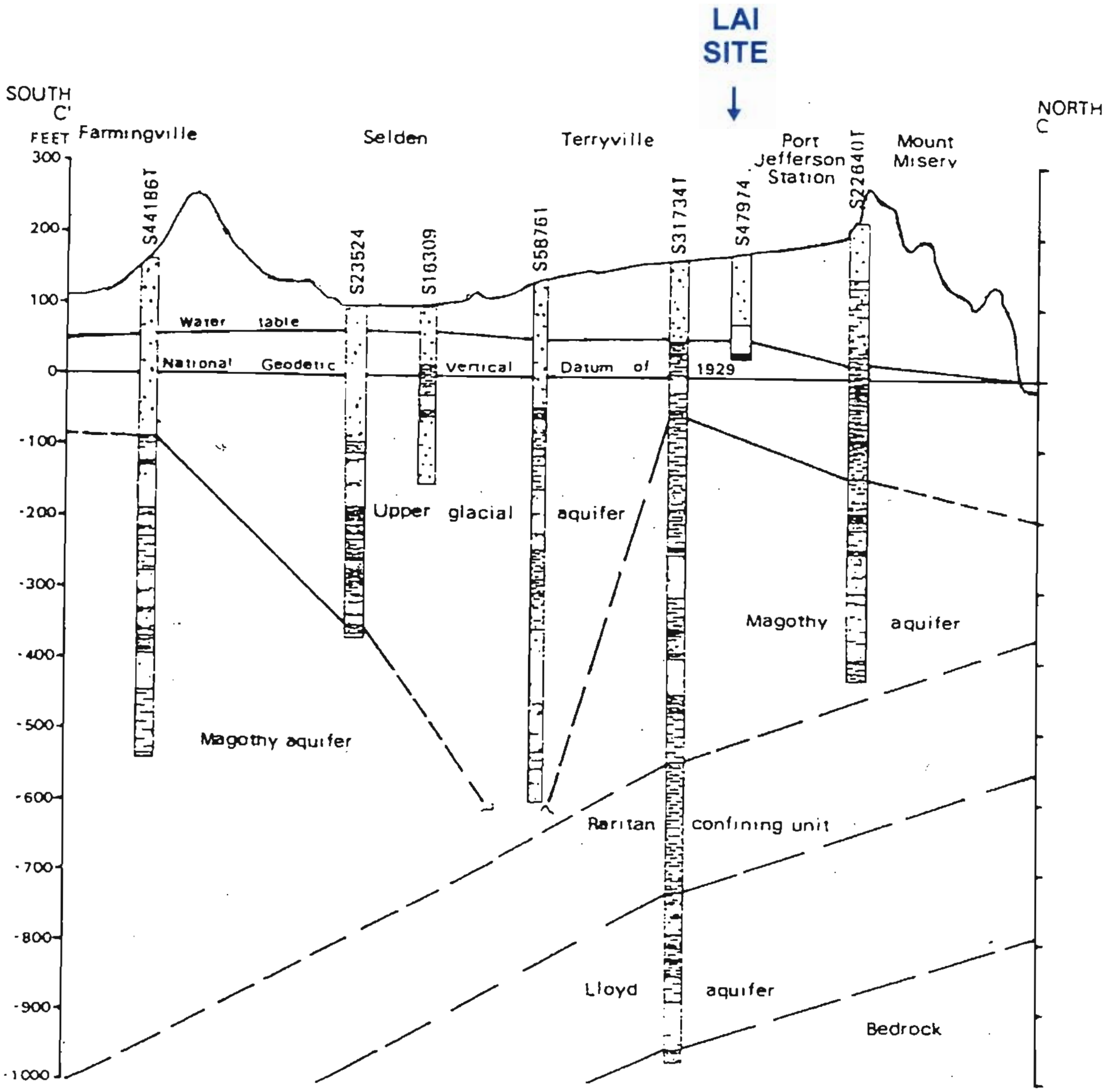
Figure 3-7
Altitude of Top-Magothy Formation in the Vicinity of the LAI Site
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



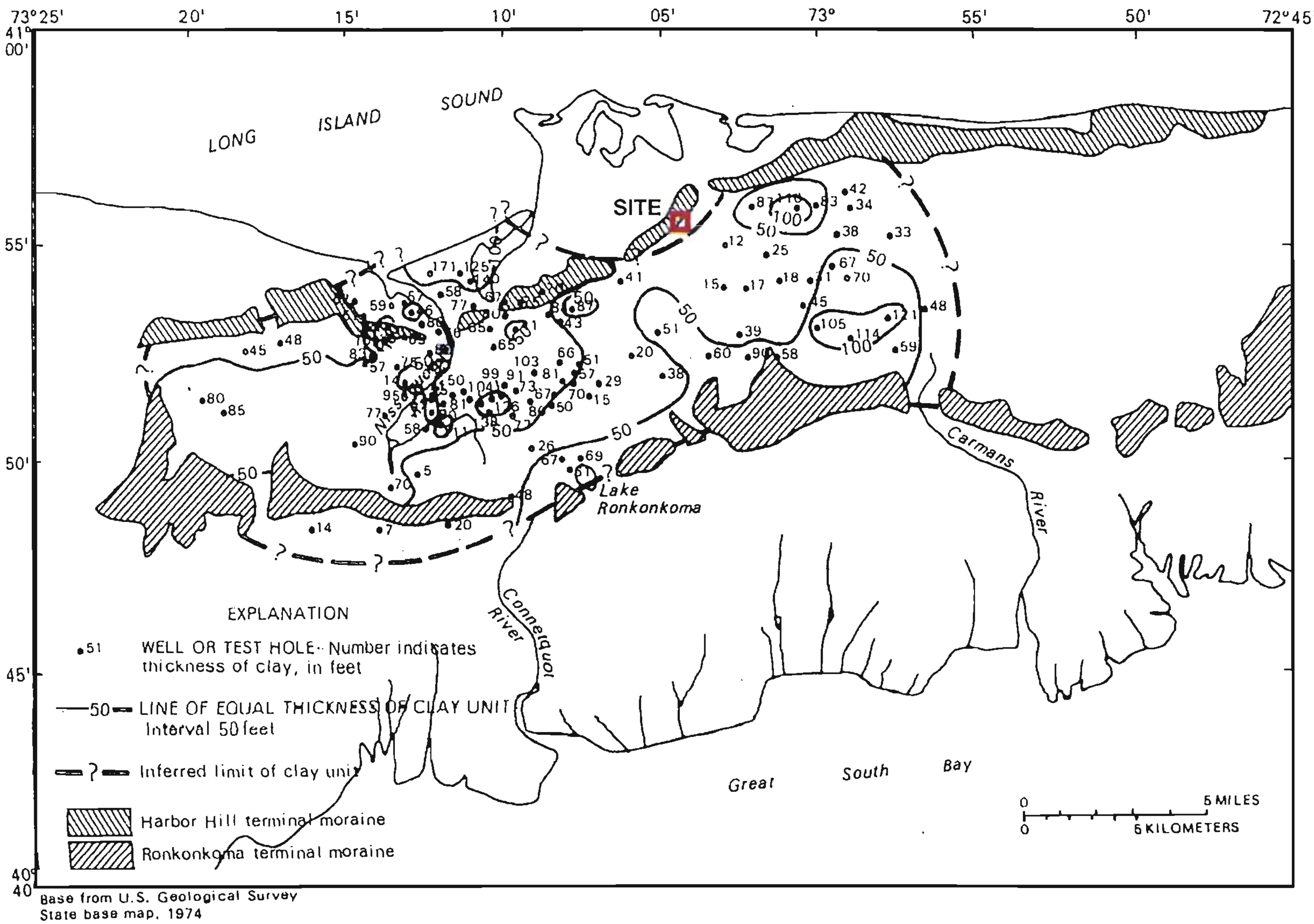
(from Koszalka, 1984)

CDM

A Subsidiary of Camp Dresser & McKee

Figure 3-8
Hydrogeologic Cross-Section across Northern Part of the Town of Brookhaven

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



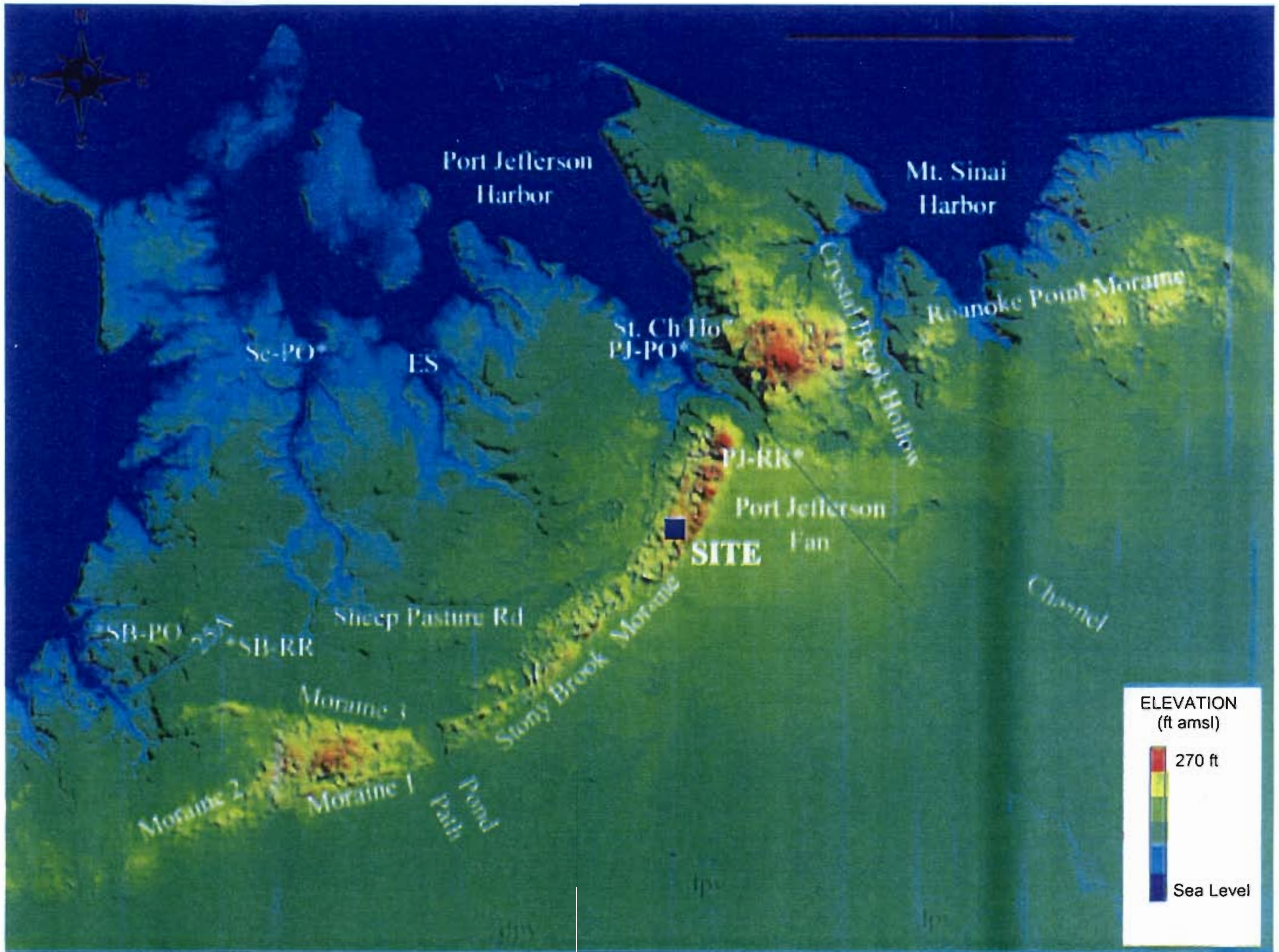
(from Koszalka, 1984)

CDM

A Subsidiary of Camp Dresser &McKee

Figure 3-9
Thickness of Smithtown Clay Unit, West Suffolk County, New York

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



from Hanson (2000)

dpv - Dendritic Periglacial Valley

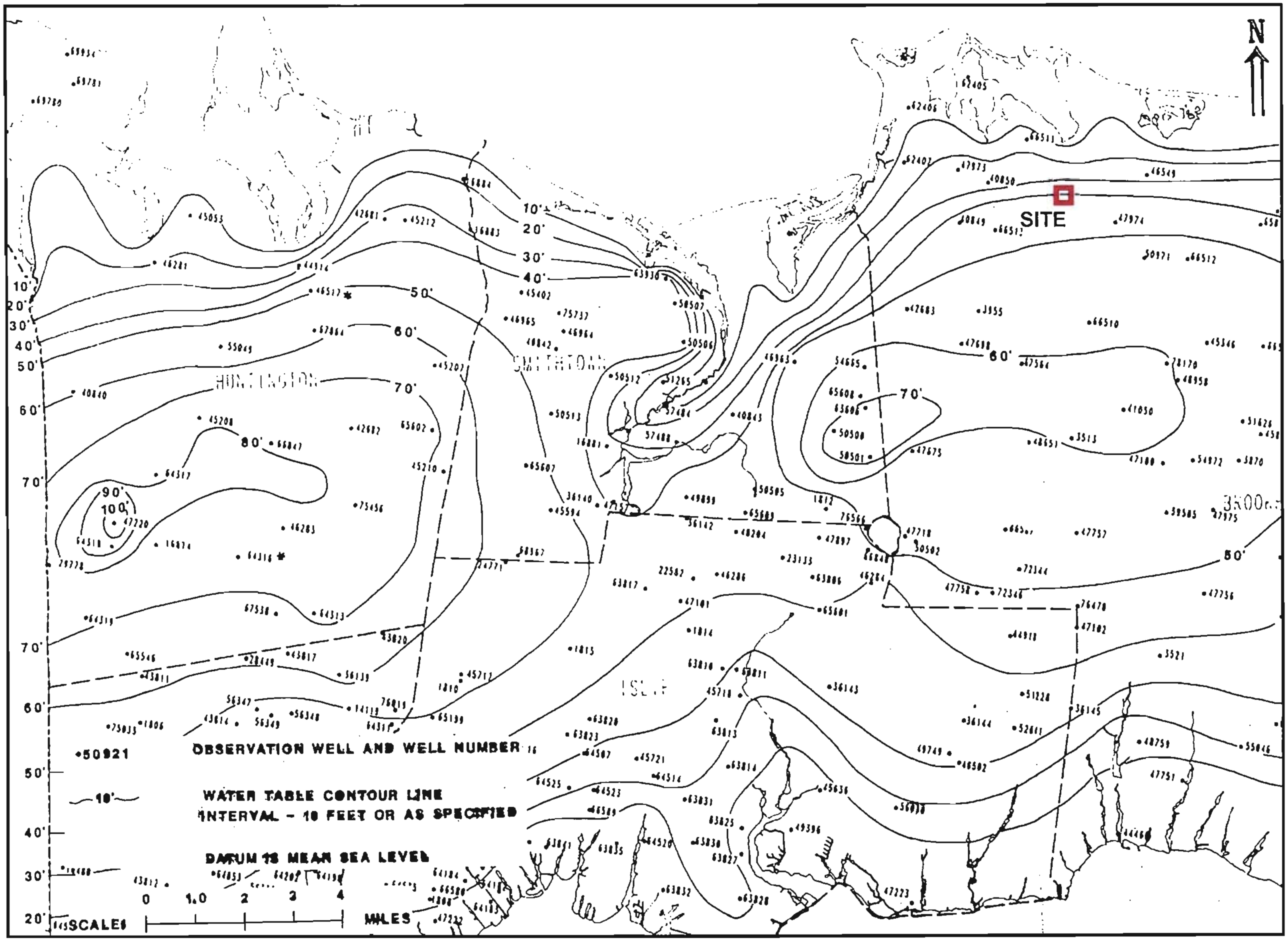
(see text for explanation)

