Final Record of Decision for the Three Mile Creek Area of Concern (SD-31) at the Former Griffiss Air Force Base Rome, New York

December 2003

AIR FORCE REAL PROPERTY AGENCY

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List of Abbreviations and Acronyms

AFB	Air Force Base
AFRPA	Air Force Real Property Agency
Air Force	United States Air Force
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BGS	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPCs	chemicals of potential concern
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FFA	Federal Facility Agreement
FS	Feasibility Study
GLDC	Griffiss Local Development Corporation
HI	Hazard Index
HQ	Hazard Quotient
IRP	Installation Restoration Program
LDR	land disposal restrictions
LTM	long-term monitoring
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NYCRR	New York Code of Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PISCES	passive in situ concentration/extraction sampling
RI	remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SI	Supplemental Investigation
SVOC	semivolatile organic compound
TBCs	To-Be-Considereds
TCLP	toxicity characteristic leaching procedure
TSD	treatment, storage and disposal
VOC	volatile organic compound

1 Declaration

1.1 Site Name and Location

The Three Mile Creek Area of Concern (AOC) (site identification designation SD-31) is located at the former Griffiss Air Force Base (AFB) in Rome, Oneida County, New York.

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the remedial action with long-term monitoring alternative for the Three Mile Creek AOC at the former Griffiss AFB. This alternative has been chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The remedy has been selected by the United States Air Force (Air Force) in conjunction with the United States Environmental Protection Agency (EPA) and with the concurrence of the New York State Department of Environmental Conservation (NYSDEC) pursuant to the Federal Facility Agreement (FFA) among the parties under Section 120 of CERCLA. This decision is based on the administrative record file for this site.

1.3 Assessment of the Site

The remedial action selected in this ROD is necessary to protect the public health or welfare, or the environment, from actual or threatened releases of hazardous substances from the AOC into the environment.

1.4 Description of Selected Remedy

The Selected Remedy for the Three Mile Creek AOC is excavation of contaminated sediments with long-term monitoring. Under the selected remedial approach, contaminated sediments will be excavated and characterized to determine placement/disposal location. Sediments determined to be non-hazardous will be used at Landfill 6 as grading material prior to installation of the impermeable cover over the landfill. Hazardous materials will be disposed off base at an authorized treatment, storage and disposal (TSD) facility.

As outlined in the 2002 Three Mile Creek Feasibility Study (FS) addendum, the Selected Remedy involves excavation along the entire length of the on-base portion of the creek, discrete and localized off-base portions of the creek, and Three Mile Creek Pond. This remedial action is required because concentrations of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and dioxins exceeding criteria are present throughout this area (primarily in the on-base portion).

The selected cleanup scenario involves sediment excavation of the on-base portion of the creek to a uniform depth of 2.5 feet along the channel (approximate depth to native soil). In addition, the following localized areas will be excavated to a depth of 4 feet below the current creek bottom: the Landfill 5 tributary between sample locations LF5SD-1 and LF5SD-2; the north creek channel between sample locations TMCSD-1 and TMCSD-5; and the main creek channel between sample locations TMCSD-4 and TMCSD-7, TMCSD-8-1 and TMCSD-9-1, and TMCSD-10 and TMCSD-11 (see Figures 5 and 6).

Full-scale excavation of sediments is not warranted downstream of the base because contaminant concentrations are considerably lower in off-base sediments than in on-base sediments. From the base boundary through the pastureland, sediment will be excavated at 16 locations were contamination is localized in silt deposits (see Figure 7).

At Three Mile Creek Pond, where elevated levels of PCBs, cadmium, and lead were found, excavation of sediments to a depth of 3.5 feet across the entire pond will be performed (see Figure 8). There will be no direct remediation for the relatively low levels of contamination downstream of Three Mile Creek Pond or in the wetland area upstream of the pond.

The estimated volume of sediment to be removed includes: 7,100 cubic yards from the on-base portion of the creek; 80 cubic yards from the off-base portion of the creek; and 7,300 cubic yards from Three Mile Creek Pond. In addition, up to 1,700 cubic yards of dredge spoil piles that were side-cast during the original excavation of the on-base portion of the creek will be removed.

The sample results collected from the RI, SI, and the 2001 FS investigations (vertical profile sampling along the on-base portion of Three Mile Creek and at Three Mile Creek Pond was performed to define the vertical and lateral extent of contamination) were used in the development of this Selected Remedy. To determine the required depth of contaminated sediment removal, the sampling results were compared to federal and New York State sediment guidance values. Based on this review, the Selected Remedy is expected to reduce the levels of sediment contamination in the on-base portion of the creek and the pond as follows: PCBs from 110 ppm to approximately 1 ppm or less; VOCs from greater than100 ppm to approximately 1 ppm or less; and for metals such as lead from greater than 900 ppm to approximately 50 ppm or less. The Selected Remedy will result in the removal of the vast majority of sediment contamination. Any remaining contamination in the on-base portion of the creek and the pond is expected to be negligible. The Selected Remedy will also remove the majority of low-level contamination detected in the off-base creek sediments by targeting the removal of areas of deposition and areas with fine-grained, highly absorptive sediments. Further, the pathway to any low-level contamination remaining in the creek and pond following the removal action will be cut off from receptors by backfilling dredged areas with clean fill to minimize exposure to any remaining isolated low-level sediment contamination.

All excavated on-base and off -base portions of the creek, and the pond, will be backfilled with clean soil to a minimum of 2.5 feet for the entire on-base portion of the creek and a minimum of 1.5 feet for the pond. The final backfill elevations will be further developed during the remedial design, and will provide for a shallow habitat zone in the pond. Restoration of the physical and functional state of the creek will be performed according to a remedial design to be developed with the EPA and NYSDEC. The goal of the design will be to restore the aquatic habitat of the creek as well as provide restoration and enhancement of wetlands associated with the on-base portion of the creek. The design will be consistent with state wetland and stream regulations (6 NYCRR Part 663 and 608) and restoration activities will be completed concurrently with the remedial action.

Source control is also a key factor in the restoration process for Three Mile Creek and its surrounding habitats. The processes that created the chemicals discharged to floor drains and sumps are no longer being conducted and investigations and cleanups are ongoing (e.g., plugging of various floor drains and decommissioning of various drywells). Additional source control measures include the remedial actions being taken at other sites within the Three Mile Creek drainage basin (capping of Landfill 5 and planned capping of Landfill 6; removal, capping, and consolidation of construction and demolition debris from Hardfills 49c and 49d; removal of Landfill 4 and the removal of PCB-contaminated soils near the Electrical Power Substation).

A long-term monitoring (LTM) program, including surface water, sediment, and fish tissue sampling, will be implemented following remediation and site restoration to confirm the effectiveness of the remedy and ensure the continued protection of human health and the environment. Annual monitoring of surface water and sediments will be performed and samples analyzed for VOCs, SVOCs, metals, pesticides, and PCBs. Fish tissue samples will be collected one year after the remediation and every third year thereafter, and analyzed for metals, pesticides and PCBs. A benthic community analysis will be performed one year after the remediation and every third year thereafter. The long-term monitoring plan will be developed with the EPA, NYSDEC, and NYSDOH and they will review the data generated during the program to determine whether any additional actions are necessary. If the results of the long-term monitoring indicate that fish tissue levels do not decline or the ecological community does not recover, additional investigation or remediation may be necessary.

Executive Order 11990 Finding of No Practicable Alternative – Wetlands

There are no practicable alternatives to prevent disturbance of the wetlands during remediation of Three Mile Creek. Some disturbance and discharge of fill material may occur either in or immediately adjacent to the wetlands. The Air Force will take all practicable measures to minimize harm to the wetlands and will restore the wetlands in accordance with the Basewide Wetlands Management Plan (E & E 2003), which is presently being developed with the EPA and NYSDEC. The Air Force will obtain the necessary funding, to the extent Congress appropriates such funds, to implement the wetlands management plan.

1.5 Statutory Determinations

The Air Force Real Property Agency (AFRPA) (formerly Air Force Base Conversion Agency) and EPA, with concurrence from NYSDEC, have determined that remedial action with long-term monitoring is warranted for this site. The Selected Remedy is protective of human health and the environment, complies with federal and New York State (NYS) applicable or relevant and appropriate requirements (ARARs), is cost effective, and utilizes permanent solutions to the extent possible. Although this remedy does not use treatment as a principal element of the remedy it accomplishes the required end result of protection of human health and the environment.

Five-year reviews will be performed by the Air Force, in conjunction with the EPA and NYSDEC, to ensure that the Selected Remedy is still performing as planned and is protective of public health and the environment.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for this site.

- The chemicals of potential concern (COPCs) and their respective concentrations are presented in Section 2.5, Site Characteristics.

- Current and reasonably anticipated future use assumptions used in the baseline risk assessment are presented in Section 2.6, Current and Potential Future Site and Resource Uses.

- The baseline risk represented by the COPCs is presented in Section 2.7, Summary of Site Risks.

- The key factors that led to the selection of the remedy are presented in Section 2.10, Comparative Analysis of Alternatives.

1.7 Authorizing Signatures

On the basis of the remedial investigations performed at Three Mile Creek and the baseline risk assessment, the selected remedy for the Three Mile Creek AOC is remedial action with long-term monitoring. The selected remedy meets the requirements for remedial action set forth in CERCLA, Section 121. The NYSDEC has concurred with the selected remedial action presented in this ROD.

Albert F. Lowas, Jr. — December 24, 2003

Albert F. Lowas, Jr.
Director
Air Force Real Property Agency

Date

March 26, 2004

George Pavlou
Director, Emergency and Remedial Response Division
United States Environmental Protection Agency, Region 2

Date

2 Decision Summary

2.1 Site Name, Location, and Brief Description

The Three Mile Creek AOC (site identification designation SD-31) is located at the former Griffiss AFB in Rome, Oneida County, New York (see Figure 1). Pursuant to Section 105 of CERCLA, Griffiss AFB was included on the National Priorities List (NPL) on July 15, 1987. On August 21, 1990, the EPA, NYSDEC, and the AFRPA entered into an FFA under Section 120 of CERCLA.

Three Mile Creek was a natural stream before the construction of Griffiss AFB and was dredged and straightened in 1942 and again at least once in 1962. A drainage ditch located adjacent to the Hardfill 49d northeast of Landfill 5 (Landfill 5 tributary) is also included in this AOC. Three Mile Creek receives both surface water runoff and groundwater from the surrounding watershed as well as storm water from the south-central portion of the base. Three Mile Creek originates at the points of discharge for the base storm water collection system and flows southeasterly across the base eventually flowing into Three Mile Creek Pond and then the NYS Barge Canal located 1 mile south of the installation boundary. The creek is approximately 10,000 feet long (entire length from its headwaters to its outfall) and up to 10 feet wide, with water depths ranging from 2 inches to 2 feet.

2.2 Site History and Enforcement Activities

The Former Griffiss AFB Operational History

The mission of the former Griffiss AFB varied over the years. The base was activated on February 1, 1942, as Rome Air Depot, with the mission of storage, maintenance, and shipment of material for the U.S. Army Air Corps. Upon creation of the U.S. Air Force in 1947, the depot was renamed Griffiss Air Force Base. The base became an electronics center in 1950, with the transfer of Watson Laboratory Complex (later Rome Air Development Center [1951], Rome Laboratory, and then the Information Directorate at Rome Research Site, established with the mission of accomplishing applied research, development, and testing of electronic air-ground systems). The 49th Fighter Interceptor Squadron was also added. The Headquarters of the Ground Electronics Engineering Installations Agency was established in June 1958 to engineer and install ground communications equipment throughout the world. On July 1, 1970, the 416th Bombardment Wing of the Strategic Air Command was activated with the mission of maintenance and implementation of both effective air refueling operations and long-range bombardment capability. Griffiss AFB was designated for realignment under the *Base Realignment and Closure Act* in 1993 and 1995, resulting in deactivation of the 416th Bombardment Wing in September 1995. The Information Directorate at Rome Research Site and the Northeast Air Defense Sector will continue to operate at their current locations; the New York Air National Guard operated the runway for the 10th Mountain Division deployments until October 1998, when they were relocated to Fort Drum; and the Defense Finance and Accounting Services has established an operating location at the former Griffiss AFB.

Environmental Background

As a result of the various national defense missions carried out at the former Griffiss AFB since 1942, hazardous and toxic substances were used and hazardous wastes were generated, stored, or disposed at various sites on the installation. The defense missions involved, among others, procurement, storage, maintenance, and shipping of war materiel research and development; and aircraft operations and maintenance.

Numerous studies and investigations under the U.S. Department of Defense Installation Restoration Program (IRP) have been carried out to locate, assess, and quantify the past toxic and hazardous waste storage, disposal, and spill sites. These investigations included a records search in 1981 (Engineering Science 1981), interviews with base personnel, a field inspection, compilation of an inventory of wastes, evaluation of disposal practices, an assessment to determine the nature and extent of site contamination, Problem Confirmation and Quantification studies (similar to what is now designated a Site Investigation) in 1982 (Weston 1982) and 1985 (Weston 1985), soil and groundwater analyses in 1986, a basewide health assessment in 1988 by the U.S. Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR 1988); base-specific hydrology investigations in 1989 and 1990 (Geotech 1991), a groundwater investigation in 1991, and site-specific investigations between 1989 and 1993. ATSDR issued a Public Health Assessment for Griffiss AFB, dated October 23, 1995 (ATSDR 1995), and an addendum, dated September 9, 1996 (ATSDR 1996). An RI was conducted in 1994 and the draft-final RI report covering 31 AOCs was delivered to the EPA and NYSDEC in December 1996 (Law Environmental 1996). The final Supplemental Investigation (SI) Report was delivered in July 1998 (E & E 1998). The FS for Three Mile Creek was issued in January 1999 (E & E 1999), and the Final FS Addendum was delivered in July 2002 (E & E 2002).

2.3 Community Participation

A proposed plan for the Three Mile Creek AOC (AFRPA 2003), indicating remedial action with long-term monitoring for recreational use, was released to the public on Thursday, July 24, 2003. The document was made available to the public in both the administrative record file located at 153 Brooks Road in the Griffiss Business and Technology Park and in the Information Repository maintained at the Jervis Public Library. The notice announcing the availability of this document was published in the *Rome Sentinel* on July 23, 2003. The public comment period lasted from July 24, 2003, to August 23, 2003, and was set up to encourage public participation in the alternative selection process. In addition, a public meeting was held on Tuesday, August 5, 2003. The AFRPA, NYSDEC, and the NYSDOH held an information session at the beginning of the public meeting and answered questions about issues at the AOC and the proposal under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD (see Section 3).

