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## Eighteenmile Creek

### Remedial Action Plan

#### Summary

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August 1997

August 1991

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SUMMARY

Remedial Action Plan

Eighteenmile Creek

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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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# 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 inflow 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 (AOC). This designation indicates that the area has been reported to exhibit environmental degradation, and that some beneficial uses of the water or biota are likely to be 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. A RAP defines the environmental problems in the Area of Concern, identifies what needs to be done to restore beneficial uses, establishes time schedules, designates the responsible agencies, and describes a monitoring process needed to track remediation.

The Eighteenmile Creek RAP was developed by the New York State Department of Environmental Conservation (DEC) in cooperation with citizens concerned about the creek's revitalization. In 1994 a group of interested citizens was appointed by DEC as the Eighteenmile Creek Remedial Action Committee (RAC) comprising 15 environmental, industrial, sportsperson, community, and local government representatives. RAC representatives and DEC staff participated in the development of the Eighteenmile Creek RAP. The Committee established the goals for the RAP, mapped out a project workplan, defined responsibilities, and reviewed document drafts. Interested parties who were not represented on the RAC were involved through announcements, newsletters and public meetings held in various communities near the Area of Concern.

The RAP will serve as a guide to coordinate remedial actions on Eighteenmile Creek by various concerned agencies and 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 biennial status reports.

This document summarizes the Eighteenmile Creek RAP. More information about problems and contaminant sources is contained in the full RAP report.





## 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. 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

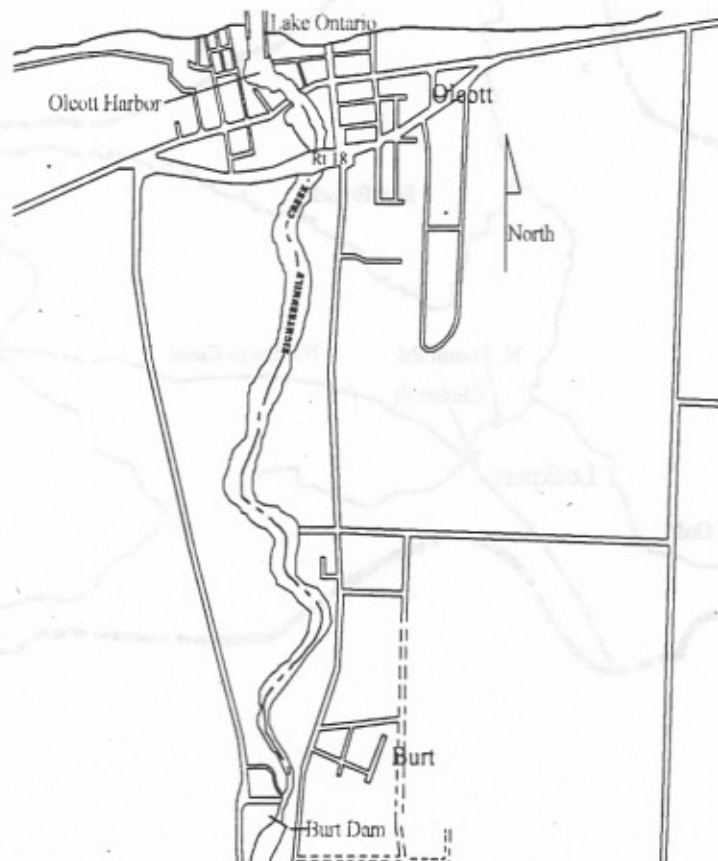
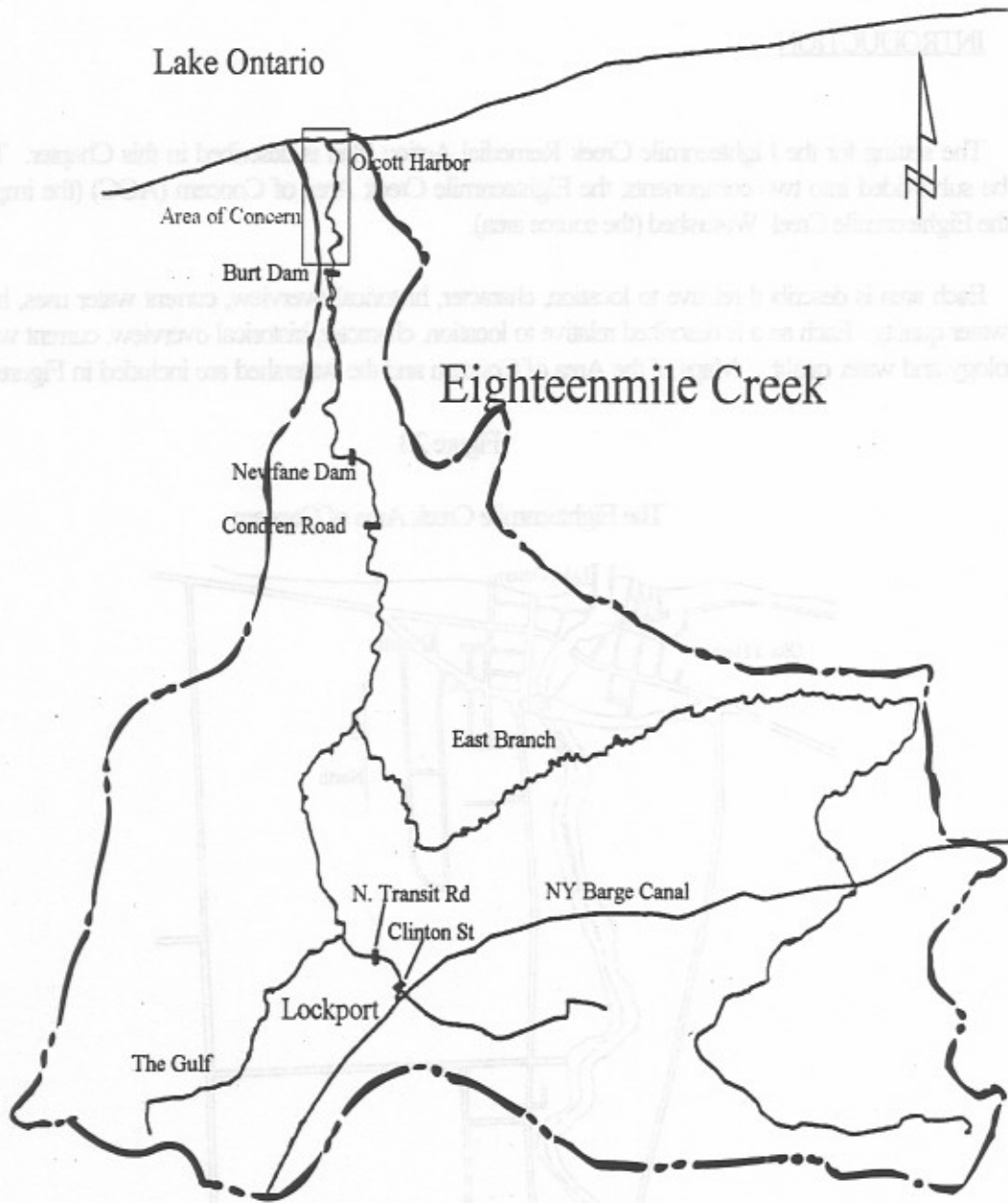


