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MAUMEE RIVER BASIN
AREA OF CONCERN
REMEDIAL ACTION PLAN

Volume 4
Recommendations for Implementation

Maumee River
REMEDIAL ACTION PLAN

Toledo Metropolitan Area
Council of Governments
123 N. Michigan Street
Toledo, OH 43624-1996
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TOLEDO METROPOLITAN AREA
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PREFACE

The *Remedial Action Plan* (RAP) goal is fishable and swimmable waters with zero discharge of persistent toxic pollutants. The intent is for remediation, but not to be punitive.

The Maumee Area of Concern (AOC) is the area along the Maumee River from the site of the Bowling Green water intake to and including Maumee Bay at the southwestern corner of Lake Erie. Included in the AOC are those tributaries in Lucas, Ottawa and Wood Counties that drain into these waters. Principal among these are Swan Creek, the Ottawa River (Ten Mile Creek), Duck Creek, Otter Creek, Cedar Creek, Grassy Creek and Crane Creek.

To guide the preparation of the RAP, eight subcommittees of the RAP Advisory Committee were established. Dealing with sources of pollutants were the following subcommittees: Agricultural Runoff, Public & Industrial Dischargers, Landfills & Dumps, Harbor Dredging, and Home Sewage Disposal. Subcommittees oriented toward the use of our streams and public involvement included: Water Quality/Water Uses, Fish & Wildlife, and Education.

These subcommittees met steadily, developing, preparing and refining the recommendations. The Steering Committee, made up of the chairman of all the subcommittees and the chairman of the RAP Advisory Committee, was the directional guide of the overall process. The Steering Committee met monthly throughout the process. It was determined early on that all problems that might arise must be resolved within each of the subcommittees. If any problem couldn't be resolved at this level, then the Steering Committee had to resolve the issue. To the credit of each subcommittee, no problems were referred to the Steering Committee.

The RAP Recommendations Report consists of six chapters. First, is the environmental data base discussing the background, current conditions and specific conditions, including impairment of beneficial uses. The water resources impaired include drinking water, sport fishing, shipping and recreation. The natural areas impacted include waterfowl habitat, fish community and Lake Erie eutrophication.

Chapter 2 is the ecosystem approach which includes the RAP goals which are based on the Great Lakes Water Quality Agreement. The water quality and habitat objectives for **desired future state** are presented. To restore beneficial uses, a major focus is on recommendations to develop management plans for habitat acquisition, on control of pollutant discharges, on monitoring, and on public education and participation. To balance and allow for competing uses, management plans are recommended for fisheries and wildlife, for wetlands and open space preservation, and for recreational usage and public access.

Chapter 3 deals with the Maumee River and its tributaries and with the smaller streams flowing to the north and south Maumee Bay areas, including recommendations for the thirteen pollutant sources identified in the *Investigation Report*. These pollutant sources include: Publicly-Operated Treatment Works; Combined Sewer Overflows; Industrial Dischargers; Urban Runoff; Agricultural Runoff; Contaminated Stream Sediments; Dredged Disposal; Package Plants; Home Sewage Disposal; Landfills and Dumps; Leaking Underground Storage Tanks; Atmospheric Deposition; and Water Treatment Plant Sludge.

Chapter 4 presents the recommendations for these same thirteen pollutant sources for the Swan Creek watershed, with Chapter 5 addressing recommendations for the Ottawa River watershed, and Chapter 6 including recommendations for the tributaries which flow directly into Lake Erie.

The estimated cost of implementing the proposed recommendations is, for capital costs, from $396 to $724 million, with an estimated annual cost of $1.8 million. Not included are recommendations for remedying the problem of contaminated sediments. Currently the data base is not adequate to characterize the problem. Thus, remediation measures cannot be proposed. One objective of the recommended monitoring and implementation program is to provide a data base sufficient to define remedies for this problem.

Currently, there are several ongoing programs pursuing the goals of the RAP. The City of Toledo is constructing pipeline storage to reduce overflows from combined sewers for downtown area on the west side of the Maumee River and for Swan Creek. TMACOG and Clear Water, Inc. have begun an educational program in the secondary schools, involving stream monitoring and a student congress to present and discuss results. Citizens have initiated stream clean-up programs on the Maumee River, Swan Creek and the Ottawa River. To some degree these activities are spinoffs from the RAP process.

Every opportunity has been taken to involve the public in the RAP process. Our "pollutant source" subcommittees include the problem dischargers. Members of the RAP subcommittees have appeared on local television and radio many times to tell the public about the RAP. Numerous articles have appeared in local magazines and newspapers and talks have been given to concerned groups.

The RAP Newsletter is providing outreach, with circulation over 4,000, and invites citizens to get involved. The newsletter's message: what our problems are, who's acting to solve them, how they will benefit our streams and their use, and who will pay.

Future work will center around securing funding and participation in the RAP implementation process. Crucial in this will be education of citizens and providing them with information so that they become convinced that remediation is possible and probable.

Restoring beneficial uses in the Maumee AOC will require the efforts, cooperation and resources of many. Few argue that the AOC is without problems. However, many view these problems as insolvable or if perceived as capable of remediation then seen as too costly. The impetuous provided by designation of AOCs and the RAP's call for requirement for restoration of beneficial uses has greatly helped dispel the notion that remediation is impossible or improbable, creating hope that the RAP's goal of fishable and swimmable waters will be achieved.

A composite cost summary follows which displays the capital investment needed to support the remediation of the Maumee AOC. This could be termed as a "shopping list" of needed actions. This cost summary is repeated with each chapter. With each recommendation for action, there is included a brief description of the problem, who should act?, estimated cost, potential funding source, and time line for implementation. Each are instructive and can stand alone.

The RAP recommendations build on an agreed goal to restore the water resources of the AOC to a fishable and swimmable condition. This goal underlies the objectives of the report.

Maumee RAP Recommendations Cost Summary

Sec.	Item	CAPITAL COSTS Low	High	Median	Annual	Other
2	***ECOSYSTEM APPROACH FOR BASINWIDE PROGRAMS***					
2.3.1	Comprehensive Fisheries Management Plan Funded by responsible agency as part of day to day operating costs.					
2.3.2	Comprehensive Wildlife Habitat Management Plan Funded by responsible agency as part of day to day operating costs.					
2.3.3	Acquisition of fish and wildlife habitats	$2,800,000	$2,800,000	$2,800,000		
2.3.4	Wetlands and open space preservation Mitigation costs borne by real estate developers and passed on to buyers/users.					
2.3.5	Control of introduced species Costs borne by responsible agencies.					
2.3.6	404 and 401 education - per session costs					$1,500
2.3.7	Mosquito control				$100	
2.3.8	Long-term monitoring of AOC				$250,000	
2.3.9	Recreational usage and public access	$40,000	$400,000	$220,000		
2.3.10	Coordinating committee & institutional framework	$20,000	$20,000	$20,000	$100,000	
2.3.11	Increased public participation and awareness				$100,000	
2	*Total - Ecosystem approach*	$2,860,000	$3,220,000	$3,040,000	$450,100	$1,500
3	***MAUMEE RIVER AND BAY POLLUTANT SOURCES***					
3.1	Publicly-operated treatment works					
3.1.1	City of Toledo	$1,000,000	$5,000,000	$3,000,000		
3.1.2	City of Perrysburg	$6,200,000	$6,200,000	$6,200,000		
3.1.3	City of Oregon	$4,000,000	$4,000,000	$4,000,000		
3.1.4	Lucas County					
	Construction	$5,176,000	$9,429,000	$7,302,500		
	Sludge Handling	$2,465,000	$2,465,000	$2,465,000		
3.2	Combined Sewer Overflows					
	City of Toledo					
	Maumee East					
	Storage	$2,300,000	$55,250,000	$28,775,000		
	Treatment	$5,310,000	$10,615,000	$7,962,500		
	Downtown					
	Storage	$12,500,000	$12,500,000	$12,500,000		
	Treatment	$4,225,000	$28,830,000	$16,527,500		
	Maumee West					
	Storage	$16,650,000	$81,905,000	$49,277,500		
	Treatment	$8,107,000	$36,905,000	$22,506,000		
	City of Maumee	$3,600,000	$3,600,000	$3,600,000		
	City of Perrysburg	$10,000,000	$11,000,000	$10,500,000		
3.3	Industrial Dischargers					
3.3.1	Conrail - Emerald Ave.	Unknown				
3.3.2	Libbey-Owens-Ford					
	East Toledo	$1,758,000	$1,758,000	$1,758,000		
	Rossford	$102,000	$102,000	$102,000		
3.3.3	BP Oil	Unknown				
3.3.4	Sun Oil Co.	$20,000,000	$20,000,000	$20,000,000		
3.4	Urban Runoff					
	City of Toledo	$600,000	$600,000	$600,000		
	Sylvania, Maumee, Perrysburg, Rossford, and Oregon	$600,000	$600,000	$600,000		
3.5	Agricultural Runoff				$1,750,000	
3.6	Contaminated stream sediments					
	Office set-up	$15,000	$15,000	$15,000		
3.7	Dredge disposal	$12,000,000	$35,000,000	$23,500,000		
3.8	Package Plants				$7,750	
3.9	Home sewage disposal - user fee annually				$500,000	
3.10	Landfills and Dumps: Over	$100,000,000	$100,000,000	$100,000,000		
3.11	Leaking Underground storage tanks monitoring				$15,000	
3.12	Atmospheric Deposition	$3,000,000	$5,000,000	$4,000,000		
3.13	Water Treatment Plant Sludge No additional cost beyond those assumed by local municipalities					
3	*Total - Maumee River and Bay Sources*	$219,608,000	$430,774,000	$325,191,000	$2,272,750	$0

Sec.	Item	CAPITAL COSTS				
		Low	High	Median	Annual	Other
4	***SWAN CREEK WATERSHED POLLUTANT SOURCES***					
4.1	Publicly-operated Treatment Works	none				
4.2	Combined Sewer Overflows					
	City of Toledo	$31,000,000	$31,000,000	$31,000,000		
	Village of Swanton	Unknown				
	Village of Whitehouse	Unknown				
4.3	Industrial Dischargers	None				
4.4	Urban Runoff	See 3.4				
4.5	Agricultural Runoff	See 3.5				
4.6	Contaminated Stream Sediments	See 3.6				
4.7	Dredged Disposal	$940,000	$940,000	$940,000		
4.8	Package Plants				$6,750	
4.9	Home Sewage Disposal	See 3.9				
4.10	Landfills and Dumps	Unknown				
4.11	Leaking Underground Storage Tanks	See 3.11				
4.12	Atmospheric Deposition	See 3.12				
4.13	Water Treatment Plant Sludge	Unknown				
4	*Total Swan Creek Pollutant Sources*	$31,940,000	$31,940,000	$31,940,000	$6,750	$0
5	***OTTAWA RIVER WATERSHED POLLUTANT SOURCES***					
5.1	Publicly-operated Treatment Works	None				
5.2	Combined Sewer Overflows					
	City of Toledo					
	Storage	$1,090,000	$41,500,000	$21,295,000		
	Treatment	$30,900,000	$106,800,000	$68,850,000		
5.30	Industrial Dischargers					
	General Mills	Unknown				
	Doehler Jarvis Plant #2	Unknown				
5.4	Urban Runoff	See 3.4				
5.5	Agricultural Runoff	See 3.5				
5.6	Contaminated Stream Sediments	See 3.6				
5.7	Dredged Disposal	$10,000,000	$10,000,000	$10,000,000		
5.8	Package Plants				$8,750	
5.9	Home Sewage Disposal	See 3.9				
5.10	Landfills and Dumps	$100,000,000	$100,000,000	$100,000,000		
5.11	Leaking Underground Storage Tanks	See 3.11				
5.12	Atmospheric Deposition	See 3.12				
5.13	Water Treatment Plant Sludge	None				
5	*Total Ottawa River Watershed Sources*	$141,990,000	$258,300,000	$200,145,000	$8,750	$0
6	***DIRECT TRIBUTARIES TO LAKE ERIE - POLLUTANT SOURCES***					
6.1	Publicly-operated Treatment Works	None				
6.2	Combined Sewer Overflows	None				
6.3	Industrial Dischargers					
	Conrail - Stanley Yards	Unknown				
6.4	Urban Runoff	See 3.4				
6.5	Agricultural Runoff	See 3.5				
6.6	Contaminated Stream Sediments	See 3.6				
6.7	Dredged Disposal	None				
6.8	Package Plants				$8,250	
6.9	Home Sewage Disposal	See 3.9				
6.10	Landfills and Dumps	Unknown				
6.11	Leaking Underground Storage Tanks	See 3.11				
6.12	Atmospheric Deposition	See 3.12				
6.13	Water Treatment Plant Sludge	None				
6	*Total - Lake Erie Direct Tributaries Sources*	$0	$0	$0	$8,250	$0
	Grand Totals	$396,398,000	$724,234,000	$560,316,000	$2,746,600	$1,500

TABLE OF CONTENTS

1.0 ENVIRONMENTAL DATA BASE

1.1 BACKGROUND.

Lake Erie was the last of the Great Lakes to be discovered by Europeans and the Maumee basin was one of the last areas around Lake Erie to be settled. "The Maumee lake plain, on which Toledo is located, was once a part of a vast swamp known as the Great Black Swamp, which was drained, canalized, and deforested during the past 140 years for agricultural development." (Pinsak and Meyer, 1976, p.11). In 1887 Maumee Bay was believed to be the most prolific fish spawning ground in Lake Erie (Pinsak and Meyer, 1976).

1.1.1 The Early Years. The Black Swamp area contained a fish fauna dominated by species requiring a habitat with rooted aquatic vegetation and with water almost entirely free of clayey silts and that contained aquatic vegetation (Trautman, 1981). Scott in 1793 described the Maumee River near Grand Rapids as "near 600 yards wide and near the head of the rapids it resembles a meadow flooded over." Further downstream he described it as looking "like a flooded meadow with long grass entirely across." (Trautman, 1981, p.16).

In 1815, Samuel Brown, an officer with General Harrison, described Maumee Bay as being similar to Sandusky Bay in resembling a little lake and that "within the bosom of this bay grow several thousand acres of follie avoine (wild rice)." (Trautman, 1981, p.16). He commented that "the quantity of fish at the rapids (Grand Rapids) is almost incredible..... So numerous are they at this place that a spear may be thrown at random, and will rarely miss killing one!..... Some days there were not less than 1,000 taken with the hook within a short distance of the fort, and of an excellent quality..... The river, Swan Creek (in downtown Toledo), and the shoals of the bay, swarm with ducks, geese, etc. The woods are filled with deer, elk and wild turkeys." (Horowitz, et al. 1975, p.19).

In 1850, due to the effects of dams, over fishing, and pollution, Kirtland was able to observe that "still greater changes, if possible, have occurred with the finny tribes. The sturgeon has nearly forsaken this (south) shore of Lake (Erie); the muskellunge has become scarce, and no longer seeks the mouth of the rivers to deposit its spawn." (Trautman, 1981, p.19). Trautman writes (1981, p.20) that "Except for white-tailed deer and those mammals extirpated prior to 1850, all of the large fur bearers such as the river otter, "varmints" such as the bobcat, and the larger game such as the black bear were extirpated or reduced to an occasional stray during this period. Some white-tailed deer still remained in the Black Swamp (Fisher, Klippart, Cummings, 1878:65)." "This period saw a steady annual increase in the number of miles of streams which were ditched. In 1850, the Black Swamp of northwestern Ohio, which was about 120 miles (193 km) long and averaged 40 miles (64 km) wide, was still undrained except for isolated areas about its periphery. Shortly after 1850, ditching and draining activities greatly increased so that by 1875 much of the swamp had been drained." By 1900 most of the great swamp was gone.

Between 1844 and 1970 the southern shoreline of Maumee Bay had retreated 2,000 feet. In 1976, the average depth of Maumee Bay was 2 feet less than in 1844, and the reduction has been attributed to deposition of sediments from culturally induced processes (Pinsak and Meyer, 1976). "The shallow depths, wind and wave activity tend to sustain high background turbidity in the Bay." (Pinsak and Meyer, 1976, p.31).

1.1.2 The Transitional Years. By 1927-28 pollution at the mouth of Maumee Bay was an acute fishery problem but the Bay, beyond a few miles, was not yet greatly affected. "Maumee Bay was the most polluted area in the western basin and contained the most phytoplankton due to the large nutrient load from the Maumee River during 1928-30 (Wright, 1955)." (Pinsak and Meyer, 1976, p.87).

Valuable clear water fish began to be superseded in the Bay by species more tolerant of low dissolved oxygen and turbidity. Phenol and industrial wastes in 1930 had not yet affected algae and crustacea. Large beds of aquatic vegetation were present in the Maumee River until about 1950, after which only small remnants remained (Trautman, 1981).

Maumee Bay may have the highest productivity in the Great Lakes based on chlorophyll content of the water. The Maumee Bay is very eutrophic by Sakamoto's standards. "Phytoplankton standing crops, as measured by chlorophyll a, were higher in Maumee Bay than either Lake Erie or the Maumee River. This is a consequence of the mixing of these waters in a shallow ecosystem" (Fraleigh, 1979, p.213).

Rotifers and copepod nauplii were the dominant zooplankton in Maumee Bay in 1930, decreasing in abundance lakeward. The high zooplankton density indicated an enriched condition. Between 1963 and 1972 rotifers decreased and cladocera and copepods increased during the same period.

Prior to 1953 the dominant organism in the mud bottom of western Lake Erie was the mayfly *Hexagenia*. After 1953 they declined from an average of 400 larvae per square meter to virtually none by 1965 (Trautman, 1981). This was due to eutrophication which became extreme during the 1960s.

Other problems in Maumee Bay that may be affecting the fishery include: increased predation on fry due to lack of marshy areas for protection, and sand and gravel removal from the Bay causing reduced spawning (Pinsak and Meyer, 1976). Also, the thermal discharge from the Toledo Edison power plant was suspected of causing premature spawning, an increase in carp and goldfish, diversion of fish migration, unnatural feeding habits in fish, thermal stress, and killing of zooplankton (Pinsak and Meyer, 1976). Figure 1.1 on the following page displays the possible locations of spawning areas for the Maumee Bay.

Construction of the diked confined disposal facility (CDF) at the river mouth east of the channel caused the following impacts to the fishery: eliminated 2% of Maumee Bay spawning and rearing grounds; eliminated 242 acres of plankton producing waters (and benthic organisms); obstructed fish movement from the Bay to the River; exacerbated the effect of Toledo Edison's plume; the steep angle of the dike walls aren't conducive to walleye and white bass spawning.