CDM

A Subsidiary of Camp Dresser &McKee

Figure 3-10
Digital Elevation Model (DEM) of Northwest Suffolk County, New York

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

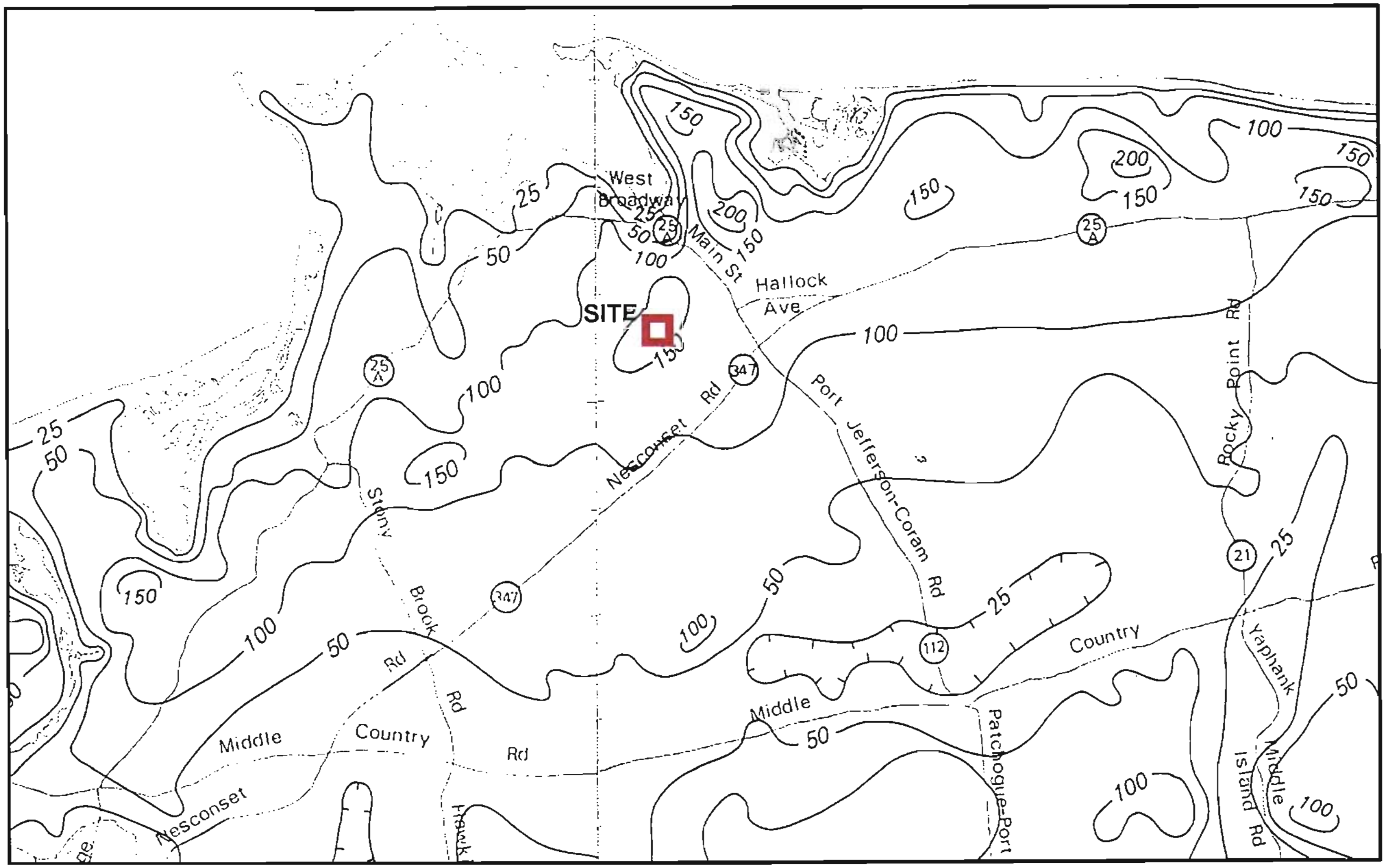


from Simmons (1988)

CDM

A Subsidiary of Camp Dresser &McKee

Figure 3-11
Watertable Elevation Contour Map
West Suffolk County, New York
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



EXPLANATION

—100 ┬┬┬┬ LINE OF EQUAL DEPTH TO WATER-- Contour interval 50 feet; 25-foot contour line included. Hachures indicate depression

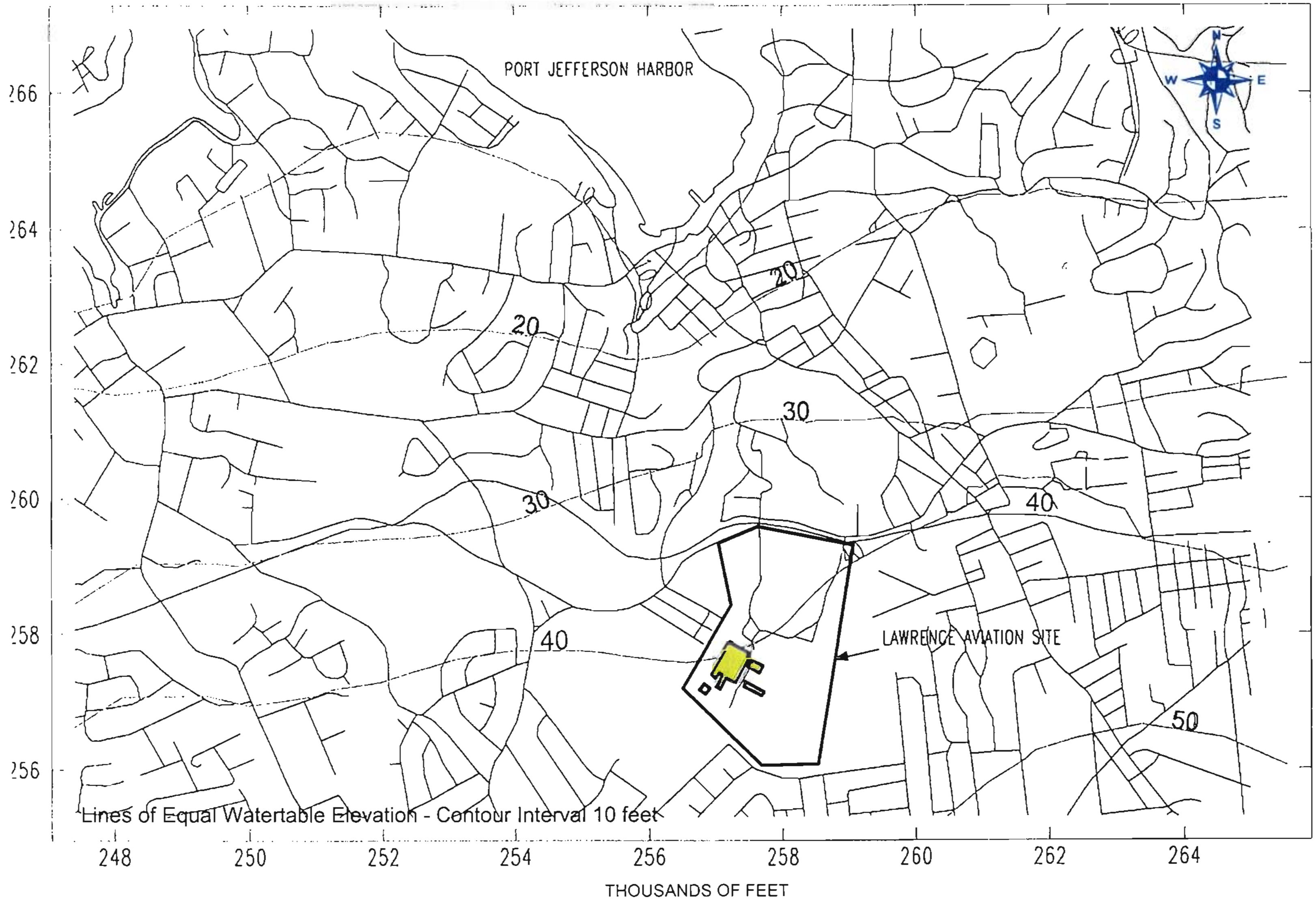
0 1 2 3 MILES
0 1 2 3 4 5 KILOMETERS

from Simmons (1988)

CDM

A Subsidiary of Camp Dresser &McKee

Figure 3-12
Depth to Watertable Contour Map
NW Suffolk County, New York
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

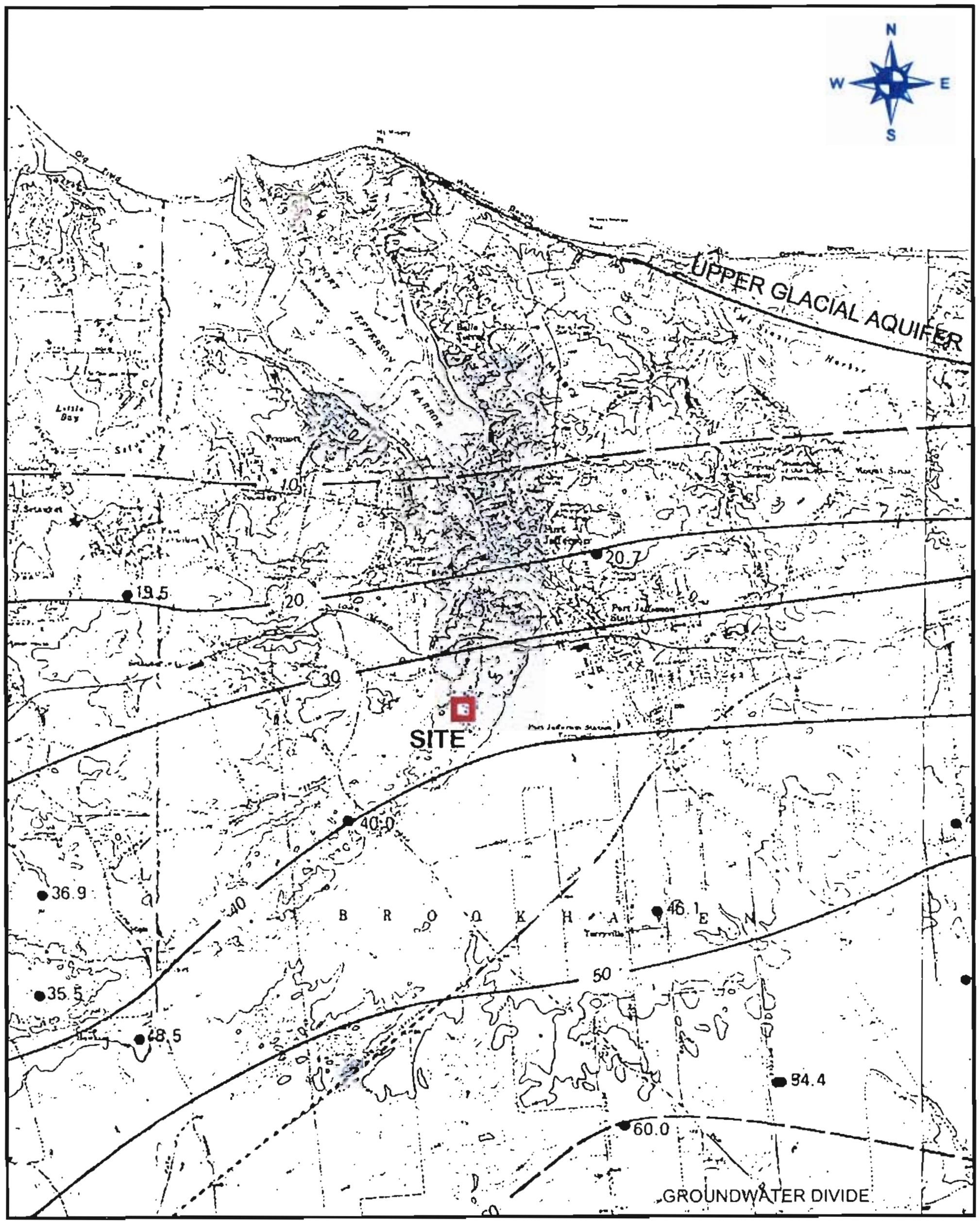


(from CDM, 2000)

CDM

A Subsidiary of Camp Dresser &McKee

Figure 3-13
Simulated Watertable Elevation Contour Map
NW Suffolk County, New York
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



EXPLANATION

—— 60 — — POTENTIOMETRIC CONTOUR-- Shows altitude of water level in tightly cased wells. Dashed where inferred. Contour interval 10 feet. Datum is sea level

