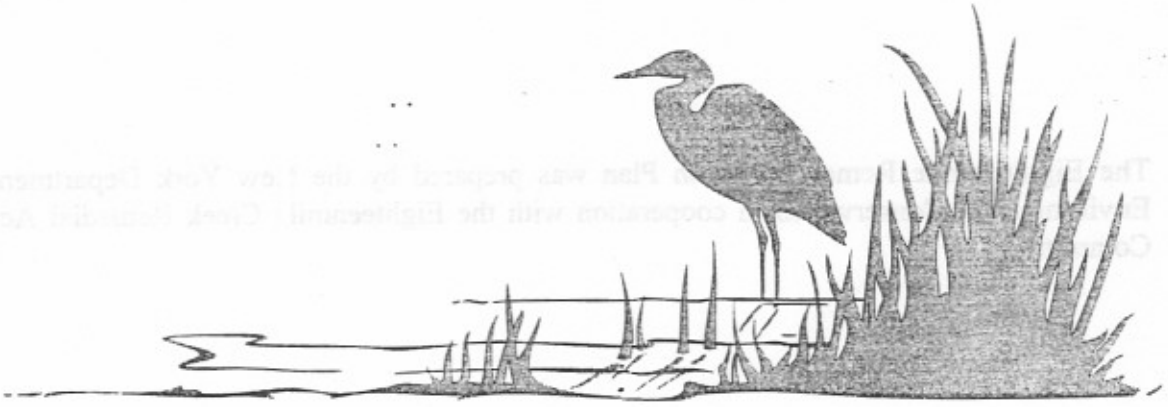

Eighteenmile Creek

Remedial Action Plan

August 1997

New York State Department of Environmental Conservation

The Eighteenmile Remedial Action Plan was prepared by the New York Department of Environmental Conservation in cooperation with the Eighteenmile Creek Remedial Action Committee.

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Table of Contents

Chapter	Title	Page
	Executive Summary	S-1
1	Introduction	1-1
2	Setting	2-1
3	The Goals	3-1
4	The Problems	4-1
5	Sources	5-1
6	Remedial Programs	6-1
7	Recommended Remedial Strategy	7-1
8	Commitments	8-1
9	Tracking Eighteenmile Creek RAP Implementation	9-1
10	Public Participation	10-1
	References	R-1
Appendix A	Water Quality Data	A-1
Appendix B	Sediment Quality Data	B-1

Table of Contents
Tables

No.	Title	Page
4.1	Selected New York State Water Quality Standards and Guidance Values for Class B & C Streams as Applied to Conditions in Eighteenmile Creek	4-2
4.2	NYSDEC Sediment Screening Guidance	4-6
4.3	Metals Concentrations from 1994 DEC Olcott Harbor Sediment Sampling (Estabrooks et al) in Eighteenmile Creek	4-8
4.4	Concentrations of PCBs, Dioxins, Furans, 2,3,7,8-TCDD Toxic Equivalence Factor, Mirex and HCB in the Sediments of Eighteenmile Creek. DEC Sampling - 1990 (Estabrooks)	4-11
4.5	Metal Concentrations of Sediments Taken from Jacques Road Bridge on Eighteenmile Creek During the 1989-1990 RIBS	4-12
4.6	Results of Adult Fish Sampling in Eighteenmile Creek	4-16
4.7	Fish Species Observed and/or Collected in the Eighteenmile Creek Area of Concern During the 1980's and 1990's	4-23
4.8	Partial Listing of Species Present in the Area of Concern Taken from the Rating Form for Eighteenmile Creek Under the Significant Coastal Fish and Wildlife Habitat Program	4-24
4.9	Comparison of Surface Sediment Samples Taken in Eighteenmile Creek in 1994 to NYSDEC Division of Fish and Wildlife Sediment Guideline Values for Metals	4-28
4.10	Comparison of Surface Sediment Samples Taken in Eighteenmile Creek in 1994 to NYSDEC Division of Fish and Wildlife Sediment Guideline Values for Nonpolar Organic Compounds	4-29

Table of Contents
Tables

No.	Title	Page
4.11	Statistical Summary of Survival and Weight Data for *H. azteca* exposed to the Sediments of Eighteenmile Creek	4-30
4.12	Statistical Summary of Survival and Weight Data for *C. tentans* exposed to the Sediments of Eighteenmile Creek	4-31
4.13	Statistical Summary of Eighteenmile Creek Elutriate Acute Toxicity Data for *D. magna*	4-31
4.14	Statistical Summary of Eighteenmile Creek Elutriate Acute Toxicity Data for *P. promelas*	4-32
4.15	Number and Species of Benthic Organisms Found in the 1994 Olcott Harbor Sediment Sampling	4-33
4.16	Sediment Containment Concentrations from the 1987 U.S. Army Corps of Engineers Study	4-37
4.17	Overall Ratings of the Six Sampling Sites in the 1977, 1981 and 1987 U.S. Army Corps of Engineers Sediment Studies in Olcott Harbor, Eighteenmile Creek	4-37
4.18	Summary of Impairments for Eighteenmile Creek	4-45
5.1	PCB, Dioxin and Dibenzofuran Concentrations in the Sediments of Eighteenmile Creek Above and Below the Discharge of the NY Barge Canal on Both the Main Stem and East Branch	5-2
5.2	Annual Average Containment Loadings to Eighteenmile Creek from the Major Permitted Industrial and Municipal Discharges in 1993 and 1994	5-6
5.3	Summary of the Hazardous Waste Sites in the Eighteenmile Creek Watershed	5-10
5.4	Priority Pollutant Sampling of the City of Lockport Wastewater Treatment Plant Influent 1991 to 1995	5-15

Table of Contents
Tables

No.	Title	Page
5.5	Dioxin and Debenzofuran Concentrations in the Suspended Sediments of the City of Lockport Sewer System	5-16
5.6	PCB Concentrations in the Surface Sediment Samples of the Main Stem of Eighteenmile Creek	5-23
5.7	Dioxin and Dibenzofuran Concentrations in the Surface Sediment Samples of Eighteenmile Creek	5-25
5.8	Summary of Impairments, Causes and Sources	5-28
7.1	Methods for Monitoring the Success of Remedial Actions for the Use Impairments Found in Eighteenmile Creek	7-6
8.1	Eighteenmile Creek Remedial Action Plan Commitments	8-8
9.1	Relationship Between State Budget Cycle and RAP Activities	9-2
	Appendix A	
A.1	Water Quality Data from Various DEC Stream Surveys from 1983-1987	A-4
A.2	Water Quality Sampling for the 1989-1990 RIBS	A-5
A.3	PISCES and Pressure Filtration Data from DEC Sampling During 1993 and 1994. NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)	A-7
A.4	Mercury Data from DEC Whole Water Sampling During 1993 and 1994. NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)	A-12
A.5	PISCES and Pressure Filtration Data from DEC Sampling in 1995 (Litten)	A-13

Table of Contents
Tables

No.	Title	Page
	Appendix B	
B.1	Surface and Core Data, NYSDEC Olcott Harbor Sediment Sampling - 1994 (Estabrooks et al)	B-15
B.2	Sediment Data, NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)	B-23
B.3	Dioxin/Furan Data, NYSDEC Sampling - 1990 (Estabrooks)	B-25
B.4	Eighteenmile Creek, DEC Sediment Sampling for 1990 RIBS	B-26
B.5	Eighteenmile Creek, Sediment Data, NYSDEC Sampling - 1987 (Litten)	B-27
B.6	U.S. Army Corps of Engineers Sediment Study - 1977, 1981, and 1987	B-32
B.7	Sediment Sampling, USEPA - 1981	B-36

Table of Contents
Figures

No.	Title	Page
2.1	The Eighteenmile Creek Area of Concern	2-1
2.2	The Eighteenmile Creek Watershed	2-2
3.1	Process for the Development of the Eighteenmile Creek RAP	3-5
4.1	Concentrations of Chromium and Copper in the Sediments of Eighteenmile Creek from U.S. Army Corps of Engineers Sediment Studies Dated 1977, 1981, and 1987	4-14
4.2	Location of Sample Sites for 1977, 1981, and 1987 U.S. Army Corps of Engineers Sediment Studies	4-36
5.1	Concentration of Total PCBs in the Sediments of the NY Barge Canal as a Function of Distance from the Canal's Discharge to Eighteenmile Creek	5-3
5.2	Concentration of Total Dioxins (As Measured and Normalized to 9% TOC) in the Sediments of the NY Barge Canal as a Function of Distance from the Canal's Discharge to Eighteenmile Creek	5-4
5.3	Concentration of Total Dibenzofurans (As Measured and Normalized to 9% TOC) in the Sediments of the NY Barge Canal as a Function of Distance from the Canal's Discharge to Eighteenmile Creek	5-4
5.4	Locations of Hazardous Waste Sites in the Eighteenmile Creek Drainage Basin	5-9
5.5	Remediation Status of Hazardous Waste Sites in the Eighteenmile Creek Drainage Basin	5-12
5.6	Aqueous and Adsorbed Phase PCB Concentrations in the Waters of Eighteenmile Creek, its Tributaries and Sources	5-21

Table of Contents
Figures

Appendix A

No.	Title	Page
A.1	Water Quality Sampling Sites, Eighteenmile Creek	A-1
A.2	Water Quality Sampling Sites, Eighteenmile Creek	A-2
A.3	Water Quality Sampling Sites, Eighteenmile Creek	A-3
	Appendix B	
B.1	Sediment Sampling Sites, Eighteenmile Creek	B-1
B.2	Sediment Sampling Sites, Eighteenmile Creek	B-2
B.3	Sediment Sampling Sites, Eighteenmile Creek	B-3
B.4	Sediment Sampling Sites, Eighteenmile Creek	B-4

Eighteenmile Creek Remedial Action Plan

Executive Summary

INTRODUCTION

This report is in response to a recommendation from the Water Quality Board of the International Joint Commission that Remedial Action Plans (RAPs) be prepared for 43 Areas of Concern in the Great Lakes Basin. Eighteenmile Creek is one of the six Areas of Concern in New York State. The Eighteenmile Creek RAP is a joint product of the New York State Department of Environmental Conservation (NYSDEC) and the Eighteenmile Creek Remedial Action Committee (RAC), a group representing environmental, economic, and local government interests appointed by the Commissioner of the Department of Environmental Conservation. It was prepared with the assistance and participation of many representatives of local, state and federal government, business and private citizens.

RAP MISSION AND GOALS

The mission of the RAP is, to restore the chemical, physical and biological integrity of the ecosystem in the Eighteenmile Creek Area of Concern in a manner that reflects the community's concern for the preservation and protection of the waterway. Specific goals of the RAP are the protection and enhancement of human health, fish and wildlife, aesthetics, recreation and the economy of the Eighteenmile Creek Area of Concern. Bathing and aquatic life have been established as the best uses of Eighteenmile Creek through a public process under the New York State Stream Classification System. The RAP is designed to restore these uses where they have been impaired and to move toward the reduction of all sources of pollutants.

PROBLEMS AND CAUSES

Eighteenmile Creek has been polluted by past industrial and municipal discharges, the disposal of waste and the use of pesticides. Fishing has been impaired by PCBs and dioxins found in the flesh of various game fish. The health of the benthos has been impaired by PCBs and metals in creek sediments. Bird and animal health is likely impaired by PCBs, dioxins, DDT and its metabolites and dieldrin found in fish flesh. PCB and metals contamination prevents open lake disposal of dredged sediments. Additionally, fish and wildlife populations, the presence of fish tumors or other deformities and the status of phytoplankton and zooplankton populations are unknown.

SOURCES OF PROBLEMS

Contaminated sediments in Eighteenmile Creek, inflow from the past discharge of contaminants into the NY Barge Canal which passes a portion of its flow into Eighteenmile Creek, and an as yet to be determined source of PCBs between Olcott St and N. Transit Rd in

Eighteenmile Creek are certain sources of pollutants. Other sources have been identified as potential sources because the contaminants causing impairments are known to exist, but the link between the source and the impairment has not been clearly established.

REMEDIAL OBJECTIVES AND RECOMMENDATIONS

A comprehensive and focused strategy has been developed to:

- continue assessment of sediment contamination in the creek
- identify and address sources of PCBs including the as yet to be identified source between Olcott St and N. Transit Rd
- remediate inactive hazardous waste sites
- continue including Eighteenmile Creek as a Rotating Intensive Basin Study (RIBS) program area
- continue ongoing programs that control point and nonpoint sources of pollution which protect the watercourse
- address inflow of contaminants from the NY Barge Canal
- address the status of undetermined impairment indicators

The remedial program is:

Stream Monitoring

Objective:

Assure that all sources have been addressed in the Remedial Action Plan and collect data to evaluate progress toward RAP goals.

Recommendation:

1. Continue inclusion of Eighteenmile Creek as a RIBS program study area every five to six years.
2. Conduct sampling to determine if flow through the Burt Dam is mobilizing contaminated sediments into the Area of Concern

Remediate Bottom Sediments

Objective:

Correct the impairments to the creek caused by contaminated bottom sediments.

Recommendation:

1. Develop sediment criteria to identify the sediments causing impairment to aquatic life which need to be addressed.

2. Assess sediments in the Area of Concern according to the criteria to determine which areas need remediation.

3. Evaluate removal/armoring alternatives.

4. Conduct a comprehensive sampling of the creek to identify all sources of PCBs.

NY Barge Canal

Objective:

Identify the source of impairment causing contaminants which have entered the NY Barge Canal which is a source of flow to the creek.

Recommendation:

1. Conduct comprehensive sampling of canal sediments to determine what sediments need to be addressed.

2. Evaluate remedial actions.

Remediate Inactive Hazardous Waste Sites

Objective:

Prevent inactive hazardous waste sites from contributing contaminants to the creek.

Recommendation:

1. Continue the ongoing program for remedial work in the Eighteenmile Creek drainage basin.

2. Conduct sampling at the William St Island to determine if it is a source of PCBs to the creek.

Continue Controls on Municipal and Industrial Wastewater Discharges

Objective:

Insure that municipal and industrial wastewater discharges do not significantly contribute to the impairment of the creek.

Recommendation:

1. Renew permits incorporating water quality enhancement measures, current technology and water quality based limits.

2. Carry out monitoring of industrial and municipal discharges and undertake compliance or enforcement actions as needed.

Improve Combined Sewer Overflow System

Objective:

Insure that combined sewer overflows do not significantly contribute to impairment of the creek. (Note: Combined Sewer Overflows are used to relieve flow to sewage treatment plants during storms when surface runoff would cause the flow to exceed the capacity of the system)

Recommendation:

1. Carry out system assessment to determine where improvements can be made within the system to minimize overflows.

2. Maintain the system plus design and carry out improvements as necessary.

Conduct Biota Sampling to Assess the Status of Undetermined Impairment Indicators

Objective:

Evaluate the status of the following impairment indicators: Degradation of Fish and Wildlife, Fish Tumors and other Deformities, and Degradation of Phytoplankton and Zooplankton Populations.

Recommendation:

1. Develop study plans to assess the status of these impairment indicators.

COMMITMENTS AND FUTURE ACTIONS

The Department of Environmental Conservation has committed to a number of initial actions in this plan where funding is available. As further funding becomes available; further commitments can be made. DEC has made commitments for specific actions to begin the remediation strategy:

- Continue including Eighteenmile Creek as a Rotating Intensive Basin Study (RIBS) program watershed - Ongoing

- Sample and analyze suspended sediments from upstream of the Burt Dam reservoir and at the turbine outlets for metals, PCBs and pesticides - 1998

- Conduct a systematic sampling of Eighteenmile Creek to determine the sources (or source areas) of PCBs - 1998

- Conduct a comprehensive sampling of the sediments of the NY Barge Canal with the NYS Canal Corporation to determine the horizontal and vertical extent of contamination and to identify possible sources - 1998

- Conduct Phase II field investigation at the Diamond Shamrock hazardous waste site to complete initial site assessment - 1997

- Conduct Remedial Investigation/Feasibility Study at the AKZO hazardous waste site to assess alternative remedial measures - 1997

- Conduct sampling to locate source of PCBs between Olcott St and N. Transit Rd - 1998

- Continue discharge permit monitoring to achieve compliance with secondary treatment for municipal discharges and best available technology and best management practices for industrial discharges - Ongoing

- Develop a combined sewer overflow assessment for the City of Lockport Sewer System - 1999

- Conduct sampling for PCBs in the sewer system to determine if there are any continuing sources of PCBs to the system - 1998

- Develop study plans to assess contaminant levels in fish and to determine the status of the Degradation of Fish and Wildlife Populations, Fish Tumors and other Deformities and the Degradation of Phytoplankton and Zooplankton Populations impairment indicators - 1997

A continuing process, based on biennial status reports and workplans has been established for reporting on remedial progress, for making commitments as funding becomes available and for revising the Remedial Action Plan as new information develops.

The Department, having received comment on the draft RAP, has completed and submitted this Remedial Action Plan to the International Joint Commission.

CHAPTER 1

INTRODUCTION

The International Joint Commission (IJC) has designated Eighteenmile Creek as an Area of Concern. This designation indicates that the area has been reported to exhibit environmental degradation, and that some beneficial uses of the water or biota are impaired.

Under the 1987 Amendments to the U.S.-Canada Great Lakes Water Quality Agreement, Remedial Action Plans (RAPs) are to be developed by the States and Province of Ontario for the Areas of Concern under their jurisdiction. These plans are to define the environmental problems in the Area of Concern, identify remedial measures needed to restore beneficial uses with a time schedule and designation of the responsible agency, and describe a monitoring process needed to track remediation. The RAP is to be submitted to the International Joint Commission in three stages:

I) when the problem has been defined;
ii) when remedial measures are selected; and
iii) when monitoring indicates beneficial uses have been restored.

The New York State Department of Environmental Conservation (DEC) is the lead agency for the Eighteenmile Creek Remedial Action Plan. DEC's Division of Water is responsible for developing the RAP for submission by the Commissioner of the Department of Environmental Conservation to the IJC. The Division of Water, while holding the major responsibility for completion of the RAP, worked closely with other DEC Divisions to ensure an ecosystem perspective that was desired in developing the RAP.

The RAP development was also a coordinated effort between community leaders and DEC. Many interested parties played an active role through the Eighteenmile Creek Remedial Action Committee (RAC) comprised of 15 environmental, sportspersons, business, university, community, and local government representatives. Interested parties not represented on the RAC were involved through announcements and newsletters and public meetings held in various communities near the Area of Concern.

The RAP satisfies sections 4(a)(I) and (a)(ii) of the Great Lakes Water Quality Agreement, Annex 2, and is the first submission for the Eighteenmile Creek RAP under that Agreement. It also includes the other sections required by Annex 2, but some of these are incomplete at this time. A general strategy is outlined for deciding on the appropriate remedial measures; and commitments are made to proceed with the first steps of that strategy. As progress is made to the point where specific remedial plans can be adopted, the RAP will be revised and submitted as prescribed in Annex 2.

DEC, as the lead agency, intends to use this RAP as a management document to guide and coordinate remedial actions on Eighteenmile Creek by various concerned agencies for an improved federal, state, and local partnership in addressing the goals of the plan. Specific commitments will be made as funding becomes available, and these commitments will be documented in reports to be issued biennially.

Other interested parties can use this RAP, with the biennial reports, to track progress on remedial activity in Eighteenmile Creek. Funding agencies can use the RAP to determine where resources can best be applied to restore the beneficial uses of the creek.

CHAPTER 2

SETTING

INTRODUCTION

The setting for the Eighteenmile Creek Remedial Action Plan is described in this Chapter. The basin can be subdivided into two components, the Eighteenmile Creek Area of Concern (AOC) (the impact area) and the Eighteenmile Creek Watershed (the source area).

Each area is described relative to location, character, historical overview, current water uses, hydrology and water quality. Maps of the Area of Concern and the watershed are included in Figures 2.1 and 2.2

Figure 2.1

The Eighteenmile Creek Area of Concern

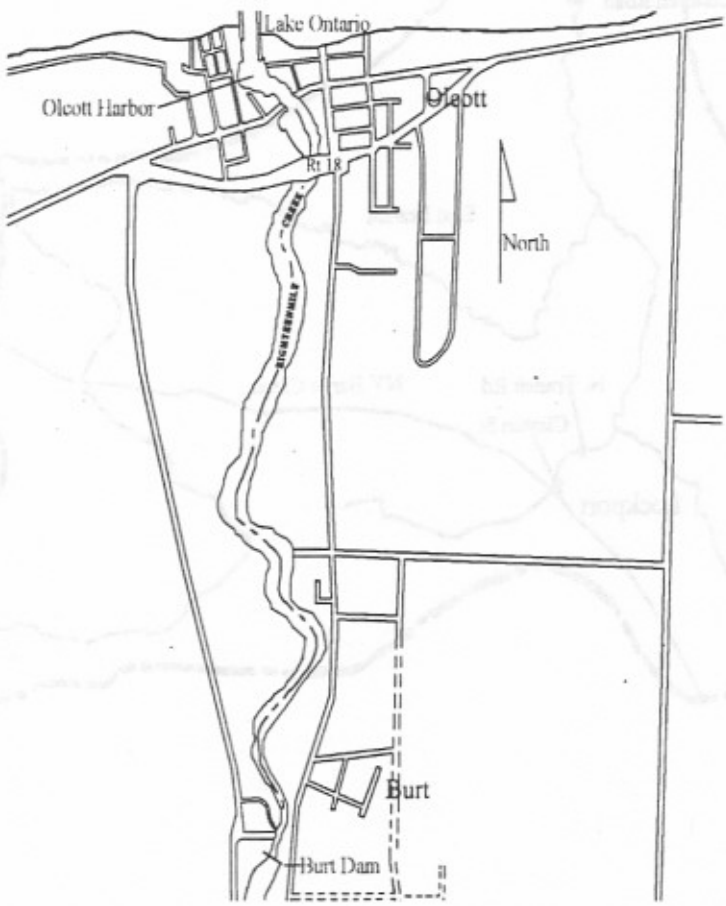
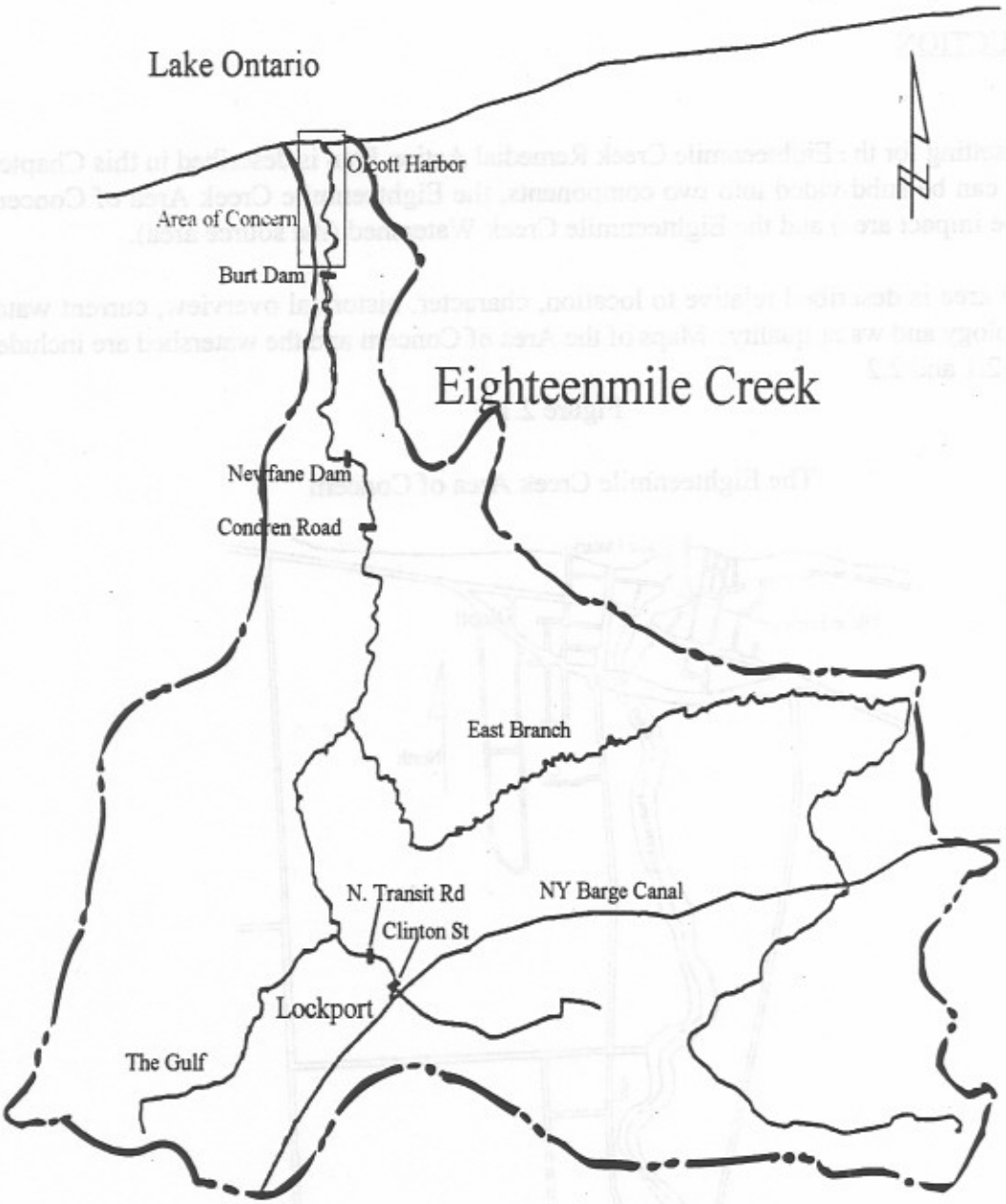


Figure 2.2

The Eighteenmime Creek Watershed



Area of Concern (AOC)

General Description

The Eighteenmile Creek Area of Concern is located in the Town of Newfane, Niagara County, in Western New York State. The creek flows from the south and discharges into Lake Ontario approximately 18 miles east of the mouth of the Niagara River.

The Eighteenmile Creek Area of Concern extends from the mouth of the creek to the farthest point upstream at which backwater conditions exist during Lake Ontario's highest monthly average lake level. This point is located just downstream of a dam located about two miles upstream from the mouth in Burt, New York.

During the late 1800s and early 1900s, Olcott was a very popular lakeside resort. There were three resort hotels located at Olcott Beach and people came from all over New York State and from as far away as Ohio to vacation in the area. Although the large resort hotels and amusement parks no longer exist, recreation and tourism continue to be important for the local economy.

Eighteenmile Creek and Olcott Harbor provide important aquatic habitat for both cold and warmwater fish. The Area of Concern is mainly characterized by activities centering around sportfishing. The Olcott Harbor area located at the mouth of the creek is heavily developed with marina facilities.

Current Uses

Sportfishing and recreational boating have been and continue to be important uses of the study area. Most of the land bordering Olcott Harbor is occupied by marine-related commercial enterprises with service marine docking facilities occupying extensive water areas in the harbor. This is a regional harbor in that it draws small boat owners from areas throughout Western New York and Southern Ontario.

Despite access to the creek being limited by steep banks and private landownership, Eighteenmile Creek is one of the most popular fishing streams on Western Lake Ontario primarily due to the fact that it provides a habitat for major spawning runs for salmonids and other lake-based fish populations. The New York State Department of Environmental Conservation stocks the creek with chinook and coho salmon. The creek also provides a high quality warmwater fishery, particularly in the more natural stream reach south of the Hamlet of Olcott upstream to the Burt Dam. This area supports substantial natural reproduction of smallmouth bass, northern pike, rock bass, black crappie, brown bullhead and largemouth bass.

A significant coastal wildlife habitat zone borders the creek between the Route 18 bridge at Olcott and the dam at Burt. The variety of species include blue heron, mallard, march wren, swamp sparrow, muskrat, mink and raccoon. Thus, besides fishing, the area is also utilized by local residents to a limited extent for waterfowl hunting and trapping.

Hydrology

During the early 1970's, the U.S. Army Corps of Engineers built the parallel 861 foot piers to protect the entrance to Olcott Harbor. At the same time, a 12 foot deep, 140 foot wide access channel was dredged to Lake Ontario. A locally maintained channel continues upstream through the Harbor to the Route 18 bridge to facilitate access to marina facilities. Maintenance dredging is infrequent because of limited siltation below the Burt Dam and also the prevention of accretion of material in the channel due to the extension of the piers into the Lake.

Lake Ontario sediments near the mouth of Eighteenmile Creek are granular while in the upstream harbor area they are more silty. When Lake levels are high, backwater effects from Lake Ontario extend upstream to just downstream of the dam at Burt. The flow from the upper portion of the watershed is not restricted by the dam. The hydroelectric generating station at the Burt Dam is operated in a "run-of-the-river" mode which means that the entire flow of the creek is allowed to pass over the dam or through the turbines and is not held back in the reservoir during certain periods.

Water and Sediment Quality

DEC maintains a system of stream classification based on the best usage developed to protect the water resource. The portion of Eighteenmile Creek from the mouth to 0.5 miles upstream is designated as Class B for the protection of contact recreation. The portion of the creek from 0.5 miles upstream of the mouth to the Burt Dam is designated as Class C. The best usage of Class C waters is fishing and these waters shall be suitable for fish propagation and survival.

Water and sediment data are summarized in Chapter 4 of this report. Sediment data for the Area of Concern previous to this study was associated primarily with navigational dredging in Olcott Harbor. Elevated levels of metals in these sediments lead to the designation of Eighteenmile Creek as an Area of Concern.

Eighteenmile Creek Watershed

General Description

The watershed of Eighteenmile Creek has a drainage area of about 93 square miles. The entire drainage basin is located within Niagara County. Most of the basin is relatively flat, agricultural land. Industry is concentrated in the City of Lockport at the headwaters of the creek.

The two major tributaries are The Gulf and the East Branch. However, much of the flow in the main stem comes from water diverted from the New York Barge Canal where the creek flows under the Canal. From the north side of the canal the creek flows in a mainly northerly direction.

Approximately one mile from where the creek resurfaces from under the canal, it is joined by The Gulf tributary which originates southwest of the City of Lockport and travels in a northeast direction over the Niagara Escarpment joining the main stem just downstream of the City of Lockport's Wastewater Treatment Plant. Delphi Harrison Thermal Systems, the area's largest industry, discharges treated wastewater into The Gulf.

Four miles north of its juncture with The Gulf, the main stem is joined by the East Branch (locally known as Red Creek), its largest tributary. The East Branch originates in the Town of Royalton and travels in a generally northerly direction flowing through Mirror Lake on the east end of the Village of Gasport and then under the Barge Canal. Water is diverted into the East Branch from the canal at this point. In the Town of Hartland, the East Branch bends sharply to the west. Along its length, the East Branch is joined by a number of sub-tributaries most of which flow from the south. The East Branch drains about 43 square miles of Niagara County.

Historical Overview

Land use in the watershed area has historically been of an agricultural and industrial nature. Most industry, including the manufacturers of chemicals, paper/paperboard, felt, textiles, cotton batting, automobile radiators and air conditioners, saw blades, asphalt, metal alloys, plastics, and machinery as well as paper converters and foundries was concentrated in the City of Lockport on the canal and on Eighteenmile Creek from just downstream of the headwaters to The Gulf.

Those industries located on the banks of Eighteenmile Creek took advantage of the power provided by the creek. Several millraces and millponds were built along the creek during the 1800s to provide power for the various industries that were located there. In the City of Lockport, an underground cave raceway on the north side of the canal and an extensive millrace area on the south side of the canal were built. A number of industries were established along the canal during the 1800s to take advantage of the convenient transportation of goods provided by the canal.

Current Uses

The main stem of Eighteenmile Creek receives treated discharges from industry and the City of Lockport. The Gulf receives treated process wastewater from Delphi Harrison Thermal Systems. The East Branch receives treated wastewater from the Gasport Sewer District in the Town of Royalton. Fifteen inactive waste disposal sites have been identified within the Eighteenmile Creek basin of which eleven have been remediated or where it has been determined that remediation was not required.

Eighteenmile Creek is not used as a source of drinking water. The main source of drinking water for the City of Lockport is the Niagara River. The city operates its own water treatment plant and distribution system. The Towns of Lockport and Newfane are served by the Niagara County Water District whose source of water is also the Niagara River.

Hydrology

The East Branch discharges into the main stem about 9.3 miles upstream from the mouth of the creek. The Gulf enters the main stem at approximately 13.1 miles upstream from the mouth. There are a number of small intermittent streams which enter the main stem of the creek and the East Branch.

The major topographical feature of the drainage basin is the Niagara Escarpment, a ridge which extends across the basin and passes through Lockport. Both Eighteenmile Creek and The Gulf flow over this ridge.

There are two operating dams located in the Eighteenmile Creek Watershed Area - one is located approximately two miles south of the mouth of the creek in the Hamlet of Burt (at the upper end of the Area of Concern). The other is in the Hamlet of Newfane near Ewings Road. A third smaller dam is located within the City of Lockport one-tenth of a mile downstream from Clinton Street, however, this structure no longer retains water as its sluice gates have been removed.

Historically, there were a number of dams along the main stem and East Branch. The submerged remains of these dams as well as the Burt, Newfane and small dam downstream of Clinton Street act as sediment traps in the creek.

Flow in both the main stem and East Branch is augmented from the Barge Canal. During dry weather, the 50 cubic foot per second (cfs) diversion from the canal to the main stem of the creek accounts for essentially all of the flow in the creek in the City of Lockport.

Water and Sediment Quality

Water and sediment data are summarized in Chapter 4 of this report. The water quality data collected by the New York State Department of Environmental Conservation at Jacques Road in the Town of Newfane in 1989 and 1990 are compared in Chapter 4 with Class C standards and guidance values for fish propagation and survival.

CHAPTER 3

THE GOALS

INTRODUCTION

The overall goal of the Eighteenmile Creek Remedial Action Plan is the resolution of conditions causing impairment of beneficial use of the creek in the Area of Concern. The indicators of impairment are factors that result in an imbalance of the chemical, physical and biological integrity of the ecosystem.

Attainment of this goal is to be achieved in a manner that is consistent with the provisions set forth in the Great Lakes Water Quality Agreement for restoration of all Areas of Concern. The revised Great Lakes Water Quality Agreement signed by Canada and the United States in 1987 contains the requirements which guide the development of a remedial action plan.

Fundamental to the implementation of this plan is the need to restore and maintain water quality to provide for contact recreation, and the propagation of fish, shellfish, and wildlife as required by state law and at the same time identify additional legislation, and regulations that may be necessary to achieve restoration of the fourteen impaired beneficial uses as identified by the International Joint Commission (IJC).

Annex 2 of the Great Lakes Water Quality Agreement lists the fourteen beneficial impaired uses and the listing/delisting criteria developed by the IJC provide milestones and measures which guide the evaluation of impairment of these uses.

These fourteen beneficial uses (or indicators) shall be the basis upon which progress will be measured in implementing the Eighteenmile Creek Remedial Action Plan.

IDENTIFICATION OF GOALS

Water bodies in New York State are required by law to be classified for their best uses. The classification is based on such factors as the character of bordering lands, stream flow, water quality, present and past uses, and future uses that may be made of the water. The Department of Environmental Conservation (DEC) assigns to each fresh surface water one of the following classifications, reflecting actual or intended best use of that water. Each class includes all uses for the classes below it.

Class	Best Water Use
AA, A, A-Special	Drinking water
B	Primary contact recreation
C	Fishing and fish propagation
D	Fishing

The Great Lakes Water Quality Agreement has specific objectives which are numerical values for water quality. These objectives apply specifically to boundary waters and are considered in the adoption of New York State standards for such waters. Eighteenmile Creek is situated entirely within New York State.

Eighteenmile Creek is classified as B from the mouth to the first tributary which enters the creek from the southeast in the southern part of Olcott. The remaining part of the creek in the Area of Concern is classified C. These classifications which establish best uses of the creek provide the water quality basis for restoration of impairments.

Each designated classification has a set of standards defining the type and quantity of substances the water can contain and still be used as intended. The standards describe the chemical, physical and biological characteristics necessary to achieve the designated usages.

The fourteen impairment indicators listed in the Great Lakes Water Quality Agreement, Annex 2, are used to determine whether or not the RAP goal is being met. These impairment indicators are in many cases synonymous with New York's best uses. However, in some cases (e.g., restrictions on dredging activities) they go beyond what New York considers a best use and in other cases (e.g., degradation of benthos), they should be considered as indicators of a best use impairment and not a best use itself. In any case, all the impairments or impairment indicators in Annex 2 are addressed in determining whether or not an impairment requiring remediation exists. The fourteen impairment indicators are as follows:

1. restrictions on fish and wildlife consumption
2. tainting of fish and wildlife flavor
3. degradation of fish and wildlife populations
4. fish tumors or other deformities
5. bird or animal deformities or reproduction problems
6. degradation of benthos (bottom-dwelling organisms)
7. restrictions on dredging activities
8. eutrophication or undesirable algae
9. restrictions on drinking water consumption, or taste and odor problems
10. beach closings
11. degradation of aesthetics
12. added costs to agriculture or industry
13. degradation of phytoplankton and zooplankton populations
14. loss of fish and wildlife habitat

Specific concerns and goals have been identified through previous surveys of local residents and discussions with the Remedial Action Committee (RAC) working with DEC on the Remedial Action Plan. Concerns could be grouped into issues pertaining to aesthetics, habitat and human health. These issues will be fully evaluated within the context of the assessment of the fourteen indicators of impairment. Their associated goals include improved aesthetics through more prudent human activity and practices on land adjacent to the creek. Habitat enhancement can occur through identification and protection of sensitive areas such as wetlands. Human health concerns will be addressed through control of contaminants that restrict consumption or cause tainting of fish, ducks and turtles. Water quality will be maintained for contact recreation where that best use is designated. Other specific concerns raised by citizens pertain more to sources than impairments to beneficial use. Sediment quality and control of existing and historic pollution sources will address some of the source identification questions raised through the assessment of impairments. Local concerns and goals will be used to assist in the development of the remedial strategy for the sources identified to be causing the impairment of beneficial uses of the creek.

In addition to addressing impairment of beneficial use, the Remedial Action Plan must be consistent with the purpose and objectives of the Great Lakes Water Quality Agreement. The consistency of the RAP with "virtual elimination of persistent toxic substances" relates to Article II of the Great Lakes Water Quality Agreement which states it is the policy of the Parties that:

> The discharge of toxic substances in toxic amounts be prohibited and the discharge of persistent toxic substances be virtually eliminated;

While the Agreement contains no further definition of "virtually eliminated", it is a policy that requires mechanisms to be in place by the Parties that will, over time, reduce the total loading of persistent toxic substances discharged to the Great Lakes. In the 1987 revisions to the Agreement, the phrase "pending virtual elimination of persistent toxic substances in the Great Lakes ecosystem,..."in Annex II, 2b, indicates concern not only for point sources into the system, but also indirect sources to the Great Lakes and documented hot-spots where high concentrations exist.

There are a number of ongoing activities in New York State that are reducing and will continue to reduce the loadings of persistent toxic substances. Examples of some are:

- use of best available technology economically achievable for control of point source discharges;
- remedial action at hazardous waste sites;
- use of best management practices to control nonpoint source runoff;
- reduction in use of persistent toxic substances in manufacturing through pollution prevention measures.

If and when technology and economic feasibility do not allow for the further reduction of toxic loadings, further plans and controls may be required to meet the general principles of the Agreement and the goal of the Clean Water Act.

REMEDIAL ACTION PLAN DEVELOPMENT

The structure associated with the development of the Eighteenmile Creek RAP is outlined in Figure 3.1. It starts with the establishment of goals, and then proceeds through:

- an assessment of impairments that prevent attainment of the goals;
- a determination of the pollutants or disturbances causing impairments;
- a determination of the sources of the pollutants or disturbances;
- the development of a remedial strategy for the sources or origins so that beneficial uses are restored and goals are attained;
- the decision on commitments that can be made now to certain parts of the remedial strategy;
- the design of a monitoring program to show that the impairments have been corrected and how progress is being made to attain the goals.

ASSESSMENT OF IMPAIRMENTS

With the establishment of specific goals, the actual impairments that prevent these goals from being realized can be identified. Examination of environmental information shows whether or not the Great Lakes Water Quality Agreement indicators suggest a water quality impairment.

In many cases, it is not easy to determine whether or not an impairment exists because of the absence of information on the environmental system, or the subjective nature of some of the impairment indicators. Therefore, instead of always stating definitely that a beneficial use is or is not impaired, conclusions derived from data analysis may be listed as "likely", "not likely", or "no evidence".

POLLUTANTS OR CONDITIONS CAUSING IMPAIRMENT

Each of the indicators of impairment for the beneficial uses can be examined to determine the direct cause of the impairment, whether it be a specific pollutant such as a chemical substance, or a condition of the Area of Concern such as a lack of suitable habitat.

Again, as with the assessment of impairments, in some cases definite causes may not be able to be assigned to impairments with a high degree of certainty. In the succeeding chapters, the identification of this uncertainty is explicit when it occurs.

Figure 3.1
Process for the Development of the Eighteenmile Creek RAP

SOURCES OF POLLUTANTS OR ORIGIN OF CONDITIONS

The actual points of entry of pollutants or the origin of the conditions must be determined before the remedial actions needed can be defined. These sources (or origins) may include discharge pipes, run-off of stormwater over land, atmospheric deposition, release of pollutants from sediments, or construction activities which have obliterated wildlife habitats. The identification of some sources may be uncertain or in some cases outside of the Area of Concern.

REMEDIAL STRATEGY

The identified sources and conditions are the basis for the remedial strategy. This strategy must be broad enough to deal with the uncertainties noted above in the assessment of impairments, pollutants/conditions, and sources/origins. Therefore, the strategy will have in it elements of further investigation, information gathering, and decision making based on new findings and interpretations. As progress is made in carrying out the remedial strategy, additional data will become available, and alterations in the strategy may be needed.

Within the overall strategy, there are some specific remedial activities that can be described now. These specific activities are of two types: 1) those where agencies can make specific commitments to complete with a time schedule; and 2) those where commitments cannot be made because funding or other resources are not available.

The inability to obtain funds to support specific parts of the strategy may be an important indicator that either there is not a real public acceptance of the strategy and the strategy will require revision, or that the public does not perceive that the benefits gained by fully restoring the use are worth the cost, and that only partial restoration of the use may be needed.

MONITORING REMEDIAL ACTIONS AND GOAL ATTAINMENT

As the detailed remedial activities are designed, there will be accompanying monitoring components to insure that the remedial actions work as planned, and that the indicators of use impairment show recovery. To the extent feasible, assessments will be made directly of the ecosystem to examine the status of the impairment indicators.

CHAPTER 4
THE PROBLEMS

INTRODUCTION

Use impairments and their likely causes in Eighteenmile Creek are identified in this Chapter through examination of the 14 Great Lakes Water Quality impairment indicators. Water quality and bottom sediment data are summarized early in the chapter because of the general applicability of these data in the consideration of impairments. Biological data are presented as they relate to specific impairment indicators.

WATER QUALITY DATA

New York State classifies the waterways within the state. Eighteenmile Creek in the Area of Concern is classified as a class C stream from the Burt Dam to just below the Route 18 bridge which means the highest intended use of this reach of stream is fish propagation. From slightly below the Route 18 bridge to the outlet to Lake Ontario, it is class B which means that the highest use is primary contact recreation (swimming). Each classification carries with it a set of water quality standards that the stream must meet. These standards are minimum or maximum values for certain parameters such as dissolved oxygen and pH and maximum levels of other pollutants. These standards are used to calculate allowable water quality based limits for pollutants in the writing of State Pollutant Discharge Elimination System (SPDES) permits for facilities that discharge into the water body. Additionally, there are guidance values for other pollutants which are goals the DEC attempts to meet. Some of the standards and guidance values for class B and C streams are listed in Table 4.1. Standards and guidance values (such as for ammonia, lead, zinc and chromium) are not fixed values but are dependent on water conditions such as temperature, pH and hardness. Formulas are provided in the regulations and the actual value for a particular water body is calculated from them. The appropriate values for Eighteenmile Creek were calculated using average temperature, pH and hardness data from the 1990 Rotating Intensive Basin Study (RIBS). The values in Table 4.1 and in the rest of the report were calculated using an average hardness of 226 mg/l, an average temperature of 13.3 °C and a pH of 7.7.

Table 4.1

Selected New York State Water Quality Standards and Guidance Values For Class B and C Streams as Applied to Conditions in Eighteenmile Creek.