Figure 2.2

The Eighteenmile 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 through Olcott Harbor. The 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 just downstream of a dam located about two miles upstream from the mouth in Burt, New York.

### Current Uses

Sportfishing and recreational boating have been and continue to be important uses of the area. Most of the land bordering Olcott Harbor is occupied by marine-related commercial enterprises with 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. Eighteenmile Creek is also one of the most popular fishing streams on Western Lake Ontario primarily due to major spawning runs for salmonids. A significant coastal wildlife habitat zone also borders the creek between the Route 18 bridge at Olcott and the dam at Burt.

### Hydrology

Olcott harbor has two parallel 861 foot piers at its entrance with a 12 foot deep, 140 foot wide access channel dredged into Lake Ontario. A locally maintained channel continues upstream to the Route 18 bridge.

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 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.

## Eighteenmile Creek Watershed

### General Description

The watershed of Eighteenmile Creek has a total drainage area of about 93 square miles. The entire drainage basin is located within Niagara County. Most of the land in the basin is relatively flat agricultural and rural residential with most of the industry 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 canal the creek flows mainly in a northerly direction.

Approximately one mile downstream from the canal, the creek is joined by The Gulf tributary which originates southwest of the City of Lockport and joins the main stem just north of the City of Lockport's Wastewater Treatment Plant. Delphi Harrison Thermal Systems discharges treated wastewater into The Gulf.

Four miles downstream 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, flows through Mirror Lake on the east end of the Village of Gasport and passes under the NY Barge Canal which supplements its flow with diverted water. The East Branch drains about 43 square miles.

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

#### 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 the Delphi Harrison Thermal Systems. The East Branch receives treated wastewater from the Gasport Sewer District in the Town of Royalton. There are fifteen known inactive waste disposal sites within the Eighteenmile Creek basin of which eleven have been remediated or where remediation was not required.

Eighteenmile Creek is not used as a source of drinking water. The City of Lockport has its own water treatment and distribution system whose main water source is the Niagara River. 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 intermittent streams entering 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.

There are two operating dams on Eighteenmile Creek. One is about two miles south of the mouth of the creek in the Hamlet of Burt. Another is in the Hamlet of Newfane near Ewings Road. A third dam is located in 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 on the main stem and East Branch. The submerged remains of these dams and the Burt, Newfane and 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 the navigation season. 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.



## CHAPTER 3

### THE GOALS

#### INTRODUCTION

The overall goal of the Eighteenmile Creek Remedial Action Plan is to remove conditions that impair beneficial use of the creek in the Area of Concern.

The plan seeks to restore and maintain water quality to provide for contact recreation, and the propagation of fish, shellfish, and wildlife as required by state law. At the same time it will identify additional actions that may be necessary to restore the fourteen beneficial uses identified by the International Joint Commission (IJC). These fourteen beneficial uses (or indicators) are used to measure progress in implementing the RAP.

#### IDENTIFICATION OF GOALS

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

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

Eighteenmile Creek is classified as B from the mouth to the first tributary which enters the creek from the southeast in Olcott. The remaining part of the creek in the Area of Concern is classified C. These classifications which established 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 are used to determine if the RAP goals are being met. These

indicators are, in many cases, the same as New York's best uses. However, in some cases (e.g., restrictions on dredging) they go beyond what New York considers a best use and in other cases (e.g., degradation of benthos), they are indicators of a best use impairment and not a best use itself. All the indicators are used in determining if an impairment requiring remediation exists. The fourteen impairment indicators are:

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 through the Eighteenmile Creek Remedial Action Committee (RAC) working with DEC on the RAP. Their concerns 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 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 in the development of the remedial strategy for the sources identified as 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;

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 through pollution prevention measures.

If technology or cost do not allow 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.