Pinsak and Meyer (1976) and Carl Baker of the Division of Wildlife, Ohio Department of Natural Resources, believed that because of the tremendous silt load and high turbidity in the Bay, the presence of substantial spawning grounds in Maumee Bay has been unlikely. Russel Scholl of the Great Lakes Fishery Commission (1975) made a similar observation. Several commercial fishermen had taken an opposite view because of high fish catches in certain areas. Until 1976 fish eggs had not been studied in Maumee Bay to try to determine the existence of spawning beds (Pinsak and Meyer, 1976). In 1977 Fraleigh and Frank put out egg trees which showed walleye spawning adjacent to the navigation channel in Maumee Bay, near the CDF walls, and in the east bay.

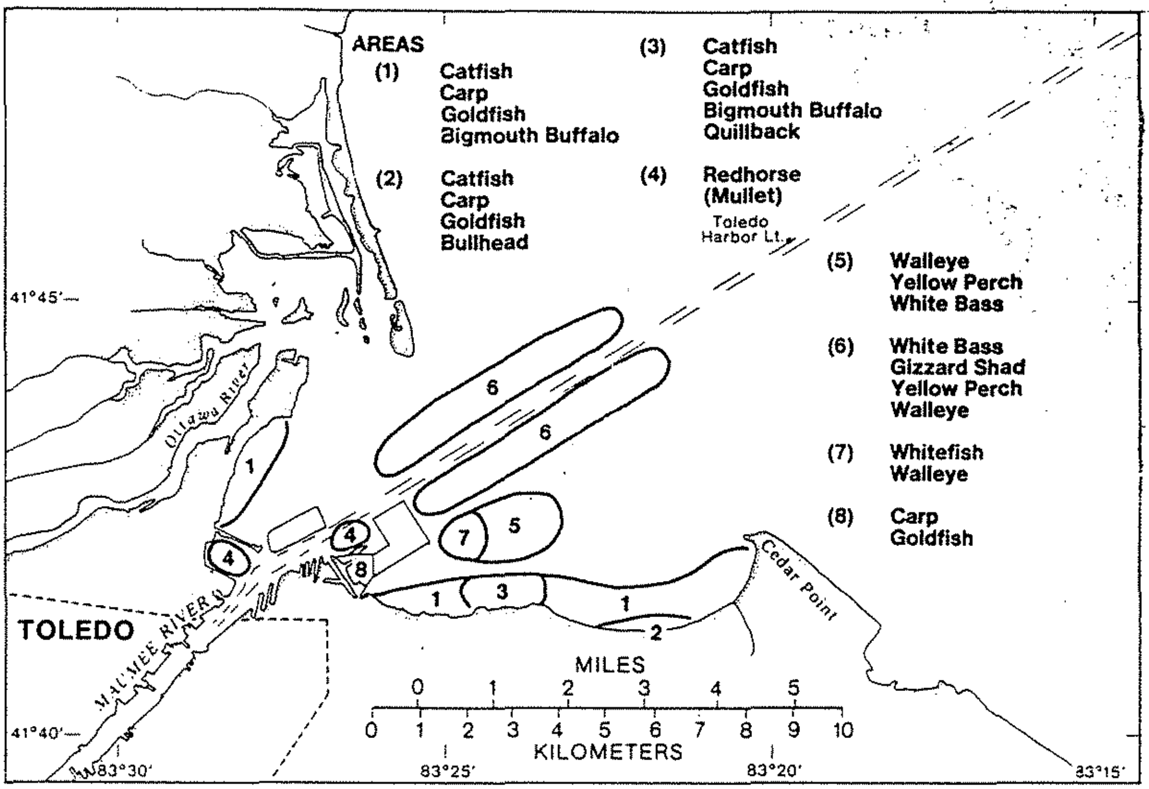

Figure 1.1 Possible locations of spawning areas in Maumee Bay.
(Taken from Pinsak and Meyer, 1976, page 95.)

1.1.3 Decline of Fish Species. The decline of the following fish species in Lake Erie and the Maumee River system was described by Trautman (1981):

1. Sturgeon

Prior to 1950 the lake sturgeon was abundant in Lake Erie waters. The Auglaize River and tributaries were favored spawning areas before 1880. "The Ottawa River in Putnam County was a particularly favored spawning stream" (Trautman, 1981, p.169). During corn planting in May and June, farmers would carry spears to catch sturgeon when they heard them splash in the river while spawning. In 1891 Smith and Snell (1891) reported a decrease of sturgeon in the Maumee River, "Sturgeon once ran up the river by hundreds as far as the rapids above Perrysburg, but at present (1885).... are absent" (Trautman, 1981, p.169). Kirsch (1895) mentioned that sturgeon were formerly very abundant in the Maumee River near Waterville. The decline of the sturgeon was caused by dams blocking access to the spawning grounds; destruction of spawning habitat by silt, pollution and drainage; destruction of mussels and gastropods in streams and Lake Erie; and possible overfishing (Trautman, 1981).

2. Lake Whitefish

"Until 1890 whitefishes spawned in the Detroit River and Maumee Bay....about 1900 the ever increasing silt load of the Maumee River began smothering the Maumee Bay spawning areas, causing the annual take in Maumee Bay to decline until by 1918 only 10 to 20 whitefishes were taken daily by such commercial fishermen as Cameron King and his father." (Trautman, 1981, p.238). Since 1940 only an occasional whitefish has been taken (Trautman, 1981).

3. Grass Pickerel

Kirsch (1895) said that the grass pickerel was "common throughout the Maumee basin" (Trautman, 1981, p.247). By 1925 it was no longer common and continued to decrease from 1925-40 after which it was rare. Trautman (1981) linked its decline to ditching, dredging and other forms of channelization which are common in the Maumee River drainage. Recent sampling indicates that they are increasing.

4. Northern Pike

Northern pike was abundant in Lake Erie waters prior to 1900. In 1900, one net in Maumee Bay took around 2,200 pounds. By 1945 the total catch for all of Lake Erie was only 3,764 pounds. Trautman attributed decline after 1900 to an inability to reach spawning grounds because of dams and polluted water; ditching, draining and diking of streams and marshes; turbidity and siltation which had eliminated aquatic vegetation; and overfishing. In the period from 1955 to 1980 Trautman said that the Tiffin River was the most successful spawning stream. He warned that the U.S. Soil Conservation Service had plans to channelize the Tiffin River reach having the best pike water, thereby eliminating this fish from those waters (Trautman, 1981).

5. Great Lakes Muskellunge

Trautman said this was one of the first fishes in Ohio to show a decrease in abundance. By 1895 it had declined from its former abundance in the Maumee River and was decreasing in Lake Erie. Between 1902 and 1905 up to 100 muskellunge per day were taken in Maumee Bay by Cameron King (Trautman, 1981). By 1950 it was in danger of extirpation. "Formerly the clear streams of the Maumee system were particularly suited for spawning purposes for these low gradient streams widely overflowed their banks in spring, submerging prairie and swamp forest vegetation and producing favorable conditions for deposition of eggs and growth of fry." (Trautman, 1981, p.255). Muskellunge habitat has been almost completely destroyed by agricultural practices: ditching of streams; isolating marshes from Lake Erie by diking; turbidity and siltation in streams and bays; pollution; dams; and elimination of vegetated overflow areas (Trautman, 1981).

<u>1.1.4 Causes of the Decline</u>. Pinsak and Meyer (1976) gave the causes for the decline or extirpation of some fish species in Maumee Bay as:

1.	sturgeon northern pike	:inability of fish to reach spawning ground
2.	mooneye Great Lakes muskellunge stonecat madtom northern smallmouth blackbass yellow walleye yellow perch	:increase in turbidity siltation and industrial waste
3.	whitefish	:smothering of spawning grounds by siltation

Yellow walleye and yellow perch have improved and now appear to have rehabilitated.

Pinsak and Meyer, 1976, believed that the largest detrimental effect on the fisheries of Maumee Bay came from the finely particulate sediment load carried by the Maumee River into the bay. In ponds, hatcheries and reservoirs, maximum fish productions were shown by Buck (1956) to occur at turbidities less than 25 Jackson Turbidity Units (JTU) (Pinsak and Meyer, 1976). Turbidities between 25 and 100 JTU reduce fish production 40% and turbidities over 100 JTU reduce fish production 90% and simultaneously reduce plankton production (Pinsak and Meyer, 1976, p.98). In March 1975, turbidities in Maumee Bay ranged from 50 to 130 JTU (Herdendorf and Cooper, 1975, p.238). Other data in Herdendorf and Cooper (1975) for 11 dates (June through November) from 1970 to 1972 gave an average turbidity of 37.2 JTU for 3 stations in Maumee Bay, the highest reading was 150 JTU. High turbidities and siltation have also reduced the abundance of aquatic vegetation and the refugium this provides for young fish.

1.1.5 Avian Flyways. Three-fourths of all North American bird species are dependent on wetlands at some time in their life cycle. Branches of both the Atlantic and Mississippi flyways pass over the western end of Lake Erie and large numbers of waterfowl (tundra swan, geese and duck) migrate through the Toledo area. The waters of Maumee Bay, national wildlife refuge at Little Cedar Point and Ottawa, and state wildlife areas of Metzger Marsh and Magee Marsh provide the majority of remaining habitat available to migrating waterfowl. While peak numbers of waterfowl may reach over 100,000 during migration the remaining wetland habitat is also important to production with Canada geese, mallard, black duck, blue-winged teal, and wood duck the most common species of nesting waterfowl.

Maumee Bay was extensively used as a resting and feeding area for diving ducks (redhead, scaup and canvasback) prior to the loss of aquatic vegetation. "Dependence of migratory waterfowl on macrophytes was demonstrated in Rondeau Bay (Lake Erie) by a dramatic drop in their numbers after a die-off of plants had occurred (Dennis et al. 1984, Prince 1985)", (Crowder and Bristow, 1988). Average peak use during fall migration during the 1980's was 5000 diving ducks. A massive buildup was documented in 1989 with a peak of 38,500. This may have been a one time phenomenon or a response to a new food source in the zebra mussel.

Sporadic occurrences of Avian Botulism have been documented at the dredge fill basin in Maumee Bay. The worst outbreak was the fall of 1980 when an estimated kill of 5000 was recorded (USFWS, 1981).

Thermals created along the interface between land and water result in huge migrations of raptors each spring. Counts as high as 10,000 in a day have been recorded.

Lake Erie represents a major obstacle to migrating land birds (warblers, thrushes, vireos, jays, etc.) and tremendous "fall outs" may occur along the remaining remnant beach ridges during migration. A funneling effect is created around the western reaches of Lake Erie by way of Little Cedar Point across Maumee Bay into Michigan. The destruction of habitat along the lake shore has greatly increased the perils of migration for these species.

Fragmentation of the Black Swamp through development and drainage has greatly reduced potential breeding habitat for most native birds. Robbins (1989) has documented the reduction of breeding diversity and numbers as habitat is fragmented. The importance of loss or fragmentation of wetland habitat is reflected in the percentage of those birds listed as endangered, threatened or of special concern in Ohio (ODNR, 1989), and is shown as follows:

	Number Listed	Number Dependent on Wetlands or Adjacent Associations	Percentages
Endangered (E)	18	14	78
Threatened (T)	2	2	100
Special Concern (SC)	19	10	53
Total	39	26	67

On this list of 39 are several species that are closely tied to habitat loss in the Maumee River drainage basin. These include the American Bittern (E), Least Bittern (E), Bald Eagle (E), King Rail (E), Piping Plover (E), Common Tern (E), Black Tern (E), Golden-winged Warbler (E), Lark Sparrow (E), Sedge Wren (SC), and Marsh Wren (SC).

1.1.6 Mammals With the destruction of the Black Swamp most large mammals disappeared from the region. Indigenous species such as elk, wolf and bear have long since passed on. Also gone are the aquatic species of river otter and beaver. The remaining habitat holds healthy populations of white-tailed deer, muskrat, red fox, raccoon, mink and opossum. A stable population of coyote also occurs in the region. Most remaining wooded areas contain adequate population of fox squirrels. Only the river otter, which has been extirpated from the region is listed as endangered on the Ohio mammal list.

1.1.7 Other Fauna The destruction of the Black Swamp has had a major impact on many native species of lower forms of vertebrates and invertebrates. The severe pressure on the Oak Opening component of the Maumee River Basin has resulted in many species to be reduced in number. Species on the Ohio endangered species list include the blue-spotted salamander and the butterflies Karner Blue, Persius dusky wing and Frosted Elfin.

1.2 CURRENT CONDITIONS

The Lower Maumee River Area of Concern (AOC) has a wide variety of pollution problems. Although there have been dramatic water quality improvements over the past decade, serious problems still exist that affect not only water quality itself, but also the area's fish, wildlife, wetlands and public uses. These problems are being caused by excess sediments, nutrients and toxics entering the system. The result has been the need to issue fish consumption advisories, curtailment of body contact water use, and increased stress for aquatic organisms.

An AOC is an area, recognized by the International Joint Commission, where water uses are impaired or where objectives of the Great Lakes Water Quality Agreement or local environmental standards are not being achieved. Heavy metals and organic chemical contamination have led to the Lower Maumee River being classified as an AOC. (Great Lakes International Surveillance Plan, 1986)

The *Investigation Report on the Lower Maumee Basin* is the supporting documentation that identifies the environmental problems and the water and related uses that are impaired as a result of the problems. It discusses existing water uses and includes current water quality and sediment quality data. It also describes intensive or short-term monitoring surveys which have occurred along with an analysis of the data. Ten different pollutant sources and the impacts of each are described. These include phosphorus sources, NPDES wastewater discharge permits for industrial and municipal sectors, package treatment plants, agricultural runoff, open water disposal of dredged materials, urban stormwater, home sewage disposal, active and closed landfills/dumpsites, and atmospheric deposition related to acid rain.

1.2.1 Suspended Sediments and Phosphorus. The Maumee River contributes the largest tributary load of suspended sediments and phosphorus to Lake Erie. The major source is agricultural runoff upstream from the AOC. Phosphorus is considered the critical nutrient contributing to the eutrophication of Lake Erie.

Sediment is the most prevalent nonpoint pollutant by volume and is a result of soil erosion. The problem stems from the predominance of agricultural land use, the extensive use of row crop agricultural systems, and the soil characteristics of the Maumee River basin. In spite of low per acre erosion rate, the 1.2 million metric tons annually cause a significant water quality problem.

The largest phosphorus load to Lake Erie is from the Maumee River Basin with 2113.3 metric tons per year from non-point sources and 222.5 metric tons from point sources, totaling 2335.8 metric tons per year (1984). Ohio EPA's Phosphorus Reduction Strategy for the Lake Erie Basin states that a total loading reduction of 1365 tons of phosphorus per year needs to be achieved. This is for the entire Lake Erie Basin in Ohio, which contributes an estimated 5617 metric tons per year.

The proposed phosphorus reductions for priority watersheds by PEMSO (Ohio EPA's Planning and Engineering Data Management System for Ohio) watershed group as displayed in *Table V-6 of the State of Ohio Phosphorus Reduction Strategy for Lake Erie (1985, p. 65b, 66, 67)* are as follows:

PEMSO WATERSHED GROUP	CROPLAND ACRES	AGRICULTURAL PHOSPHORUS METRIC TONS	PHOSPHORUS REDUCTION METRIC TONS
Ten Mile Creek (1)	51,364	74	26
Maumee River Mainstem (2)	90,468	116	41
Maumee River Mainstem (4)	56,005	41	20
Tiffin River (5)	159,418	132	63
Auglaize River Mainstem (6)	78,059	73	28
Little Auglaize River (7)	143,374	146	54
Auglaize River Headwaters (8)	140,398	139	55
Blanchard River (10)	74,189	161	42
Maumee River Mainstem (11)	46,549	55	21
St. Mary's River (12)	192,277	181	69
Lake Erie Direct (Partial) (14)	63,878	78	28
TOTAL	1,095,979	1,197	447

Total phosphorus loadings to Lake Erie from various sources in the PEMSO watershed group are estimated as 1416 tons per year and shown as follows:

Agricultural Runoff	1197	Tons
POTWs	189	Tons
Urban Runoff	21	Tons
Package Plants	9	Tons

1.2.2 Nitrogen. Nitrogen is an essential plant nutrient that is applied to cropland as a fertilizer. Nitrates are soluble and are carried to waterways with the runoff water, rather than with the sediment. Field tile effluent often carries nitrates to waterways. Nitrate concentrations have exceeded drinking water standards on the Maumee River, causing both Waterville and Bowling Green to issue alerts during the spring and early summer in the past.

1.2.3 Metals. The Maumee River sediments are classified as either moderately or heavily polluted for heavy metals from a point at Rossford to Maumee Bay, with the highest concentrations of most metals being found between the mouth or slightly above the mouth near Toledo's Wastewater Treatment Plant, and near River Mile 2 (vicinity of Norfolk Southern Railroad Bridge). Metals of concern include: cadmium, chromium, copper, lead, nickel, zinc, manganese and arsenic.

Aquatic life classification for the Maumee River becomes non-attainment at Rossford (RM 9.4) and persists all the way into Maumee Bay. Arsenic seems to be the most significant industrial problem. Combined sewer overflows become a real problem from the confluence of Swan Creek to beyond the area of Portside (RM 4.7). All the metals elevate at the Martin Luther King Bridge, and continue at high concentrations to the mouth, where they are diluted by the Maumee Bay waters. Zinc, however, is elevated above the mouth of the Maumee River.

Metals are also a problem in the lower reaches of Swan, Duck and Otter Creeks and in the Ottawa River.

1.2.4 Organic Chemicals. These are the categories of toxic pollutants which are of concern and include polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and phthalates. These toxic chemicals, as well as the heavy metals, are known to biomagnify, bioaccumulate, or are suspected of causing cancer or can be acutely toxic to aquatic organisms.

PAHs and phthalates have been found at detectable levels in the sediments in the shipping channel. Dioxins and furans, however, have not been studied. The PAH concentrations are at the lower end of the range of values for sites with cancer epizootics and thus pose a possible problem and must be of concern.

Fish tissue sampling conducted on carp taken at St. Clair Street on Swan Creek in 1986 showed 5.9 parts per million (PPM) of PCBs from whole body composite. The U.S. Food and Drug Administration Health Standards for PCBs in fish is 2.0 PPMs for edible portions. The Ohio Department of Health Fish Consumption Advisory warns that people should not eat carp or catfish taken from Lake Erie.

1.2.5 Bacteria Bacteria are normally present in streams. Certain groups of bacteria, primarily fecal coliform bacteria, are used as indicators that a stream is contaminated with human wastes. The presence of fecal coliform bacteria indicate pollution from warm-blooded animals and, therefore, indicate the possible presence of pathogenic organisms. It is, however, important to understand that the correlation between coliform concentrations and human pathogens in natural waters is not absolute since these bacteria can originate from both the feces of humans and other warm-blooded animals. Coliforms from the intestinal tract of a human cannot be distinguished from those of animals.