Pollutant (in ug/l except as noted)	Class B	Class C
Minimum Dissolved Oxygen (mg/l)	4.0	4.0
Minimum Daily Average DO (mg/l)	5.0	5.0
Fecal Coliforms (cfu/100 ml)	200	200
Dissolved Solids (mg/l)	500	500
pH	6.5<pH<8.5	6.5<pH<8.5
Chlorine Residual	5	5
Ammonia	21 [1]	21 [1]
Nitrite	100	100
Cadmium (acid soluble)	2.15 [2]	2.15 [2]
Chromium (acid soluble)	403 [2]	403 [2]
Chromium (hexavalent)	11	11
Copper (dissolved)	23.7 [2]	23.7 [2]
Iron	300	300
Lead	9.03 [2]	9.03 [2]
Mercury	0.2 (g)	0.2 (g)
Nickel	178 [2]	178 [2]
Zinc (dissolved)	165 [2]	165 [2]
PCBs	0.001 [3]	0.001 [3]
Dioxins (2,3,7,8-TCDD)	0.000001	0.000001
Trichloroethylene	11 (g)	11 (g)
Aldrin, Dieldrin	0.001	0.001
Chlordane	0.002(g)	0.002(g)
DDT, DDD & DDE	0.001	0.001
Endosulfans	0.009	0.009
Endrin	0.002	0.002
Heptachlor & Heptachlor epoxide	0.001	0.001
Hexachlorocyclohexanes	0.01	0.01

[1] Calculated for an average pH of 7.7 and an average temperature of 13.3°C

[2] Calculated based on average hardness value of 226 mg/l

[3] In addition to the 0.001 ug/l aquatic standard, there is a bioaccumulation guidance value of 0.0000006 ug/l.

(g) Guidance Value

There have been several water quality studies done on Eighteenmile Creek in recent years. Appendix Tables A-1 to A-5 contain the water quality data from these studies and Appendix Figures A-1 to A-3 indicate the location of the sampling stations.

NYSDEC Stream Surveys (1983-87)

Appendix Table A-1 contains conventional water quality parameters such as dissolved oxygen content, biochemical oxygen demand, coliforms and nutrient concentrations along the length of the creek. The samples were collected from 1983 to 1987 at either mid-depth in shallow waters or one meter below the surface in deep waters. Elevated pH values and a low dissolved oxygen value was observed during this period in the Area of Concern. The pH values may be related to the rock strata in the watershed.

NYSDEC Rotating Intensive Basin Survey (1990)

The 1990 Rotating Intensive Basin Study (RIBS) was the most comprehensive of the water quality sampling studies conducted on Eighteenmile Creek. As part of this study, a data set (20 samples) was collected for a wide range of parameters including metals, common ions and various organic compounds. The RIBS report provides a primary data set for evaluating the current water quality of the creek (Appendix Table A-2).

The water quality portion of the Eighteenmile Creek RIBS data included two sets of samples taken from the Jacques Road bridge (Appendix Figure A-2). One set consisted of 9 samples collected from April 12, 1989 to November 9, 1989. The other set included 10 samples taken from March 27, 1990 to November 13, 1990.

For conventional parameters, the RIBS study showed that the creek is well within most water quality standards. The average dissolved oxygen for the two years was 7.4 ug/l with no samples below the minimum standard of 4 ug/l. The RIBS data includes several samples taken during two different summers, typically the time of highest temperature and lowest dissolved oxygen. All measurements of pH and ammonia as nitrogen were also within standards. The standard of 500 ug/l for dissolved solids was exceeded only once in the data set on April 12, 1989 with a concentration of 520 ug/l. The 1989 mean, 1990 mean and the average of the two years were all well below the dissolved solids standard with values of 390 ug/l, 352 ug/l and 371 ug/l, respectively.

The RIBS data on metals and organic chemicals shows that the creek generally meets all standards and guidance values with the exception of lead and iron. The 1989 mean for lead (10.4 ug/l) was above the standard of 9.0 ug/l, however, the 1990 mean and two year average (7.4 ug/l and 8.8 ug/l respectively) were below the standard. The 1989 mean, 1990

mean and two year average for iron all exceeded the standard of 300 ug/l (with values of 535 ug/l, 1148 ug/l and 857 ug/l respectively). Iron is abundant in the local rock strata suggesting that the elevated levels in the water column may be of natural origin. The RIBS report did not list any organic contaminants that exceeded standards or guidance values.

NYSDEC Dioxin/Furan Sampling - 1990 (Estabrooks)

A single water sample which was analyzed for dioxins and furans was taken at Jacques Rd bridge as part of the NYSDEC 1990 Dioxin/Furan Sampling of Eighteenmile Creek. The water quality standard for class B and C waters is 0.000001 ug/l for 2,3,7,8-TCDD. The dioxin analysis did not detect the presence of 2,3,7,8-TCDD. The concentration of total dioxins was quantified at 0.000095 ug/l and total furans was quantified at 0.000077 ug/l. The 2,3,7,8-TCDD toxicity equivalence from this data was calculated as 0.000004 ug/l.

NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

Additional water quality data on PCBs and pesticides was provided from PISCES and pressure filtration data in water samples collected by DEC from various locations along Eighteenmile Creek and the NY Barge Canal in 1993 and 1994 (Appendix Table A-3) as part of the Lake Ontario Tributary Sampling (Litten). PISCES are passive samplers that measure the quantity of a contaminant in the dissolved phase of the water column. Contaminants in the water pass through a membrane on the sampler and into a quantity of hexane within the sampler. The water concentration measurements from PISCES samples are semi-quantitative. Pressure filtration measures the amount of a contaminant that is adsorbed onto suspended solids in the water column and is quantitative.

The samples collected showed the presence of PCBs at concentrations above the 0.001 ug/l water quality standard for the protection of aquatic life. The highest value was measured at Olcott Harbor between October 5-20, 1993 with a dissolved concentration of 0.148 ug/l. The average of the samples taken from Olcott Harbor is 0.069 ug/l in the dissolved phase and 0.010 ug/l in the adsorbed phase. The highest value upstream of the harbor was obtained at the North Transit Road site with a dissolved phase concentration of 0.206 ug/l (only one measurement was taken at this location).

The calibration of the PISCES sampling units is much less precise for pesticides than for PCBs. The comparison with water quality standards, however, indicated three exceedances for pesticides in the dissolved phase. The water quality standard for Aldrin/Dieldrin of 0.001 ug/l and Endrin of 0.002 ug/l was exceeded at Olcott Harbor on November 10, 1994 at 0.00225 ug/l and in The Gulf above Niagara Street on August 10, 1994 at 0.00309 ug/l. The standard for endosulfans of 0.009 ug/l was exceeded in The Gulf above Niagara Street also on August 10, 1994 at 0.01520 ug/l (Appendix Figure A-2).

The pressure filtration samples for pesticides indicated two exceedances of water quality standards both on September 14, 1994 at Stone Road. The standards for aldrin/dieldrin of 0.001 ug/l and endrin of 0.002 ug/l were exceeded by the combined value of 0.00334 ug/l and the guidance value for chlordane of 0.002 ug/l was exceeded at 0.00895 ug/l. Total suspended solids on September 14, 1994 was very high at 232 mg/l compared with a mean of 36.5 mg/l and a median of 6 mg/l.

Mercury measurements were taken from whole water samples collected by DEC (Litten) in 1993 and 1994 (Appendix Table A-4). The samples were analyzed with a new, more sensitive and reliable analytical technique. No exceedances of the water quality guidance value of 0.2 ug/l for mercury were observed.

NYSDEC PCB Sampling - 1995 (Litten)

A series of additional PISCES and pressure filtration samples were taken, by DEC (Litten), during the Summer of 1995 (Appendix Table A-5). These samples, again, show exceedances of the 0.001 ug/l aquatic water quality standard for PCBs. The PISCES measurements ranged from 0.008 to 0.016 ug/l at the discharge of the Barge Canal to Eighteenmile Creek, 0.066 to 0.084 ug/l at N. Transit Road and 0.033 to 0.089 ug/l at Stone Road. The pressure filtration measurements ranged from 0.003 to 0.100 ug/l at the discharge of the canal to the creek and from 0.015 to 0.110 ug/l at N. Transit Road.

NYSDEC Phenols and Chlorinated Benzenes Sampling - 1995

DEC personnel sampled the creek for phenols and chlorinated benzenes on November 13, 15 and 17, 1995. The analyses of these samples did not detect the presence of either class of compounds.

BOTTOM SEDIMENT DATA

Evaluation of bottom sediments in rivers and lakes is considerably less precise than evaluation of water quality. Unlike the water column, the makeup of sediments and their pollution content is not uniform along a given reach of the stream bottom and can vary widely over short distances. Sediment particle size and composition can effect the affinity of the sediments for pollutants and the effects those pollutants have on the environment.

There have been several studies of sediment quality in Eighteenmile Creek from 1977 to the present. The scope of these studies (type of sampling, areas sampled and contaminants analyzed) varies (Appendix Figures B-1 to B-4, Appendix Tables B-1 to B-7).

Interim sediment screening guidance was developed by the DEC in 1994 to assess the level of sediment contamination for environmental protection. Sediment contaminants have a wide and complex range of biotic and abiotic efforts, may lead to acute or chronic toxicity of wildlife, bioaccumulation in the food chain or contamination of surface water. The selected parameters for sediment screening and the associated contaminant levels are listed on Table 4.2. The sediment data in the Appendix Tables indicate the sediment screening parameters in boldface, the moderate contaminant levels in italics and the high contaminant levels in boldface.

Table 4.2
NYSDEC Sediment Screening Guidance
(mg/kg)

Parameter	Moderate to High Contaminant Levels
Cadmium	0.6 to 10
Copper	16 to 110
Lead	30 to 100
Mercury	0.1 to 4
PCBs (total)	0.1 to 10
DDT, DDE and DDD	0.005 to 0.6
Dieldrin	0.003 to 0.044
Mirex	0.002 to 0.2
2,3,7,8 - TCDD or TEF*	0.0000045 to 0.00005
PAH (total)	1 to 35
Anthracene	0.1 to 1
Benzo(a)anthracene	0.04 to 0.22
Chrysene	0.4 to 2.8
Benzene, Toluene and Xylene	0.5 to 10
Benzene	0.014 to 10
Methylethylketone (2-Butanone)	1 to 100
Trichloroethylene	0.1 to 10
Ammonia	40 to 200

*TEF - 2,3,7,8 - TCDD toxicity equivalence factor

NYSDEC Olcott Harbor Sediment Sampling - 1994 (Estabrooks et al)

The most comprehensive and recent study of Eighteenmile Creek sediments was conducted by DEC personnel (Estabrooks et al) in the Summer of 1994 (Appendix Table B-1). In this study, sediment cores were taken at seven sites in Eighteenmile Creek from Olcott Harbor to Clinton Street in Lockport. Surface samples were also taken at six of the seven sites (the Newfane Dam site was not included) and from Lake Ontario just east of the creek's outlet with a ponar dredge. The cores were sectioned and analyzed, along with the surface samples, for metals, pesticides, polycyclic aromatic hydrocarbons (PAHs), dioxins, dibenzofurans and PCBs. The cores were cut into one to four segments depending on their length. While the core segments were analyzed for dioxins and dibenzofurans the surface samples were not. A scan for seven common mixtures of PCBs (Arochlors) was conducted on all samples.

The analyses indicated that, in general, the sediments upstream of the Area of Concern are more contaminated than those within the Area of Concern with the highest values in the sediments behind the Burt and Newfane dams. The sediment contaminant values were generally greater in the surface samples than the core segments for three of the four sites (sites three, four and five) in the Area of Concern (Appendix Figure B-2 "Esta-94"). The sample that did not exhibit this trend (site two) was closest to the outlet to Lake Ontario (Appendix Figure B-1 "Esta-94"). The samples upstream of the Area of Concern indicated that contaminant levels were generally greater in the deeper sediments compared to the surface samples (Appendix Figures B-2 to B-4 "Esta-94").

Sediments in the Area of Concern

Natural sediments are made up of various heavy metals such as iron, aluminum, copper, chromium, cadimum and others. Heavy metals background concentrations can vary greatly depending upon factors such as the type of bedrock found in the immediate and upstream areas of the watershed.

There was heavy metal contamination in all of the core segments and surface samples in the Area of Concern. The metals detected in the surface samples were: arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium and zinc. The metals arsenic, chromium, copper, iron, lead, nickel and zinc were detected in all of the core samples. Additionally, silver was detected in both segments of core number two in Olcott Harbor, in the 70 to 80 inch segment from the core at site number three in Olcott Harbor and in the 80 inch to end segment of core number four, upstream of the Route 18 bridge. Mercury was also detected in both segments of core number two, in Olcott Harbor. Cadmium and selenium were not detected in any of the cores. Table 4.3 contains the metals data from the surface samples.

Table 4.3
Metals Concentrations from 1994 DEC Olcott Harbor Sediment Sampling (Estabrooks et al) in Eighteenmile Creek (mg/kg)

	Site 1 Lake Ontario	Site 2 Olcott Harbor	Site 3 Olcott Harbor	Site 4 Upstr of Rt 18 Br	Site 5 Dwnstr of Burt Dam	Site 6 Upstr of Burt Dam	Site 8 Clinton Street
Arsenic, Total	1	2.5	4	4.5	4.3	5.6	3.6
Cadmium, Total	ND	*1.2*	*2.1*	*3.2*	*1.6*	*5.7*	*2*
Chromium, Total	9.6	21.6	94.7	112	80	189	44.8
Copper, Total	5.6	*35.9*	**131**	**142**	**127**	**353**	**238**
Iron, Total	10700	9190	19400	21700	21500	28200	14400
Lead, Total	3.8	*66.4*	**226**	**196**	**178**	**486**	**475**
Mercury, Total	ND	*0.53*	*0.48*	*0.55*	*0.72*	*0.69*	*0.66*
Nickel, Total	5.6	11.6	102	90.9	49.2	79.8	31.8
Selenium, Total	ND	0.45	0.75	1.1	0.8	1.7	1.4
Silver, Total	ND	ND	ND	0.9	ND	2	2.1
Zinc, Total	53.7	128	746	918	470	1540	423

ND - Not Detected
DEC sediment screening guidance parameters in **boldface**, moderate contaminant levels in *italics* and high contaminant levels in **boldface**

Within the Area of Concern, the surface sampling detected the presence of PCBs and 4, 4'-DDE (a metabolite of DDT). Analyses of the core samples did not detect any PCB Arochlors or pesticides. Surface samples number three through five contained Arochlor 1248 in concentrations ranging from 0.42 mg/kg to 0.63 mg/kg and Arochlor 1254 from 0.16 to 0.23 mg/kg. No Arochlors were detected in surface sample at site two. All surface samples, except for site two (the closest sample to the outlet), in Olcott Harbor contained 4, 4'-DDE at concentrations ranging from 0.008 mg/kg to 0.016 mg/kg.

All of the surface samples from the Area of Concern contained PAHs. The PAH found at the highest concentration was indeno (1,2,3-cd) pyrene at 2.5 mg/kg in the surface sample at site two. Other PAHs in the Area of Concern were detected at concentrations between 1.7 mg/kg for chrysene and 0.05 mg/kg for anthracene in the surface samples. The core samples from the Area of Concern, except for site two, only indicated the presence of benzo(b)fluoranthene from 0.14 to 0.44 mg/kg. Site two contained a greater variety and total concentration.

The cores in this study were analyzed for dioxins and dibenzofurans. Within the Area of Concern, sediment core total dioxin concentrations ranged from 0.00011 mg/kg in the bottom segment of site four to 0.00050 in the bottom segment of site two. Total furan concentrations ranged from non-detects at sites three through five to 0.00023 mg/kg in the bottom segment of site two. All of the samples were dominated by the more highly chlorinated dioxins and furans, particularly octachlorodibenzo(p)dioxin (OCDD). 2,3,7,8-

TCDD was not detected in any of the core samples in the Area of Concern. Except for site two, all sites in the Area of Concern were below the lowest level for dioxins under the NYS sediment guidelines.

Sediments Upstream of Area of Concern

Samples upstream of the Area of Concern were collected at sites six, seven and eight (Appendix Figures B-2 to B-4 "Esta-94"). With one exception (selenium was not detected in core number eight), the core and surface samples upstream of the Area of Concern contained all of the metal analytes. Both core and surface metal concentrations tended to be higher in the sites upstream of the Area of Concern although there were exceptions. Generally, the core segments from sites upstream of the Area of Concern had higher metals concentrations than the corresponding surface samples at those sites.

Pesticide, PCB and PAH concentrations also tended to be higher in the samples upstream of the Area of Concern. The pesticides 4,4'-DDE and 4,4'-DDT were both detected at slightly higher concentrations in the surface sample behind the Burt Dam than in downstream surface samples but only 4,4'DDD was detected in the surface sample from Clinton St. DDT and it's metabolites were detected in all three cores taken upstream of the Area of Concern. They were not detected in the downstream cores. Sites upstream of the Area of Concern all had greater surface and core PCB concentrations than those downstream. The cores from behind the Burt and Newfane Dams had PCB concentrations of 20 mg/kg and 18 mg/kg of Arochlor 1248, respectively,in core segments. The PCB concentration in the surface sample behind the Burt Dam was 2.5 mg/kg. PAH concentrations were more variable although the upstream sites tended to have a greater variety and concentration of PAHs with the Clinton St site having the highest total PAHs.

Dioxin and dibenzofuran concentrations were also higher in the sediment core samples taken upstream of the Area of Concern. 2,3,7,8-TCDD was detected at levels that ranged from 0.000004 mg/kg to 0.000026 mg/kg in the top segments at the three sample sites. The predominant isomer was octachlorodibenzo(p)dioxin (OCDD) which ranged from 0.011 to 0.250 mg/kg in the top core segments. The total sediment dioxin concentrations in the upstream top core segments ranged from 0.013 to 0.290 mg/kg. Total furan concentrations in the same top core segments ranged from 0.0037 to 0.0079 mg/kg.

NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

Another source of sediment data is from samples collected in the 1994 Lake Ontario Tributary Sampling which includes analyses for mercury, PCBs, dioxins and dibenzofurans (Appendix Table B-2). One sediment core of 25 inches was taken in Olcott Harbor (Appendix Figure B-1 "Littn-94"). The first four segments to a depth of 9 inches had mercury concentrations that ranged from 1.89 to 3.76 mg/kg. The remaining segments all had mercury concentrations below 0.102 mg/kg. An additional sediment surface sample from Olcott Harbor had a mercury concentration of 0.655 mg/kg.

The dioxin/dibenzofuran levels in the sediment samples collected from Olcott Harbor were 0.0322 mg/kg total dioxins and 0.00436 mg/kg total furans. The 2,3,7,8-TCDD toxicity

Area of Concern, behind the Burt and Newfane Dams, near the Rt 104 bridge on the East Branch, at the confluence of The Gulf with Eighteenmile Creek and at Clinton Street in Lockport (Appendix Figures B-1 to B-4 "Lttn-87").

The 1987 DEC core samples from the Area of Concern show levels of contamination that are roughly comparable to those from core samples in the 1994 Olcott Harbor Sediment Sampling. The top most segments of the 1987 core from the Olcott spoil bar site (in Olcott Harbor) tended to have comparable but somewhat lower metals concentrations than the 1994 surface sample at site 2 and considerably lower concentrations than site 3 in 1994. The top segments of the 1987 sample from upstream of the Route 18 bridge had lower concentrations of all metals except iron than the 1994 surface sample from site 4 in the same general area. The concentration vs depth profiles tended to vary among sites and contaminants. With a small number of exceptions, however, the contaminant concentrations did not vary considerably over depth or between the two sites in the Area of Concern.

Upstream of the Area of Concern, the sediments behind the two dams have the higher levels of contamination. The samples from behind the Newfane Dam showed the highest levels: arsenic (12.9 mg/kg), lead(4760 mg/kg), mercury(2.7 mg/kg), selenium (0.9 mg/kg), silver (5 mg/kg), copper (2750 mg/kg), nickel (895 mg/kg), zinc (21200 mg/kg), molybdenum (116 mg/kg) and tin (1100 mg/kg). The highest levels for all of the other compounds were from the sediments behind the Burt Dam. These included chromium (2160 mg/kg), cadmium (9.7 mg/kg), barium (403 mg/kg) and several others. These levels range from about 1. 5 times to two orders of magnitude greater than comparable levels from samples in the Area of Concern. The cause of this is most likely the result of sediment deposition in the slow moving waters in the reservoirs behind the dams. Considering the lower levels of contaminants in the slower moving waters of the Area of Concern, the reservoirs at the dams appear to have acted as sinks for contaminants.

The remainder of the sampling sites (i.e., Clinton St., The Gulf, and the East Branch at Rt 104 bridge) showed elevated sediment metal contaminant levels as well. These were, however, generally lower than the levels from behind the two dams. Overall, the data shows that the upper portion of the creek (above the Area of Concern) is contaminated with metals such as copper and lead and that the reservoirs behind the two dams act as sedimentation basins and thus contain a high portion of the sediment contaminant loading.

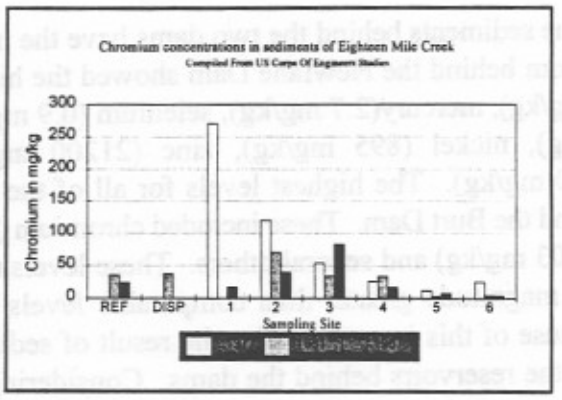
US Army Corps of Engineers Studies (1977, 1981 & 1987)

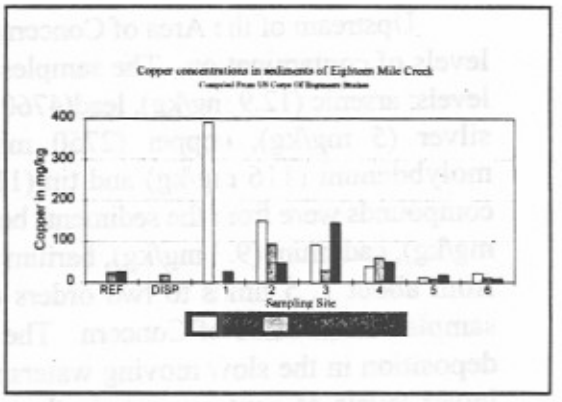
The earliest data set for sediments is a series of three studies done for the US Army Corps of Engineers in 1977, 1981 and 1987. In these studies, each of the same six sites were sampled in the Area of Concern from the outlet to Lake Ontario to just downstream of the Rt 18 bridge (Appendix Figure B-1). The last two studies also included a reference site in Lake Ontario (1.5 miles N 45' west of Olcott light). In these studies single grab samples were collected (with replicates for one of the sites) at each of the sites. The 1987 study is the

most recent comprehensive study of sediment contamination in the navigational channel. This dataset is, therefore, included for use in evaluating the restrictions on dredging activities impairment indicator. The data from this study is contained in Appendix Table B-6.

Comparable sample sites (Corps sites 4 and 3 are near the Olcott Harbor Sediment Sampling (Estabrooks et al) sites 2 and 3, respectively) in the 1987 Corps study and the 1994 Estabrooks et al study show similar levels of metals contamination. In addition, the Corps study indicates that, for metals, the level of sediment contamination decreases from the Rt. 18 bridge towards the outlet to Lake Ontario. This is illustrated in Figure 4.1.

Figure 4.1
Concentrations of Chromium and Copper in the Sediments of Eighteenmile Creek from US Army Corps of Engineers Sediment Studies Dated 1977, 1981 and 1987





USEPA Great Lakes National Program Office Study (1981)

Another study similar to the three Corps studies is the EPA Great Lakes National Program Office 1981 Harbor Sediment Program for Lake Ontario. The data from this study is contained in Appendix Table B-7 and is similar to the data obtained in the more recent sampling efforts.

STATUS OF IMPAIRMENTS RELATED TO SHORT-TERM GOAL AND ASSESSMENT OF THEIR CAUSES

In the following portion of this Chapter the 14 Great Lakes Water Quality Agreement impairments or impairment indicators are examined relative to Eighteenmile Creek and conclusions are drawn using the available data. The causes of the impairments identified are described and assessed.

1. Restrictions on Fish and Wildlife Consumption

Impairment Status: Yes

Fish:

Based on data from the New York State Department of Environmental Conservation (DEC), the New York State Department of Health (DOH) has issued a fish consumption health advisory for Eighteenmile Creek. The DOH advisory for Eighteenmile Creek is to EAT NO fish of any species, based on elevated PCB levels in fish from Eighteenmile Creek.

Fish that migrate from Lake Ontario are present in the Area of Concern (from Olcott Harbor outlet to Burt Dam). The DOH advisory for this area is the same advisory that applies to Lake Ontario waters which is based on levels of PCBs, mirex and dioxins. The advisory is:

- Eat no American eel, channel catfish, carp, lake trout, chinook salmon, rainbow trout, white perch, coho salmon over 21", and brown trout over 20".
- Eat no more than one meal/month of white sucker, smaller coho salmon, and smaller brown trout.

Table 4.6 contains a summary of the results of recent studies of contaminant levels in the fish from Eighteenmile Creek. The contaminants of greatest concern in the creek are PCBs. All of the samples from above Burt Dam and three out of eight from below the dam exceeded the Food and Drug Administration (FDA) limit for human consumption of 2 mg/kg for PCBs. Of the fish analyzed for dioxins, two whole fish samples (a carp and a brown trout both from the Olcott area) exceeded the New York State guideline concentration of 0.00001 mg/kg with concentrations of 0.0000432 mg/kg and 0.000012 mg/kg respectively.

Snapping Turtles:

There is a state wide advisory that women of child bearing age and children under the age of 15 should not consume snapping turtles because of possible PCB contamination.

Table 4.6
Results of Adult Fish Samplings in Eighteenmile Creek (mg/kg)

Sample Set	Species	# of Fish	# of Analyses	Length (mm)	Weight (g)	Lipid %	Fish Part	2,3,7,8-TCDD	Total Dioxin TEF*	Total PCBs
July 1987	Northern pike	3	1	595±69	1387± 565	0.80	SF	0.0000007	0.0000009	0.40
Downstream of Burt Dam	Carp	3	1	649±34	3652± 631	19.70	WH	**0.0000337**	**0.0000567**	**9.31**
October 1987	Brown trout	10	1	NA	NA	17.00	WHC	**0.0000120**	**0.0000120**	NA
Downstream of Burt Dam										
June and July 1989	Largemouth bass	2	2	NA	NA	0.62	SF	0.0000005	0.0000007	0.62
Downstream of Burt Dam	Rock Bass	1	1	NA	NA	0.96	SF	0.0000006	0.0000021	0.49
July 1992	Smallmouth bass	8	2	361±19	731±149	3.73	SF	NA	NA	1.51
Downstream of Burt Dam	Largemouth bass	12	8	314±14	536±70	2.25	SF	NA	NA	**3.64**
	Carp	10	3	586±63	3001± 787	13.5	SF	NA	NA	**6.80**
	Brown bullhead	11	3	348±20	596±93	1.48	SF	NA	NA	1.50
July and August 1992	Largemouth bass	11	8	304±14	497±62	0.96	SF	NA	NA	**3.81**
Upstream of Burt Dam	Black crappie	12	2	190±16	116±26	3.08	SF	NA	NA	**6.54**
	White sucker	10	3	407±13	734±85	1.64	SF	NA	NA	**3.21**
	Northern pike	3	3	700±98	2203±782	1.76	SF	NA	NA	**5.16**
	Rock bass	3	2	201	179	0.89	SF	NA	NA	**2.31**
	Walleye	1	1	493	1105	1.68	SF	NA	NA	**6.74**
	Channel catfish	2	1	465	1036	7.48	SF	NA	NA	**15.3**
Standards and Guidelines										
U.S. FDA								0.00001 +	0.00001 +	2.00
DEC Wildlife Criteria								0.0000023	0.0000023	0.11

+ NYS DOH guideline concentration
*Total Dioxin TEF - toxicity equivalence of 2,3,7,8 - TCDD
WHC - Whole Fish, eviscerated with head, gills and kidneys left
WH - Whole Fish
SF - Standard Fillet
NA - Not Analyzed or Not Reported
ND - Not Detected

Table 4.6
Results of Adult Fish Samplings in Eighteenmile Creek (mg/kg)

Sample Set	Species	DDT, DDE &DDD	Dieldrin	Hg	Alpha Endo-sulfan	Mirex & Photo-mirex	HCB	Chlordane & Metabolites
July 1987 Downstream of Burt Dam	Northern pike	0.030	0.0030	0.17	NA	0.006	ND	0.003
	Carp	1.010	0.0850	0.08	NA	0.073	0.043	0.140
October 1987 Downstream of Burt Dam	Brown trout	NA	NA	NA	NA	NA	NA	NA
June and July 1989 Downstream of Burt Dam	Largemouth bass	0.068	ND	0.3	0.005	NA	NA	NA
	Rock Bass	0.070	ND	0.19	ND	NA	NA	NA
July 1992 Downstream of Burt Dam	Smallmouth bass	0.288	ND	ND	NA	0.1	0.007	0.046
	Largemouth bass	0.332	ND	ND	NA	0.034	0.005	0.080
	Carp	1.903	ND	ND	NA	0.062	0.027	0.158
	Brown bullhead	0.334	ND	ND	NA	0.08	0.003	0.028
July and August 1992 Upstream of Burt Dam	Largemouth bass	0.213	ND	ND	NA	ND	0.001	0.002
	Black crappie	0.195	ND	ND	NA	ND	ND	ND
	White sucker	0.348	ND	ND	NA	ND	0.002	ND
	Northern pike	0.247	ND	ND	NA	ND	0.004	0.010
	Rock bass	0.054	ND	ND	NA	ND	0.003	0.004
	Walleye	0.272	ND	ND	NA	ND	0.004	ND
	Channel catfish	0.709	ND	ND	NA	0.002	0.016	0.058
Standards and Guidelines								
U.S. FDA		5.000	-	1.0	-	0.1	-	0.300
DEC Wildlife Criteria		0.200	0.0220	-	-	0.33	0.200	0.370

Waterfowl:

No site specific waterfowl consumption advisories are in effect at this time. However, there is a state wide advisory against eating Mergansers due to contamination with PCBs, mirex, chlordane and DDT. For all other waterfowl, it is recommended to eat no more that two meals per month. Chlordane is associated with the historical use of this pesticide on Long Island and does not appear to be a concern for the Lake Ontario region of the state.

Mammals:

There are currently no consumption advisories in effect for mammals.

2. Tainting of Fish and Wildlife Flavor

Impairment Status: No

The substances of primary concern for tainting of fish are phenols (especially chlorinated phenols) and chlorinated benzenes. Phenols in the water column may taint fish flesh at levels above 5 ug/l, and chlorinated phenols are food-tainting at levels above 1 ug/l. Chlorinated benzenes can taint fish flesh at concentrations of 50 ug/l. DEC testing done on November 13,15 and 17, 1995 did not detect the presence of either phenols (detection limit of 5 ug/l) or chlorinated benzenes (detection limit of 10 ug/l). There have been no reports of fish tainting to DEC Fish and Wildlife personnel. Because of these facts, this indicator is not considered to be impaired.

3. Degradation of Fish and Wildlife Populations

Impairment Status: Unknown

Eighteenmile Creek has become a significant Lake Ontario tributary fishery during the past 20 years. Most angler effort has been directed at migratory trout and salmon, however the creek also provides fishing opportunities for warm water species. Quantitive information on angler effort in the Area of Concern (AOC) is not readily available.

Much of the recreational fishing activity in the AOC has resulted from the NYSDEC Great Lakes salmonid stocking program. The AOC has been stocked with chinook salmon, coho salmon, rainbow trout (including steelhead strains), brown trout and lake trout. Significant numbers of returning salmon and trout create outstanding angling opportunities, particularly during the fall. Recreational fishing is conducted by boat-based as well as shore-based anglers. Snatching was a popular method for catching Pacific salmon until it was banned in 1994.

Diminished migratory runs of Pacific salmon (chinook and coho), the ban on snagging and several other factors have reduced angler activity in the AOC. However, Eighteenmile Creek remains an important fishery in the region.

The existing fish community in the AOC is typical of that found in many Great Lakes estuaries. Fish species observed and/or collected in the AOC by NYSDEC Regional Fisheries Staff during the 1980's and 1990's are listed in Table 4.7. The list reflects sampling activity during the summer and does not fully represent the fish community on a year-round basis. Table 4.8 contains a partial listing of the wildlife species present within the Area of Concern. Additionally, a Blanding's Turtle which is a threatened species in New York was spotted in this area in August 1990 by an Environmental Conservation Officer.

Historical information indicates portions of the creek were polluted and fish populations were degraded. Fish collections in 1939 indicate these degraded conditions existed upstream of the AOC and probably influenced conditions at least in upstream portions of the AOC. In July 1939, fish were collected from shallows on the west shore of Olcott Harbor just upstream of the creek mouth. Thirteen species of fish, all immatures were collected using a 50 ft seine. A juvenile blue pike, a species now considered extinct, was also collected at this site. Water quality problems were not noted at the site, however there was a notation that sheepshead and bowfin used to be present. The creek at this sampling point was described as a bay, approximately 500 ft wide, used as a boat haven.

In July 1939, collections were also conducted along the creek's east bank approximately 1 1/4 mile upstream from the mouth. Fifteen species of fish were caught, most of which were young or juvenile. This suggests the estuary historically functioned as an important

spawning and nursery area. One of two *Stizostedion vitreum* immatures collected was a blue pike.

The presence of a cattail (*Typha*) marsh was noted on one or both sides of the creek all the way from the Rt 18 bridge upstream to the Burt Dam. There existed very few openings in the cattail marsh, presenting few opportunities for seining. *Potamogeton* was observed in shallower water along the sides of the channel. Currently, much of the estuary, from the Route 18 bridge upstream to just short of the Burt Dam, contains a similar cattail cover type.

In August 1939, Dr U. B. Stone sampled a site slightly downstream of Newfane Dam. The current was described as moderate to swift, and *Elodea* and *Potamogetons* were judged to be abundant. A 10 ft seine was used for sampling. Eight species of immature fishes and a crayfish were collected. One other species of fish was observed at the site. Dr Stone noted that minnows were scarce and there was "evidence of much pollution".

During the same sampling episode in August 1939, Dr Stone conducted collections in Eighteenmile Creek upstream of the AOC, approximately 1 1/8 mile south of Newfane. Seining produced four species of fish. It was noted that fish life was scarce and there was "heavy sewage pollution from Lockport". (In 1939 the City of Lockport commenced construction of a primary wastewater treatment plant.)

A New York State Department of Health report published in the late 1950s described existing water uses in Eighteenmile Creek for fishing and fish culture as follows:

> "Eighteenmile Creek from the dam near Burt to the source is not considered to be fishing water, although prior to 1938 great northern pike and pikeperch were reported present in the reservoir formed by the dam. The substandard, if not actually lethal, condition of the stream as relates to fish life, particularly during periods of low stream flow, results from oxygen-demanding and toxic materials from the sewage and industrial discharges at Lockport. The Burt Dam also forms a physical barrier to the passage of fish upstream on migration runs from Lake Ontario, when stream conditions are more favorable.
>
> The backwater from Lake Ontario extends nearly to the dam at Burt and is populated at times with most of the species to be found in the shallow-water areas of Lake Ontario. Reportedly bullhead, yellow perch, largemouth bass, rock bass, pikeperch and northern pike are present. Although some fishing is conducted in this area, catches are generally poorer than in the mouths of other less polluted streams. The two-and-a-half-mile length of estuarine water could become an important recreational facility to this area, with the proper adjustment of the

pollutional loading on the stream and the reduction or elimination of toxic chemical waste discharges."

The Health Department report indicated that dissolved oxygen was a major factor limiting fish populations in the section of Eighteenmile Creek from Lockport downstream to the Burt Dam. Toxic substances from industrial discharges at or near lethal levels indicated a potential danger, especially when coupled with low oxygen levels. Reduction in oxygen levels downstream from the Burt Dam were not found to be as critical as in the upstream section.

The report also discussed potential for reclamation of the impacted sections of the Creek as follows:

> "There seems little justification for attempting to reclaim the section of the stream from above the Burt Dam for fishing purposes, and it is doubtful if this could be accomplished unless a greater flow is released to the creek from the barge canal. However, unless conditions permitting the survival of fish life can be maintained in this section, it is improbable that the full potential of the more valuable estuarine waters near Lake Ontario can be realized."

The Health Department report identified Burt Dam as an impassable barrier to upstream fish migrations. This structure has probably contributed to degrading lake-based populations of migratory fishes which historically gained access to upstream portions of the creek for spawning and nursery habitat. Some of this impact may be mitigated by the drifting of upstream fish eggs and larvae, through the Burt Dam hydropower facility to the estuary.

Table 4.7
Fish Species Observed and/or Collected in the Eighteenmile Creek Area of Concern During the 1980's and 1990's

Common Name	Scientific Name
Alewife	*Alosa pseudoharengus*
American eel	*Anguilla rostrata*
Black crappie	*Pomoxis nigromaculatus*
Bluegill	*Lepomis macrochirus*
Bowfin	*Amia calva*
Brown trout	*Salmo trutta*
Brown bullhead	*Ameiurus nebulosus*
Carp	*Cyprinus carpio*
Common shiner	*Luxilus cornutus*
Freshwater drum	*Aplodinotus grunniens*
Gizzard shad	*Dorosoma cepedianum*
Golden shiner	*Notemigonus crysoleucas*
Goldfish	*Carassius auratus*
Largemouth bass	*Micropterus salmoides*
Logperch	*Percina caprodes*
Longnose gar	*Lepisosteus osseus*
Muskellunge	*Esox masquinongy*
Northern pike	*Esox lucius*
Pumpkinseed	*Lepomis gibbosus*
Rainbow trout	*Oncorhynchus mykiss*
Redhorse sucker	*Moxostoma sp.*
Rock bass	*Ambloplites rupestris*
Smallmouth bass	*Micropterus dolomieu*
Walleye	*Stizostedion vitreum*
White bass	*Morone chrysops*
White sucker	*Catostomus commersoni*
White perch	*Morone americana*
Yellow perch	*Perca flavescens*

Listing of fishes observed and/or collected in AOC during sampling on July 13, 1987, July 6, 1989, June 27, 1989 and July 6 and 7, 1992

Above the Rt 18 bridge, the creek runs through a steep gorge. This reach of the creek is approximately 1 3/4 miles long. Within the confines of this gorge lies a large coastal wetland which has been preserved almost undisturbed due to its inaccessibility and its status as a state protected wetland. This is a productive estuary and supports a variety of wildlife. Trees and shrubs along the sides of the gorge are used by birds for nesting and perching sites and the wetland is resting, breeding and foraging habitat for a number of fish and wildlife species. Table 4.8 contains a partial listing of the species present within the Area of Concern.

Table 4.8
Partial Listing of Species Present in the Area of Concern Taken from the Rating Form for Eighteenmile Creek Under the Significant Coastal Fish and Wildlife Habitat Program

Belted kingfisher	Mink
Common yellowthroat	Muskrat
Great blue heron	Raccoon
Green backed heron	
Mallard	
Marsh wren	
Redwinged blackbird	
Swamp sparrow	
Wood duck	

The fish and wildlife habitat in the creek and the estuary upstream upstream of Rt 18 is productive, however, since there have been no year-round fish and wildlife population surveys in the AOC the status of this impairment is considered unknown.

4. Fish Tumors and Other Deformities

Impairment Status: Unknown

Fish tumors have been viewed as an indicator of contaminant stresses in the ecosystem, and an interference with human uses of the resource such as fishing and fish consumption. They have also indicated a health risk, if human carcinogens were present in the flesh of food fish. Recent research has found that tumorous fish are present in relatively uncontaminated water bodies. There are a wide range of natural factors, in addition to contaminants, that may cause fish tumors.

The IJC criteria for determination of impairment is when the incidence of fish tumors or other deformities exceed rates of unimpacted control sites or when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers.

There have been no fish pathology studies done in the Eighteenmile Creek Area of Concern. As such, the status of this impairment indicator is unknown.

5. Bird or Animal Deformities or Reproductive Problems

Impairment Status: Likely

There is no data available on the incidence of bird or animal deformities or reproductive problems in the Area of Concern. There are, however, contaminants in the creek that are known to bioaccumulate and (in some instances) cause deformities or reproductive problems in wildlife. The creek is easily accessible to picivorous wildlife.

Young-of- the-year fish are a likely food source for many picivorous birds and animals. There have been no samplings for contaminant level analysis of young-of-the-year fish in Eighteenmile Creek however.

Adult fish may also serve as a food source for picivorous wildlife. Table 4.6 contains a summary of various fish sampling programs for Eighteenmile Creek. All fish that were analyzed for PCBs in this table exceeded the DEC wildlife criteria of 0.11 mg/kg. In the 1992 sampling, all species sampled, except for black crappie and rock bass (both taken above Burt Dam), exceeded the criteria for DDT and its metabolites of 0.2 mg/kg. One carp sample exceeded the wildlife criteria for dieldrin (0.022 mg/kg) with a concentration of 0.085 mg/kg. The criteria for 2,3,7,8- tetrachlorodibenzodioxin of 0.0000023 mg/kg was exceeded in a carp sample collected in 1987 from the Olcott area.

Because DEC wildlife criteria for contaminant concentrations in adult fish flesh are exceeded for several substances in multiple samples from Eighteenmile Creek, this indicator is considered likely to be impaired.

6. Degradation of Benthos

Impairment Status: Yes

Bottom-dwelling organisms serve as both a food source for higher organisms such as fish, and as an indicator of pollution stress. Measurements of benthic macroinvertebrates inhabiting the creek were made in 1977 for the Army Corps of Engineers. In 1987, the Corps did a study of the effects of creek sediment pollution on certain benthic organisms. The New York State Department of Environmental Conservation also collected benthic samples on three occasions during 1989 and 1990 as part of the 1990 Rotating Intensive Basin Study. All studies that applied ratings to the stream, concluded that it was moderately impacted.

The 1994 sediment sampling in Eighteenmile Creek (from both Olcott Harbor Sediment Sampling and the core taken from Olcott Harbor in the Lake Ontario Tributary Sampling) provides a data set of sediment contaminant concentrations which can be evaluated using the recently published DEC *Division of Fish and Wildlife Sediment Guideline Values.* This guidance contains numeric criteria for determining the benthic impact of contaminated sediments based on metals and nonpolar persistant organic compounds. For metals, there are contaminant concentrations at which moderate and severe impact to the benthos is likely to occur. The metals criteria were derived from similar Ontario Ministry of Environment guidance. These criteria were obtained from observations of the extent of benthic impairment in areas with sediments contaminated by metals. They do not, however, account for the effects of sediment organic content or other factors which may influence contaminant toxicity. The sediment criteria for nonpolar persistent organic compounds are based on equilibrium partitioning modeling utilizing New York State water quality standards. Because these criteria are based on water quality standards, there are different criteria for human health through bioaccumulation, benthic aquatic life acute and chronic toxicity and wildlife bioaccumulation.

Applying this guidance to the 1994 Olcott Harbor Sediment Sampling data for the Area of Concern shows several areas of potential benthic impairment. Table 4.9 contains a comparison of sediment data with the DEC Division of Fish and Wildlife guideline values. Surface samples at sites three, four and five all exceeded the severe impact threshold for copper, lead, nickel and zinc. These sites also exceeded the lowest impact threshold for cadmium and mercury. Site four exceeded the severe impact level for chromium while sites three and five exceeded the lowest impact level for chromium. Additionally, the top segment of the sediment core taken from Olcott Harbor as part of the 1994 Lake Ontario Tributary Sampling exceeded the severe impact level for mercury at 2.25 mg/kg. Site two did not exceed the severe impact level for any metals but exceeded the lowest impact level for cadmium, copper, lead, mercury and zinc.