●47.2 OBSERVATION WELL-- Number is water-level altitude, in feet above sea level

UPPER GLACIAL AQUIFER Northern Boundary of Magothy Aquifer

0 1 2

MILES

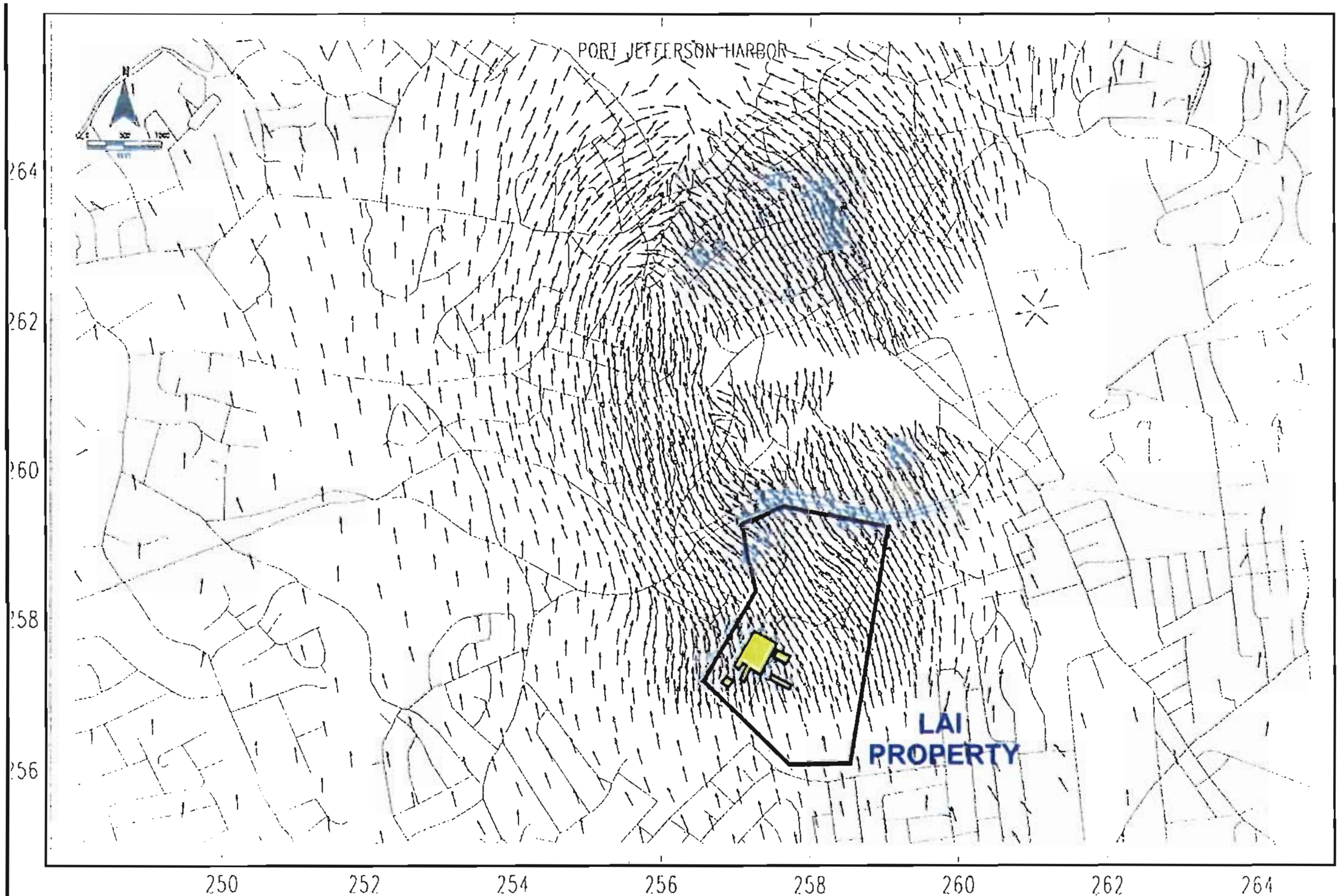
(from Koszalka, 1984)

CDM

A Subsidiary of Camp Dresser & McKee

Figure 3-14
Altitude of Magothy Potentiometric Surface

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York



(from CDM, 2000)

Note: Areas where flow vectors are lacking indicate areas where the simulated groundwater surface dips below the bottom of the Upper Glacial deposits

CDM

A Subsidiary of Camp Dresser &McKee

Figure 3-15
Simulated Flow Vectors of the Upper Glacial Aquifer
NW Suffolk County, New York

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

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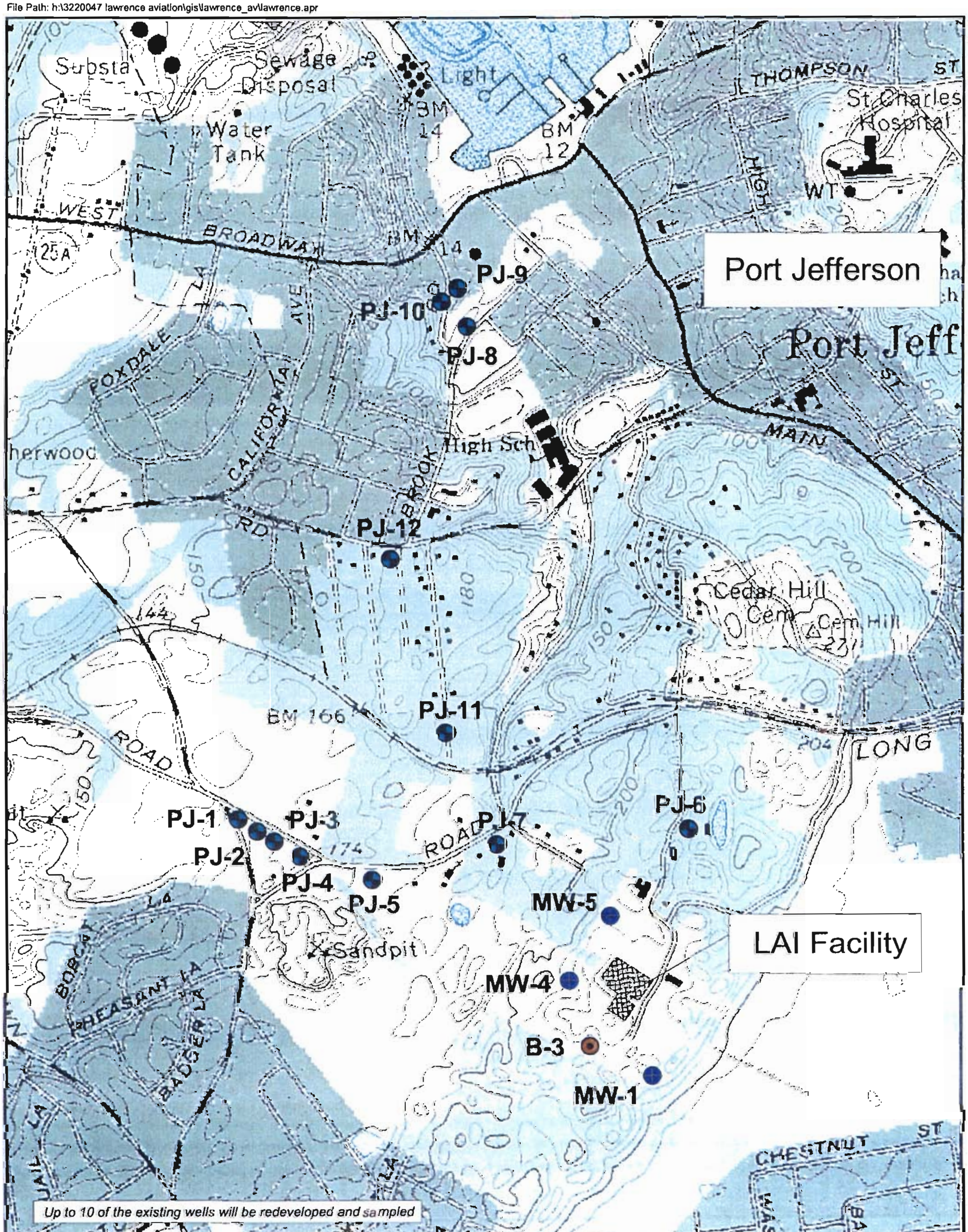

LEGEND

- Soil Boring
- NYSDEC Monitoring Wells
- PJ Monitoring Wells

N

0 700 1400 Feet

Figure 3-16
Existing Monitoring Well and Soil Boring Locations
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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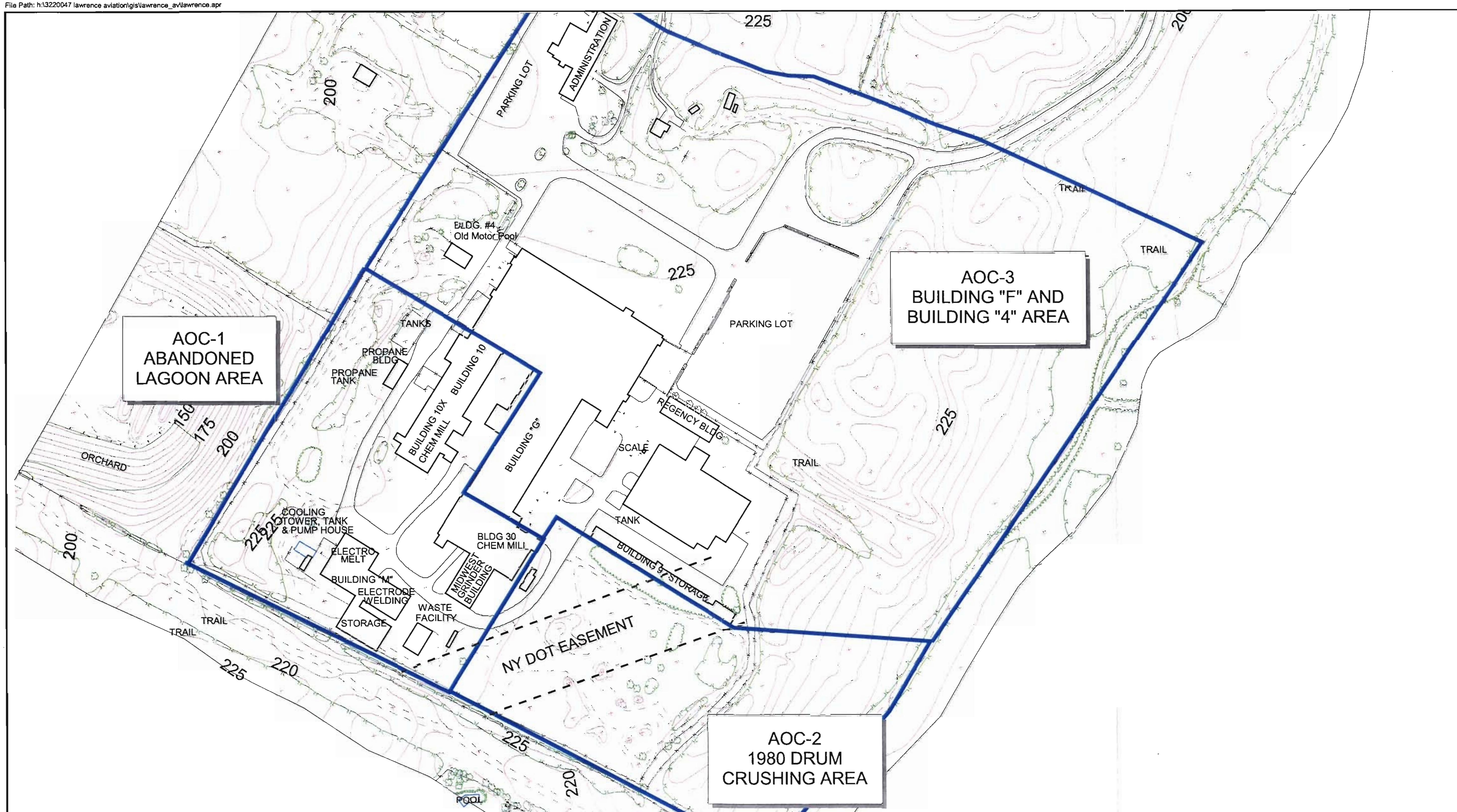
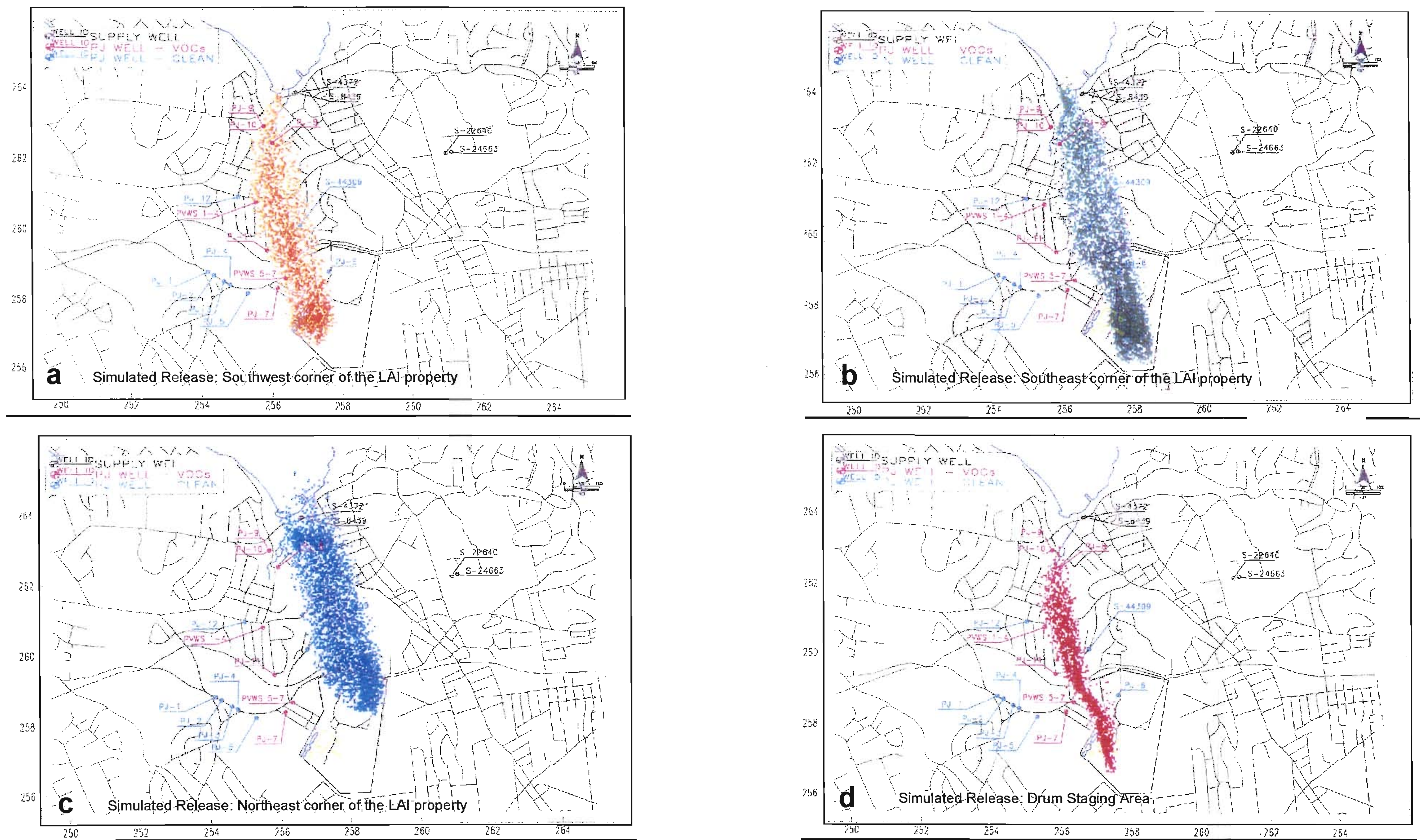