Figure 3.1  
Process for Development of the Eighteenmile Creek RAP



## 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 as they are generally applicable to the consideration of impairments. Biological data are presented as they relate to specific impairment indicators.

#### WATER QUALITY DATA

New York 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 that DEC attempts to meet. Some of the 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. When assessing whether Eighteenmile Creek meets these standards and guidance values, average values of temperature, pH and hardness were utilized from the sampling data reported in the 1990 Rotating Intensive Basin Study (RIBS).

There have been several water quality studies done on Eighteenmile Creek in recent years.

For conventional parameters, the 1990 Rotating Intensive Basin Study (RIBS) showed that the creek is well within most water quality standards. The RIBS (1990) data includes a number of samples taken over a two year period. The average dissolved oxygen for the two years had no samples below the minimum standard. All measurements of pH and ammonia as nitrogen were also within standards. The standard for dissolved solids was exceeded only once. The 1989 mean, 1990 mean and the average of the two years were all below the dissolved solids standard.

The RIBS (1990) 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 was above the standard, however, the 1990 mean and two year average were below the standard. The 1989 mean, 1990 mean and the two year average for iron all exceeded the standard. Iron is abundant in the local rock strata suggesting that the elevated levels in the water column may be of natural origin. The RIBS (1990) report did not list any organic contaminants that exceeded standards or guidance values.

The 1990 Dioxin/Furan Sampling (Estabrooks) included a single water quality sample analyzed for dioxins and furans. This analysis did not detect the presence of 2,3,7,8 - tetrachloro-dibenzo(p)dioxin (2,3,7,8-TCDD) for which the water quality standard is based. It did, however, show the presence of other dioxins and furans.

The 1994 Lake Ontario Tributary Sampling (Litten) and the 1995 PCB Sampling (Litten) employed PISCES and pressure filtration sampling. PISCES are passive samplers which absorb contaminants that are dissolved in the water column. Pressure filtration measures the amount of a contaminant that is attached to suspended sediment particles in the water column. The 1994 Lake Ontario Tributary Sampling and the 1995 PCB Sampling showed every sample exceeding the aquatic water quality standard for PCBs.

The 1994 Lake Ontario Tributary Sampling showed the presence of pesticides in the waters of Eighteenmile Creek. 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 and Endrin were exceeded by the combined sample value for all three and the guidance value for chlordane was exceeded. The suspended solids content of the water was higher on this date than for all other samples collected during the study.

The 1994 Lake Ontario Tributary Sampling used a new analytical technique for mercury sampling which is both more sensitive and accurate than the current commonly used analyses. The 1994 Lake Ontario Tributary sampling showed no exceedances of the water quality guidance value for mercury.

The 1995 Phenols and Chlorinated Benzenes Sampling did not reveal the presence of either of these classes of compounds.

The data from these studies is contained in Appendix A of the full RAP report.

#### 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 their effects 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.

Interim sediment screening guidance was developed by the DEC in 1994 to assess the level of sediment contamination for environmental protection. This guidance provides a set of numeric sediment contaminant levels with which to rank sediments as class A (unpolluted), B (moderately polluted) or C (polluted). Sediment contaminants may lead to acute or chronic toxicity of benthic organisms, bioaccumulation in the food chain or contamination of surface water.

### Sediments in the Area of Concern

The analyses of data from the various studies indicates that, in general, the sediments in the Area of Concern are less contaminated than those upstream of it. They also showed that, in most parts of the Area of Concern, the surface sediments are more contaminated than those in sediment cores taken at the same site.

To varying degrees, the sediments of the Area of Concern exhibit metals contamination. The most recent sediment study (1994 Olcott Harbor Sediment Sampling - Estabrooks et al) showed generally higher metals concentrations in surface samples than in sediment cores except for one site closest to the outlet to Lake Ontario. Except for this site, all the surface samples in the Area of Concern would be rated class C (polluted) under the interim guidance for copper and lead. Corps of Engineers studies identified an area of high metals contamination in a deposition area near the mid-point in Olcott Harbor. Corps of Engineers sampling in this area rate it as class C (polluted) for copper and lead and class B (moderately polluted) for mercury. Corps of Engineers sampling indicates that the sediments between the two piers at the outlet are, generally, less contaminated with metals than upstream samples.

The 1987 Corps of Engineers study analyzed for a number of chlorinated organic compounds including a number of common solvents. This sampling did not indicate the presence of any of these compounds.

The surface sampling in the 1994 Olcott Harbor Sediment Sampling detected the presence of PCB Arochlor mixtures in the Area of Concern. The analytical levels would cause these sites to be rated as class B (moderately polluted) for PCBs. Analyses of the core samples did not detect any PCB Arochlors. The 1987 Corps of Engineers study did not detect any PCBs.

The 1994 Olcott Harbor Sediment Sampling detected the presence of the DDT metabolite DDE in the Area of Concern. All surface samples, except one, contained DDE. The concentrations found would cause the sediments to be classified as class B (moderately polluted) for DDT and metabolites. The 1994 Olcott Harbor Sediment Sampling did not find any other pesticides in Area of Concern. The 1987 Corps of Engineers study did not indicate any pesticides.

The 1994 Olcott Harbor Sediment Sampling indicated a number of polycyclic aromatic hydrocarbons (PAHs) to be present. All of the samples from the Area of Concern contained PAHs. The PAH found at the highest concentration was indeno (1,2,3-cd) pyrene in a surface sample. Two surface samples, one in Olcott Harbor and one above the Rt. 18 bridge would be rated class C (polluted) for benzo(a) anthracene and one sample (below Burt Dam) would be rated class B (moderately polluted) for that substance. The core samples from the Area of Concern, except for one site, indicated benzo(b)fluoranthene to be present. One site, near the outlet of the harbor, contained a greater variety and total concentration of PAHs than the others sites in the Area of Concern.