Table 4.9
Comparison* of Surface Sediment Samples Taken in Eighteenmile Creek in 1994 to NYSDEC Division of Fish and Wildlife Sediment Guideline Values for Metals (all Values in mg/kg)

	Sediment Guidance		Sediment Sample Results				
Analyte	Lowest Impact	Severe Impact	Site 1 Lake Ontario	Site 2 Olcott Harbor	Site 3 Olcott Harbor	Site 4 Above Rt 18 Bridge	Site 5 Below Burt Dam
Arsenic, Total	6	33	1	2.5	4	4.5	4.3
Cadmium, Total	0.6	9	ND	*1.2*	*2.1*	*3.2*	*1.6*
Chromium, Total	26	110	9.6	21.6	*94.7*	**112**	*80*
Copper, Total	16	110	5.6	*35.9*	**131**	**142**	**127**
Iron, Total	20000	40000	10700	9190	19400	*21700*	*21500*
Lead, Total	31	110	3.8	*66.4*	**226**	**196**	**178**
Mercury, Total	0.15	1.3	ND	*0.53*	*0.48*	*0.55*	*0.72*
Nickel, Total	16	50	5.6	11.6	**102**	**90.9**	*49.2*
Silver, Total	1	2.2	ND	ND	ND	0.9	ND
Zinc, Total	120	270	53.7	*128*	**746**	**918**	**470**

*Sediment values exceeding the severe impact level are in **boldface** and those between the lowest and severe impact levels are in *italics*.
ND - Not Detected

Comparison of the sediment concentrations of organic contaminants to the sediment guideline values for nonpolar organic compounds indicates little or no chronic or acute toxicity. All of the sediments sampled within the Area of Concern were below the guideline values for both acute and chronic toxicity to benthic life. The one exception is that the sediments from site number four (above the Rt 18 bridge) exceeded the PCB guideline value for chronic toxicity. Table 4.10 contains the guideline values and measured sediment contaminant concentrations for nonpolar organic compounds.

Table 4.10
Comparison* of Surface Sediment Samples Taken in Eighteenmile Creek in 1994 to NYSDEC Division of Fish and Wildlife Sediment Guideline Values for Nonpolar Organic Compounds (All Values in mg/kg of Sediment Organic Carbon)

	Sediment Guidance		Sediment Sample Results				
Analyte	Chronic Toxicity	Acute Toxicity	Site 1 Lake Ontario	Site 2 Olcott Harbor	Site 3 Olcott Harbor	Site 4 Above Rt 18 Bridge	Site 5 Below Burt Dam
Acenaphthene	140	NG	ND	ND	ND	ND	ND
Chlordane	0.03	1.4	ND	ND	ND	ND	ND
DDT	1.0	1100	ND	ND	ND	ND	ND
Dieldrin	9.0	NG	ND	ND	ND	ND	ND
Endosulfans	0.03	0.78	ND	ND	ND	ND	ND
Endrin	4.0	NG	ND	ND	ND	ND	ND
Fluoranthene	1020	NG	ND	13	21	28	ND
Heptachlor & Heptachlor epoxide	0.1	13.1	ND	ND	ND	ND	ND
Hexachloro - cyclohexane (BHC)	0.06	12.6	ND	ND	ND	ND	ND
Methoxychlor	0.6	ND	ND	ND	ND	ND	ND
Mirex	0.7	NG	ND	ND	ND	ND	ND
Phenanthrene	120	NG	ND	7	23	21	ND
PCBs	19.3	2760	ND	ND	*20*	*40*	18
Toxaphene	0.01	3.2	ND	ND	ND	ND	ND

*Sediment values exceeding the acute toxicity level are in **boldface** and those exceeding the chronic toxicity level are in *italics*.
ND - Not Detected
NG - No Guidance Value

In addition to contaminant analyses of sediments, the 1994 Olcott Harbor Sediment Sampling included toxicity testing of some of the surface sediments on various benthic and non-benthic organisms. The tests conducted were: *Hyalella azteca* and *Chironomus tentans* 10 Day Survival and Growth Test for Sediments (USEPA Test Methods 100.1 and 100.2); Acute Toxicity of Sediments to Early Life Stages of *Daphnia magna* (water flea) and *Pimephales promelas* (fathead minnow) and microtox testing on Eighteenmile Creek sediments and sediment pore water. The results of these tests are as follows.

The growth tests for *H. azteca* were greater than or close to the control for all sites indicating a nontoxic response. The mortality data for *H. azteca* did not show any statistically significant difference in the control samples (Table 4.11). The growth tests showed that *C. tentans* larvae had a toxic response to the sediments from all samples except

for site number eight (Clinton St) in that the growth of *C. tentans* was significantly less (all results were tested to within $\alpha = 0.05$ level of significance) than that of the control samples. The mortality data, however, for *C. tentans* did not indicate any statistically significant difference from the control samples except for site two (Table 4.12). The *C. tentans* mortality for site two was significantly greater than the control. The duplicate for this sample did not, however, show a similar response. Leeches were found in two test replicate samples from site two. These leeches may have been responsible for this result at test site two.

Table 4.11
Statistical Summary of Survival and Weight Data for *H. azteca* exposed to the Sediments of Eighteenmile Creek.

Site Number	Number of Survivors			Weight of Organism		
	Mean	Range	Std. Dev.	Mean	Range	Std. Dev
Control A	8.25	5 - 10	2.36	0.089	0.079 - 0.094	0.007
2D	8.25	7 - 10	1.26	0.101	0.086 - 0.114	0.012
3	9.50	9 - 10	0.58	0.083	0.073 - 0.113	0.020
5	8.00	5 - 10	2.16	0.084	0.076 - 0.090	0.006
8	9.00	7 - 10	1.41	0.130	0.107 - 0.154	0.020
Control B	9.75	9 - 10	0.50	0.083	0.076 - 0.090	0.006
1	10.0	10	0	0.096	0.091 - 0.102	0.005
2	8.75	8 - 10	0.96	0.079	0.071 - 0.090	0.009
4	8.25	6 - 10	1.71	0.090	0.078 - 0.099	0.009
6	8.50	6 - 10	1.73	0.078	0.064 - 0.094	0.012

Table 4.12
Statistical Summary of Survival and Weight Data for *C. tentans* exposed to the Sediments of Eighteenmile Creek.

Site Number	Number of Survivors			Weight of Organism		
	Mean	Range	Std. Dev.	Mean	Range	Std. Dev
Control A	9.75	9 - 10	0.50	1.71	1.47 - 1.86	0.178
2D	9.00	6 - 10	2.00	0.970	0.693 - 1.19	0.206
3	9.50	9 - 10	0.58	0.863	0.769 - 1.02	0.118
5	9.50	9 - 10	0.58	0.877	0.762 - 1.01	0.129
8	9.50	9 - 10	0.58	2.16	1.73 - 2.44	0.305
Control B	9.75	9 - 10	0.50	1.73	1.55 - 1.92	0.185
1	7.75	4 - 9	2.50	1.10	0.879 - 1.56	0.312
2	2.5	0 - 10	5.00	1.14	0	0
4	9.00	8 - 10	1.15	1.10	0.985 - 1.25	0.108
6	8.5	8 - 9	0.58	1.18	1.09 - 1.38	0.136

The acute toxicity tests for *D. magna* and *P. promelas* did not reveal any significant sediment toxicity to either organism. Tables 4.13 and 4.14 contain the data from this study. All samples showed no statistically significant decrease in survival from the control at sediment elutriate concentrations ranging from 6.25 - 100%.

Table 4.13
Statistical Summary of Eighteenmile Creek Elutriate Acute Toxicity Data for *D. magna*

Site Number	Date Tested	Percent Survival at Elutriate Concentrations					
		Control	6.25%	12.5%	25%	50%	100%
1	10/20/94	100	100	100	100	100	95
2	10/21/94	100	100	95	90	100	95
2D	10/19/94	100	100	100	100	100	95
3	10/19/94	100	100	100	100	100	100
4	10/18/94	100	100	100	100	100	100
5	10/18/94	100	100	100	100	100	100
6	10/17/94	90	100	95	90	95	95
8	10/17/94	90	90	95	90	100	100

Table 4.14
Statistical Summary of Eighteenmile Creek Elutriate Acute Toxicity Data for *P. promelas*

Site Number	Date Tested	Percent Survival at Elutriate Concentrations					
		Control	6.25%	12.5%	25%	50%	100%
1	10/20/94	90	100	100	100	95	100
2	10/21/94	100	100	100	100	90	95
2D	10/19/94	100	100	100	90	95	100
3	10/19/94	100	100	100	100	100	100
4	10/18/94	100	100	100	100	100	100
5	10/18/94	100	100	100	100	100	100
6	10/17/94	100	95	100	100	100	95
8	10/17/94	100	100	100	100	100	100

Eighteenmile Creek sediments exhibited toxicity in Microtox testing. Mircotox testing is an automated testing procedure which measures light output from the biofluorescent microorganism *Photobacterium phosphoreum* to measure the toxicity of a particular substrate. In testing, Eighteenmile Creek sediments exhibited EC50's (the sediment dilution at which the total light output of the organisms is reduced by 50 %) at average dilutions of 2.75% for Olcott Harbor and 0.83% for site four (below Burt Dam). The average EC50's for pore water (the supernatant from centrifuging 230 g of sediments at room temperature for 15 min) from these sediments was 23% for Olcott Harbor and above the detection limit (i.e. less toxic) for site four. While Microtox measurements are not a direct measure of benthic impairment, this data does suggest possible sediment toxicity.

In addition to sediment contaminant analyses and sediment toxicity studies, the 1994 Olcott Harbor Sediment Sampling in Eighteenmile Creek also included a sampling and inventory of benthic organisms at sites one (Lake Ontario) and four (above the Rt 18 bridge). Table 4.15 contains a breakdown of the number and species of benthic organisms found. The assessment of the number and species diversity of the benthic organisms in the Area of Concern indicates slight to moderate impairment.

Comparison of nonpolar persistant organic compounds in surface sediments in the Area of Concern with the DEC Division of Fish and Wildlife sediment guideline values indicate little or no chronic or acute toxicity. The mortality tests for *Hyalella azteca* and *Chironomus tentans* and the acute toxicity tests for *Daphnia magna* and *Pimephales promelas* did not indicate sediment toxicity. The DEC Division of Fish and Wildlife sediment guideline values were exceeded for metals and the *C. tentans* growth tests as well as the Microtox tests did indicate a toxic response. Based on the above, the degradation of benthos indicator is considered to be impaired.

Table 4.15
Number and Species of Benthic Organisms Found in the 1994 Olcott Harbor Sediment Sampling

Species	Site 1				Site 4			
Replicate	A	B	C	Total	A	B	C	Total
PLATYHELMINTHES								
TURBELLARIA								
Undetermined Turbellaria	-	-	-	-	-	-	4	4
NEMERTEA								
Prostoma graecense (=rubrum)	-	-	-	-	4	-	-	4
ANNELIDA								
OLIGOCHAETA								
Tubificidae								
Limnodrilus hoffmeisteri	-	-	-	-	96	128	160	384
Potamothrix moldaviensis	48	73	50	171	-	-	-	-
MOLLUSCA								
GASTROPODA								
Hydrobiidae								
Amnicola limosa	-	-	-	-	-	-	4	4
PELECYPODA								
Sphaeriidae								
Pisidium sp.	-	-	-	-	4	12	20	36
Sphaerium sp.	-	-	-	-	20	-	4	24
ARTHROPODA								
CRUSTACEA								
AMPHIPODA								
Gammaridae								
Gammarus sp.	-	-	-	-	44	84	8	136
INSECTA								
ODONATA								
Coenagrionidae								
Enallagma sp.	-	-	-	-	-	4	-	4
TRICHOPTERA								
Leptoceridae								
Oecetis sp.	-	-	-	-	-	4	4	8
DIPTERA								
Ceratopogonidae								
Undetermined	-	-	-	-	4	-	4	8
Ceratopogonidae								
Chironomidae								
Tanypodinae								
Procladius sp.	-	-	-	-	42	49	22	113
Chironominae								
Chironomini								
Chironomus sp.	-	-	-	-	4	4	31	39
Cryptochironomus fulvus gr.	2	2	1	5	13	8	13	34
Dicrotendipes fumidus	-	-	-	-	-	12	4	16
Tribelos jucundum	-	-	-	-	221	163	174	558

7. Restrictions on Dredging Activities

Impairment Status: Yes

Recreational boating is a beneficial use of Eighteenmile Creek that requires dredging of sediments. The Olcott Harbor outlet to Lake Ontario is protected by piers constructed by the US Army Corps of Engineers. The navigation channel in the outlet is periodically dredged by the Corps. Additionally, areas within the harbor have been dredged by the Town of Newfane. The latest studies of sediments within Olcott Harbor were the 1994 Olcott Harbor Sediment Sampling, the 1994 Lake Ontario Tributary Sampling, the 1988 DEC sediment study and the 1987 Corps sediment study. In addition to the 1987 study, the Corps in 1977 and 1981 also conducted comprehensive sampling of the navigational channel for metals and organic contaminants.

In the Great Lakes, the dredging spoils from any given site are classified as either suitable or unsuitable for open lake disposal. This classification is made in accordance with the EPA's *Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments* issued in 1977.

In 1994, DEC developed interim guidance for freshwater navigational dredging. This interim guidance is similar to EPA's Great Lakes guidelines; however the DEC guidelines include more organic contaminants.

Table 4.16 contains a summary of the contaminant concentrations found in the 1987 Corps study and Table 4.17 contains overall site ratings based on both EPA and DEC guidelines for the 1977, 1981 and 1987 Corps studies. Figure 4.2 shows the location of the sampling sites for these studies. There have been some dredging restrictions placed on Eighteenmile Creek under the EPA guidelines. The area surrounding US Army Corps of Engineers sample site number three was classified as unsuitable for open lake disposal. The sediments from this individual site were classified as polluted with chromium, copper, lead, manganese, nickel, zinc and cyanides. Any dredging spoils from this area must be disposed in a land based confined disposal facility. This constitutes an impairment of this indicator. Site three would also have dredging restrictions placed on it based on the DEC guidelines.

The 1994 Lake Ontario Tributary Sampling contained mercury data from a single core sample taken in Olcott Harbor and also dioxin and dibenzofuran data from a single surface ponar sample. The top nine inches of the core had mercury concentrations ranging from 1.89 to 3.76 mg/kg which would exceed the 1977 EPA dredging guidelines of 1.0 mg/kg. The dioxin sample had a 2,3,7,8-TCDD toxicity equivalence of 0.000237 mg/kg which exceeds the DEC interim guidance value of 0.00005 mg/kg.

The 1994 Olcott Harbor Sediment Sampling had two sample sites in the Area of Concern, both of which have contaminant levels which exceed the EPA and DEC criteria. Site two in this study is near Corps site four. The core segments from this site contained mercury at 2.8 and 3.3 mg/kg which exceed the EPA guidance value of 1.0 mg/kg. The core segments at site two also contain lead, copper and benzo(a)anthracene in excess of the class C levels in the DEC interim guidance. Site three in the 1994 Olcott Harbor Sediment Sampling is near site three in the Corps studies. The contaminant levels in the sediment core segments from this site are all below both the EPA and DEC guidance values, however the surface samples are not. The surface sample from site three exceeds the EPA guidance values for chromium, lead, copper, nickel and zinc. They also exceed class C levels under the DEC interim guidance for copper, lead and benzo(a)anthracene. This would place dredging restrictions on these sites under both sets of guidelines.

The 1987 DEC study had one sampling site within the navigational channel which it referred to as the "Olcott Spoil Bar". This site was in the area of Corps sites two and three. The contaminant levels in this sample were comparable with those in Corps site two. There were single core segments (this core was sectioned into fifteen two inch segments) that would have exceeded the EPA guidelines for copper and zinc (not in the same segments).

Because of the restrictions already placed on dredging and the exceedances of both the EPA and DEC interim guidance values of sediments from recent sampling efforts, this indicator is impaired.

Figure 4.2
Location of Sample Sites for the 1977, 1981 and 1987 US Army Corps of Engineers Sediment Studies.

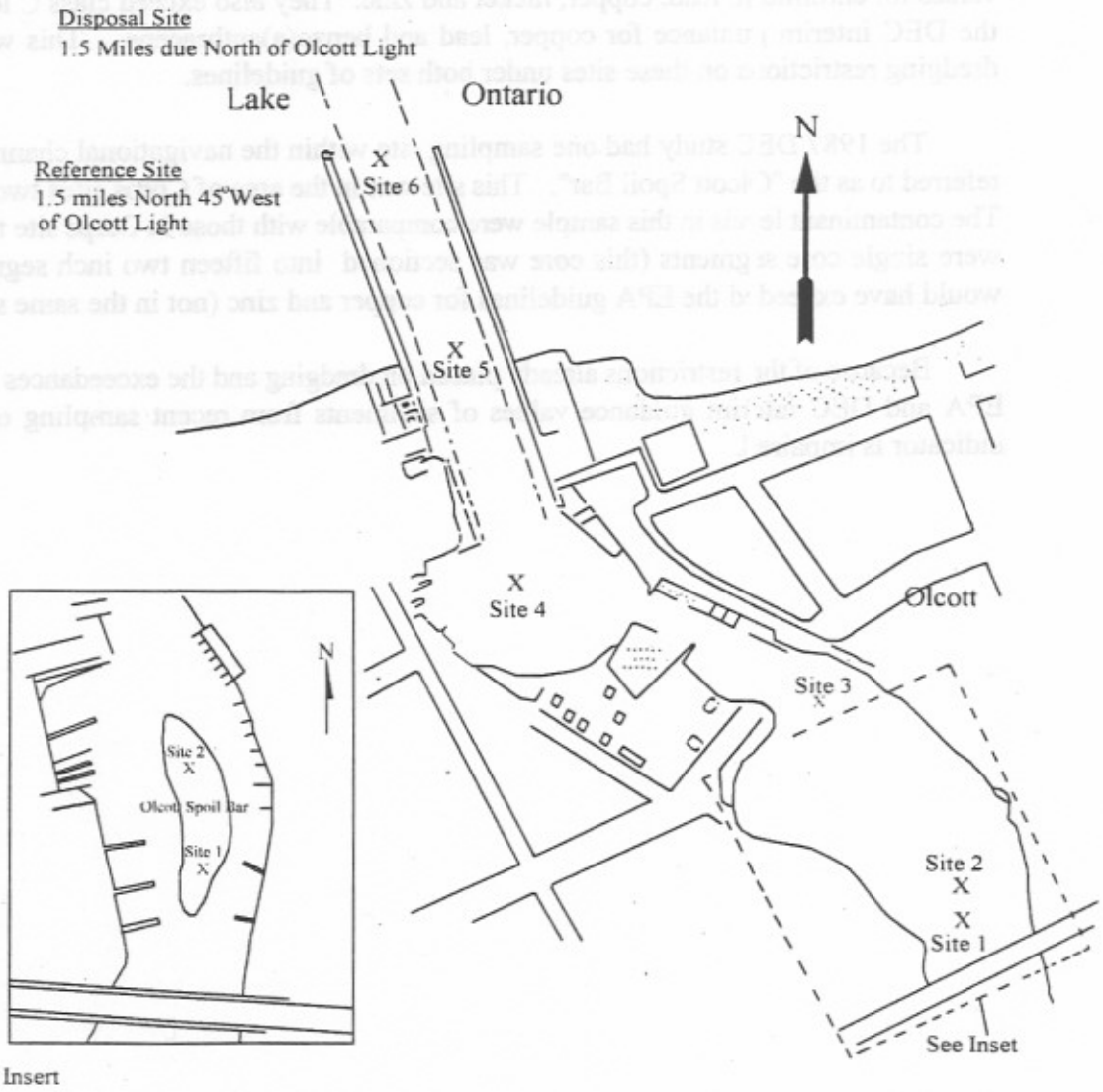


Table 4.16
Sediment Contaminant Concentrations from the 1987 US Army Corps of Engineers Study (mg/kg)

Parameter	USEPA Dredging Guidelines	REF*	Site 1	Site 2	Site 3	Site 3a	Site 4	Site 5	Site 6
Arsenic	8	7	4	6	6	7	4	2	2
Cadmium	6	1	0.5	1	2	2	1	2	1
Chromium	75	24	17	40	**87**	**79**	17	8	4
Copper	50	26	26	48	**140**	**150**	**50**	18	9
Iron	25000	12200	14000	11000	13000	14500	8300	6900	5700
Lead	60	35	38	**89**	**200**	**200**	**73**	20	5
Manganese	500	320	280	300	440	**540**	330	**540**	**520**
Mercury	1	**2.5**	0.17	0.78	0.59	0.78	0.82	0.05	0.03
Nickel	50	22	24	40	**110**	**110**	17	14	8
Zinc	200	150	150	**330**	**920**	**940**	**200**	100	44
Cyanide	0.25	**0.53**	**0.81**	0.12	**0.4**	**0.54**	**0.37**	**0.5**	**0.43**
Total PCBs	10	ND	ND	ND	ND	ND	ND	ND	ND

* REF - Reference site in Lake Ontario

Table 4.17
Overall Ratings for the Six Sampling Sites in the 1977, 1981 and 1987 US Army Corps of Engineers Sediments Studies in Olcott Harbor, Eighteenmile Creek

Site/Year	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
	EPA	DEC	EPA	DEC	EPA	DEC	EPA	DEC	EPA	DEC	EPA	DEC
1977	P	C	P	C	M	C	M	C	U	B	U	B
1981	X	X	P	C	M	B	P	B	U	B	U	B
1987	M	B	M	B	P	C	M	B	U	B	U	B

U=Unpolluted (EPA Guidelines)
M=Moderately Polluted (EPA Guidelines)
P=Polluted (EPA Guidelines)
X=Not Sampled or Analyzed
A=Unpolluted (DEC Guidlines)
B=Moderately Polluted (DEC Guidelines)
C=Polluted (DEC Guidelines)

8. Eutrophication or Undesirable Algae

Impairment Status: No

Eutrophication is a process in which excessive nutrients and organic inputs to a watershed increase photosynthetic activity with overproduction of algae. This results in reduced transparency and oxygen depletion as the additional biomass input to the watershed is metabolized by aerobic bacteria. This can often result in dramatic changes to the whole ecosystem including changes to the fish population and undesirable algae blooms.

Excessive algae and aquatic plant growth is a primary indicator of eutrophic conditions in a water body. There are no indications of algae blooms or excessive algae growth in the Area of Concern. There is considerable growth of duckweed along the creek. This plant provides habitat for fish but is not commonly used as a food source for aquatic wildlife.

While there is considerable growth of duckweed, it has not adversely affected the dissolved oxygen content of the water. This is evidenced by the creek meeting the applicable dissolved oxygen standards. There have, also, been no reports of the odor problems often associated with eutrophic plant growth. Eutrophic streams and rivers will also have supersaturated levels of dissolved oxygen during daylight hours, especially near the water surface. This effect has not been observed in any of the studies of the creek.

These observations would indicate that the creek is not impaired for this indicator.

9. Restrictions on Drinking Water Consumption or Taste or Odor Problems

Impairment Status: No

Eighteenmile Creek is not currently used as a source of public water supply. Within the Area of Concern, the hamlets of Olcott and Burt in the Town of Newfane are served by the Niagara County Water District. The water district obtains its raw water from the Niagara River and distributes treated water throughout Niagara County.

Upstream of the Area of Concern, the remaining portion of the Town of Newfane as well as the Town of Lockport are also served by the Niagara County Water District. The City of Lockport operates its own water treatment and distribution system. Water is drawn from the Niagara River and piped to the treatment plant located in the southwest part of the city. A backup intake is located in the New York Barge Canal in the vicinity of the water treatment plant.

10. Beach Closings

Impairment Status: No

There are no public bathing areas on Eighteenmile Creek in the Area of Concern. There is a bathing beach along Lake Ontario just downlake of the outlet of the creek. It is reasonable to assume that flow patterns in the lake may result in the flow from Eighteenmile Creek having an effect on water quality in the vicinity of the beach. The bathing beach is part of Krull Park, a county park in the Town of Newfane.

Standards for bathing beaches promulgated by the New York State Department of Health are as follows:

Total coliforms shall not exceed a logarithmic mean of 2400/100 ml for a series of five or more samples in a 30 day period, nor shall 20 percent of total samples during the period exceed 5000/100 ml.

Fecal coliform density from a series of five or more samples in any 30 day period shall not exceed a logarithmic mean of 200/100 ml. When fecal coliform density of any sample exceeds 1000/100 ml, consideration shall be given to closing the beach.

The Niagara County Health Department performs sampling at Krull Park to ascertain compliance with these standards. The last time the beach was closed for exceedance of standards was in August 1972. Data for 1994 indicates total coliform logarithmic means ranging from 10-54/100 ml and fecal coliform values from 10-17/100 ml. It can be concluded that the water quality at the public bathing beach at Krull Park is not being adversely affected by Lake Ontario flow patterns, including the influence of the outflow of Eighteenmile Creek.

11. Degradation of Aesthetics

Impairment Status: No

Determination of aesthetics degradation for purposes of remedial action plans focuses on water quality aesthetics. The IJC criteria for impairment is when any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g., oil slick, surface scum).

The Eighteenmile Creek Area of Concern consists of the lower two miles of the creek below the Burt Dam. The creek flows at the bottom of a fifty foot gorge and empties into the harbor which is used for recreational boating. The shoreline at the bottom of the gorge is undeveloped, extensively vegetated and primarily privately owned. Portions of the creek have a state designation as wetlands which protect it from development including such actions as the installation of boat docks. The creek is heavily utilized for fishing in this area.

The harbor contains both private and public boat launch and marina facilities which have undergone expansion in recent years. Extensive use is made of the harbor facilities both by local residents and out-of-state anglers to fish in Lake Ontario.

The portion of the creek upstream of the harbor has a natural appearance and the wetland areas provide valuable habitat for aquatic species. The surface of the water can at times be largely covered with an aquatic plant called duckweed. This plant is an important component of the ecosystem. Influences to the aesthetics of this portion of the creek include debris left by fishermen along the creek. The debris includes fishing line, lures and other remnants that appear during the spring and fall salmonid spawning runs. This debris however does not fit the IJC criteria as a persistent objectionable deposit in the waterway.

A significant amount of boat traffic takes place in Olcott Harbor. Boat fueling and docking presents the potential for fuel leaks and spills. Aesthetic degradation associated with this type of activity has not been documented to date.

12. Added Cost to Agriculture and Industry

Impairment Status: No

The impairment of this beneficial use exists when there are additional costs required to treat the water prior to use for agricultural purposes (i.e. livestock watering, irrigation or crop spraying) or industrial purposes (i.e. intended for commercial or industrial applications and non-contact food processing). For Eighteenmile Creek in the Area of Concern, water is not used for these purposes. Land use in the lower portion of the Area of Concern includes primarily commercial uses associated with Olcott Harbor. In the upper portion of the Area of Concern, from the Rt. 18 bridge to Burt Dam, land bordering the creek consists largely of private residential use.

In the portion of the watershed above the Area of Concern, the creek is used for both agricultural and industrial purposes. Water used for agricultural purposes, primarily along the East Branch tributary, does not require additional treatment. Industrial use along the main stem consists mostly of water withdrawal for non-contact cooling purposes by several firms in the Lockport area. Again, additional treatment is not required for this use.

13. Degradation of Phytoplankton and Zooplankton Populations

Impairment Status: Unknown

There is no available data on phytoplankton and zooplankton populations in Eighteenmile Creek. Because of this, the status of this impairment indicator is unknown.

14. Loss of Fish and Wildlife Habitat

Impairment Status: No

While the Area of Concern in Eighteenmile Creek has seen considerable development, it still contains valuable fish and wildlife habitat. The portion of the creek from the outlet at Lake Ontario to the Rt 18 bridge has seen heavy commercial development and provides little habitat for wildlife. The portion of the creek extending from above the bridge to the base of Burt Dam, however, is a largely undisturbed coastal wetland which provides excellent habitat for both fish and wildlife. The areas upstream and downstream of the Rt 18 bridge form distinct habitat zones.

The area below the Rt 18 bridge provides rather poor fish and wildlife habitat and is heavily impacted by human activities. This reach of the creek is approximately 1/2 mile long. It consists of the outlet to Lake Ontario and Olcott Harbor. The outlet to Lake Ontario is a pair of jetties and the channel is dredged periodically for navigation. The harbor area also contains several marinas and is bulkheaded along most of its banks. The harbor area is also dredged periodically and sees heavy recreational boat traffic. Almost all of this area has been shaped by construction and other human activities.

Above the Rt 18 bridge, the creek runs through a steep gorge. This reach of the creek is approximately 1 3/4 miles long. Within the confines of this gorge lies a large coastal wetland which has been preserved almost undisturbed due to its inaccessibility and its status as a state protected wetland. This is a productive estuary and supports a variety of wildlife. Trees and shrubs along the sides of the gorge are used by birds for nesting and perching sites and the wetland is resting, breeding and foraging habitat for a number of fish and wildlife species.

Because a considerable percentage of the Area of Concern is largely undisturbed and provides excellent habitat, this indicator is considered to be unimpaired.

IMPAIRMENT SUMMARY

The status of each potential impairment or impairment indicator related to Eighteenmile Creek is summarized in Table 4.18. For each impairment the likely causes are listed. Known impairments are restrictions on fish and wildlife consumption, degradation of benthos and restrictions on dredging. An impairment, which existing evidence suggests is likely , is bird or animal deformities or reproduction. Impairments for which the status is unknown due to the absence of data are degradation of fish and wildlife populations, fish tumors and other deformaties and degradation of phytoplankton and zooplankton populations.

The likely causes of the noted impairments include the chemical substances: PCBs, DDT and metabolites, dioxins, dieldrin, metals and cyanides.

Table 4.18
Summary of Impairments for Eighteenmile Creek

#	Impairment	Status	Likely Cause
1	Restrictions on Fish and Wildlife Consumption	Yes	PCB's, dioxins
2	Tainting of Fish and Wildlife Flavor	No	
3	Degradation of Fish and Wildlife Populations	Unknown	
4	Fish Tumors and Other Deformities	Unknown	
5	Bird or Animal Deformities or Reproduction Problems	Likely	PCBs, DDT and metabolites, dioxins and dieldrin
6	Degradation of Benthos	Yes	PCBs, various metals
7	Restrictions on Dredging	Yes	chromium, copper, cyanides, lead, manganese, mercury, nickel, zinc, dioxins
8	Eutrophication or Undesirable Algae	No	
9	Restrictions on Drinking Water Consumption	No	
10	Beach Closings	No	
11	Degradation of Aesthetics	No	
12	Added Cost to Agriculture or Industry	No	
13	Degradation of Phytoplankton and Zooplankton Populations	Unknown	
14	Loss of Wildlife Habitat	No	

14	Force of Multiple M. [illegible]	No	
13	Zoophilacous Polyn. [illegible] Determination of Pr. [illegible] [illegible]	Unknown	
12	Added Cost to [illegible] [illegible] of [illegible]	No	
11	Determination of Ac. [illegible]	No	
10	Bread Complete	No	
9	Establishment of Dr. [illegible] Alone Consumption	No	
8	Determination of [illegible] Alone	No	
7	Establishment of Dr. [illegible]	Yes	[illegible] [illegible] material, metal, [illegible] [illegible] copper, [illegible] [illegible]
6	Determination of Dr. [illegible]	Yes	PCR's [illegible] [illegible]
5	Implicit Bias of Values in [illegible] of [illegible]	Likely	[illegible] PCR's DDT [illegible] [illegible] [illegible]
4	Line Tones [illegible] [illegible] Determine	Unknown	
3	Determination of [illegible] [illegible] Multiple Independent	Unknown	
2	Transfer of Line [illegible] Multiple Hands	No	
1	Consumption – Accessions on Line and Multiple	Yes	PCR's [illegible]
#	Indicator	Score	Likely Cause

Table 4.18 Assessment of Independence for Kilometerstile Check

Line 1 is the only case of the board independent indicator for electrical expenses: PCR's DDT and [illegible] [illegible] [illegible] [illegible] and [illegible].

The likely causes of the board independent indicator are [illegible] [illegible] [illegible] [illegible]

CHAPTER 5

SOURCES

INTRODUCTION

A number of potential contaminant sources may contribute to the impairments listed in Chapter 4. A general overview of potential sources and their locations is presented in this chapter. The contaminants primarily responsible for the impacts listed in Chapter 4 are PCBs, dioxins, dibenzofurans and metals. Additionally, DDT and its metabolites and dieldrin are also impacting the creek. Potential sources of contaminants to Eighteenmile Creek are the NY Barge Canal, municipal and industrial wastewater discharges, inactive hazardous waste sites, bottom sediments and combined sewer overflows.

In this chapter, general source categories are presented along with data on specific potential sources within each category. The relationship of the contaminant sources to the impairments is also discussed.

GENERAL OVERVIEW OF POLLUTION SOURCES

NY Barge Canal

While operating, the NY Barge Canal discharges approximately 65 cubic feet per second (cfs) of water to Eighteenmile Creek (50 cfs into the main stem at Lockport and 15 cfs into the East Branch at Gasport). This water forms a significant portion of the creek's flow, especially during periods of dry weather.

Water quality sampling done in the canal shows PCB levels above the aquatic water quality standard. Two PISCES samples taken in the canal, as part of the 1994 Lake Ontario Tributary Sampling, contained aqueous phase PCBs at estimated concentrations of 0.0185 ug/l and 0.0143 ug/l. This is above the aquatic water quality standard of 0.001 ug/l. It should be noted that PISCES sampling is only semiquantitative and direct comparison to standards is not definitive. Additional PISCES and pressure filtration sampling done by DEC (Litten) in 1995 confirmed that the water from the canal at its discharge to Eighteenmile Creek contains PCBs at concentrations in excess of the aquatic water quality standard in both the dissolved phase and adsorbed to suspended sediments in the water column. While this data shows that the canal water contains PCBs, water quality data from Eighteenmile Creek suggests that a source within the creek between Olcott St and N Transit Rd is a more important source of PCBs to the creek.

The 1994 Lake Ontario Tributary Sampling also included water sampling for mercury and pesticides in the Barge Canal. The mercury concentrations observed in the canal were all below the water quality standard. All pesticide measurements in the canal, except for one, revealed concentrations below water quality standards. One measurement was for the combined

concentrations of aldrin, endrin and dieldrin. This sum was greater than the water quality standard for aldrin/dieldrin but less than the standard for endrin.

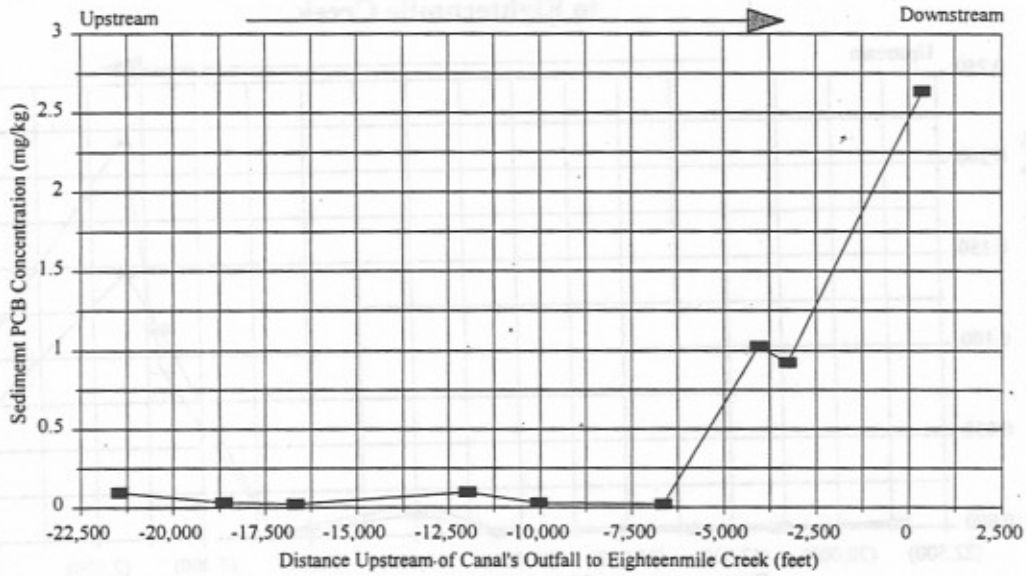
Sediment sampling undertaken in 1994, by the NYS Canal Corporation revealed a total PCB concentration of 0.42 mg/kg at the Main St site. Sediment samples were collected, by DEC (Estabrooks) in 1991, upstream and downstream of the canal's discharge to the creek on both the main stem and East Branch of Eighteenmile Creek, as well as sediments in the canal. The sediment data for Eighteenmile Creek (Table 5.1) shows the PCB concentrations in creek sediments increasing from upstream to downstream. An additional sediment sample taken in 1994 from Eighteenmile Creek behind the impoundment of a small dam below Clinton St contained 3.66 mg/kg of PCBs. This sample was taken as part of the 1994 Lake Ontario Tributary Sampling.

Table 5.1
PCB, Dioxin and Dibenzofuran Concentrations (in mg/kg) in the Sediments of Eighteenmile Creek Above and Below the Discharge of the NY Barge Canal on Both the Main Stem and East Branch.

	Main Stem		East Branch	
	Remic Pkwy (above canal)	Clinton St (below canal)	Royalton Ravine (above canal)	Lower E. Branch (below canal)
PCBs	0.0133	0.361	0.0122	0.109
Dioxins	0.00056	0.0107	0.000766	0.00179
Furans	0.000064	0.0024	0.000117	0.000514

PCB analyses of sediment sampling done as part of the 1990 Dioxin/Furan Sampling is also available. Figure 5.1 shows PCB contamination of the sediments of the Barge Canal in the Lockport area. Samples within this area had PCB concentrations ranging from 0.925 mg/kg at the intersection with Main St. and 2.64 mg/kg at Exchange St. (Stations -3260 and +390, respectively, in Figure 5.1). As seen in this figure, the PCB data for the Barge Canal indicates the area of contamination is localized in the Lockport area.

Figure 5.1
Concentration of Total PCBs in the Sediments of the NY Barge Canal as a Function of Distance from the Canal's Discharge to Eighteenmile Creek



The analyses of sediments in the canal have also indicated the presence of dioxins and dibenzofurans. The 1990 Dioxin/Furan Sampling indicated the extent of these contaminants in the canal and Eighteenmile Creek. The highest total dioxin and furan concentrations (0.147 mg/kg and 0.0208 mg/kg respectively) in canal sediments were at the intersection of Main St in Lockport and the canal. This was the closest upstream sample site to the canal's discharge to Eighteenmile Creek. Figures 5.2 and 5.3 show the dioxin and dibenzofuran concentrations in canal sediments plotted against distance upstream of the canal's discharge to the creek. These graphs show that the area of highest contamination is localized in the Lockport area. Samples were also taken upstream and downstream of the canal in Eighteenmile Creek on both the Main Stem and the East Branch. The downstream samples (in both cases) had higher concentrations of dioxins and dibenzofurans than the upstream samples. Table 5.1 contains sediment dioxin and dibenzofuran concentrations from the upstream/downstream sampling. Additionally, in 1994, the NYS Canal Corporation sampled sediments in the canal. At the Main St site the total dioxin concentration was 0.175 mg/kg and total furans were 0.019 mg/kg.

Figure 5.2
Concentration of Total Dioxins (as Measured and Normalized to 9% TOC) in the Sediments of the NY Barge Canal as a Function of Distance from the Canal's Discharge to Eighteenmile Creek

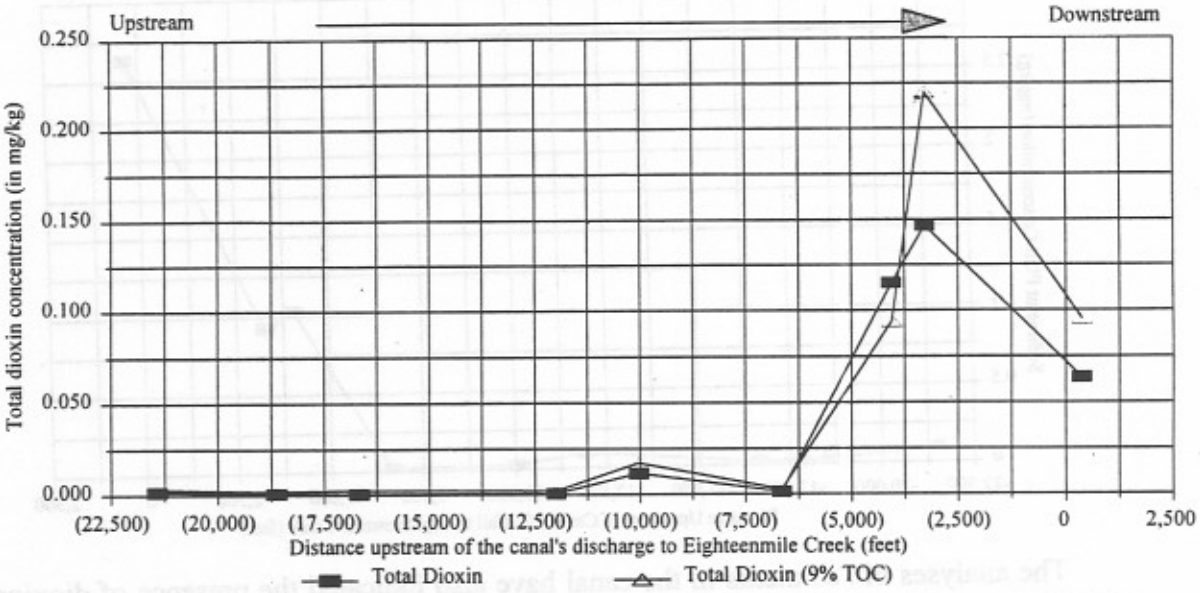
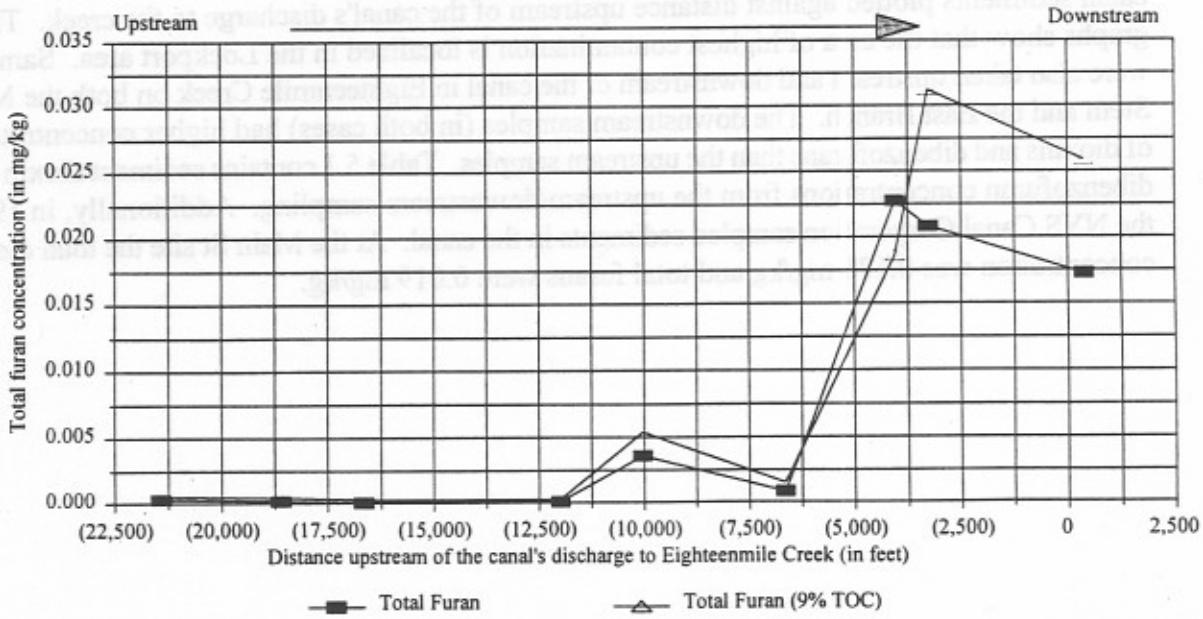


Figure 5.3
Concentration of Total Dibenzofurans (As Measured and Normalized to 9% TOC) in the Sediments of the NY Barge Canal as a Function of Distance from the Canal's Discharge to Eighteenmile Creek.



The sediment and water quality data suggests that the canal is a source of PCBs, dioxins and dibenzofurans to the creek. This data also indicates the canal is not a source of pesticides and mercury to the creek. There is no data on metals other than mercury in the canal water or sediments.

Industrial and Municipal Wastewater Discharges

Direct discharge of wastewater to the creek from industrial facilities and municipal wastewater treatment plants is a potential source of contaminants to Eighteenmile Creek. New York State regulates these discharges through the State Pollutant Discharge Elimination System (SPDES) program. SPDES permits specify the allowable volume, contaminant concentrations and physical characteristics (temperature and pH) of the discharge as well as reporting and monitoring requirements. There are five industrial and municipal facilities currently permitted to discharge to Eighteenmile Creek.