Figure 3-17
Site Plan with Areas of Concern
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Sulfolk County, New York

CDM

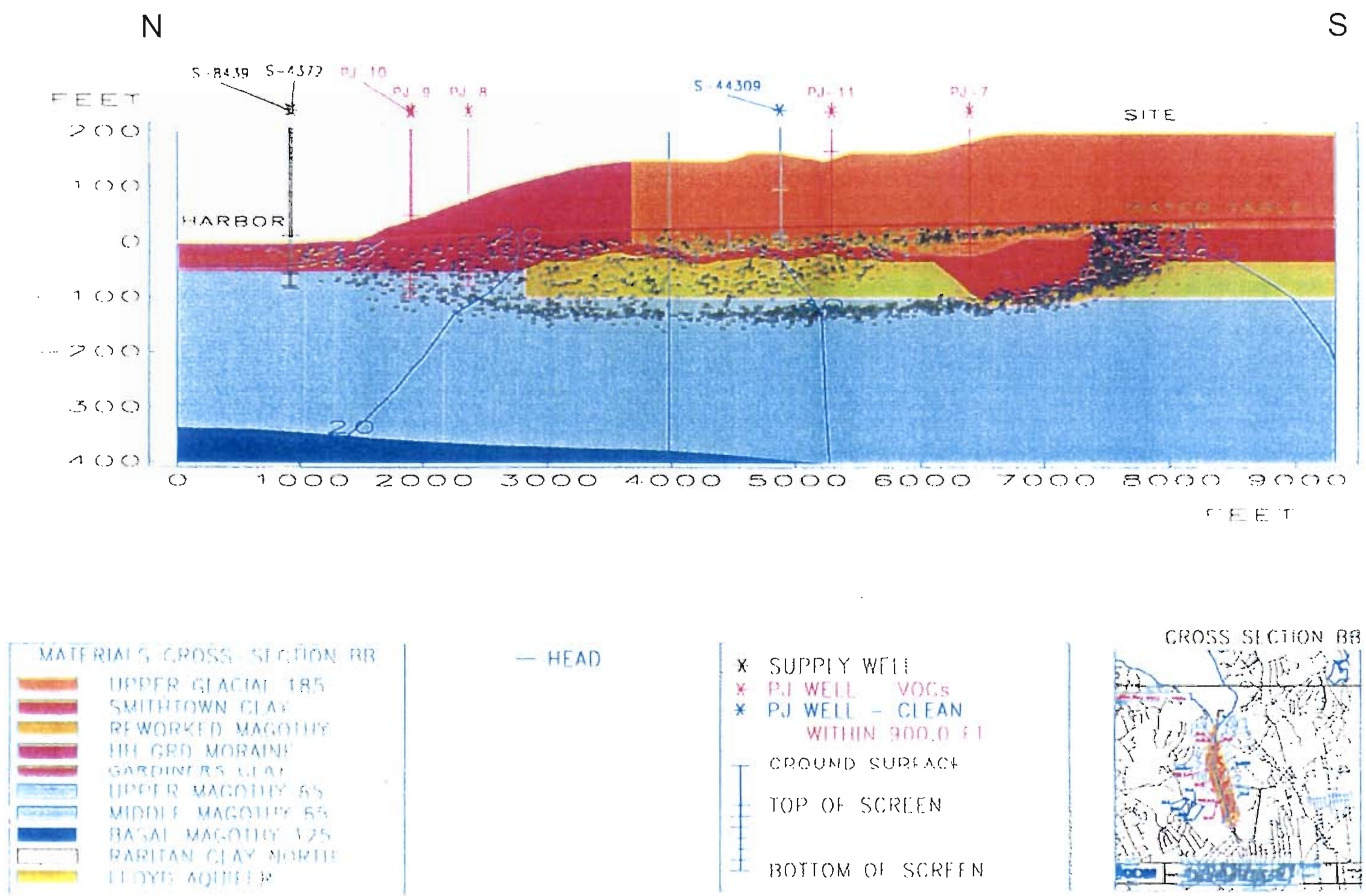


from CDM (2000)

Figure 3-18
Simulated Particle Backtracks for Groundwater Contamination Observed in Downgradient Wells Potentially Originating from Four Hydraulically Upgradient Source Locations on the LAI Property (for the period 1963 through 1996)

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM
A Subsidiary of Camp Dresser & McKee



(from CDM, 2000)

CDM

A Subsidiary of Camp Dresser &McKee

Figure 3-19
North-South Cross Section Simulating Groundwater Contaminant Plume Migration originating from the southwest corner of the LAI property

Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

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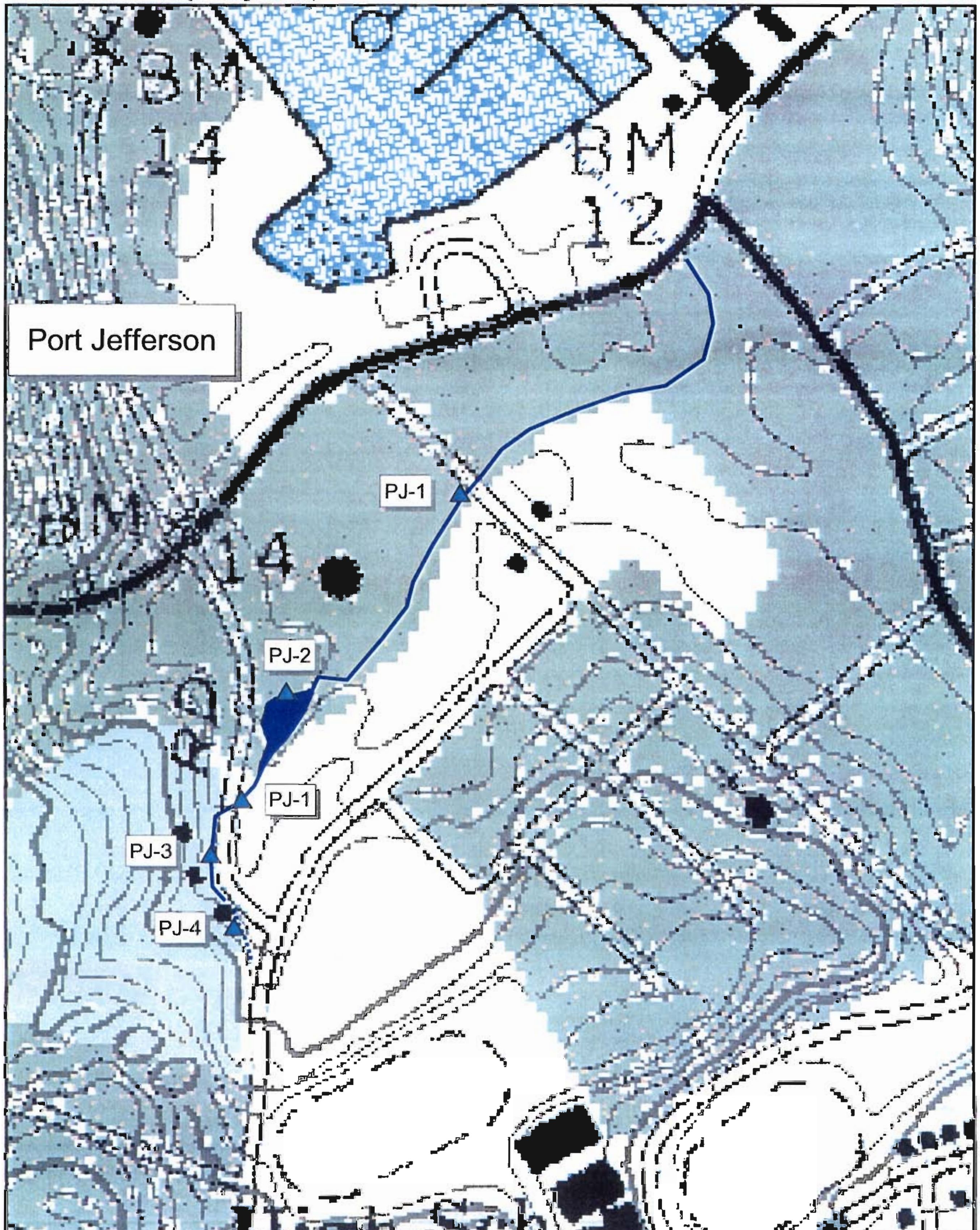


LEGEND

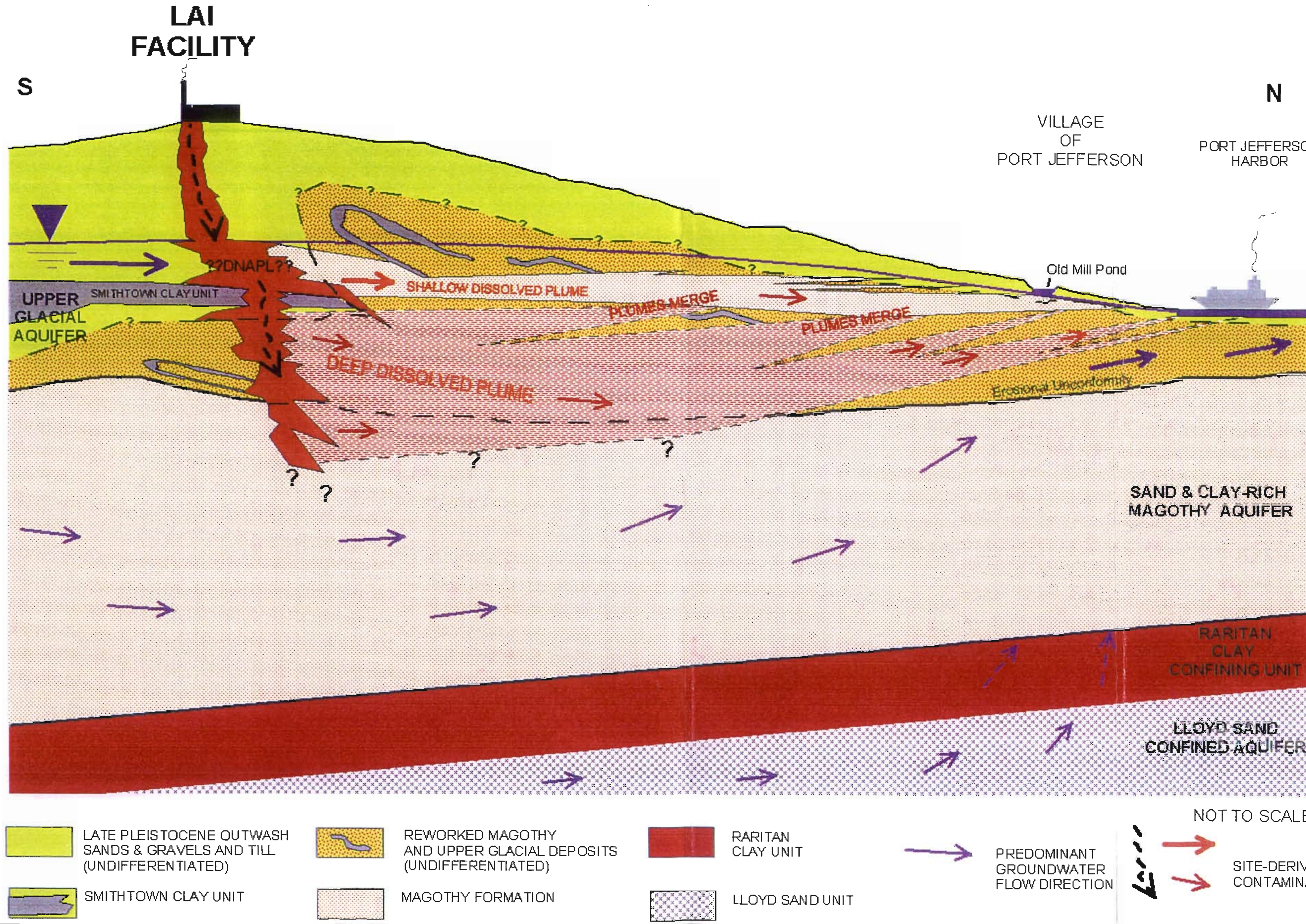
▲ 1991 Suface Water Sampling Locations
Note: in historical data from 1991 two locations were designated at PJ-1 as shown on this figure.