The EPA criterion for fecal coliform bacteria in waters used for (body contact) swimming is a geometric mean of 200 per 100 milliliters of volume, based on a minimum of five samples taken over a 30-day period, with not more than 10% of the total samples exceeding 400 per 100 milliliters. Fecal coliform bacteria concentrations exceeding these levels in urban areas generally indicate the presence of human pollution.

Sources of human pollution in urban areas include improperly treated municipal wastewater, combined sewer overflows, failed or inadequate home sewage disposal systems or package plants and illegal discharges from boats or marinas. Sources of excessive fecal coliform concentrations in rural areas include failed or inadequate home sewage disposal systems, package plants and feedlot runoff.

Contributing to the Maumee River water quality problems are combined sewers which periodically discharge raw and/or diluted sewage within the inner city areas of Toledo. The lower reach of Swan Creek, which empties into the Maumee River, is also within the combined sewer area, as is a portion of the Ottawa River. Violations of this standard have also been documented for Delaware, Grassy, Otter, Shantee and Silver Creeks and Heilman and Hill Ditches.

1.2.6 Oxygen Sewage and stormwater contain materials which consume oxygen as they decompose. If the rate of oxygen demand exceeds the oxygen supply rate, the oxygen level in the stream drops and the stream becomes unsuitable for certain aquatic species. If the oxygen demand is too great, then the stream may turn septic. The water quality standard for dissolved oxygen is 5.0 milligrams per liter. Oxygen levels in portions of the Maumee River, Ottawa River and Swan Creek drop below 2 milligrams per liter during summer months.

The rate of oxygen supply is determined by the physical characteristics of the stream.

These characteristics include stream depth, the presence of rapids, temperature and velocity. The rate at which the oxygen is depleted is dependent upon the above factors plus stream bottom characteristics and oxygen demanding materials in the water.

Oxygen demanding wastes can enter waterways from a variety of sources. These sources include point sources such as inadequately treated effluent from wastewater treatment plants, industrial discharges and non-point sources such as urban runoff, combined sewer overflows, home sewage disposal systems, package plants, and feedlots.

<u>1.2.7 Pesticides and Herbicides</u> Studies to Toledo Harbor sediments that have been available for review have not shown sediment bound pesticides to be at levels high enough to arouse concern. Most of the pesticides present in streams occur primarily in the dissolved state rather than attached to sediments. Consequently, the removal of sediments at drinking water treatment plants does not remove most pesticides. Since other aspects of conventional water treatment, such as chlorination, do not remove or alter these compounds, finished tap water has very similar concentrations of these pesticides to those found in the raw water. Activated carbon can be used to remove these compounds at water treatment plants and research is underway to evaluate other possible treatment techniques.

The Water Quality Laboratory at Heidelberg College examined the Maumee River at Waterville for concentrations of pesticides and extrapolated loads to the lower Maumee River. These data are shown as follows:

PESTICIDE	TRADE NAME	1983 Conc. ppb	1983 Load kg	1984 Conc. ppb	1984 Load kg	1985 Conc. ppb	1985 Load kg
Simazine	Princep	0	0	0.185	290.95	0.165	67.33
Carbofuran	Furadan	0.175	245.95	0.188	509.38	0.046	27.41
Atrazine	Aatrex	1.751	2476.11	2.975	4807.74	1.902	727.89
Terbufos	Counter	0.001	2.35	0	.53	0.001	0.34
Fonofos	Dyfonate	0	0	0.002	6.45	0	0.53
Metribuzin	Sencor, Lexone	0.443	700.06	0.448	1816.42	0.254	125.68
Alachlor	Lasso	1.046	2053.38	1.756	5251.98	0.472	264.131
Linuron		0.036	46.86	0.040	54.96	0.013	19.81
Metolachlor	Dual	1.308	1763.06	1.574	3056.82	1.316	618.73
Cyanazine	Bladex	0.662	1160.87	1.146	2888.98	0.322	137.28
Penoxalin		--	59.91	--	118.51	--	0

Source: Lake Erie Agro-Ecosystem Program: Sediment, Nutrient, and Pesticide Export Studies

At present, US EPA has not established maximum contaminant levels in drinking water for any of the pesticides monitored in these studies, even though this set makes up about 85% by weight of the compounds used in Ohio. For the present several states are establishing their own drinking water standards and the National Agricultural Chemicals Association has also suggested interim health guidance levels for some compounds (NACA 1985). The concentrations in Lake Erie tributaries do exceed some of these guidelines, for relatively short periods of maximum concentration.

According to the Heidelberg Water Quality Laboratory studies, the concentrations of many currently used pesticides increase in Lake Erie tributaries during spring and early summer. In general, the concentrations of herbicides are much higher than the concentration of insecticides, and concentrations of both are generally proportional to their usage. The herbicide concentrations in the rivers studied appear to be higher than in many other rivers draining cropland.

The effects of these herbicides on ambient water quality remain uncertain. Because of the low acute toxicity, the relatively low persistence and the insignificant bioaccumulation of most herbicides, direct toxic effects on animal life in streams and rivers appear unlikely. However, the concentrations of herbicides observed in these streams are within the range where effects on both algal and higher aquatic plant communities could be expected. Such effects may already be manifest in the existing algal and rooted aquatic plant communities in our streams and rivers, and within their associated wetlands and bays. Changes in these plant communities could affect the fish and invertebrate communities in streams and rivers. Also the herbicide concentrations could possibly induce behavioral responses in animals that could be detrimental to these communities.

1.3 SPECIFIC CONCERNS

The Great Lakes Water Quality Agreement is concerned with impairment of beneficial uses (Annex 2). This means a change in the chemical, physical or biological integrity of the Great Lakes system sufficient to cause any of the following:

(i) Restrictions on fish and wildlife consumption;

(ii) Tainting of fish and wildlife flavour;

(iii) Degradation of fish and wildlife populations;

(iv) Fish tumors or other deformities;

(v) Bird or animal deformities or reproduction problems;

(vi) Degradation of benthos;

(vii) Restrictions on dredging activities;

(viii) Eutrophication or undesirable algae;

(ix) Restrictions on drinking water consumption, or taste and odour problems;

(x) Beach closings;

(xi) Degradation of aesthetics;

(xii) Added costs to agriculture or industry;

(xiii) Degradation of phytoplankton and zooplankton populations; and

(xiv) Loss of fish and wildlife habitat.

<u>1.3.1 Impairment of Beneficial Uses</u> Much improvement has occurred in the AOC. However, many desired uses are still impaired due to current problems. The *specific concerns* of the RAP Advisory Committee are as follows:

Drinking Water. Lake Erie is the major surface water source of drinking water. Toledo's 120 million gallons per day (mgd) system services a total population of approximately 464,000 plus industrial customers, with Oregon's 8 mgd system serving a population of 25,000 and industrial customers. The Maumee River supplies the 0.8 mgd Waterville plant and the 6 mgd facility in Bowling Green. These two plants have had problems with nitrate and trihalomethane levels exceeding drinking water standards in the treated water. These four systems service a combined population of just over 524,000. Agricultural pesticides have been found in the Maumee River in low concentrations. These bear continued monitoring.

Shipping. The Toledo Harbor is vital to the economic well-being of the region, with its location as a logical turn around point for the St. Lawrence Seaway traffic and the railroads. Various goods are shipped to and received from domestic, Canadian and foreign locations. Toledo is the third largest Port on the Great Lakes. Due to sediment loading dredging and disposal are problems.

Sport Fishing. The walleye run, virtually non-existent for many years, has come back strongly. Walleye and white bass are the principal sport fish in the Maumee River, with the spring walleye run drawing people from as far away as Alaska. Other fish include yellow perch, channel catfish, small mouth bass, sauger and white perch. Both sport and commercial fishing occur in the Maumee Bay. The Western Basin of Lake Erie is known as the *Walleye Capital of the World.* While walleye declined in the late 1950s, their comeback has made charter boat services an important industry for the area.

Recreation. The principal water-based recreational activities include sailing, canoeing, power boating, fishing, swimming, sail boarding, jet skiing, hunting and trapping, birding and water skiing. Two state parks, nine metroparks and three state nature preserves are directly linked to the AOC's surface waters. Due to warnings for body contact recreation, activities on the Ottawa River are limited to boating.

Waterfowl Habitat. There are some 23 square miles of coastal and estuarine marshes remaining in the AOC, with 8 specific marshes which attract migratory waterfowl from the Atlantic and Mississippi Flyways.

Fish Community. Fish community composite and quality values decrease from the Grand Rapids dam to the mouth. It is thought that the upstream movement of the Toledo WWTP plume and the numerous combined sewer overflow discharges are the cause of the low community values. The lowest fish community values are found from the Toledo WWTP into the Maumee Bay area of the Toledo Edison Plant intake channel.

Benthic Community. Bottom dwelling organisms avoid or cannot exist in areas which are highly contaminated with toxic compounds. They may however survive in areas where low levels of toxicants are found. This means that they are constantly exposed to these contaminants throughout their life spans. After accumulating toxicants, such as PCBs, these organisms, if eaten, are the starting point for toxicants to move up the food chain to fish, then into fish-eating birds and/or humans where they can accumulate.

Ottawa River. Impacting water quality on the Ottawa River are the wall-to-wall dumps once sited in the floodplains which leak solvents, conventional pollutants and organic priority pollutants. The Dura Dump leachate, for example, contains high BOD, COD and organics, among which are PCBs. The City of Toledo has posted the area advising persons to avoid contact with the water sediments and fish.

Otter Creek. The degradation of Otter Creek is directly related to arsenic leaking from settling ponds created over thirty years ago. This creek has been a known "industrial sewer" for over twenty years, with oil soaked banks, and nickel and cyanide being detected in its waters. The creek also receives runoff from open and closed solid waste and hazardous waste landfills and impoundments known as Evergreen, Westover, Commercial Oil, Fondessy and Envirosafe.

Swan Creek. Swan Creek has poor water quality from its mouth to four miles upstream. Heavy metals have the heaviest impact between Hawley Street and Collingwood Boulevard. Fish in this lower reach, especially the bottom feeders such as catfish and carp, were found to have external abnormalities such as lesions, eroded fins, blackspots and other deformities. The worst area is near Collingwood Boulevard. Creosote (an oily liquid obtained by distillation of coal tar and used in preserving wood) was found in sediments at Hawley Street on Swan Creek. From the area of the Swan Creek Preserve to the mouth, the Toledo Department of Health has posted warnings for no body contact.

Maumee River and Other Direct Tributaries. The water quality in the main stem and larger tributaries in the AOC is so degraded as to exceed the Ohio water recreation fecal coliform (pollution indicator) standard by more than ten-fold. Maumee State Park beach has been posted for no swimming as a result of poor water quality.

1.3.2 Impact of Problems Identified. The *Water Quality Problem Matrix* assesses the impact of the problems identified in the *Investigation Report* on each stream in the AOC. The streams are divided into sub-drainage basins, or watersheds. Each watershed is given a rating for the severity of the impact from each of thirteen water quality problem areas identified.

More than a hundred persons had input into the rating process for severity of impact. The RAP Advisory Committee was subdivided into seven subcommittees, bringing other persons into the process. These subcommittees included: Water Quality and Water Uses, Dredge Disposal, Agricultural Runoff, Home Sewage Disposal, Landfills and Dumps, Public and Industrial Dischargers, and Fish and Wildlife.

The thirteen water quality problem areas were assigned to these subcommittees. When the subcommittees had finished their work, the full Advisory Committee met to review the ratings. This group discussed the ratings, made some changes, and then approved the severity ratings assigned.

The thirteen problems that were rated for severity of impact were: Publicly Operated Treatment Works; Industrial Dischargers; Urban Runoff; Combined Sewer Overflows; Agricultural Runoff; Contaminated Stream Sediments; Dredged Disposal; Package Plants; Home Sewage Disposal; Landfills and Dumps; Leaking Underground Storage Tanks; Atmospheric Deposition; and Water Treatment Plant Sludge.

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Appendix II: Time Weighted Mean Pesticide Concentrations and Pesticide Loadings at Lake Tributary Monitoring Stations, 1983-1985 Water Years, Water Quality Laboratory, Heidelberg College, 1987. A description of the monitoring and analysis methodology is in *Lake Erie Agro-Ecosystem Program: Sediment, Nutrient, and Pesticide Export Studies, Heidelberg College, 1987 Chapter 7.*

2.0 ECOSYSTEM APPROACH

2.1 RAP GOALS

Remedial Action Plans (RAPs) are a source of hope for many of the people living in the Great Lakes Basin. To some it may mean that enough resources will be focused on cleaning up the most persistently and severely contaminated areas and that state and local governments are committed to such clean up. The inspiring vision of the Great Lakes Quality Agreement describes what the future could be like:

> The chemical, physical and biological integrity of the Great Lakes Basin Ecosystem is restored and maintained,
>
> The discharge of toxic substances in toxic amounts (is) prohibited,
>
> The discharge of any or all persistent toxic substances (is) virtually eliminated, and;
>
> The waters are free from substances produced by humans that would produce conditions that are toxic or harmful to human, animal, or aquatic life.

The 120 member RAP Advisory Committee with its eight different subcommittees representing local industries, interest groups and local governmental entities hold this vision as their goal for the ***Desired Future State.***

The Great Lakes Water Quality Agreement arose out of the Boundary Waters Treaty signed by Great Britain and the United States in 1909. The Treaty created the International Joint Commission to assist the governments in carrying out their promises under the Treaty. Concern about pollution problems in the Great Lakes led to the signing of the Great Lakes Water Quality Agreement in 1972.

Substantial progress was made concerning excess algal growth, but the increasing threat of toxic contaminants led to the signing of the 1978 Water Quality Agreement. It pledged the two countries (Canada and United States) to work together, using an ecosystem approach, to rid the Great Lakes of toxic contamination problems. It espoused the philosophy that the only rational approach to managing the worst pollutants is zero discharge and their virtual elimination. Unfilled promises led to the 1987 Amendments.

The 1987 Great Lakes Amendment to the Clean Water Act (Section 118) declares that it is "the purpose of this section to achieve the goals embodied in the Great Lakes Water Quality Agreement of 1978...." The Clean Water Act has been amended again to ensure that Section 118 also applied to the 1987 Great Lakes Water Quality Agreement.

The Great Lakes Water Quality Agreement forbids use of dilution to remediate pollution. Article IV.1.(d) states "The responsible regulatory agencies shall not consider flow augmentation as a substitute for adequate treatment to meet the Specific Objectives". The U.S. Clean Water Act has similar provisions. One of the typical places where the issue of dilution comes up is in provisions on the "design flow of waste stream". Governments state what volume of water in a waste stream to use in calculating how concentrated with toxics a company's discharge can be and still meet water quality standards.

The practice of dilution is unacceptable when applied to persistent toxic substances because the Great Lakes and its tributaries act as a sink for whatever is discharged to them. Mixing zones should not be allowed for discharges of persistent toxic substances. The Agreement recognizes the existence of "Point Source Impact Zones," which are akin to mixing zones (Annex 2). They are defined as areas adjacent to point source discharges where water quality does not comply with the General and Specific Objectives. The Agreement states that Point Source Impact Zones...."shall not be acutely toxic to aquatic species, nor shall their recognition be considered a substitute for adequate treatment or control of discharges at their sources (Annex 2.1.(d).

The goal of the RAP process is fishable/swimmable waters for the Lower Maumee River Basin with a "toxic freeze" (zero discharge) on persistent pollutants which are the worst pollutants including: total PCBs, DDT and metabolites, dieldrin, toxaphene, 2,3,7,8 TCDD dioxin, 2,3,7,8, TCDF furan, mirex, mercury, alkylated lead, benzo(a)pyrene and hexachlorobenzene.

2.2 WATER QUALITY AND HABITAT OBJECTIVES.

To achieve this **Desired Future State** certain water quality and habitat objectives have been developed and agreed upon by the RAP Advisory Committee. The objectives accept that fact that "there is always a downstream", and the components of air, land, water and living organisms, including humans, interact. These include the following:

At minimum meet current state water quality standards.

Achieve zero discharge of persistent toxics to both air and water.

Have safe drinking water after conventional treatment.

Have all waters fishable and swimmable.

Expand water quality sampling and research programs with integration of the ecosystem approach.

Have all NPDES dischargers in full compliance with permits.

Have no restrictions on fish and wildlife consumption.

Restore the River and Bay as a nursery and production area for aquatic and terrestrial wildlife.

A clearer Maumee River with a productive littoral zone.

Restore a healthy benthic macroinvertebrate community.

Sustain and increase the walleye production.

Support the goals and objectives of the North American Waterfowl Management Plan's Great Lakes Joint Venture and the Lake Erie Marshes Focus Area Plans.

Consider bald eagle reproduction as an ecological health indicator.

Support acquisition and management of habitat to encourage growth of the Black duck population.

Protect existing wetlands and reestablish or restore lost wetlands.

Create wetlands to filter stream flow discharges using naturally occurring flora.

Improve floodplain protection (floodplain management with a no build/no fill premise of the 100-year floodplain).

Develop and support efforts for Stormwater Management.

Develop and implement a comprehensive Agricultural Pollution Abatement Strategy.

Support agricultural pollution abatement programs that are already underway and network related programs.

Support the Nonpoint Source Pollution Assessment Process of the Ohio EPA and support implementation of ODNR's Nonpoint Source Pollution Management Program.

Preserve the existing area of Maumee Bay from further filling.

Fish and wildlife mitigation must be required for all new CDFs.

Correct the Combined Sewer Overflow problem--prevent the first "flush" of a storm event from entering surface waters.

Encourage increased and environmentally compatible public access to the Lake and its near shore water resources.

Maintain shipping viability.

Develop and expand upon existing River Quality Education Programs.

Establish a permanent citizen group to oversee the implementation of the goals and objectives.

2.3 RECOMMENDATIONS FOR WATER QUALITY AND HABITAT

These recommendations need to be specific enough to improve the aquatic environment, yet broad enough to provide overall public benefits. The basic criteria for the recommendations include realistic goals and timeframes, proper standards to monitor progress and incentives/penalties for compliance. The watersheds affected include the Maumee River and Bay and their tributaries. Other areas affecting the aquatic environment include wetlands, marshes, embayments and shorelines adjacent to the Maumee River and the Maumee Bay.

2.3.1 COMPREHENSIVE FISHERIES MANAGEMENT PLAN

2.3.1.1 Description of the Problem

Desirable sport and commercial fish populations are dependent on acceptable water qualities and aquatic habitats. Improper agricultural practices, disposal of industrial and municipal waste, and land use developments are the principal causes for degradation of the aquatic environment. Increasing human populations and cultural changes are placing greater demands on fish populations and the very aquatic environment essential to their existence.