The five facilities permitted to discharge into Eighteenmile Creek are: Delphi Harrison Thermal Systems, Milward Alloys, Vanchem, the City of Lockport Wastewater Treatment Plant, and the Gasport Sewer District #1 Wastewater Treatment Plant. Delphi Harrison Thermal Systems has regular, though not continuous, discharges. Milward Alloys discharges only non-contact cooling water and is regulated for temperature, pH and flow. Vanchem also discharges only non-contact cooling water. The City of Lockport Wastewater Treatment Plant and Gasport Sewer District #1 have continuous treated wastewater discharges. There are no permitted discharges of pesticides, PCBs, dioxins or furans to the creek.

Table 5.2 contains a summary of the permitted discharges from Delphi Harrison Thermal Systems and the City of Lockport Wastewater Treatment Plant. Gasport Sewer District No. 1 is a minor municipal discharge.

Table 5.2
Annual Average Contaminant Loadings, in ug/l, to Eighteenmile Creek from the Major Permitted Industrial and Municipal Discharges in 1993 and 1994

Lockport Wastewater Treatment Plant		
Substance	1993	1994
Nickel(Total)	17.0	23.4
Antimony (total)	0.544	0.651
Chromium (total)	13.1	10.0
Lead (total)	3.11	3.57
Copper (total)	8.80	7.12
Zinc (total)	17.2	31.0
Mercury (total)	0.00	0.00
Dichlorobromomethane	7.58	6.95
Dibromochloromethane	2.35	4.03
Chloroform	8.51	9.03
Benzene	0.339	0.00
Bis (2-ethylhexyl) phthalate	4.76	9.37
Trichloroethylene	0.731	0.00

Delphi Harrison Thermal Systems		
Substance	1993	1994
Nickel(Total)	3.33	2.5
Antimony (total)	0.00	0.00
Chromium (total)	37.5	22.5
Lead (total)	50	16.7
Copper (total)	15	30.8
Iron	334	25.0
Zinc (total)	314	243
Cadmium	0.833	0.833
Thallium	0.833	0.00
Silver	0.00	0.00
Aluminum	2540	2540
Arsenic	0.00	0.00
Beryllium	0.00	0.00
Manganese	20.8	10.8
Selenium	0.00	0.00
Cyanide, free	0.833	0.00
Fluoride	13500	13300
Phenols	2.08	0.00
Trichloroethylene	84.2	65.0
Tetrachloroethylene	9.17	6.67
1,2,trans-dichloroethylene	10	10.8

Inactive Hazardous Waste Sites

Contaminants in the ground water and soil at hazardous waste sites have the potential to migrate off site. Because of this, sites within the watershed of Eighteenmile Creek are potential sources of contaminants to the creek. There are fifteen hazardous waste sites within the Eighteenmile Creek watershed. The locations of these sites are shown in Figure 5.4. A summary of their status is given in Table 5.3 and Figure 5.5.

When a hazardous waste site is identified, it is listed in the registry of hazardous waste sites. A site code denotes the site's potential threat to public health and the environment. The site codes and their meanings are as follows:

1- Site causes or presents an imminent danger of causing irreversible or irreparable damage to the public health or the environment, immediate action required.
2- Site is a significant threat to public health or the environment, action required.

2a-Temporary classification given to sites for which there is insufficient data to assign them to the other classifications.
3- Site does not present a significant threat to public health or the environment, action may be deferred.
4- Site properly closed, requires continued management.
5- Site properly closed, no evidence of present or potential adverse impact, no further action required.
D-Site delisted. Sites for which is has been determined that no hazardous waste were disposed, no further action required.

As a site moves through the process of investigation and remediation, the site code will change as the status of the site changes.

After listing, a site goes through several steps in the process of assessment and remediation. The first is a Phase I investigation where the site history is checked and a physical survey of the site is conducted. The second step is a Phase II investigation in which the health and environmental impact of the site is assessed through sampling, various geophysical techniques and study of the site's geology and geography. For sites where remediation is required, a remedial investigation/feasibility study (or RI/FS) is undertaken to complete the site characterization and to evaluate remedial alternatives. Design and construction follow after selection of a remedial alternative.

Phase I studies have been completed at all of the hazardous waste sites in the Eighteenmile Creek drainage basin and Phase II investigations are complete for all sites except the Diamond Shamrock site. While a Phase I investigation was completed at the Diamond Shamrock site, a preliminary site assessment is continuing due to possible presence of alkali and PAH bearing wastes. Phase II studies are complete at the Norton Labs and Guterl Steel sites. Evaluation is on-going at the Norton Labs site and further investigation and remediation will be required at the Guterl Steel site.

Following Phase II site investigations, five sites were delisted because the investigations indicated no hazardous waste to be present. These sites are: Diversified Manufacturing, Dussalt Foundry, Niagara Materials, Flintkote and the Town of Lockport Landfill. A remedial investigation/feasibility study is being undertaken at the AKZO Chemicals Inc. site under the Resource, Conservation and Recovery Act (RCRA) program.

The Harrison Radiator (the company name has been changed to Delphi Harrison Thermal Systems), Lockport City Landfill, Niagara County Refuse Disposal District, Van De Mark Chemical and the Wilson-Cambria-Newfane Landfill sites have been remediated.

In addition to the known sites, water quality and stream sediment sampling done in the 1994 Lake Ontario Tributary Sampling indicate a strong likelihood that an additional source of PCBs exists somewhere between Olcott Bridge and North Transit Rd on Eighteenmile Creek.

Two sediment samples taken from the swale on the East side of an island in the creek at William St contained PCB concentrations of 1.87 mg/kg and 3.27 mg/kg. Soil samples taken on the island contained PCBs at 0.849 mg/kg and 0.062 mg/kg. This area is currently under investigation.

Figure 5.4
Locations of Hazardous Waste Sites in the Eighteenmile Creek Drainage Basin

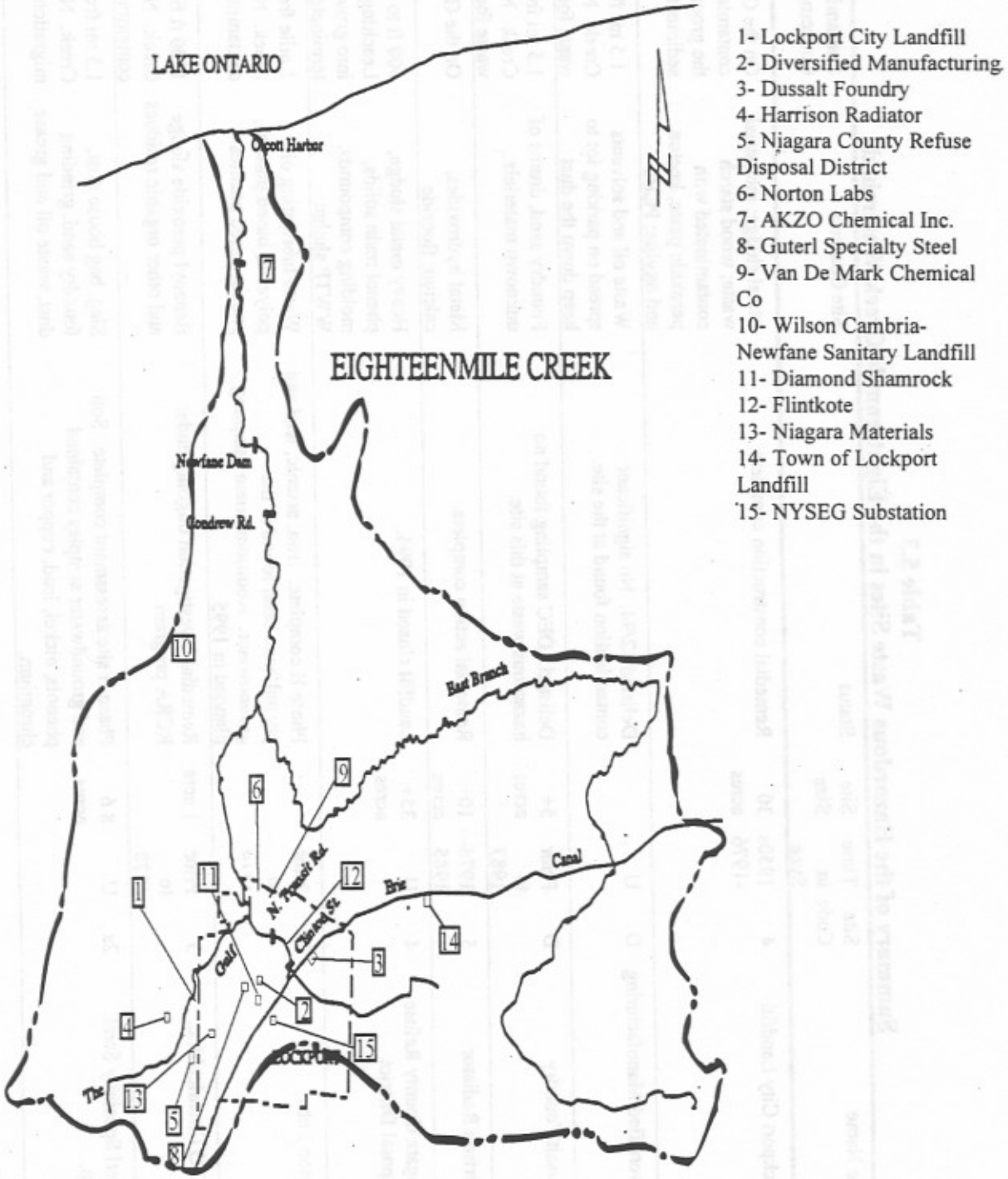


Table 5.3
Summary of the Hazardous Waste Sites in the Eighteenmile Creek Watershed

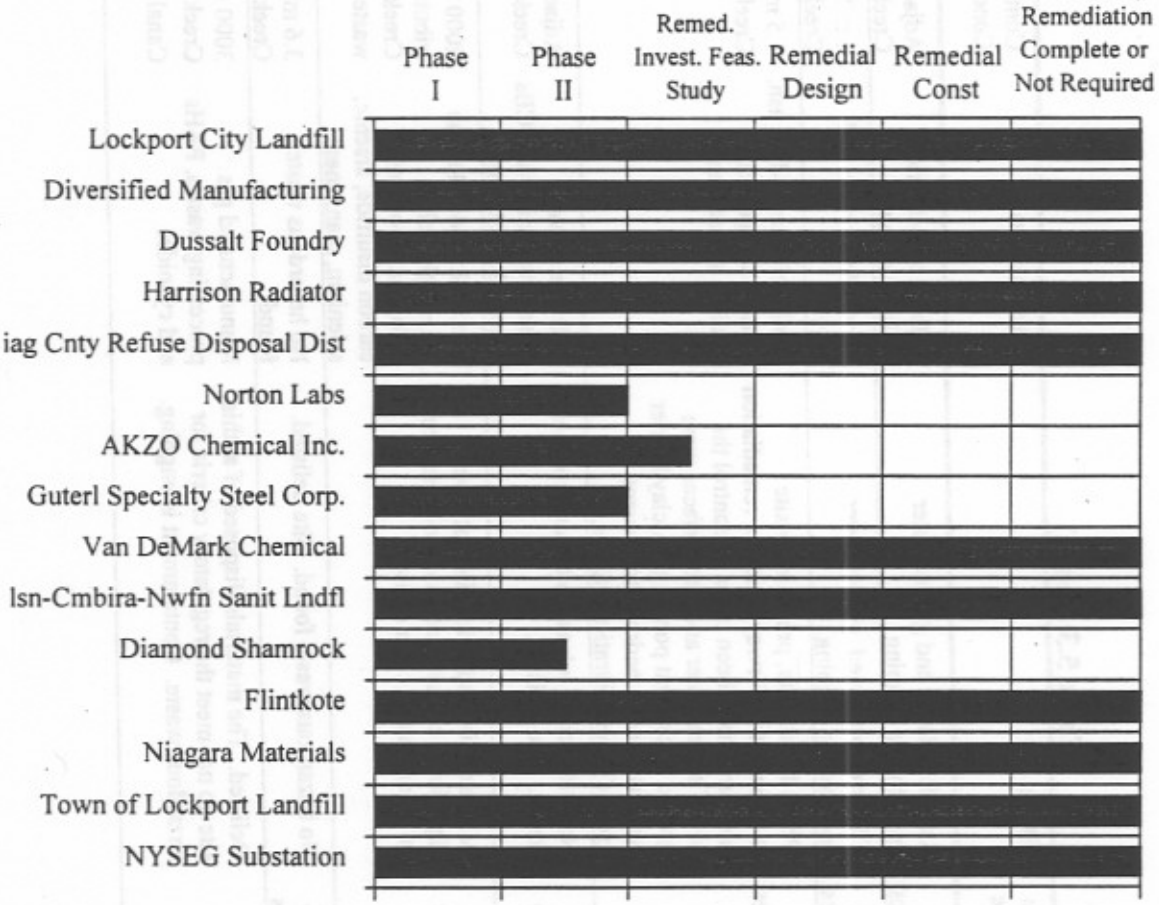
Site Number	Site Name	Site Code	Time in Svce	Site Size	Status	Site Contents	Contaminant migration Concerns
932010	Lockport City Landfill	4	1950s -1976	30 acres	Remedial construction complete.	Metal sludge; industrial waste; wood starch contaminated with peroxide paste, keetox and oxylite; PCBs	On the Gulf tributary. Site contaminants were found in the groundwater and creek sediments.
932011	Diversified Manufacturing	D	U		Delisted 12/94. No significant contamination found at the site.	Waste oil and solvents spread on parking lot to keep down the dust	1.5 mi from Eighteenmile Creek. No hazardous waste found.
932012	Dussalt Foundry	D	Prior to 1987	5+ acres	Delisted. DEC sampling found no hazardous waste at this site.	Foundry sand, drums of unknown materials	1.5 mi from Eighteenmile Creek. No hazardous waste found.
932017	Harrison Radiator	5	1978-1985	10+ acres	Remedial action complete.	Metal hydroxides, calcium fluoride	On the Gulf tributary.
932024	Niagara County Refuse Disposal District	4	U	35+ acres	Landfill closed in 1994.	Heavy metal sludge, phenol resin solids, molding compounds, WWTP sludge	500 ft to the Gulf. Leaching of contaminants into groundwater terminated.
932029	Norton Labs	2a	Prior to 1976		Phase II complete. Iron, arsenic, lead and phenol have been found in the groundwater. Additional field sampling planned in 1995.	Waste lubricating oil, polyester based plastics, phenol based plastics	1 mile from Eighteenmile Creek. No data on contaminant migration.
932030B	AKZO Chemical Inc.	3	Prior to 1978	1 acre	Remedial investigation ongoing under RCRA program.	Benzoyl peroxide sludge and other organic residues	1500 ft from Eighteenmile Creek. No data on contaminant migration.
932032	Guterl Specialty Steel Corp.	2a	U	8.6 acres	Phase II site assessment complete. Soil and groundwater samples contained phenols, nickel, lead, copper and chromium.	Slag, bag house dust, foundry sand, grinding dust, waste oil and grease	1.5 mi from Eighteenmile Creek. No data on migration potential.

Table 5.3 (con't.)

Site Number	Site Name	Site Code	Time in Svce	Site Size	Status	Site Contents	Contaminant migration Concerns
932039	Van DeMark	4	1968-1982	5+ acres	Landfill closed and groundwater monitoring ongoing.	Silicon tetrachloride, chlorosisiloxane	Adjacent to Eighteenmile Creek.
932069	Wilson-Cambria-Newfane Sanitary Landfill	4	1960-1984	50 acres	Closure completed, groundwater monitoring ongoing.	Peroxides, keetox and oxylite	4 miles from Eighteenmile Creek.
932071	Diamond Shamrock	2a	1923-presnt	5 acres	Phase I complete, preliminary site assessment underway. Interim remediation measures have been taken to control the pH of storm water and site surfaces were graded to prevent ponding. A clay barrier was installed to bedrock to prevent groundwater migration off site.	Boiler cinders and fly ash, bottom sludge from sodium silicate tanks.	1.5 mi from Eighteenmile Creek.
932072	Flintkote	D	U	≈1 acre	No evidence of release to the environment found. Site delisted.	7 drums of waste transformer oil with PCBs detected at <2.0 mg/l	Adjacent to Eighteenmile Creek.
932073	Niagara Materials	D	2 yrs during 1950s	≈1 acre	A Phase 2 investigation did not reveal significant contamination of soil, surface or groundwater. Site delisted.	Hexachloro-di-siloxane PAHs, phenolics, halogenated organics, carbon disulfide, arsenic, selenium, manganese	2000 ft from the Gulf tributary to Eighteenmile Creek. No hazardous waste found.
932077	Town of Lockport Landfill	D	1948-1961	18.5 acres	No hazardous waste found. Site delisted.	No hazardous wastes found.	3.6 mi from Eighteenmile Creek.
932098	NYSEG Substation	D	U		Delisted. The materials disposed of at this site do not meet the regulatory criteria for hazardous waste. Containment is ongoing.	Manufactured gas processing wastes, PAHs and cyanides	3000 ft from Eighteenmile Creek. Adjacent to Barge Canal.

U - Unknown

Figure 5.5
Remediation Status of Hazardous Waste Sites in the Eighteenmile Creek Drainage Basin



Bottom Sediments

Sediments accumulate contaminants through the attachment of chemicals from the dissolved phase onto solid particles. The presence of sediments indicates that an area is a deposition zone but not all deposition zones are stable. Runoff velocities associated with storm events can remobilize surficial sediments into the water column. Bottom feeding organisms may ingest contaminants in sediments which may cause toxic effects or contaminants may bioaccumulate to the point of threatening higher food chain consumers. When the sources of toxic discharge are curtailed and sediment stability is high, sedimentation itself will gradually bury toxic substances so they will not be bioavailable. Where dredging and other expected disturbances are likely or concentrations are high enough to cause adverse effects, remedial action becomes necessary.

As discussed in Chapter 4, there is sediment contamination along the length of the creek. Appendix B contains the sediment sampling data from 1977 to 1994. The sediment section at the beginning of Chapter 4 contains a discussion of the type and distribution of sediment contamination in the creek. The contaminants consistently found at elevated levels were metals, PCBs, dioxins and dibenzofurans.

The sediments in the Area of Concern are less contaminated than those upstream. The contamination levels in the Area of Concern (as rated under EPA's Great Lakes National Program Office 1977 guidelines for pollutional classification of sediments) range from the low end of polluted to unpolluted. The sediments at the outlet into Lake Ontario are the cleanest while sections upstream in the Area of Concern show higher levels of contamination. These contaminated sediments are likely contributing factors to several impairments in the Area of Concern.

The heaviest sediment contaminant concentrations upstream of the Area of Concern lie in the reservoirs behind the Burt and Newfane Dams. Additionally, Eighteenmile Creek sediments in the area of the William St Island site and in the impoundment area of a former dam just downstream of Clinton St contain PCBs at concentrations ranging from 1.87 mg/kg to 3.66 mg/kg. The sediments upstream of the Area of Concern, but not in the dam reservoirs, also contain metals, PCBs, dioxins and dibenzofurans. All of these sediments require consideration due to their migration potential.

Both the 1994 Olcott Harbor Sediment Sampling and the 1994 Lake Ontario Tributary Sampling data showed greater contamination near the surface than in deeper sediments in the Area of Concern. This trend is not seen, however, in the sediments behind and upstream of Burt Dam, thus suggesting that the dam may be the source of contamination. Disturbance of the surficial sediments in the Area of Concern may also be a factor.

Combined Sewer Overflows

The City of Lockport combined sewer system periodically discharges storm related excess flow into Eighteenmile Creek during periods of high precipitation. In the absence of sampling data from actual CSO discharges to the creek, the treatment plant influent can be used to represent contaminant content for CSO discharges. Table 5.4 contains the analyses from priority pollutant sampling conducted on the plant's influent by both DEC and the City of Lockport during the period 1991-95. All toxic substances quantified in the analyses are included in the table.

Table 5.4
Priority Pollutant Sampling of the City of Lockport Wastewater Treatment Plant Influent
1991 to 1995 (ug/l)

Analyte	Feb 26-27 1991 1/	Oct 1-2 1991 2/	Apr 30-1 1992 2/	Jun 9-10 1993 2/	Dec 14-15 1993 1/	Apr 19-20 1994 2/	Nov 14-15 1995 2/
Precipitation (day 1) 3/	0	0.07	0.18	0.71	0	0.03	0.06
Precipitation (day 2) 3/	0	0.11	0.01	0.40	0	0.02	0.74
Arsenic	ND	ND	ND	4.93	ND	15.6	ND
Beryllium	ND	ND	ND	0.555	ND	ND	ND
Selenium	NR	ND	ND	ND	ND	24.3	ND
Thallium	ND	ND	ND	ND	ND	1.02	ND
Silver	6	ND	ND	13.4	23.5	0.2	1.2
Nickel	30.8	49	ND	48.2	211	57.4	7.6
Cadmium	ND	ND	13	ND	0.3	0.6	2.2
Chromium	104	12	20	38.5	82	ND	4.0
Copper	56	57	62.9	47.5	73	43.8	22
Lead	15	14	27	22.6	16	10.3	13
Zinc	121	170	77.8	90	116	77	85
Mercury	ND	ND	ND	ND	ND	8.8	ND
Bis (2-ethylhexyl) phthalate	ND	ND	ND	2.3	ND	ND	69
Benzyl alcohol	NR	ND	ND	2.3	NR	ND	NR
Diethyl phthalate	ND	ND	ND	NR	ND	ND	ND
Chloroform	ND	ND	ND	24	ND	ND	2.6
Toluene	ND	ND	ND	1.7	ND	ND	ND
Acetone	NR	160	240	52	NR	ND	NR
Cyanide, total	NR	11	27	32	17	34	NR
Phenols	NR	29	NR	35	34	45	41
Methylene Chloride	ND	ND	ND	330	ND	6.2	1.7
1,2-Dichloroethene	ND	ND	ND	1.3	ND	ND	1.4
Bromodichloromethane	ND	ND	ND	4.6	ND	ND	9.7
Trichloroethene	ND	ND	ND	3.4	7	ND	1.1
Total xylenes	NR	ND	ND	NR	ND	NR	NR
2-Methyl-naphthalene	NR	ND	ND	3.9	NR	ND	NR

Analyses includes all EPA priority pollutants. Quantified values listed.
1/ DEC Sampling
2/ City of Lockport Sampling
3/ Precipitation (inches/day)
ND - Not Detected
NR - Not Reported

In addition to the influent sampling, DEC did PISCES and pressure filtration sampling in

the City of Lockport sewer system as part of the 1994 Lake Ontario Tributary Sampling. The PISCES sampling indicated estimated PCB concentrations between 0.0088 ug/l at the manhole at Main Street to 0.318 ug/l at the Prospect St. manhole. The sample points at the Mill St. manhole (0.0128 ug/l) and theWilliam St. manhole (0.0641 ug/l) are both near CSO outfalls to the creek. These sites lie across the creek from each other near the William St Island site. The Mill St site is on the East side of the creek and William St is on the West. The pressure filtration sampling in the City of Lockport sewer system also revealed the presence of dioxins and dibenzofurans, however none of these samples were taken from manholes that were near CSO discharges to Eighteenmile Creek. Table 5.5 contains a summary of this data. While the data show the presence of dioxins in the sewers, the levels are below the applicable water quality standards for Eighteenmile Creek. Analyses also show that the relative abundance of dioxin and dibenzofuran homologs is different than that observed in creek sediments.

Table 5.5
Dioxin and Dibenzofuran Concentrations (in ug/l) in the Suspended Sediments of the City of Lockport Sewer System.

	Prospect St manhole	Exchange St manhole	Market St manhole
Total Dioxin	0.000227	0.000099	0.000178
Total Furan	0.0000196	ND	0.0000208
EPA TEF*	0.0000006	0.00000015	0.00000057

* TEF - 2,3,7,8 TCDD Toxicity Equivalence Factor

RELATIONSHIP OF SOURCE CATEGORIES TO IMPAIRMENTS:

Existing information suggests five substances (or classes of substances) that are causes or potential causes for the use impairments listed in Chapter 4. These substances and the associated impairments are:

- DDT and its metabolites for bird and animal deformities or reproductive problems.
- Dieldrin for bird and animal deformities or reproductive problems.
- PCBs for restrictions on fish and wildlife consumption, degradation of benthos and bird and animal deformities or reproductive problems.
- Dioxins for restrictions on fish and wildlife consumption, bird and animal deformities or reproductive problems and dredging restrictions.
- Metals for dredging restrictions and degradation of benthos.

DDT and its metabolites

Impairment Observations

DDT is a pesticide that has been banned in New York since 1971. DDT and its metabolites are a cause of the likely impairment of the bird and animal deformities or reproductive problems indicator. This stems from fish flesh sampling that found DDT and its metabolites at levels exceeding the DEC criterion (0.2 mg/kg) for protection of wildlife. In 1987, 1989 and 1992, DEC conducted fish flesh sampling for DDT and other substances. The results are contained in Table 4.6 in Chapter 4. In the 1992 sampling, smallmouth bass, largemouth bass, carp and brown bullhead taken in the Area of Concern and largemouth bass, white sucker, northern pike, walleye and channel catfish caught upstream of the Area of Concern exceeded the DEC wildlife criterion. The 1989 study also detected DDT and its metabolites at levels below the DEC wildlife criterion in rock bass and largemouth bass. In the 1987 sampling, conducted in the Area of Concern, carp flesh contained DDT and its metabolites in excess of the DEC wildlife criterion.

Sources

Industrial and Municipal Wastewater Discharges

There are no permitted dischargers of DDT or its metabolites to Eighteenmile Creek. DEC compliance monitoring of the discharges from Delphi Harrison Thermal Systems and the City of Lockport Wastewater Treatment Plant did not reveal the presence of DDT and its metabolites.

Combined Sewer Overflows

Influent sampling at the City of Lockport Wastewater Treatment Plant did not indicate the presence of DDT or its metabolites. It is therefore assumed that DDT is not present in combined sewer overflows.

Inactive Hazardous Waste Sites

No inactive hazardous waste sites in the Eighteenmile Creek drainage basin are known to contain DDT or its metabolites.

NY Barge Canal

In the 1994 Lake Ontario Tributary Sampling, a PISCES sample taken from the canal and a pressure filtration sample taken from Olcott St on Eighteenmile Creek (just downstream of the canal) were analyzed for DDT and its metabolites. The analyses indicated that both samples were within water quality standards. It should be noted that PISCES analyses yields only estimated concentrations. Additionally, the calibration of PISCES units for pesticides is considerably less precise than for PCBs. The pressure filtration sample (which gives more

accurate measurements) only measures the adsorbed phase of the contaminant. This data, however, is an indication that the canal is not a source of DDT and its metabolites.

Sediments

DDT is found in the sediments of Eighteenmile Creek. The 1994 Olcott Harbor Sediment Sampling found the DDT metabolite DDE in three out of four surface samples in the Area of Concern at concentrations of 0.0079 mg/kg to 0.016 mg/kg. DDT was also detected in surface samples from behind the Burt Dam at 0.012 mg/kg along with DDE at 0.018 mg/kg and at Clinton St with a DDD concentration of 0.009 mg/kg in this sampling. The 1989-90 RIBS study found DDT and its metabolites at 0.008 mg/kg at Jacques Rd (upstream of the Area of Concern). Bottom sediments, in both the Area of Concern and the portion of the creek upstream of the Burt Dam are a confirmed source of DDT and its metabolites.

Summary

The only known source of DDT in Eighteenmile Creek is creek sediments.

Dieldrin

Impairment Observations

Dieldrin is a pesticide that has been restricted in New York since 1971 and banned since 1985. It is a cause of the likely impairment of the bird and animal deformity and reproductive problems indicator. A single carp taken from the Area of Concern contained dieldrin at a concentration above the DEC wildlife criterion of 0.022 mg/kg (Table 4.6). Additionally, two Northern Pike taken from the Olcott area during the same sampling contained dieldrin at levels below the wildlife criterion. It is possible that these fish were not native to Eighteenmile Creek and that these samples represented the influence of fish migration from Lake Ontario into Eighteenmile Creek. No dieldrin was found in fish samples taken above the Area of Concern.

Sources

Industrial and Municipal Wastewater Discharges

There are no permitted dischargers of dieldrin into Eighteenmile Creek. DEC compliance monitoring of the discharges from Delphi Harrison Thermal Systems and the City of Lockport Wastewater Treatment Plant did not reveal the presence of dieldrin.

Combined Sewer Overflows

Influent sampling at the City of Lockport Wastewater Treatment Plant did not indicate the presence of dieldrin. It is therefore assumed that dieldrin is not present in combined sewer overflows.

Inactive Hazardous Waste Sites

Dieldrin has been found in the sediments of The Gulf tributary adjacent to and just

downstream of the City of Lockport Landfill, an inactive hazardous waste site. This sampling was conducted as part of the City of Lockport Landfill Remedial Investigation (see sediment section below for data). No dieldrin was found in the on-site samples in the landfill but was found in a sample taken from a swale running off the site at a concentration of 0.00002 mg/kg.

NY Barge Canal

In the 1994 Lake Ontario Tributary Sampling, a PISCES sample taken from the canal and a pressure filtration sample taken from Olcott St on Eighteenmile Creek (just downstream of the canal) were analyzed for the sum of aldrin, dieldrin and endrin. The pressure filtration analyses indicated that the Olcott St sample was within water quality standards. The analyses of the PISCES sample showed a concentration greater than the water quality standard for aldrin/dieldrin but less than the standard for endrin. It should be noted PISCES analyses yields only estimated concentrations. Additionally, calibration of PISCES units for pesticides is considerably less precise than for PCBs. The pressure filtration sample (which gives more accurate measurements) only measures the adsorbed phase of the contaminant. The data, however, is an indication that the canal is not a source of dieldrin.

Sediments

Dieldrin was not detected in any of the sediment samples taken in the 1994 Olcott Harbor Sediment Sampling. It has, however, been found in the sediments of The Gulf tributary adjacent to and just downstream of the City of Lockport Landfill. The Remedial Investigation/Feasibility Study for the City of Lockport Landfill contained sediment sampling data for the sections of The Gulf tributary next to, upstream and downstream of the landfill as well as in a swale downstream of the landfill. This data showed no dieldrin upstream of the site and detected dieldrin in the sediments at concentrations of 0.0085 mg/kg and 0.58 mg/kg at the sites adjacent to and downstream of the landfill, respectively. No sediment sampling elsewhere in the creek indicated the presence of dieldrin.

Summary

The only known source of dieldrin to Eighteenmile Creek is the sediments of The Gulf tributary. This contamination may have come from the City of Lockport Landfill.

PCBs

Impairment Observations

PCBs are factors in restrictions on fish and wildlife consumption, bird and animal deformities or reproductive problems and degradation of benthos. A surface sediment sample taken in the 1994 Olcott Harbor Sediment Sampling from the Area of Concern contained PCBs at a concentration greater than the DEC guidance for screening of contaminated sediments. This makes PCBs a parameter of concern relative to the degradation of benthos. Fish sampling in

1987, 1989 and 1992 detected PCBs (Table 4.6, Chapter 4). Ten of fifteen fish flesh samples from the creek contained PCBs at levels above the FDA action level of 2.0 mg/kg. Within the Area of Concern, largemouth bass exceeded the action level in a 1992 sampling and carp exceeded the action level in 1987 and 1992. In 1992, largemouth bass, black crappie, white sucker, northern pike, rock bass, walleye and channel catfish all exceeded the FDA action level for human consumption upstream of the Area of Concern. All fish sampled for PCBs in the creek during these years (smallmouth bass, brown bullhead, brown trout, largemouth bass, black crappie, white sucker, northern pike, rock bass, walleye and channel catfish) exceeded the DEC wildlife criterion of 0.11 mg/kg, making PCBs a concern relative to the bird and animal deformities or reproductive problems impairment.

Sources

Industrial and Municipal Wastewater Discharges

There are no permitted dischargers of PCBs to Eighteenmile Creek. DEC compliance monitoring of the discharges from Delphi Harrison Thermal Systems and the City of Lockport Wastewater Treatment Plant did not reveal the presence of PCBs.

Combined Sewer Overflows

While influent sampling at the City of Lockport Wastewater Treatment Plant did not detect the presence of PCBs, PISCES sampling in the sewer system did detect them. Sampling done in the 1994 Lake Ontario Tributary Sampling revealed estimated PCB concentrations between 0.0088 ug/l at the manhole at Main St. to 0.318 ug/l at the Prospect St. manhole. Two sewer system sample points (Mill St. manhole at 0.0128 ug/l and William St. manhole at 0.0641 ug/l) are near CSO outfalls to the creek. These sites lie across the creek from each other near the William St Island site. The Mill St. site is on the East side of the creek and William St is on the West. Further effort is required to determine if CSOs are a significant source of PCBs to the creek.

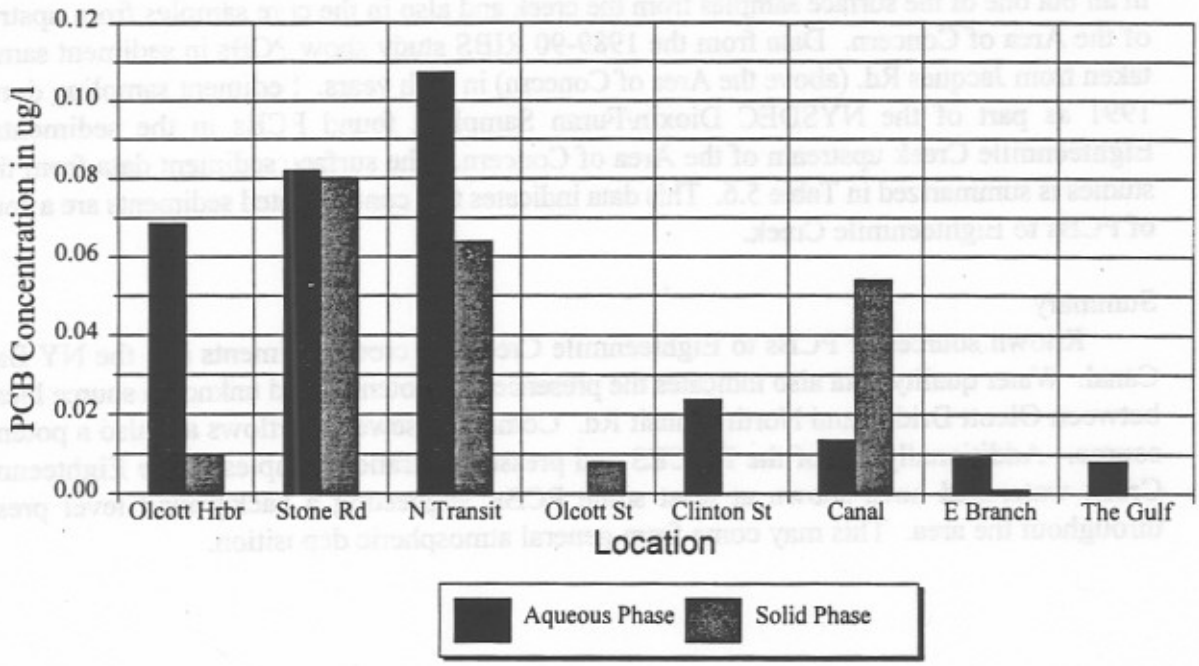
Inactive Hazardous Waste Sites

The subsurface fill material at the City of Lockport Landfill contains PCBs at concentrations up to 43 mg/kg. Sediments collected from The Gulf tributary adjacent to the site contained PCBs at concentrations of up to 2.3 mg/kg. Sediments taken from The Gulf tributary at a site upstream of the landfill, however, also contained PCBs at concentrations of up to 2.9 mg/kg. Additionally, PISCES sampling in The Gulf tributary revealed aqueous PCB concentrations at 0.0083 ug/l and 0.00593 ug/l which is roughly background level for the area. Because of this, the City of Lockport Landfill is not considered a significant source of PCBs to the creek. No other listed hazardous waste sites are known to contain PCBs.

The changing concentration of PCBs in the water column along the length of Eighteenmile Creek suggests the existence of an additional source of PCBs between Olcott Bridge and North Transit Rd. Water quality data from the 1994 Lake Ontario Tributary Sampling indicates that the aqueous phase concentration of PCBs in the creek water increases going downstream from

Olcott Bridge to North Transit Rd (Figure 5.6). The PCB concentrations found at N Transit Rd compared to those from the canal, The Gulf tributary and the East Branch indicate that the source between Olcott Bridge and N Transit Rd is the primary source of PCBs to the creek. The William St Island site in this reach is currently under investigation.

Figure 5.6
Aqueous and Adsorbed Phase PCB (in ug/l) Concentrations in the Waters of Eighteenmile Creek, its Tributaries and Sources.



NY Barge Canal

Sediment sampling, done by the DEC and the NYS Thruway Authority, in the NY Barge Canal, showed the presence of PCBs. As can be seen in Figure 5.1, the PCB data set for the Barge Canal indicates the area of contamination is localized to the Lockport area. Sediment sampling in Eighteenmile Creek upstream and downstream of the canal's discharge shows an increase in PCB concentrations downstream of the canal (Table 5.1). This indicates that the canal does contribute PCBs to the creek.

Two PISCES water quality samples taken in the canal between the discharge to Eighteenmile Creek and the locks during May - June and August 1994, as part of the 1994 Lake Ontario Tributary Sampling, indicate that the water in the canal contains PCBs at estimated concentrations of 0.0184 ug/l and 0.0142 ug/l; both in excess of the 0.001 ug/l aquatic water quality standard. Additionally, a PISCES sample at Clinton St (which is the first street

downstream of the discharge from the canal to the creek) had an estimated PCB concentration of 0.0237 ug/l. A series of PISCES and pressure filtration samples taken in the canal during 1995 also show the presence of PCBs at concentrations above the aquatic water quality standard. This data indicates that the canal is a source of PCBs to the creek, however it is not clear that this contamination originates within the Lockport area or from upstream sources.

Sediments

Sampling data from several studies has shown the presence of PCBs in the sediments of Eighteenmile Creek. The 1994 Olcott Harbor Sediment Sampling showed the presence of PCBs in all but one of the surface samples from the creek and also in the core samples from upstream of the Area of Concern. Data from the 1989-90 RIBS study show PCBs in sediment samples taken from Jacques Rd. (above the Area of Concern) in both years. Sediment sampling done in 1991 as part of the NYSDEC Dioxin/Furan Sampling found PCBs in the sediments of Eighteenmile Creek upstream of the Area of Concern. The surface sediment data from these studies is summarized in Table 5.6. This data indicates that contaminated sediments are a source of PCBs to Eighteenmile Creek.

Summary

Known sources of PCBs to Eighteenmile Creek are creek sediments and the NY Barge Canal. Water quality data also indicates the presence of a potential and unknown source located between Olcott Bridge and North Transit Rd. Combined sewer overflows are also a potential source. Additionally, all of the PISCES and pressure filtration samples in the Eighteenmile Creek watershed have shown at least some PCBs, suggesting a background level present throughout the area. This may come from general atmospheric deposition.

Table 5.6
PCB Concentrations (in mg/kg) in the Surface Sediment Samples of the Main Stem of Eighteenmile Creek.

Sampling	Yr Taken	Location	Total PCBs	In AOC
EPA	1981	EPA Site #1, Olcott Harbor	*0.118*	Y
COE 1/	1981	COE Site #4 Olcott Harbor	*0.1*	Y
COE	1977	COE Site #4, Olcott Harbor	*0.12*	Y
COE	1977	COE Site #3, Olcott Harbor	*0.19*	Y
Olcott Harbor Sediment	1994	Esta #3 (Olcott Harbor)	*0.62*	Y
COE	1977	COE Site #2, Olcott Harbor	*0.32*	Y
COE	1977	COE Site #1, Olcott Harbor	*0.1*	Y
Olcott Harbor Sediment	1994	Esta #4 (Upstr Rt 18)	*0.86*	Y
Olcott Harbor Sediment	1994	Esta #5 (Dwnstr of Burt Dam)	*0.63*	Y
Olcott Harbor Sediment	1994	Esta #6 (Upstr of Burt Dam)	*2.49*	N
RIBS	1989	Jacques Rd	*0.87*	N
RIBS	1990	Jacques Rd	*0.37*	N
Lake Ontario Tributary	1994	Swale at Williams St Island site	*3.27*	N
Lake Ontario Tributary	1994	Swale at Williams St Island site	*1.87*	N
Lake Ontario Tributary	1994	Behind dam below Clinton St	*3.66*	N
Olcott Harbor Sediment	1994	Esta #8 (Clinton St)	*1.39*	N
Dioxin/Furan	1991	Clinton St (below canal)	*0.361*	N
Dioxin/Furan	1991	Remic Pkwy. (above canal)	0.0133	N

1/ COE - US Army Corps of Engineers

Dioxins and Dibenzofurans

Impairment Observations

Dioxins and dibenzofurans are contributing factors to restrictions on fish and wildlife consumption, bird and animal deformities or reproductive problems and restrictions on dredging activities. Dioxins and dibenzofurans are also a factor in fish and wildlife consumption advisories and the bird and animal deformities or reproductive problems indicator. In 1987 carp and brown trout caught in the Area of Concern exceeded both the DEC wildlife criterion of 0.0000023 mg/kg for 2,3,7,8 tetrachlorodibenzodioxin and the NYS Department of Health guideline concentration of 0.00001 mg/kg for 2,3,7,8 tetrachlorodibenzodioxin or the EPA total dioxin and dibenzofuran toxicity equivalent. A single surface sediment sample taken in Olcott

Harbor, as part of the 1994 Lake Ontario Tributary Sampling, contained dioxins and dibenzofurans with an EPA toxicity equivalence of 0.00011 mg/kg. This is in exceedance of the NYS interim sediment guidance value of 0.00005 mg/kg which would be a concern relative to dredging.

Sources

Industrial and Municipal Wastewater Discharges

There are no permitted dischargers of dioxins or dibenzofurans to Eighteenmile Creek.

Combined Sewer Overflows

While influent sampling at the City of Lockport Wastewater Treatment Plant did not detect them, pressure filtration sampling in the sewer system revealed the presence of dioxins and dibenzofurans. Table 5.5 contains a summary of this data. While the data show the presence of dioxins and dibenzofurans in the sewers, the levels are below the water quality standard. Analyses also shows that the relative abundance of dioxin and dibenzofuran homologs is different than that observed in creek sediments. Because of this, CSOs are not considered to be a significant source of dioxins and dibenzofurans to the creek.

Inactive Hazardous Waste Sites

No hazardous waste sites in the Eighteenmile Creek watershed are known to contain dioxins or dibenzofurans.

NY Barge Canal

Sampling of the sediments in the NY Barge Canal from West of Lockport to near the discharge to Eighteenmile Creek showed the presence of dioxins and dibenzofurans. The sediment concentrations of these contaminants are greatest in the Lockport area near the canal's discharge to Eighteenmile Creek (Figures 5.2 and 5.3). Sediment sampling in Eighteenmile Creek upstream and downstream of the canal's discharge also indicates that the canal is a source of dioxins and dibenzofurans to the creek (Table 5.1). Additionally, the creek and canal sediments both show similar patterns of relative abundances of dioxin and dibenzofuran homologs.

Sediments

Surface sediment sampling data from the Dioxin/Furan Sampling in Eighteenmile Creek has indicated the presence of dioxins and dibenzofurans. The samples for this study were all collected above the Area of Concern. Additional sediment samples for dioxins in the 1994 Lake Ontario Tributary Sampling show the presence of dioxins/dibenzofurans in the Area of Concern as well. This data is summarized in Table 5.7 below. Based on the NYS interim sediment screening guidance, the samples which indicate moderate contaminant levels are in italics and those that indicate high contaminant levels are in bold face.

Table 5.7
Dioxin and Dibenzofuran Concentrations (in mg/kg) in the Surface Sediment Samples of Eighteenmile Creek.

Sampling	Year Taken	Location	Total Dioxins	Total Dibenzofurans	EPA TEF*
Dioxin/Furan	1991	Remic Pkwy (above canal)	0.00056	0.000064	0.000004
Dioxin/Furan	1991	Clinton St (below canal)	0.0108	0.0024	**0.000103**
Dioxin/Furan	1991	East Branch (above canal)	0.000766	0.000117	0.000004
Dioxin/Furan	1991	East Branch (below canal)	0.00179	0.000514	*0.000021*
Dioxin/Furan	1990	N Transit Rd	0.169	0.00312	**0.000116**
Dioxin/Furan	1990	Condren Rd	0.0266	0.0054	**0.000177**
Dioxin/Furan	1990	Newfane Dam	0.0348	0.00779	**0.000282**
Lake Ontario Tributary	1994	Olcott Harbor	0.0347	0.00670	**0.000110**

* TEF-2,3,7,8 TCDD Toxicity Equivalence Factor

Summary

The known sources of dioxins and dibenzofurans to Eighteenmile Creek are creek sediments and the NY Barge Canal.