The cores (but not the surface samples) in the 1994 Olcott Harbor Sediment Sampling were analyzed for dioxins and dibenzofurans. All of the sediment core samples contained dioxins and almost all contained dibenzofurans. 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 one site, which was rated class B (moderately polluted) for dioxins/furans, all sites in the Area of Concern were below the lowest level for dioxins under the NYS sediment guidelines.

## Sediments Upstream of the Area of Concern

Sediment sampling upstream of the Area of Concern showed that these sediments are generally more polluted than those in the Area of Concern. Additionally, there are areas of higher contaminant concentration behind the Burt and Newfane dams. The impoundments behind the dams act as traps for sediments. All of the contaminants found in the Area of Concern are present in higher concentrations behind the dams than at most other locations in the creek. Sediments from the William Street Island and the sediments behind a small dam just downstream of Clinton St. showed elevated PCB concentrations relative to most other sampling locations in the creek. The sediments upstream of the Area of Concern tend to be more contaminated at greater depths, unlike the Area of Concern where surface sediments showed the highest contaminant concentrations.

## 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.

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 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 Health Department guideline concentration.

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.

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.

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 in 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. Quantitative 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. Snatching was a popular method for catching Pacific salmon until it was banned in 1994.

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 4.1. The list reflects sampling activity during the summer and does not fully represent the fish community on a year-round basis. Table 4.2 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. A New York State Department of Health report published in the late 1950s 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.

**Table 4.1**  
**Fish Species Observed and/or Collected in the Eighteenmile Creek Area of Concern**  
**During the 1980's and 1990's**

| Common Name    |                 |                 |                 |
|----------------|-----------------|-----------------|-----------------|
| Alewife        | Carp            | Logperch        | Rock bass       |
| American eel   | Common shiner   | Longnose gar    | Smallmouth bass |
| Black crappie  | Freshwater drum | Muskellunge     | Walleye         |
| Bluegill       | Gizzard shad    | Northern pike   | White bass      |
| Bowfin         | Golden shiner   | Pumpkinseed     | White perch     |
| Brown bullhead | Goldfish        | Rainbow trout   | White sucker    |
| Brown trout    | Largemouth bass | Redhorse sucker | Yellow perch    |

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 4.2 contains a partial listing of the species present within the Area of Concern.

**Table 4.2**  
**Partial Listing of Wildlife 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   | Redwinged blackbird |
| Common yellowthroat | Swamp sparrow       |
| Great blue heron    | Wood duck           |
| Green backed heron  | Mink                |
| Mallard             | Muskrat             |
| Marsh wren          | Raccoon             |



The fish and wildlife habitat in the creek and the estuary 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 unknown.

#### 4. Fish Tumors and Other Deformities

Impairment Status: Unknown

Fish tumors are both an indicator of contaminant stresses in the ecosystem, and an interference with human uses of the resource such as fishing and fish consumption. They may also indicate a health risk, if human carcinogens are present in the flesh of food fish.

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 AOC. 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 fish eating 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. All fish that were analyzed for PCBs exceeded the DEC wildlife criteria. 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. One carp sample exceeded the wildlife criteria for dieldrin. The criteria for 2,3,7,8-tetrachlorodibenzodioxin 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. The 1994 Olcott Harbor Sediment Sampling contained three data sets to evaluate the health of the benthos in Eighteenmile Creek. These are: sediment contaminant concentrations, data from toxicity testing of Eighteenmile Creek sediments and the species makeup of sampling for benthic

organisms. An evaluation of this and other data indicates that the benthos in Eighteenmile Creek is slightly to moderately impaired.

Sediment contaminant concentrations 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 for metals and persistent organic compounds. Under this guidance, the 1994 Olcott Harbor Sediment Sampling indicated that surface samples at three sites in the Area of Concern exceeded the severe impact threshold for copper, lead, nickel and zinc (one site also exceeded the severe impact level for chromium). The top segment of the sediment core taken from Olcott Harbor as part of the 1994 Lake Ontario Tributary Sampling also exceeded the severe impact level for mercury. Sediment concentrations of persistent organic contaminants do not exceed the guideline values for either chronic or acute toxicity with the exception of one site above the Rt 18 bridge which exceeded the PCB guideline value for chronic toxicity.

In addition to contaminant analyses of sediments, the 1994 Olcott Harbor Sediment Sampling included a 10-day survival and growth test and an acute toxicity test of some of the surface sediments on various benthic and non-benthic organisms. The 10-day survival and growth tests indicated a toxic response for one of the organisms tested and a non-toxic response for the other test organism. The growth tests showed that larvae had a toxic response to the sediments from all samples in the Area of Concern. The mortality data for both test organisms did not indicate a toxic response except for one anomalous result (out of two analyses) for one site which may have been caused by leeches in that sample. The acute toxicity tests did not reveal any significant sediment toxicity to either of the two test organisms.

Eighteenmile Creek sediments also exhibited toxicity in Microtox testing. Microtox testing is an automated testing procedure which measures light output from a biofluorescent microorganism to measure the toxicity of a particular substrate. The Eighteenmile Creek sediments tested showed toxicity under this method. 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 toxicity studies, the 1994 Olcott Harbor Sediment Sampling in Eighteenmile Creek also included a sampling and inventory of benthic organisms in the nearshore area of Lake Ontario and at a site above the Rt 18 bridge. The assessment of the number and species diversity of the benthic organisms in the Area of Concern indicates slight to moderate impairment.