N

0 100 200 Feet

Figure 3-20
1991 Surface Water Sampling Locations
Remedial Investigtion/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM



CDM

Figure 3-21
Conceptual Site Model
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

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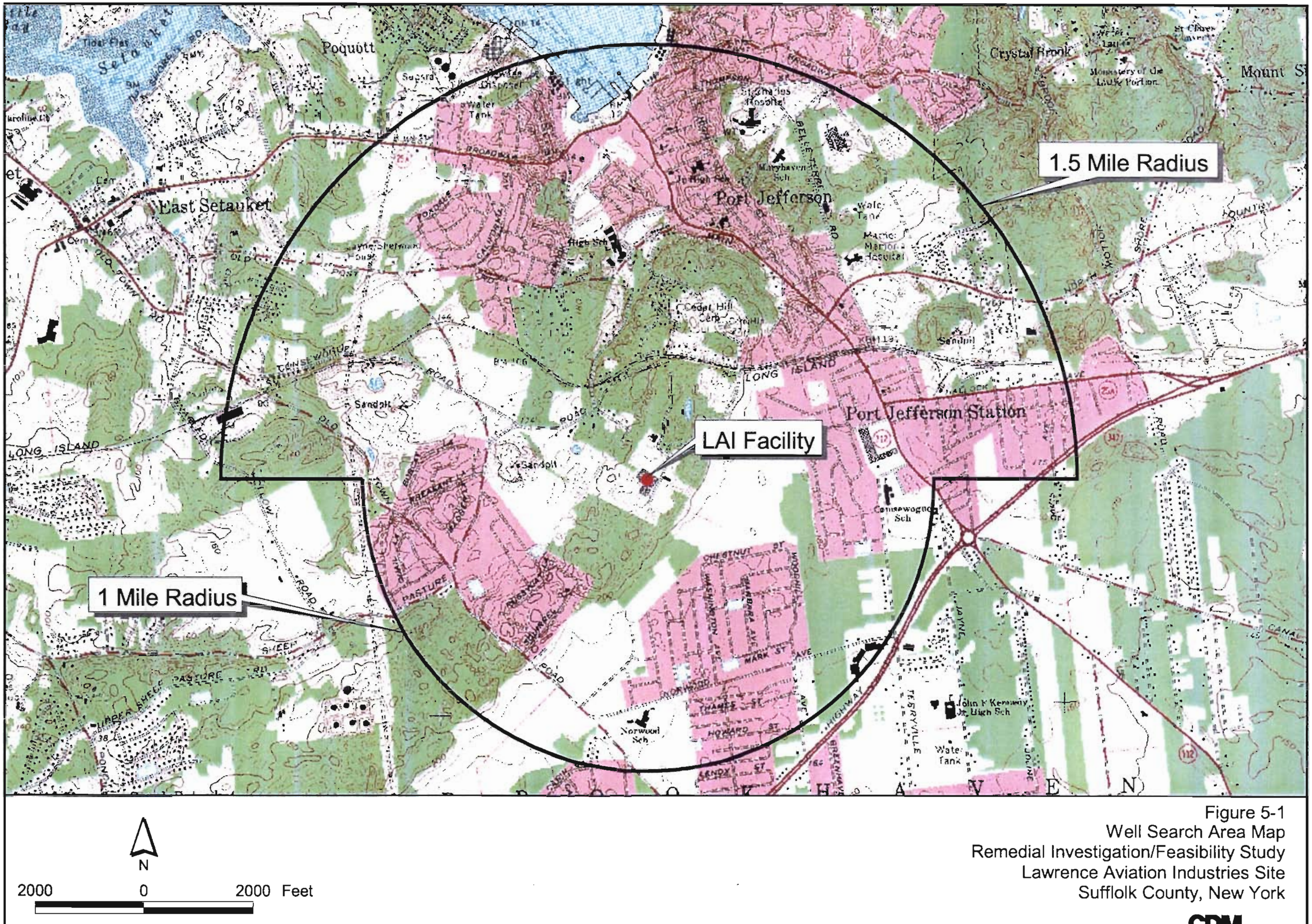

Figure 5-1
Well Search Area Map
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Sufflolk County, New York

CDM

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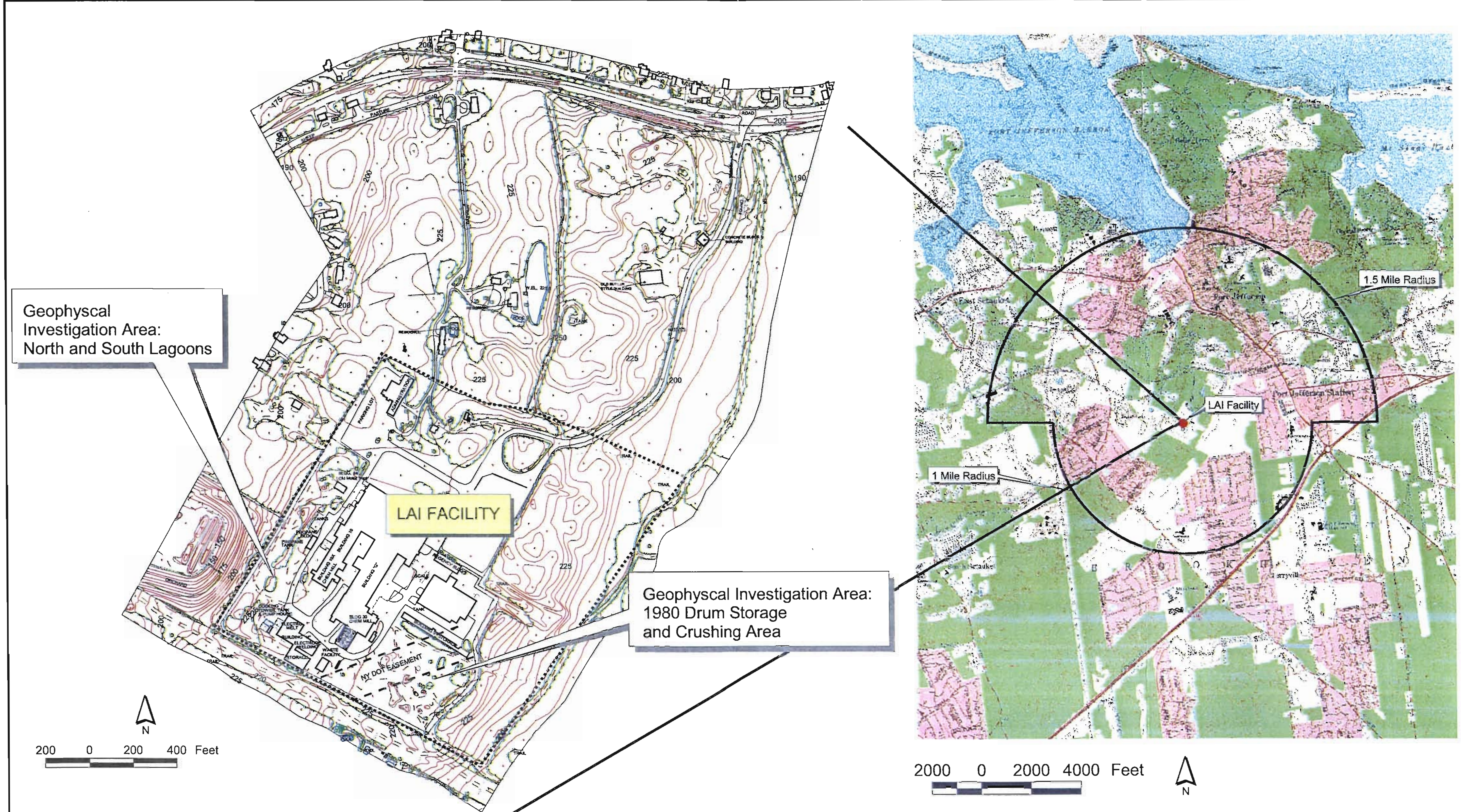

Figure 5-2
Topographic and Geophysical Survey Areas
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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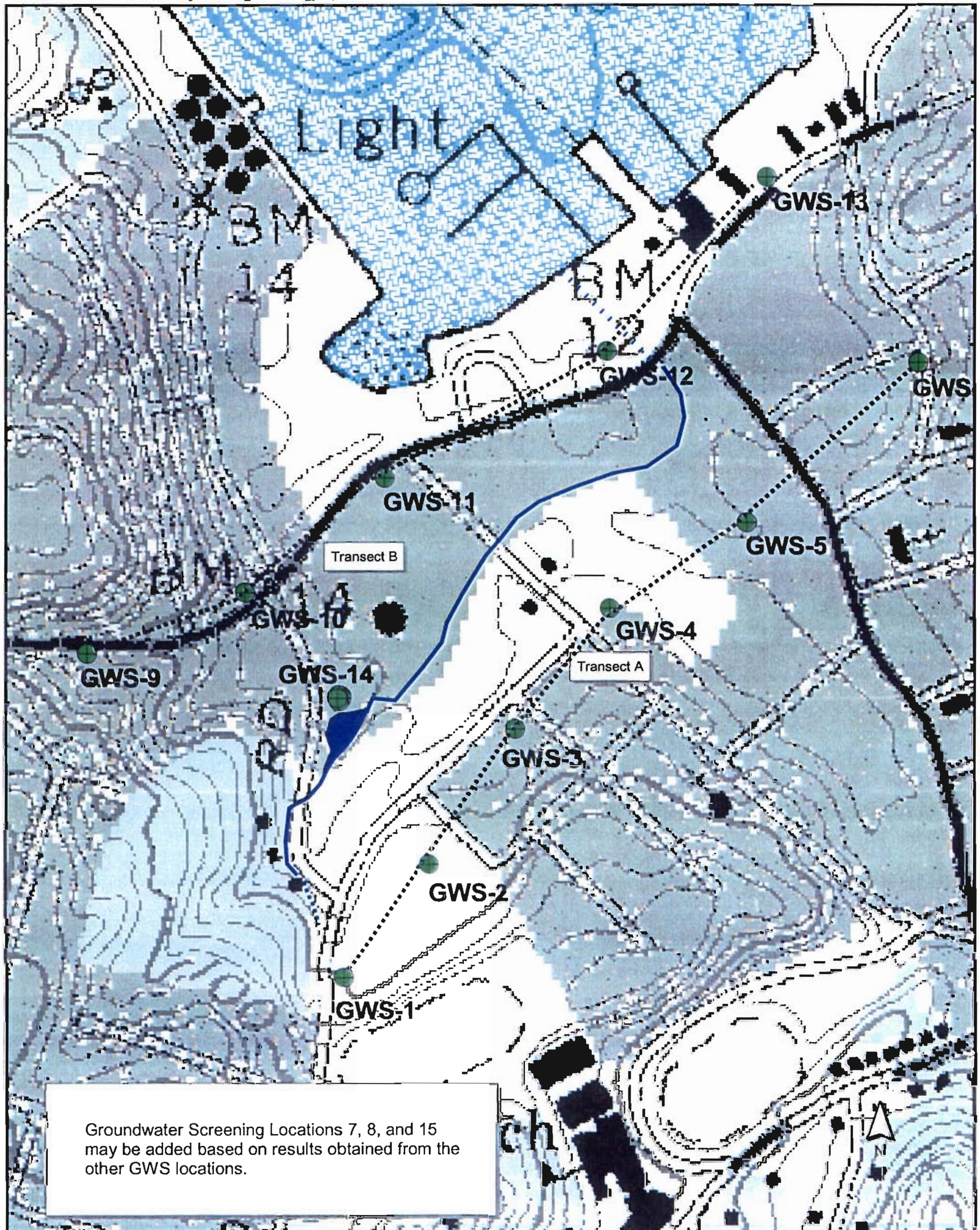

LEGEND
- MIP Groundwater Screening Locations
- Old Mill Pond
- Old Mill Creek
- Creek - Upstream of Pond
- Old Mill Creek, culvert under 25A

400 0 400 Feet

Figure 5-3
MIP Groundwater Sampling Locations
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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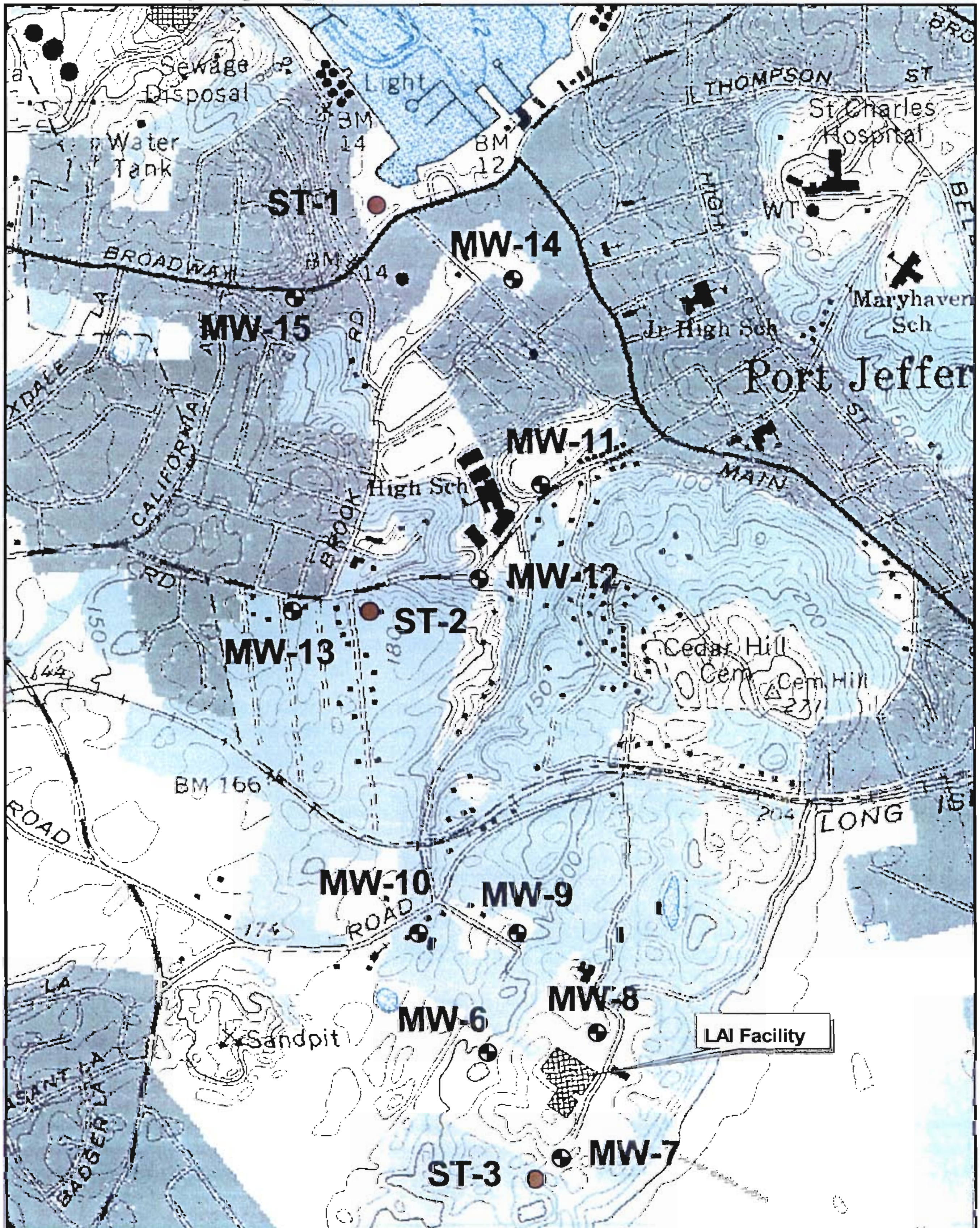