Metals

Impairment Observations

Metals are associated with dredging restrictions and degradation of the benthos. The specific metals associated with these impairments are: barium, chromium, copper, lead, manganese, mercury, nickel and zinc. The above mentioned metals were found in the Area of Concern at concentrations exceeding the 1977 USEPA guidelines for disposal of dredged material in the Great Lakes and the 1994 DEC interim sediment guidance for freshwater navigational dredging. Cadmium, chromium, copper, lead, mercury, nickel and zinc were found in the surface sediments of the Area of Concern at levels exceeding the DEC Division of Fish and Wildlife sediment guideline levels for chronic and acute toxicity in benthic species.

Sources

Industrial and Municipal Wastewater Discharges

Municipal and industrial discharges to the creek do contain metals. The two active dischargers of metals are the City of Lockport Wastewater Treatment Plant and Delphi Harrison Thermal Systems. Both of these dischargers are in compliance with their SPDES permits. Because of this, industrial and municipal discharges are not considered a source of metals to the creek.

Combined Sewer Overflows

Influent sampling at the City of Lockport Wastewater Treatment Plant (Table5.4) detected the following metals in two or more samples: arsenic (5-16 ug/l), cadmium (0.3-13 ug/l), chromium (4-104 ug/l), copper (22-73 ug/l), lead (10-27 ug/l), nickel (8-211 ug/l), silver (0.2 - 24 ug/l) and zinc (77-170 ug/l).

A National Urban Runoff Study issued by the EPA in 1983 indicates the presence of metals and cyanides in urban runoff. Copper (1 to 100 ug/l), lead (6 to 460 ug/l) and zinc (10 to 2400 ug/l) were by far the most prevalent constituents found. All were found in at least 91 percent of the samples. Among other inorganic parameters detected in the urban runoff study were arsenic (1 to 50 ug/l) in 52 percent of the samples and cyanides (2 to 300 ug/l) in 23 percent of the samples. Barium, iron and manganese were not analyzed as they are not priority pollutants.

Periodic storm related excess flow discharges from the City of Lockport combined sewer system is a source of metals to Eighteenmile Creek.

Inactive Hazardous Waste Sites

The Guterl Steel and the City of Lockport Landfill sites contain metals. Both sites have caused some metals contamination of the groundwater and soil. These sites do not appear to be significant contributors of metals to Eighteenmile Creek, however. Overall, inactive hazardous waste sites are not significant sources of metals to the creek.

NY Barge Canal

There is no direct data available on metals concentration levels in the NY Barge Canal at or near its discharge to Eighteenmile Creek. The 1989-90 RIBS data collected at Jacques Road along Eighteenmile Creek indicated that the only parameter that exceeded water quality standards was iron. Iron is abundant in the local rock strata suggesting that elevated levels in the water column may be of natural origin.

Sediments

The sediments along the entire length of Eighteenmile Creek contain metals to varying degrees. In addition to historic sources, soils and rock contain metals such as arsenic, chromium, copper, lead, nickel and zinc. Erosion of these materials from the watershed can be a source of these contaminants in bottom sediments. The contamination levels are the highest behind the

two dams. Within the Area of Concern, the contamination is low at the outlet to Lake Ontario and increases as one moves upstream. Contaminated sediments from the basin behind Burt Dam could be migrating into the Area of Concern.

Summary

The known source of metals in Eighteenmile Creek are creek sediments with the potential of periodic discharges from CSOs.

SUMMARY OF IMPAIRMENTS, CAUSES AND SOURCES

A summary of impairments, causes and sources is shown in Table 5.8.

Table 5.8
Summary of Impairments, Causes and Sources

#	Impairment Indicators	Impairment	Likely Cause	Known Sources	Potential Sources
1	Restrictions on Fish and Wildlife Consumption	Yes	PCB's	Barge Canal Bottom Sediments	Combined Sewer Overflows Atmospheric Deposition Unknown Source Between Olcott Br and N. Transit Rd
			dioxins	Barge Canal Bottom Sediments	
2	Tainting of Fish and Wildlife Flavor	No			
3	Degradation of Fish and Wildlife Populations	Unknown			
4	Fish Tumors and Other Deformities	Unknown			
5	Bird or Animal Deformities or Reproduction Problems	Likely	PCBs	Barge Canal Bottom Sediments	Combined Sewer Overflows Atmospheric Deposition Unknown Source Between Olcott Br and N. Transit Rd
			DDT and metabolites	Bottom Sediments	
			dioxins	Barge Canal Bottom Sediments	
			dieldrin	Bottom Sediments	Inactive Hazardous Waste Sites

Table 5.8 (con't.)
Summary of Impairments, Causes and Sources

#	Impairment Indicators	Impairment	Likely Cause	Known Sources	Potential Sources
6	Degradation of Benthos	Yes	PCBs	Barge Canal Bottom Sediments	Combined Sewer Overflows Atmospheric Deposition Unknown Source Between Olcott Br and N. Transit Rd
			metals	Bottom Sediments	Combined Sewer Overflows
7	Restrictions on Dredging	Yes	metals	Bottom Sediments	Combined Sewer Overflows
			dioxins	Barge Canal Bottom Sediments	
8	Eutrophication or Undesirable Algae	No			
9	Restrictions on Drinking Water Consumption	No			
10	Beach Closings	No			
11	Degradation of Aesthetics	No			
12	Added Cost to Agriculture or Industry	No			
13	Degradation of Phytoplankton and Zooplankton Populations	Unknown			
14	Loss of Wildlife Habitat	No			

Table 2.8 (cont.)

Summary of Intentional Causes and Sources

8	Intentional Injection	Intentional	Chemical Flash	Known Sources	Potential Sources
9	Detonation of Bombs	Yes	HCBP	Bombs Small	Unknown Sources Between Orion Ba and N. Tower Rd Atmospheric Detonation Combined Sewer Overflows
			Iodine	Bombs Sediments	Combined Sewer Overflows
7	Reactions on Dredging	Yes	Iodine	Bombs Sediments	Combined Sewer Overflows
			Glycols	Bombs Small Barge Canal	
8	Contamination of Underwater Areas	No			
9	Reactions on Dredged Areas	No			
10	Beach Closures	No			
11	Deformation of Aquatics	No			
12	Added Cost to Alternative or Highway	No			
13	Deformation of Pyrotechnics and Explosives	Unknown			
14	Loss of Wildlife Habitat	No			

CHAPTER 6

REMEDIAL PROGRAMS

INTRODUCTION

A number of remedial programs are ongoing which have been or are being implemented to address sources of contaminant entry into Eighteenmile Creek. These programs are described in this Chapter to provide the reader with an overview of pollution control and remedial programs in effect in New York State. Remedial options that could apply to known or potential causes of impairment in Eighteenmile Creek are also discussed.

REMEDIAL PROGRAMS

The major programs which affect contaminant entry into water bodies are those which address municipal and industrial discharges, combined sewer overflows, inactive hazardous waste sites and other nonpoint sources. Program development is required for contaminants in river bottom sediments.

Municipal and Industrial Discharges

Municipal and Industrial Discharges are regulated under the State Pollutant Discharge Elimination System (SPDES) system which is administered by the NYSDEC Division of Water. New York State has chosen the "Substance Specific" approach as the primary method of water-quality-based toxic substance management and control for point sources. Water quality standards and guidance values have been adopted for over 200 toxic substances in both fresh and marine waters for the protection of human health and aquatic life. These are in addition to federally mandated technology-based treatment standards, and best professional judgment where such standards are lacking. As a secondary mechanism of toxics control, whole-effluent toxicity testing (exposure of the organisms Daphnia magna and Pimephales promelas) is being included in "third round" SPDES permits (permits currently being issued), particularly where water-quality-based controls may not assure conformance with water quality standards.

In New York State, the identification of waters needing water-quality-based controls began in the 1960's through the project/basin assessment process. This process focused on the control of conventional, non-toxic pollutants (biochemical oxygen demand, suspended solids, pH, etc.) from municipal and industrial discharges. In the late 1960's New York also began requiring technology limits based on the permit writer's "best professional judgment".

The Federal Water Pollution Control Act of 1972 officially required both treatment technology and water quality based effluent limitations. By this time, New York State

already had half a decade of experience in writing permits that contained water quality limitations and was developing the experience to create other workable treatment technology limitations. Moving into the arena of uniform national wastewater-treatment-technology standards proved to be a very slow process, fraught with controversy and law suits.

Relative to the control of toxic discharges to New York State's waterways, the most important new feature of the 1972 Water Pollution Control Act was the legal requirement to establish national industrial wastewater treatment technology standards in the form of "Best Available Treatment Economically Achievable". For the various categories of industry, EPA was to promptly develop uniform national guidance documents containing treatment technology values for: Best Available Technology (BAT); New Source Performance Standards; and Industrial Pretreatment Requirements. The industrial discharges were expected to comply with these technology guidelines by 1983 for BAT and by 1984 for industrial pretreatment.

It was 1981 when the first set of EPA industrial technology guidance documents appeared for the electroplating category of industries. In the absence of these national industrial technology standards for other industrial categories, the project review engineers in New York State assigned with the responsibility to approve wastewater treatment facilities for industries gradually developed a comprehensive body of guidance values based on their own "best professional judgment" of what BAT should be. In 1983 New York formalized these best professional judgment (BPJ) values in the form of written policy guidance for the issuance of wastewater permits. At the present time permit writers use federal BAT guidance where available and state BPJ guidance values for all other industrial categories. As of this time, EPA has promulgated its forty-fifth set of industrial wastewater-treatment guidance values.

As the number of substance-specific ambient water quality criteria increased, a formal tabulation was prepared in 1983. The procedure for the development of criteria was incorporated into regulation in 1985, as were many of the substance-specific numerical criteria. These substance specific criteria were further updated in regulations in 1991. The criteria are called "standards" if in regulation and "guidance values" if not. Standards or guidance values currently exist for about 215 toxic substances for both fresh and marine waters.

Prior to the development of "third round" permits, a basin approach to toxic substances control was initiated (1981 to 1984). This was consistent with the total maximum daily load (TMDL) and wasteload allocation (WLA) concept contained in the EPA regulation "Water Quality Planning and Management", 40 CFR 130. To implement the basin approach, a toxic discharge inventory for each substance is developed. This is compared to the maximum allowable load in the most critical downstream segment in each basin under critical low flow conditions. The assumption is made that all toxic substances are conservative. That is, a substance which enters the water column remains in downstream segments unaffected by

biological, chemical, and physical processes.

DEC reviews the self-monitoring reports from dischargers, flagging any which exceed permit limits and using pre-determined criteria to assess significance (toxics are considered more significant than conventional pollutants, and large or frequent violations more significant than small or occasional exceedances).

In addition, DEC inspects facilities in operation and independently samples effluent to check the validity of self-monitoring data. Inspections often detect small operational problems before they grow into permit violations, and are focused on facilities with a history of problems and on dischargers to sensitive receiving waters.

Significant violations of permit conditions trigger corrective compliance or enforcement measures. In extreme cases, DEC may impose summary abatement or closure to end an immediate or very serious health or environmental threat. The department can also pursue criminal or civil penalties for illegal discharge. The common initial approach, however, is establishment of an "integrated compliance strategy" to abate the discharge as quickly as possible. The violator is obligated to follow the compliance strategy, which may include construction, corrective maintenance or changes in operation. DEC surveillance of the discharger is increased until permit limits are achieved.

A requirement of industrial dischargers in the State Pollutant Discharge Elimination System permits administered by the DEC Division of Water is the development and implementation of Best Management Practices (BMP) Plans to deal with the prevention of releases of significant amounts of toxics or hazardous materials from plant site runoff, accidental spills and leakage, waste disposal or drainage from raw material storage. The permittee reviews all facility components including material storage areas, in-plant transfer, process and material handling areas and waste disposal areas where toxic or hazardous pollutants are used, manufactured, stored or handled to evaluate the potential for the release of significant amounts of pollutants to groundwater or surface water. In selecting appropriate BMPs, the permittee considers spill reporting procedures, risk identification and assessment, employee training, inspections and records, preventive maintenance, good housekeeping, materials compatibility and security as well as structural measures such as secondary containment where appropriate. The economic achievability of end-of-pipe treatment is not considered until plant site toxic "hot spot" sources have been identified, contained, removed or minimized through the imposition of BMPs or internal facility treatment technology.

Today, New York State has in place and exercises the elements needed to control the discharge of toxics to surface water from point sources. These elements include:

- SPDES permit authority which has demonstrated successful control of toxics and conventional pollutants;

- Written procedures for setting effluent limits for toxics;
- Federally promulgated technology-based treatment standards and DEC's best professional judgment technology-based standards;
- Water-quality standards for 95 toxic substances;
- Criteria for more than 120 additional toxic substances (these criteria may become standards in the future, and are used in setting permit limits);
- A statewide basin-by-basin inventory of toxic substance discharges;
- A State laboratory certification program to ensure the reliability of effluent monitoring by dischargers;
- Stringent civil and criminal penalties for illegal discharge;
- A program to monitor dischargers and to achieve compliance;
- Citizens and public officials who are determined to keep surface waters free of toxic contamination.

Industrial Pretreatment Program

An Industrial pretreatment program has been developed and is being implemented for the City of Lockport. Gasport Sewer District #1 does not have (and is not required to have) an industrial pretreatment program because of its small size and lack of significant industrial users. This program regulates the discharge of toxic substances from industries to the wastewater treatment plant. The primary objectives of the pretreatment regulations are to prevent the discharge of toxic pollutants which interfere with the operation of municipal wastewater treatment facilities and which may either pass through these facilities untreated, or severely limit disposal options for large volumes of municipal sludge.

The City of Lockport industrial pretreatment program was approved in August 1984 and currently has 16 significant industrial users (SIUs). All SIUs are subject to the Federal General Pretreatment Regulations as well as any local regulations developed by the implementing municipal authority. SIUs in a particular service area are issued permits for their discharges into the sewer system in a manner analogous to the State issued SPDES permits for surface or groundwater discharges. These permits are pollutant specific and limit the volume, mass and concentration of allowable pollutant discharges into the sewer systems. The local permits specify SIU self monitoring and record keeping requirements.

The Federal General Pretreatment Regulations establish prohibited discharge standards and categorical pretreatment standards to control pollutant discharges into treatment plants. Prohibited discharge standards apply to all industrial and commercial establishments connected to wastewater treatment plants. Categorical pretreatment standards apply to industrial and commercial discharges in specific industrial categories determined to be the most significant sources of toxic pollutants. Each categorical pretreatment standard contains limits for pollutants commonly discharged by the specific industrial category. All dischargers regulated by a particular category are required to comply with these standards.

The municipal authorities implement the industrial pretreatment programs through a system of permits, inspections, sampling and enforcement for cases of non-compliance. The legal authority necessary to implement the compliance and enforcement portions of the program was established during program development. Enforcement action in response to SIU non-compliance may include civil actions, civil or criminal penalties and termination of service.

Inactive Hazardous Waste Sites

The New York State Abandoned Sites Act of 1979 (Chapter 282) marks the formal beginning of New York State's Inactive Hazardous Waste Site Remedial Program. The Abandoned Site Act mandated a statewide inventory of inactive hazardous waste sites, established the New York Registry of Inactive Hazardous Waste Sites, and provided DEC and the Department of Health the authority to order responsible parties to clean up their waste sites, or to initiate cleanup activities in the event that no responsible party could be identified.

The abandoned Sites Act spotlighted New York State as a leader in the hazardous waste remedial cleanup arena. Federal regulation came about somewhat later with the passage of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA or Public Law 96-510).

As more sites were discovered and the need for additional funding became evident, New York enacted the State Superfund Law of 1982 (Chapter 857). This law established the Hazardous Waste Remedial Fund (State Superfund) from fees assessed against wastes generated in or transported into New York State. These monies were dedicated to pay for site investigation, remedial programs at sites where there was no responsible party, financing the non-federal share of remediation activities carried out under federal Superfund, and emergency response actions for spills involving hazardous waste.

Five classifications for hazardous waste sites are specified in the Environmental Conservation Law (ECL) to be used by DEC in preparing the registry of inactive hazardous waste disposal sites. The classifications are:

Classification 1 - causing or presenting an imminent danger of causing irreversible or

irreparable damage to the public health or environment -- immediate action required;

Classification 2 - significant threat to the public health or environment -- action required;

Classification 2a has been added by DEC. This temporary classification has been assigned to sites for which there is inadequate data to assign them to the five classifications specified by the law.

Classification 3 - does not present a significant threat to the public health or environment -- action may be deferred;

Classification 4 - site properly closed -- requires continued management;

Classification 5 - site properly closed, no evidence of present or potential adverse impact -- no further action required.

The Superfund Law required DEC to prepare an Inactive Hazardous Waste Remedial Plan. The plan was to identify both methods and schedules for completing the hazardous waste remedial program in New York State. It also authorized the creation of the first State Superfund Management Board whose function was to oversee the remedial program as outlined in the Remedial Plan. Upon completion of its legal mandate in June 1984, the original Board ceased to exist.

State Executive Order #33 issued on December 29, 1983 mandated DEC to survey industry's past hazardous waste disposal practices. Questionnaires were distributed to nearly 15,000 industries suspected of generating or transporting hazardous wastes during the thirty-year period from 1952 to 1981. Approximately 60% of the questionnaires sent out were returned; 449 potential new disposal sites were identified. These sites required further investigation in order to decide which sites should be added to the Registry of Inactive Hazardous Waste Sites. The report of suspected waste sites was released April 1, 1985.

The State anticipated $10 million per year in receipts from the waste-end assessments on industries that generate or transport hazardous wastes in New York State. In actuality these assessments yielded only $3.5 million per year. To remedy this shortfall, the State passed the 1985 Amendments to the State Superfund Law (Chapter 38). The 1985 Amendments authorized a significant increase in revenue totaling $22 million per year through industry-based fees. In addition, $8 million was appropriated out of the State's General Fund, thereby making available a total of $30 million to fund New York's remedial program.

The 1985 Amendments require DEC to publish Quarterly Reports indicating progress

made in enforcement, site investigation and/or remedial activities at each site listed in the Registry. The Department was also required to prepare a status report and annual update of the Remedial Plan by July 1, 1986, and in each successive year. This law constituted the second State Superfund Management Board, directing it to evaluate the State's implementation of the New York State Hazardous Waste Site Remedial Program.

With Superfund revenues of $22 million per year (plus $8 million from the State's General Fund), it was estimated that it would take at least 40 years to fund the State's share of remediating an estimated 500 hazardous waste sites. In order to complete cleanup within the State Superfund Management Board's accelerated 13-year schedule, an additional funding commitment was needed from both industry and government. The Environmental Quality Bond Act of 1986 was prepared to raise $1.45 billion. Of this amount, $1.2 billion was earmarked for remedial action at hazardous waste sites when other sources of funding were not available. Debt service incurred on the bonds issued to clean up hazardous waste sites was to be shared equally by New York State and industries that produce or process hazardous waste. On November 4, 1986, the Bond Act was approved overwhelmingly by voters of New York State.

Once a hazardous waste site is listed in the Registry, the State must (1) determine whether hazardous waste at the site constitutes an imminent or significant threat to the environment or public health, and (2) identify potentially responsible parties. Priority for action is dependent upon the type of waste deposited at the site, the potential for contaminant migration and the presence of groundwater or surface water contamination from the site.

DEC has conducted two levels of preliminary investigations (Phase I and Phase II) at suspected inactive hazardous waste sites. For Phase I studies, DEC hires engineering consultants to search records of federal, state, and local agencies known to be involved with the site, and to interview site owners (if known) and local residents to gather pertinent information on the site. Phase I site investigations provide preliminary characterizations of hazardous substances present at each site; estimate pathways by which pollutants might be migrating from the original site of disposal; identify the population and resources which might be affected by pollutants from the site; observe how the disposal area was used or operated; and gather information regarding who might be responsible for wastes at the site. They also identify data gaps which must be filled for proper assessment of the site's characteristics. Phase I studies typically require eight to twelve months to complete.

If additional information is needed to classify and rank a site, DEC will conduct a Phase II investigation to determine whether or not the site poses a significant threat to public health and the environment. Data gathered in the Phase II study are used to classify the site, to apply these data to the EPA Hazard Ranking System Model to determine whether the site should become part of the National Priorities List (Federal Superfund site list) and to identify the needs (if required) of a Remedial Investigation/Feasibility study. Phase II studies typically require more than one year to complete.

Recently, Phase I and Phase II studies have been combined by DEC into a single undertaking called a Preliminary Site Assessment.

A Remedial Investigation (RI)/Feasibility Study (FS) is undertaken when a site is determined to pose a significant threat to public health or the environment, (i.e., a class 2 site in New York State's priority system). The Remedial Investigation is designed to determine the areal and vertical extent of contamination whereas the Feasibility Study provides the analysis and recommended solution to the particular site problem. An RI/FS normally requires about two years to complete.

Once a remedy is selected, a remedial design is prepared and the remedial construction is carried out. Remedial designs typically require one year while remedial construction may take several years to complete depending on the complexity of the site.

Several of these past disposal sites are being addressed under the Resource, Conservation and Recovery Act program (RCRA). A similar approach involving assessment, investigation, corrective measures evaluation, design and construction is utilized.

Bottom Sediments

No formal programs to address contaminated bottom sediment currently exist at the federal or state level.

In the Great Lakes Amendment to the U.S. Clean Water Act, the EPA Great Lakes National Program Office was authorized to "carry out a five year study and demonstration projects relating to the control and removal of toxic pollutants in the Great Lakes, with emphasis on the removal of toxic pollutants from bottom sediments." Five areas were suggested as ones that should receive priority consideration as sites for the demonstration projects. All five are Areas of Concern as identified by IJC for RAP development. The Amendment authorized the expenditure of $4.4 million per year for Federal Fiscal Years 1987-1991 for the demonstration projects. In 1990, the program was extended and scheduled for completion by the end of calendar year 1993. This project has been completed and is to be continued under the 1996 Federal Water Resources Development Act.

Remedial options for sediments include excavation (spot or entire) or retention-in-place through natural or man-made armoring and discontinuation or modification of dredging for navigational purposes.

To assess excavation feasibility and costs, bottom sediment criteria would have to be established, investigations would have to be conducted of the horizontal and vertical distribution of contaminant levels, volume estimates would have to be prepared, disposal site

capacity would have to be established and dredging mechanisms would have to be evaluated to determine the least disruptive method of bottom sediment removal.

The remedial alternative of excavation for contaminated bottom sediments would require a detailed survey, analysis and mapping of the river bottom areas to depict the horizontal and vertical extent of contamination. Analytical chemical, physical and biological data would be compared with sediment quality criteria to determine the degree to which excavation would be required to effectively remove the contaminants.

The potential exists for the retention-in-place of contaminated bottom sediments through natural or man-made armoring and the discontinuance or modification of current dredging practice.

Prior to undertaking any remedial actions relative to the bottom sediments it will be necessary to demonstrate that there are no continuing sources of unacceptable levels of sediment contaminating constituents in the system.

Combined Sewer Overflows

Combined sewer overflows are included in municipal State Pollutant Discharge Elimination System permits as separate discharge points. Dry-weather overflows are not allowed from a combined sewer system. DEC has provided guidance through the Technical and Operation Guidance Series (TOGS) for decisions in the evaluation of CSOs to ensure that water quality objectives are met, and to protect the best usage of the State's water resources from significant impairment by the direct and residual degrading effects of CSOs through the elimination or reduction of CSO discharges.

EPA and DEC, through the Construction Grants Program, have awarded grants to CSO abatement projects designed to restore uses of the receiving waters in priority water quality areas which have been impaired by the impact of CSOs. A revolving loan program has replaced the construction grant program as a source of continuing financial support for remedial activity. The same categories of wastewater collection and treatment facilities that were eligible for grants remain eligible under the revolving loan program.

Other Nonpoint Sources

A nonpoint source (NPS) of pollution is usually considered an areawide source or many small sources of pollution distributed diffusely over an area, which cumulatively make a

significant contribution to water quality degradation. Toxics may enter surface waters either dissolved in runoff or attached to sediment or other organic materials and may enter groundwater through soil infiltration. Contaminants transported from the land by runoff following a storm event are usually characterized as nonpoint if they enter the waterbody diffusely rather than at a discrete stormwater discharge point.

NPS impacts are associated with both long-term, fixed land uses (e.g., agriculture, urban development) and more sporadic and transitory activities (e.g., construction sites, timber harvesting). Programs to address activities such as forestry and construction must be preventive in nature; i.e., they must promote awareness and understanding of proper site management before a project is undertaken so that site-specific impacts can be prevented. On the other hand, the impacts of agricultural or urban land uses typically manifest themselves as identifiable longer-term problems in a waterbody (e.g., eutrophication of a lake or reservoir) which must be prevented or corrected by efforts to promote proper long-term management practices on the landscape.

Addressing nonpoint source pollution involves a broad array of program activities on the part of several federal, state and local agencies. In New York State, the DEC has lead responsibility, by virtue of its statutory authority, for the management of water resources and control of water pollution. County water quality committees have been established to participate in addressing nonpoint source pollution.

"Best Management Practices" (BMPs) are essential tools to better link water quality with the land management activities of pertinent resource management agencies and with the activities of local government. Since most of the institutional capability for implementing management practices to control NPS exists at the local level, cooperation and coordination among agencies is an essential part of "outreach" to develop awareness and enthusiasm for BMPs on the part of local government and the public.

Nonpoint sources of water pollution within the scope of the State's management strategy which may include substances of a toxic nature are: diffuse urban runoff; household on-lot wastewater disposal; chemical and petroleum bulk storage; pesticide and fertilizer use in agricultural and silvicultural operations by commercial turf grass, yard care, and vegetation control operations, and by homeowners; small spills, accidents and leaks of hazardous substances associated with poor housekeeping at industrial and commercial facilities; and storage and use of road salt and other deicing chemicals and abrasives. Some examples of NPS control related activities/ programs are:

-Septic tank control programs under the New York State Department of Health and county health departments which enforce standards for on-lot wastewater disposal systems.

-Chemical and petroleum bulk storage programs administered by DEC which require owners to register, periodically test and inspect storage systems and report results to the department. These programs require that the repair or replacement of leaking facilities must be in accordance with standards for new installations.

-Training and certification of commercial and private (farmer) pesticide applicators by DEC. DEC also registers and classifies products for use in New York State with authority to cancel these registrations if necessary. DEC is also responsible for the pesticide enforcement program to deter misuse of pesticides.

-The Agricultural Conservation Program of the U.S. Department of Agriculture which is used to partially fund soil and water conservation BMPs on private land.

As the major point sources of water pollution are brought under control in New York, as well as nationwide, the water quality impacts of NPS become relatively more apparent. In recognition of these impacts, the Water Quality Act of 1987 provided new direction and authorized Federal assistance for the preparation and implementation of state NPS programs.

Under the Water Quality Act, the State was required to submit, for EPA approval, an assessment report identifying those waters that cannot reasonably be expected to attain or maintain applicable water quality standards or the goals and requirements of the Clean Water Act due to NPS pollution. This report also described the specific NPS categories affecting these waters and general programs and methods used for controlling this pollution.

The State was also required to submit, for EPA approval, a NPS management program providing an overview of the State's NPS program, as well as what the State intended to accomplish over the next four years. While the assessment report identified the overall dimensions of the NPS problem, the management plan targeted a subset of these waters on a watershed-by-watershed basis. Statewide approaches to problems such as urban stormwater runoff from developing areas were also established.

With the approval of the NPS assessment and management plans, DEC began the implementation phase of the program. NPS program implementation is being accomplished through a cooperative arrangement between DEC and the New York State Soil and Water Conservation Committee. The committee is an association of district managers from county Soil and Water Conservation District (SWCD) offices. Working with DEC, the SWCD managers have formed county water quality committees which will develop county water quality strategies for NPS control. The strategies will utilize the DEC assessment and management plans and will prioritize NPS problems within each county. Completion of the strategy will result in a county being eligible to apply to DEC for monies for implementation of specific NPS abatement projects. Funding for these projects will come from EPA grants to DEC for NPS implementation as authorized by Section 319 of the Clean Water Act.

Fish and Wildlife Habitat

The physical alteration of natural shoreline, wetlands and shallow water areas in the Olcott Harbor area in the Eighteenmile Creek Area of Concern resulting from commercial development, contributes to a loss of fish and wildlife habitat. Much of this alteration is irreversible. However, New York State now has in place regulatory programs which are used to protect the remaining shoreline, wetland and shallow water habitats.

Protection of Waters Program

The policy of New York State as set forth in the Environmental Conservation Law (ECL) Article 15, Title 5, is to preserve and protect lakes, rivers, streams and ponds. To implement this policy, the New York State Department of Environmental Conservation created the Protection of Waters Regulatory Program, which is designed to prevent undesirable activities that do not meet the following criteria:

1. Are compatible with the preservation, protection, and enhancement of the present and potential values of the water resources,

2. Will protect the public health and welfare, and

3. Will be consistent with the reasonable economic and social development of the state.

The Protection of Waters Program regulates two different categories of activities which pertain directly to Eighteenmile Creek:

1. Disturbance of the bed or banks of a "protected stream"or other watercourse. The section of Eighteenmile Creek from the outlet to Lake Ontario to just upstream of Olcott Harbor is considered to be a protected stream by virtue of its class B designation. All water bodies with stream classifications of A, B or C(T) are protected waters.

2. Excavation and/or filling in "navigable waters". Eighteenmile Creek is considered to be a navigable water from the outlet at Lake Ontario upstream to the Burt Dam.

The Protection of Waters Permit Program regulates activities that occur in or near protected waters that have been identified and mapped. Generally, regulated activities include any alteration (including filling) or excavation of the bed or banks of a protected waterway (river, stream, etc.) or any excavation or fill in a navigable body of water or watercourse. For projects involving disturbance of protected waterways, the bed or banks of

a stream are considered to be the area immediately adjacent to the bed of the watercourse, not to extend more than 50 feet horizontally from the mean high water line.

Department staff participate in reviews of projects which qualify for Protection of Waters jurisdiction. The reviews are subject to the three criteria cited above, with emphasis on minimizing adverse impacts to aquatic resources and habitats.

Freshwater Wetlands Program

The New York State Freshwater Wetlands Act, Article 24 of the Environmental Conservation Law, was passed by the legislature in 1975. The Wetlands Act defines wetlands as lands and submerged lands, commonly called marshes, swamps, sloughs, bogs, and flats, supporting aquatic or semi-aquatic vegetation. The Act declares that the policy of the State is to preserve, protect and conserve freshwater wetlands and the benefits they provide. These benefits include among others wildlife habitat, sources of nutrients in freshwater food cycles and nursery grounds and sanctuaries for freshwater fish.

To implement this policy, the Department of Environmental Conservation created the Freshwater Wetlands Regulatory Program which is designed to prevent the despoliation and destruction of freshwater wetlands.

In most cases, to be protected under the Act, a wetland must be 12.4 acres or larger. Smaller wetlands may be protected if they are determined to be of unusual local importance for one or more of the described wetland benefits. Under the Wetlands Regulatory Program activities are regulated that may occur in wetlands and their adjacent areas (areas outside the wetland which extend 100 feet from the wetland boundary). Examples of activities which require a Wetlands Permit include: the construction of buildings, roadways, septic systems or bulkheads; the placement of fill, excavation; the modification or expansion of existing structures; drainage, except for agriculture; and application of pesticides. Certain activities are exempt from regulation such as: normal agricultural practices, harvesting of natural products, recreational activities, routine maintenance of existing structures, and selective cutting of trees.

Regulated wetlands are identified on New York State Wetlands Maps which were produced by the Division of Fish and Wildlife. Protection is given to fish and wildlife habitats when permit applications are reviewed by Department Staff. Permits for activities which could potentially harm fish and wildlife resources are either denied or modified to be made more compatible. Mitigation is required for wetland losses.

The area within the Eighteenmile Creek gorge upstream of Olcott Harbor to the base of the Burt Dam is a both a state and federal wetland.

Natural Heritage Program

The New York Natural Heritage Program was established in 1984 as a cooperative effort of the New York State Department of Environmental Conservation (DEC) and The Nature Conservancy, (a nonprofit conservation organization). Much of the initial support for the Natural Heritage Program came from state taxpayers through voluntary Return a Gift to Wildlife contributions. Now, funding comes from the Division of Fish and Wildlife, and the Division of Lands and Forests in DEC and from The Nature Conservancy.

The Program's goal is to establish and maintain an up-to-date inventory on the location and status of New York's rarest animal and plant species and the highest quality examples of all our natural communities. This goal is similar to those of other Heritage Programs now operating in 47 other states. Working independently but with common goals, the Heritage Programs in these states collectively form a network of information on the status of our nation's rare and vulnerable natural resources.

Information on the status and distribution of rare and endangered animals and plants and the best examples of New York's ecological communities is collected, stored and analyzed in an integrated data management system. Map files, manual files and computer files keep information organized and readily accessible. Data are indexed by such characteristics as location, species and community name, rarity, population size, and land ownership. The inventory is a flexible system that can produce information in a broad spectrum of formats to meet the needs of users.

Significant Coastal Fish and Wildlife Habitats

The Federal Coastal Zone Management Act of 1972 (CZMA) established a voluntary participation program to encourage coastal states to develop rational, comprehensive processes to coordinate various levels of government agencies and to resolve conflicts between coastal development demands and coastal resource protection. New York uses the Coastal Management Program (CMP) as a mechanism to assist in protecting its most valuable coastal fish and wildlife resources. The CMP is administered in New York State by the Department of State. The objective of the program is to protect the diversity of fish and wildlife species in the coastal zone by protecting the habitats and communities supporting vulnerable animal species, significant animal populations and rare coastal ecosystems (Hart and Milliken, 1991).

In order to protect these habitats, they must first be identified and then evaluated through a system of criteria that considers population level, species vulnerability, ecosystem rarity, human use and replaceability. Using these criteria, a numerical rating system has been developed by NYSDEC to determine which areas qualify for designation as a Significant Coastal Fish and Wildlife Habitat. The process for identifying, evaluating and

recommending areas for designation has been well documented (Ozard, 1984).

The process of habitat designation is a dynamic, ongoing function consisting of gathering initial and supporting information from a variety of sources including local officials and environmental organizations in informal forums, followed by formal hearing to provide opportunity for public comment and additional information. For each area recommended as a significant habitat, documentation is prepared including a map and a descriptive narrative (Hart and Milliken, 1991).

The entire Eighteenmile Creek Area of Concern is included as a coastal zone management area. The Department of State has also designated the coastal wetland area reaching from upstream of the Rt 18 Bridge to the base of the Burt Dam as a significant fish and wildlife coastal habitat.

This coastal habitat was state designated in 1987 and has since been federally approved. From a regulatory viewpoint, CZMA authority provides that a federal permit (including those required for private development) cannot be issued unless the state has determined that the proposed activity is consistent with state coastal policies. Where state habitat designations have been federally approved, the habitat policy is incorporated in the state's CMP, and the federal consistency provisions of the CZMA can be used to implement the habitat policy. These provisions allow the state to review federal actions including certain types of permit actions for which the U.S. Army Corps of Engineers has regulatory jurisdiction. The Significant Habitat Program has other regulatory and planning-related benefits at state and local levels.

CHAPTER 7

RECOMMENDED REMEDIAL STRATEGY

INTRODUCTION

The remedial strategy for Eighteenmile Creek is described in this Chapter. The strategy provides a systematic, focused approach to address use impairments in the creek. The strategy is presented as a process which identifies the assessment, remediation and verification activities required for each remedial action and their interrelationship with other remedial activities.

Remedial activities include both assessment and address of contaminant sources and continued assessment of impairments. The first actions in each category are noted as initial remedial activities. These are the activities which require initial funding commitments to initiate the remedial process. The remedial activities have in many instances been described in earlier chapters as regulatory program elements.

REMEDIAL ACTIONS

Stream Water Quality Monitoring

Stream water quality monitoring is required to continue the assessment of the creek's compliance with water quality standards. Eighteenmile Creek is included in the Rotating Intensive Basins Study (RIBS) every five to six years. This is an intensive two year study of selected water bodies in New York State. These activities will be continued.

DEC will also collect water quality samples to determine if the Burt Dam hydroelectric facility is mobilizing contaminated sediments from the dam reservoir. Both the 1994 Olcott Harbor Sediment Sampling and the 1994 Lake Ontario Tributary Sampling data suggest that this may be occurring. DEC will take pressure filtration samples from above and within the reservoir and from the turbine outlet to determine if contaminated sediments from the reservoir are being transported into the Area of Concern. This sampling will be an initial remedial activity.

Bottom Sediments

Contaminated bottom sediments in Eighteenmile Creek are known to be a contributing cause to four use impairments. Because sediments contribute to several impairments, multiple actions may be required.

Criteria for contaminated sediments are required to determine the extent of (both horizontally and vertically) sediment contamination that may impair beneficial uses of the creek. The USEPA has been working to develop criteria over the past several years. The set of sediment criteria is needed before sediment remediation can begin. The development of bottom sediment criteria is being undertaken as an initial remedial activity.

Once the bottom sediment criteria are developed, bottom sediment testing will be needed to assess current contaminant levels and compare them with the newly developed criteria. Areas exceeding the guidelines will require the assessment of remedial alternatives.

Based on a preliminary evaluation and resulting preliminary alternative selection, data acquisition leading to specific alternative design would proceed. For sediment removal and treatment/disposal, a detailed determination of sediment volume, based on criteria levels, would be required. Based on the treatment/disposal method selected, a treatment/disposal site would be identified, evaluated and acquired. With site acquisition, sediment removal design and treatment/disposal facility design would proceed.

There are three alternatives for remediating sediments that exceed guidelines. These options are:

1) Removal and disposal/treatment of contaminated sediments.
2) Isolation of the contaminated sediments by placement of an armoring layer over them.
3) Allowance of natural sediment deposition to cover the contaminated sediments.

The third option may be the only alternative in areas where sediment removal or armoring are impractical or where they would do more harm than good (such as in the protected wetland upstream of the Rt 18 bridge). After selection of a remedial alternative, a funding source will need to be identified for remedial design and construction.

Analyses of the PCB concentrations in the water along the length of Eighteenmile Creek suggests the presence of a source of PCBs between Olcott St. and N Transit Rd. The possible presence of other smaller PCB sources elsewhere on the creek may exist along with a contribution from the NY Barge Canal. Water quality data from these studies also suggests that a certain amount of the PCB contamination in the creek may be from general atmospheric deposition which is considered background. Before the remediation of bottom sediments in the creek is considered, all the sources of PCBs to the creek need to be identified and addressed. A continued program of sampling will be undertaken along the creek to account for and quantify all sources of PCBs to the creek as an initial remedial activity.

Sources of PCBs, identified as a result of this sampling, will be addressed on a case-by-case basis. DEC will perform an evaluation of sources to determine control requirements.

NY Barge Canal

The sediments and water of the NY Barge Canal are a source of PCBs, dioxins and dibenzofurans to Eighteenmile Creek. Before remediation of the bottom sediments in the creek can proceed, the entry of PCBs, dioxins and dibenzofurans from the canal needs to be controlled. The first step in this process is to define the source(s) of these contaminants to the canal and then to determine the extent (vertically and horizontally) of the contamination in the sediments of the canal. Additional sediment and water quality sampling in the barge canal and potential source areas will be conducted to identify the extent of contamination and sources of PCB, dioxins and dibenzofurans to the canal as an initial remedial activity.

Following this, an assessment of remedial alternatives can begin. The alternatives include removing the contaminated sediments, immobilizing them with an armoring layer and discontinuing the discharge of canal water to the creek. Once a remedial alternative has been selected and funding acquired, remedial design and construction can commence.

Inactive Hazardous Waste Sites

An ongoing program for remediation of inactive hazardous waste sites is being implemented by DEC and EPA.

The initial steps in the program consist of Phase I investigations (existing data accumulation and assessment) and Phase II investigations (studies to fill data gaps necessary for initial site assessment). These investigations are used to classify each site. This classification determines the need to proceed with further remedial action.

If further action at a site is necessary, a Remedial Investigation/Feasibility Study (RI/FS) is done. An RI/FS defines the extent of contamination and assesses alternative remedial measures. These are done by the parties responsible for disposal of the waste at the site under consent orders issued by DEC/EPA. They are performed by DEC/EPA when the responsible parties are unknown, do not exist anymore or are unable pay for the work. After the RI/FS is completed, remedial design is undertaken followed by remedial construction. Following completion of remedial construction, sites are monitored to insure that the site no longer poses a threat to public safety or the environment.

Site remediation status is presented in Figure 5.5 (Chapter 5). hase I and II investigations have been completed for all of the sites in the Eighteenmile Creek drainage basin except the Diamond Shamrock site. Remedial Investigation/Feasibility Studies (RI/FS) are underway or possibly pending at three sites. They are: AKZO Nobel, Guterl Steel, and Norton Labs. All other sites have either completed remedial construction and are being monitored or have been removed from the inactive hazardous waste site registry.

PISCES sampling along the creek indicates the presence of a source of PCBs between Olcott St and N. Transit Rd on the main stem of the creek. Sediment sampling on and around the William St Island located between these two roadways indicates the presence of PCBs. DEC Division of Environmental Remediation will investigate this site to determine if it is a source of PCBs or other contaminants to the creek as an initial remedial activity. If this sampling reveals the presence of sufficient quantities of PCBs or other contaminants, DEC will list this site as an inactive hazardous waste site.

Municipal and Industrial Wastewater Facilities

Existing municipal and industrial wastewater facility discharges are in general compliance with their State Pollutant Discharge Elimination System (SPDES) permits. These facilities will continue to be monitored. Their SPDES permits will also be periodically updated to meet water quality standards with a minimum of secondary treatment for municipal discharges and best available technology and best management practices for industrial discharges.

Discharge monitoring data containing summaries of toxic discharges is supplied to DEC by permitted municipal and industrial facilities as a requirement of their SPDES permits. This data, along with DEC sampling, allows the identification of any potential for exceedance of water quality guidelines and the assessment of the impact of permitted sources on the water quality of the creek.

Combined Sewer Overflows

Combined sewer overflows (CSOs) are potential sources of contaminants. The City of Lockport sewer system discharges untreated storm diluted wastewater to Eighteenmile Creek during storm events.

The City of Lockport Wastewater Treatment Plant's SPDES permit has recently been updated and, among other things, will address CSOs. The new permit will require the city to undertake a detailed assessment of the combined sewer system. This study will include measurements of the volume, duration and the impact of CSOs on the receiving body.

PISCES and pressure filtration sampling in the City of Lockport sewer system indicate that CSOs may be a source of PCBs to the creek. Further sampling will be needed to determine if there are sources of these contaminants entering the system. DEC will conduct additional sampling as an initial remedial activity.

Fish and Wildlife Habitat

There is a large state protected wetland in the Area of Concern. Continued protection of this wetland from development and degradation is a priority for DEC.

Since the status of the degradation of fish and wildlife populations impairment indicator is unknown, a fish and wildlife population study plan will be developed to determine the status of this indicator. A study plan will also be developed for fish sampling to determine the status of the fish tumors and other deformities impairment indicator. Additionally, a study plan to assess the status of the degradation of phytoplankton and zooplankton impairment indicator will be developed. These will be initial remedial activities.

MONITORING

Monitoring is carried out to determine whether the remedial actions that have been undertaken are achieving the expected improvements. The details of this monitoring must be linked closely with the specific remedial measures. They should be designed with the remedial program.

Since a definitive remedial scheme to correct the problems of Eighteenmile Creek cannot be described at this time, a monitoring program cannot be established. However, some general statements can be made about monitoring methods, parameters, and indicators for the impairments defined by the Great Lakes Water Quality Agreement. For each of the use impairments known or likely to be occurring in Eighteenmile Creek, Table 7.1 shows a proposed sampling method, parameters to be measured, and indicators of recovery.

A particular caution should be noted with regard to measurements of fish and wildlife, particularly those ordinarily consumed by humans. These may travel outside Eighteenmile Creek and are likely to be affected by water quality outside of the Area of Concern. To determine whether remediation within the Area of Concern has affected fish populations, the use of caged fish suspended in the creek may be required.

Table 7.1
Methods for Monitoring the Success of Remedial Actions for the Use Impairments Found in Eighteenmile Creek.