Sediment concentrations of organic contaminants do not exceed the guideline values for persistent organic compounds for either chronic or acute toxicity and the mortality and acute toxicity tests did not indicate sediment toxicity. However, the DEC Division of Fish and Wildlife sediment guideline values were exceeded for metals and the growth and Microtox tests did indicate a toxic response. Based on the above, the degradation of benthos indicator is considered to be impaired.

#### 7. Restrictions on Dredging Activities

Impairment Status: Yes

Recreational boating is a beneficial use of Eighteenmile Creek that requires dredging of sediments. The outlet to Lake Ontario is protected by two piers and the navigation channel is periodically dredged by the US Army Corps of Engineers. Other areas in the harbor have been periodically dredged by the Town of Newfane.

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 Pollutational Classification of Great Lakes Harbor Sediments* issued in 1977. In 1994, DEC also developed interim

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

There have been some dredging restrictions placed on Eighteenmile Creek under the EPA guidelines. The area surrounding a Corps of Engineers site located at the mid-point of the harbor was classified as unsuitable for open lake disposal. The sediments from this site were classified as polluted with chromium, copper, lead, manganese, nickel, zinc and cyanides. All dredging spoils from this area must be placed in a land based confined disposal facility. This constitutes an impairment of this indicator. This site would also have dredging restrictions placed on it based on the DEC guidelines.

Other sediment studies had samples that exceeded either the EPA or DEC guidance for one or more contaminants. The 1994 Lake Ontario Tributary Sampling had two samples from Olcott Harbor, one of which exceeded EPA guidelines for mercury (the top nine inches of a core) and the other which exceeded the DEC interim guidance value for 2,3,7,8-TCDD toxicity equivalence. The 1994 Olcott Harbor Sediment Sampling had two sample sites in the harbor area, both of which had contaminant levels which exceed the EPA and DEC criteria for copper, chromium, lead, mercury, nickel, zinc and benzo(a)anthracene. The 1987 DEC Sediment Sampling had one sampling site (mid-way in the harbor) which contained a single core segment (this core was sectioned into fifteen segments) that exceeded the EPA guidelines for copper and zinc.

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 considered impaired.

#### 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.

The Niagara County Health Department performs sampling at Krull Park to ascertain compliance with New York State Department of Health standards for bathing beaches. The last time the beach was closed for exceedance of standards was in August 1972. 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 4.3. 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 problems. Impairments for which the status is unknown due to the absence of data are degradation of fish and wildlife populations, fish tumors and other deformities, 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 4.3**  
**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      |   |

## 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 during the navigation season, 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.

Sampling indicates that the NY Barge Canal is a source of PCBs to Eighteenmile Creek. Water quality sampling done in the canal shows PCB levels above the aquatic water quality standard. While this data shows that the canal water contains PCBs, water quality data from Eighteenmile Creek suggests that a source between Olcott St and N Transit Rd is a more important source of PCBs to the creek. Sediment sampling in the canal also found PCBs located in the Lockport area. Sediment sampling was done on both the Main Stem and East Branch of Eighteenmile Creek at points above and below where the canal discharges to the creek. The analyses showed higher PCB concentrations downstream of the canal for both branches. These observations indicate that the NY Barge Canal is a source of PCBs to the creek.

The 1994 Lake Ontario Tributary Sampling 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, indicated 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.

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 in canal sediments were at its intersection with Main St. This was the closest upstream sample site to the canal's discharge to Eighteenmile Creek. The highest levels are localized in the Lockport area. Sediment samples collected upstream in the canal, West of Lockport, indicated essentially no dioxins or furans to be present. 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. This sediment data indicates that the NY Barge Canal is a source of dioxins and

dibenzofurans to Eighteenmile Creek.

The sediment and water quality data suggests that the canal is a source of PCBs, dioxins and dibenzofurans to the creek. The canal is likely 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 and the City of Lockport and Gasport Sewer District #1 Wastewater Treatment Plants. 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.

#### 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 5.1. A summary of their status is given in Table 5.1 and Figure 5.2.

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:

- 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 it 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.