2.4 Scope and Role of Site Response Action

The scope of the plan for remedial action with long-term monitoring for the Three Mile Creek AOC addresses the concerns for human health and the environment. The remedial action with long-term monitoring is consistent with the results of the risk assessment performed for recreational users and terrestrial and aquatic wildlife. In addition, source control, which is a key factor in the restoration of Three Mile Creek, has been or will be attained through the performance of remedial actions at numerous other AOCs in the Three Mile Creek drainage basin (see Section 1.4).

2.5 Site Characteristics

The former Griffiss AFB covered approximately 3,552 contiguous acres in the lowlands of the Mohawk River Valley in Rome, Oneida County, New York. Topography within the valley is relatively flat, with elevations on the former Griffiss AFB ranging from 435 to 595 feet above mean sea level. Three Mile Creek, Six Mile Creek (both of which drain into the NYS Barge Canal, located to the south of the base), and several state and/or federal-regulated wetlands are located on the former Griffiss AFB, which is bordered by the Mohawk River on the west. Due to its high average precipitation and predominantly silty sands, the former Griffiss AFB is considered a groundwater recharge zone.

The Three Mile Creek AOC is an approximately 10,000-foot-long, 10-foot-wide drainage ditch, ranging in depth from 2 inches to 2 feet. Three Mile Creek was a natural stream before the construction of Griffiss AFB. The creek was dredged and straightened in 1942 during the initial stages of base construction and again at least once in 1962 to accommodate discharges from the base storm water collection system. A drainage ditch, which is included in this AOC, is located adjacent to the Hardfill 49d northeast of Landfill 5 and forms, in effect, a "tributary" (Landfill 5 tributary) to Three Mile Creek, and contaminants found there reflect those found in the Creek rather than those found at the landfill.

The headwaters of Three Mile Creek originate at the points of discharge for the base storm water collection system. These discharge points (two large culverts) are located at Ellsworth Road and Wright Drive, near the electrical power substation. Two smaller culverts that drain from the area surrounding the electrical power substation enter the creek downstream from the two main culverts. Both surface water runoff and groundwater from the surrounding watershed are received by the creek including storm water drainage from Hardfill Areas 49c and 49d, Landfills 4, 5, and 6, and the electrical power substation (see Figures 1, 2, and 3). The creek also receives storm water from the south-central portion of the base, which reportedly contained discharges from floor drains.

The creek flows to the southeast across the base, continues off-base through pastureland and then wetland as it crosses under NYS Route 365, into a pond located just north of NYS Route 49, and eventually crosses under NYS Route 49 and empties into the NYS Barge Canal approximately 1 mile downstream of the installation boundary (see Figure 4).

Three Mile Creek has been classified as a Class C stream. According to the New York Code of Rules and Regulations (NYCRR) 701, the best usage for Class C stream waters is fishing, where waters shall be suitable for fish propagation and survival. Based on an Aquatic Habitat Assessment performed in 1993, at least 12 species of fish are found in Three Mile Creek. Due to the presence of PCBs in fish tissue, NYSDOH has issued a health advisory for Three Mile Creek. NYSDOH recommends that women of childbearing age, infants, and children under the age of 15 should not eat any fish species from Three Mile Creek, and that other people should eat no more than one meal per month of white sucker from this creek. The NYSDOH Health Advisories are issued independent of the CERCLA process and are provided to all individuals who seek a NYS fishing license and a copy can be obtained by contacting NYSDEC.

Site Investigations

Preliminary studies of Three Mile Creek were performed in 1981, 1987, and 1988. Soil, sediment, surface water, groundwater, and fish tissue samples were collected. Numerous metals, polynuclear aromatic hydrocarbons (PAHs), PCBs, and pesticides were detected in the streambed sediments and the fish tissue was contaminated with PCBs, some PAHs, and metals. The results of these studies led to the performance of an RI from 1993 through 1995.

The RI was performed to characterize the nature and extent of environmental contamination at the Three Mile Creek AOC to determine whether remedial action was necessary to eliminate potential threats to human health and the environment from exposures that might arise under existing or expected future site conditions. The RI included an aquatic survey, surface water sampling, sediment sampling, and fish tissue sampling. The aquatic survey was used to evaluate creek habitat, water quality, benthic and drift macroinvertebrate communities, and fish populations within four 100-meter segments of the on-base part of the creek (one near the Electrical Power Substation, one near Landfill 5, one near the Thor Street residential area, and one further downstream just inside the base boundary). At approximately the same locations, sediment samples were collected for toxicity testing and fish samples were collected for pesticide, PCB, and metals analyses. Results from the sediment toxicity tests done as part of the aquatic survey indicated that chemicals were not present at levels acutely toxic to aquatic life. A slight impairment of benthic macroinvertebrate populations was noted at the locations near Landfill 5 and near the base boundary. The fish population assessment indicated that fish communities were in poor to fair condition which could be due to site contaminants and, in part, to the lack of quality habitat. The results of the fish tissue analysis indicated the presence of PCBs, pesticides, and mercury at levels exceeding NYSDEC ecological risk guidelines for protection of piscivorous wildlife (see Table 1).

Surface water samples were collected from 12 locations along Three Mile Creek and analyzed for VOCs, SVOCs, PCBs, pesticides, metals, glycols, radionuclides, and water quality parameters. One VOC, 15 SVOCs, four pesticides, and seven metals were detected at concentrations above the most stringent criteria for surface water (see Table 2). Sediment samples were collected at two depths below the surface water/sediment interface (0.5 ft. and 1.0 ft.) from 15 locations, including the 12 locations along Three Mile Creek and three locations along the drainage ditch near Landfill 5. The samples were analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, dioxins, metals, and radionuclides. Three VOCs, 22 SVOCs, 18 pesticides, dioxin, and ten metals were detected at concentrations above the most stringent criteria for sediment (see Table 3).

In 1995, NYSDEC performed passive in situ concentration/extraction sampling (PISCES) at one location in Three Mile Creek to test for PCBs and other organochlorines. PCBs and DDE were detected. Naturally occurring conditions such as below average rainfall and low flow in the stream may have affected the ability of PISCES to detect additional contaminants.

In 1997, for a separate investigation of PCB contamination associated with Landfill 5, sediment samples were collected at two depth intervals (0 to 0.5 ft. and 1 to 1.5 ft.) from seven locations in the Landfill 5 tributary to Three Mile Creek. PCBs were detected at concentrations above the most stringent criteria (see Table 4).

In June 1997, as part of a basewide SI, three PISCES samples and two surface water samples were collected from Three Mile Creek for pesticide and PCB analysis. Pesticides were detected in two of the PISCES samples (see Table 5). No contaminants were detected in the surface water.

In July 1998, additional SI samples were taken from the off-base portion of Three Mile Creek to fill data gaps that had been identified in the RI sampling. These included two surface water samples and eight sediment samples (see Figure 4). Four metals were detected in surface water samples above the most stringent criteria (see Table 6). Concentrations of 18 SVOCs, one pesticide, one PCB, and five metals detected in sediment were above the most stringent criteria (see Table 7).

A visual inspection of the habitat quality of Three Mile Creek was conducted in 1999 by the Air Force, USACE, NYSDEC, EPA, and US Fish and Wildlife Service to gain a better understanding of creek conditions and the impact of potential remedial actions. In the same year, for the Three Mile Creek FS, sediment samples were collected from six locations in Three Mile Creek Pond (located off-base between NYS Routes 365 and 49) and analyzed for PCBs, cadmium, lead (see Figure 4). In 2001, the same six areas in the pond were vertically profiled to depths of 3.5 feet below creek bottom to determine the vertical extent of sediment contamination and the appropriate depth for sediment remediation. Twelve additional samples were collected, two samples per location. PCBs, cadmium, and lead were all detected at concentrations exceeding the most stringent criteria (see Table 8).

The 2001 FS investigation also included sampling along the on-base portion of the Three Mile Creek channel and the Landfill 5 tributary in order to define the vertical and lateral extent of contamination to better determine the potential breadth and depth of sediment remediation in those areas. Samples of sediment and native soil (beneath sediment) were collected at selected locations from depth intervals of up to 3.5 feet. Five

VOCs, 24 SVOCs, 15 pesticides, two PCBs, dioxins, and 10 metals were detected at concentrations exceeding the most stringent criteria (see Table 9). While many of the same chemicals were also detected in the native soil samples, the concentrations were not as great, and fewer exceeded the most stringent criteria (see Table 10).

Summary: On-Base Three Mile Creek Channel and Landfill 5 Tributary

Multiple sediment sampling events within the on-base portion of Three Mile Creek and the Landfill 5 Tributary have determined that contaminants are present throughout the creek at various concentration levels and various depths. The sediments in the on-base portion of the creek range in thickness from 0.5 foot at TMCSD-9-2 to 2.8 feet at TMCSD-5-1. Native soils were observed beneath the creek sediments at 16 locations at an average depth of 1.75 feet. Significant areas of sediment deposition (greater than 3.5 feet) occur near the headwaters at TMCSD-5 and mid-stream at TMCSD-8-1. A more detailed discussion of the results and the development of screening criteria can be found in the Final Three Mile Creek FS Addendum (E & E 2002).

PCBs were detected at all 26 RI and 2001 sample locations in at least one depth interval at levels exceeding the ecological screening criteria. PCBs above human health risk levels were detected at five locations (TMCSD-1, -2, -3, -5, and -11) at depths of 1.1 to 2.7 feet below ground surface (BGS). All of the highest concentrations occurred in sediments no deeper than 2.5 feet. Pesticides were detected at all 26 RI and 2001 sample locations in at least one depth interval at levels exceeding ecological screening criteria. No pesticides exceeded human health risk levels. Concentrations exceeding ecological risk values in the 2.5-to-3.5-foot depth interval occurred in nine samples near the headwaters, two mid-stream locations, and three downstream locations near the installation boundary.

Dioxins were detected at 23 of the 26 RI and 2001 sample locations in at least one depth interval and exceeded ecological screening criteria in 12 of the 2001 sediment samples analyzed. No dioxins were detected above human health risk levels. VOCs were detected in 24 of the 26 RI and 2001 sample locations in at least one depth interval. Concentrations exceeded ecological screening criteria near the headwaters of the creek. Exceedances in the 2.5 - to 3.5-foot depth interval occurred in only one sample (TMCSD-5). No VOCs were detected above human health risk levels. SVOCs were detected at all 26

RI and 2001 sample locations in at least one depth interval. Concentrations exceeded ecological screening criteria in all but one sediment sample and three native soil samples. Exceedances in the 2.5-to 3.5-foot depth interval occurred in eight samples near the headwaters and one downstream location near the installation boundary.

Metals were detected at all 26 RI and 2001 sample locations in at least one depth interval. Concentrations exceeded ecological screening criteria in all but four sediment samples and seven native soil samples. Exceedances in the 2.5- to 3.5-foot depth interval occurred in eight samples near the headwaters, and four locations near the installation boundary. One metal exceeded human health risk levels (TMCSD-1) at a depth of 1.8 to 2.4 feet BGS.

In conclusion, contaminant concentrations were generally highest upstream and decreased in concentration downstream; they also decreased with depth. The underlying native soil layer was significantly less contaminated, and in many cases contaminant-free, than the overlying sediments. Exceedances occurred in the 2.5- to 3.5-foot depth interval between the headwaters to the Landfill 5 tributary, intermittently mid-stream, and downstream near the installation boundary.

Summary: Three Mile Creek Pond

PCBs, cadmium, and lead were detected at all locations at concentrations higher than the ecological screening criteria but below human health risk levels. The highest levels for PCBs and cadmium were detected at the shallow pond inlet location (TMCSD-23-IL). The highest lead concentration was detected at a depth of 1.5 to 2.5 feet (TMCSD-28-OL). Contaminants were present to depths of 3 feet at all but one of the locations tested.

Summary: Off-Base Portions of the Creek

Concentrations of VOCs, SVOCs, PCBs, metals, and dioxins/furans exceeded screening criteria in the portion of the creek from the base boundary to the downstream edge of the pasture; however, the concentrations were generally less than the on-base concentrations. Contaminant accumulation areas were identified through substrate composition. The contaminants of concern adsorb more significantly to fine silty deposits rather than sandy substrates characteristic of fast-moving portions of the creek. Therefore, a global positioning system survey was performed to identify and quantify the areas where fine, silty sediments have accumulated and the approximate width and depth of the deposits were measured in the field. Because this part of the stream is easily accessed, sediment removal would result in only limited damage to the habitat.

From the pasture edge to Three Mile Creek Pond, contaminant levels were considerably lower. Wetland habitat in this section is more extensive, less accessible, and more vulnerable to physical damage from remedial activities. Contaminant concentrations again decreased downstream of the pond to the confluence with the Barge Canal.

2.6 Current and Potential Future Site and Resource Uses

Griffiss AFB was designated for realignment under the Defense Base Closure and Realignment Act in 1993 and 1995, resulting in deactivation of the 416th Bombardment Wing in September 1995. As a result of the realignment, a Master Reuse Strategy was developed by the Griffiss Local Development Corporation (GLDC) to provide the framework for reuse of the base after realignment and closure (GLDC 1995). The proposed reuse plan recommended in the final Master Reuse Strategy was evaluated in the Final Environmental Impact Statement (EIS) dated November 1995. As outlined in the Master Reuse Plan and EIS, the current and future land uses for the Three Mile Creek AOC is as public/recreational/open space and wetlands.

2.7 Summary of Site Risks

Site risks were analyzed based on the extent of contamination at the Three Mile Creek AOC. In 1994, as part of the RI, a baseline risk assessment was conducted to evaluate current and future potential risks to human health and the environment associated with contamination found in the surface water, sediments, and fish in Three Mile Creek. The results of this risk assessment were considered when formulating the alternative for remedial action with long-term monitoring.

2.7.1 Human Health Risk Assessment

A baseline human health risk assessment was conducted during the RI to determine whether chemicals detected at the Three Mile Creek AOC could pose health risks to individuals under current and proposed future land use conditions. As part of the baseline risk assessment, the following four-step process was used to assess site-related human health risks for a reasonable maximum exposure scenario:

- Hazard Identification—identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration;

- Exposure Assessment—estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathway (e.g., ingestion of contaminated soil) by which humans are potentially exposed;

- Toxicity Assessment—determines the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and

- Risk Characterization—summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative (e.g., one-in-a-million excess cancer risk and non-cancer Hazard Index [HI] value) assessment of site-related risks and a discussion of uncertainties associated with the evaluation of the risks and hazards for the site.