Impairment	Sampling Method	Measured Parameter(s)	Indicator of Recovery
Restrictions on Fish and Wildlife Consumption	Collection of edible fish species, possibly caged fish.	PCBs, dioxins, dibenzofurans and DDT in fish flesh	Contaminant levels fall below DOH and FDA guidelines for human consumption.
Bird and Animal Deformities and Reproductive Problems	Collections of young of the year fish and adult prey fish.	PCBs, dioxins, dibenzofurans, DDT and it's metabolites and dieldrin	Contaminant levels fall below DEC guidelines for protection of wildlife
Degradation of Benthos	Surveys of the benthic community	Species present, their numbers and various biotic indicators used to measure the health of the benthos	When the sampled species and numbers are close to that typical of a healthy stream for that stream bottom type.
Restrictions on Dredging Activities	Collection of sediment cores.	PCBs, Dioxins, dibenzofurans and metals	Contamination levels are below both the DEC and EPA/USCOE dredging guidelines.

CHAPTER 8

COMMITMENTS

INTRODUCTION

The Remedial strategy outlined in Chapter 7 will require funding. Commitments will depend on the availability of funds and these are likely to be available on a step-by-step basis as the investigation and decision process proceeds.

DEC and other responsible agencies have been and are currently implementing remedial actions relative to environmental problems along Eighteenmile Creek. Based on funding currently available, certain commitments can be made at this time. Most are for the initial elements of projects identified as required in Chapter 7.

DEC will provide the general coordination for implementation of the remedial strategy. However, participation of other agencies at the local, state and federal levels is required.

COMMITMENTS

An overview of agency commitments describing objectives, dates for completion and responsible agencies is shown in Table 8.1. A more detailed description is of each commitment follows. Under each commitment, the "Next step" heading denotes those activities needed to carry out the overall strategy after completion of the committed activities.

A. Stream Water Quality Monitoring

1. Eighteenmile Creek Water Quality Monitoring

Continue including Eighteenmile Creek as a Rotating Intensive Basin Study (RIBS) program watershed.

The NYS DEC Division of Water monitors the overall health of New York's waterways under the RIBS program. This includes analyses of water and sediment samples for chemical contaminants as well as toxicity tests. RIBS also includes macroinvertibrate sampling for both chemical contamination and species diversity. Eighteenmile Creek will be included as a RIBS site every five to six years.

Completion date: Ongoing
Responsible agency: DEC

Next step: Data from the RIBS sampling will be used for continuing assessment of the water quality in Eighteenmile Creek.

2. Determine if Sediment Transport from the Reservoir of the Burt Dam is Impacting Downstream Water and Sediment Quality

Sample and analyze suspended sediments from upstream of the dam reservoir and at the turbine outlets for metals, PCBs and pesticides.

Recent sediment sampling has suggested that flow through the Burt Dam may be mobilizing contaminated sediments from its reservoir into the Area of Concern. Higher contaminant concentrations in the suspended sediments from the water at the turbine outlet than that from upstream would indicate that this is occurring.

Completion date: 1998
Responsible agency: DEC
Next step: If the sampling indicates that impoundment sediments are being transported and are impacting downstream water and sediment quality, the formulation of remedial measures will be initiated.

B. Bottom Sediments

1. Criteria Development

Develop method for determining sediment contamination criteria that have scientific validity.

EPA has been working for several years on developing and validating tests and associated acceptance criteria. These would allow decisions to be made about the likely environmental impacts of contaminated sediments. This work will be brought to a conclusion with a report on recommended tests and criteria.

Completion date: ?
Responsible agency: USEPA
Next step: Once a criteria methodology has been developed by EPA, DEC will apply this methodology to Eighteenmile Creek sediments.

2. Trackdown Sampling for PCBs

Continue sampling of Eighteenmile Creek to determine the sources (or source areas) of PCBs.

Sampling data has indicated the presence of PCBs throughout the Eighteenmile

Creek watershed. The data indicates the presence of a source between Olcott St and N. Transit Rd as well as the possibility of other smaller sources. Sediment remediation cannot proceed until all sources of PCBs are addressed.

Completion date: 1998
Responsible agency: DEC

Next step: After completing the sampling and analyses, the data will be used to formulate plans for sediment remediation and to guide further sampling if any new potential contaminant sources are identified.

C. NY Barge Canal

1. Conduct Sediment Sampling in the NY Barge Canal

Conduct sampling of the sediments of the NY Barge Canal in the Lockport area to determine possible sources and the horizontal and vertical extent of contamination.

Sampling indicates that the sediments of the NY Barge Canal contain PCBs, dioxins and furans and that the canal is a source of these contaminants to Eighteenmile Creek. Before remediation of these sediments can begin, the sources as well as the vertical and horizontal extent of the contamination in the canal must be determined through sampling.

Completion date: 1998
Responsible agency: NYS Canal Corporation and DEC

Next step: After the sampling is completed, appropriate remedial measures can be investigated.

D. Inactive Hazardous Waste Sites

1. Phase I Site Investigations

Conduct Phase I investigations involving existing data accumulation and assessment.

Phase I studies have been completed at each of the listed inactive hazardous waste sites in the Eighteenmile Creek drainage basin by the responsible parties or by DEC.

Completion date: Completed
Responsible agency: DEC

Next step: Once Phase I investigations have been completed, Phase II studies will be

conducted.

2. Phase II Site Investigations

Conduct Phase II field investigations to fill data gaps to complete initial site assessments.

Phase II investigations have been completed at all of the significant sites in the Eighteenmile Creek drainage basin except for the Diamond Shamrock site in the City of Lockport. This investigation is ongoing.

Completion date: 1997
Responsible agency: DEC

Next step: Upon completion of Phase II site investigations, the sites are ranked and DEC makes determinations of need for the a Remedial Investigation/Feasibility Studies (RI/FS). Once a determination is made that an RI/FS is required, action is implemented under a DEC consent order by the responsible party or by DEC in the absence of a known responsible party.

3. Remedial Investigation/Feasibility Studies

Conduct Remedial Investigation/Feasibility Studies to define contaminant pathways and assess alternative remedial measures.

A Remedial Investigation/Feasibility Study is underway at the AKZO Chemical site.

Completion date: 1997
Responsible agency: EPA/DEC

Next step: Once remedial investigation/feasibility studies are complete, site remedial measures can be designed.

4. Conduct investigation to locate the PCB source between Olcott St and N. Transit Rd

Collect soil and sediment samples from the William St Island and analyze for PCBs.

DEC sampling indicates the presence of a source of PCBs to Eighteenmile Creek between Olcott St and N Transit Rd. Sediment sampling on and around an island in the creek at William St has found PCBs. DEC will investigate this site to determine if it is a source of PCBs to the creek.

Completion date: 1998

Responsible agency: DEC

Next step: DEC will assess the results of the sampling and initiate appropriate follow-up action.

E. Municipal and Industrial Wastewater Facilities

1. Discharge permit monitoring and renewal

Continue discharge permit monitoring to achieve compliance with secondary treatment for municipal discharges and best available technology and best management practices for industrial discharges.

DEC reviews self monitoring reports from dischargers, inspects operating facilities and independently samples effluent to check on the validity of self monitoring data. Significant violations of permit conditions trigger compliance or enforcement measures.

Completion date: Ongoing
Responsible agency: DEC

Next step: As new standards or technologies are developed, each permit will be reassessed to assure that updated water quality standards and technology requirements are applied.

F. Combined Sewer Overflows

1. Combined Sewer Assessment

Develop a CSO Assessment for the City of Lockport Sewer System.

The recent SPDES permit renewal for the City of Lockport Sewer System contains provisions that the city develop an assessment of its combined sewer system. This study will include measurements of the volume, duration and impact of CSOs on the receiving body.

Completion date: 1999
Responsible agency: City of Lockport

Next step: The data collected will be used to assess possible improvements in the sewer system to reduce or eliminate combined sewer overflows.

2 PCB Sampling in Sewer System

Conduct sampling for PCBs in the sewer system to determine if there are continuing sources of PCBs to the system.

PISCES and pressure filtration sampling in the City of Lockport sewer system indicate that CSOs may be a source of PCBs to the creek. Further sampling is needed to determine if there are sources of these contaminants entering the system.

Completion date: 1998
Responsible agency: DEC

Next step: If continuing PCB sources to the system are indicated, follow-up investigation of the sources will be initiated.

G. Fish and Wildlife

1. Contaminant Monitoring in Fish

Develop a plan for contaminant monitoring in fish.

This plan is to describe fish collections and analyses necessary to determine the current levels of chlorinated organic compounds in both adult and young-of-the-year fish in Eighteenmile Creek.

Completion date: 1997
Responsible agency: DEC

Next step: With completion of this plan, fish collections and analyses will be undertaken.

2. Fish, Wildlife and Plankton Sampling

Develop study plans for fish, wildlife and plankton to determine the status of the Degradation of Fish and Wildlife Populations, Fish Tumors and other Deformities and the Degradation of Phytoplankton and Zooplankton Populations impairment indicators.

The status of the Fish and Wildlife Populations, Fish Tumors and other Deformities and the Degradation of Phytoplankton and Zooplankton Populations impairment indicators is currently unknown. DEC will develop a fish and wildlife population study plan, a plan to have fish examined for tumors and a study plan to assess plankton populations.

Completion date: 1997
Responsible agency: DEC

Next step: Once these plans developed, DEC will seek to identify funding sources for their implementation.

Table 8.1
Eighteenmile Creek Remedial Action Plan
Commitments

Objective		Completion Date	Responsible Agency
A.	Stream Water Quality Monitoring		
	1. Continue Monitoring Eighteenmile Creek through the RIBS Program	Ongoing	DEC
	2. Determine if Sediment Transport From the Reservoir of the Burt Dam is Impacting Water and Sediment Quality	1998	DEC
B.	Sediments		
	1. Develop Methods for Determining Sediment Contamination Criteria	?	EPA
	2. Continue Sampling of Eighteenmile Creek to Determine the Sources (or source areas) of PCBs	1998	DEC
C.	NY Barge Canal		
	1. Conduct Sediment Sampling in the Barge Canal	1998	DEC & NYS Canal Corp.
D.	Inactive Hazardous Waste Sites		
	1. Conduct Phase II Investigations		
	•Diamond Shamrock	1997	DEC
	2. Conduct Remedial Investigation/Feasibility Study		
	•AKZO Chemical	1997	DEC
	3. Conduct Sampling to Locate Source of PCBs between Olcott St and N. Transit Rd	1998	DEC

Table 8.1 (con't.)

Objective		Completion Date	Responsible Agency
E.	Municipal and Industrial Wastewater Facilities		
	1. Discharge Permit Monitoring and Renewal	Ongoing	DEC
F.	Combined Sewer Overflows		
	1. Combined Sewer Assessment	1999	City of Lockport
	2. PCB Sampling in the Sewer System	1998	DEC
G.	Fish and Wildlife		
	1. Fish Contaminant Monitoring Plan	1997	DEC
	2. Fish and Wildlife Population Study Plan	1997	DEC
	3. Fish Tumor Study Plan	1997	DEC
	4. Plankton Study Plan	1997	DEC

	4. Hampton St Kyle Plan	1991	DEC
	3. First Tarbert Single Plan	1991	DEC
	2. First and W. Idaho Properties Single Plan	1991	DEC
	1. First Comm. Annex Monitoring Plan	1991	DEC
C	First and W. Idaho		
	3. PCB Sample of in the Sewer System	1998	DEC
	1. Completed Sewer Assessment	1991	City of Location
F	Completed Sewer Overflows		
	1. Disciplined Storm Monitoring and Removal	Ongoing	DEC
E	Mandated and Implement Wastewater Facilities		
Objective		Completion Date	Agency responsible

Table 8.1 (cont.)

CHAPTER 9

TRACKING EIGHTEENMILE CREEK RAP IMPLEMENTATION

INTRODUCTION

DEC will produce biennial reports that show the progress on the remediation to date and firm commitments that can be made for future activities. In addition, during the course of remediation, DEC may find it necessary to make revisions to the RAP. New facts may be discovered and other factors may arise that will dictate changes in the strategy; either through changes in the proposed series of steps and decision points or through the addition of remediation paths not included in the original RAP. Revisions to the RAP will also be required to satisfy the phased submission to the International Joint Commission called for in Annex 2 of the Great Lakes Water Quality Agreement. DEC will continue the public participation that has been important in the development of the original RAP in preparing both the biennial reports and possible revisions to the RAP. Table 9.1 shows the relationship between the state budget cycle and other activities to track and report on remediation.

ANNUAL REPORT

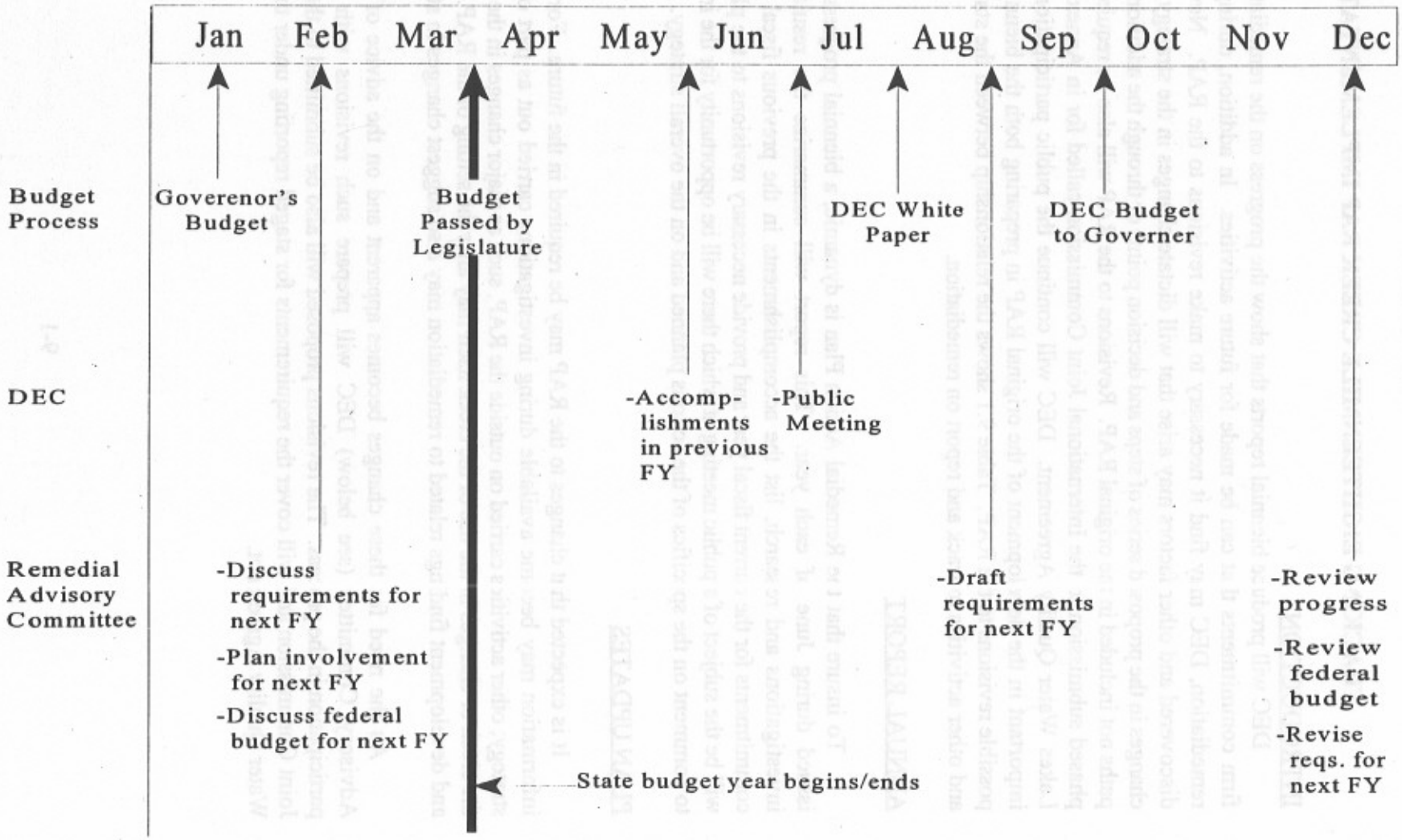
To insure that the Remedial Action Plan is dynamic, a biennial progress report will be issued during June of each year. This report will summarize the results of remedial investigations and research, list the accomplishments in the previous fiscal year, describe commitments for the current fiscal year and provide necessary revisions to the plan. The report will be the subject of a public meeting at which there will be opportunity for the interested public to comment on the specifics of the actions planned and on the overall strategy.

PLAN UPDATES

It is expected that changes to the RAP may be required in the future. For example: new information may become available during investigations carried out as part of the remedial strategy; other activities carried on outside the RAP, such as major changes in the land use along the creek or changes in the use of the creek itself may alter the setting of the RAP. New research and development findings related to remediation may also suggest changes in strategy.

As the need for these changes becomes apparent and on the advice of the Remedial Advisory Committee (see below) DEC will prepare such revisions with active public participation in the process. The revisions proposed will also be submitted to the International Joint Commission and will cover the requirements for staged reporting under the Great Lakes Water Quality Agreement.

Table 9.1
Relationship Between State Budget Cycle and RAP Activities



REMEDIAL ADVISORY COMMITTEE

A Remedial Advisory Committee (RAC) will be formed to advise and assist DEC in it's implementation of the RAP. The RAC will be representative of concerned groups outside of DEC that have an interest in Eighteenmile Creek. It will advise DEC on both biennial reports and RAP activities.

The RAC will meet with DEC staff at least three times each year. The participants at these three meetings will:

March Meeting: Discuss DEC commitments for the next fiscal year based on the governor's budget and the likely legislative decisions on the budget. Begin discussion of remedial recommendations for the next plus one fiscal year. Discuss the federal budget for the next federal fiscal year. Provide input to the annual report. Committee members will plan their involvement through the next fiscal year to help move the remediation forward.

August Meeting: Review results of public meeting and begin to draft recommendations for remediation in the next fiscal year.

November Meeting: Review progress, review federal budget, begin discussion of federal budget for next fiscal year and complete recommendations for the next fiscal year.

The RAC will advise DEC on amendments to the RAP and will recommend the need for major revisions and submittal to the IJC. The RAC will be appointed in 1997 by the Commissioner of DEC.

Twelve RAC members will be selected to represent a balance among:

Elected and appointed government officials;
Public interest groups (non-economic interest);
Economic interest;
Private citizens (non-economic interest).

In addition to RAC members, agencies at all levels of government will be asked to participate and provide input in RAP implementation as needed.

CHAPTER 10

PUBLIC PARTICIPATION

INTRODUCTION

Public participation is an essential part of the RAP process. To implement the RAP and achieve its goals, all responsible interested entities need to be involved in developing the plan. The interested and affected public was identified along with its concerns and ideas. Community members and elected officials became informed and involved in the planning process and built support for the Eighteenmile Creek RAP.

The International Joint Commission calls for an ecosystem approach in developing the RAP, as well as extensive public involvement. The RAP integrates a variety of existing programs within the DEC into one plan.

This Chapter provides a description of the public participation process.

HISTORY OF THE PUBLIC PARTICIPATION PROCESS

Development of the Eighteenmile Creek RAP began in 1994. To promote public involvement, DEC established a Remedial Advisory Committee (RAC) to participate in the preparation of the RAP report. Through discussions with local officials, candidates were nominated for the RAC and the committee was selected from that list. Candidates were selected to provide a balanced representation of various segments of the community along the river. A 15-member RAC was appointed by the DEC Commissioner in March 1994.

RAC representatives and DEC staff worked cooperatively to organize technical information needed to prepare the plan, to create public awareness and support for the Eighteenmile Creek RAP, and to comprehensively develop and review report material. This relationship will continue.

THE PUBLIC PARTICIPATION PLAN PROCESS

In general, the amount of public participation is determined by the community's needs as well as available resources. Planning for public participation can effectively identify and incorporate public input needs. To be effective, a detailed plan to conduct public participation is necessary. It should identify the communication objectives, the interested and affected public, the information exchange needs, and the activities to be carried out. Public participation activities should be designed to coincide with the tasks of the project workplan. The following outline lists (I) the communication objectives, (II) segments of the public to be contacted during the RAP process, (III) the information to be exchanged among DEC, RAC, and the public, and

(IV) information materials, meetings, and events related to the RAP.

Eighteenmile Creek RAP Public Participation

I. Communication Objectives

A. To involve the interested and affected public in the development of the Eighteenmile Creek RAP.

B. To fulfill IJC's requirement for public involvement in the Eighteenmile Creek RAP.

C. To exchange information with the public regarding the Eighteenmile Creek RAP at all the appropriate decision making stages.

D. To build and maintain understanding of DEC's policies and programs related to Eighteenmile Creek.

E. To build public support for and community ownership of the Eighteenmile Creek RAP.

F. To utilize the resources of the community.

G. To facilitate and incorporate ecosystem perspectives in developing the Eighteenmile Creek RAP.

II. Public to be Reached

A. Government Agencies and Elected Officials

1. Niagara County
Local - Mayors, Supervisors, Council Members from the City of Lockport and the Towns of Lockport and Newfane; Niagara County Health Department, Planning Board, Environmental Management Council, Soil and Water Conservation District, Cooperative Extension and Fisheries Board, Town of Royalton Wastewater Treatment Plant and the City of Lockport Wastewater Treatment Plant.

2. State - Department of Environmental Conservation, Department of Health and the NYS Canal Corporation.

3. Federal - U.S. Army Corps of Engineers, U.S. Fish & Wildlife Service, U.S. Soil Conservation Service and the Federal Energy Regulatory Commission.

B. Interested Public Groups and Organizations

1. Environmental - Niagara County Environmental Management Council.

2. Sports Interests - Niagara County Federation of Conservation Clubs, Niagara County Fisheries Board.

C. Interested business and industry within the Area of Concern - Delphi Harrison Thermal Systems, VanDeMark Group, Akzo-Nobel, Burt Dam Power Company and the Town of Newfane Marina Commission.

D. Other

1. Other RAP Groups in New York State.

2. General public.

III. Information Exchange

A. Information given to the public:

1. Purpose, goals, time frame, background and details about the RAP project.

2. Ways to participate in the RAP process.

3. Progress of RAP development and RAC activities.

4. List of impaired beneficial uses and recommendations being considered.

5. Supporting data and existing information on Eighteenmile Creek.

6. A draft RAP document with summary report.

7. Other informational brochures.

B. Information received from the public:

1. Opinions regarding the problems of the creek and restorative goals for the creek's future.

2. Additional data and facts to support the RAP.

3. Input on the impaired beneficial uses, the Area of Concern, and recommended solutions.

4. Comments on the draft RAP.

5. Evaluation of communication efforts.

C. Between DEC and the RAC. DEC and the RAC shared information, exchanged ideas, and worked cooperatively to carry out the tasks needed to develop a RAP, including formulating and reviewing the following:

1. Goal statement.

2. Workplan and time frame.

3. Public participation plan.

4. Statement of impaired beneficial uses.

5. Document outline.

6. Compilation of draft chapters.

IV. Information Materials, Meetings, and Events

A. Written Materials - In addition to the written materials listed above, DEC and the RAC produced:

1. Mailing lists for monthly meetings.

2. Meeting summaries for the monthly RAC meetings.

3. An informational brochure for general distribution.

4. Background handouts.

5. An informal survey about perceived problems in the creek.

B. Meetings - Meetings were a major form of communication among DEC, the RAC, and the interested public. Below is a list and brief description of the types of meetings that were employed in the public participation process:

1. RAC Meetings - Held monthly to review data and in-process drafts; and to provide educational presentations and activities to enhance understanding of environmental issues in the Area of Concern.

2. Public Meetings - To introduce the RAP process and receive public input on perceived problems and to receive public comment on the draft RAP.

3. Public Workshops - To present the draft Eighteenmile Creek RAP and discuss related issues prior to receipt of public comment.

C. Events and Presentations - The RAC participated in these activities to increase public awareness of Eighteenmile Creek and the RAP development.

1. Eighteenmile Creek Boat Tour - Held in August 1994 to facilitate information exchange between DEC and the RAC and gain a first-hand view of the Area of Concern.

2. Eighteenmile Creek Watershed Tour - Held in October 1994 to facilitate information exchange between DEC and the RAC and gain a first-hand view of the whole watershed.

3. Niagara County Sixth Grade Conservation Days - A presentation of RAP information to sixth graders from throughout Niagara County in the Royalton Ravine County Park during June 1995.

4. Health Scope Segment on Cable TV - A moderated panel discussion on the RAP with a DEC representative and several RAC members presented on a public access cable TV show dedicated to health issues. The segment was broadcast several times during the spring and summer of 1995.

5. Niagara County Fair - The RAC set up a booth at the fair (August 1995) with informational materials, a display board and the RAP video.

6. RAP Video - An educational video on the RAP was produced.

7. Delphi Harrison Thermal Systems Wastewater Treatment Plant Tour - A tour of the facilities was given in September 1995 for informational purposes.

8. City of Lockport Wastewater Treatment Plant Tour - A tour of the facilities was given in October 1995 for informational purposes.

9. New York Power Authority Wildlife Days - The RAP display board and informational material were co-displayed with material from the US Fish and Wildlife Service in September 1995.

10. RAP public Meeting - The RAC held a public informational meeting on April 11, 1996. The meeting included an introduction of the RAC, general background information on the RAP and the RAP process, a summary of the draft impairment assessments and their causes. Group discussions followed the presentations.

KEY AREAS WHERE THE PUBLIC HAS CONTRIBUTED

Public participation took place in all tasks performed to complete the RAP. While most of this input was provided through the RAC, public meetings were also a key activity.

Key Contributions of the RAC

The RAC has been instrumental in the development of the RAP and the implementation of public outreach activities. These activities have maintained the continued involvement and interest of the organizations represented on the RAC and built general public interest and support for the RAP in the community.

Public Meetings

The RAC held a public meeting on April 11, 1996 in the Olcott Fire Hall. It focused on presentations of background information on the RAP and RAP process and a summary of the draft impairment assessments for the creek and their causes. The meeting was publicized through announcements to local newspapers, the local cable TV franchise, mailing announcements to people on the RAP mailing list and by posting flyers for the meeting in local

venues throughout the watershed.

Upon completion and publication of the draft Remedial Action Plan two workshops were held to present the findings of the plan to the public. The workshops were held on February 5, 1997 at the Olcott Fire Hall and on February 13, 1997 at the City of Lockport Municipal Building. Copies of the draft Remedial Action Plan were mailed to a number of interested parties including: municipalities, industries, sportsmens groups, conservation groups, libraries and local media. Copies of the draft report were also available at the workshops.

On February 26, 1997 a meeting to receive public comments on the Remedial Action Plan was held at the Olcott Fire Hall. Interested parties could also submit written comments either at the meeting or by mail. The deadline for receiving comments by mail was March 14, 1997.

With the completion of the RAP report, future public participation will focus through the Remedial Advisory Committee (RAC) as described in Chapter 9.

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APPENDIX

A- Water Quality Data

B - Sediment Data

Figure A-1
Water Quality Sampling Sites
Eighteenmile Creek

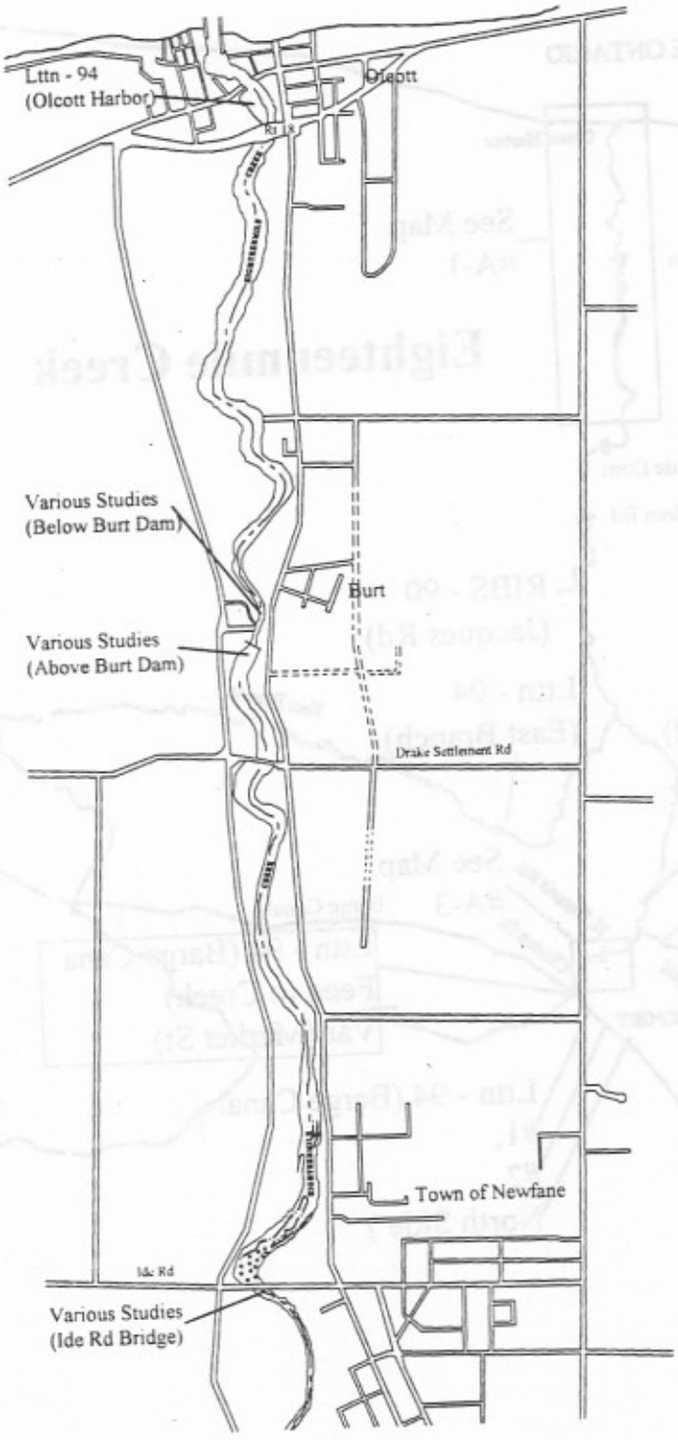

Figure A-2
Water Quality Sampling Sites
Eighteenmile Creek

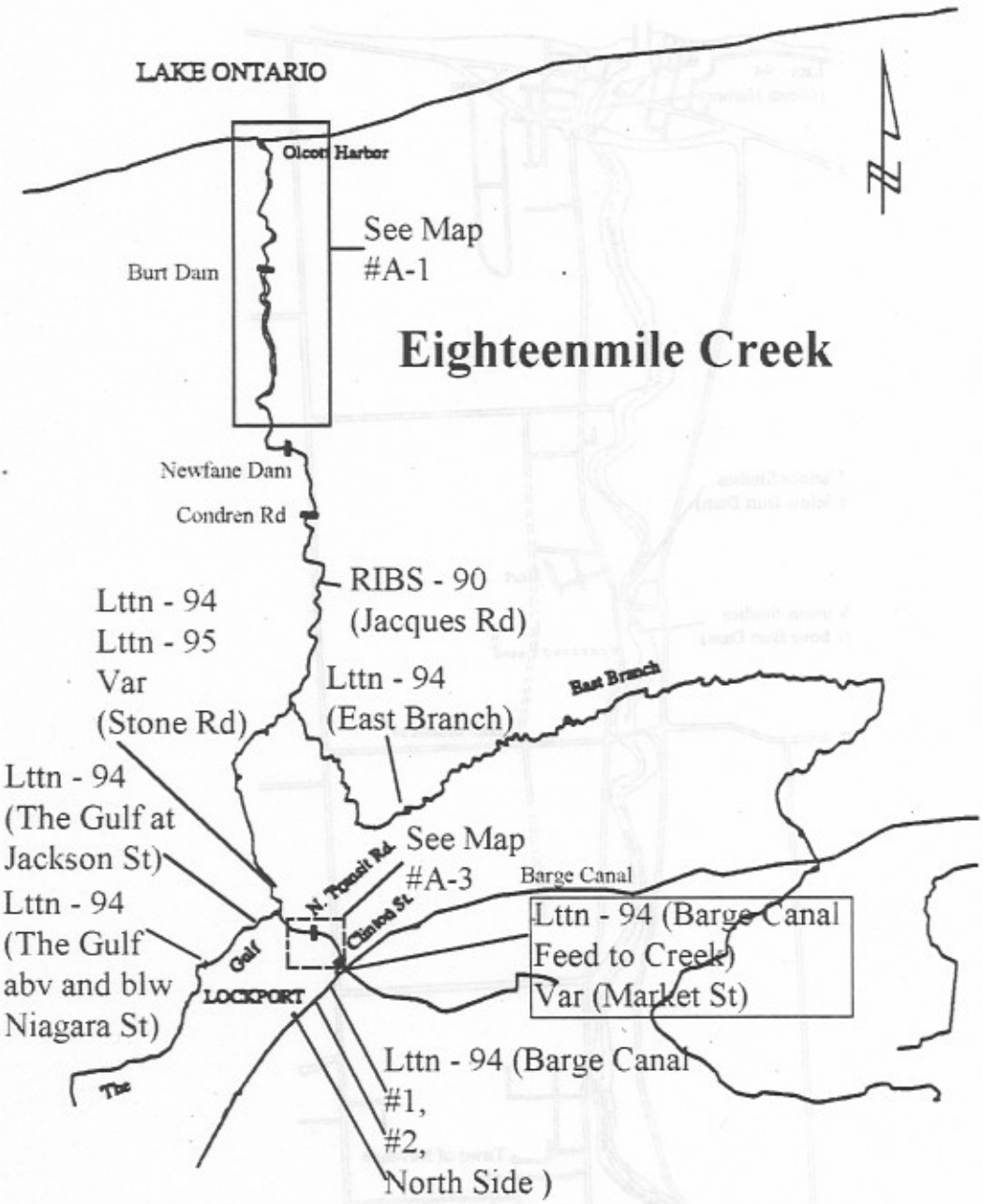

Figure A-3
Water Quality Sampling Sites
Eighteenmile Creek

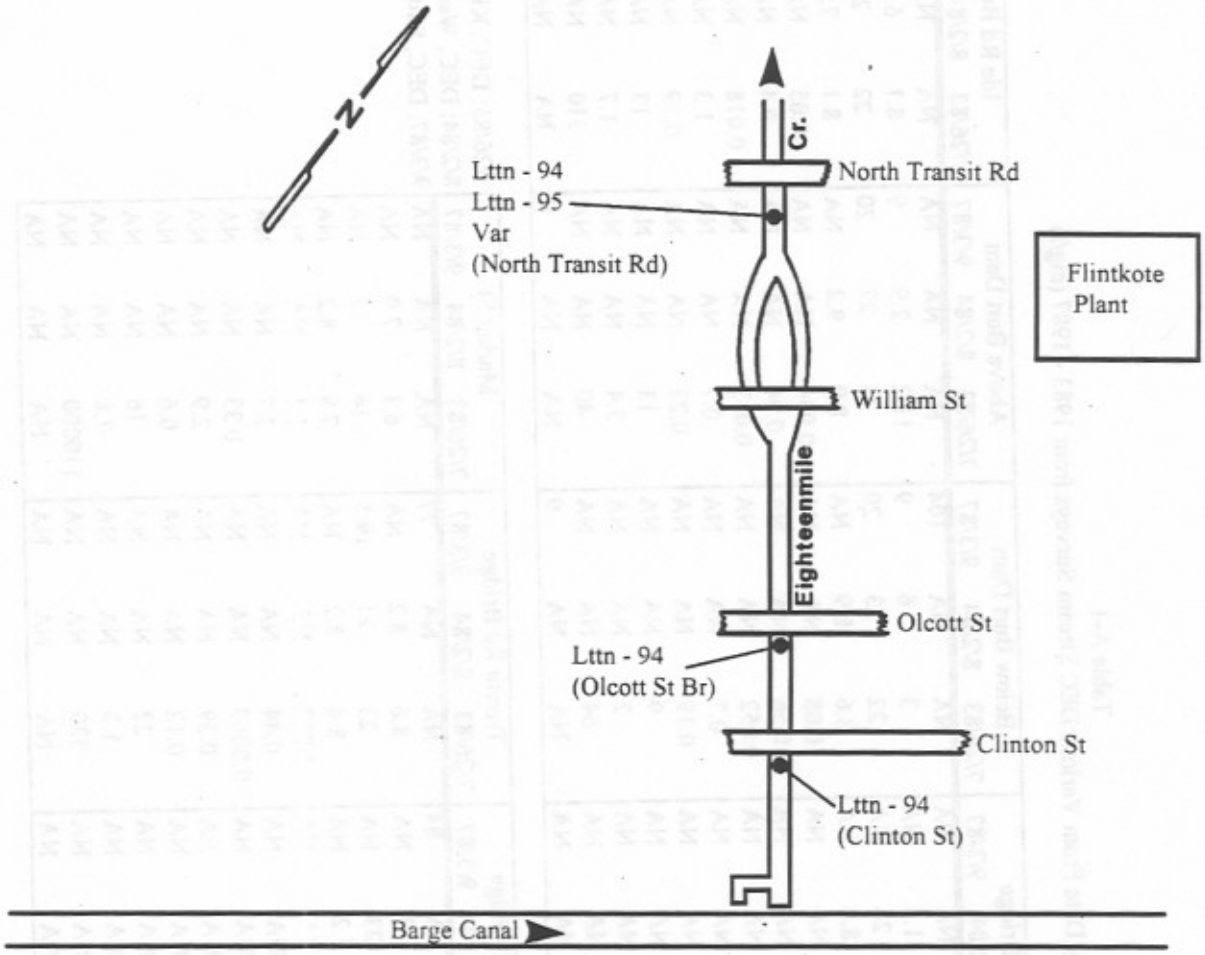

Table A-1
Water Quality Data From Various DEC Stream Surveys from 1983 - 1987 (mg/l)

Parameter	Rt 18 Bridge			Below Burt Dam			Above Burt Dam			Ide Rd Bridge		
(in mg/l except as noted)	7/26/83	8/2/84	9/3/87	7/26/83	8/2/84	9/3/87	7/26/83	8/2/84	9/3/87	7/26/83	8/2/84	9/3/87
Flow (CFS)	NA	NA	NA	NA	NA	104	NA	NA	NA	NA	NA	88
Dissolved Oxygen	7.7	11.2	NA	3	6	9	11.2	2.9	9	8.1	6.2	9.4
Temperature (C)	24	24	NA	22	23	20	24	27	20	22	23	18.5
pH	8.2	8.8	NA	8.6	8.9	NA	8.9	9.2	NA	8.1	7.9	NA
Ammonia as Nitrogen	0.055	NA	NA	0.08	NA	NA	0.034	NA	NA	0.05	NA	NA
Total Kjeldahl Nitrogen	0.69	NA	NA	0.56	NA	NA	0.94	NA	NA	0.4	NA	NA
Nitrite	0.046	NA	NA	0.052	NA	NA	0.033	NA	NA	0.018	NA	NA
Nitrite + Nitrate	0.54	NA	NA	0.7	NA	NA	0.7	NA	NA	1.3	NA	NA
Total Phosphorus	0.26	NA	NA	0.19	NA	NA	0.22	NA	NA	0.19	NA	NA
Solids, Total Dissolved	8	NA	NA	9	NA	NA	13	NA	NA	13	NA	NA
BOD (5)	3.4	NA	NA	2	NA	NA	5.4	NA	NA	1.7	NA	NA
Fecal Coliform (CFU/100 ml)	50	NA	NA	64	NA	NA	40	NA	NA	310	NA	NA
Chlorine Residual	NA	NA	NA	NA	NA	0	NA	NA	0	NA	NA	0

Parameter	Stone Rd Bridge			Transit Rd Bridge			Market St		
	7/26/83	8/2/84	9/3/87	7/26/83	8/2/84	9/3/87	7/26/83	8/2/84	9/3/87
Flow (CFS)	NA	NA	84	NA	NA	77	NA	NA	NA
Dissolved Oxygen	7.6	3	NA	8.6	8.2	NA	6.1	7.9	NA
Temperature (C)	23	23	NA	23	21	19.5	16	17	NA
pH	8	7.2	NA	8.4	8.2	NA	7.9	8.2	NA
Ammonia as Nitrogen	0.21	NA	NA	0.032	NA	NA	1.1	NA	NA
Total Kjeldahl Nitrogen	0.72	NA	NA	0.44	NA	NA	2.7	NA	NA
Nitrite	0.071	NA	NA	0.0069	NA	NA	0.33	NA	NA
Nitrite + Nitrate	1.1	NA	NA	0.39	NA	NA	2.9	NA	NA
Total Phosphorus	0.14	NA	NA	0.12	NA	NA	0.6	NA	NA
Solids, Total Dissolved	17	NA	NA	22	NA	NA	16	NA	NA
BOD (5)	1.8	NA	NA	1.3	NA	NA	7.8	NA	NA
Fecal Coliform (CFU/100 ml)	300	NA	NA	320	NA	NA	110000	NA	NA
Chlorine Residual	NA	NA	NA	NA	NA	NA	NA	NA	NA

7/26/83: DEC, Kiser 7/26/83
8/2/84: DEC, Wiaceck 11/19/84
9/3/87: DEC, Sutton 9/3/87

Table A-2
Water Quality Sampling for the 1989 - 1990 RIBS

Parameter	Units	1989 Samplings Taken From the Jacques Rd Bridge on Eighteenmile Creek										Cls B/C
		04/12/89	05/01/89	05/24/89	06/14/89	07/12/89	08/16/89	09/14/89	10/10/89	11/09/89	Avg	Standard
Time of Sampling		10:00	13:00	9:00	9:00	14:00	10:00	13:00	12:00	13:00		
Flow	CFS	78	14	108	162	64	110	110	NR	119	95.63	
Dissolved Oxygen	mg/L	10.2	8.2	6	6	5	7.4	6.8	6.2	6.4	6.91	4
Water Temperature	deg. C	5	12.0	17.0	17.5	24.0	22.0	19.0	12.0	11.0	15.5	
pH		7.3	8.0	7.3	7.6	7.6	7.6	7.2	7.5	7.9	7.6	6.5 - 8.5
Nitrogen, Ammonia, as N	mg/L	0.23	0.092	0.29	0.14	0.092	0.16	0.17	0.3	0.49	0.2	21
Nitrogen, Kjeldahl, as N	mg/L	0.79	0.7	0.51	0.77	0.22	0.41	0.43	0.65	1.4	0.7	NS
Nitrogen, Nitrate +Nitrite	mg/L	5.31	1.33	1.53	1.72	2.24	1.17	0.94	1.01	1.06	1.8	NS
Phosphate, Reactive as P	mg/L	0.065	0.084	ND	0.075	0.18	0.14	0.084	0.24	0.14	0.1	NS
Phosphate, Total as P	mg/L	0.12	0.14	ND	0.18	0.27	0.2	0.15	0.29	0.23	0.2	NS
Solids, Total	mg/L	575	502	516	447	499	416	301	300	363	435.4	NS
Solids, Total Volatile	mg/L	151	143	149	129	202	107	77	54	97	123.2	NS
Solids, Suspended	mg/L	11	3	9	30	26	17	19	6	12	14.8	NS
Solids, Total Dissolved	mg/L	520	435	465	392	456	378	266	280	325	390.8	500
Hardness as CaCO3	mg/L	266	269	272	227	237	207	159	171	188	221.8	NS
Turbidity	N.T.U.	5	2	2	NR	11	7	13	4	8	6.5	NS
Conductivity	umho/cm	861	744	775	661	713	624	486	487	560	656.8	NS
Cadmium (total rec.)	ug/L	1	ND	ND	ND	ND	ND	ND	ND	ND	0.1	2.15
Copper (total rec.)	ug/L	9	10	9	10	11	8	8	2	6	8.1	23.7
Iron (total rec.)	ug/L	390	180	340	1200	820	490	620	310	470	535.6	300
Lead (total rec.)	ug/L	8	4	11	14	17	13	12	1	14	10.4	9.03
Manganese (total rec.)	ug/L	60	70	70	90	80	70	60	20	80	66.7	NS
Nickel (total rec.)	ug/L	8	5	10	6	6	6	4	1	7	5.9	178
Zinc (total rec.)	ug/L	70	40	30	50	70	40	50	ND	60	45.6	165
Aluminum (total rec.)	ug/L	240	80	220	1000	550	50	460	210	170	331.1	NS
Mercury (total rec.)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0	0.2 (g)
Bromodichloromethane	ug/L	0.2	0.2	ND	0.2	ND	ND	ND	ND	ND	0.1	NS
Chloroform	ug/L	0.7	0.5	0.4	0.8	0.5	0.3	0.3	0.4	0.6	0.5	NS
Methylene Chloride	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0	NS
Tetrachloroethane	ug/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND	0.1	NS
Trichloroethene	ug/L	0.2	0.1	0.1	0.1	ND	ND	ND	0.1	0.3	0.1	11 (g)