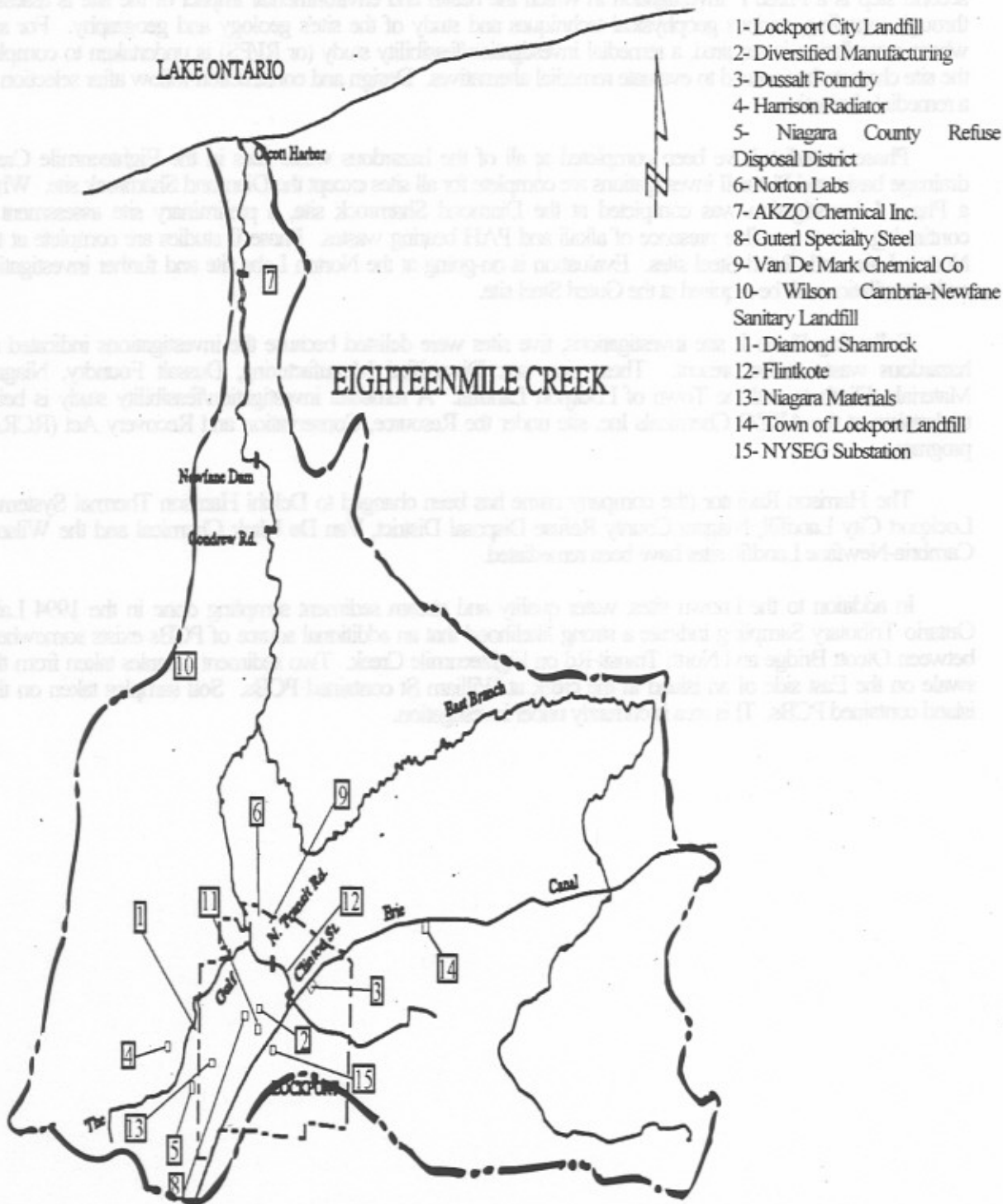
Following Phase II site investigations, five sites were delisted because the investigations indicated no hazardous waste to be present. These sites are: Diversified Manufacturing, Dussalt Foundry, Niagara Materials, Flintkote and the Town of Lockport Landfill. A remedial investigation/feasibility study 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 PCBs. Soil samples taken on the island contained PCBs. This area is currently under investigation.



**Figure 5.1**  
**Locations of Hazardous Waste Sites in the Eighteenmile Creek Drainage Basin**



- 1- Lockport City Landfill
- 2- Diversified Manufacturing
- 3- Dussalt Foundry
- 4- Harrison Radiator
- 5- Niagara County Refuse Disposal District
- 6- Norton Labs
- 7- AKZO Chemical Inc.
- 8- Guterl Specialty Steel
- 9- Van De Mark Chemical Co
- 10- Wilson Cambria-Newfane Sanitary Landfill
- 11- Diamond Shamrock
- 12- Flintkote
- 13- Niagara Materials
- 14- Town of Lockport Landfill
- 15- NYSEG Substation

**Table 5.1  
Summary of the Hazardous Waste Sites in the Eighteenmile Creek Watershed**

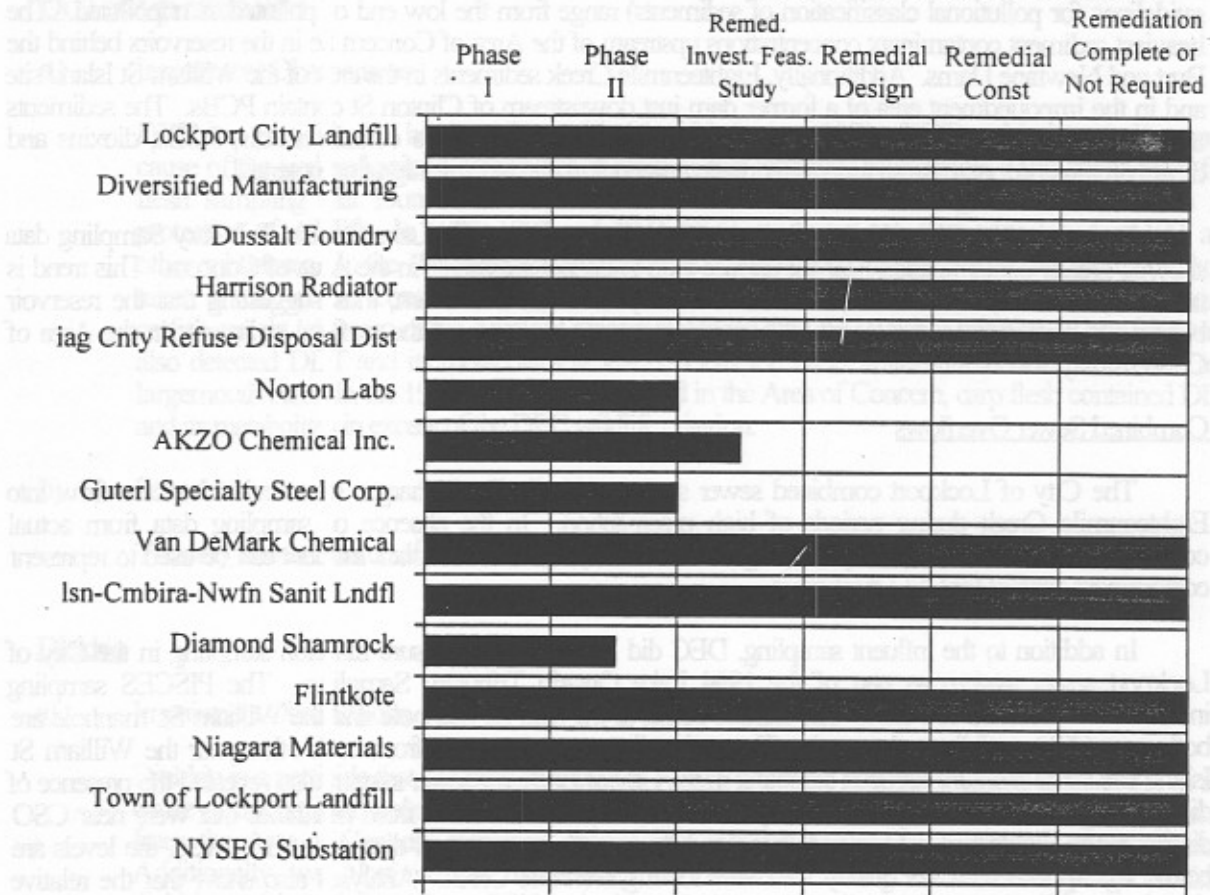
| Site Number | Site Name                               | Site Code | Time in Svce  | Site Size | Status   | Site Contents  | Contaminant migration Concerns  |
|-------------|---|-----------|---------------|-----------|--|--|---|
| 932010      | Lockport City Landfill                  | 4         | 1950s - 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 5.1 (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-present       | 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 5.2**  
**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. 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.