All contaminants detected in the surface water, sediment, and fish tissue samples from the site were considered COPCs with the exception of inorganics detected at concentrations less than twice the mean background concentrations; elements considered to be essential human nutrients (iron, magnesium, calcium, potassium, and sodium); and chemicals detected in less than 5% of the total samples and at concentrations below ARARs and To-Be-Considereds (TBCs). As a class, petroleum hydrocarbons were not included as a COPC; however, the individual toxic constituents (e.g., benzene, toluene, ethylbenzene) were evaluated.

Future potentially exposed human receptors are expected to be similar to current receptors, i.e., recreational users who may wade, fish, or otherwise use the creek on the base or downstream of the base. The receptors and pathways evaluated in the risk assessment are summarized in Table 11. The exposure assumptions for each pathway and receptor, which were selected in accordance with EPA guidance, are more fully described in the RI report.

Quantitative estimates of carcinogenic and noncarcinogenic risks were calculated for the Three Mile Creek AOC as part of a risk characterization. The risk characterization evaluates potential health risks based on estimated exposure intakes and toxicity values. For carcinogens, risks are estimated as an incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen. The risks of the individual chemicals are summed for each pathway to develop a total risk estimate. The range of acceptable risk is generally considered to be 1 in 10,000 (1×10^{-4}) to 1 in 1,000,000 (1×10^{-6}) of an individual developing cancer over a 70-year lifetime from exposure to the contaminant(s) under specific exposure assumptions. Therefore, sites with carcinogenic risk below the acceptable risk range for a reasonable maximum exposure do not generally require cleanup based upon carcinogenic risk under the NCP.

To assess the overall noncarcinogenic effects posed by more than one contaminant, EPA has developed the Hazard Quotient (HQ) and the HI. The HQ is the ratio of the chronic daily intake of a chemical to the reference dose for the chemical. The reference dose is an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a portion of a lifetime. The HQs are summed for all contaminants within an exposure pathway (e.g., ingestion of soil) and across pathways to determine the HI. When the HI exceeds 1, there may be concern for potential noncarcinogenic health effects if the contaminants in question are believed to cause similar toxic effects.

EPA bases its decisions to conduct site remediation on the risk to human health and the environment. Generally, cancer risks exceeding 1×10^{-4} will require actions to mitigate exposure. When carcinogenic risks are between 1×10^{-4} and 1×10^{-6} and the HI is greater than 1, cleanup actions may be taken on a case-by-case basis depending on consideration of a variety of risk management factors (scientific, social, political, and regulatory). Risks less than 1×10^{-6} and an HI of less than 1 generally do not require cleanup.

The risk assessment for Three Mile Creek AOC, which was performed during the RI, evaluated potential recreational exposures to COPCs in surface water, sediment, and fish for receptors in four age groups: a child (exposed from ages 0 through 5 years), a youth (exposed from ages 6 though 11 years), an adolescent (exposed from ages 12 through 17 years), and an adult (exposed over a duration of 30 years). The potential carcinogenic and noncarcinogenic risks from exposure to sediment, surface water, and fish consumption are summarized below.

Carcinogenic Risk

Because carcinogenic risks are based on total lifetime exposure, and because the adult receptor has the greatest estimated total lifetime exposure (due to the longer assumed exposure duration), only the adult's carcinogenic risks were presented in the RI. The greatest carcinogenic risk was associated with consumption of fish from the creek. The carcinogenic risk estimate for fish ingestion was 4×10^{-2}, which exceeds EPA's target risk range due mainly to the presence of PCB 1260 and arsenic in the fish tissue. The RI cautions that the risk may be overestimated because exposure concentrations are based on whole body fish tissue analysis rather than the concentrations in the edible portions of the fish, which may be considerably lower.

The total carcinogenic risk associated with recreational exposures to creek sediment and surface water were 9×10^{-5} and 4×10^{-6}, respectively, which are within EPA's target risk range.

Noncarcinogenic Risk

Noncarcinogenic risks were evaluated for recreational receptors in all four age groups. The total HIs calculated for fish consumption ranged from 11 for the adolescent receptor to 26 for the child receptor. The total HIs were driven by the presence of arsenic, manganese, and aldrin in fish tissue.

The total HIs associated with recreational exposures to sediment and surface water were all below 1, indicating that direct exposures to chemicals in these media would not be expected to cause noncarcinogenic effects. The highest HIs for exposure to sediment and surface water for the child receptor were 0.03 and 0.4, respectively.

2.7.2 Uncertainties

There are inherent uncertainties associated with the overall risk assessment process and with each of its components. However, conservative (health-protective) assumptions are used throughout the process to ensure that the risk estimates will be protective of human health. Examples of uncertainties associated with the risk assessment of Three

Mile Creek include (1) Samples were collected from locations with known or suspected contamination rather than random locations, which may result in a potential overestimation of risk; (2) The concentrations of COPCs in fish, which are based on the analysis of whole-body samples, may not be representative of exposure by fish consumption since many of these chemicals tend to concentrate in portions of the fish that are not generally consumed by humans (e.g., pesticides in fatty tissues, metals in bones and fins); (3) Dermal exposures to most COPCs in sediment were not evaluated quantitatively in the assessment, which may result in a potential underestimation of the risk from this route; (4) Due to a lack of basewide background data for sediment and surface water, chemicals that may have been unrelated to the site could not be excluded; consequently, risks from the site may have been overestimated; and (5) Due to the lack of toxicity values for some COPCs, some risks were not included in the quantitative risk estimates, which may result in a potential underestimation of risk.

2.7.3 Ecological Risk Assessment

A baseline risk assessment for ecological receptors in Three Mile Creek was also conducted in conjunction with the RI. Terrestrial wildlife including the short-tailed shrew, the raccoon, and the American woodcock, were evaluated for exposures by ingestion of COPCs in surface water and sediment. HQs were calculated for each COPC and indicator species. For the short-tailed shrew, two of the calculated HQs were greater than 1.0. These HQs were associated with ingestion of thallium (HQ = 6.3) and ingestion of cadmium (HQ = 1.1). All other HQs for terrestrial wildlife were less than 1.0. To evaluate the risk to aquatic wildlife, exposure of the northern water snake was estimated by assuming that its entire diet was fish from the creek. HQs calculated from the maximum fish tissue concentrations were all less than 1.0, indicating that adverse effects would not be expected.

Modeling of bioaccumulation to higher order species was not performed, nor was the cumulative effect of multiple contaminants considered. This tends to underestimate the risk to ecological receptors.

There are no federally listed (U.S. Department of the Interior) threatened or endangered plant or animal species at the former base. Although certain state-listed endangered plants and animals have been on or in the vicinity of the base, no threatened and/or endangered species have been identified at this site. However, a special-interest natural area, Three Mile Creek Woods (hemlock-hardwood swamp and pitch pine-scarlet oak community), is present at this site (Corey 1994).

2.8 Remedial Action Objectives

The following are the remedial action objectives developed for this site based upon the site data presented in the RI and SI reports.

Restrict Exposure to Contamination

Remedial action with long-term monitoring will be implemented to eliminate or reduce exposures that could potentially pose unacceptable risks to human health and the environment and to maintain the creek's status as a Class C stream (suitable for fish propagation and survival). By removing the contaminated sediments, contaminant concentrations will be reduced to acceptable levels. Source control is also a key factor in restricting exposure to contamination. The processes that created the chemicals discharged to floor drains and sumps are no longer being conducted and investigations and cleanups are ongoing (e.g., plugging of various floor drains and decommissioning of various drywells). Additional source control measures implemented to prevent re-contamination of the creek include the remedial actions being taken at other sites within the Three Mile Creek drainage basin (capping of Landfills 5 and 6; removal, capping, and consolidation of construction and demolition debris from Hardfills 49c and 49d; removal of Landfill 4, and the removal of PCB-contaminated soils near the Electrical Power Substation).

Evaluate Effectiveness of the Remedy

Five-year reviews will be performed by the Air Force, in conjunction with the EPA and NYSDEC, to ensure to ensure that the Selected Remedy is still performing as planned and is protective of public health and the environment.

A long-term monitoring (LTM) program, including surface water, sediment, and fish tissue sampling, will be implemented following remediation and site restoration to confirm the effectiveness of the remedy and ensure the continued protection of human health and the environment. Annual monitoring of surface water and sediments will be performed and samples analyzed for VOCs, SVOCs, metals, pesticides, and PCBs. Fish tissue samples will be collected one year after the remediation and every third year thereafter, and analyzed for metals, pesticides and PCBs. A benthic community analysis will be performed one year after the remediation and every third year thereafter. The long-term monitoring program will be developed with the EPA, NYSDEC, and NYSDOH and they will review the data generated during the program to determine whether any additional actions are necessary. If the results of the long-term monitoring indicate that fish tissue levels do not decline or the ecological community does not recover, additional investigation or remediation may be necessary.

2.9 Description of Alternatives

CERCLA regulations mandate that a remedial action must be protective of human health and the environment, cost effective, and utilize permanent solutions and treatment technologies to the maximum extent practicable. This ROD evaluates a No Action scenario as dictated by CERCLA, and compares it to six alternatives including the remedial action with long-term monitoring alternative. A summary of the six alternatives is presented below.

Alternative 1 (No Action)

CERCLA requires that the No Action alternative be compared with other alternatives. The No Action alternative involves no remedial action but would include long-term environmental monitoring to document site conditions for a period of at least 30 years. No institutional controls restricting habitation or use would be established. Costs and construction time are not associated with this alternative.

Alternative 2 (Institutional Actions)

This alternative involves institutional actions in the form of fencing and/or warning signs, educational programs to discourage fishing in the creek and thereby limit exposures of human (but not environmental) receptors, and long-term environmental monitoring.

Alternative 3 (Sediment Excavation, Off-site Disposal, and Clean Backfill)

This alternative involves remedial action in the form of sediment excavation, use of the non-hazardous dredged sediments at Landfill 6 as grading material prior to installing the landfill cap, off-base disposal of hazardous material, and replacement of excavated material with clean backfill. Long-term environmental monitoring for a period of 30 years would also be performed.

Alternative 4 (Sediment Excavation, Off-base Incineration, and Clean Backfill)

This alternative involves remedial action in the form of sediment excavation, off-base incineration, and replacement with clean backfill. Long-term environmental monitoring for a period of 30 years would also be performed.

Alternative 5 (Sediment Excavation, Soil Washing, Off-base Disposal, and Clean Backfill)

This alternative involves remedial action in the form of sediment excavation, soil washing, off-base disposal, and replacement with clean backfill. Long-term environmental monitoring for a period of 30 years would also be performed.

Alternative 6 (Sediment Excavation, Solvent Extraction and Soil Washing, Off-base Disposal, and Clean Backfill)

This alternative involves remedial action in the form of sediment excavation, solvent extraction and soil washing, off-base disposal, and replacement of sediment with clean backfill. Long-term environmental monitoring for a period of 30 years would also be performed.

2.10 Comparative Analysis of Alternatives

Remedial alternatives are assessed on the basis of both a detailed and a comparative analysis pursuant to the NCP. The analysis of Three Mile Creek consisted of (1) an assessment of the individual alternatives against nine evaluation criteria and (2) a comparative analysis focusing upon the relative performance of each alternative against the criteria. In general, the following "threshold" criteria must be satisfied by an alternative for it to be eligible for selection:

1. Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or remedial action with long-term monitoring.

2. Compliance with ARARs addresses whether a remedy would (a) meet all of the ARARs or (b) provide grounds for invoking a waiver.

In addition, the following "primary balancing" criteria are used to make comparisons and identify the major trade-offs among alternatives:

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

4. Reduction of toxicity, mobility, or volume via treatment refers to a remedial technology's expected ability to reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants at the site.

5. Short-term effectiveness addresses (a) the period of time needed to achieve protection and (b) any adverse impacts on human health and the environment that may be posed during the construction and implementation periods until cleanup goals are achieved.

6. Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed.

7. Cost includes estimated capital, operation and maintenance, and present-worth costs.

Finally, the following "modifying" criteria are considered fully after the formal public comment period on the proposed plan is complete:

8. State acceptance indicates whether, based on its review of the RI and the proposed plan, the state supports or opposes the preferred alternative and/or has identified any reservations with respect to the preferred alternative.

9. Community acceptance refers to the public's general response to the alternatives described in the proposed plan and the RI reports. Factors of community acceptance include support, reservation, or opposition by the community.

A comparative analysis of the six alternatives based on the nine evaluation criteria follows.

1. Overall Protection of Human Health and the Environment

   Under Alternatives 1 (No Action) and 2 (Institutional Actions), no actions would be taken to reduce levels of contamination in surface water or sediments that exceed criteria based on protection of human health and/or aquatic life. Neither alternative would reduce environmental risks or bioaccumulation hazards.

   Alternatives 3 through 6 would employ excavation to remove contaminated sediment, thereby reducing contaminant levels in the creek and the associated bioaccumulation hazards and environmental risks. More specifically, the Selected Remedy (Alternative 3) will prevent exposure to the public because contaminated sediment in the on-base portions and the off-base portions of the creek, in addition to Three Mile Creek Pond, will be excavated, thus preventing contact with contaminated sediments. Under the selected remedial alternative, the vast majority of contamination will be removed and any remaining contamination in the on-base portion of the creek and Three Mile Creek Pond is expected to be negligible. This Selected Remedy will also remove the majority of low-level contamination detected in the off-base creek sediments by targeting areas of deposition and areas with fine-grained, highly absorptive sediments. Further, the pathway to any low-level contamination remaining in the creek and pond following the removal action will be cut off from receptors by backfilling dredged areas with clean fill. In addition, an LTM program will be implemented in which sediments and surface water will be sampled annually and fish tissue samples will be sampled every three years. Although potential wildlife exposure and environmental risks will be reduced, excavation will temporarily destroy existing aquatic and benthic populations and habitat. However, re-population of the creek by these organisms following post-excavation restoration is expected.

   In New York State, NYSDOH has issued health advisories for all applicable streams, creeks and water bodies, including Three Mile Creek. These advisories provide general warnings or recommendations for recreational fisherman who may eat the fish. The NYSDOH Health Advisories are provided to all individuals who seek a NYS fishing license and can be obtained by contacting NYSDEC. NYSDOH has also issued a fish advisory for Three Mile Creek recommending that women of child-bearing age, infants, and children under the age of 15 should not eat any fish species from Three Mile Creek, and that other people should eat no more than one meal per month of white sucker from this creek. In addition, during the remediation of Three Mile Creek, health advisory signs will be posted near the creek.

Source control measures (e.g., planned capping of Landfills 5 and 6; removal, capping, and consolidation of construction and demolition debris from Hardfills 49c and 49d; removal of Landfill 4, and the removal of PCB-contaminated soils near the Electrical Power Substation) have been implemented to prevent re-contamination of the creek. Although Alternatives 4, 5, and 6 would use treatment technologies that satisfy the regulatory preference for treatment as a remedial action, they have no significant advantage in terms of reducing human health or environmental risks; therefore, the additional costs of these alternatives would not be justified.