Table A-2
Water Quality Sampling for the 1989 - 1990 RIBS

Parameter	Units	1990 Samplings Taken From the Jacques Rd Bridge on Eighteenmile Creek											Cls B/C
		03/27/90	04/11/90	04/30/90	05/23/90	06/26/90	07/17/90	08/22/90	09/18/90	10/30/90	11/13/90	Avg	Standard
Time of Sampling		13:00	11:00	13:00	10:00	9:00	13:00	16:00	13:00	9:00	13:00		
Flow	CFS	62	2190	94	209	94	64	74	64	64	71	298.6	
Dissolved Oxygen	mg/L	10.8	10.2	NR	6.2	6	6.4	7.6	7.9	8.8	6.2	7.01	4
Water Temperature	deg. C	5.0	5.0	16.0	13.5	20.0	20.0	21.4	18.0	9.0	5.0	13.3	
pH		7.9	7.9	8.1	7.0	7.3	7.3	NR	7.8	8.1	7.9	6.93	6.5 - 8.5
Nitrogen, Ammonia, as N	mg/L	0.26	0.099	0.091	0.1	0.078	0.21	0.072	0.096	0.096	0.14	0.124	21
Nitrogen Kjeldahl, as N	mg/L	0.420	0.380	0.210	0.600	0.420	0.350	0.340	0.220	0.380	0.450	0.377	NS
Nitrogen, Nitrate+Nitrite	mg/L	1.8	1.87	1.07	1.84	1.65	1.54	2.14	1.41	0.58	1.76	1.57	NS
Phosphate, Reactive as P	mg/L	0.085	0.02	0.084	0.065	0.17	0.14	0.21	0.13	0.15	0.17	0.122	NS
Phosphate, Total as P	mg/L	0.13	0.36	0.13	0.22	0.27	0.19	0.27	0.16	0.18	0.23	0.214	NS
Solids, Total	mg/L	496	329	426	393	418	137	441	350	384	494	387	NS
Solids, Total Volatile	mg/L	82	81	87	117	126	49	101	115	79	146	98.3	NS
Solids, Suspended	mg/L	11	101	NR	43	28	19	12	8	NR	NR	22.2	NS
Solids, Total Dissolved	mg/L	457	229	396	334	385	120	402	343	381	472	352	500
Hardness as CaCO3	mg/L	266	NR	NR	NR	NR	NR	NR	NR	NR	NR	266	NS
Turbidity	N.T.U.	10	108	7	30	18	3	7	3	2	2	19.0	NS
Conductivity	umho/cm	763	334	643	564	616	188	632	521	630	740	563	NS
Cadmium (total rec.)	ug/L	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	0.100	2.15
Copper (total rec.)	ug/L	7	5	8	7	11	7	9	7	7	8	7.60	23.7
Iron (total rec.)	ug/L	550	5700	520	1900	1000	620	390	310	240	250	1148	300
Lead (total rec.)	ug/L	8	13	7	8	14	4	7	8	4	1	7.40	9.03
Manganese (total rec.)	ug/L	110	110	80	60	80	70	50	40	20	40	66.0	NS
Nickel (total rec.)	ug/L	5	7	4	4	22	1	4	6	4	5	6.20	178
Zinc (total rec.)	ug/L	40	60	20	40	30	20	40	50	40	30	37.0	165
Aluminum (total rec.)	ug/L	370	5800	280	1600	600	240	240	160	130	130	955	NS
Mercury (total rec.)	ug/L	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	0.010	0.2 (g)
Bromodichloromethane	ug/L	ND	ND	0.2	ND	0.4	0.2	0.8	0.8	0.4	ND	0.280	NS
Chloroform	ug/L	0.3	0.3	0.7	0.7	0.9	0.3	1.6	1.5	0.8	0.3	0.740	NS
Methylene Chloride	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	NS
Tetrachloroethane	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	NS
Trichloroethene	ug/L	0.2	0.2	0.1	0.2	ND	ND	ND	ND	ND	ND	0.070	11 (g)

Table A-3

PISCES and Pressure Filtration Data from DEC Sampling During 1993 and 1994 (ug/l)

NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

Analyses of Samples for PCBs											
Type	Date(s)	Olcott Harbor	Stone Rd	N Transit Rd	Olcott St Bridge	Clinton St	East Branch	Gulf Below Niagara St	Gulf Above Niagara St	Barge Canal #1	Barge Canal #2
PISCES	10/05/93 - 10/20/93	0.14800									
	10/20/93 - 11/03/93		0.12700	0.206		0.0237	0.00953				
	03/31/94 - 04/13/94	0.12700									
	04/13/94 - 04/27/94	0.04760									
	04/27/94 - 05/11/94	0.05010									
	05/25/94 - 06/08/94									0.01430	
	07/06/94 - 07/28/94							0.00830			
	07/28/94 - 08/10/94	0.03660							0.00593		
	08/10/94 - 08/31/94										0.01850
	08/30/94 - 09/13/94	0.02440									
	10/27/94 - 11/10/94	0.07100									
	09/13/94 - 11/21/94	0.03310									
	11/10/94 - 11/21/94	0.07980									
Average		0.06860	0.12700	0.206		0.0237	0.00953	0.00830	0.00593	0.01430	0.01850
Std Dev		0.03118	0	0		0	0	0	0	0	0
Pressure Filtration	4/13/94	0.01330									
	4/27/94	0.02770									
	6/21/94	0.00948	0.01590		0.00814		0.00154				
	7/6/94	0.00784	0.02890		0.01110		0.00147				
	7/28/94	0.00889	0.31200		0.01020		0.00104				
	8/10/94	0.00500									
	8/30/94	0.00707									
	9/13/94	0.00619									
	9/14/94		0.10700								
	9/26/94	0.00570									
	10/11/94	0.00500									
	10/27/94	0.00700	0.00856		0.00317		0.00013				
	11/10/94	0.01630	0.00861		0.00694		0.00121				
	11/21/94	0.00789									
Average		0.00980	0.08016		0.00791		0.00108				
Std Dev		0.00629	0.11956		0.00312		0.00057				

PCB aquatic standard 0.001 ug/l

Table A-3

PISCES and Pressure Filtration Data from DEC Sampling During 1993 and 1994 (ug/l)

NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

Type	Date Out	Analyses of Samples For Aldrin/Dieldrin, Endrin*						Analyses of Samples For Endosulfans**					
		Olcott Harbor	Stone Rd	Olcott St Bridge	East Branch	Gulf Above Niagara St	Barge Canal #2	Olcott Harbor	Stone Rd	Olcott St Bridge	East Branch	Gulf Above Niagara St	Barge Canal #2
PISCES	10/20/93	ND						ND					
	4/13/94	ND						0.00002					
	4/27/94	ND						0.00001					
	5/11/94	ND						0.00001					
	8/10/94	0.00133				0.00309		0.00296				0.01520	
	8/31/94						0.00134						0.00160
	9/13/94	ND						0.00165					
	11/10/94	0.00225						0.00299					
	11/21/94	0.00084						0.00241					
Average		0.00055				0.00309	0.00134	0.00126				0.01520	0.00160
Std Dev		0.00080				0.00000	0.00000	0.00130				0.00000	0.00000
Pressure Filtration	7/28/94	0.00019	ND	0.00045	ND			0.00005	ND	0.00063	ND		
	8/10/94	0.00014						ND					
	9/13/94	0.00014						ND					
	9/14/94		0.00334						ND				
	9/26/94	0.00020						ND					
	10/11/94	0.00010						ND					
	10/27/94		0.00003		ND				0.00009		ND		
Average		0.00015	0.00112	0.00045	0.00000			0.00001	0.00003	0.00063	0.00000		
Std Dev		0.00004	0.00192	0.00000	0.00000			0.00002	0.00005	0.00000	0.00000		

* the sum of aldrin, dieldrin, endrin, endrin ketone and endrin aldehyde

** the sum of endosulfan I endosulfan II and endosulfan sulfate

Aldrin/Dieldrin standard 0.001 ug/l

Endrin standard 0.002 ug/l

Endosulfan standard 0.009 ug/l

Table A-3
PISCES and Pressure Filtration Data from DEC Sampling During 1993 and 1994 (ug/l)
NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

		Analyses of Samples For Sum of BHC*						Analyses of Samples For Heptachlor**					
Type	Date Out	Olcott Harbor	Stone Rd	Olcott St Bridge	East Branch	Gulf Above Niagara St	Barge Canal #2	Olcott Harbor	Stone Rd	Olcott St Bridge	East Branch	Gulf Above Niagara St	Barge Canal #2
PISCES	10/20/93	0.00688						ND					
	4/13/94	ND						ND					
	4/27/94	ND						ND					
	5/11/94	ND						ND					
	8/10/94	0.00018				0.00812		0.00042				ND	
	8/31/94						0.00339						0.00065
	9/13/94	0.00214						ND					
	11/10/94	0.00404						ND					
	11/21/94	0.00135						0.00027					
Average		0.00182				0.00812	0.00339	0.00009				ND	0.00065
Std Dev		0.00233				0.00000	0.00000	0.00015				0.00000	0.00000
Pressure Filtration	7/28/94	0.00024	ND	0.00004	0.00013			0.00006	0.00122	0.00079	0.00009		
	8/10/94	ND						0.00007					
	9/13/94	0.00467						ND					
	9/14/94		0.00344						ND				
	9/26/94	0.00032						0.00011					
	10/11/94	ND						0.00010					
	10/27/94		ND		0.00002				0.00017		0.00002		
Average		0.00105	0.00115	0.00004	0.00008			0.00007	0.00046	0.00079	0.00006		
Std Dev		0.00203	0.00199	0.00000	0.00008			0.00004	0.00066	0.00000	0.00005		

*the sum of alpha BHC, beta BHC, delta BHC and gamma BHC
** the sum of heptachlor and heptachlor epoxide
BHC standard 0.01 ug/l
Heptachlor & heptachlor epoxide standard 0.001 ug/l

Table A-3

PISCES and Pressure Filtration Data from DEC Sampling During 1993 and 1994 (ug/l)

NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

		Analyses of Samples For Sum of DDT*						Analyses of Samples For Sum of Chlordane**					
Type	Date Out	Olcott Harbor	Stone Rd	Olcott St Bridge	East Branch	Gulf Above Niagara St	Barge Canal #2	Olcott Harbor	Stone Rd	Olcott St Bridge	East Branch	Gulf Above Niagara St	Barge Canal #2
PISCES	10/20/93	ND						ND					
	4/13/94	ND						ND					
	4/27/94	ND						ND					
	5/11/94	ND						ND					
	8/10/94	0.00051				ND		ND				ND	
	8/31/94						0.00084						0.00086
	9/13/94	ND						ND					
	11/10/94	ND						ND					
	11/21/94	ND						ND					
Average		0.00006				ND	0.00084	0.00000				ND	0.00086
Std Dev		0.00017				0.00000	0.00000	0.00000				0.00000	0.00000
Pressure Filtration	7/28/94	0.00008	ND	0.00016	0.00070			0.00004	0.00079	0.00052	ND		
	8/10/94	ND						0.00061					
	9/13/94	0.00011						0.00027					
	9/14/94		ND						0.00895				
	9/26/94	0.00008						0.00055					
	10/11/94	0.00008						0.00053					
	10/27/94		0.00014		0.00022				0.00017		ND		
Average		0.00007	0.00005	0.00016	0.00046			0.00040	0.00330	0.00052	0.00000		
Std Dev		0.00004	0.00008	0.00000	0.00034			0.00024	0.00490	0.00000	0.00000		

*the sum of 4,4'-DDT, 4,4'-DDD and 4,4'-DDE

** the sum of alpha chlordane and beta chlordane

DDT and metabolites standard 0.001 ug/l

Chlordane guidance value 0.002 ug/l

Table A-3
Pressure Filtration Data from DEC Sampling During 1993 and 1994 (mg/l)
NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

		Analyses of Samples For Total Organic Carbon						Analyses of Samples For Total Suspended Solids					
Type	Date Out	Olcott Harbor	Stone Rd	Olcott St Bridge	East Branch	Gulf Above Niagara St	Barge Canal #2	Olcott Harbor	Stone Rd	Olcott St Bridge	East Branch	Gulf Above Niagara St	Barge Canal #2
Pressure Filtration	7/28/94	3.70	20.00	2.60	3.30			3.0	97.0	17.0	26.0		
	8/10/94	3.70						5.0					
	9/13/94	4.60						4.0					
	9/14/94		18.60						232.0				
	9/26/94	3.90						6.0					
	10/11/94	5.30						2.0					
	10/27/94		3.15		3.70				5.5		5.0		
Average		4.2	13.9	2.6	3.5			4.0	111.5	17.0	15.5		
Std Dev		0.7	9.4	0.0	0.3			1.6	113.9	0.0	14.8		

Table A-4
Mercury Data from DEC Whole Water Sampling During 1993 and 1994
NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)
(total mercury in ug/l)

	Location								
Date	Olcott Harbor	Below Burt Dam	Jacques Rd	Stone Rd	Clinton St	E Branch at Transit	The Gulf at W Jackson St	Barge Canal (South Side)	Barge Canal (North Side)
1/7/93				0.0205					
1/7/93				0.0196					
7/22/93				0.0107	0.0051		0.0006		
9/23/93		0.0013		0.0053		0.0013			0.0011
10/22/93	0.0023								
3/31/94	0.0064								
4/13/94	0.0069								
4/27/94	0.0075								
5/11/94	0.0064								
06/08								0.0043	
9/14/94			0.0206	0.1390					
9/26/94	0.0026								
Average	0.0054	0.0013	0.0206	0.0390	0.0051	0.0013	0.0006	0.0043	0.00105
Std Dev	0.0023	0	0	0.0562	0	0	0	0	0

Mercury guidance value 0.2 ug/l

Table A-5
PISCES and Pressure Filtration Data from DEC Sampling in 1995 (ug/l)
(Litten, 1995)

PISCES Sampling for PCBs									
	Barge Canal Overflow to 18-Mile Cr.			N. Transit			Stone Rd		
Date In	07/13	07/27	08/10	07/13	07/27	08/10	07/14	07/27	08/10
Date Out	07/27	08/10	08/23	07/27	08/10	08/23	07/27	08/10	08/23
PCB	0.008	0.011	0.016	0.066	0.075	0.084	0.033	0.080	0.089
Percentage PCB Congener Makeup of Samples Sorted by Number of Chlorine Substitutions									
di	3.22%	32.95%	27.61%	6.94%	31.67%	28.28%	5.58%	25.90%	24.52%
tri	48.44%	35.18%	36.20%	43.49%	29.53%	36.66%	46.02%	31.75%	30.12%
tetra	33.69%	22.34%	23.37%	34.49%	27.75%	27.25%	37.74%	31.47%	28.47%
penta	12.05%	7.25%	9.97%	11.45%	8.83%	7.27%	8.96%	9.43%	12.48%
hexa	2.35%	2.06%	2.22%	2.73%	1.11%	0.53%	1.28%	1.24%	3.13%
hepta	0.11%	0.21%	0.63%	0.61%	1.11%	0.00%	0.28%	0.22%	1.01%
octa	0.14%	0.00%	0.00%	0.24%	0.00%	0.00%	0.12%	0.00%	0.20%

PCB aquatic standard 0.001 ug/l

Table A-5
PISCES and Pressure Filtration Data from DEC Sampling in 1995 (ug/l)
(Litten, 1995)

Pressure Filtration Sampling for PCBs									
	Barge Canal Overflow to 18-Mile Cr.			N. Transit Rd			Stone Rd		
Date	07/13	07/27	08/10	07/13	07/27	08/10	07/13	07/27	08/10
PCB	0.059	0.100	0.003	0.067	0.110	0.015	NA	NA	NA
Percentage PCB Congener Makeup of Samples Sorted by Number of Chlorine Substitutions									
di	4.00%	4.03%	5.37%	4.24%	3.86%	5.96%	NA	NA	NA
tri	12.1%	12.3%	24.4%	16.8%	14.2%	21.7%	NA	NA	NA
tetra	24.6%	24.2%	31.6%	29.5%	27.8%	38.5%	NA	NA	NA
penta	22.5%	21.1%	23.8%	21.8%	21.4%	24.6%	NA	NA	NA
hexa	14.9%	15.6%	8.92%	12.9%	13.4%	5.39%	NA	NA	NA
hepta	16.5%	17.3%	4.33%	10.8%	14.4%	2.92%	NA	NA	NA
octa	5.47%	5.58%	1.56%	3.87%	5.02%	0.96%	NA	NA	NA

PCB aquatic standard 0.001 ug/l

Figure B-1
Sediment Sampling Sites
Eighteenmile Creek

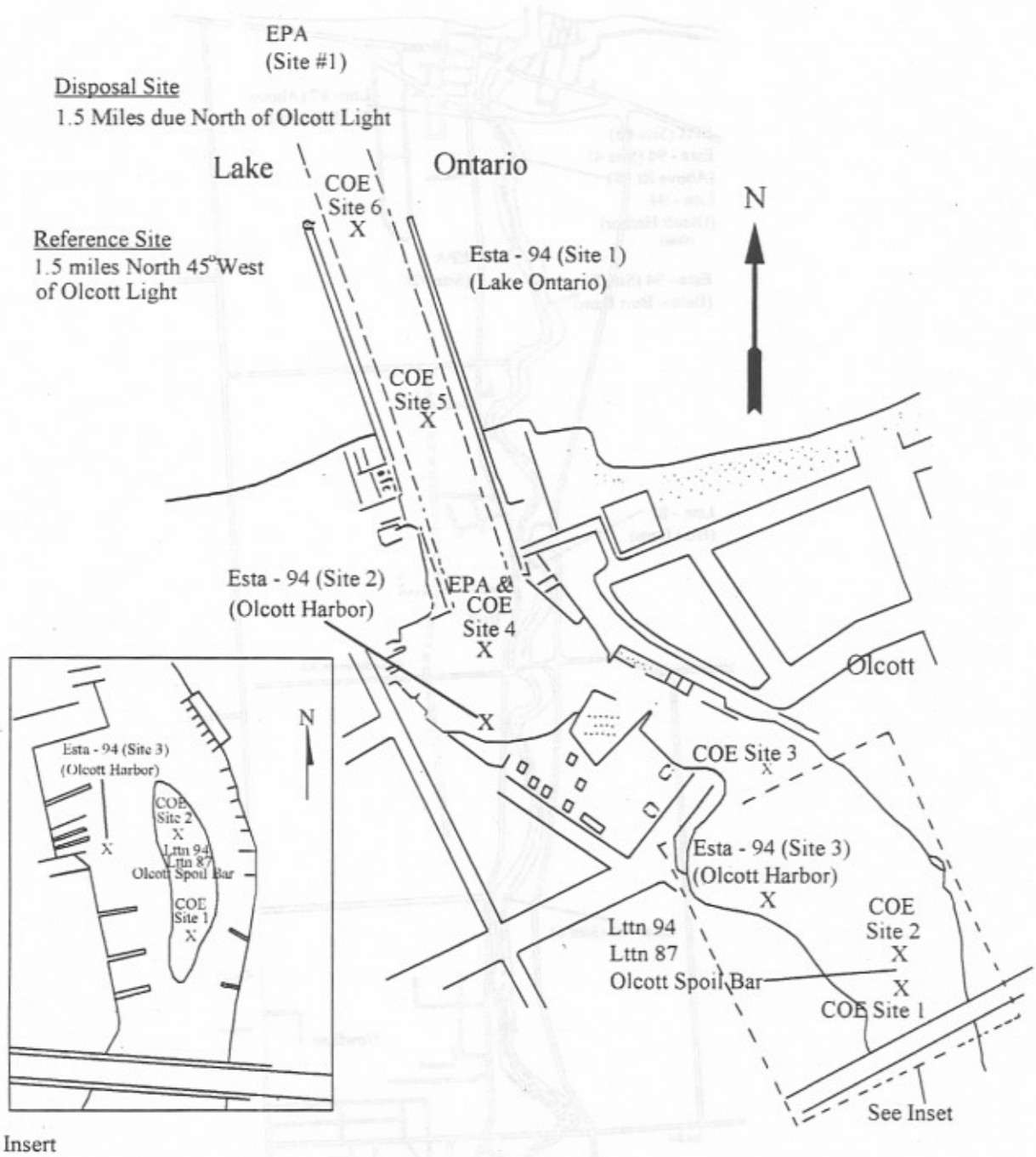

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Figure B-2
Sediment Sampling Sites
Eighteenmile Creek

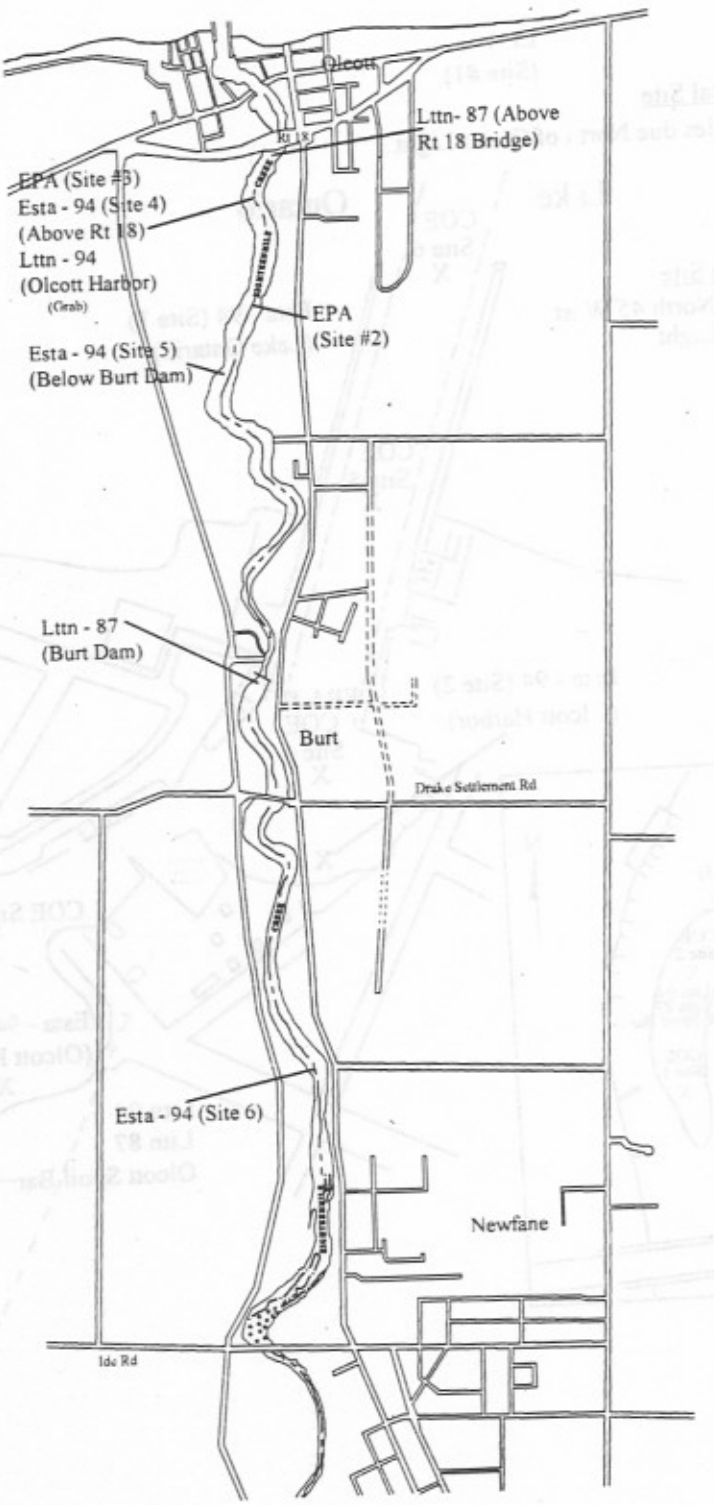


Figure B-3
Sediment Sampling Sites
Eighteenmile Creek

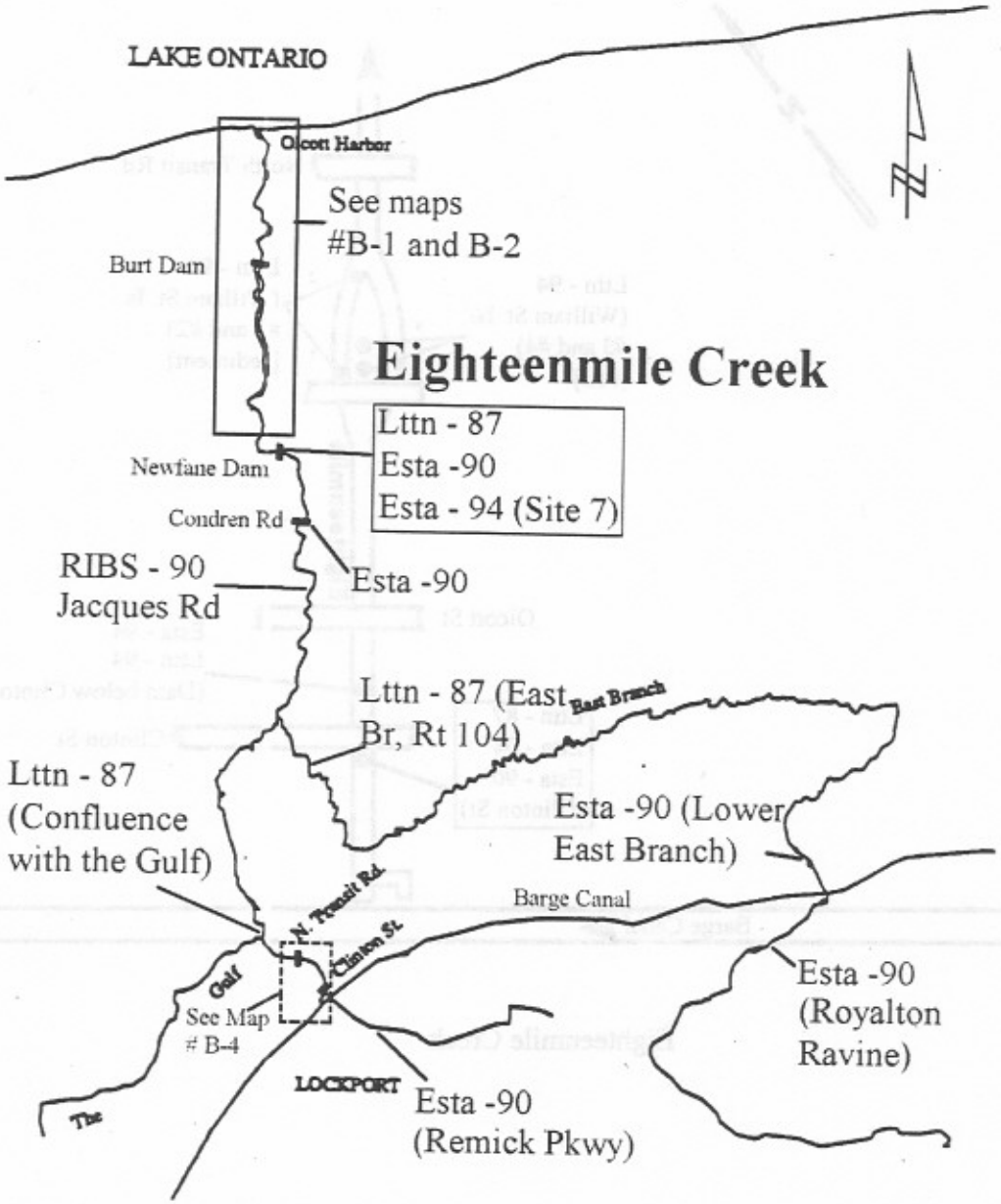
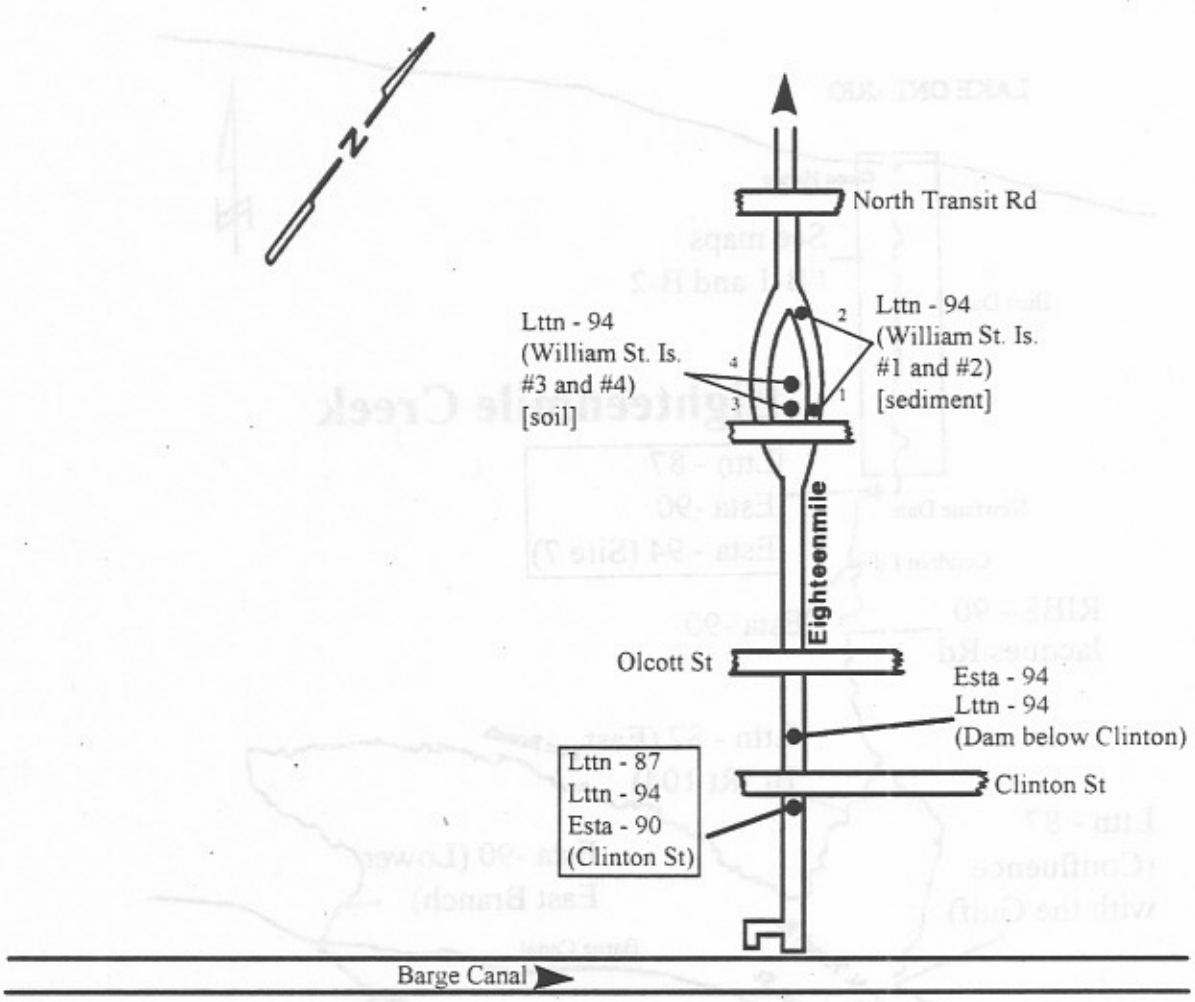


Figure B-4
Sediment Sampling Sites



Eighteenmile Creek

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Metals									
Site	Site #1	Site #2			Site #3				
	Oct 12	Oct 11	Sep 12		Oct 12	Sep 12			
Core Segment (in)	Surf	Surf	00 - 24	24 - 46	Surf	00 - 24	24 - 70	70 - 80	80 - 110
Arsenic, Total	1	2.5	11.3	11.6	4	1.8	1.6	1.9	1.5
Cadmium, Total	ND	*1.2*	ND	ND	*2.1*	ND	ND	ND	ND
Chromium, Total	9.6	21.6	61.2	101	94.7	17.7	17.2	17.9	16.3
Copper, Total	5.6	*35.9*	*106*	**155**	**131**	10.9	11.2	13.1	11
Iron, Total	10700	9190	23500	24500	19400	20600	20200	20900	20300
Lead, Total	3.8	*66.4*	**231**	**419**	**226**	6.7	7.2	7.5	7.6
Mercury, Total	ND	*0.53*	*2.8*	*3.3*	*0.48*	ND	ND	ND	ND
Nickel, Total	5.6	11.6	23.6	21.4	102	22.9	20.6	20.7	21.6
Selenium, Total	ND	0.45	ND	ND	0.75	ND	ND	ND	ND
Silver, Total	ND	ND	2	1	ND	ND	ND	1.8	ND
Zinc, Total	53.7	128	299	401	746	67.2	66	68.2	67.4

Site #1 Lake Ontario

Site # 2 and 3 Olcott Harbor

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Metals											
Site	Site #4				Site #5				Site #6		
	Oct 12	Sep 12			Oct 12	Sep 12			Oct 11	Oct 11	
Core Segment (in)	Surf	00 - 24	24 - 80	80 - 113	Surf	00 - 24	24 - 96	96 - 120	Surf	00 - 20	20 - 24
Arsenic, Total	4.5	1.1	1	1.4	4.3	1.4	1.6	1.4	5.6	5.1	14.5
Cadmium, Total	*3.2*	ND	ND	ND	*1.6*	ND	ND	ND	*5.7*	*5.6*	**26**
Chromium, Total	112	18	17.7	18.7	80	18.5	17.7	19	189	250	1910
Copper, Total	**142**	11.1	10.2	10.2	**127**	10.3	11.2	10.8	**353**	**462**	**2340**
Iron, Total	21700	22900	22000	22700	21500	20400	20200	21200	28200	28000	32900
Lead, Total	**196**	8.6	7.6	6.4	**178**	7.1	7.6	6.7	**486**	**644**	**4500**
Mercury, Total	*0.55*	ND	ND	ND	*0.72*	ND	ND	ND	*0.69*	*0.79*	*1.1*
Nickel, Total	90.9	20.1	22.2	22.6	49.2	23.7	22.8	24	79.8	150	523
Selenium, Total	1.1	ND	ND	ND	0.8	ND	ND	ND	1.7	1.6	2.3
Silver, Total	0.9	ND	ND	0.66	ND	ND	ND	ND	2	1.7	5.7
Zinc, Total	918	86.4	74	68.6	470	63	61.7	63.6	1540	2360	16500

Site #4 Upstream of the Rt 18 Bridge

Site #5 Downstream of the Burt Dam

Site #6 Upstream of the Burt Dam

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Metals				
Site	Site #7*		Site #8	
	Oct 12		Oct 12	Oct 12
Core Segment (in)	00 - 12	12 - 20	Surf	00 - 13
Arsenic, Total	11.3	12.7	3.6	4.8
Cadmium, Total	**22.3**	**11.2**	2	*8.9*
Chromium, Total	1470	927	44.8	66.5
Copper, Total	**2130**	**1620**	**238**	**447**
Iron, Total	26400	30600	14400	18300
Lead, Total	**7850**	**3670**	**475**	**1260**
Mercury, Total	*2.2*	*1.7*	*0.66*	*2.1*
Nickel, Total	350	383	31.8	46.7
Selenium, Total	1.7	1.3	1.4	ND
Silver, Total	4.4	4.2	2.1	4.2
Zinc, Total	24000	10500	423	874

*Site # 7 has no surface sample

Site #7 Upstream of Newfane Dam

Site #8 Clinton St

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

PCB Aroclors									
Site	Site #1	Site #2			Site #3				
Core Segment (in)	Surf	Surf	00 - 24	24 - 46	Surf	00 - 24	24 - 70	70 - 80	80 - 110
% Solids	83.3	83.8	52.2	45.5	51	51.3	44.6	53.2	53.3
% Volatile Solids	0.33	2	10.7	16.7	8.6	9.9	14.2	11.1	9.6
TOC	4430	31500	19100	15100	30800	41200	44000	27900	39300
Aroclor-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1248	ND	ND	ND	ND	*0.46*	ND	ND	ND	ND
Aroclor-1254	ND	ND	ND	ND	*0.16*	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PCBs	ND	ND	ND	ND	*0.62*	ND	ND	ND	ND

Site #1 Lake Ontario Site # 2 and 3 Olcott Harbor

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

PCB Aroclors											
Site	Site #4				Site #5				Site #6		
Core Segment (in)	Surf	00 - 24	24 - 80	80 - 113	Surf	00 - 24	24 - 96	96 - 120	Surf	00 - 20	20 - 24
% Solids	42.3	47.9	52.4	70.8	46.6	53.3	53.9	53.2	28.5	33.9	28
% Volatile Solids	8.7	9.3	8.2	4.2	7.9	10.7	8.4	8.8	13.4	11.9	25.8
TOC	21700	16900	16000	25000	35700	49100	27500	40100	28200	44400	29700
Aroclor-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1248	*0.63*	ND	ND	ND	*0.42*	ND	ND	ND	*1.9*	*1.8*	**20**
Aroclor-1254	*0.23*	ND	ND	ND	*0.21*	ND	ND	ND	*0.59*	*0.62*	ND
Aroclor-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*0.72*
Total PCBs	*0.86*	ND	ND	ND	*0.63*	ND	ND	ND	*2.49*	*2.42*	**20.7**

Site #4 Upstream of the Rt 18 Bridge Site #5 Downstream of the Burt Dam Site #6 Upstream of the Burt Dam

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

PCB Aroclors				
Site	Site #7*		Site #8	
Core Segment (in)	00 - 12	12 - 20	Surf.	00 - 13
% Solids	39.2	38	39.1	40.4
% Volatile Solids	19.8	19.6	12.4	16.7
TOC	107000	132000	53800	52400
Aroclor-1016	ND	ND	ND	ND
Aroclor-1221	ND	ND	ND	ND
Aroclor-1232	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	ND
Aroclor-1248	**18**	**12**	*1.2*	*4.4*
Aroclor-1254	ND	ND	ND	ND
Aroclor-1260	*0.36*	*0.56*	*0.19*	*0.27*
Total PCBs	**18.36**	**12.56**	*1.39*	*4.67*

Site #7 Upstream of Newfane Dam Site #8 Clinton St *Site # 7 has no Surface Sample

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Pesticides									
Site	Site #1	Site #2			Site #3				
Core Segment (in)	Surf	Surf	00 - 24	24 - 46	Surf	00 - 24	24 - 70	70 - 80	80 - 110
alpha-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	*0.011*	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma- Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mirex	NA	NA	ND	ND	ND	ND	ND	ND	ND
Octylchloro styrene	NA	NA	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND

Site #1 Lake Ontario Site # 2 and 3 Olcott Harbor

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1
Surface and Core Data (mg/kg)
NYSDEC Olcott Harbor Sediment Sampling (1994)

Pesticides											
Site	Site #4				Site #5				Site #6		
Core Segment (in)	Surf	00 - 24	24 - 80	80 - 113	Surf	00 - 24	24 - 96	96 - 120	Surf	00 - 20	20 - 24
alpha-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	*0.016*	ND	ND	ND	*0.0079*	ND	ND	ND	*0.018*	ND	*0.28*
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND	ND	ND	*0.012*	ND	*0.021*
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma- Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mirex	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND
Octylchloro styrene	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND
Toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Site #4 Upstream of the Rt 18 Bridge Site #5 Downstream of the Burt Dam Site #6 Upstream of the Burt Dam

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Pesticides				
Site	Site #7*		Site #8	
Core Segment (in)	00 - 12	12 - 20	Surf	00 - 13
alpha-BHC	ND	ND	ND	ND
beta-BHC	ND	ND	ND	ND
delta-BHC	ND	ND	ND	ND
gamma-BHC	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND
Heptachlor epoxide	ND	ND	ND	ND
Endosulfan I	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND
4,4'-DDE	ND	*0.036*	ND	ND
Endrin	ND	ND	ND	ND
Endosulfan II	ND	ND	ND	ND
4,4'-DDD	*0.031*	ND	*0.009*	*0.059*
Endosulfan sulfate	ND	ND	ND	ND
4,4'-DDT	ND	*0.016*	ND	*0.062*
Methoxychlor	ND	ND	ND	ND
Endrin ketone	ND	ND	ND	ND
Endrin aldehyde	ND	ND	ND	ND
alpha-Chlordane	ND	ND	ND	ND
gamma- Chlordane	ND	ND	ND	ND
Mirex	ND	ND	ND	ND
Octylchloro styrene	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND

Site #7 Upstream of Newfane Dam Site #8 Clinton St *Site # 7 has no Surface Sample

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

PAHs									
Site	Site #1	Site #2			Site #3				
Core Segment (in)	Surf	Surf	00 - 24	24 - 46	Surf	00 - 24	24 - 70	70 - 80	80 - 110
Naphthalene	ND	0.51	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	1.5	0.91	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	0.21	ND	0.4	0.7	ND	ND	ND	ND
Anthracene	ND	0.05	ND	0.07	0.14	ND	ND	ND	ND
Fluoranthene	ND	0.42	ND	0.64	0.64	ND	ND	ND	ND
Pyrene	ND	0.39	0.42	0.71	0.54	ND	ND	ND	ND
Benzo(a) anthracene	ND	*0.19*	ND	**0.33**	**0.24**	ND	ND	ND	ND
Chrysene	ND	*1.6*	ND	ND	*1.7*	ND	ND	ND	ND
Benzo(b)fluoranthene	ND	0.84	0.22	0.35	0.41	0.15	0.14	ND	0.16
Benzo(k)fluoranthene	ND	0.12	0.087	0.15	0.15	ND	ND	ND	ND
Benzo(a)pyrene	ND	0.17	0.14	0.23	0.25	ND	ND	ND	ND
Dibenzo(a,h) anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd) pyrene	ND	2.5	ND	ND	0	ND	ND	ND	ND
Total PAHs	0	*7*	0.867	*4.38*	*5.68*	0.15	0.14	0	0.16

Site #1 Lake Ontario Site # 2 and 3 Olcott Harbor

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

PAHs											
Site	Site #4				Site #5				Site #6		
Core Segment (in)	Surf	00 - 24	24 - 80	80 - 113	Surf	00 - 24	24 - 96	96 - 120	Surf	00 - 20	20 - 24
Naphthalene	0.65	ND	ND	ND	0.74	ND	ND	ND	2.3	1.3	1.7
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.6
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	0.45	ND	ND	ND	ND	ND	ND	ND	0.66	0.55	2.2
Anthracene	0.084	ND	ND	ND	ND	ND	ND	ND	*0.11*	0.088	*0.19*
Fluoranthene	0.61	ND	ND	ND	ND	ND	ND	ND	1.4	ND	1.9
Pyrene	0.67	ND	ND	ND	0.38	ND	ND	ND	1.5	1.1	3
Benzo(a) anthracene	**0.29**	ND	ND	ND	*0.19*	ND	ND	ND	**0.64**	**0.49**	**0.53**
Chrysene	*0.48*	ND	ND	ND	ND	ND	ND	ND	*1.1*	ND	*2.8*
Benzo(b)fluoranthene	0.52	0.33	0.25	0.2	0.47	0.43	0.44	0.39	1.1	ND	ND
Benzo(k)fluoranthene	0.19	ND	ND	ND	0.12	ND	ND	ND	0.53	0.37	0.51
Benzo(a)pyrene	0.31	ND	ND	ND	0.2	ND	ND	ND	0.88	0.57	1.6
Dibenzo(a,h) anthracene	0.29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	0.24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd) pyrene	0.53	0.14	ND	ND	0.41	0.099	0.11	0.1	1.8	0.79	0.56
Total PAHs	*5.434*	0.47	0.25	0.2	*2.51*	0.529	0.55	0.49	*12.02*	*5.258*	*18.59*

Site #4 Upstream of the Rt 18 Bridge Site #5 Downstream of the Burt Dam Site #6 Upstream of the Burt Dam

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

PAHs				
Site	Site #7*		Site #8	
Core Segment (in)	00 - 12	12 - 20	Surf	00 - 13
Naphthalene	4.1	0.55	22	9.7
Acenaphthene	1.6	ND	ND	9.6
Acenaphthylene	2.4	1.7	ND	ND
Fluorene	0.95	0.43	0.7	ND
Phenanthrene	4	1.2	10	8.1
Anthracene	**1.1**	*0.3*	**2**	**1.8**
Fluoranthene	2.7	1.8	21	11
Pyrene	4.4	2.7	18	9.5
Benzo(a) anthracene	**0.53**	**0.38**	**8.7**	**4.3**
Chrysene	**3.4**	ND	**15**	**6.6**
Benzo(b)fluoranthene	ND	ND	ND	4
Benzo(k)fluoranthene	0.55	0.45	0.93	2.1
Benzo(a)pyrene	1.4	1.2	2.4	3.7
Dibenzo(a,h) anthracene	ND	ND	9.8	3
Benzo(g,h,i)perylene	ND	ND	6.2	1.6
Indeno(1,2,3-cd) pyrene	0.63	0.54	2.4	2.5
Total PAHs	*27.76*	*11.25*	**119.13**	**77.5**