LEGEND

Proposed Monitoring Wells

Stratigraphic Soil Borings

N

1000 0 1000 Feet

Figure 5-4
Proposed Stratigraphic Soil Borings and Monitoring Wells
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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Note:
Five additional deep soil screening locations may be located based on data collected during the screening investigation

LEGEND

- Area of Concern
- Deep Soil Screening Location
- Shallow Soil Screening Location

Figure 5-5
Soil Screening Locations
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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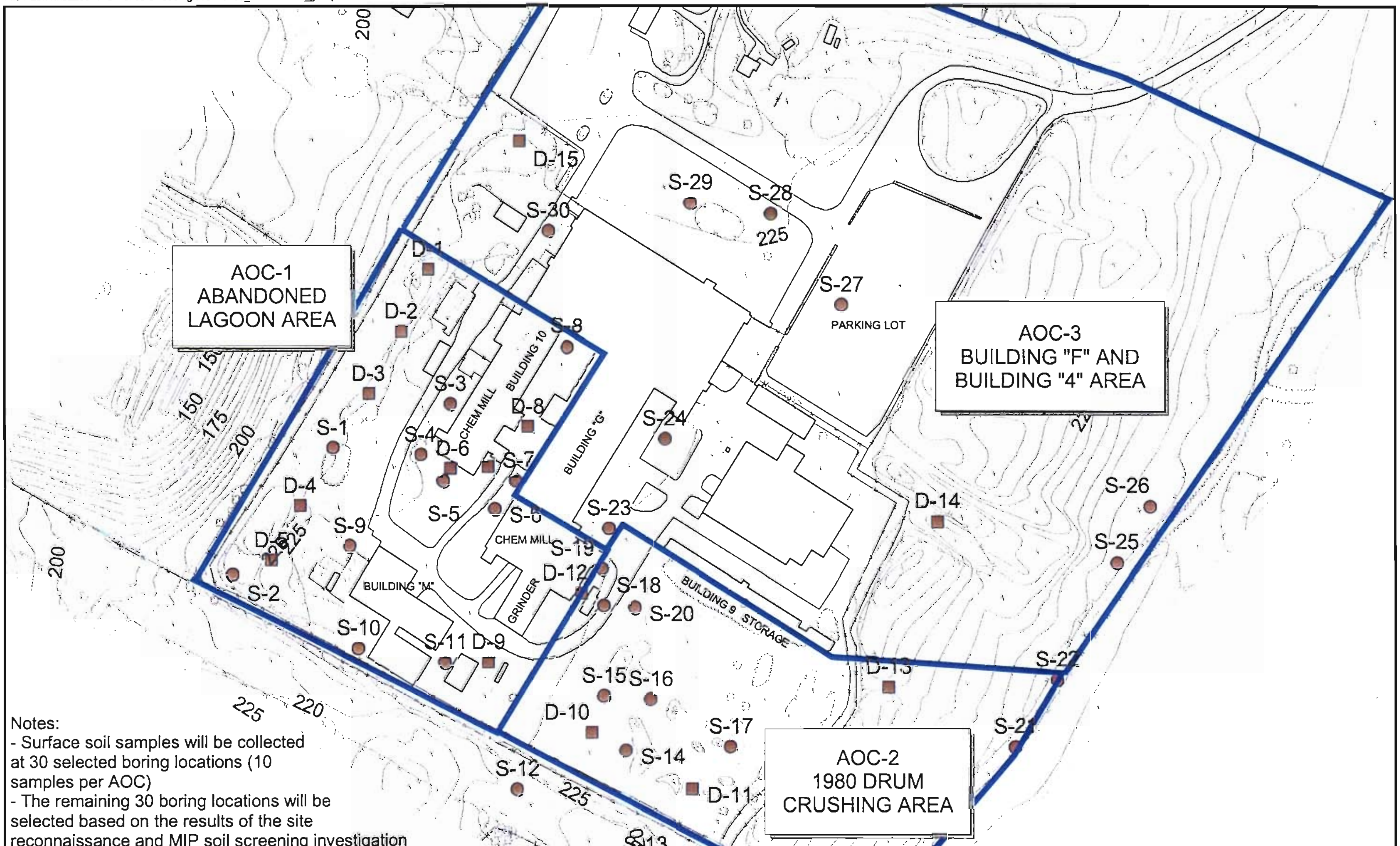

Notes:
- Surface soil samples will be collected at 30 selected boring locations (10 samples per AOC)
- The remaining 30 boring locations will be selected based on the results of the site reconnaissance and MIP soil screening investigation

LEGEND
- Deep Soil Boring
- Shallow Soil Boring
- Area of Concern

N

0 200 400 Feet

Figure 5-6
On-Site Soil Boring Locations
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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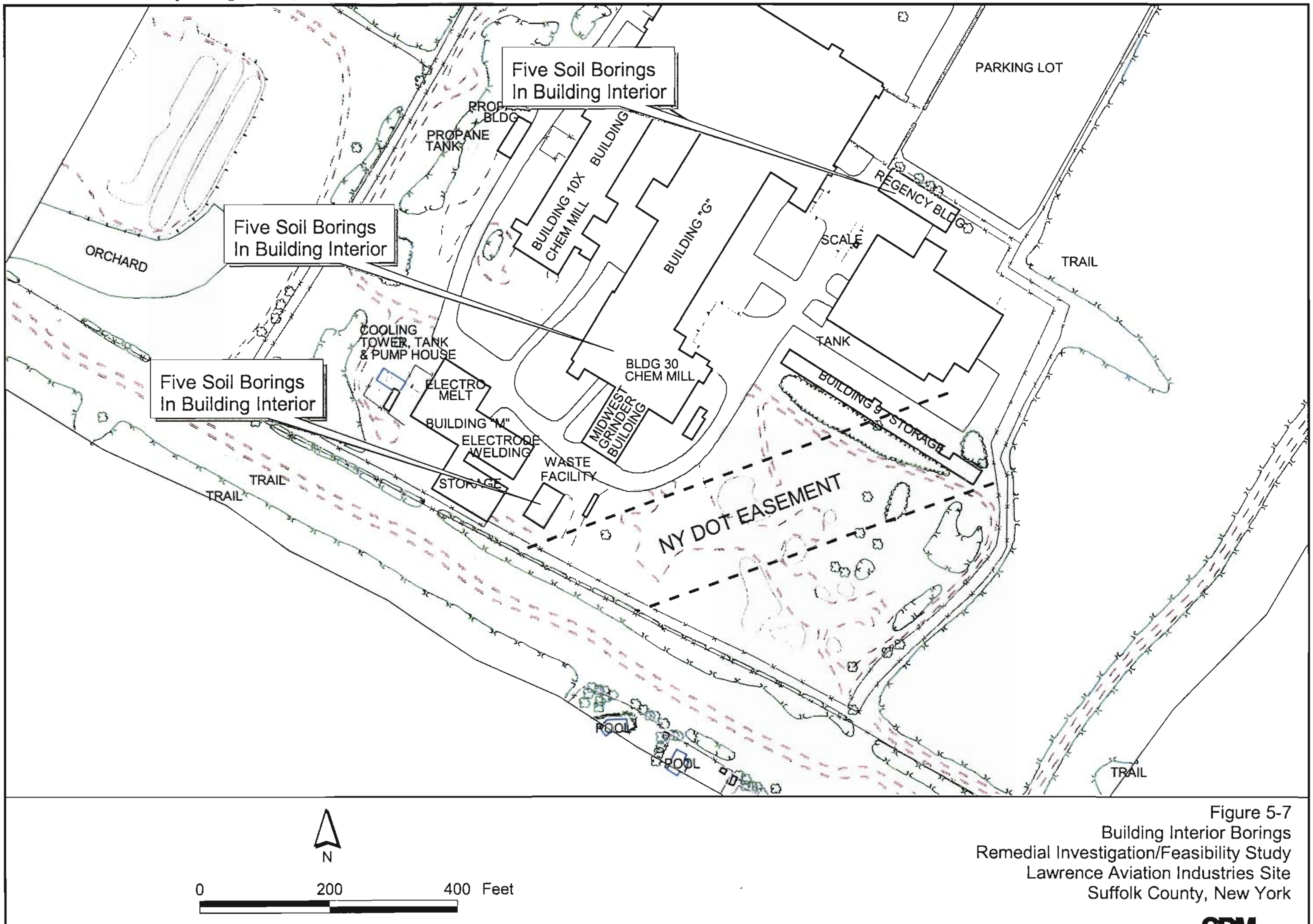

Figure 5-7
Building Interior Borings
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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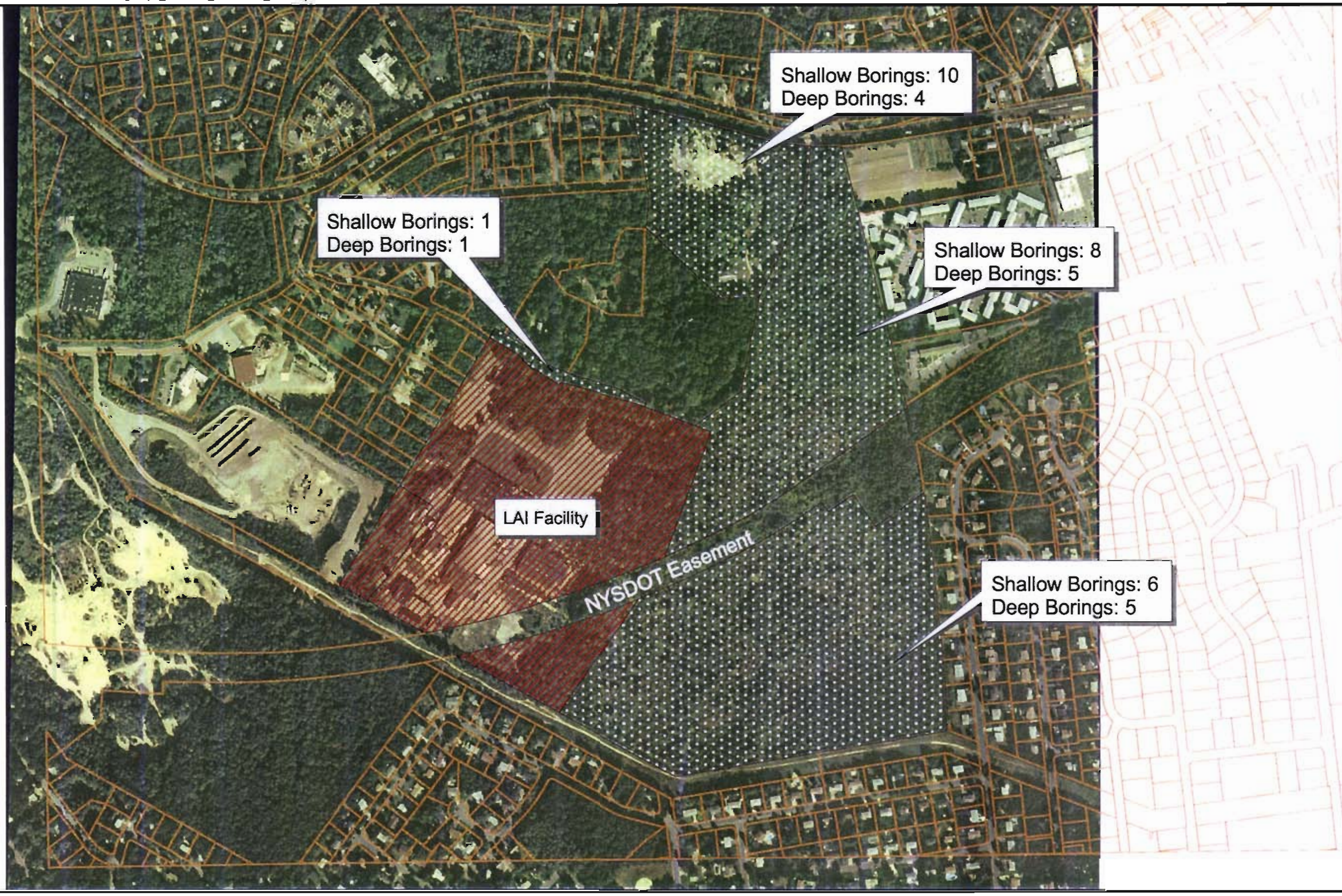

LEGEND

- LAI Facility
- Outlying Parcels
- Port Jefferson Parcels

N

0 300 600 Feet

Data Sources: Parcel boundary information was supplied by Suffolk County, New York. Aerial Photography was originally acquired at a scale of 1:12,000 and scanned at a resolution of 1300 dots per inch (DPI). Imagery provided to CDM by USEPA, image date 2001.