2. Compliance with ARARs

Currently there are no chemical-specific ARARs for sediment at this site. Therefore, other non-promulgated federal and state advisories and guidance values, referred to as TBCs and background levels of the contaminants were used. Contaminant concentrations will not immediately comply with the ARARs for surface water and TBCs for sediment under the No Action alternative (Alternative 1) or Alternative 2.

Alternatives 4 through 6 require a variety of treatment and disposal technologies, each with respective action-specific ARARs. For each of these alternatives, compliance with ARARs will be accomplished because contaminated sediments will be removed from the creek and the transport of chemicals from the sediment to the surface water will be eliminated. The Selected Remedy will be designed to meet the substantive technical requirements of 6 NYCRR Part 663 Freshwater Wetland Permit Requirements and 6 NYCRR Part 608 Use and Protection of Waters, which are two NYS location-specific ARARs.

3. Long-term Effectiveness and Permanence

The No Action alternative (Alternative 1) would not allow for reliable protection of human health and the environment in the long term since no actions would be taken to reduce levels of contamination in surface water or sediments that exceed criteria based on protection of human health and/or aquatic life. Alternative 2, which calls for institutional actions only, would moderately reduce the potential for human receptor exposure to contaminants through access restriction; however, it would not provide adequate access restrictions for environmental receptors.

For Alternatives 3 through 6, no residual risks would remain because sediment excavation would eliminate the contaminated sediments from the creek and any potential future effects on human and ecological health. Long-term monitoring will be conducted annually to ensure the effectiveness of this alternative. Incineration under Alternative 4 and soil washing under Alternative 5 would provide a permanent method for remediating the majority of the contamination found at the site. Solvent extraction under Alternative 6, however, may be ineffective in remediating the organic-contaminated sediments at this site due to the problems inherent with the fine-grained nature of these sediments.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

   The No Action alternative (Alternative 1) and Alternative 2 do not provide any treatment or containment of contaminant migration, therefore, they do not result in any reduction of toxicity, mobility, or volume.

   Alternatives 4 through 6, would comply with the regulatory preference for treatment as a remedial action by irreversibly reducing contaminant concentration such that no residuals would remain following treatment. The Selected Remedy (Alternative 3) does not necessarily satisfy the preference for selecting remedial actions that employ treatment technologies permanently and significantly reducing the toxicity, mobility, or volume of the contaminants, since these factors are not reduced through excavation alone. The mobility of the contaminants will be limited through off-base disposal of sediment at an approved TSD facility or use of the sediment as grading material at Landfill 6 prior to installation of the impermeable cover over the landfill. If the contaminated sediments fail the toxicity characteristic leaching procedure (TCLP) tests or exceed 50 milligrams per kilogram PCBs, treatment to meet characteristic waste land disposal restrictions (LDR) or PCB LDR treatment standards would be required prior to disposal off base at an approved TSD facility. Historically, however, these levels have rarely been exceeded.

5. Short-term Effectiveness

   Since no remedial actions will be taken under the No Action alternative, there would be no adverse impacts to human health or the environment in the short term. Alternative 2 is expected to take four to six months to complete. There would be minor noise disturbances, as well as dust generation, associated with the construction of a fence under Alternative 2, however, as with the No Action alternative, no environmental impacts are expected.

   The duration of Alternatives 3 through 6 prior to the five-year environmental monitoring component is estimated at 18 to 24 months, 22 to 30 months, 24 to 36 months, and 34 to 54 months, respectively. The excavation phase for these alternatives would last for 6 to 9 months, 7 to 10 months, 8 to 12 months, and 11 to 18 months, respectively. These alternatives would temporarily produce dust, noise, and traffic disturbances in the community while they are implemented. These short-term effects could be minimized through prudent scheduling and the use of various engineering controls. Engineering controls will also be used to minimize sediment suspension and movement during excavation. Excavated sediments will be staged and covered to discourage accidental human or wildlife exposure. Dermal contact with the sediments by workers will be controlled with protective clothing. Although the excavation of the creek will temporarily destroy existing aquatic and benthic populations and habitat, re-population following site restoration is expected.

6. Implementability

There would be no limitations to implementing the No Action alternative (Alternative 1) or Alternative 2 and environmental monitoring would serve only to track naturally occurring reductions in contaminant concentrations.

The technology, services, equipment, materials, specialists, and labor are readily available to implement Alternatives 3 through 6 and they are likely locally available for Alternative 3. The excavation component will be relatively easy to implement for Alternatives 3 through 6. Dewatering will be performed utilizing standard techniques, which will be evaluated during the design stage. LTM sampling procedures will be conducted as outlined in the LTM plan. Transportation of contaminated sediments off base will be performed with 20-cubic yard, lined, and covered roll-offs. Diversion of the creek flow will be necessary throughout the duration of this project. Restoration of the physical and functional state of the creek will be performed in accordance with the Basewide Wetlands Management Plan that is jointly being developed with the EPA and NYSDEC. Implementation of this plan is likely to include work in and around Three Mile Creek in an effort to refine the remedy and to provide the best habitat possible. Restoration may include a combination of raising the base elevation of the creek bottom and the removal of discrete and discernible dredge spoil piles that were side-cast during the original excavation of the creek. In addition, the construction of riffle pools and meanders to improve the riparian conditions and habitat quality is being considered. The proposed restoration work will provide a quality habitat for returning aquatic organisms. These activities will be completed concurrently with the remedial actions in the creek.

Proven construction methods exist for both Alternatives 5 and 6 and proven operation methods exist for both Alternatives 4 and 5. However, the operation of solvent extraction of fine-grained sediments may be difficult or ineffective, thus favorable results of a treatability study as well as pilot -scale test would be required prior to implementation of Alternative 6. Soil washing under Alternatives 5 and 6 would also require favorable results of a treatability study prior to implementation.

7. Cost

The estimated costs for the six alternatives are provided in the table below. Although Alternative 3 costs in the millions of dollars, it is the least expensive of the active remediation alternatives. Moreover, Alternatives 4, 5, and 6 would have no significant advantage in terms of reducing human health or environmental risks, therefore, the additional costs of these alternatives would not be justified.

Cost Estimates for Three Mile Creek Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
No Action (includes LTM)	Institutional Actions and LTM	Sediment Excavation, Off-site Disposal, Clean Backfill, and LTM	Sediment Excavation, Off-site Incineration, Clean Backfill, and LTM	Sediment Excavation, Soil Washing, Off-site Disposal, Clean Backfill, and LTM	Sediment Excavation, Solvent Extraction and Soil Washing, Off-site Disposal, Clean Backfill, and LTM
$ 3,425,000	$ 3,789,630	$ 5,091,300	$ 18,024,800	$ 9,919,300	$ 14,499,500

Note: All alternative costs include $3,425,000 for long-term monitoring (LTM) for a period of 30 years.

8. Agency Acceptance

   AFRPA, NYSDEC, and EPA have mutually agreed to select the Remedial Action with long-term monitoring. The Selected Remedy satisfies the threshold criteria and ensures compliance with applicable regulations.

9. Community Acceptance

   Community acceptance of the Selected Remedy was assessed at the public meeting and during the public comment period.

2.11 Principal Threat Wastes

There are no principal threat wastes at the Three Mile Creek AOC.

2.12 Selected Remedy

The Selected Remedy for the Three Mile Creek AOC is excavation of contaminated sediments with long-term monitoring. Under the selected remedial approach, contaminated sediments will be excavated and characterized to determine placement/disposal location. Sediments determined to be non-hazardous will be used at Landfill 6 as grading material prior to installation of the impermeable cover over the landfill. Hazardous materials will be disposed off base at an authorized treatment, storage and disposal (TSD) facility.

As outlined in the 2002 Three Mile Creek Feasibility Study (FS) addendum, the Selected Remedy involves excavation along the entire length of the on-base portion of the creek, discrete and localized off-base portions of the creek, and Three Mile Creek Pond. This remedial action is required because concentrations of VOCs, SVOCs, pesticides, PCBs, metals, and dioxins exceeding criteria are present throughout this area (primarily in the on-base portion).

The selected cleanup scenario involves sediment excavation of the on-base portion of the creek to a uniform depth of 2.5 feet along the channel (approximate depth to native soil). In addition, the following localized areas will be excavated to a depth of 4 feet below the current creek bottom: the Landfill 5 tributary between sample locations LF5SD-1 and LF5SD-2; the north creek channel between sample locations TMCSD-1 and TMCSD-5; and the main creek channel between sample locations TMCSD-4 and TMCSD-7, TMCSD-8-1 and TMCSD-9-1, and TMCSD-10 and TMCSD-11 (see Figures 5 and 6).

Full-scale excavation of sediments is not warranted downstream of the base because contaminant concentrations are considerably lower in off-base sediments than in on-base sediments. From the base boundary through the pastureland, sediment will be excavated at 16 locations were contamination is localized in silt deposits (see Figure 7).

At Three Mile Creek Pond, where elevated levels of PCBs, cadmium, and lead were found, excavation of sediments to a depth of 3.5 feet across the entire pond will be performed (see Figure 8). There will be no direct remediation for the relatively low levels of contamination downstream of Three Mile Creek Pond or in the wetland area upstream of the pond.

The estimated volume of sediment to be removed includes: 7,100 cubic yards from the on-base portion of the creek; 80 cubic yards from the off-base portion of the creek; and 7,300 cubic yards from Three Mile Creek Pond. In addition, up to 1,700 cubic yards of dredge spoil piles that were side-cast during the original excavation of the on-base portion of the creek will be removed.

The sample results collected from the RI, SI, and the 2001 FS investigations (vertical profile sampling along the on-base portion of Three Mile Creek and at Three Mile Creek Pond was performed to define the vertical and lateral extent of contamination) were used in the development of this Selected Remedy. To determine the required depth of contaminated sediment removal, the sampling results were compared to federal and New York State sediment guidance values. Based on this review, the Selected Remedy is expected to reduce the levels of sediment contamination in the on-base portion of the creek and the pond as follows: PCBs from 110 ppm to approximately 1 ppm or less;

VOCs from greater than100 ppm to approximately 1 ppm or less; and for metals such as lead from greater than 900 ppm to approximately 50 ppm or less. The Selected Remedy will result in the removal of the vast majority of sediment contamination. Any remaining contamination in the on-base portion of the creek and the pond is expected to be negligible. The Selected Remedy will also remove the majority of low-level contamination detected in the off-base creek sediments by targeting the removal of areas of deposition and areas with fine-grained, highly absorptive sediments. Further, the pathway to any low-level contamination remaining in the creek and pond following the removal action will be cut off from receptors by backfilling dredged areas with clean fill to minimize exposure to any remaining isolated low-level sediment contamination.

All excavated on-base and off -base portions of the creek, and the pond, will be backfilled with clean soil to a minimum of 2.5 feet for the entire on-base portion of the creek and a minimum of 1.5 feet for the pond. The final backfill elevations will be further developed during the remedial design, and will provide for a shallow habitate zone in the pond. Restoration of the physical and functional state of the creek will be performed according to a remedial design to be developed with the EPA and NYSDEC. The goal of the design will be to restore the aquatic habitat of the creek as well as provide restoration and enhancement of wetlands associated with the on-base portion of the creek. The design will be consistent with state wetland and stream regulations (6 NYCRR Part 663 and 608) and restoration activities will be completed concurrently with the remedial action.

Source control is also a key factor in the restoration process for Three Mile Creek and its surrounding habitats. The processes that created the chemicals discharged to floor drains and sumps are no longer being conducted and investigations and cleanups are ongoing (e.g., plugging of various floor drains and decommissioning of various drywells). Additional source control measures include the remedial actions being taken at other sites within the Three Mile Creek drainage basin (capping of Landfill 5 and planned capping of Landfill 6; removal, capping, and consolidation of construction and demolition debris from Hardfills 49c and 49d; removal of Landfill 4; and the removal of PCB-contaminated soils near the Electrical Power Substation).

A long-term monitoring (LTM) program, including surface water, sediment and fish tissue sampling, will be implemented following remediation and site restoration to confirm the effectiveness of the remedy and ensure the continued protection of human health and the environment. Annual monitoring of surface water and sediments will be performed and samples analyzed for VOCs, SVOCs, metals, pesticides, and PCBs. Fish tissue samples will be collected one year after the remediation and every third year thereafter, and analyzed for metals, pesticides and PCBs. A benthic community analysis will be performed one year after the remediation and every third year thereafter. The long-term monitoring plan will be developed with the EPA, NYSDEC, and NYSDOH and they will review the data generated during the program to determine whether any additional actions are necessary. If the results of the long-term monitoring indicate that fish tissue levels do not decline or the ecological community does not recover, additional investigation or remediation may be necessary.

2.13 Statutory Determinations

The AFRPA and EPA, with concurrence from NYSDEC, have determined that remedial action (sediment excavation, off-site disposal, and clean backfill) with long-term monitoring is warranted for this site. The Selected Remedy is protective of human health and the environment, complies with federal and NYS ARARs, is cost effective, and utilizes permanent solutions to the extent possible. Although this remedy does not use treatment as a principal element of the remedy it accomplishes the required end result of protection of human health and the environment.

Five-year reviews will be performed by the Air Force, in conjunction with the EPA and NYSDEC, to ensure that the Selected Remedy is still performing as planned and is protective of public health and the environment.

2.14 Documentation of Significant Changes

No significant changes have been made to the Selected Remedy from the time the proposed plan was released for public comment.

3 Responsiveness Summary

On Thursday, July 24, 2003, AFRPA, following consultation with and concurrence of the EPA and NYSDEC, released for public comment the proposed plan for source control/long-term monitoring at the Three Mile Creek AOC located at the former Griffiss AFB. The release of the proposed plan initiated the public comment period, which concluded on August 23, 2003.

During the public comment period, a public meeting was held on Tuesday, August 5, 2003, at 05:00 p.m. at the Plumley Auditorium, Mohawk Valley Community College, Rome Campus, Floyd Avenue, Rome, New York, to present the selected remedies for Three Mile Creek and Six Mile Creek. A court reporter recorded the proceedings of the public meeting. Copies of the transcript and attendance list are included in the Administrative Record. The public comment period and the public meeting were intended to elicit public comment on the proposed plan for this site.

This document summarizes and provides responses to the verbal comments received at the public meeting and the written comments received during the public comment period.