2.3.1.2 RAP Recommendations

There are currently in place several "umbrella" type comprehensive management plans that affect the Maumee River watershed fish populations. But there is no single plan. Specific areas such a plan should address, but not be limited to, are the following:

Reduce water quality problems caused by non-point source pollution related to agricultural practices including silt, nutrients (phosphates, nitrates, etc.), herbicides and insecticides. Close controls should be instituted regarding the use of herbicides and insecticides. Silt loss from sheet and gully erosion also serves as a carrier for the other contaminants. Improved agricultural land management practices must occur throughout the Maumee River drainage basin to affect improvement in the AOC.

All toxicants if persistent (including acids, alkalies, heavy metals, oil, PCBs, etc.) must be eliminated from all discharges. Municipal waste treatment systems must also control or eliminate nutrients (phosphates, nitrates, ammonia) and toxicants placed in their systems by industrial operations. New toxic landfills must not be allowed to develop and existing toxic landfills must be removed.

Aquatic habitats must be protected from extensive dredging and dredged material disposal caused by commercial shipping and recreational boating developments. Improved land management practices would reduce the need for such dredging. The conversion of aquatic habitats into confined dredge disposal areas and non-water related landfill developments must be eliminated. Reasonable shore erosion protection practices should be continued only to maintain water area integrity. There must be fish and wildlife mitigation for any CDF construction.

Native fish populations must be protected from the unwanted introduction of exotic or non-native fishes that could reduce native fishes and usurp their habitat. Such exotics potentially gain access to these waters through accidental or deliberate introductions by citizens or governments through aquacultural operations and indiscriminate stocking. Federal laws must be passed to prohibit ocean-going vessels that contain fresh water ballasts in the Great Lakes.

Preserve all wetlands with special emphasis on estuarine wetlands which are extremely limited. Wetland development should be a required mitigation for land and water developments regulated by the U.S. Corps of Engineers.

Protect endangered species by preserving unique habitat and maintaining desirable water quality. Since damming of streams stops some fish from spawning and cause their decline, the ODNR should undertake review of all dams in the Maumee Basin of Ohio, and breach all such structures not currently in use.

Area governments should encourage applied research and land use practices to reduce turbidity so to promote the development of a balanced wetland ecosystem.

In addition to enforcement of all necessary regulations to protect the aquatic environment, the education of the American public (including farmers, manufacturers, consumers, and government officials) will be necessary for habitat protection and enhancement to occur.

2.3.1.3 Who Should Act?

Technical and financial assistance may be provided by:

Soil Conservation Service
ODNR
Ohio EPA
Great Lakes Fisheries Commission
US EPA
USFWS
US Corps of Engineers
IJC

2.3.1.4 Estimated Cost

The cost of implementing the comprehensive fisheries management plan will be that of the overall RAP plan. Many recommendations will be funded by the responsible agency as part of their day to day operating cost. For other recommendations the cost is reflected in the acquisition and pollution abatement sections elsewhere in this report.

2.3.1.5 Potential Funding Source

Soil Conservation Service
ODNR
OEPA
Great Lakes Fisheries Commission
US EPA
USFWS
US Corps of Engineers
IJC
Wildlife and environmental groups
Corporate and private donors

2.3.1.6 Time Line for Implementation

Immediately with ongoing periodic reviews.

2.3.2 COMPREHENSIVE WILDLIFE HABITAT MANAGEMENT PLAN

2.3.2.1 Description of the Problem.

The western basin of Lake Erie is the fastest developing area of the entire Great Lakes region. As industrial, recreational and residential development continues, additional pressures mount on all aspects of the environment. Natural habitats are destroyed or severely damaged through degradation or fragmentation. Considerable data exists to support the requirements for natural habitats not only for wildlife but for humans. A lack of an overall habitat management plan will result in a disjointed and failed attempt at integrating development with conservation.

Buffer strips are zones of permanent vegetation paralleling waterways. Such strips are effective in reducing the overland transport of sediments, agricultural nutrients and urban runoff. Attainment of fishable and swimmable conditions in our nation's waters is the goal of the Clean Water Act. The highest degree of biotic integrity is possible with forested buffers. A forest canopy provides shade which stabilizes water temperature and deters growth of nuisance vegetation in the stream channel. Forest buffers also serve as windbreaks and their root structure holds banks in place. Both functions have a positive effect in reducing erosion. Stream ecosystems are functionally dependent on the amount of forest cover which acts as habitat for a variety of stream dependent species.

2.3.2.2 RAP Recommendations.

Good stewardship demands that a comprehensive fish and wildlife habitat management plan be developed to ensure a high quality of life in this area for future generations. Such a plan should include the following:

The minimum effective width of buffer strips varies with waterway size. All ditches and intermittent streams should be maintained with at least one continuous row of trees on both banks. Perennial streams should have at least 66 feet of forest or grassland buffer on both sides which is consistent with the federal standards of the Conservation Reserve Program. The Maumee River, a designated component of the State Scenic Rivers Program, should have 120 feet of forest buffer along both banks.

Inclusion of goals and objectives of the North American Waterfowl Management Plan's (NAWMP) Great Lakes Joint venture and the Lake Erie Marshes Focus Area Plans.

Backing of existing plans to introduce statewide wetlands habitat protection legislation.

Utilization of a wetlands inventory to identify wetlands in the AOC. This information should be made available to all local governments.

Incorporate fish and wildlife habitat education into public school systems through programs such as Project Wild, Aquatic Project Wild, and Learning Tree.

Land acquisition of targeted fish and wildlife habitat tracts.

Economic incentive for fish and wildlife habitat restoration and/or protection in the private sector.

Green space zoning requirements to ensure adequate woodland habitat for terrestrial wildlife communities.

Mitigation for all fish and wildlife habitat destruction by development.

Encourage the US Corps of Engineers to accept and enforce their responsibilities for wetland habitat protection under Section 404.

Develop a purple loosestrife control plan and obtain cost sharing for removal.

Require ditch banks to be no less than a 3:1 slope to allow for vegetation establishment.

Develop stringent guidelines and strong penalties concerning discharges of toxic materials into waterways.

Develop a comprehensive plan utilizing both enclosed wetland management units and estuarine management areas. These can be required mitigation for development.

Support legislation that would restrict sea going vessels from emptying freshwater ballast in the Great Lakes to eliminate introduced species.

Incorporate wildlife management plans into existing and future park lands and natural areas.

Establish goals and guidelines for establishing green space (humans per acre = # acres of green space).

Strictly enforce and adhere to the federal Endangered Species Act.

2.3.2.3 Who Should Act?

Technical and financial assistance should be provided by:

ODNR Division of Wildlife
ODNR Division of Natural Areas and Preserves
Regional and Local Park Districts
US Fish and Wildlife Service
US Army Corps of Engineers
US Department of Agriculture Soil Conservation Service
Ohio EPA
Local Governments

2.3.2.4 Estimated Cost

The cost of implementing the comprehensive wildlife management plan will be that of the overall RAP plan. Many recommendations will be funded by the responsible agency as part of their day to day operating cost. For other recommendations the cost is reflected in the acquisition and pollution abatement sections elsewhere in this report.

2.3.2.5 Potential Funding Source

U.S. Government (CRP)
State Government
Ohio Division of Wildlife Tax Checkoff
Ohio Division of Natural Areas & Preserves Tax Checkoff
Private Funding Sources (donations)
National Wildlife Foundation
ASCS
US Corps of Engineers
In Kind Service (National Guard Engineering Units)
Mitigation Requirements
Local taxes/assessments

2.3.2.6 Time Line for Implementation

Immediately with ongoing periodic reviews.

2.3.3 ACQUISITION OF FISH AND WILDLIFE HABITATS

2.3.3.1 Description of the Problem

Worldwide natural resources are disappearing at an alarming rate. Areas such as the Maumee River basin are subjected to tremendous demands and stresses caused by development. Many of the natural buffers provided by habitat have been lost or are rapidly disappearing.

2.3.3.2 RAP Recommendations

Management of land for wildlife and endangered or threatened species would allow the natural biological processes to interact, reestablishing these natural buffers or filters for the environment. Naturally vegetated areas act as filters for the waters that pass through them and are purifiers of the air above. Natural habitats serve to preserve and protect wildlife and endangered and threatened species and ultimately provide environmentally sound measures leading to cleaner air and water.

Public agencies should be encouraged to acquire fish and wildlife habitat lands within the AOC. Plans should be adopted to encourage the perpetuation of native species and to identify and restore areas to their historical states. Inventories should be established and the ODNR Division of Natural Areas and Preserves Heritage Program could be accessed to encourage preservation and acquisition of key habitat areas. Specific recommendations are as follows:

Lands in the public trust at present should be managed to preserve existing habitat and should follow management programs which encourage species conservation and diversity.

Management plans should set aside public lands as Natural Areas and should identify and monitor area species.

Identify sites within the AOC for interception, filtering and discharge of stream flows using naturally occurring flora on a monitored site.

Increase natural buffer areas by concentrating public land acquisition in the public trust in four distinct areas:

Maumee River floodplain - add 2,000 acres
Lake Erie Coastal Zone wetlands - add 2,000 acres
Swan Creek middle reach floodplain - add 1,000 acres
Western Lucas County Wet Prairies - add 2,000 acres
and Oak Savannahs

2.3.3.3 Who Should Act?

State and Local Governments
Wildlife and Environmental Groups
Corporate and Private Donors
North American Waterfowl Management Plan group.

2.3.3.4 Estimated Cost

$2,800,000 for 7000 acres ($4,000 per acre average) for acquisition;

$500,000 for access and monitoring.

2.3.3.5 Potential Funding Source

Ohio Income Tax Refund Checkoff Program for areas meeting threatened or endangered habitat criteria for acquisition as natural areas or preserves.

City and Metropolitan Parks.

Private natural resources preservation organizations.

Soil and Water Conservation Districts.

2.3.3.6 Time Line for Implementation

Immediately with ongoing periodic reviews.

2.3.4 WETLANDS AND OPEN SPACE PRESERVATION

2.3.4.1 Description of the Problem

Conflicting ideas of appropriate land use and high land costs have caused destruction of many wetland areas in the AOC. Yet, according to the Ohio Coastal Resource Management Plan, each acre of wetland yearly performs $3,850 in services, such as reduction in nearshore sediment, nutrient and contaminant loading as well as protection against shore erosion for the public, at essentially no current cost.

Moist habitats are viewed as worthless and considered wastelands and conversion to other uses have historically been encouraged. The trend in recent decades, however, has altered this perception. In spite of this increased awareness, there still is pressure to convert wetlands to cropland, commercial development sites, and other uses.

The Clean Water Act, Section 404, defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include swamp forests, wet prairies and marshes and are generally found within the boundary of the 100-year floodplain.

2.3.4.2 RAP Recommendations

Wetlands currently owned and managed by governmental entities and the private sector should be preserved as natural habitats but should receive sufficient management action to maximize wildlife usage and native plant communities.

Counties, cities and villages should adopt their own legislation following the federal definitions and guidelines as outlined in Section 404 of the Clean Water Act. An example of this approach is the proposed City of Toledo ordinance entitled *Nontidal Wetlands Protection.*

The loss of wetlands to real estate development activities should be discouraged by governmental agencies involved in the permit review process. Should development activities adversely affect wetlands, mitigation projects should be required which actually replace lost acreage with high quality, man-made wetland areas.

Building on the *National Wetlands Inventory Maps, USFWS*, local governments should prepare a comprehensive plan and maps which identify wetlands and floodplains, followed by adoption of prohibition on development within identified areas. The planning process must include a review of existing floodplain and zoning legislation, with maps being made available to the general public to monitor the disposition of these areas. Said comprehensive plan should be reviewed every five years, but the initial process should be open to a wide array of interested parties..

To be established at the state level, is the creation of a Coastal Wetlands Preservation Program and it should be supported with a special revenue Wetlands Preservation Fund in the State budget. Identified coastal wetlands should be valued as prime agricultural land for tax purposes. Responsibility for such program should be within ODNR in order to carry forward new improvements to create, restore or preserve coastal wetlands.

Educational programs need to be initiated by the RAP Coordinating Committee and by all governmental entities on the need for these programs.

2.3.4.3 Who Should Act?

All local governmental units.
Private Sector Owners of Wetlands
Real Estate Developers
Ohio EPA
ODNR

2.3.4.4 Estimated Cost

The highest cost would be mitigation projects which could run into millions of dollars. But these costs should be borne by real estate developers and passed on to buyers/users.

2.3.4.5 Potential Funding Source

State Wildlife Management Agencies
Private Conservation Organizations
State and Local Governments through tax incentives
Private Developers

2.3.4.6 Time Line for Implementation

Immediately

2.3.5 CONTROL OF INTRODUCED SPECIES

2.3.5.1 Description of the Problem

The flora and fauna of the Great Lakes region was, at the time of settlement, a generally closed biological system. Animal and plant communities, that became established in post-glacial times, largely had reached climax stages, with respect to climatic stability, by the time European settler arrived. But with settlement pathways opened for invasions by new species, often with negative effects on native species.

Some of these species were intentionally introduced under the assumption that they would be welcome additions. Purple loosestrife (*Lythrum salicaria*) was introduced into lowland fields as "meadow honey", intended to support hives of bees. A century later, it threatens to crowd native vegetation out of Lake Erie's coastal wetlands.

Likewise, the common carp (*Cyprinus carpio*) was introduced in anticipation of its receiving European and Asian-style acclaim as a foodfish. Instead, it drew scorn as it proliferated into wetland spawning areas, altering habitat critical to native fishes. A similar introduction was made of rainbow smelt (*Osmerus mordax*), in anticipation of harvesting valuable food from the Great Lakes. By the middle of the 20th century, smelt were being implicated in population reductions of walleye and other species.

Other problem species needed only to have a doorway opened to invade the Great Lakes. Niagara Falls stood as a supreme barrier to oceanic species that might try to invade inland beyond Lake Ontario. The construction of canals around the Falls opened that door for the dreaded sea lamprey (*Petromyzon marinus*), which would annihilate stocks of commercially important species, as well as the alewife (*Alosa pseudoharengus*), which quickly filled a niche once occupied by coregonid forage fishes. White perch (*Morone americanus*) later traversed the canal system, and by the mid-1980's have become Lake Erie's second most abundant fish species, competing with native fishes for forage.

Other unwanted species apparently hitchhiked into the Great Lakes, in the bilges of ocean-going cargo ships. Picked up with ballast water in the oceans or in European freshwater ports, these species were released into the Great Lakes when bilge tanks later were pumped out. Some of these species, such as flounders (*Pleuronectidae*) or mitten crabs (*Eriocheir sinensis*), are encountered only as occasional oddities. But others, particularly freshwater species, have shown the ability to reproduce rapidly, and may pose more serious consequences to the Great Lakes.

A large, European zooplankter called *Bythotrephes cederstroemi* (B.c.) has virtually filled Lake Erie's central basin. While B.c. appears to have value as forage for small fish, researchers are investigating the possibility that it may be preying upon native zooplankton.

The river ruffe (*Gymnocephalus cernua*), a European perch, has been found in Lake Superior waters and is reproducing rapidly. Ruffe have been noted to colonize new territory very quickly, out-competing native species that occupy the same niche. Now another unwanted immigrant, the zebra mussel (*Dreissena polymorpha*), has colonized Lakes St. Clair and Erie very heavily and are rapidly spreading. These rapidly-breeding mollusks spread by free-swimming larval stages and have reached densities of tens of thousands individuals per square meter in some areas. Many municipal and industrial intakes are suffering severe water flow restrictions due to biofouling. Researchers fear that the planktonic food base and rocky spawning areas could be severely impacted.

While some introduced species, such as alewife and B.c. usually restrict their movements to open lake water, others, like carp and white perch are found in many of the drainages within the AOC. New introductions such as zebra mussels and possibly the river ruffe can potentially infest all watersheds within the AOC.

2.3.5.2 RAP Recommendations

It is recommended that penalties be developed that would provide strong deterrents to the intentional and/or negligent release of exotic species.

It is also recommended that the federal Exotic Species Control Act, being developed at the time of this report, be passed and supported with permanent regulations prohibiting foreign freshwater ballast discharges be implemented.

Although purple loosestrife is controlled effectively on many government-owned marshes and hunting clubs, incentives should be developed that would promote increased levels of control on private wetlands.

2.3.5.3 Who Should Act?

Implementation would require ongoing communication with the US F&WS, ODNR and university researchers to monitor new appearances of exotic species or the proliferation of those already here. Where appropriate, control efforts by government agencies, commercial skippers or private landowners should be encouraged or required.

2.3.5.4 Estimated Cost

Chemical treatment of lamprey spawning streams is very expensive--often running into tens of thousands of dollars per stream. These costs are usually borne by state, federal and international agencies. Intangible costs are also incurred in the form of mortality among non-target species.

Herbicide applications to control purple loosestrife typically range from $50 to $300 per acre. These funds are currently provided by the wetland owners, whether private or governmental. Future subsidies for less affluent, private wetland owners may be necessary for effective control.

The costs of changing ballast tank pumping procedures among trans-oceanic ships should be minimal. Short delays in route would be experienced during pumping and minor energy costs would be incurred.

Costs incurred through the enforcement of laws prohibiting the willful introduction of exotic species could likely be covered by fines imposed upon violators.

2.3.5.5 Potential Funding Source

For the few cases mentioned above in which a managerial response might effectively exert control, little change from the current mode can be expected in developing funding sources.

2.3.5.6 Time Line for Implementation

Appropriate legal mandates to halt introduction of exotic species should commence immediately, and with proper support, be fully implemented within two years.

2.3.6 404 AND 401 EDUCATION

2.3.6.1 Description of the Problem

Development of wetlands and other areas involving surface waters causes the loss of fish and wildlife habitats, reduces open space and natural aesthetics, and affects water quality. The Lake Erie shoreline and tributaries of Lake Erie are continually assaulted with ill-advised and poorly engineered projects, many of which destroy wetlands. Continuing urbanization has led to the filling of wetlands for construction and other purposes as land better suited for development becomes scarce.

2.3.6.2 RAP Recommendations

There are no laws directly protecting wetlands. However, instances involving dredging and filling in waters of the United States (most waters and wetlands) require that a

Federal permit issued by the US Army Corps of Engineers be obtained prior to the work. These permits are issued under Section 404 of the Clean Water Act and allow for public review and comment before a decision is made to issue the permit. Through this process an environmentally harmful project can often be redesigned to eliminate or lessen environmental problems or to mitigate damages that will occur.