parameter of concern relative to the degradation of benthos. Fish sampling in 1987, 1989 and 1992 detected PCBs. Ten of fifteen fish flesh samples from the creek contained PCBs at levels above the FDA action level. 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, making PCBs a concern relative to the bird and animal deformities or reproductive problems impairment.

b) Sources

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.

### Dioxins and Dibenzofurans

a) 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 for 2,3,7,8 tetrachlorodibenzodioxin and the NYS Department of Health guideline concentration 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 in exceedance of the NYS interim sediment guidance value which would be a concern relative to dredging.

b) Sources

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

### Metals

a) 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.

b) Sources:

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 5.2.

| Impairment                  | Location                        | Priority | Cause | Source                          |
|-----------------------------|---------------------------------|----------|-------|---------------------------------|
| 1. Excessive turbidity      | Station 20 (upstream of bridge) | High     | CSOs  | Station 20 (upstream of bridge) |
| 2. Excessive sediment       | Station 20 (upstream of bridge) | High     | CSOs  | Station 20 (upstream of bridge) |
| 3. Excessive nutrients      | Station 20 (upstream of bridge) | High     | CSOs  | Station 20 (upstream of bridge) |
| 4. Excessive metals         | Station 20 (upstream of bridge) | High     | CSOs  | Station 20 (upstream of bridge) |
| 5. Excessive pathogens      | Station 20 (upstream of bridge) | High     | CSOs  | Station 20 (upstream of bridge) |
| 6. Excessive organic carbon | Station 20 (upstream of bridge) | High     | CSOs  | Station 20 (upstream of bridge) |
| 7. Excessive phosphorus     | Station 20 (upstream of bridge) | High     | CSOs  | Station 20 (upstream of bridge) |
| 8. Excessive nitrogen       | Station 20 (upstream of bridge) | High     | CSOs  | Station 20 (upstream of bridge) |

Table 5.2

**Table 5.2  
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<br>Bottom Sediments | Combined Sewer Overflows<br>Atmospheric Deposition<br>Unknown Source Between Olcott Br and N. Transit Rd |
|   |   |            | dioxins             | Barge Canal<br>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<br>Bottom Sediments | Combined Sewer Overflows<br>Atmospheric Deposition<br>Unknown Source Between Olcott Br and N. Transit Rd |
|   |   |            | DDT and metabolites | Bottom Sediments                |  |
|   |   |            | dioxins             | Barge Canal<br>Bottom Sediments |  |
|   |   |            | dieldrin            | Bottom Sediments                | Inactive Hazardous Waste Sites   |



**Table 5.2 (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<br>Bottom Sediments | Combined Sewer Overflows<br>Atmospheric Deposition<br>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<br>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         |              |                                 |  |



## 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.

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.

Through all the measures above, New York State has in place and exercises the elements of a comprehensive program to control the discharge of toxics to surface water from point sources.

#### 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.

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

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. A Phase I and Phase II site assessment is performed to identify these concerns.

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. 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.

### Bottom Sediments

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

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 contaminants 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 area wide 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 water body 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 the address of 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.

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.

DEC is now in 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

### 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.

Phase 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 sites 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 Street 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 7.0**  
**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 to complete the implementation of this strategy 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, annual dates for completion and responsible agencies is shown in Table 8.1. A more detailed description 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 macroinvertebrate sampling for both chemical contamination and species diversity. Eighteenmile Creek will be included as a RIBS site every five to six years.

###### 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.

## 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.

### 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.

## 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.

## 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.

### 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.

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.

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

Collect soil and sediment samples from 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 the William Street Island has found PCBs. DEC will investigate this site to determine if it is a source of PCBs to the creek.

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.

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.

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.