ORAL COMMENTS

Comment #1

The commentor asked why there have not been signs posted on the creeks warning against fishing and fish consumption although it has been continually requested. When informed of the fish advisory at Three Mile Creek, he mentioned the kids fishing there and asked whether AFRPA is prevented from posting signs. He also stated that he doesn't care about the other streams in New York State; he just cares about these two creeks and feels it is an "inexpensive pacifier" compared to the millions being spent on this project.

Response #1

NYSDOH has issued a health advisory for Three Mile Creek recommending that women of childbearing age, infants and children under the age of 15 should not eat any fish species from Three Mile Creek, and that other people should eat no more than one meal per month of white sucker from this creek. The NYSDOH health advisories are issued independent of the CERCLA process and are provided to all individuals who seek a NYS fishing license and a copy can be obtained by contacting NYSDEC. It is not common practice to post signs at these streams. This request has been discussed with the EPA, NYSDEC, and NYSDOH and it has been decided that signs will be posted at Three Mile Creek during the remedial action and removed when the action is completed.

The response for Six Mile Creek is presented in the Six Mile Creek ROD.

Comment #2

The commentor asked whether the long-term monitoring surface water and sediment sampling locations have been established and whether there will be any off-base downstream locations all the way down to the NYS Barge Canal.

Response #2

During the Remedial Investigation (RI) and Supplemental Investigation (SI), surface water and sediment samples were collected from Three Mile Creek downstream to the NYS Barge Canal. A long-term monitoring (LTM) plan will incorporate the results of the RI and SI sampling efforts in conjunction with the proposed remedial actions for the creek in determining the appropriate monitoring sample locations. A draft long-term monitoring plan has been prepared and is currently under review by the EPA and NYSDEC. Presently the AFRPA does not plan to sample downstream of the pond at Three Mile Creek, however, the draft LTM plan has provisions to include additional downstream sample points if during the review of the LTM data, additional sample points are warranted.

The response for Six Mile Creek is presented in the Six Mile Creek ROD.

Comment #3

The commentor asked whether there have been any recent studies, or whether there will be any future studies of the "higher incidence of cancer in this area."

Response #3

NYSDOH completed a study for the Rome/Floyd area, which covered the time period for the years 1978-1987. Cancer rates by zip code are available on the NYSDOH website, www.health.state.ny.us. No additional studies are planned for the area. The commentor was contacted directly by a NYSDOH cancer specialist to discuss cancer and her concerns.

WRITTEN COMMENTS

Two letters were received during the public comment period. One report was received from Stearns and Wheeler Companies, consultant to the Restoration Advisory Board (RAB) under the Technical Assistance for Public Participation (TAPP) program. A second letter was received from a private citizen.

Comment #4 (RAB consultant)

"The remedial action objectives (RAOs) should more explicitly state the need to maintain the creeks' Class C status (suitable for fish survival and propagation). As written, the RAO[s] reference protecting "the environment," without specifics. This is potentially significant, because the measurables against which the remedy's effectiveness is to be evaluated need to be clearly defined."

Response #4

The RAOs have been revised to include statements concerning the need to maintain Three Mile Creek's Class C status.

Comment #5 (RAB consultant)

"Human consumption of fish should be more aggressively discouraged by posting signs along the creeks. This is easily done, and inexpensive."

Response #5:

NYSDOH has issued a health advisory for Three Mile Creek recommending that women of childbearing age, infants and children under the age of 15 should not eat any fish species from Three Mile Creek, and that other people should eat no more than one meal per month of white sucker from this creek. The NYSDOH health advisories are issued independent of the CERCLA process and are provided to all individuals who seek a NYS fishing license and a copy can be obtained by contacting NYSDEC. It is not common practice to post signs at these streams. This request has been discussed with the EPA, NYSDEC, and NYSDOH and it has been decided that signs will be posted at Three Mile Creek during the remedial action and removed when the action is completed.

The response for Six Mile Creek is presented in the Six Mile Creek ROD.

Comment #6 (RAB consultant)

"The five-year reviews of remedial progress in the creek[s] will also need to integrate the remedial status at the various other source AOCs."

Response #6

During the performance of the five-year reviews, all source AOCs with an executed ROD requiring a five-year review will be evaluated collectively. The first five-year review is scheduled for 2004 and will include many of the source AOCs affecting Three Mile Creek.

Comment #7 (RAB consultant)

"It will be difficult to judge the effectiveness of the proposed remediation until after the remediation at the other AOCs is substantially completed."

Response #7

All of the known potential source sites have undergone or will undergo remedial action in the next few years. AFRPA acknowledges this comment and an LTM program will be implemented with the intent to determine whether or not the ongoing and completed remedial actions at the potential source sites have the intended results of reducing contamination in the creek environment. The data will be reviewed by EPA, NYSDEC, and NYSDOH to assess whether the contamination levels are associated with former Griffiss AFB potential sources or background conditions (e.g. storm water runoff) and will take appropriate actions if warranted.

Comment #8 (RAB consultant)

"In addition to the planned five-year reviews, annual data summaries should be made available for TAPP Subcommittee review. The annual summaries would not necessarily include extensive interpretations or recommendations (which are to be provided in the five-year review), but will be useful for the subcommittee to develop a preliminary assessment after the fourth year, in preparation for the five-year review.

Response #8

The data obtained throughout the performance of the LTM program will be forwarded to the EPA and NYSDEC on an annual basis and will be made available to the TAPP Subcommittee. The data will also be available to the public through the Administrative Record.

Comment #9 (RAB consultant)

"Groundwater contamination from AOCs that drain into the creek does not appear to be a primary source for the main contaminants of concern the creek sediments and fish tissue (polychlorinated biphenyls [PCBs], pesticides, and metals). The effects of groundwater in the creek can be more clearly assessed after the other sources (i.e., other AOCs) have been remediated."

Response #9

All of the known potential source sites have undergone or will undergo remedial action within the next few years. AFRPA acknowledges this comment and will review the progress and effectiveness of the remedial efforts collectively.

Comment #10 (RAB consultant)

As a conclusion, TAPP stated that, "The above noted observations are not significant enough to discredit the proposed remedial programs. Overall, the proposed remedial action plans for the creeks are considered to be appropriate, and derived in a manner consistent with regulatory statute. However, because the effectiveness of the creek remediation will be directly related to the success of remediation at the other AOCs, and because the implementation of remedial programs at the other AOCs will take a number of years to complete, it may be many years before the success of the creek remedial program is apparent.

Response #10

AFRPA acknowledges this comment and an LTM program will be implemented with the intent of determining whether or not the ongoing and completed remedial actions at the potential source sites have the intended results of reducing contamination in the creek environment. The data will be reviewed to assess whether the contamination levels are associated with former Griffiss AFB potential sources or background conditions (e.g. storm water runoff) and will take appropriate actions if warranted.

Comment #11 (private citizen)

The commentor stated that she was pleased with the proposed Three Mile Creek clean up but questioned the assessment of Six Mile Creek.

Response #11

Comment noted for the Three Mile Creek proposed alternative. The complete comment and response to the proposed alternative for Six Mile Creek is presented in the Six Mile Creek ROD.

4 References

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__________, November 1985, *Installation Restoration Program Phase II - Problem Confirmation and Quantification Study Stage 2, Griffiss Air Force Base, Rome, New York*, prepared for United States Air Force, Brooks AFB, Texas.

A Tables

Table 1
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK AOC
RI COMPOSITE WHOLE-BODY FISH TISSUE SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
Pesticides/PCBs (mg/kg)			
4,4'- DDT and metabolites	0.023 - 0.21	1/11	0.2 [a]
Aldrin	0.076 J - 0.146 J	3/11	0.022 [a]
PCBs (Aroclor 1260)	0.028 J - 32.5	7/11	0.11 [a]
Metals (mg/kg)			
Mercury	0.122 - 0.64	1/10	0.5 [a]

[a] NYSDEC Ecological Risk Guidelines for Piscivorous Wildlife.

Key:
J - estimated concentration

Table 2
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK AOC
RI SURFACE WATER SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (μg/L)			
cis-1,2-Dichloroethene	0.12 J - 0.19 J	3/12	0.033 [a,b]
SVOCs (μg/L)			
Acenaphthylene	0.015 J	1/12	0.0028 [a,b]
Anthracene	0.004 J - 0.04 J	6/12	0.0028 [a,b]
Benzo(a)anthracene	0.03 J - 0.1	3/12	0.0028 [a,b]
Benzo(a)pyrene	0.003 J - 0.12 J	5/12	0.0028 [a,b]
Benzo(b)fluoranthene	0.007 J - 0.2 J	6/12	0.0028 [a,b]
Benzo(g,h,i)perylene	0.031 J - 0.1 J	3/12	0.0028 [a,b]
Benzo(k)fluoranthene	0.028 J - 0.076 J	4/12	0.0028 [a,b]
Bis(2-ethylhexyl)phthalate	0.6 J - 0.8 J	2/12	0.6 [a,c]
Chrysene	0.0079 J - 0.2 J	6/12	0.0028 [a,b]
Dibenzo(a,h)anthracene	0.03 J	1/12	0.0028 [a,b]
Fluorene	0.011 J - 0.04 J	3/12	0.0028 [a,b]
Hexachlorobenzene	0.032 J	1/12	0.00072 [a,b]
Indeno(1,2,3-cd)pyrene	0.05 J - 0.1 J	3/12	0.0028 [a,b]
Phenanthrene	0.09 J - 0.26 J	9/12	0.0028 [a,b]
Pyrene	0.014 J - 0.3 J	10/12	0.0028 [a,b]
Pesticides/PCBs (μg/L)			
alpha-Chlordane	0.012 J	1/12	0.002 [a,b]
gamma-Chlordane	0.014 J	1/12	0.002 [a,b]
4,4'- DDT	0.089 - 0.1	3/12	0.001 [a,c]
Malathion	0.21 J	1/12	0.1 [d]
Metals (mg/L)			
Aluminum	0.0095 - 0.37	2/12	0.1 [d]
Arsenic	0.003 - 0.003	2/12	0.0000022 [a,b]
Iron	0.058 - 0.59	2/12	0.3 [d]
Lead	0.002 - 0.01	6/12	0.001 [d]
Manganese	0.008 - 0.099	5/12	0.05 [a,b]
Selenium	0.005	1/12	0.001 [d]
Zinc	0.01 - 0.18	3/12	0.045 [a,c]

[a] Federal Aquatic Water Quality Criterion (AWQC), EPA 440/5-86-001, May 1, 1987.

[b] AWQC for protection of human health.

[c] AWQC for protection of aquatic organisms.

[d] NYSDEC Surface Water Standard for protection of aquatic organisms (Class C).

Key:
J - estimated concentration

Table 3
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK AOC
RI SEDIMENT SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (μg/kg)			
Benzene	4 J - 10,000 D	4/30	6 [a,b]
Chlorobenzene	1 J - 160,000 D	4/30	35 [a,c]
Vinyl chloride	3 J	1/30	0.7 [a,b]
SVOCs (μg/kg)			
1,2-Dichlorobenzene	15 J - 1,700	8/34	120 [a,c]
1,4-Dichlorobenzene	36 J - 5,600	7/34	120 [a,c]
2-Methylnaphthalene	60 J - 20,000	16/34	70 [f]
Acenaphthene	12 J - 31,000	17/34	16 [f]
Acenaphthylene	13 J - 810 J	14/34	44 [f]
Anthracene	29 J - 40,000	26/34	85 [f]
Benzo(a)anthracene	64 J - 89,000	27/34	13 [a,b]
Benzo(a)pyrene	63 J - 62,000	33/34	13 [a,b]
Benzo(b)fluoranthene	140 J - 73,000	29/34	13 [a,b]
Benzo(k)fluoranthene	71 J - 49,000	29/34	13 [a,b]
Bis(2-chloroethyl)ether	100 J	1/34	0.3 [a,b]
Bis(2-ethylhexyl)phthalate	64 J - 3,800 J	1/35	1995 [a,b]
Chrysene	71 J - 77,000	30/34	13 [a,b]
Dibenzo(a,h)anthracene	59 J - 16,000 J	16/35	63.4 [f]
Fluoranthene	150 J - 20,000	26/34	600 [f]
Fluorene	130 J - 34,000	23/34	19 [f]
Indeno(1,2,3-cd)pyrene	180 J - 40,000	24/34	13 [a,b]
Naphthalene	74 J - 56,000	14/34	160 [f]
Pentachlorophenol	10,000 - 260,000	2/34	400 [a,c]
Phenanthrene	100 J - 190,000	28/34	240 [f]
Phenol	370 J - 660 J	4/34	5 [a,c]
Pyrene	110 J - 140,000	26/34	665 [f]

[a] NYSDEC Technical Guidance for Screening Contaminated Sediments, November 1993.

[b] Human Health Bioaccumulation (assuming 1% organic carbon in sediment).

[c] Benthic Aquatic Life Chronic Toxicity (assuming 1% carbon in sediment).

[d] Wildlife Bioaccumulation (assuming 1% organic carbon in sediment).

[e] Lowest Effect Level, Sediment Criteria for Metals.

[f] Effects Range - Low (Long, MacDonald, Smith, and Calder, 1995).

Key:
J - estimated concentration
D - result from diluted sample

Table 3 (Cont.)
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK AOC
RI SEDIMENT SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
Pesticides/PCBs (µg/kg)			
4,4'- DDD	9.8 J - 990	8/24	0.1 [a,b]
4,4'- DDE	5.5 J - 870	7/30	0.1 [a,b]
4,4'- DDT	66 J - 480	3/30	0.1 [a,b]
Aldrin	3.8 J - 21.4 J	6/30	1 [a,b]
alpha-BHC	0.88 J - 2.5	2/30	0.6 [a,c]
beta-BHC	2.1 J - 7.5	2/30	0.6 [a,c]
delta-BHC	3.4 J	1/30	0.6 [a,c]
alpha-Chlordane	2.2 J - 240	13/30	0.01 [a,b]
gamma-Chlordane	10 J - 37	3/30	0.01 [a,b]
Dieldrin	8.8 J - 62 J	3/30	1 [a,b]
alpha -Endosulfan	2.4 J	1/30	0.3 [a,c]
Endrin	13 J - 540	3/30	8 [a,b]
Guthion (Azinphos-methyl)	79 J - 230 J	4/30	0.01 [a,c]
Heptachlor epoxide	70	1/30	0.008 [a,b]
Mirex	170	1/24	0.7 [a,b]
Parathion, Ethyl	45	1/24	0.03 [a,c]
Parathion, Methyl	2.9 J - 120	2/24	0.03 [a,c]
PCB 1254	1,230 - 1,500	2/30	0.008 [a,b]
PCB 1260	330 - 110,000	25/30	0.008 [a,b]
Dioxins/Furans (µg/kg)			
2,3,7,8- TCDD	0.00077 - 0.033	8/35	0.002 [a,d]
Metals (mg/kg)			
Arsenic	1 - 50.2	14/31	6.0 [a,e]
Cadmium	1.6 - 29.4	12/31	0.6 [a,e]
Chromium	5.8 - 65.8	12/31	26 [a,e]
Copper	8.4 - 126	21/31	16 [a,e]
Lead	17.3 - 316	27/31	31 [a,e]
Manganese	70.8 - 1210	5/31	460 [a,e]
Mercury	0.2 - 0.94	15/31	0.15 [a,e]
Nickel	5.5 - 43.3	20/31	16 [a,e]
Silver	1.2 - 3.190	12/31	1 [a,e]
Zinc	39.1 - 319	16/31	120 [a,e]

[a] NYSDEC Technical Guidance for Screening Contaminated Sediments, November 1993.