Projection : UTM, Zone 18 North
Datum: NAD83

Figure 5-8
Outlying Parcels Soil Boring Program
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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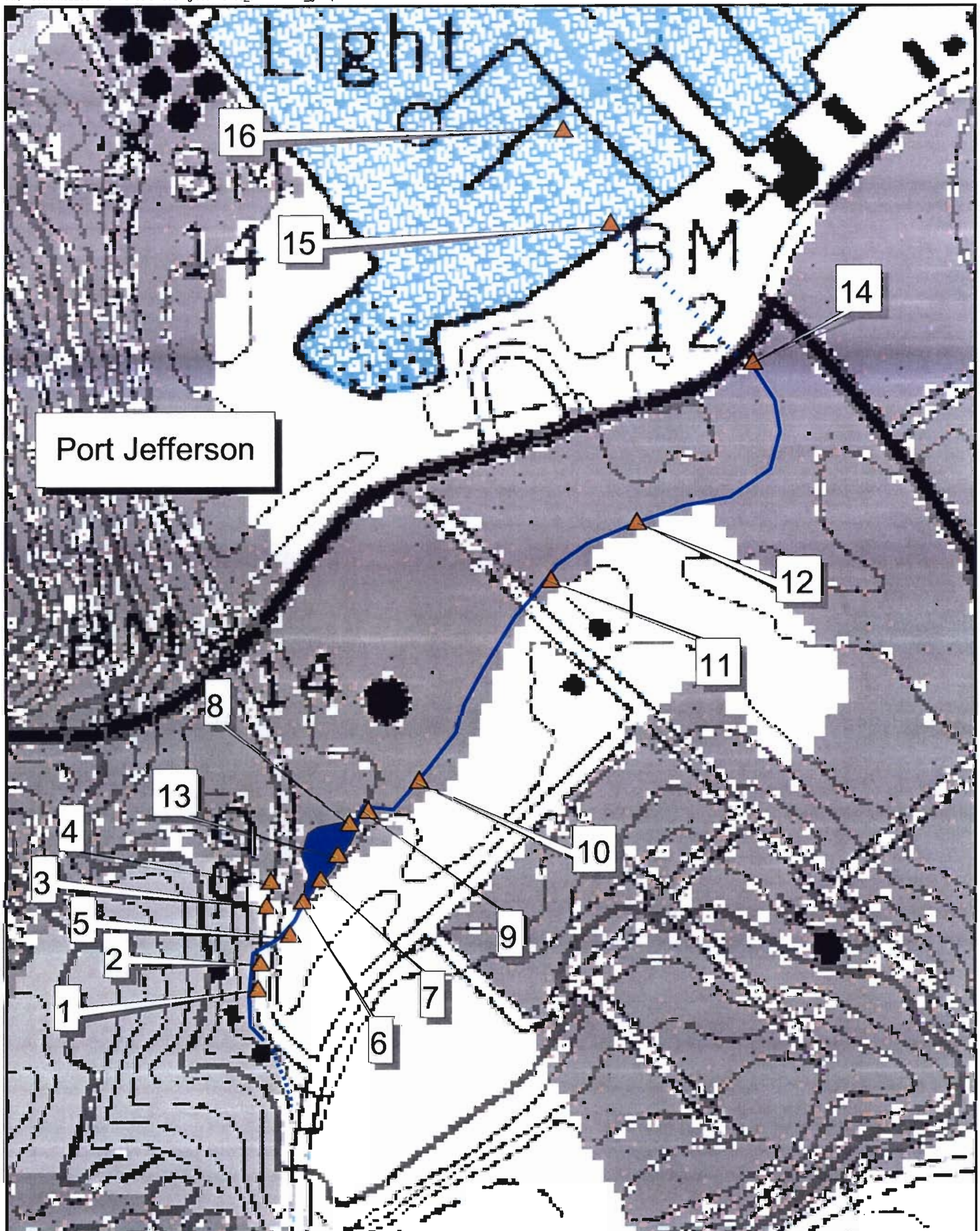


LEGEND

- Sampling Location
- Old Mill Pond
- Old Mill Creek, culvert under Rt. 25A
- Old Mill Creek
- Creek - Upstream of Pond

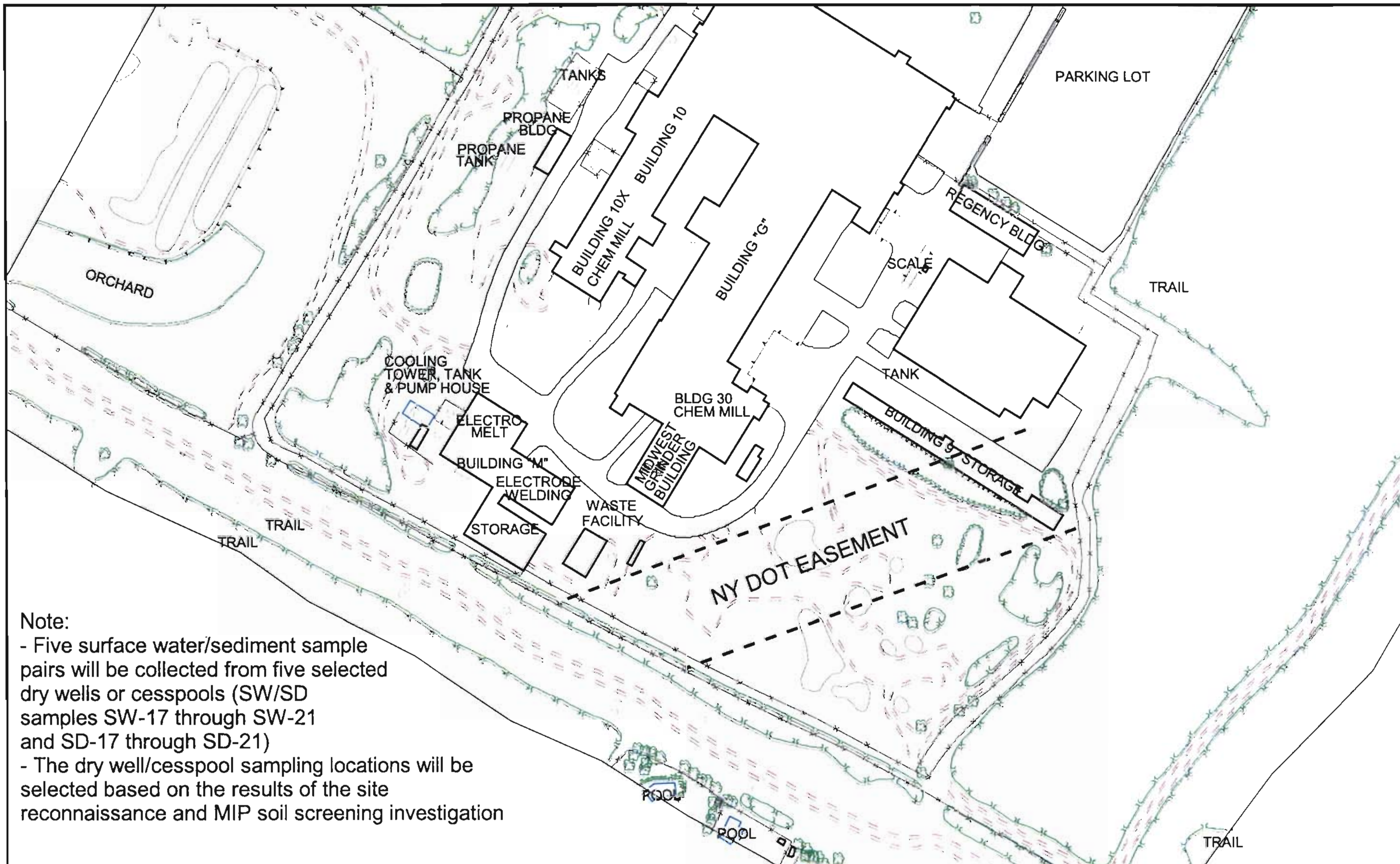
N

200 0 200 400 Feet

Figure 5-9
Old Mill Creek and Pond Surface Water and Sediment Locations
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

vCessPool SW/SD Locations



Note:
- Five surface water/sediment sample pairs will be collected from five selected dry wells or cesspools (SW/SD samples SW-17 through SW-21 and SD-17 through SD-21)
- The dry well/cesspool sampling locations will be selected based on the results of the site reconnaissance and MIP soil screening investigation

N

0 200 400 Feet

Figure 5-10
Cesspool Surface Water/Sediment Sampling Locations
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

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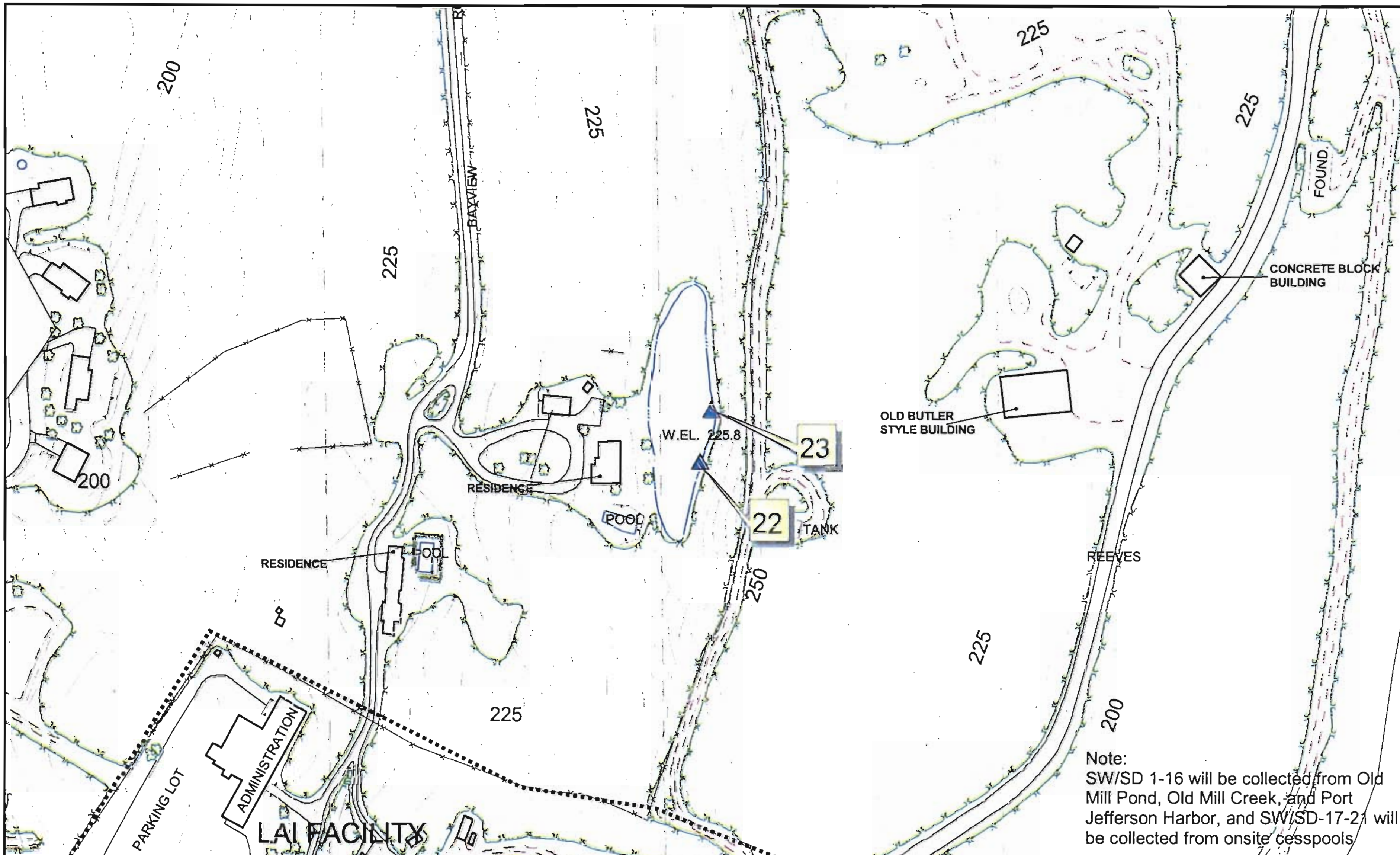


LEGEND

▲ Surface Water and Sediment Sampling Locations (locations may be revised)

N

0 200 400 Feet

Figure 5-11
Unnamed Pond Surface Water and Sediment Sampling Locations
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Site
Suffolk County, New York