Site #7 Upstream of Newfane Dam Site #8 Clinton St *Site # 7 has no Surface Sample

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Dibenzofurans and Dioxins									
Site	Site #1	Site #2			Site #3				
Core Segment (in)	Surf	Surf	00 - 24	24 - 46	Surf	00 - 24	24 - 70	70 - 80	80 - 110
TCDFs (total)	NA	NA	0.000066	0.000180	NA	ND	ND	ND	ND
2,3,7,8- TCDF	NA	NA	0.000021	0.000041	NA	ND	ND	ND	ND
PeCDFs(Total)	NA	NA	ND	0.000026	NA	ND	ND	ND	ND
1,2,3,7,8-PeCDF	NA	NA	ND	0.000012	NA	ND	ND	ND	ND
2,3,4,7,8-PeCDF	NA	NA	ND	ND	NA	ND	ND	ND	ND
HxCDFs (total)	NA	NA	ND	0.000013	NA	ND	ND	ND	ND
1,2,3,4,7,8 HxCDF	NA	NA	ND	0.000013	NA	ND	ND	ND	ND
1,2,3,6,7,8-HxCDF	NA	NA	ND	ND	NA	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	NA	NA	ND	ND	NA	ND	ND	ND	ND
1,2,3,7,8,9-HxCDF	NA	NA	ND	ND	NA	ND	ND	ND	ND
HpCDFs (total)	NA	NA	ND	0.000011	NA	ND	ND	ND	ND
1,2,3,4,6,7,8 HpCDF	NA	NA	ND	0.000011	NA	ND	ND	ND	ND
1,2,3,4,7,8,9-HpCDF	NA	NA	ND	ND	NA	ND	ND	ND	ND
OCDF	NA	NA	ND	ND	NA	ND	ND	ND	ND
TCDDs (total)	NA	NA	ND	ND	NA	ND	ND	ND	ND
2,3,7,8-TCDD	NA	NA	ND	ND	NA	ND	ND	ND	ND
PeCDDs (total)	NA	NA	ND	ND	NA	ND	ND	ND	ND
1,2,3,7,8 PeCDD	NA	NA	ND	ND	NA	ND	ND	ND	ND
HxCDDs (total)	NA	NA	ND	ND	NA	ND	ND	ND	ND
1,2,3,4,7,8 HxCDD	NA	NA	ND	ND	NA	ND	ND	ND	ND
1,2,3,6,7,8-HxCDD	NA	NA	ND	ND	NA	ND	ND	ND	ND
1,2,3,7,8,9-HxCDD	NA	NA	ND	ND	NA	ND	ND	ND	ND
HpCDDs (total)	NA	NA	0.000012	0.000013	NA	0.000014	ND	ND	ND
1,2,3,4,6,7,8-HpCDD	NA	NA	ND	ND	NA	0.000014	ND	ND	ND

Site #1 Lake Ontario Site # 2 and 3 Olcott Harbor

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Dibenzofurans and Dioxins									
Site	Site #1	Site #2			Site #3				
Core Segment (in)	Surf	Surf	00 - 24	24 - 46	Surf	00 - 24	24 - 70	70 - 80	80 - 110
OCDD	NA	NA	0.00048	0.00049	NA	0.00037	0.00028	0.00029	0.00033
Total Furans	NA	NA	0.000066	0.000230	NA	0.000000	0.000000	0.000000	0.000000
Total Dioxins	NA	NA	0.000492	0.000503	NA	0.000384	0.000280	0.000290	0.000330
EPA TEF *	NA	NA	*0.000005*	*0.000009*	NA	0.000002	0.000001	0.000001	0.000002

Site #1 Lake Ontario Site # 2 and 3 Olcott Harbor

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

* 2,3,7,8 - TCDD Toxicity Equivelant Factor

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Dibenzofurans and Dioxins											
Site	Site #4				Site #5				Site #6		
Core Segment (in)	Surf	00 - 24	24 - 80	80 - 113	Surf	00 - 24	24 - 96	96 - 120	Surf	00 - 20	20 - 24
TCDFs (total)	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000410	0.002200
2,3,7,8- TCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000023	0.000350
PeCDFs(Total)	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000160	0.002500
1,2,3,7,8-PeCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND
2,3,4,7,8-PeCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000017	0.000230
HxCDFs (total)	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000710	0.011000
1,2,3,4,7,8 HxCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000240	0.004200
1,2,3,6,7,8-HxCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000056	0.000800
2,3,4,6,7,8-HxCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	0.000260
1,2,3,7,8,9-HxCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND
HpCDFs (total)	NA	ND	ND	ND	NA	0.000003	ND	ND	NA	0.003700	0.028000
1,2,3,4,6,7,8 HpCDF	NA	ND	ND	ND	NA	0.000001	ND	ND	NA	0.001800	0.021000
1,2,3,4,7,8,9-HpCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000053	0.000330
OCDF	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.002900	0.020000
TCDDs (total)	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000084	0.000600
2,3,7,8-TCDD	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000004	*0.000027*
PeCDDs (total)	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	0.000580
1,2,3,7,8 PeCDD	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	0.000039
HxCDDs (total)	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000690	0.003100
1,2,3,4,7,8 HxCDD	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	0.000085
1,2,3,6,7,8-HxCDD	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000100	0.000630
1,2,3,7,8,9-HxCDD	NA	ND	ND	ND	NA	ND	ND	ND	NA	0.000028	0.000170
HpCDDs (total)	NA	0.000021	0.000010	ND	NA	0.000039	0.000010	0.000011	NA	0.004800	0.023000
1,2,3,4,6,7,8-HpCDD	NA	0.000011	0.000010	ND	NA	0.000019	0.000010	0.000011	NA	0.002300	0.012000

Site #4 Upstream of the Rt 18 Bridge Site #5 Downstream of the Burt Dam Site #6 Upstream of the Burt Dam

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Dibenzofurans and Dioxins											
Site	Site #4				Site #5				Site #6		
Core Segment (in)	Surf	00 - 24	24 - 80	80 - 113	Surf	00 - 24	24 - 96	96 - 120	Surf	00 - 20	20 - 24
OCDD	NA	0.00029	0.00027	0.00011	NA	0.00029	0.00021	0.00025	NA	0.031000	0.140000
Total Furans	NA	0.000000	0.000000	0.000000	NA	0.000003	0.000000	0.000000	NA	0.007880	0.063700
Total Dioxins	NA	0.000311	0.000280	0.000110	NA	0.000329	0.000220	0.000261	NA	0.036574	0.167280
EPA TEF *	NA	0.000002	0.000001	0.000001	NA	0.000002	0.000001	0.000001	NA	**0.000244**	**0.001763**

Site #4 Upstream of the Rt 18 Bridge Site #5 Downstream of the Burt Dam Site #6 Upstream of the Burt Dam

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

* 2,3,7,8 - TCDD Toxicity Equivelant Factor

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Dibenzofurans and Dioxins				
Site	Site #7*		Site #8	
Core Segment (in)	00 - 12	12 - 20	Surf	00 - 13
TCDFs (total)	0.000670	0.000430	NA	0.000200
2,3,7,8- TCDF	0.000067	0.000046	NA	0.000009
PeCDFs(Total)	0.000400	0.000390	NA	0.000180
1,2,3,7,8-PeCDF	ND	ND	NA	ND
2,3,4,7,8-PeCDF	0.000030	0.000018	NA	ND
HxCDFs (total)	0.003200	0.003800	NA	0.000560
1,2,3,4,7,8 HxCDF	0.000130	0.000140	NA	0.000130
1,2,3,6,7,8-HxCDF	0.000060	0.000052	NA	0.000033
2,3,4,6,7,8-HxCDF	0.000840	0.000043	NA	0.000021
1,2,3,7,8,9-HxCDF	ND	0.000014	NA	ND
HpCDFs (total)	0.014000	0.017000	NA	0.001600
1,2,3,4,6,7,8 HpCDF	0.003100	0.004100	NA	0.000740
1,2,3,4,7,8,9-HpCDF	0.000190	0.000280	NA	0.000019
OCDF	0.009300	0.014000	NA	0.001200
TCDDs (total)	0.000150	0.000190	NA	0.000074
2,3,7,8-TCDD	*0.000026*	*0.000024*	NA	*0.000005*
PeCDDs (total)	0.000330	0.000520	NA	0.000048
1,2,3,7,8 PeCDD	0.000028	0.000040	NA	ND
HxCDDs (total)	0.005100	0.006800	NA	0.000330
1,2,3,4,7,8 HxCDD	0.000083	0.000090	NA	ND
1,2,3,6,7,8-HxCDD	0.000860	0.001000	NA	0.000049
1,2,3,7,8,9-HxCDD	0.000220	0.000240	NA	0.000020
HpCDDs (total)	0.034000	0.041000	NA	0.002000
1,2,3,4,6,7,8-HpCDD	0.015000	0.017000	NA	0.001000

Site #7 Upstream of Newfane Dam Site #8 Clinton St *Site # 7 has no Surface Sample

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

Table B-1

Surface and Core Data (mg/kg)

NYSDEC Olcott Harbor Sediment Sampling (1994)

Dibenzofurans and Dioxins				
Site	Site #7*		Site #8	
Core Segment (in)	00 - 12	12 - 20	Surf	00 - 13
OCDD	0.250000	0.270000	NA	0.110000
Total Furans	0.027570	0.035620	NA	0.003740
Total Dioxins	0.289580	0.318510	NA	0.112452
EPA TEF *	**0.001622**	**0.001690**	NA	**0.000595**

Site #7 Upstream of Newfane Dam Site #8 Clinton St *Site # 7 has no Surface Sample

DEC sediment screening guidance parameters in boldface, moderate contaminant levels in italics and high contaminant levels in boldface

* 2,3,7,8 - TCDD Toxicity Equivelant Factor

Table B-2
Sediment Data (mg/kg)
NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

	Clinton St	Downstream Clinton St ++	William St. Island. (#1) (swale)	William. St. Island (#2) (swale)	William. St. Island (#3) (island)	William. St. Island (#4) (island)	Olcott Harbor (surface)
Total PCBs	NA	*3.662*	*1.869*	*3.269*	*0.849*	0.062	NA
2,3,7,8-TCDD	NA	NA	NA	NA	*0.000040*	ND	ND
1,2,3,7,8-PCDD	NA	NA	NA	NA	0.000068	0.000008	ND
1,2,3,4,7,8-HCDD	NA	NA	NA	NA	0.000088	0.000025	0.000014
1,2,3,6,7,8-HCDD	NA	NA	NA	NA	0.000530	0.000008	0.000070
1,2,3,7,8,9-HCDD	NA	NA	NA	NA	0.000190	0.000002	0.000013
1,2,3,4,6,7-HpDD	NA	NA	NA	NA	0.018000	0.000290	0.002100
OCDD	NA	NA	NA	NA	0.150000	0.006000	0.030000
Total Dioxins	NA	NA	NA	NA	0.168916	0.006333	0.032197
2,3,7,8-TCDF	NA	NA	NA	NA	0.000010	0.000016	0.000022
1,2,3,7,8-PCDF	NA	NA	NA	NA	0.000017	0.000007	0.000015
2,3,4,7,8-PCDF	NA	NA	NA	NA	0.000053	0.000013	0.000021
1,2,3,4,7,8-HCDF	NA	NA	NA	NA	0.000073	0.000009	0.000110
1,2,3,6,7,8-HCDF	NA	NA	NA	NA	0.000038	0.000006	0.000031
2,3,4,6,7,8-HCDF	NA	NA	NA	NA	0.000064	0.000009	0.000022
1,2,3,7,8,9-HCDF	NA	NA	NA	NA	ND	ND	0.000008
1,2,3,4,6,7,8-HpDF	NA	NA	NA	NA	0.003200	0.000240	0.001400
1,2,3,4,7,8,9-HpCDF	NA	NA	NA	NA	0.000120	ND	ND
OCDF	NA	NA	NA	NA	0.008000	0.000250	0.002700
Total Furans	NA	NA	NA	NA	0.011575	0.000550	0.004329
EPA TEF*	NA	NA	NA	NA	**0.000570**	**0.000030**	**0.000110**
Mercury	*1.492*	NA	NA	NA	*2.82*	*3.34*	*0.655*

* 2,3,7,8 TCDD Toxicity Equivalent Factor
++ Behind dam downstream of Clinton St

Table B-2
Sediment Data (mg/kg)
NYSDEC Lake Ontario Tributary Sampling - 1994 (Litten)

	Olcott Harbor Core Segments							
	1-1.5 in	1.5-3 in	3-5 in	5-9 in	9-13 in	13-17 in	17-20 in	21-25 in
Mercury	*2.251*	*1.892*	*3.759*	*3.609*	0.102	0.0422	0.038	0.033

Table B-3
Dioxin/Furan Data (mg/kg)
NYSDEC Sampling - 1990 (Estabrooks)

	Main Stem of Eighteenmile Creek					East Branch of Eighteenmile Creek	
	Remic Pkwy	Clinton St	Transit Rd	Condren Rd	Newfane Dam	Royalton Ravine	Lower East Branch
TOC	8.3	2.2	5	6.8	2	8.4	3.1
Total PCBs	0.013300	*0.361000*	NA	NA	NA	0.012200	*0.109000*
Di	0	0.0295	NA	NA	NA	0	0.0023
Tri	0.0004	0.0779	NA	NA	NA	0.0012	0.0115
Tetra	0.0029	0.144	NA	NA	NA	0.0042	0.0428
Penta	0.0034	0.0773	NA	NA	NA	0.004	0.0313
Hexa	0.0051	0.023	NA	NA	NA	0.0016	0.0124
Hepta	0.00128	0.0077	NA	NA	NA	0.001	0.0071
Octa	0.0002	0.001	NA	NA	NA	0.0002	0.0008
Nona	0	0.0004	NA	NA	NA	0	0.0003
EPA TEF*	0.000004	**0.000103**	**0.000116**	**0.000177**	**0.000282**	0.000004	*0.000021*
2,3,7,8-TCDD	ND	ND	ND	ND	ND	ND	ND
Total TCDDs	ND	0.000018	0.000013	0.000015	0.000029	ND	ND
Total PCDDs	ND	0.000007	0.000017	0.000033	0.000084	ND	ND
Total HeCDDs	ND	0.000180	0.000220	0.000410	0.000580	0.000026	0.000037
Total HpCDDs	0.000130	0.001500	0.002600	0.004100	0.005100	0.000140	0.000250
OCDD	0.000430	0.009000	0.014000	0.022000	0.029000	0.000600	0.001500
Total Dioxins	0.000560	0.010700	0.016900	0.026600	0.034800	0.000781	0.001795
Total TCDFs	ND	0.000022	0.000120	0.000200	0.000360	ND	0.000029
Total PCDFs	ND	0.000094	0.000150	0.000190	0.000320	0.000014	0.000026
Total HeCDFs	0.000017	0.000370	0.000350	0.000670	0.000900	0.000012	0.000079
Total HpCDFs	0.000047	0.001000	0.001400	0.002300	0.003300	0.000045	0.000190
OCDF	ND	0.000910	0.001100	0.002043	0.002900	0.000046	0.000190
Total Furans	0.000064	0.002400	0.003120	0.005403	0.007780	0.000117	0.000514
HCB	0.000300	0.000310	NA	NA	NA	0.000000	0.000000
Mirex	*0.007400*	0.000200	NA	NA	NA	0.000000	0.000000

* 2,3,7,8 TCDD Toxicity Equivalent Factor

Table B-4
Eighteenmile Creek
DEC Sediment Sampling For 1990 RIBS (mg/kg)

Parameter	Samples From Jacques Rd August 16 1989	August 22 1990
Total Solids (%)	NA	24
Volatile Solids	150000	147000
Volatile Solids (%)	NA	12
TOC (Combustion)	NA	4
TOC (UV OX)	NA	0
Sulfides	NA	260
Grain Size (% <0.004 MM)	36	9
Grain Size (% <0.062 MM)	85	25
Grain Size (% <0.125 MM)	100	100
Aluminum	9500	11000
Cadmium	5	3
Copper	**220**	**310**
Iron	17000	21000
Lead	**340**	**400**
Manganese	660	940
Mercury	*1*	*1*
Nickel	60	80
Zinc	780	1100
Alpha BHC	ND	ND
Beta BHC	ND	0.004
Delta BHC	ND	ND
Gamma BHC	ND	ND
Endrin	ND	ND
4,4,-DDD	ND	0.001
4,4,DDE	ND	*0.007*
4,4, DDT	ND	ND
Arochlor 1016/1242	*0.77*	*0.33*
Arochlor 1221	ND	ND
Arochlor 1248	ND	ND
Arochlor 1254	*0.1*	0.04
Arochlor 1260	ND	0.008
PCBs	*0.87*	*0.378*
Aldrin	ND	ND

Table B-5
Eighteenmile Creek
Sediment Data (mg/kg)
NYSDEC Sampling - 1987 (Litten)

	Core Sample Taken From Sediment Bar in Olcott Harbor (Referred to as Olcott Spoil Bar in Sampling Report)														
DEPTH RANGE (in)	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30
Volatile Solids (%)	8	10	9	9	15	12	12	9	10	10	10	11	9	8	6
TOC-1*	6560	4580	6910	5320	5430	6700	8010	5780	6730	6640	5190	4470	6650	5060	4090
TOC-2*	39700	36300	49300	50000	45300	39500	52800	30100	24600	18000	98800	20400	34200	22200	18500
Total PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aluminum	17100	24900	25300	25600	26200	26600	24400	20500	23100	25400	23400	21700	20700	28500	29800
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	1.8	1.5	2	1.9	1.2	2.2	1.7	1.2	1.8	1.7	1.3	1.3	1.2	1.8	2
Barium	82	134	136	139	150	164	154	139	148	153	138	142	131	162	182
Beryllium	1.7	1.9	2	2	2	2	1.9	1.7	1.8	1.9	1.8	1.8	1.7	2	2.1
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	32	25	25	24	26	26	24	21	26	25	23	23	21	26	28
Cobalt	5.9	9	9.7	9.6	11	8.5	9.1	7.9	10	8.2	8.5	8.8	8.9	8.9	8.9
Copper	**141**	12	12	12	13	14	13	12	12	13	13	13	12	11	11
Iron	19900	23300	28100	26900	27200	26700	25700	23600	24600	26400	25200	24900	24000	26600	27900
Lead	4	3.6	3.6	3.2	3.4	3.4	3.4	3.3	3.6	3.6	3.4	3.6	3.5	3.4	20
Manganese	177	301	293	279	305	295	291	268	279	288	285	284	265	280	283
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Molybdenum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	22	29	29	28	30	28	27	26	28	29	27	28	26	28	30
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Strontium	ND	24	24	24	25	25	25	21	22	28	25	25	22	23	21
Thorium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Titanium	385	139	180	217	126	218	188	31	45	88	158	15	186	198	209
Vanadium	29	40	42	41	41	43	41	31	35	40	38	30	34	44	46
Zinc	229	81	80	77	83	82	79	75	82	82	79	80	76	86	81

*TOC-1 = Total Organic Carbon using the pensulfate ultraviolet oxidation method
TOC-2 = Total Organic Carbon using the combustion infrared method

Table B-5
Eighteenmile Creek
Sediment Data (mg/kg)
NYSDEC Sampling - 1987 (Litten)

	Core Sample Taken From Estuary Upstream Of Rt 18 Bridge														
DEPTH RANGE (in)	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30
Volatile Solids (%)	8	7	6	7	9	7	7	7	7	8	10	10	9	12	13
TOC-1*	5560	2500	3000	1210	1900	3150	2080	2530	1830	2150	5840	2830	2540	3280	3090
TOC-2*	27500	23400	19300	39100	13600	22400	25100	22500	27900	27100	34500	23200	30000	41200	42600
Total PCBs	0.007	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND
Aluminum	25000	25900	25800	26700	23800	21700	20900	24200	24100	25400	24000	19900	19300	17000	19100
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	1.9	1.8	2	1.7	1.6	1.8	1	1.2	1.2	1.8	1.4	1.1	ND	ND	ND
Barium	96	119	126	133	120	107	105	117	118	125	121	99	95	100	103
Beryllium	1.9	1.9	1.9	1.9	1.8	1.7	1.6	1.7	1.7	1.8	1.9	1.6	1.5	1.5	1.5
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	25	25	25	25	23	20	19	22	22	23	23	20	19	18	19
Cobalt	8.5	9.2	9.3	9.6	8.9	8.3	7.8	8	8.3	9	9.2	9	8.3	9	8.6
Copper	10	9.9	12	11	13	8.9	9	8.8	9.3	12	12	10	9.8	12	11
Iron	25700	26800	27000	26900	25400	25000	24800	24800	25500	26600	27600	24400	23400	23400	23400
Lead	*100*	*30*	20	16	4	3.4	3.4	3.5	3.2	3.3	3.5	3.2	2.9	3.1	3.3
Manganese	324	337	328	311	310	298	283	264	282	301	325	290	283	295	284
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Molybdenum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	30	27	27	27	28	24	24	24	26	27	28	26	26	26	26
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Strontium	28	23	27	23	21	23	20	ND	ND	22	21	ND	ND	ND	ND
Thorium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Titanium	116	170	147	169	66	156	213	153	93	193	173	169	156	152	148
Vanadium	39	41	40	42	35	35	34	38	37	41	39	33	32	28	32
Zinc	86	81	75	75	81	61	59	60	63	70	75	66	65	68	67

*TOC-1 = Total Organic Carbon using the pensulfate ultraviolet oxidation method
TOC-2 = Total Organic Carbon using the combustion infrared method

Table B-5
Eighteenmile Creek
Sediment Data (mg/kg)
NYSDEC Sampling - 1987 (Litten)

	Three Core Samples Taken From the Reservoir Above Burt Dam									
	West Side of Dam					Center of Dam		East Side of Dam		
DEPTH RANGE (in)	0-5	5-10	10-15	15-20	20-25	0-5	5-10	0-5	5-10	10-16
Volatile Solids (%)	14	15	17	25	22	15	15	21	15	25
TOC-1*	15900	13100	11500	18000	11900	12500	8770	11600	12200	9410
TOC-2*	27800	42300	32500	24300	34000	29700	18700	25600	13500	19200
Total PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	42200	42300	35000	40400	38500	45100	37600	37800	36800	36600
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	7.5	7.4	10.2	11.2	10.7	6.3	5.8	6.3	6.6	10
Barium	325	320	352	399	385	315	320	316	304	403
Beryllium	2.9	2.9	2.7	2.6	2.8	3.1	2.7	2.8	2.8	2.9
Cadmium	*3.9*	*3.4*	*6.7*	*9.7*	*6*	*2.2*	*2.8*	ND	*3*	*9*
Chromium	371	331	754	2160	930	162	181	258	304	1260
Cobalt	28	27	31	17	22	15	20	18	21	24
Copper	**635**	**560**	**810**	**2280**	**1760**	**316**	**339**	**422**	**519**	**1430**
Iron	48500	47800	47400	47000	48500	44200	40400	44500	45600	51500
Lead	**1090**	**934**	**1450**	**3600**	**4100**	**507**	**610**	**741**	**867**	**2280**
Manganese	592	596	528	397	476	1050	1260	800	713	563
Mercury	*0.6*	*0.5*	*0.7*	*2.2*	*1.6*	*0.5*	*0.5*	*0.6*	*0.6*	*1.1*
Molybdenum	40	30	98	110	44	8	8	17	23	111
Nickel	377	323	445	479	458	90	132	231	318	520
Selenium	0.6	0.8	0.8	1	0.8	0.5	ND	ND	0.9	0.9
Silver	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Strontium	86	87	92	158	131	89	99	124	110	117
Thorium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin	158	118	142	888	568	87	33	132	60	280
Titanium	191	119	90	247	206	226	81	197	99	142
Vanadium	78	75	100	109	84	74	62	66	62	108
Zinc	3300	3010	3320	13800	11200	1340	1700	2150	2460	6950

*TOC-1 = Total Organic Carbon using the pensulfate ultraviolet oxidation method
TOC-2 = Total Organic Carbon using the combustion infrared method

Table B-5
Eighteenmile Creek
Sediment Data (mg/kg)
NYSDEC Sampling - 1987 (Litten)

PARAMETER	Grab Samples From Eighteenmile Creek			Core Samples From Newfane Dam (East Side)	
	Clinton St	Clinton St (reanalyses)	The Gulf, Confluence With 18 Mile Creek	0-7 In	7-13.5 In
Volatile Solids (%)	9	NA	14	21	18
TOC-1*	5560	NA	18800	9190	10300
TOC-2*	9400	NA	72000	12400	12700
Total PCBs	NA	NA	0.035	NA	NA
Aluminum	9800	11700	28700	35800	29000
Antimony	ND	ND	ND	ND	ND
Arsenic	4.1	4.7	4.9	12.9	12.6
Barium	150	158	108	368	187
Beryllium	1.6	1.6	1.8	2.4	2.1
Cadmium	*2.9*	ND	ND	9.4	12
Chromium	91	95	329	1390	1080
Cobalt	5.3	5.2	5.8	25	27
Copper	**605**	**650**	**718**	**2750**	**2060**
Iron	26600	27600	27900	39300	33600
Lead	**1330**	**1320**	**1120**	**4760**	**3450**
Manganese	802	867	378	453	450
Mercury	*1.8*	*1.8*	*0.27*	*2.7*	*2.2*
Molybdenum	8	ND	12	116	62
Nickel	50	49	59	895	822
Selenium	ND	ND	ND	0.9	0.8
Silver	ND	4	ND	5	ND
Strontium	108	107	76	137	106
Thorium	ND	ND	ND	ND	ND
Tin	20	54	108	1100	25
Titanium	73	108	66	237	39
Vanadium	23	24	38	101	69
Zinc	790	833	2700	21200	14700

*TOC-1 = Total Organic Carbon using the pensulfate ultraviolet oxidation method
TOC-2 = Total Organic Carbon using the combustion infrared method

Table B-5
Eighteenmile Creek
Sediment Data (mg/kg)
NYSDEC Sampling - 1987 (Litten)

	Grab Samples Taken on the East Branch of Eighteenmile Creek Near the Rt 104 Bridge			
	Initial Sample	Repeat Samples		
PARAMETER	50 Ft Upstream	50 Ft Upstream	At Bridge	50 Ft Downstream
Volatile Solids (%)	9	5	7	7
TOC-1*	NA	NA	8670	NA
TOC-2*	21300	12800	23000	17600
Total PCBs	NA	NA	ND	NA
Aluminum	20100	25400	23800	24500
Antimony	ND	ND	ND	ND
Arsenic	2.8	2.9	8.3	3.3
Barium	205	166	156	159
Beryllium	1.7	2.3	2.3	2
Cadmium	ND	ND	ND	ND
Chromium	17	20	34	20
Cobalt	6.3	11	15	7.2
Copper	*28*	13	**142**	*23*
Iron	23600	31900	38700	28010
Lead	*44*	21	**216**	*34*
Manganese	282	1370	1100	443
Mercury	*0.31*	ND	0.04	*0.11*
Molybdenum	ND	ND	ND	ND
Nickel	23	28	32	28
Selenium	ND	ND	ND	ND
Silver	ND	ND	ND	ND
Strontium	33	30	55	57
Thorium	ND	ND	ND	ND
Tin	ND	ND	ND	ND
Titanium	80	198	121	122
Vanadium	30	43	36	37
Zinc	770	95	564	175

*TOC-1 = Total Organic Carbon using the pensulfate ultraviolet oxidation method
TOC-2 = Total Organic Carbon using the combustion infrared method

Table B-6
US Army Corps of Engineers Sediment Study (mg/kg)
1977

PARAMETER:	Sites (see Appendix Figure B-1) 1	2	3	4	4a	5	6
Total Solids (%)	29.2	27.6	52.7	52.3	60.8	69.5	71.9
Volatile Solids (%)	14.1	16.1	3.1	3.1	ND	ND	ND
Chemical Oxygen Demand	210000	180000	40000	35000	4800	4600	2900
Total Kjeldahl Nitrogen	4900	5000	1000	1300	190	110	110
Ammonia as N	260	310	83	250	46	33	22
Total Phosphorus	2800	1500	730	900	410	400	460
Oil-Grease	5900	2500	1200	NA	ND	ND	ND
Arsenic	11	4	4	4	ND	ND	4
Cadmium	*9*	*6*	*3*	*3*	*2*	*2*	*3*
Chromium	270	120	54	32	20	12	25
Copper	**390**	**150**	*91*	*47*	*29*	12	*22*
Iron	34000	24000	14000	14000	9600	9700	21000
Lead	**760**	**320**	**160**	**120**	*61*	26	*48*
Magnesium	7400	6600	6700	5500	6000	6300	5400
Manganese	410	350	620	580	500	730	540
Mercury	*0.8*	*0.4*	*0.1*	*0.1*	*0.1*	ND	ND
Nickel	930	250	95	130	40	30	24
Zinc	3500	1200	750	450	350	140	150
Cyanide	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	ND	ND	ND	0.023	NA	0.018	ND
beta-Benzenehexachloride	ND	ND	ND	ND	NA	ND	ND
Lindane	ND	ND	ND	ND	NA	ND	ND
Treflan	ND	ND	ND	ND	NA	ND	ND
Aldrin	ND	ND	ND	ND	NA	ND	ND
Isodrin	ND	ND	ND	ND	NA	ND	ND
Heptachlor Epoxide	ND	ND	ND	ND	NA	ND	ND
gamma-Chlordane	ND	ND	ND	ND	NA	ND	ND
o,p-DDE	ND	ND	ND	ND	NA	ND	ND
p,p'-DDE	ND	ND	ND	ND	NA	ND	ND
o,p-DDD	ND	ND	ND	ND	NA	ND	ND
o,p-DDT	ND	ND	ND	ND	NA	ND	ND
p,p'-DDD	ND	ND	ND	ND	NA	ND	ND
p,p'-DDT	ND	ND	ND	ND	NA	ND	ND
Methoxychlor	ND	ND	ND	ND	NA	ND	ND
Mirex	ND	ND	ND	ND	NA	ND	ND
2,4-D, Isopropyl Ester	ND	ND	ND	ND	NA	ND	ND
Endosulfan I	ND	ND	ND	ND	NA	ND	ND
Dieldrin	ND	ND	ND	ND	NA	ND	ND
Endosulfan II	ND	ND	ND	ND	NA	ND	ND
DCPA	ND	ND	ND	ND	NA	ND	ND
Aroclor 1016 (1242)	0.100	0.250	0.140	0.090	NA	ND	ND
Aroclor 1248	ND	ND	ND	ND	NA	ND	ND
Aroclor 1254	ND	0.070	0.050	0.030	NA	ND	ND
Aroclor 1260	ND	ND	ND	ND	NA	ND	ND
Total PCBs	*0.100*	*0.320*	*0.190*	*0.120*	NA	ND	ND
Endrin	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA

Table B-6
US Army Corps of Engineers Sediment Study (mg/kg)
1981

Parameter	Sites (see Appendix Figure B-1) REF	DISP	2	2a	3	4	5	6
Total Solids (%)	71.88	74.05	40.88	NA	47.11	71.92	79.94	78.98
Volatile Solids (%)	1.41	1.47	10.69	NA	9.93	1.89	0.41	0.53
Chemical Oxygen Demand	157	189	1679	NA	1159	246	35	425
Total Kjeldahl Nitrogen	686	514	4959	NA	5703	850	99	132
Ammonia as N	50.24	28.22	149.08	NA	168.33	42.01	19.85	9.09
Total Phosphorus	825	787	1409	NA	1625	960	376	521
Oil-Grease	800	1700	7345.3	NA	1045.9	ND	872.3	698.8
Arsenic	5.1	7.1	8.9	8.6	8.7	8.4	1.5	1.6
Cadmium	0.5	*3.3*	*1.9*	*0.8*	*0.9*	0.5	0.5	ND
Chromium	35.4	37.4	69.4	70.8	33.7	33.9	2.8	4.5
Copper	*22.5*	*18.2*	*94.4*	*93.2*	*28.4*	*59.2*	8.2	10.5
Iron	173600	247800	272200	186200	250700	119600	72700	91300
Lead	27.1	19.8	**130.3**	**137.6**	*35.3*	*90.6*	3.8	9.3
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	335	337	346.4	353.9	297.5	342.5	497	418.2
Mercury	*2.7*	*0.27*	*0.16*	NA	*0.12*	*0.18*	0.09	*0.11*
Nickel	21.4	22.9	113.2	111.8	51.6	54.5	19.1	16.4
Zinc	105.1	83.7	335.9	336.6	153.9	260.8	60.9	66.6
Cyanide	0.593	ND	0.626	NA	ND	NA	0.019	0.093
Phenol	0.365	0.082	0.026	NA	0.629	ND	ND	ND
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
beta-Benzenehexachloride	NA	NA	NA	NA	NA	NA	NA	NA
Lindane	0.05	ND	0.06	NA	ND	ND	ND	ND
Treflan	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	0.02	ND	ND	NA	ND	ND	ND	ND
Isodrin	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	ND	ND	ND	NA	1.4	ND	ND	ND
gamma-Chlordane	ND	ND	ND	NA	ND	ND	ND	ND
o,p-DDE	NA	NA	NA	NA	NA	NA	NA	NA
p,p'-DDE	NA	NA	NA	NA	NA	NA	NA	NA
o,p-DDD	NA	NA	NA	NA	NA	NA	NA	NA
o,p-DDT	*0.02*	ND	ND	NA	*0.13*	ND	*0.02*	ND
p,p'-DDD	NA	NA	NA	NA	NA	NA	NA	NA
p,p'-DDT	ND	ND	ND	NA	ND	ND	ND	ND
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA
Mirex	ND	ND	ND	NA	*0.08*	ND	ND	ND
2,4-D, Isopropyl Ester	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	ND	ND	ND	NA	ND	ND	ND	ND
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA
DCPA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016 (1242)	ND	ND	ND	NA	ND	ND	ND	ND
Aroclor 1248	ND	ND	ND	NA	ND	0.1	ND	ND
Aroclor 1254	0.3	ND	ND	NA	ND	ND	ND	ND
Aroclor 1260	ND	ND	ND	NA	ND	ND	ND	ND
Total PCBs	*0.3*	ND	ND	NA	ND	*0.1*	ND	ND
Endrin	ND	ND	ND	NA	ND	ND	ND	ND
Heptachlor	ND	ND	ND	NA	ND	0.01	0.02	0.01
Toxaphene	ND	ND	ND	NA	ND	ND	ND	ND

Table B-6
US Army Corps of Engineers Sediment Study (mg/kg)
1987

Parameter	Sites (see Appendix Figure B-1) REF	1	2	3	3a	4	5	6
Total Solids (%)	64.2	46.7	56.8	38	36.6	71.9	70.5	80.4
Volatile Solids (%)	1.7	6.8	3.8	8.1	8.3	2.3	2.1	0.3
Chemical Oxygen Demand	1100	3100	11000	24000	33000	13000	3600	460
Total Kjeldahl Nitrogen	587	1520	365	716	1110	445	376	84
Ammonia as N	16.8	30.2	11.1	51	54.5	26.5	7.65	5.9
Total Phosphorus	499	540	612	1450	1400	507	515	302
Oil-Grease	546	579	598	1330	1680	1070	281	128
Arsenic	7	4	6	6	7	4	2	2
Cadmium	*1*	0.5	*1*	*2*	*2*	*1*	*2*	*1*
Chromium	24	17	40	87	79	17	8	4
Copper	*26*	*26*	*48*	**140**	**150**	*50*	*18*	9
Iron	12200	14000	11000	13000	14500	8300	6900	5700
Lead	*35*	*38*	*89*	**200**	**200**	*73*	20	5
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	320	280	300	440	540	330	540	520
Mercury	*2.5*	*0.17*	*0.78*	*0.59*	*0.78*	*0.82*	0.05	0.03
Nickel	22	24	40	110	110	17	14	8
Zinc	150	150	330	920	940	200	100	44
Cyanide	0.53	0.81	0.12	0.4	0.54	0.37	0.5	0.43
Phenol	ND	0.42	0.15	0.2	0.09	ND	0.06	0.1
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
beta-Benzenehexachloride	ND	ND	ND	ND	NA	ND	ND	ND
Lindane	ND	ND	ND	ND	NA	ND	ND	ND
Treflan	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	ND	ND	ND	ND	NA	ND	ND	ND
Isodrin	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	ND	ND	ND	ND	NA	ND	ND	ND
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA
o,p-DDE	NA	NA	NA	NA	NA	NA	NA	NA
p,p'-DDE	ND	ND	ND	ND	NA	ND	ND	ND
o,p-DDD	NA	NA	NA	NA	NA	NA	NA	NA
o,p-DDT	NA	NA	NA	NA	NA	NA	NA	NA
p,p'-DDD	ND	ND	ND	ND	NA	ND	ND	ND
p,p'-DDT	ND	ND	ND	ND	NA	ND	ND	ND
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA
Mirex	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D, Isopropyl Ester	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	ND	ND	ND	ND	NA	ND	ND	ND
Dieldrin	ND	ND	ND	ND	NA	ND	ND	ND
Endosulfan II	ND	ND	ND	ND	NA	ND	ND	ND
DCPA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016 (1242)	ND	ND	ND	ND	NA	ND	ND	ND
Aroclor 1221	ND	ND	ND	ND	NA	ND	ND	ND
Aroclor 1232	ND	ND	ND	ND	NA	ND	ND	ND
Aroclor 1242	ND	ND	ND	ND	NA	ND	ND	ND
Aroclor 1248	ND	ND	ND	ND	NA	ND	ND	ND
Aroclor 1254	ND	ND	ND	ND	NA	ND	ND	ND
Aroclor 1260	ND	ND	ND	ND	NA	ND	ND	ND

Table B-6
1987 US Army Corps of Engineers Sediment Study (mg/kg)
1987

Parameter	Sites (see Appendix Figure B-1) REF	1	2	3	3a	4	5	6
Total PCBs	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	ND	ND	ND	ND	NA	ND	ND	ND
Heptachlor	ND	ND	ND	ND	NA	ND	ND	ND
Toxaphene	ND	ND	ND	ND	NA	ND	ND	ND
Bromoform	ND	ND	ND	ND	NA	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	NA	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	NA	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	NA	ND	ND	ND
Chloroethane	ND	ND	ND	ND	NA	ND	ND	ND
2-Chloroethyl Vinyl Ether	ND	ND	ND	ND	NA	ND	ND	ND
Chloroform	ND	ND	ND	ND	NA	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	NA	ND	ND	ND
1, 2-Dichlorobenzene	ND	ND	ND	ND	NA	ND	ND	ND
1, 3-Dichlorobenzene	ND	ND	ND	ND	NA	ND	ND	ND
1, 4-Dichlorobenzene	ND	ND	ND	ND	NA	ND	ND	ND
1, 1-Dichloroethane	ND	ND	ND	ND	NA	ND	ND	ND
1, 2-Dichloroethane	ND	ND	ND	ND	NA	ND	ND	ND
1, 1-Dichloroethene	ND	ND	ND	ND	NA	ND	ND	ND
1, 2-Dichloropropane	ND	ND	ND	ND	NA	ND	ND	ND
trans 1, 3-Dichloropropene	ND	ND	ND	ND	NA	ND	ND	ND
Methyl Chloride	ND	ND	ND	ND	NA	ND	ND	ND
1, 1, 2, 2-Tetrachloroethane	ND	ND	ND	ND	NA	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	NA	ND	ND	ND
trans-1, 2-Dichloroethene	ND	ND	ND	ND	NA	ND	ND	ND
1, 1, 1-Trichloroethane	ND	ND	ND	ND	NA	ND	ND	ND
1, 1, 2-Trichloroethane	ND	ND	ND	ND	NA	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	NA	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	NA	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	NA	ND	ND	ND

Table B-7
Sediment Sampling (mg/kg)
USEPA 1981

Parameter	Site #1	Site #2	Site #3	Site #4
Total Solids (%)	117000	505000	502000	471000
Volatile Solids (%)	150000	110000	100000	95000
Total Kjeldahl Nitrogen	9300	1900	2700	2500
Total Phosphorus	1200	570	850	1100
COD	180000	170000	160000	120000
Aluminum	9400	8900	13000	11000
Barium	88	44	330	290
Boron	9.1	ND	ND	ND
Cadmium	*0.9*	ND	0.3	0.4
Calcium	79000	3600	3700	11000
Chromium	30	15	88	60
Cobalt	9.1	11	13	11
Copper	*49*	13	**130**	*110*
Lead	*43*	ND	**290**	**230**
Lithium	29	32	36	30
Magnesium	9300	5400	6500	8200
Manganese	680	240	260	400
Mercury	ND	ND	*3*	*1.9*
Molybdenum	ND	ND	ND	ND
Nickel	37	28	32	25
Potassium	1500	1100	1200	1000
Silver	ND	ND	0.8	0.7
Sodium	200	600	200	100
Strontium	140	70	35	44
Tin	ND	ND	11	13
Vanadium	19	18	21	18
Yttrium	13	14	15	14
Zinc	190	66	350	320
Iron	16000	16000	21000	19000
Phenols	7.1	1.4	1.4	1.5
Cyanide	3.5	1.2	1.2	4.1

Site #1 - Lake Ontario floating mud - clay sample
Site #2 - Downstream of Burt Dam
Site #3 - Upstream of Rt. 18
Site #4 - Olcott Harbor

Table B-7
Sediment Sampling (mg/kg)
USEPA 1981

Parameter	Site #1	Site #1 Duplicate	Site #2	Site #3	Site #4
Arochlor 1242	ND	ND	ND	ND	ND
Arochlor 1248	*0.118*	*0.128*	ND	ND	ND
Arochlor 1254	ND	ND	ND	ND	ND
Arochlor 1260	ND	ND	ND	ND	ND
o,p-DDE	ND	ND	ND	ND	ND
p,p'-DDE	*0.012*	*0.015*	ND	ND	ND
o,p-DDD	ND	ND	ND	ND	ND
p,p'-DDD	ND	ND	ND	ND	ND
o,p-DDT	ND	ND	ND	ND	ND
p,p'-DDT	ND	ND	ND	ND	ND
g-Chlordane	ND	ND	ND	ND	ND
Oxychlorodane	ND	ND	ND	ND	ND
Heptachlor epoxide	ND	ND	ND	ND	ND
Zytron	ND	ND	ND	ND	ND
b-BHC	0.033	0.036	ND	ND	ND
g-BHC	ND	ND	ND	ND	ND
Hexachlorobenzene	0.003	0.003	ND	ND	ND
Trifluralin	ND	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND
DCPR	ND	ND	ND	ND	ND
Endosulfan I	0.006	0.004	ND	ND	ND
Endosulfan II	0.003	0.003	ND	ND	ND
Dieldrin	ND	ND	ND	ND	ND
Di-n-Butyl phthalate	ND	ND	ND	ND	ND
Naphthalene	0.17	0.2	0.06	0.06	0.12
Anthracene/phenanthrene	0.4	0.4	ND	0.14	0.3
Fluorene	ND	ND	ND	ND	0.04
Fluorenthene	ND	ND	ND	0.1	0.28
Chrysene/Benzo(a)anthracene	ND	ND	ND	0.18	0.5
Pyrene	ND	ND	ND	0.08	0.24
Diethyl phthalate	0.6	0.7	0.1	0.04	0.04
Di-n-butyl phthalate	1.7	2.3	0.66	0.2	0.62
Butylbenzyl phthalate	0.49	0.7	0.18	ND	ND
bis(2-Ethylhexyl) phthalate	0.8	0.8	0.28	0.12	0.46
Dichloromethane	0.0147	0.0082	0.0066	0.0149	ND
Trichloromethane	0.0167	0.0145	0.0295	0.0382	0.0228
Tribromomethane	ND	ND	ND	0.0544	ND
1,1,2,2 - Tetrachloroethane	ND	ND	ND	0.1026	0.0272
Trichloroethene	0.0226	0.0187	0.0199	0.0847	0.0511
Toluene	0.0146	0.012	ND	ND	ND
Ethylbenzene	0.0026	0.0043	0.0032	0.004	ND

Site #1 - Lake Ontario floating mud - clay sample
Site #2 - Downstream of Burt Dam
Site #3 - Upstream of Rt. 18
Site #4 - Olcott Harbor