[b] Human Health Bioaccumulation (assuming 1% organic carbon in sediment).

[c] Benthic Aquatic Life Chronic Toxicity (assuming 1% carbon in sediment).

[d] Wildlife Bioaccumulation (assuming 1% organic carbon in sediment).

[e] Lowest Effect Level, Sediment Criteria for Metals.

[f] Effects Range - Low (Long, MacDonald, Smith, and Calder, 1995).

Key:
J - estimated concentration
D - result from diluted sample

Table 4
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
LANDFILL 5 DRAINAGE SWALE PCB INVESTIGATION, 1997
SEDIMENT SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
Pesticides/PCBs (µg/kg)			
PCB 1242	130	1/14	0.008 [a,b]
PCB 1260	50 - 65,070	12/14	0.008 [a,b]

[a] NYSDEC Technical Guidance for Screening Contaminated Sediments, November 1993.

[b] Human Health Bioaccumulation (assuming 1% organic carbon in sediment).

Table 5
PESTICIDES DETECTED IN PISCES SAMPLES
THREE MILE CREEK SUPPLEMENTAL INVESTIGATION

Compound	Frequency of Detection	Range of Detected Concentrations
Pesticides (μg)		
4,4'- DDD	1/3	0.0066 J
Dieldrin	2/3	0.0066 J - 0.025 J
Endosulfan sulfate	2/3	0.0088 J - 0.013 J
gamma-BHC (Lindane)	2/3	0.0058 J - 0.017 J

Key:
J - estimated concentration

Table 6
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK AOC
SI SURFACE WATER SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
Metals (mg/L)			
Aluminum	0.14	1/2	0.1 [a]
Iron	0.33 - 0.48	2/2	0.3 [a]
Lead	0.002 - 0.006	1/2	0.0063 [a,b]
Manganese	91 - 180	2/2	0.1 [c]

[a] NYSDEC Surface Water Standard for protection of aquatic organisms (Class C).

[b] Value based on hardness.

[c] EPA Water Quality Criterion (WQC) for protection of human health, consumption of organisms, Volume 64 No. 77/Notices, April 1999

Table 7
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK AOC
SI SEDIMENT SAMPLES

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
SVOCs (μg/kg)			
2-Methylnaphthalene	88 - 440 J	2/10	70[a]
4-Methylphenol	100 J	1/10	26[b,c]
Acenaphthene	59 J - 1,200	5/10	16[a]
Acenaphthylene	70 J	1/10	44[a]
Anthracene	81 J - 1,200	7/10	85[a]
Benzo(a)anthracene	97 J - 2,000	9/10	68[b,d]
Benzo(a)pyrene	120 J - 1,700	9/10	68[b,d]
Benzo(b)fluoranthene	89 J - 1,600	9/10	68[b,d]
Benzo(g,h,i)perylene	54 J - 500	5/10	170[e]
Benzo(k)fluoranthene	140 J - 2,100	9/10	68[b,d]
Chrysene	140 J - 2,000	9/10	68[b,d]
Dibenzo(a,h)anthracene	58 J - 250 J	5/10	60[e]
Fluoranthene	470 - 3400	6/10	600[a]
Fluorene	68 J - 910	6/10	19[a]
Indeno(1,2,3-cd)pyrene	54 J - 250 J	6/10	68[b,d]
Naphthalene	89 J - 1,200	2/10	160[a]
Phenanthrene	110 J - 4,000	8/10	240[a]
Pyrene	46 J - 4,900	7/10	490[e]
Pesticides/PCBs (μg/kg)			
4,4'- DDD	7.6 J	1/10	0.52[b,d]
PCB 1260	27 - 590	10/10	0.042[b,d]
Metals (mg/kg)			
Arsenic	1.6 - 8.9	1/10	6[e]
Cadmium	1.4 - 3.9	10/10	0.6[e]
Copper	9.6 - 24	4/10	16[e]
Lead	7.4 - 50	4/10	31[e]
Manganese	140 - 740	2/10	460[e]

[a] Effects Range - Low (Long, MacDonald, Smith, and Calder, 1995).

[b] NYSDEC Technical Guidance for Screening Contaminated Sediments, November 1993.

[c] Benthic Aquatic Life - Chronic (assuming 5.24% organic carbon in sediment).

[d] Human Health Bioaccumulation (assuming 5.24% organic carbon in sediment).

[e] Lowest Effect Level, Guidelines for the Protection and Management of Aquatic Sediments Quality in Ontario, June 1994.

NOTE:
The percent of TOC in the sediment affects the screening criteria. During the SI, the TOC was calculated based on the collection and analysis of many samples; an average TOC of 5.24% was then used for Tables 7, 9, and 10, and the criteria changed accordingly. The previous TOC of 1% reported in Tables 3 and 4 is commonly used when TOC is not measured or the number of samples is limited.

Key:
J - estimated concentration

Table 8
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK AOC FEASIBILITY STUDY
SEDIMENT SAMPLES FROM THREE MILE CREEK POND

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
PCBs (μg/kg)			
PCB 1260	12.0 J - 2,100	18/18	0.042[a,b]
Metals (mg/kg)			
Cadmium	1.9 J - 176	15/18	0.6[c]
Lead	1.7 - 189	8/18	31[c]

[a] NYSDEC Technical Guidance for Screening Contaminated Sedi ments, January 1999.

[b] Human Health Bioaccumulation (assuming 5.24% organic carbon in sediment).

[c] Lowest Effect Level, Guidelines for the Protection and Management of Aquatic Sediments Quality in Ontario, June 1994.

Key:
J - estimated concentration

Table 9
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK FEASIBILITY STUDY
SEDIMENT SAMPLES FROM THREE MILE CREEK
AND LANDFILL 5 TRIBUTARY

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
VOCs (µg/kg)			
1,1,2,2-Tetrachloroethane	257 J	1/31	16 [a,b]
Benzene	9.16 J - 2,980	4/31	31 [a,b]
Chlorobenzene	1.55 J - 111,000	4/31	183[a,c]
Trichloroethene	2.36 J - 205 J	1/31	105[a,b]
Vinyl chloride	5.98 J - 9.04 J	3/31	3.7[a,b]
SVOCs (µg/kg)			
1,2-Dichlorobenzene	85 J - 7,500	6/31	629[a,c]
1,4-Dichlorobenzene	127 J - 5,140	4/31	629[a,c]
2,4-Dimethylphenol	204 J	1/31	26[a,c]
2-Methylnaphthalene	78.9 J - 13,700	15/31	70[e]
2-Methylphenol	882 J	1/31	26[a,c]
4-Methylphenol	250 J - 3,110 J	4/31	26[a,c]
Acenaphthene	51.8 J - 17,000	23/31	16[e]
Acenaphthylene	76.6 J - 4,430	23/31	44[e]
Anthracene	37.7 J - 37.900 J	26/31	85[e]
Benzo(a)anthracene	69.5 J - 57,300	29/31	68[a,b]
Benzo(a)pyrene	57.5 J - 42,500	29/31	68[a,b]
Benzo(b)fluoranthene	58.1 J - 32,300	29/31	68[a,b]
Benzo(g,h,i)perylene	79.3 J - 24,600	22/31	170[f]
Benzo(k)fluoranthene	67.0 J - 32,100	26/31	68[a,b]
Chrysene	76.1 J - 54,600	29/31	68[a,b]
Dibenzo(a,h)anthracene	77.7 J - 16,600	23/31	60[f]
Dibenzofuran	102 J - 21,500	5/31	2000[g]
Fluoranthene	167 - 139,000	23/31	600[e]
Fluorene	63.8 J - 24,800	23/31	19[e]
Indeno(1,2,3-cd)pyrene	131 J - 19,500 J	26/31	68[a,b]
Naphthalene	68.1 J - 41,100 J	16/31	160[e]
Phenanthrene	96.0 J - 156,000	24/31	240[e]
Phenol	1360 J	1/31	26[a,c]
Pyrene	153 J - 99,600	22/31	490[f]

[a] NYSDEC Technical Guidance for Screening Contaminated Sediments, January 1999.

[b] Human Health Bioaccumulation (assuming 5.24% organic carbon in sediment).

[c] Benthic Aquatic Life - Chronic (assuming 5.24% organic carbon in sediment).

[d] Wildlife Bioaccumulation (assuming 5.24% organic carbon in sediment).

[e] Effects Range - Low (Long, MacDonald, Smith, and Calder, 1995).

[f] Lowest Effect Level, Guidelines for the Protection and Management of Aquatic Sediments Quality in Ontario, June 1994.

[g] Sediment Quality Benchmark, USEPA OSWER Interim sediment criteria for non-polar contaminants, January 1996.

[h] Effects Range - Low (Long & Morgan, 1991).

NOTE:
The percent of TOC in the sediment affects the screening criteria. During the SI, the TOC was calculated based on the collection and analysis of many samples; an average TOC of 5.24% was then used for Tables 7, 9, and 10, and the criteria changed accordingly. The previous TOC of 1% reported in Tables 3 and 4 is commonly used when TOC is not measured or the number of samples is limited.

Key:
J - estimated concentration

N - Identification tentative

Table 9 (Cont.)
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK FEASIBILITY STUDY
SEDIMENT SAMPLES FROM THREE MILE CREEK AND LANDFILL 5 TRIBUTARY

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
Pesticides/PCBs (µg/kg)			
4,4'- DDD	2.42 NJ - 149 NJ	19/31	0.52 [a,b]
4,4'- DDE	0.435 NJ - 20.5 NJ	2/31	0.52 [a,b]
4,4'- DDT	1.15 NJ - 471 NJ	20/31	0.52 [a,b]
Aldrin	24.9 NJ - 1,560 NJ	10/31	5.2 [a,b]
alpha-Chlordane	1.5 NJ - 32 NJ	14/31	0.052 [a,b]
delta-BHC	12.4 NJ	1/31	3.1 [a,b]
Dieldrin	3.62 NJ - 33.5 NJ	4/31	0.02 [h]
Endosulfan I	2.64 NJ - 1,040 NJ	10/31	1.6 [a,c]
Endosulfan II	3.45 NJ	1/31	1.6 [a,c]
Endrin	3.82 NJ - 209 NJ	3/31	3 [f]
gamma -BHC	5.98 NJ	1/31	3 [f]
gamma-Chlordane	0.705 NJ - 104 NJ	16/31	0.052 [a,b]
Heptachlor	3.53 NJ - 4.02 NJ	2/31	0.042 [a,b]
Heptachlor epoxide	1.25 NJ - 131 NJ	14/31	0.042 [a,b]
Methoxychlor	50.6 NJ - 1,760 NJ	3/31	31.4 [a,c]
PCB 1242	71.4 J	1/31	0.042 [a,b]
PCB 1260	17.7 J - 45,300	29/31	0.042 [a,b]
Dioxins/Furans (ng/kg)			
2,3,7,8- TCDD equivalents	0.02 - 72.1	11/30	10 [a,d]
Metals (mg/kg)			
Arsenic	1.8 - 46.5	20/31	6 [f]
Cadmium	0.29 J - 40.4	14/31	0.6 [f]
Chromium	4.7 - 240	11/31	26 [f]
Copper	12.2 - 97.0	21/31	16 [f]
Iron	8,800 J - 28,500	11/31	20,000 [f]
Lead	2.6 - 921	21/31	31 [f]
Manganese	84.1 J - 1,280 J	2/31	460 [f]
Mercury	0.022 J - 0.65 J	13/31	0.15 [f]
Nickel	6.1 - 28.7	12/31	16 [f]
Zinc	31.2 - 224	8/31	120 [f]

[a] NYSDEC Technical Guidance for Screening Contaminated Sediments, January 1999.

[b] Human Health Bioaccumulation (assuming 5.24% organic carbon in sediment).

[c] Benthic Aquatic Life - Chronic (assuming 5.24% organic carbon in sediment).

[d] Wildlife Bioaccumulation (assuming 5.24% organic carbon in sediment).

[e] Effects Range - Low (Long, MacDonald, Smith, and Calder, 1995).

[f] Lowest Effect Level, Guidelines for the Protection and Management of Aquatic Sediments Quality in Ontario, June 1994.

[g] Sediment Quality Benchmark, USEPA OSWER Interim sediment criteria for non-polar contaminants, January 1996.

[h] Effects Range - Low (Long & Morgan, 1991).

NOTE:
The percent of TOC in the sediment affects the screening criteria. During the SI, the TOC was calculated based on the collection and analysis of many samples; an average TOC of 5.24% was then used for Tables 7, 9, and 10, and the criteria changed accordingly. The previous TOC of 1% reported in Tables 3 and 4 is commonly used when TOC is not measured or the number of samples is limited.