A 404 permit may not be issued until the State grants a "certification". The Clean Water Act (Section 401) allows the state to grant or deny "certification" for a federally permitted or licensed activity that may result in a discharge to waters of the United States. In States without a wetlands regulatory program, the water quality certification process may be the only way that a state can exert any direct control over projects in or affecting wetlands.

Local developers are often unaware of provisions of the Clean Water Act and projects often go forward without the required permits. This can be expensive and embarrassing to the developer. Similarly, local and county officials often aren't familiar enough with the permitting system to advise developers or defend their jurisdictions from environmentally unsound projects.

Thus, there is a need to inform local governments and developers about the provisions of Sections 404 and 401 of the Clean Water Act. Although this need has existed for several years there has been no effort to educate these groups.

Forum(s) and/or seminar(s) held in the Toledo area would do much to foster a general awareness of the provisions of Sections 404 and 401 in the community and among key government staff. Topics to be covered should include the new wetland delineation procedures, National Wetland Inventory (NWI) maps, functions and values of wetlands, and hydric soils. In November 1989 the Cuyahoga Soil and Water Conservation District sponsored such a forum in the Cleveland area. The forum was held in a restaurant meeting room and was attended by about 150 people, mostly local planners and developers. Speakers included representatives of the US Army Corps of Engineers, ODNR, USFWS, and the Soil Conservation Service.

Such forums could become part of a periodic series, perhaps annually. TMACOG and area governments might be encouraged to maintain files, maps, and expertise on Sections 404 and 401. They should also be made aware of their right to review and comment upon proposed permits and encouraged to monitor to permit public notices in their jurisdictions.

2.3.6.3 Who Should Act?

Soil Conservation Service
ODNR
USFWS
TMACOG

2.3.6.4 Estimated Cost

Costs would include renting a hall for the meeting, organizational and mailing costs, copying maps, laws and other pertinent documents, arranging a catered lunch, at $1500 per session.

2.3.6.5 Potential Funding Source

Most or some of the costs might be collected as registration fees or from the sale of maps. Up front money might be made available by groups interested in sponsoring such training.

2.3.6.6 Time Line for Implementation

Immediately.

2.3.7 MOSQUITO CONTROL

2.3.7.1 Description of the Problem

In most of Ohio, mosquito control is left to local health departments or other governmental subunit. In Lucas County, mosquito control is the responsibility of the Toledo Area Sanitary District (TASD), the only independent district in Ohio created for mosquito control. The 11 member advisory committee is appointed by the Director of TASD who is appointed by the Common Pleas Court of Lucas County. Tax revenues of about $1,400,000 per year are used to fund mosquito control projects. The TASD has influenced mosquito control practices throughout the State of Ohio.

The TASD uses Golden Bear-1536 oil for control of the aquatic mosquito larvae and undiluted malathion (93% active ingredient) as a fog or mist (l/2 ounce per acre) for control of adult mosquitoes. In 1988 fogging crews treated 1,243 square miles and misting crews covered 707 linear miles. Some of this may have involved repeated treatments. The district also has a program that involves draining, deepening, or filling mosquito breeding sites. Heavy equipment is used by the district for these purposes.

Although malathion is generally acknowledged to be one of the environmentally least offensive insecticides, it is not without ecological impacts. A 1970 study by Robert Giles (The Ecology of a Small Forested Watershed Treated with the Insecticide Malathion - S 35, Wildlife Monographs, No. 24) found that on a forested study area in Dover, Ohio, spraying malathion caused the silencing of bird song for two days. This was attributed to bird emigration associated with loss of food or sublethal insecticide effects. Such an emigration effect would have much greater consequences if it occurred during nesting. There was also a 30% reduction of mice and chipmunks on the treated area.

The areas where the district undertakes draining or filling operation could in some instances be wetlands or other waters that require a Section 404 permit from the Corps of Engineers and/or Section 401 water quality certification from the OEPA. Conducting these operations without proper authorization could result in criminal penalties, not to mention destruction of fish and wildlife habitat.

2.3.7.2 RAP Recommendations

TASD should be invited to send representatives to any forums, seminars, or other educational programs regarding wetland delineation and Sections 401 and 404 of the Clean Water Act that may result from the RAP process (see 2.3.6).

TASD should routinely query the Corps of Engineers prior to dredging, draining and filling operations, and comply with the 404 regulations.

Local governments are encouraged to request the application of a *Bacillus thurigensis* variety which is specific to the control of mosquito larvae, while leaving other aquatic species unaffected. This request must be made by the entity to TASD directly as the use of *Bacillus thurigensis* is still in the experimental stage, but has proven effective. (Source: telephone conversation with Lee Mitchell, TASD.)

TASD may wish to reconsider the efficiency and size of the adulticide program and redirect funding into the larvicide program, retaining the use of malathion for emergency situations. This work activity should be coordinate with the local health department.

TASD should be encouraged to seek input from environmental and fish and wildlife interests, and could perhaps be reflected in appointments to the Advisory Committee or through other arrangements with appropriate agencies or groups such as the Ohio Division of Wildlife, Toledo Environmental Services, Metro Parks, OEPA, and any interested environmental groups such as the Audubon Society or the Sierra Club. The annual public meeting(s) would be an appropriate vehicle to discuss the season's operations and for educating and communicating with the public.

TASD should consider using a computer geographical information system (GIS) to integrate mosquito and breeding site data available from District records with cartographic data for wetlands and other areas. We understand that the Metropolitan Mosquito Control District of St. Paul, Minnesota has began to use such a system. It might be possible to coordinate this with LANDSAT computer data for the Toledo area being used by ODNR to map wetlands.

2.3.7.3 Who Should Act?

TMACOG should present this remedial action to TASD in order to make them aware of our concerns and solicit a response to these recommendations.

Most of the above recommendations would require implementation by TASD.

2.3.7.4 Estimated Cost

The costs of wetlands training should be negligible, less than $100, providing that a local training program can be implemented.

Other costs are undetermined, however, if TASD were to buy a computer GIS system this could be relatively expensive.

2.3.7.5 Potential Funding

Funding of recommendations would have to come from redirection of existing TASD resources ($1,400,000 annually). GIS capability might be available at a reduced cost from an outside source such as ODNR.

2.3.7.6 Time Line for Implementation

One year from publication of the final Remedial Action Plan.

2.3.8 LONG-TERM MONITORING OF AOC

2.3.8.1 Description of the Problem

Long-term monitoring of conditions is needed to assess the effectiveness of implemented remedial actions. Background and current conditions have been described in reports of several studies including the City of Toledo's Environmental Services Division's (TESD) river and stream monitoring studies, the Corps of Engineer's harbor channel sediment studies, Ohio EPA's Biological Water Quality Report (BWQR), and the Toledo-

Lucas County Port Authority/University of Toledo Maumee Bay Environmental Quality Studies. The results of these have been presented in the *Investigation Report.* In addition, raw water data from the Bowling Green Water Treatment Plant should be included in the database.

In addition, the IJC has published "Guidance on Characterization of Toxic Substances Problems in Areas of Concern in the Great Lakes Basin" (March 1987), which provides direction for developing a monitoring program. Herein is described a monitoring program that involves continuation of previous programs, with the addition of certain analyses recommended by the IJC, for the long-term evaluation of the effectiveness of the remedial action program.

2.3.8.2 RAP Recommendations

The monitoring program should be conducted by a consortium of local water quality monitoring entities including the University of Toledo, TESD, and US Army Corps of Engineers, and involving Ohio EPA with oversight being provided by the RAP Implementation Committee. The long-term monitoring should include the following:

Continuation of the TESD river and stream monitoring and the Corps of Engineers harbor sediment analyses and other data generated from NPDES dischargers and monitoring sites.

Acquisition of necessary equipment and a RAP boat to assist with education, monitoring and research efforts.

Establishment of a monitoring buoy at the mouth of the Maumee River for detection of spills and discharges.

Initiation of sediment and biological studies, focusing on determination of contaminant levels, to be done at four year intervals at each TESD site and at several BWQR sites.

To have a relatively even work load each year, which could be useful for a long-term monitoring program, a specific group of sites could be studied each year with the objective of rotating back to the initial set of sites every fifth year.

As initial results may show that certain analyses and/or sites may not be productive, it is anticipated that the study design should evolve with time.

Recommended study sites and schedules are as follows:

Year 1: Maumee River (mile -0.9, 0.0, 1.7, 4.5, 8.1, 13.4, 20.4), Otter Creek (4 BWQR sites), and Duck Creek (2 BWQR sites).

Year 2: Ottawa River (mile 1.6, 3.1, 4.7, 6.0, 7.0, 8.9, 10.9, 14.1), Hill Ditch, Silver Creek and Shantee Creeks.

Year 3: Swan Creek (mile 0.6, 1.3, 2.6, 3.9, 5.0, 10.6), Heilman Ditch, Delaware Creek and Grassy Creek.

Year 4: Maumee Bay (10 sites).

Sampling would be most productively done during August or September and should be done at the same time of the year each year, for determining long-term trends. The assays for each site are as follows:

Benthic invertebrate densities and the invertebrate community index. Contaminant body burden on collected *Chironomus tentans.*

Fish species composition and relative abundance (overnight gill netting and fry trawl). Contaminant body burden on Young of the Year (YOY) spottail shiners as well as adult carp, suckers, and bullheads (resident species). Presence/absence of deformities, tumors, lesions, etc.

Sediment chemistry (As, Cd, Cr, Cu, Fe, Pb, Zn, Ni, Mn, Ba, Hg, COD, P, Oils, Cyanide, PCBs, ammonia, TKN, Vol. solids and organics).

Acute lethality - Sediments: *Ceriodaphnia* survival bioassay on sediment pore water; fathead minnow flow-through bioassay or in situ bioassay.

Acute sublethal toxicity - Microtox (TM) test (bacterial luminescence bioassay) on sediment pore water. It may also be useful to do these on water samples.

Chronic sublethal toxicity and mutagenicity - Examine fish for abnormalities (see above); Ames *Salmonella/microsome* assay.

Bioconcentration - Assay body burden of resident fish and *Chironomus tentans* (see above).

2.3.8.3 Who Should Act?

TESD
Ohio EPA
US Army Corps of Engineers
US EPA
University of Toledo
TMACOG.

2.3.8.4 Estimated Cost

$250,000 annually.

2.3.8.5 Potential Funding Source

US EPA
USFWS
US Army Corps of Engineers
Ohio EPA
City of Toledo.

2.3.8.6 Time Line for Implementation

Immediately

2.3.9. RECREATIONAL USAGE AND PUBLIC ACCESS

2.3.9.1 Description of the Problem

Recreational usage (swimming, boating and fishing) and waterfront parks must share the limited shoreline with shipping and port activities, municipal wastewater and industrial facilities, wetlands that are managed for waterfowl, agricultural activities, historic preservation sites and private home sites.

Public access to and enjoyment of the shoreline is a necessary element in establishing local commitment to improving water quality. Therefore, a balance between competing shoreline interests is necessary by developing a coordinated, comprehensive approach to decision making which acknowledges the interrelationship of all coastal interests.

2.3.9.2 RAP Recommendations

Recreational boating:

Increased recreational boating has created a need for more dock and storage space and more public boat launch ramps. Toledo's two public launch sites, Cullen Park and Walbridge Park, have recently been upgraded and repaired. Toledo is planning further improvements blacktop paving for Cullen and blacktop, new docks and a permanent tie-off area for Walbridge. These launch ramps are heavily used (8,655 boats launched in 1988) and needed improvements should be completed.

Recommend that a new public launch ramp be considered at Toledo's Riverfront North area (undeveloped acreage north of Riverside Park) which has sufficient land for parking. East Toledo and Oregon have no public launch ramps, but they are needed.

Perrysburg has three public launch ramps used primarily by fishermen, but parking is limited especially during the walleye season. Recommend that increased parking sites be considered.

At Ward's Canal the ODNR operates a public launch ramp which is in need of repairs and more car-trailer parking. Recommend that additional land be acquired. Public launch sites at Cooley Canal, Rossford and Farnsworth Metropark are generally considered adequate but recommend that all sites be evaluated on a regular basis by the agency administering the site.

There were 16,899 boats registered in Lucas County in 1987 and most marina owners who maintain long waiting lists indicated there is a need for more dock and storage space. Recommend that private marina development be encouraged but new facilities should not be sited in wetlands. Recommend that suitable areas for marina development be identified.

Recommend that all boat holding tanks be pumped out at marina pumpout facilities, and no bypass valves be permitted.

Waterfront Parks and Public Lands:

The AOC has a variety of waterfront parks and public lands. Water provides a natural attraction for people who enjoy active and passive recreation. Municipal parks provide picnicking, walking paths and waterfront access within
Toledo, Oregon, Rossford, Maumee, Perrysburg and Waterville.

The Metropark District administers over 6,460 acres adjacent to area streams and waterways in the AOC. Their primary mission is to create and preserve a system of natural area parks to be held in public ownership and maintained in essentially unimpaired form for the use and enjoyment of this and future generations. A secondary mission is the acquisition and preservation of historic areas. Recreational facilities are provided including picnic areas, playgrounds and playfields. Nature trails for hiking, bird watching, jogging, bicycling and winter skiing are also provided on Metropark lands.

In Oregon and Jerusalem Township the ODNR is in the process of developing the Maumee Bay State Park. Running for two miles along the bay, when completed it will offer lake oriented activities, such as beach wading, pier fishing and walking trails through natural areas (including wetlands). Planned to have a selection of recreational activities, it will accommodate conventions as well as day use.

Designated historical sites are the focus of several parks in the AOC. Included are Fort Meigs, Fort Miami, the Side Cut canal locks and Fallen Timbers Battlefield Monument in Side Cut Metropark. Other sites are Fort Deposit and Roche de Boeuf at Farnsworth Metropark, the Miami-Erie canal lands, Lock #10, Isaac Ludwig Mill, and Providence Dam at Providence Metropark. All areas offer fine riverfront views, picnicking, hiking and play areas. There remains a need to preserve existing waterfront, floodplain areas, and river islands along the Maumee River from the mouth to the Ohio Turnpike Bridge at Maumee.

Recommend that Toledo continue its plan to acquire waterfront acreage which would extend six miles of its park system offering recreational, educational and environmental opportunities. Toledo has begun this project with the construction of Promenade Park. The new master plans developed for the Riverview and Bay View areas and plans to extend the park system along Swan Creek from downtown to the proposed Farmer's Market development, should be implemented. These plans incorporate active recreational areas, such as playing fields, river access areas with launching and marina facilities, walking trails and overlooks which take advantage of the river views, natural areas with trails, and open grassy and wooded areas with benches.

The AOC has four state and federally owned wildlife refuges. Cedar Point National Wildlife Refuge, 2,200 acres of diked marshland, has no public usage other than summer fishing in a small pond. Metzger Marsh State Wildlife Area consists of 550 acres of undiked wetlands with boat launching, pier fishing and duck hunting available to the public. Ottawa National Wildlife Refuge has self-guided nature trails for public use. It is a diked wetland which is maintained for migratory waterfowl. Magee Marsh State Wildlife Area, a portion of which is in the AOC, is a diked wetland maintained for migratory waterfowl and public duck hunting available by lottery. The area also maintains a handicapped accessible half-mile bird trail on a remnant beach ridge which offers exceptional bird watching opportunities. These refuges are an invaluable resource as a site for environmental education; however, any activities to this end should in no way degrade the existing wetlands and should be coordinated with efforts to enhance them.

2.3.9.3 Who Should Act?

Cities of Toledo, Oregon, Rossford, Maumee
Lucas and Wood Counties
ODNR
RAP Implementation Committee

2.3.9.4 Estimated Cost

Costs for improving existing recreational boating sites vary significantly. Estimates, based on recent updates in Ohio are between $40,000 and $300,000. The cost of a new launch site with two lanes and 100 car parking is estimated to be $400,000. Additional requirements such as a breakwall will increase the cost. Costs of land acquisitions to expand parking cannot be estimated at this time.

Estimated costs for waterfront parks and public lands has not been calculated.

2.3.9.5 Potential Funding Source

Recreational boating:

Cities of Toledo and Oregon
Lucas County
ODNR Division of Watercraft
User fees
Private marina development
U.S. Army Corps of Engineers

Waterfront parks and public lands:

Non-game tax checkoff
Local tax levies
ODNR, Division of Wildlife.

2.3.9.6 Time Line for Implementation

Planning should begin immediately and plans should be implemented as needed.

2.3.10 COORDINATING COMMITTEE AND INSTITUTIONAL FRAMEWORK

2.3.10.1 Description of the Problem

Implementing the RAP will require the coordination and cooperation of numerous federal, state and local agencies, in addition to input and support from major stakeholders, public interest groups and the local community. There is no single agency which could carry out all of the RAP recommendations. Without establishing a new institutional framework or identifying an existing one to implement the RAP, it is unlikely that significant water quality improvements will occur in the AOC.

In addition to implementing remedial actions, "a process for evaluating remedial measure implementation and effectiveness," is a necessary component of a RAP as stated in Annex 2 (4)(a)(vii) of the Revised Great Lakes Water Quality Agreement of 1978. Such a process should include the previously mentioned groups to be effective.

The State of Ohio already has an existing water quality management framework and a coastal zone management program into which the RAP recommendations should be incorporated. The State's coastal zone management and water quality management plan framework, which identifies priority water quality problems, recommends control measures and designates state and local agencies responsible for planning, funding and/or carrying out control programs and recommendations, offers a potentially good framework for implementing and evaluating remedial actions to complement local management of the RAP. This would insure local participation, could be accomplished quickly at little cost and would insure that the remedial actions were consistent with ongoing water quality programs.

2.3.10.2 RAP Recommendations

A RAP Implementation Subcommittee of the Toledo Metropolitan Area Council of Governments (TMACOG) Areawide Water Quality Planning Council (AWQPC) should be created with the authority to coordinate and evaluate the implementation of the RAP within the existing AWQPC institutional framework. This subcommittee should be made up from representatives from the AWQPC, public interest groups, major stakeholders and the appropriate state agencies having water quality responsibilities. In addition, the AWQPC should incorporate the RAP recommendations into the TMACOG Areawide Water Quality Management Plan (AWQMP).

Areawide water quality management planning was created by Section 208 of the Water Pollution Control Act of 1972 to provide local planning and coordination of water quality improvement activities. Toward this end, TMACOG was designated by the Governor of Ohio in 1974 as the responsible interstate planning agency for Erie, Lucas, Ottawa, Sandusky and Wood Counties. A Management Framework for Areawide Water Quality Management was adopted in 1980 which provided for the necessary Designated Management Agencies (DMA) and coordination of water quality improvement activities.