CDM

Figure 7-1
Lawrence Aviation Industries Site

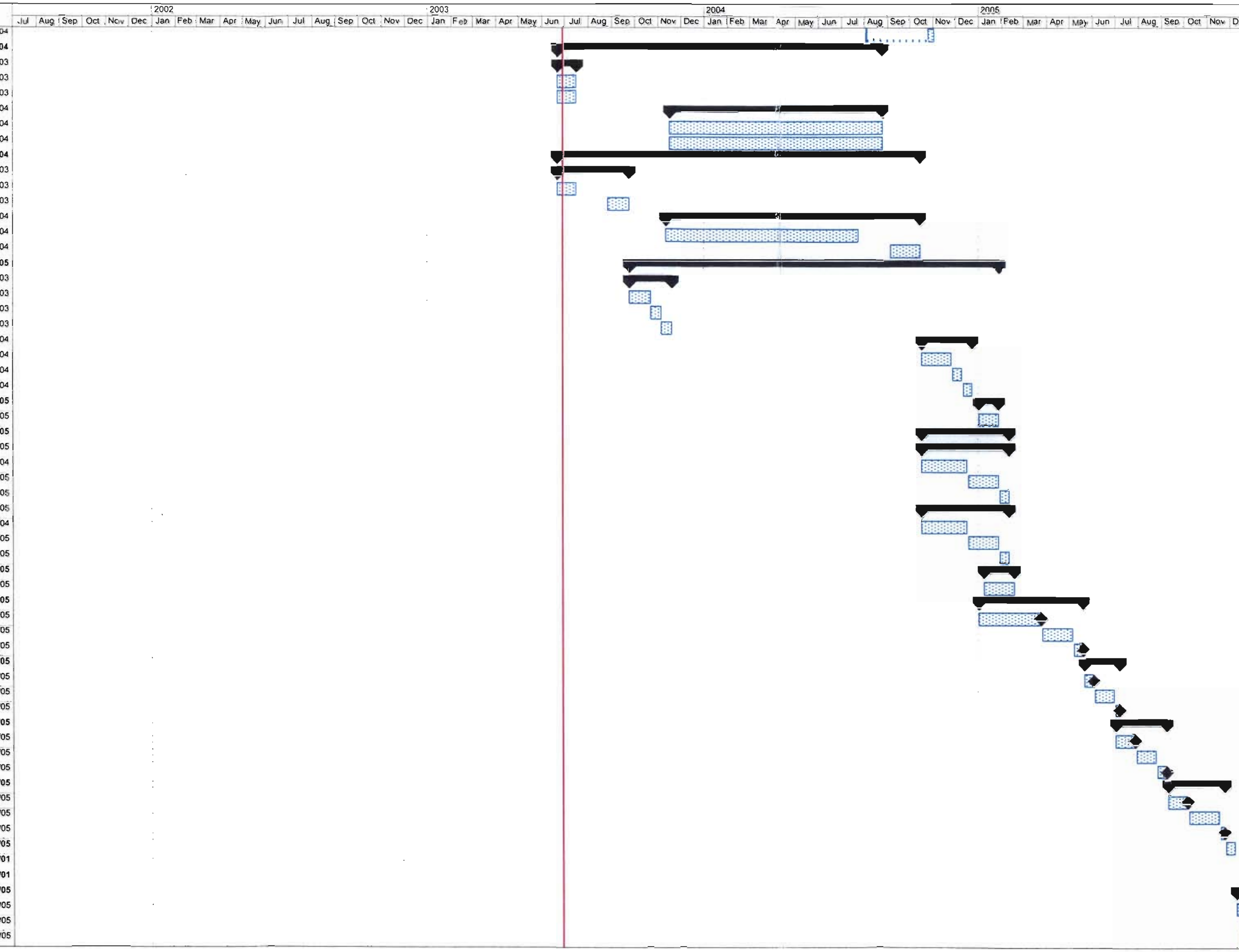
ID	Task Name	Subtask	Duration	Start	Finish
1	**Task 1 Project Planning and Support**		**1142 days**	**Thu 7/26/01**	**Fri 12/9/05**
2	Project Administration (ongoing support)	1.1	1142 days	Thu 7/26/01	Fri 12/9/05
3	Meeting (ongoing support)	1.10	1142 days	Thu 7/26/01	Fri 12/9/05
4	Attend Scoping Meetings	1.2	1 day	Thu 7/26/01	Thu 7/26/01
5	Evaluate Existing Data and Documents	1.6	121 days	Thu 7/26/01	Thu 1/10/02
6	Develop Daft Work Plan and Associated Cost Estmate	1.4	121 days	Thu 7/26/01	Thu 1/10/02
7	EPA Review of Work Plan		22 days	Thu 1/10/02	Fri 2/8/02
8	Conduct Site Visit	1.3	1 day	Thu 10/18/01	Thu 10/18/01
9	Negotiate and Revise Draft Work Plan/Budget	1.5	22 days	Fri 2/8/02	Mon 3/11/02
10	Prepare/Submit Draft QAPP	1.7	21 days	Mon 3/11/02	Mon 4/8/02
11	EPA Review of Draft QAPP		30 days	Mon 4/29/02	Fri 6/7/02
12	Prepare/Submit HASP	1.8	10 days	Mon 3/11/02	Fri 3/22/02
13	Prepare/Submit Final QAPP	1.7	12 days	Fri 4/19/02	Mon 5/6/02
14	Subcontract Procurement	1.11	30 days	Fri 4/18/03	Thu 5/29/03
15	1. Topographic Survey		30 days	Fri 4/18/03	Thu 5/29/03
16	2. Geophysical/Screening Survey		30 days	Fri 4/18/03	Thu 5/29/03
17	3. Cultural Resource Survey		30 days	Fri 4/18/03	Thu 5/29/03
18	4. Subsurface Soil and Groundwater Screening		30 days	Fri 4/18/03	Thu 5/29/03
19	5. Analytical Laboratory		30 days	Fri 4/18/03	Thu 5/29/03
20	6. Drilling Services		30 days	Fri 4/18/03	Thu 5/29/03
21	7. Multiport Monitoring Well Installation and Services		30 days	Fri 4/18/03	Thu 5/29/03
22	8. Investigation Derived Waste Disposal		30 days	Fri 4/18/03	Thu 5/29/03
23	Subcontract Management	1.12	310 days	Mon 6/2/03	Fri 8/6/04
24	1. Topographic Survey		185 days	Mon 6/2/03	Fri 2/13/04
25	2. Geophysical/Screening Survey		62 days	Mon 6/2/03	Tue 8/26/03
26	3. Cultural Resource Survey		75 days	Mon 6/2/03	Fri 9/12/03
27	4. Subsurface Soil and Groundwater Screening		93 days	Mon 6/2/03	Wed 10/8/03
28	5. Analytical Laboratory		310 days	Mon 6/2/03	Fri 8/6/04
29	6. Drilling Services		248 days	Mon 6/2/03	Wed 5/12/04
30	7. Multiport Monitoring Well Installation and Services		93 days	Mon 6/2/03	Wed 10/8/03
31	8. Investigation Derived Waste Disposal		217 days	Mon 6/2/03	Tue 3/30/04
32	Pathway Analysis Report	1.13	38 days	Mon 8/11/03	Wed 10/1/03
33	**Task 2 Community Relations (Ongoing)**		**1058 days**	**Thu 7/26/01**	**Mon 8/15/05**
34	Community Interviews	2.1	5 days	Tue 6/24/03	Mon 6/30/03
35	Community Relations Plan (CRP)	2.2	15 days	Tue 7/1/03	Mon 7/21/03
36	Site Mailing List (ongoing support)	2.8	700 days	Thu 7/26/01	Wed 3/31/04
37	Public Meeting Support - Pre-Field Work	2.3	1 day	Wed 7/2/03	Wed 7/2/03
38	Public Notices	2.6	1 day	Mon 3/1/04	Mon 3/1/04
39	Public Meeting Support - RI	2.3	1 day	Mon 3/7/05	Mon 3/7/05
40	Public Notices	2.6	1 day	Mon 7/25/05	Mon 7/25/05
41	Public Meeting Support - FS	2.3	1 day	Mon 8/1/05	Mon 8/1/05
42	Public Notices	2.6	1 day	Mon 8/15/05	Mon 8/15/05
43	**Task 3 Field Investigation**		**365 days**	**Wed 6/11/03**	**Tue 11/2/04**
44	Field Screening Activities (FSA)		68 days	Wed 6/11/03	Fri 9/12/03
45	Mobilization	3.2	5 days	Wed 6/11/03	Tue 6/17/03
46	Well Inventory	3.1	1 day	Mon 6/16/03	Mon 6/16/03
47	Cultural Resources Survey	3.1	2 days	Mon 6/16/03	Tue 6/17/03
48	Ecological Characterization	3.6	15 days	Tue 7/1/03	Mon 7/21/03
49	Review Existing Ecological Information		10 days	Tue 7/1/03	Mon 7/14/03
50	Field Investigation		4 days	Tue 7/15/03	Fri 7/18/03
51	Identification Of Endangered and Special Concern Species		1 day	Mon 7/21/03	Mon 7/21/03
52	Exisitng Well Assessment/Development	3.1	12 days	Mon 6/16/03	Tue 7/1/03
53	Site Preparation	3.2	2 days	Mon 6/16/03	Tue 6/17/03
54	Geophysical Survey	3.7	17 days	Fri 7/4/03	Mon 7/28/03
55	Topographic Survey (grid and base map)	3.2	5 days	Wed 6/25/03	Tue 7/1/03
56	Groundwater Sampling (existing wells) and Water Level Measurements	3.5	8 days	Mon 7/7/03	Wed 7/16/03
57	Surface Water Sediment Sampling	3.5	7 days	Mon 6/23/03	Tue 7/1/03
58	Stratigraphic Borings	3.4	15 days	Wed 7/2/03	Tue 7/22/03
59	Subsurface Soil Screening	3.4	23 days	Wed 7/23/03	Fri 8/22/03
60	Groundwater Screening	3.4	13 days	Mon 8/25/03	Wed 9/10/03
61	Demobilizatoin	3.2	2 days	Thu 9/11/03	Fri 9/12/03
62	Field Data Collection Activities (FDCA)		257 days	Mon 11/10/03	Tue 11/2/04
63	Mobilization	3.2	5 days	Mon 11/10/03	Fri 11/14/03
64	Exterior Subsurface Soil Borings/Sampling	3.4/3.5	30 days	Mon 11/17/03	Fri 12/26/03
65	Outlying Parcel Subsurface Soil Borings/Sampling	3.4/3.5	9 days	Thu 1/8/04	Tue 1/20/04
66	Interior Subsurface Soil Borings/Sampling	3.4/3.5	8 days	Wed 1/21/04	Fri 1/30/04
67	Monitoring Well Installation	3.4	30 days	Mon 2/2/04	Fri 3/12/04
68	Well Development	3.4	14 days	Mon 3/1/04	Thu 3/18/04
69	DNAPL Investigation	3.4	12 days	Mon 3/15/04	Tue 3/30/04
70	Packer Testing	3.3	7 days	Fri 3/19/04	Mon 3/29/04
71	Install Mulit-Port Well Equipment	3.4	17 days	Tue 3/30/04	Wed 4/21/04
72	Groundwater Sampling (all wells - Round 1) and Water Level Measurements	3.5	10 days	Thu 4/29/04	Wed 5/12/04
73	Groundwater Sampling (all wells - Round 2) and Water Level Measurements	3.5	9 days	Thu 7/22/04	Tue 8/3/04
74	Demobilization	3.2	5 days	Wed 8/4/04	Tue 8/10/04

Project: Schedule-a
Date: Fri 4/18/03

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

Figure 7-1
Lawrence Aviation Industries Site

ID	Task Name	Subtask	Duration	Start	Finish
75	Disposal of Field Generated Waste	3.8	8 days	Wed 8/4/04	Tue 11/2/04
76	**Task 4 Sample Analysis**		**308 days**	**Mon 6/23/03**	**Wed 8/25/04**
77	Field Screening Activities		18 days	Mon 6/23/03	Wed 7/16/03
78	CLP Analyses	4.2	18 days	Mon 6/23/03	Wed 7/16/03
79	Non RAS Analyses	4.3	18 days	Mon 6/23/03	Wed 7/16/03
80	Field Data Collection Activities		203 days	Mon 11/17/03	Wed 8/25/04
81	CLP Analyses	4.2	203 days	Mon 11/17/03	Wed 8/25/04
82	Non RAS Analyses	4.3	203 days	Mon 11/17/03	Wed 8/25/04
83	**Task 5 Analytical Support and Data Validation**		**345 days**	**Mon 6/23/03**	**Fri 10/15/04**
84	Field Screening Activities		68 days	Mon 6/23/03	Wed 9/24/03
85	Sample Management (Collect, Prepare and Ship Samples)	5.2	18 days	Mon 6/23/03	Wed 7/16/03
86	Data Validation (Non-CLP)	5.3	20 days	Thu 8/28/03	Wed 9/24/03
87	Field Data Collection Activities		243 days	Wed 11/12/03	Fri 10/15/04
88	Sample Management (Collect, Prepare and Ship Samples)	5.2	183 days	Wed 11/12/03	Fri 7/23/04
89	Data Validation (Non-CLP)	5.3	30 days	Mon 9/6/04	Fri 10/15/04
90	**Task 6 Data Evaluation**		**352 days**	**Thu 9/25/03**	**Fri 1/28/05**
91	Field Screening Activities		40 days	Thu 9/25/03	Wed 11/19/03
92	Data Reduction, Tabulation, and Evaluation	6.2	20 days	Thu 9/25/03	Wed 10/22/03
93	Data Usability Evaluation	6.1	10 days	Thu 10/23/03	Wed 11/5/03
94	Technical Memorandum	6.4	10 days	Thu 11/6/03	Wed 11/19/03
95	Field Data Collection Activities		50 days	Mon 10/18/04	Fri 12/24/04
96	Data Reduction, Tabulation, and Evaluation	6.2	30 days	Mon 10/18/04	Fri 11/26/04
97	Data Usability Evaluation	6.1	10 days	Mon 11/29/04	Fri 12/10/04
98	Technical Memorandum	6.4	10 days	Mon 12/13/04	Fri 12/24/04
99	**Modeling**		**20 days**	**Mon 1/3/05**	**Fri 1/28/05**
100	Modelling Technical Memorandum		20 days	Mon 1/3/05	Fri 1/28/05
101	**Task 7 Assessment of Risk**		**85 days**	**Mon 10/18/04**	**Fri 2/11/05**
102	Human Health Risk Assessment (RA)	7.1	85 days	Mon 10/18/04	Fri 2/11/05
103	Draft Baseline Human Heamth RA		45 days	Mon 10/18/04	Fri 12/17/04
104	EPA Review of Draft Baseline Human Health RA		30 days	Mon 12/20/04	Fri 1/28/05
105	Final Baseline Human Health RA		10 days	Mon 1/31/05	Fri 2/11/05
106	Screening Level Ecological Risk Assessment (RA)	7.2	85 days	Mon 10/18/04	Fri 2/11/05
107	Draft Screening Level Ecological RA		45 days	Mon 10/18/04	Fri 12/17/04
108	EPA Review of Draft Screening Level Ecological RA		30 days	Mon 12/20/04	Fri 1/28/05
109	Final Screening Level Ecological RA		10 days	Mon 1/31/05	Fri 2/11/05
110	**Task 8 Treatability Studies and Pilot Testing**		**30 days**	**Mon 1/10/05**	**Fri 2/18/05**
111	Literature Search - Technical Memorandum	8.1	30 days	Mon 1/10/05	Fri 2/18/05
112	**Task 9 Remedial Investigation Report**		**100 days**	**Mon 1/3/05**	**Fri 5/20/05**
113	Draft RI Report	9.1	60 days	Mon 1/3/05	Fri 3/25/05
114	EPA Review of Draft RI Report		30 days	Mon 3/28/05	Fri 5/6/05
115	Final RI Report	9.2	10 days	Mon 5/9/05	Fri 5/20/05
116	**Task 10 Remedial Alternatives Screening**		**35 days**	**Mon 5/23/05**	**Fri 7/8/05**
117	Draft Remedial Alternatives Screening	10.1	10 days	Mon 5/23/05	Fri 6/3/05
118	EPA Review of Draft Remedial Alternatives Screening		20 days	Mon 6/6/05	Fri 7/1/05
119	Final Remedial Alternatives Screening	10.2	5 days	Mon 7/4/05	Fri 7/8/05
120	**Task 11 Remedial Alternatives Evaluation**		**50 days**	**Mon 7/4/05**	**Fri 9/9/05**
121	Draft Remedial Alternatives Evaluation	11.1	20 days	Mon 7/4/05	Fri 7/29/05
122	EPA Review of Remedial Alternatives Evaluation		20 days	Mon 8/1/05	Fri 8/26/05
123	Final Remedial Alternatives Evaluation	11.2	10 days	Mon 8/29/05	Fri 9/9/05
124	**Task 12 FS Report**		**55 days**	**Mon 9/12/05**	**Fri 11/25/05**
125	Draft FS Report	12.1	20 days	Mon 9/12/05	Fri 10/7/05
126	EPA Review of Draft FS Report		30 days	Mon 10/10/05	Fri 11/18/05
127	Final FS Report	12.2	5 days	Mon 11/21/05	Fri 11/25/05
128	**Task 13 Post RI/FS Support**		**10 days**	**Mon 11/28/05**	**Fri 12/9/05**
129	**Task 14 Negotiation Support (NA)**		**0 days**	**Thu 7/26/01**	**Thu 7/26/01**
130	**Task 15 Administrative Record (NA)**		**0 days**	**Thu 7/26/01**	**Thu 7/26/01**
131	**Task 16 Work Assignment Closeout**		**7 days**	**Mon 12/12/05**	**Tue 12/20/05**
132	Work Assignment Closeout Report	16.1	5 days	Mon 12/12/05	Fri 12/16/05
133	Document Indexing	16.2	1 day	Mon 12/19/05	Mon 12/19/05
134	Document Retention/Conversion	16.3	1 day	Tue 12/20/05	Tue 12/20/05



Project: Schedule-a
Date: Fri 4/18/03

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

FIGURE 8-1
PROJECT ORGANIZATION
LAWRENCE AVIATION SITE
PORT JEFFERSON, NEW YORK