Key:
J - estimated concentration

N - identification tentative

Table 10
COMPOUNDS EXCEEDING STANDARDS AND GUIDANCE VALUES
THREE MILE CREEK FEASIBILITY STUDY
NATIVE SOIL/SEDIMENT SAMPLES FROM THREE MILE CREEK AND LANDFILL 5 TRIBUTARY

Compound	Range of Detected Concentrations	Frequency of Detection Above Most Stringent Criterion	Most Stringent Criterion
SVOCs (µg/kg)			
2-Methylnaphthalene	938 J	1/16	70[a]
Acenaphthene	1830	1/16	16[a]
Acenaphthylene	90.6 J	1/16	44[a]
Anthracene	57.8 J - 4370	2/16	85[a]
Benzo(a)anthracene	114 J - 6520	3/16	26[b,c]
Benzo(a)pyrene	101 J - 5,250	3/16	26[b,c]
Benzo(b)fluoranthene	92.0 J - 6,090	3/16	26[b,c]
Benzo(g,h,i)perylene	70.3 J - 1,590	1/16	170[e]
Benzo(k)fluoranthene	78.0 J - 3,950	3/16	26[b,c]
Chrysene	122 J - 6,470	3/16	26[b,c]
Dibenzo(a,h)anthracene	71.3 J - 1,160	2/16	60[e]
Fluoranthene	48.0 - 14,900	1/16	600[a]
Fluorene	2,000	1/16	19[a]
Indeno(1,2,3-cd)pyrene	149 J - 3,530	3/16	26[b,c]
Naphthalene	2,730	1/16	160[a]
Phenanthrene	70.4 J - 15,500	1/16	240[a]
Pyrene	52.8 J - 6,170	1/16	490[e]
Pesticides/PCBs (µg/kg)			
4,4'- DDD	0.429 NJ - 190 NJ	4/16	0.2[b,c]
4,4'- DDT	0.519 NJ - 2,240 NJ	5/16	0.2[b,c]
alpha-Chlordane	0.234 NJ - 0.977 NJ	4/16	0.02[b,c]
Dieldrin	2.12 NJ	1/16	0.02[f]
Endosulfan I	0.582 NJ - 0.715 NJ	1/16	0.6[b,d]
gamma-Chlordane	0.330 NJ	1/16	0.02[b,c]
Heptachlor	0.966 NJ	1/16	0.016[b,c]
Heptachlor epoxide	0.730 NJ - 168 NJ	5/16	0.016[b,c]
Methoxychlor	32.3 NJ	1/16	12[b,d]
PCB 1260	8.58 J- 1,790	8/16	0.016[b,c]
Metals (mg/kg)			
Arsenic	0.83 J - 14.8	5/16	6[e]
Copper	6.8 - 35.7	4/16	16[e]
Iron	7,160 - 27,300	1/16	20,000[e]
Lead	2.4 - 92.6	1/16	31[e]
Manganese	178 - 877	3/16	460[e]
Nickel	5.2 - 18.6	1/16	16[e]

[a] Effects Range - Low (Long, MacDonald, Smith, and Calder, 1995).

[b] NYSDEC Technical Guidance for Screening Contaminated Sediments, January 1999.

[c] Human Health Bioaccumulation (assuming 2% organic carbon in sediment).

[d] Benthic Aquatic Life - Chronic (assuming 2% organic carbon in sediment).

[e] Lowest Effect Level, Guidelines for the Protection and Management of Aquatic Sediments Quality in Ontario, June 1994.

[f] Effects Range - Low (Long & Morgan, 1991).

NOTE:
The percent of TOC in the sediment affects the screening criteria. During the SI, the TOC was calculated based on the collection and analysis of many samples; an average TOC of 5.24% was then used for Tables 7, 9, and 10, and the criteria changed accordingly. The previous TOC of 1% reported in Tables 3 and 4 is commonly used when TOC is not measured or the number of samples is limited.

Key:
J - estimated concentration

N - identification tentative

Table 11
RISK ASSESSMENT SCENARIO AND EXPOSURE PATHWAYS

RECREATIONAL SCENARIO (ADULT, CHILD, YOUTH, AND ADOLESCENT RECEPTORS)

- Incidental ingestion of surface water
- Dermal contact with surface water
- Incidental ingestion of sediment
- Dermal contact with sediment
- Ingestion of fish from Three Mile Creek

B Figures

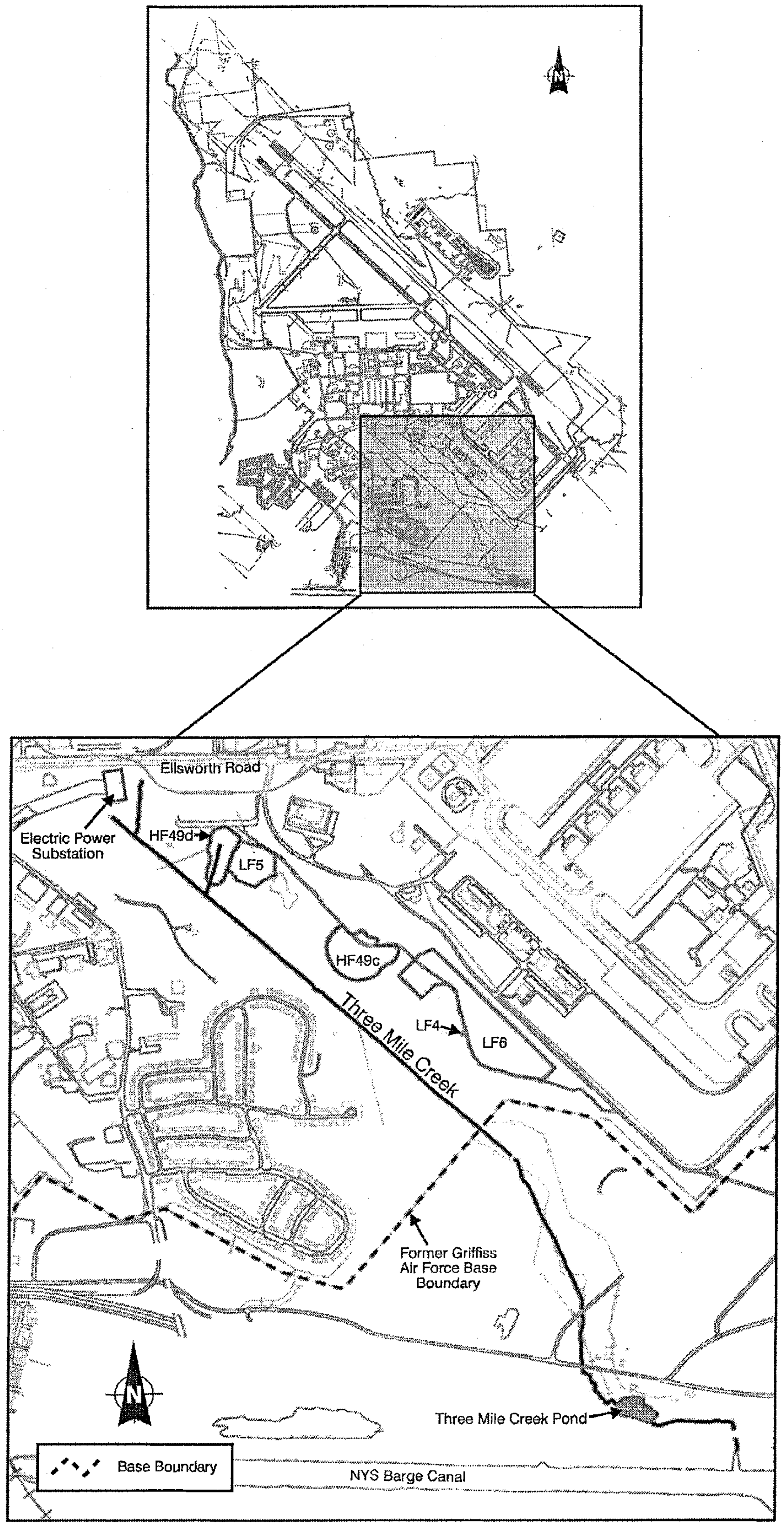
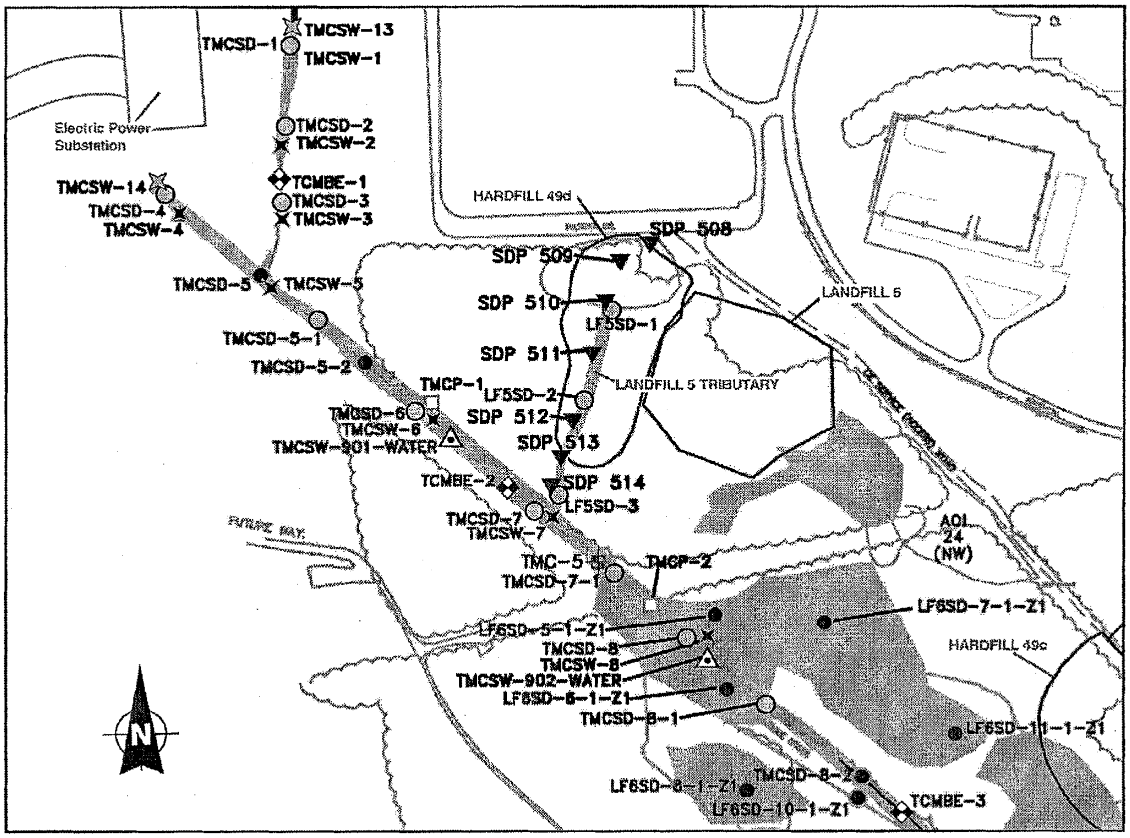


Figure 1 Three Mile Creek AOC



LEGEND

- EXISTING WETLAND AREAS
- TMCSD-5 — 2002 SEDIMENT SAMPLE LOCATIONS
- TMCSW-901-WATER — 2002 SURFACE WATER SAMPLE LOCATIONS
- TMCSD-3 — 2001 AND 1994 SEDIMENT SAMPLE LOCATIONS
- LF6/TMCSW-1 — 2000 LF6/B775 GROUNDWATER STUDY SURFACE WATER SAMPLE LOCATIONS
- TMC-5 — 1999 TMC HABITAT STUDY WATER QUALITY SAMPLE
- TMCP-1 — 1998 SI PISCES SAMPLE LOCATIONS
- TMCSW-14 — 1998 SI SURFACE WATER SAMPLE LOCATIONS
- SDP 509 — 1997 SEDIMENT SAMPLE LOCATIONS
- TCMBE-1 — 1994 RI AQUATIC SURVEY SAMPLE LOCATIONS
- TMCSW-5 — 1994 RI SURFACE WATER SAMPLE LOCATIONS

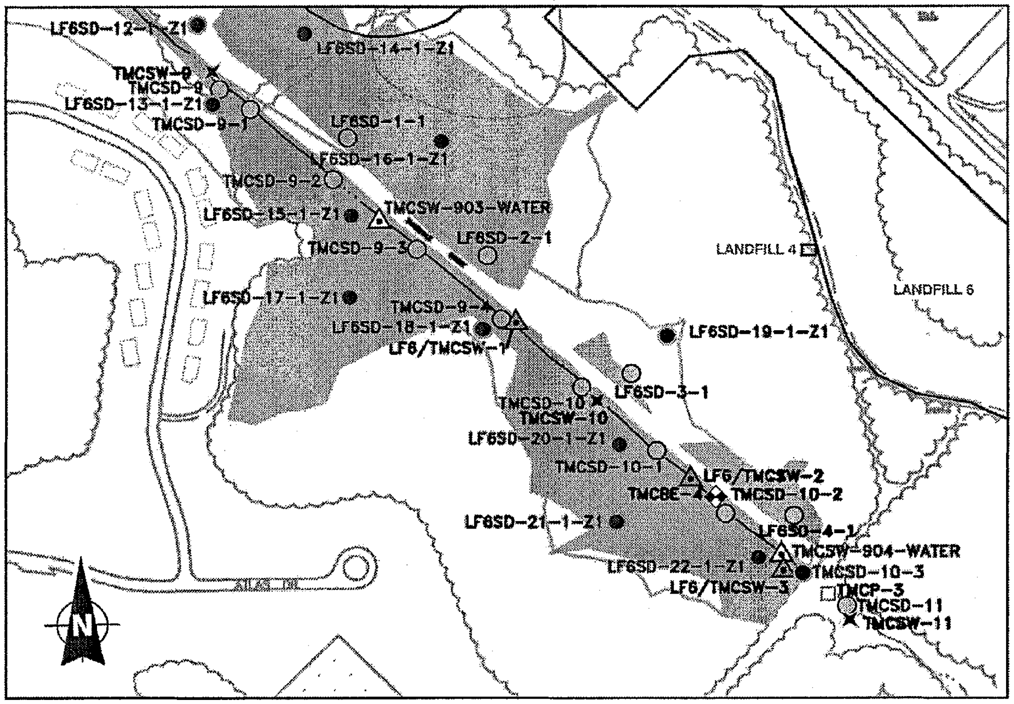
SCALE IN FEET

0 400 800 1200

NOTES

1. SEDIMENT SAMPLES TMCSD-1 THROUGH TMCSD-11 WERE ORIGINALLY COLLECTED IN 1994 FOR THE RI. ALL OF THESE SAMPLE LOCATIONS WERE RE-SAMPLED IN 2001, AND TMCSD-5, TMCSD-5-2, TMCSD-8-2, AND TMCSD-10-3 WERE RE-SAMPLED IN 2002.

Figure 2 Three Mile Creek - Sample Locations, Upper On-Base Portion



LEGEND

(shaded)	EXISTING WETLAND AREAS	TMC-5	1999 TMC HABITAT STUDY WATER QUALITY SAMPLE
TMCSD-5	2002 SEDIMENT SAMPLE LOCATIONS	TMCP-1	1998 SI PISCES SAMPLE LOCATIONS
TMCSW-901-WATER	2002 SURFACE WATER SAMPLE LOCATIONS	TMCSW-14	1998 SI SURFACE WATER SAMPLE LOCATIONS
TMCSD-3	2001 AND 1994 SEDIMENT SAMPLE LOCATIONS	SDP 509	1997 SEDIMENT SAMPLE LOCATIONS
LF6/TMCSW-1	2000 LF6/B775 GROUNDWATER STUDY SURFACE WATER SAMPLE LOCATIONS	TCMBE-1	1994 RI AQUATIC SURVEY SAMPLE LOCATIONS
		TMCSW-5	1994 RI SURFACE WATER SAMPLE LOCATIONS

SCALE IN FEET

0 400 800 1200

NOTES

1. SEDIMENT SAMPLES TMCSD-1 THROUGH TMCSD-11 WERE ORIGINALLY COLLECTED IN 1994 FOR THE RI. ALL OF THESE SAMPLE LOCATIONS WERE RE-SAMPLED IN 2001, AND TMCSD-5, TMCSD-5-2, TMCSD-8-2, AND TMCSD-10-3 WERE RE-SAMPLED IN 2002.