As defined in this management framework, TMACOG was designated as the continuing planning agency responsible for areawide coordination, monitoring and conflict resolution in the implementation of its Section 208 Water Quality Management Plan. TMACOG's responsibilities include:

Monitoring of 208 plan implementation;

Continuing planning and annual updating of the 208 Water Quality Management Plan;

Providing a forum for areawide policy decision-making on water quality concerns;

Coordination with the DMAs;

Functional coordination to ensure that the activities to solve point source and non-point source water quality problems are consistent;

Serve as an advocate for local concerns at the state and federal levels; and

Resolve conflicts between DMAs and with the 208 Water Quality Management Plan.

2.3.10.3 Who Should Act?

The AWQPC is the principal forum for these areawide responsibilities relating to water quality. As per Article VI, Section 6 of the Procedural Manual of the AWQPC of TMACOG:

"The AWQPC shall identify and form those subcommittees that it deems necessary to conduct its responsibilities. The Chairman of the AWQPC shall appoint the members of any such subcommittees."

2.3.10.4 Estimated Cost

$100,000 per year plus $20,000 for start up and set up costs.

2.3.10.5 Potential Funding Source

205 (j)
AWQPC dues
US EPA
Ohio EPA
User fees.

2.3.10.6 Time Line for Implementation

Immediately upon approval of the RAP.

2.3.11 INCREASE PUBLIC PARTICIPATION AND AWARENESS

2.3.11.1 Description of the Problem

The RAP process will only be as affective as the people involved with it. It will not succeed, in spirit, unless the public becomes involved and takes the plan as its own, with individuals and groups becoming identified with all or part of the systems in the AOC. Increased public participation will also increase the base of taxpayers, voters, contributors and even land donors who support the RAP process and effect changes through political/social processes. Increased awareness of the RAP should tend to increase public confidence in the need for the process and what it is intended to accomplish.

2.3.11.2 RAP Recommendations

Increase the extent of media coverage, possibly with a series of newspaper articles on the AOC. Stress the goal of searching for solutions, not scapegoats.

Put together mailing lists of individuals and organizations identified as potentially interested in environmental projects.

Prepare and promote multi-media presentations for schools, civic groups, conservation groups, hunters, businesses, churches, etc. This should emphasize the purpose of the RAP, and surround it with emphasis on existing natural systems, their importance and intrinsic beauty. Stress historical-type "ecology" approach, emphasizing involvement of target group in the system and the need of committed "stakeholders".

Prepare and place semi-permanent displays (kiosk-style) at important gathering places (e.g. Toledo Zoo aquarium, Portside, plants, schools) which feature ecological subsystems of the AOC, as well as future benefits of remedial actions.

Involve the curiosity of the public (and possibly "hook" a few stakeholders) by distributing stickers which might interest people who might miss other approaches.

Invite AOC residents to a series of public meetings where the RAP is discussed. To increase interest and as a "perk" for those who attend; colorful, positive nature films could be shown (e.g. PES episodes on wetlands).

Events could be sponsored by the RAP committees to involve people who might otherwise be missed (e.g. RAP "biggest walleye" contest, nature art or photography competition, RAP regatta on Maumee River).

Acquire necessary equipment and a RAP boat to assist with education, monitoring and research efforts.

Small research grants to be awarded to local university graduate students for research in the AOC.

Present RAP "award certificates" to individuals, companies, organizations, etc. who have contributed in some positive way to the bettering of conditions in the AOC, production of research information, etc.

Continue Swan Creek educational water quality testing program within area schools and initiate similar projects for the Ottawa River, Otter Creek, Duck Creek, Cedar Creek, Crane Creek, and Maumee River. Agricultural community should participate as well as other schools in the RAP area.

Establish within the old Toledo Edison Co. Steam Plant a downtown Toledo nature center and laboratory displaying the ecosystem approach.

2.3.11.3 Who Should Act?

AWQPC
RAP Implementation Committee
RAP Subcommittees

2.3.11.4 Estimated Cost

$50,000 annually for each watershed educational and water quality testing program, totaling a minimum of $100,000 per year.

2.3.11.5 Potential Funding Source

US EPA Grants
State grants
Cities
Corporations
Users fees
Fund raising events, concerts, film presentations.

2.3.11.6 Time Line for Implementation

Immediately.

Maumee RAP Recommendations Cost Summary
Ecosystem Approach for Basinwide Programs

Sec.	Item	CAPITAL COSTS Low	High	Median	Annual	Other
2	*ECOSYSTEM APPROACH*					
2.3.1	Comprehensive Fisheries Management Plan Funded by responsible agency as part of day to day operating costs.					
2.3.2	Comprehensive Wildlife Habitat Management Plan Funded by responsible agency as part of day to day operating costs.					
2.3.3	Acquisition of fish and wildlife habitats	$2,800,000	$2,800,000	$2,800,000		
2.3.4	Wetlands and open space preservation Mitigation costs borne by real estate developers and passed on to buyers/users.					
2.3.5	Control of introduced species Costs borne by responsible agencies.					
2.3.6	404 and 401 education - per session costs					$1,500
2.3.7	Mosquito control				$100	
2.3.8	Long-term monitoring of AOC				$250,000	
2.3.9	Recreational usage and public access	$40,000	$400,000	$220,000		
2.3.10	Coordinating committee & institutional framework	$20,000	$20,000	$20,000	$100,000	
2.3.11	Increased public participation and awareness				$100,000	
2	Total - Ecosystem approach	$2,860,000	$3,220,000	$3,040,000	$450,100	$1,500

3.0 MAUMEE RIVER AND BAY RECOMMENDATIONS FOR POLLUTANT SOURCES

The *Water Quality Problem Matrix* assessed the impact of the problems identified in the *Investigation Report* on each stream in the AOC. Each watershed was given a rating for the severity of the impact from each of the thirteen water quality problems areas identified. Chapter 3 deals specifically with recommendations for these problem areas for the sub-drainage basins, or watersheds, for the Maumee River and Bay.

The Maumee River is 134 miles long with headwaters at Fort Wayne, Indiana, where the St. Mary's and St. Joseph Rivers join. The river drains about 6608 square miles, of which about 85% is agricultural. Daily average discharge ranges from a high of 94,000 cubic feet per second (cfs) to a low of 32 cfs, and contributes about 25% of the total tributary discharge into Lake Erie, exclusive of the Detroit River. The average annual rainfall on the river basin is 34.5 inches.

Maumee Bay is in the southwestern corner of Lake Erie and includes approximately 21 square miles. The northern boundary of the bay is Woodtick Peninsula, a four mile spit of land extending south from the State of Michigan, with the southern boundary referred to as Little Cedar Point. Both areas are marshes with the southern spit being armored and smoothly defined. The landward side of the Woodtick Peninsula is shallow with bars and marshes, and dotted with small islands. Maumee Bay is divided into approximately two equal parts by the navigation channel which serves the Toledo Harbor.

The sub-drainage basins included for the Maumee River by name and number are as follows:

043 - at Waterville
078 - Reitz Road Ditch
044 - at Grassy Creek diversion
079 - at Bluegrass Island
045 - Grassy Creek
046 - Grassy Creek
047 - at Grassy Creek
013 - at Anthony Wayne Bridge
014 - below Anthony Wayne Bridge
015 - Duck Creek
015 - at the mouth

The sub-drainage basins included for the north Maumee Bay by name and number are as follows:

022 - Halfway Creek above Ohio/Michigan line
025 - Halfway Creek above Indian Creek
026 - Halfway Creek
021 - Halfway Creek to the mouth
023 - Silver Creek
020 - Shantee Creek

The sub-drainage basins included for the south Maumee Bay by name and number are as follows:

028 - Otter Creek
029 - Wolf Creek
030 - Lake Erie Watershed #1

Six subcommittees were involved with the development of the recommendations for pollutant sources. They are as follows: Public & Industrial Dischargers; Agricultural Runoff; Dredge Disposal; On-Site Sewage Disposal; Landfills & Dumps; and Water Quality/Water Uses.

3.1 PUBLICLY-OPERATED TREATMENT WORKS

The National Municipal Policy is US EPA's response to the Clean Water Act's mandate that all publicly owned sewage treatment works (POTWs) be in compliance with conditions in their permits no later than July 1, 1988. The Policy reads in part where there are extraordinary circumstances that preclude compliance by July 1, 1988, EPA will work with states and affected municipal authorities to "ensure these plants are on enforceable schedules for achieving compliance as soon as possible thereafter..."

Ohio EPA decided all compliance schedules that extend past the July 1, 1988 deadline must be established in an order enforceable by a court of law. Therefore, any municipal treatment plant that misses the compliance deadline must be referred to the Ohio Attorney General's Office, which represents Ohio EPA in obtaining these orders. Once the judicial orders are filed, Ohio EPA must assure that all compliance schedule deadlines are met. The Attorney General retains the responsibility for enforcing the terms of the orders if violations occur.

The 1987 Clean Water Act emphasized the importance of controlling toxic substances discharged to surface waters. To achieve this, the Act required Ohio to develop a list of streams which are impaired due to the discharge of toxic substances from point sources. This list is known as the 304(l) list. The City of Toledo is on this list and is on an aggressive schedule to bring it into compliance with discharge limits that will eliminate adverse impacts on the Maumee River.

We applaud the establishment of the watershed based permit process within Ohio EPA. This will allow permits to be due during the same timeframe with wasteload analysis being conducted. However, such analysis must include concentration and mass loading of pollutants including toxins.

This subsection deals with publicly-operated treatment works that discharge to the Maumee River and Bay.

3.1.1 CITY OF TOLEDO

3.1.1.1 Description of the Problem

The Bay View wastewater treatment plant is a 102 million gallon per day (mgd) activated sludge plant with primary clarification. Raw sludge from the primary clarifiers is thickened by gravity and is anaerobically digested along with Dissolved Air Flotation thickened waste activated sludge. The plant effluent is disinfected with chlorine. This facility serves the Cities of Toledo, Northwood and Rossford, the Villages of Walbridge and Ottawa Hills, and portions of Wood and Lucas Counties.

During the 1980s approximately $60,000,000 in both federal and local monies was spent to upgrade and add various treatment processes. This included the addition of swirl concentrator storm flows, sludge thickening and dewatering facility, gravity thickeners, plant wide process control computer system and the upgrading of all secondary and primary treatment facilities and the aeration basins. These improvements have enabled the plant to consistently show improvement in meeting the requirements of its NPDES permit.

Toledo's pretreatment program is administered by the Environmental Services Division of the Department of Public Utilities. Six people work in the pretreatment group. Of the nearly 100 significant industries discharging to the Bay View facility, 40 are regulated by federal categorical standards. An additional 600 commercial facilities also discharge to the facility.

The sewage sludge, which is rich in organic matter and plant nutrients, is applied to area agricultural land. Public opposition to land application has resulted in a shortage of acceptable sites and even a temporary suspension of sludge recycling. Currently, the facility dewaters anaerobically digested sludge prior to reuse. The reuse options per the EPA sludge management plan are: composting using the N-Viro process, land reclamation at PPB in Barborton, Ohio, topsoil production using Nu-soil process and land application. One disposal option, landfilling, is also available to insure an adequate and consistent sludge management program.

3.1.1.2 RAP Recommendations

Recommend that the City of Toledo examine the construction of an additional final clarifier as well as the reconditioning of existing final clarifiers from a maintenance perspective. This will give the plant additional secondary treatment capabilities. New NPDES permit requirements may dictate the necessity to add advanced treatment capabilities.

The active and aggressive industrial pretreatment program will help assure cleaner effluent in the future. Pretreatment by industrial users, coupled with monitoring and enforcement, will make the treatment plant less susceptible to problems caused by industrial wastes. Nationwide, lower heavy metal concentrations in treatment plants' influent is being observed. An effort needs to be made to lower the concentration of toxic organic compounds. The federal pretreatment program, although relatively new, is already making a positive impact on helping to clean our nation's waters.

Recommend that the City of Toledo continue to pursue all options for sludge management as well as to continue to optimize the digestion and dewatering processes.

3.1.1.3 Who Should Act?

The cost of the improvements should be shared by all contributing to the facility.

3.1.1.4 Estimated Cost

Construction costs are estimated to be between $1,000,000 to $5,000,000 for the addition and/or reconditioning of the final tanks.

3.1.1.5 Potential Funding Source

Ohio Water Development Authority
Capital Improvements Revenue
State Issue #2
US EPA (Grants and/or low interest loans)

3.1.1.6 Time Line for Implementation

Currently in progress.

3.1.2 CITY OF PERRYSBURG

3.1.2.1 Description of the Problem

The City of Perrysburg's wastewater treatment plant is an activated sludge treatment plant with an average design capacity of 5.4 million gallons per day (mgd) for primary and only 2.75 mgd for secondary. The wastewater is mainly of domestic origin. The plant serves the City of Perrysburg and parts of Perrysburg and Middleton Townships. The plant's effluent is not consistently meeting the NPDES standards due to the hydraulic and BOD overloading on the secondary treatment facilities.

The pretreatment program for the Perrysburg facility is only an industrial monitoring program. There is no heavy industry in the sewer district and if a problem would be found, the city would institute a program.

Perrysburg is land applying their sludge cake. The present procedure is to contract with a private firm to land apply the sludge for agricultural purposes.

3.1.2.2 RAP Recommendations

Recommend that the facility's secondary treatment be upgraded to the 5.4 mgd. This is already in process with the proposed plant being able to handle a peak load of 13.5 mgd. Perrysburg is adding 3 aeration tanks, 2 final clarifiers, chlorine contact tank and a new anaerobic digester.

3.1.2.3 Who Should Act?

Ohio EPA
City of Perrysburg

3.1.2.4 Estimated Cost

$6,200,000

3.1.2.5 Potential Funding Source

Ohio Water Development Authority Loans
City of Perrysburg

3.1.2.6 Time Line for Implementation

Late 1991

3.1.3 CITY OF OREGON

3.1.3.1 Description of the Problem

The City of Oregon's DuPont Road wastewater treatment plant is an activated sludge treatment facility with an average design capacity of 8 million gallons per day (mgd). The plant is in compliance with its NPDES permit. However, its South Shore wastewater treatment plant cannot meet its NPDES limits. Ohio EPA has ordered that it be abandoned and connected to the DuPont Road Plant. An interceptor sewer to do this will be finished by the end of 1990.

The Village of Harbor View does not have a sewage plant but does have sanitary sewers. Adjacent areas of Case Farm Beach, East Harbor and Immergrun, in the City of Oregon, do not have sanitary sewers. The entire area needs to be sewered, and tied into the DuPont Road facility.

The pretreatment program for the City of Oregon includes 2 industrial firms, both truck washes. The firms are sampled by both the City of Oregon and self-monitored. The pretreatment program is fully implemented.

The sludge is treated by aerobic digestion and is applied on farm land. The sludge is injected into the ground during the warm months and surface applied during the winter months.

3.1.3.2 RAP Recommendations

Recommend that the City of Oregon continue constructing the new sewer line along Bay Shore Road; and that the South Shore Park wastewater treatment plant abandoned and connected to the DuPont Road Plant on or before early 1991.

Recommend that the Village of Harbor View tie into Oregon's DuPont Road plant and that the subdivisions of Case Farm Beach, East Harbor and Immergrun be sewered and tied into the DuPont Road plant.

3.1.3.3 Who Should Act?

Ohio EPA
City of Oregon
Village of Harbor View

3.1.3.4 Estimated Cost

Over $4,000,000

3.1.3.5 Potential Funding Source

Ohio EPA Grant
City of Oregon
Village of Harbor View

3.1.3.6 Time Line for Implementation

The City of Oregon has requested a low-interest loan from Ohio EPA. The Village of Harbor View has requested assistance from Farmers' Home Administration.

3.1.4 LUCAS COUNTY

3.1.4.1 Description of the Problem

The Maumee River wastewater treatment plant is a 10 million gallons per day (mgd) activated sludge plant that does not have primary clarification. Waste sludge from the activated sludge process is thickened by gravity and is then digested aerobically. The plant effluent is disinfected with chlorine. This facility serves the Lucas County communities of Maumee, Sylvania, Waterville and Whitehouse. It also serves a large unincorporated area of western Lucas County and a small area of northern Wood County.

The wastewater flow into the facility is increasing steadily due to the growth in western Lucas County, especially with the recent hook-up of the Village of Whitehouse. It has been able to meet its NPDES permit but the increase in flow has made it evident that an expansion of the plant should be examined soon. This increase of flow will not only make it difficult to treat this wastewater destined for the Maumee River but the increased solids removed will require more tankage to treat it appropriately.

Non-domestic wastewater sources (industrial and commercial) have the potential to discharge materials to the sanitary sewers that could pass through the treatment plant, interfere with plant processes, or contaminate the plant's sludge. At the present time, non-domestic wastewater constitutes approximately 10% of the facility's average daily flow of 10 mgd. The amount of industrial wastewater is expected to increase as the county continues to grow and develops the Oak Opening Industrial Park and airport territory.

Wastewater treatment results in generation of sewage sludge. This material, which is rich in organic matter and plant nutrients, is applied to area agricultural land. Public opposition to land application has resulted in a shortage of acceptable sites and even a temporary suspension of sludge recycling. Proposed federal regulations may exacerbate the situation by requiring a greater reduction in sludge volatile solids than the facility achieved, on average, in 1989. Also, being an agricultural practice, access to recycling sites may be limited for extended periods of time by weather, cropping patterns, and other variables which can result in storage problems at the facility.

3.1.4.2 RAP Recommendations

Recommend that Lucas County examine expanding the plant from a hydraulic and solids handling perspective to continue to meet its NPDES permit requirements. This step is currently being undertaken, with the Lucas County Board of Commissioners having hired a consulting firm to report on necessary improvements to the facility.

The facility was required by the US EPA to institute an industrial pretreatment program in the early 1980s. There is currently an active program of industrial and commercial facility inspections, monitoring, and effluent sampling by both industry and the facility. While there are presently no problems with industrial discharges, continuation of the existing pretreatment program is recommended to preclude future difficulties.

Recommend that the current sludge application contract provisions specifying immediate spreading and incorporation of all sludge removed from the plant site continue to be strictly enforced. Additional sludge storage space should be provided at the facility in the event that field sites remain unavailable for long periods of time. Increased digester capacity must be considered to enable the facility to have sufficient time to achieve a 50% volatile solids reduction of its sludge in anticipation of proposed federal sludge regulations.

3.1.4.3 Who Should Act?

Since the facility serves several communities and unincorporated areas of Lucas County, and an area of Wood County, it will take a cooperative effort by all the entities. The cost of the improvements should be shared by all contributing to the facility.