G. Fish and Wildlife

1. Contaminant Monitoring in Fish

Develop a plan for contaminant monitoring in fish.

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

2. Fish, Wildlife & 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 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.

**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 and<br>NYS Canal Corp. |
| D.        | Inactive Hazardous Waste Sites  |                 |                            |
|           | 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. Contaminant Monitoring in Fish                   | 1997            | DEC                |
|           | 2. Fish and Wildlife Population Plankton Study Plan | 1997            | DEC                |
|           | 3. Fish Tumor Study Plan                            | 1997            | DEC                |
|           | 4. Plankton Study Plan                              | 1997            | DEC                |



## CHAPTER NINE

### TRACKING EIGHTEENMILE RAP IMPLEMENTATION

Tracking progress in implementing the RAP will have three components: (1) public participation; particularly through an advisory committee; (2) progress reports and workplans and (3) periodic plan updates and revisions.

DEC will appoint a twelve member committee in 1997 to advise and assist in implementing the RAP and producing reports and plan updates. The Remedial Advisory Committee (RAC) members will represent elected and appointed government officials, public and economic interest groups and private citizens interested in Eighteenmile Creek. In addition to RAC members, agencies at all levels of government will be asked to participate and provide input in RAP implementation as needed.

The RAC will meet with DEC at least three times a year to advise on RAP amendments, recommend RAP revisions where needed and discuss topics relevant to the RAP including agency commitments, availability of federal funds, input for reports and future RAC involvement in building support for the remedial process.

As part of tracking implementation of the Eighteenmile Creek RAP, DEC will produce progress reports and workplans. The reports will respond to public priorities and incorporate the discovery of new information.

As new information during investigation and changes occur in land use and the use of the creek itself, there will be a need to update the RAP. DEC will consult with the RAC on the need for updating. DEC will work with the RAC to prepare revisions, review them with the public and submit the revisions to the IJC as required.



## CHAPTER TEN

### 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 Action 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 PROCESS

The public participation process in the development of the Eighteenmile Creek RAP involved interaction of DEC with the RAC and RAC sponsored public outreach activities. The RAC has been meeting monthly since 1994. They have been involved in gathering information on uses of the creek, impairments, and pollution sources. They have also provided input and comments on the draft RAP document. In addition to these activities, the RAC has organized a number of public outreach activities including:

1. 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.
2. 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.
3. Niagara County Fair - The RAC set up a booth at the Fair (August 1995) with informational

materials, a display board and the RAP video.

4. RAP Video - An educational video on the RAP was produced.
5. 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.
6. RAP public Meeting - The RAC held a public informational meeting on April 11, 1996. The meeting included general background information on the RAP and the RAP process and a summary of the draft impairment assessments and their causes. Group discussions followed the presentations.
7. Public workshops to review the draft RAP were held prior to a public meeting to receive comments on the draft RAP.

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

### THE PUBLIC PARTICIPATION PROCESS

The public participation process in the development of the Remedial Action Plan (RAP) involved the participation of DEC, the RAC and RAC members. The RAC has been instrumental in providing information on the draft RAP to the public. They have also provided input and comments on the draft RAP. In addition to these activities, the RAC has organized a number of public outreach activities.

1. Meetings to provide information to the public - A presentation of RAP information to the public was held at the New York Power Authority County Park during the Spring of 1995.
2. Meetings to provide information to the public - A meeting was held on the RAP with a presentation by the RAC members on a public access cable TV show during the Spring of 1995. The segment was broadcast several times during the Spring and Summer of 1995.
3. Meetings to provide information to the public - The RAC set up a booth at the Fair (August 1995) with informational materials.

## GLOSSARY

Aquatic - Growing, living in or dependent on water.

Area of Concern - An area recognized by the International Joint Commission where the objectives of the Great Lakes Water Quality Agreement are not being met.

Armoring - A protective coating of cobbles, boulders or concrete on exposed sediments to prevent their erosion and transport.

Atmospheric deposition - Pollution from the atmosphere associated with dry deposition in the form of dust, wet deposition in the form of rain or snow, or as the result of vapor exchanges.

Benthos - The plant and animal community at the bottom of a river, lake or stream.

Bioaccumulate - The process of accumulation and concentration of a chemical from the environment in the flesh of living organisms.

Biomonitoring - The use of organisms (such as fish or mussels) to evaluate environmental conditions.

BOD - Biological Oxygen Demand. This is a measure of how much dissolved oxygen in a water sample will be consumed over a period of time by bacteria digesting organic matter in the water. (Note: some BOD is present and necessary in all waters from natural sources).

Dibenzofurans - A class of synthetic chemicals similar in structure to dioxins which are toxic and persistent.

Dioxins - A class of synthetic chemicals which are toxic and persistent.

Drainage Basin - A waterbody and the land area that drains into it.

Ecosystem - A living system made up of interacting plants, animals and bacteria together with their physical and chemical environment.

Ecosystem approach - A way of looking at environmental problems or solutions based on the boundaries of ecosystems rather than on political (e.g. country or city) boundaries.

Effluent - Waste water discharged from wastewater treatment plants.

Great Lakes Water Quality Agreement (GLWQA) - Agreement between the United States and Canada to restore and maintain the chemical, physical and biological integrity of the Great Lakes.

Habitat - The place where a particular type of animal or plant lives. An organism's habitat must provide all of the basic requirements for its life.

Hazardous waste - Any substance that is a by-product of society and is classified as potentially harmful to human health or the environment. Hazardous wastes are subject to special handling, shipping and disposal requirements under the law.

Hazardous waste site - A land disposal site for hazardous wastes.