Figure 3 Three Mile Creek - Sample Locations, Lower On-Base Portion

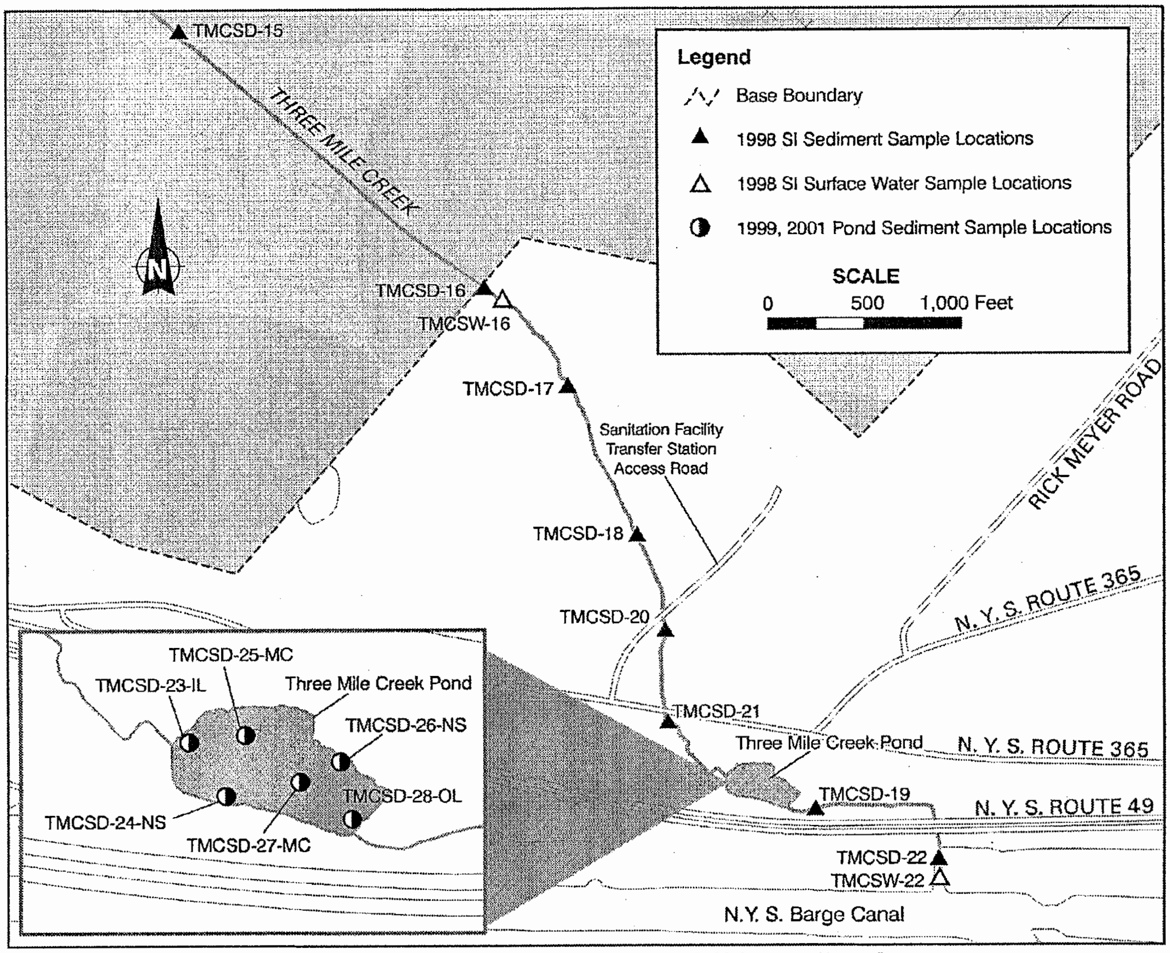


Figure 4 Three Mile Creek - Sample Locations, Off-Base Portion

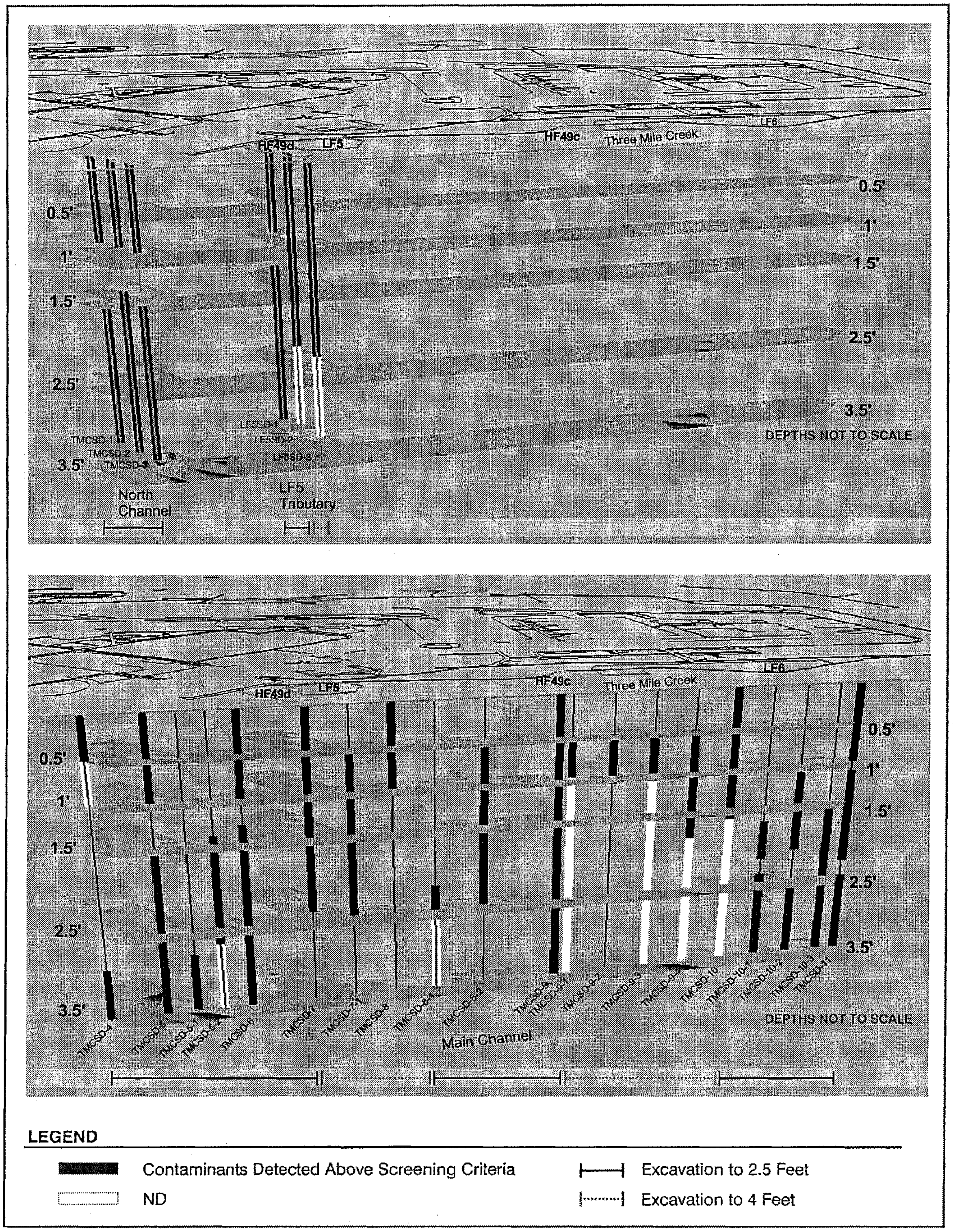


Figure 5 Vertical Profile of Contaminants Exceeding Screening Criteria

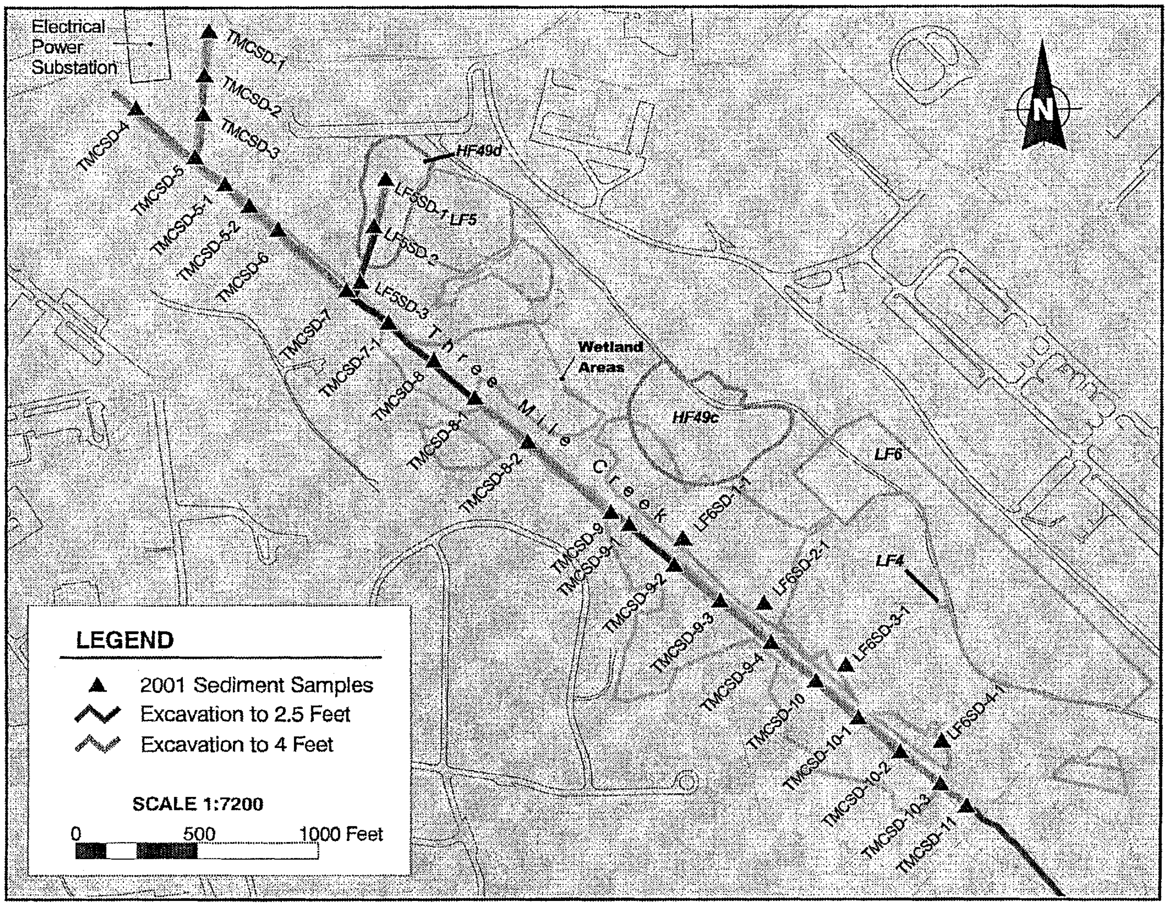


Figure 6 Sediment Excavation Plan

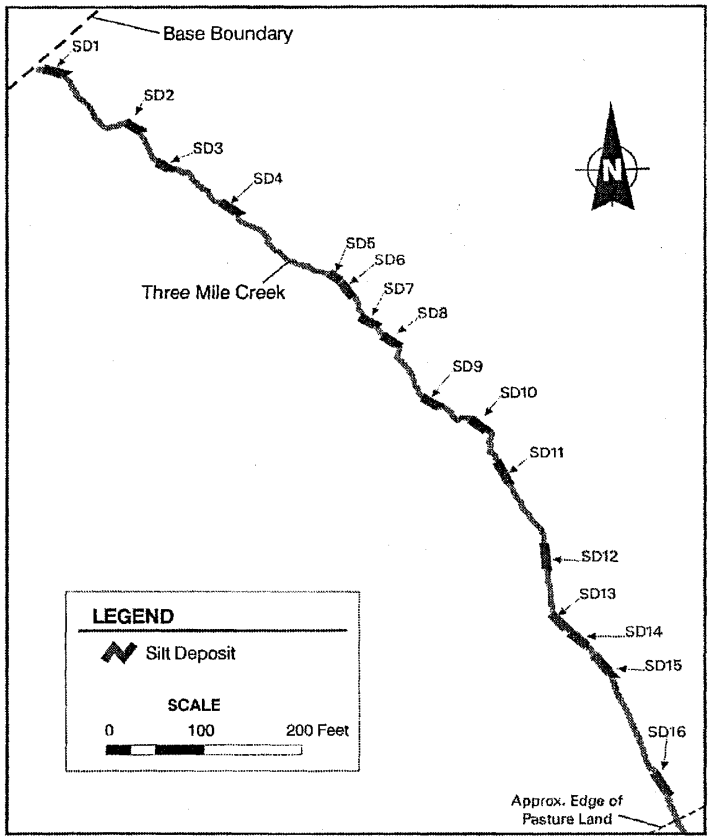


Figure 7 Silt Deposits to be Excavated

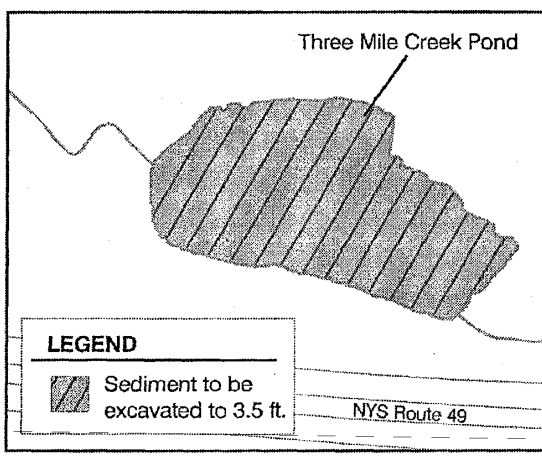


Figure 8 Pond Sediment Excavation