Although Lucas County has primary management responsibility, the costs of running the pretreatment program are allocated to each community serviced based upon measured flow. Thus, it is in the best interest of the local communities to remain aware of the actions of the Lucas County as they relate to industry within their borders.

The solution to the problem of insufficient sludge storage and the anticipated need for additional digester capacity should be a cooperative effort by all the entities involved. The facility staff should continue their diligent efforts to see that contractors who remove sludge from the treatment plant for land application do so in accordance with all applicable contract provisions as well as state and federal guidelines and regulations. Ohio EPA should exercise its regulatory authority to prevent usurpation of its power by lower governmental entities who attempt to pass local legislation designed to stop or restrict the legitimate recycling of sewage sludge.

3.1.4.4 Estimated Cost

Construction costs are estimated at $5,167,000 to $9,429,000 depending on the improvement alternative taken. Energy costs will play an important role in deciding which alternative is chosen.

Costs for the pretreatment program are unknown.

To provide additional sludge handling capacity the cost is $2,465,000. Disposal costs will depend on availability of land sites for sludge recycling.

3.1.4.5 Potential Funding Source

For construction:

Ohio Water Development Authority
Capital Improvement Revenue
State Issue #2
US EPA (Grants and/or low interest loans)

Costs associated with running the pretreatment program are passed along to the communities served based upon their flow. Recovery of the cost of this program by each community is a matter for the communities to decide.

For Sludge Handling:

Ohio Water Development Authority
Capital Improvement Revenue
State Issue #2
US EPA (Grants and/or low interest loans)

3.1.4.6 Time Line for Implementation

Construction design should begin when a consensus of action is reached by the entities involved.

The pretreatment program is already implemented.

Action should commence on sludge handling upon determination by entities involved as to the most feasible plan to adopt.

3.2 COMBINED SEWER OVERFLOWS

As communities started to develop, rain water was collected and conveyed to streams. As the population increased sanitary waste from homes and businesses tied into these storm sewers. Since these sewers collected both storm and sanitary flow the term "combined sewer" was adopted. Around 1920 the Ohio Department of Health required cities to collect these separate discharge points and convey them to a central discharge point through interceptor sewers.

During dry weather all discharge is conveyed to a treatment plant. When a storm occurs these combined sewers will surcharge the interceptor system. Relief points were established to prevent the flows during storm events from overloading the interceptor sewers. These relief points are mechanical devices called "regulators".

The regulators control the amount of flow from the combined sewers to the interceptor sewers. A float mechanism causes a gate to close if the water level rises in the combined sewer. This action isolates the combined sewer from the main interceptor. The excess flow in the combined sewer then overflows a weir and discharges to the stream. Hence the term "combined sewer overflow (CSO)".

This method proved satisfactory for a long period of time, until environmental concerns began to focus on the conditions of the receiving streams. Combined sewer overflows are but one of many contributors that impact water quality. CSOs are a source of biological oxygen demand, oil, grease, bacteria, settlable solids and flotables which effect the stream aesthetics and their usages.

This subsection deals with CSOs discharging to the Maumee River by the cities of Toledo, Maumee and Perrysburg.

3.2.1 CITY OF TOLEDO

3.2.1.1 Description of the Problem

Approximately one-third of the City of Toledo is currently served by combined sewers. The combined sewers have 34 overflow points into three area streams. The area streams, Ottawa River, Maumee River and Swan Creek, are in a state of deterioration. During periods of low flow, the waters turn septic, creating odorous conditions. During low flow and high flow conditions, unsightly objects can be seen floating on the surface and littering the banks. Discharge from the combined sewer overflow points is considered to be one of the major contributions to the above described conditions.

The Maumee River has 17 regulators with 11 regulators on the west side of the river and 6 regulators on the east side of the river.

3.2.1.2 RAP Recommendations

The City of Toledo has conducted various studies on the combined sewer overflow system. These studies include:

Ten Mile Creek Facilities Plan 1977
Combined Sewer Overflow Study 1978
Toledo Areawide Facilities Plan 1979
Toledo Recommended Plan 1979
Update of Combined Sewer Overflow Study 1986

The Update of Combined Sewer Overflow Study of 1986 was submitted to Ohio EPA for their review. From this study several grants have been awarded to the City of Toledo to improve water quality on the Maumee River and Swan Creek.

Maumee River - East. No action is recommended for Maumee River East combined sewer overflow abatement. This is recommended because minimal water quality improvements will result and beneficial use will not be affected.

Maumee River - West. No action is recommended for Maumee River West combined sewer overflow abatement except for regulator 22. This is recommended because minimal water quality improvements will result and beneficial use will not be affected. Regulator 22 is recommended for separation because it eliminates a river inflow problem. This regulator will be addressed under the City of Toledo Combined Sewer Overflow Abatement Project Phases 1 through 9. The cost to separate regulator 22 is estimated to be $1,600,000 and is scheduled for separation in 1996.

Maumee River - West (Downtown). The City of Toledo is currently constructing a tunnel in the downtown business district to abate combined sewer discharges from six regulators located along the Maumee River downtown water front. Abatement of these regulators will result in improved water quality in an area of substantial use. This tunnel will store the first "flush" from a storm event and convey this flow to the treatment plant once the main interceptor can handle the additional flow.

Recommend that the City continue to monitor its regulators and recommend corrective action should the monitoring data prove that substantial degradation is occurring to the water quality on the Maumee River. A cost effective analysis should be selected to provide the maximum benefit for the cost, or as required to meet water quality standards.

Ohio EPA should review the recommended corrective action and comment on same.

3.2.1.3 Who Should Act?

Ohio EPA
City of Toledo.

3.2.1.4 Estimated Cost

Capital costs of alternatives are as follows:

	Separation	Storage	Treatment
Maumee East	$77,320,000	$2,300,000 to $55,250,000	$5,310,000 to $10,615,000
Downtown	$56,145,000	$12,500,000	$4,225,000 to $28,830,000
Maumee West	$90,830,000	$16,650,000 to $81,905,000	$8,107,000 to $36,905,000

All figures are from the *Update of Combined Sewer Overflow Study 1986*, page 4. All cost have been adjusted to reflect 1989 dollars. Treatment reflects primary treatment prior to discharge to the receiving streams (swirl concentrators). Downtown storage reflects actual cost.

3.2.1.5 Potential Funding Source

Ohio EPA Grant
US EPA Grants
City of Toledo Sewer Rates

3.2.1.6 Time Line for Implementation

The Downtown Tunnel Project (CSO Phases 1 and 2) was completed in July 1990. A recommended corrective action plan should be completed within three years after approval of this proposal and if corrective measures should be required, as outlined in 3.2.1.2, implementation should be completed within 17 years thereafter.

3.2.2 CITY OF MAUMEE

3.2.2.1 Description of the Problem

The City of Maumee published its CSO study in 1982. It included detailed analysis of the overflow with regard to correlation between rainfall quantity, intensity, combined sewage bypasses, and their effect on the water quality of the Maumee River. While the primary focus of this study was the City of Maumee, it also included sampling on the Perrysburg side of the river. Samples were collected at two outfalls in Perrysburg, and three in Maumee. Rainfall data was collected in Maumee at four locations to correlate the response of the combined sewer system in terms of measured overflow. Sampling included primary site (quality and quantity discharged), and secondary sites (quality only). Results of this sampling indicated high levels of BOD and nutrients, and high bacteria counts.

The Maumee CSO Study concluded that rainfalls as low as 0.05 inches resulted in bypasses. These bypasses resulted in violations of the fecal coliform standards for the Maumee River, but did not have a serious impact on dissolved oxygen. The study recommended the City of Maumee proceed with a sewer separation program.

3.2.2.2 RAP Recommendations

Recommend that the City of Maumee follow their approved plan to eliminate the combined sewer regulators. The storm sewer separation program as approved by Ohio EPA in its Findings and Orders, is under a 12-year construction program. The combined sewer area is divided into 4 districts: White Street, Allen Street, Sackett Street and Duane Street.

Original plans were drawn in 1971, but never implemented until all expansion of any source of federal funds was available. Under the 12-year plan, every 3 years a new district storm sewer collection system would be constructed. These four phases (not necessarily in this order) are as follows:

- Phase 1 White Street District has been constructed and completed.
- Phase 2 Plans for the Allen Street District are under construction.
- Phase 3 Sackett Street District, and
- Phase 4 Duane Street District will be constructed by 1996.

3.2.2.3 Who Should Act?

Ohio EPA
City of Maumee

3.2.2.4 Estimated Cost

$3,600,000 balance next 6 years.

3.2.2.5 Potential Funding Sources

City of Maumee:

One-third Assessment
One-third Sewer Fund
One-third Income Tax

3.2.2.6 Time Line for Implementation

Follow Proposed Schedule

3.2.3 CITY OF PERRYSBURG

3.2.3.1 Description of the Problem

The City of Perrysburg's CSO Study was prepared in 1982. River sampling data showed significant CSO-related increases in fecal coliform bacteria concentrations, but no serious impacts on dissolved oxygen and other water quality parameters. The study included the development of combined sewer network and receiving water quality models to evaluate various CSO control alternatives.

The CSO Study concluded that rainfall as low as 0.05 inches resulted in bypasses. The study recommended the capture and conveyance of CSOs to a swirl concentrator with chlorination facilities. The treated flow would then be discharged to the Maumee River.

Considering problems experienced with swirl concentrators during the years since the preparation of the CSO Study, the city currently favors a combined sewer system separation project. Such a separation project would reduce the average annual CSO volume to the Maumee River by 90%.

3.2.3.2 RAP Recommendations

Recommend that the City of Perrysburg follow their approved plan to provide elimination or abatement of combined sewer overflows. This plan should consist of a phased program of sewer separation with the ultimate goal of achieving a 90% reduction in CSOs. Phases I and II should be completed by August 1991. These improvements will reduce CSOs at the Elm Street regulator and provide a new storm sewer outlet at East Boundary and the Maumee River.

3.2.3.3 Who Should Act?

Ohio EPA
City of Perrysburg

3.2.3.4 Estimated Cost

$10,000,000 to $11,000,000

3.2.3.5 Potential Funding Source

City of Perrysburg:

One-third Assessment
One-third Sewer Fund
One-third Income Tax

Ohio EPA - Issue Two Grants

3.2.3.6 Time Line for Implementation

Follow Proposed Schedule

3.3 INDUSTRIAL DISCHARGERS

The National Pollutant Discharge Elimination Systems (NPDES) is the major mechanism to regulate discharges from point sources (municipal and industrial). All dischargers must obtain a permit from Ohio EPA. These permits may contain compliance schedules requiring the source to reduce pollutants step by step over a specified period of time. The NPDES permit requires monitoring of the discharges on a continuing basis. Violation of the compliance schedule or any requirement in the permit is a violation of the Clean Water Act and enforceable by fines or court action. The permit program is the key to enforcement of the entire Act, and one of the most important areas for citizen participation and involvement.

For industrial dischargers that were classified as categorical industries, such as petrochemical, aluminum forming, pesticides, etc..., these industries had to comply with federally promulgated Best Available Treatment Regulations by July 1, 1984.

The 1987 Clean Water Act emphasized the importance of controlling toxic substances discharged to surface waters. To achieve this, the Act required Ohio to develop a list of streams which are impaired due to the discharge of toxic substances from point sources. This list is known as the 304(l) list. These point sources must be put on aggressive schedules to bring them into compliance with discharge limits that will eliminate adverse impacts on the streams.

These schedules and limits (individual control strategies) were accomplished by issuing new or modified NPDES permits. Ohio EPA included 25 entities on the list and developed individual control strategies by February 1989. The Ohio EPA has also begun to issue water quality based effluent permits with toxicity limits and toxicity monitoring requirements.

The permittees must take corrective actions if their effluent fails toxicity tests. Ohio EPA tracks the results and takes appropriate actions if a discharger does not initiate the necessary steps to identify the source of toxicity and then eliminate the toxicity. All dischargers are required by the Toxics Control Strategy to comply with Water Quality Standards in their permits prior to or no later than June 13, 1993.

Ohio EPA has announced its intention to gradually adopt a process to review and reissue all wastewater pollutant discharge permits within specific hydrologic drainage basins or watersheds within the same year. The change is being made because of the importance of evaluating water quality issues in the permitting process. Development of additional pollution control requirements often calls for detailed site specific knowledge of the water quality in the receiving water. The current schedule for renewal of permits was developed independent of a geographic or watershed framework and makes the collection and evaluation of adequate monitoring data inefficient or impossible given resource constraints. The basis for the regulation of these wastewater discharges is the NPDES permits which by law can be issued for no longer than 5 years.

The process of switching from the present permit renewal system to the new watershed approach will require adjustments to the expiration dates of NPDES permits. US EPA Region V administrator concurs with the value of a watershed approach to permit renewal and agreed to allow adjustments to the expiration dates of NPDES permits. Some dischargers will be given short term permits (1 to 3 years) with the present limits. Some dischargers will have their permits renewed early.

The following industries have been problem dischargers to the Maumee River and Maumee Bay with each being dealt with separately:

3.3.1 CONRAIL - EMERALD AVENUE

3.3.1.1 Description of the Problem

This facility has massive oil problems. Oil is discharged from one of the shops and a former diesel refueling area. The discharge goes to an unnamed tributary of the Maumee River. The receiving stream is, in effect, being used to treat the runoff. There are baffles across the stream which are used to trap the oil. They are located about 30 or 40 feet above a culvert the stream enters before flowing into the Maumee.

3.3.1.2 RAP Recommendations

The Ohio EPA should initiate enforcement action. It is recommended that an oil/water separator be installed to handle the oil from the sewers and it must have continuous maintenance. The soil around the former diesel fueling area must be examined for groundwater contamination as well as the ditch which received the oil.

3.3.1.3 Who Should Act?

Ohio EPA
Conrail

3.3.1.4 Estimated Cost

Unknown

3.3.1.5 Potential Funding Source

Conrail

3.3.1.6 Time Line for Implementation

The installation and elimination of the problem should be completed in 2 years.

3.3.2 LIBBEY-OWENS-FORD

3.3.2.1 Description of the Problem

The Libbey-Owens-Ford Co. (LOF) East Toledo and Rossford facilities both have wastewater discharges which are regulated under NPDES permits. The East Toledo facility no longer produces glass, while the Rossford facility is still fully operational. Prior to the common usage of the float glass process in the late 1960's, both facilities employed settling ponds to hold grinding and polishing materials used in the glass manufacturing process. There has been some evidence of discharges from the settling ponds which have the potential to affect Otter Creek (East Toledo) and the Maumee River (Rossford).

3.3.2.2 RAP Recommendations

Recommend methods, including capping and dewatering of the ponds be investigated to minimize creation of additional discharges from the ponds. Following this procedure, collection systems should be developed and installed to collect any remaining discharge. A plan has been developed and implemented to divert the south branch of Otter Creek from its current position, under the East Toledo settling ponds, to a position around the ponds which is less likely to be affected by any discharge.

LOF, in cooperation with the City of Northwood and Ohio Waste Systems Inc. (OWS), have worked to divert the south branch of Otter Creek from its current path beneath the former settling ponds. LOF recently finished construction, and will be filing by June 1, 1990, with Ohio EPA for the new and revised NPDES permit for its East Toledo facility. It is anticipated that the permit will be reviewed and granted without problem.

LOF applied for, and has received from Ohio EPA, a Permit-to-Install for an Aggregate Drainage Collection System at the Rossford facility. This system is collecting discharges from the former settling ponds and directing it to the NPDES permitted settling pond located on the property of the Rossford facility. Construction of this system is complete and the system is fully operational. Also, the application for the Rossford NPDES renewal has been submitted to Ohio EPA and is undergoing review.

Methods of minimizing the discharges from the former settling ponds at Rossford and East Toledo are being investigated, such as experimental dewatering systems that are in place and are currently being tested and capping of the East Toledo ponds.

3.3.2.3 Who Should Act?

Ohio EPA
Libbey-Owens-Ford Co.

3.3.2.4 Estimated Cost

East Toledo - $1,758,000

Rossford - $102,000 for the Aggregate Drain System

3.3.2.5 Potential Funding Source

Libbey-Owens-Ford Co.

3.3.2.6 Time Line for Implementation

East Toledo: Project is complete and NPDES permit application will be submitted by June 1, 1990

Rossford: Aggregate drain system is complete.

3.3.3 BP OIL

3.3.3.1 Description of the Problem

There have been violations of suspended solids, oil and grease, ammonia, BOD and phenols during the year 1989. There were two permitted stormwater overflows during that period.

3.3.3.2 RAP Recommendations

BP Oil is currently investigating several improvements to the Wastewater Treatment Unit (WWTU) in order to prevent sand filter bypasses. A study is being undertaken to determine if any necessary improvements are needed to the treatment system. Recommend that the following options being considered:

1. Construct a new sand filter bypass pipe. This bypass would take water from the clarifier to the inlet of the WWTU. This would eliminate the sand filter bypass which takes water from the clarifier and sends it to the final effluent.

2. Construct a new pipe which would take water from the sand filter backwash clarifier and reroute to the biological clarifier and belt press. This would improve the removal of the solids from the systems. Currently, some solids are recycled in the system because the sand filter backwash is sent to the inlet of the air flotation unit at the WWTU.

3. Consider the addition of sand filter capacity.

3.3.3.3 Who Should Act?

Ohio EPA
BP Oil

3.3.3.4 Estimated Cost

Unknown

3.3.3.5 Potential Funding Source

BP Oil

3.3.3.6 Time Line for Implementation

Study to be completed within 2 years.

3.3.4 SUN REFINING AND MARKETING COMPANY

3.3.4.1 Description of the Problem

This facility's effluent flows into Otter Creek and accounts for than majority of the stream flow during dry weather. The existing facilities are designed to handle a 10-year rain storm event. However, overflows and NPDES violations, including oil and grease, BOD and phenols, were reported in the past years.

3.3.4.2 RAP Recommendations

Sun is presently designing a new wastewater treatment system to replace the existing facilities. The new system will incorporate provisions to manage at least a 10-year rain storm event and for the internal recycling of treated water. The refinery final effluent will be sent to the City of Toledo's POTW to eliminate the discharge to Otter Creek, short of rain water during a storm event significantly greater than a 10-year event. Recommend that Sun proceed on schedule.

3.3.4.3 Who Should Act?

Sun Oil Company
Ohio EPA
City of Toledo

3.3.4.4 Estimated Cost

$20,000,000

3.3.4.5 Potential Funding Sources

Sun Refining and Marketing Company

3.3.4.6 Time Line for Implementation

First quarter of 1993

3.4 URBAN RUNOFF

3.4.1 Description of the Problem

Urban stormwater runoff constitutes a largely unquantified but potentially major source of pollution to the Maumee River basin. Because pollutants in urban stormwater runoff come from diverse nonpoint sources, control is very difficult. While US EPA has recognized the need to control pollution from urban stormwater, little guidance has been offered regarding how to do so, or what standards need to be met.

Current law requires US EPA to develop a regulatory program to control urban stormwater discharges in the near future, but it is problematic whether deadlines will be met and useful guidance will be provided. Nevertheless, since urban stormwater appears responsible for the introduction of a substantial pollutant load, it is important to actively seek and implement control mechanisms to protect the Maumee River basin.

Conventional pollutants such as suspended solids and phosphorous are typically found in elevated concentrations in urban stormwater. Given the agricultural nature of the watershed, the mass load of these pollutants from urban sources is dwarfed from the contribution from agricultural drainages. However, localized problems result from uncontrolled urban stormwater drainages, such as during active construction activities where erosion can result in large discharges of solids.

The introduction of toxins from urban drainages probably presents a greater threat than conventional pollutants in terms of degrading the Maumee River basin. Unfortunately, research on the introduction and fate of toxins from urban drainages into the watershed is very sparse. High concentrations of heavy metals have been found in some urban storm sewer sediments, elevated concentrations of oil and grease are commonly found in urban runoff, and other organic contaminants may be introduced from a number of industrial sources. Thus, while the potential for system damage from toxins is great, the understanding of how much of that potential has been realized is small.

3.4.2 RAP Recommendations

Currently, the only control on urban stormwater is a requirement in the City of Toledo and Lucas County that for a new development, any flow above the rate at which runoff occurred from a 25-year storm before development must be retained. While this requirement has significance in controlling downstream flooding, it is primarily a water quantity rather than water quality restriction.

Improving the quality of runoff is going to demand the development of new laws and aggressive management plans by local and state government. An effective way to deal with runoff pollution is to have a plan for an entire watershed. In this way, major sources of pollution can be traced, and, a baseline of water quality in the watershed can be established and used as a "yardstick" to measure the effectiveness of various correction and prevention measures.

Unfortunately, this almost always requires the cooperation of several jurisdictions. The federal NPDES permit program which will require such a plan for operators of separate storm sewers serving a population of over 100,000, will initially affect only the City of Toledo. The Toledo Metropolitan Area, however, consists of 5 other cities which will not be affected by the NPDES permit program for a few more years.

A bill was introduced in the Ohio Senate in April 1989 (H.B. 412) that would allow the creation of multi-jurisdictional stormwater management districts that would have the authority to generate revenue and restrict new development and other land-altering activities that do not meet requirements established by the district's stormwater management plan. This proposal has the support of major Ohio cities such as Columbus and Cincinnati. This bill or similar legislation should be supported because it encourages smaller cities within the metropolitan area to participate, planning can be done on a watershed basis, and combining the resources of several jurisdictions is more cost effective.

Problem Correction and Prevention. Older, developed areas are probably the worst in terms of contributing heavy metals to stormwater. It is usually more difficult to implement structural and non-structural controls in these areas, however, their substantial contribution to pollutants makes it imperative to implement control programs.

It is often more cost effective to improve and maintain water quality by correcting problems at the source rather than relying only on "end of the pipe" solutions. Illicit connections to storm sewers need to be located and eliminated. Recommend that a monitoring program be established to assist in locating these connections. An effective enforcement program also needs to be established.

Cities must be aggressive about responding to all complaints of illegal dumping and liquid waste runoff and locating parties responsible for the illegal disposal of hazardous material in drainage systems.

There are unique opportunities in developing areas for slowing down the degradation of water from non-point sources and avoiding higher clean up costs in the future. New industries and businesses should be required to submit disposal plans for water contaminating wastes. Recommend that construction site runoff be regulated by new ordinances and followed up with adequate enforcement.

Structural controls for minimizing the impacts of stormwater runoff are far less expensive when introduced during the initial construction phase of development. Construction permits should include stormwater runoff standards for quality and quantity. Meeting these standards may require the use of structural controls such as first flush diversion systems, detention/retention basins, grassy swales, oil and grease traps, modular or porous pavement, buffer strips, etc. Resolve prior to construction of these controls, responsibility for 1) costs, 2) disposal of collected hazardous materials, and 3) abatement of odor, mosquito and safety problems.

Recommend tighter restrictions on development in floodplains be imposed based on watershed plans that identify land use development patterns and existing and potential drainage problems.

Community programs (i.e., motor oil recycling, disposal of hazardous household chemicals, rewards for information leading to the conviction of chronic polluters, etc.) need to be developed that discourage illegal and inappropriate dumping into the storm sewers and waterways.

Public awareness campaigns, educational programs, and the media should be used to encourage volunteer efforts and put public pressure on business and industry.

Education Programs. Education programs should be initiated on the importance of keeping toxic pollutants from entering the urban stormwater drainages. The public and small businesses may be unaware of the significance of such actions as throwing used crankcase oil into storm sewers. State and local agencies should provide and circulate educational material designed to maximize voluntary efforts to keep toxins out of the drainage system.

Pollution Control Agencies. The various pollution control agencies should increase their presence in promoting the proper management of toxins. Leaks and spills, resulting from both sloppy housekeeping and intentional acts, should be minimized. Agencies should increase cooperative efforts to ensure that personnel are properly trained (particularly that all inspectors are trained to be observant for improper toxic management during the course of their inspections). This will require interaction between the Ohio EPA and local health and fire agencies in providing education regarding the significance of controlling this source of toxins.

Research. Research should be encouraged and funded by the US EPA and Ohio EPA to determine the effectiveness of specific control measures and the significance of urban runoff to the overall health of the receiving water. Local universities should be funded to examine the effectiveness of pilot programs designed to test control measures and resulting environmental impact.

3.4.3 Who Should Act?

Municipal and County Drainage Control Authorities
Land Use Planners
Local Health Departments
US EPA
Ohio EPA

3.4.4 Estimated Cost

Until the final regulations are promulgated, it is difficult to estimate the cost of complying with the federal permit program. Several years ago, based on proposed regulations, it was estimated that the cost for the City of Toledo to set up the federal NPDES storm sewer permit program would be at least $600,000 according to local consultants, Finkbeiner, Pettis & Strout. Annual costs to maintain the program are estimated to be at least $500,000. A comprehensive urban runoff plan for the RAP area that is expanded to include Sylvania, Maumee, Perrysburg, Rossford and Oregon would probably double the cost.

3.4.5 Potential Funding Source

Grants from the Ohio EPA, or ODNR, could fund some of the necessary research required to formulate an urban runoff pollution control strategy. Most of the money, however, will have to come from already strained municipal and county budgets. Creation of a stormwater utility or district could generate revenue through the collection of drainage fees.

3.4.6 Time Line for Implementation

The federal NPDES permit program for storm sewers mandates that cities with populations of at least 100,000 have stormwater management plans in place by mid-1992. A good regional stormwater plan would probably take at least 5 years to develop provided that regional coordination begins immediately, funding is planned, and a monitoring program can quickly be established.

3.5 AGRICULTURAL RUNOFF

3.5.1 Description of the Problem

Agricultural runoff is a major source of pollutants to the Maumee River system and Lake Erie. Sediment is considered the most prevalent non-point source pollutant and has been identified as the vehicle for transporting phosphorus.

Suspended and deposited sediment creates numerous problems within the Maumee River Watershed. The average annual sediment load is 1.2 million metric tons. It impacts biological communities, fills the extensive network of drainage channels in the basin, creates navigational problems in the Toledo Harbor and increases treatment costs of water supplies.

Phosphorus has been identified as a key factor in the degradation of fresh water lakes including Lake Erie. The 1983 Supplement to Annex 3 of the Great Lakes Water Quality Agreement confirmed Target Loads for reduction of phosphorus in Lake Erie needed to restore water quality. (Target loads for reduction of phosphorus for agriculture in the Maumee River watershed are listed in the table below). The non-point phosphorus load to Lake Erie from the Maumee Basin is 2,113 metric tons/year, eight times the load from any other Ohio Basin and just under half of the total non-point load to the Lake. Phosphorus from agricultural runoff has been identified as a significant source (80%) of non-point phosphorus reaching Lake Erie annually.

Soil erosion rates per acre in the basin are generally low. However, the large amount of cropland (80%), coupled with finely textured clay soils, produce soil particles that are easily displaced and transported. These particles have chemical and physical properties that strongly adsorb phosphorus, which in suspension create a major water quality problem.

Northwest Ohio has been extensively drained both with surface ditches and subsurface tile. During runoff events, surface runoff and tile effluent contribute to high nitrogen nitrate levels in the Maumee River. Concentrations have exceeded the drinking water standard, causing communities that draw municipal water from the Maumee to issue drinking water alerts.

Other agricultural pollutants delivered to surface water and groundwater result from the application of fertilizers, manure and pesticides to cropland. Nutrient pollution from manure in the Maumee basin is difficult to determine because it is highly dispersed and involves farm units ranging from large concentrated feedlots to small dairy and/or hog operations. Manure runoff is a source of phosphorus and nitrogen to bodies of water. Excess application of manure to cropland results in soil phosphorus accumulation greater than crop removal.

Agricultural pesticides used on cropland in the Maumee Basin have been found in surface water with higher concentrations in spring and summer. Herbicides and insecticides that are highly soluble and have a low adsorption capacity have a greater possibility of movement if applied prior to a storm event producing high runoff. In general, concentrations of herbicides are greater than insecticides, proportional to their usage in the basin. The effects of pesticides on water quality are uncertain due to low acute toxicity, low persistence and insignificant bioaccumulation.[1] As a class of pollutants, pesticides warrant continued monitoring and careful assessment of effects on the environment in the Maumee Basin and Lake Erie.

PHOSPHORUS REDUCTION GOALS FOR LAKE ERIE BASIN FROM AGRICULTURE

County	Cropland Acres (1982 NRI)	Lake Erie Basin Cropland Acres	Maumee Basin Cropland Acres	Lake Erie Direct* Watershed Acres	Tons Agricul. Goal
Allen	194,300	194,300	194,300		36.1
Auglaize	209,900	165,821	165,821		30.8
Defiance	200,100	200,100	200,100		37.1
Fulton	219,100	219,100	191,400	13,600	40.7
Hancock	280,800	280,800	195,300		52.1
Hardin	242,700	101,934	79,400		18.9
Henry	225,800	225,800	225,800		41.9
Lucas	93,300	93,300	24,200	69,100	17.3
Mercer	239,100	112,377	112,377		20.9
Ottawa	64,500	64,500		64,500	21.0
Paulding	225,500	225,500	225,500		41.8
Putnam	267,800	267,800	267,800		49.7
Seneca	280,500	280,500	5,500		52.1
Van Wert	232,100	232,100	232,100		43.1
Williams	185,400	185,400	185,400		34.4
Wood	375,100	375,100	68,300	48,000	69.6
Wyandot	209,200	209,200	24,200		38.8
Shelby	207,800	12,468	12,468		2.3
			2,409,966	195,200	

3.5.2 RAP Recommendations

The Ohio Phosphorus Strategy and the Ohio Nonpoint Source Management Program both recommend a comprehensive land treatment program be adopted, focused on Agricultural Best Management Practices (BMPs) (Exhibit 1). The cornerstone of these BMPs is residue management/conservation tillage.

Efforts to encourage land users to adopt alternative agricultural tillage systems, which have shown reduction of cropland runoff, have been widespread throughout the Maumee River Basin. Adoption of conservation tillage by land users has risen steadily since 1989, adding about 300,000 acres each year. A study by Baker, Logan, Burris, et al.,[2] indicates conservation tillage to be the most cost effective land management practice.

Farmers are encouraged to adopt BMPs through local agricultural non-point source steering committees composed of interested public and private individuals in each county within the Maumee River Basin. The committees, assisted by Soil & Water Conservation Districts will develop local strategies to implement water quality efforts tailored to the needs of each county.

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* Ten Mile Creek / Ottawa River, Cedar Creek, Crane Creek, Berger Ditch, Turtle Creek, Packer Creek, and Toussaint Creek.

Exhibit 1
Best Management Practice Summary Guide*

Key
- A Medium to high effectiveness
- B Low to medium effectiveness
- C No control to low effectiveness
- ? May increase or decrease impact[1]

	Resource Concerns										
	Surface Water Quality									***Ground Water Quality***	
Management Practices	Salinity	Temperature	Sediment	Soluble Nutrients	Adsorbed Nutrients	Soluble Pesticides	Adsorbed Pesticides	Oxygen-Demanding Substances	Pathogens	**Nutrients**	**Pesticide Loss**
Nutrient Management	C	C	C	A	A	C	C	C	C	A	C
Pest Management	C	C	C	C	C	A	A	C	C	C	A
Irrigation System, Tailwater Recovery	A	?	A	A	A	A	A	C	C	?	?
Irrigation Water Management	A	C	A	A	A	A	A	C	C	B	B
Regulating Water in Drainage Systems	B	?	C	A	C	A	C	C	C	?	?
Soil Salinity Management	A	C	B	B	B	B	B	C	C	C	C
Structure for Water Control	C	C	A	C	A	C	B	A	C	C	C
Water Table Control	B	?	C	A	C	A	C	C	C	?	?
Waste Management System[2]	C	C	A	A	A	C	C	A	A	A	C
Runoff Management System[2]	C	?	A	A	A	C	C	A	A	A	C
Vegetative and Tillage Practices											
Conservation Tillage	C	C	A	C	A	C	A	C	C	?	?
Contour Farming	C	C	A	B	A	B	A	B	B	?	?
Contour Stripcropping	C	C	A	B	A	B	A	B	B	C	C
Filter Strip	C	C	B	C	B	C	B	B	B	?	?
Field Border	C	C	B	C	B	C	B	B	B	C	C
Cover and Green Manure Crop	C	B	B	B	B	B	B	C	C	B	C
Conservation Cropping Sequence	B	C	A	B	A	B	A	C	C	B	B
Field Windbreaks	C	C	B	C	B	C	B	C	C	C	C
Pasture and Hayland Management	C	B	B	C	B	C	C	B	B	C	C
Field Stripcropping	C	C	B	B	B	B	B	C	C	C	C
Grasses and Legumes in Rotation	C	B	B	B	B	B	B	C	C	C	C
Structural Practices											
Terrace	?	?	A	B	A	B	A	B	B	?	?
Water and Sediment Control Basin	C	?	A	C	A	C	A	B	C	?	?
Diversion	C	?	B	C	B	C	B	C	B	C	C
Grade Stabilization Structure	C	C	B	C	B	C	C	C	C	C	C
Grassed Waterway	C	C	B	C	B	C	B	C	C	C	C
Streambank and Shoreline Protection	C	A	A	C	A	C	C	B	C	C	C
Wetland Development or Restoration	C	B	A	B	A	B	A	A	B	?	C

* Abstracted from USDA Agriculture Information Bulletin No. 598. NOTE: Because of the general nature of this chart, there may be situations and sites where practices will not perform as indicated.
[1] Depends on soil, crop, practice design, and management characteristics.
[2] Includes all appropriate structural, vegetative, and management characteristics.

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To achieve a reduction of the phosphorus loads to Lake Erie from cropland, erosion and sediment delivery must be reduced. This reduction must come from adoption of conservation tillage systems and other BMPs by land users and farmers in the Maumee River basin. The practice of fall moldboard plowing is discouraged and maintenance of land surface cover on all exposed soil surfaces during the critical erosion period, December to April, is encouraged.

In the Maumee River Basin the recommended management option for improved water resources is to continue high-yield agriculture with best management practices on the land surface and a comprehensive approach to stream management effective in restoring stream habitat.

Agricultural Best Management Practices

Agricultural Best Management Practices[3] are selected for their effectiveness in reducing contamination of water resources from erosion, phosphorus, manure and organic waste, biological oxygen demand (BOD) and pesticides. Agricultural BMPs are site specific, involving factors such as topography, soil type, rainfall/runoff and/or crop rotation. BMPs should be evaluated as to practicality and cost effectiveness. A number of proven management practices for protecting water quality are recommended for adoption on cropland in the Maumee Basin.

Conservation Tillage - Any tillage and planting system that maintains a reside on at least 30% of the soil surface after planting to reduce water erosion or, where soil erosion by wind is the primary concern, maintains at least 1,000 pounds of flat small grain residue equivalent on the surface during the critical erosion period.

Conservation Cover Crops - A crop of close-growing grasses, legumes, or small grain used primarily for seasonal protection and soil improvement to control erosion during periods when the major crops do not furnish adequate cover and protection.

Conservation Cropping Sequence - An adapted sequence of cropping designed to provide adequate organic residue for maintenance or improvement of soil tilth, for the purpose of reducing erosion and improving water quality.

Critical Area Planting - Planting vegetation on highly erodible or critically eroding areas to stabilize the soil and reduce damage from sediment and runoff to downstream areas.

Field Windbreak - Strips or belts of trees or shrubs established in or adjacent to a field to reduce soil blowing and deposition into drainage ditches. In addition, establishment should be with an ecosystem approach emphasizing biota benefits.

Vegetative Filter Strips - Strips or areas of vegetation established for removing sediment and other pollutants from runoff or wastewater by filtration, deposition, infiltration, absorption, adsorption, decomposition and volatilization, thereby reducing pollution of the environment.

Grassed Filter Strips should be 10 to 20 feet in width. They should be installed between the forested buffer and cropped field or other land use, and will reduce conflicts which woody vegetation may present near agricultural production areas.

A *Forested Buffer Strip* is installed to provide filtration, deposition, plant uptake, anaerobic denitrification and other natural processes to remove sediment and nutrients from runoff and subsurface flows. Buffer strips can consist of a single row of trees on both sides of intermittent streams, with a depth of 15 feet from the waterway edge. In combination with the Grassed Filter Strip, about 25 to 35 feet of vegetation should flank both sides of every intermittent stream.

In areas where forested buffer strips are not practical, socially acceptable, economically feasible or politically possible, the water quality goals will have to be temporarily compromised to allow agricultural drainage needs to be satisfied. A possible compromise between forested ditch banks or grassed ditch banks is one-sided ditch construction. It should be noted, however, biotic integrity in the Maumee River basin would not be attained utilizing one-sided construction and would result in a "modified" desired future state.

Perennial streams and major rivers require more buffer depth. The depth should be twice the stream width. Streams wider than 35 feet should have 75 feet of buffer along both banks with 20 feet of grassed filter strip.

Designated state scenic rivers should have 120 feet of buffer as recommended by the Ohio Scenic River Program.

Grassed Waterway - Establishment of a channel with adequate capacity and suitable vegetation to convey runoff without causing erosion or flooding and improving water quality.

Nutrient Management - The amount, form, placement and timing of applications of plant nutrients should be managed in a manner that minimizes the entry of such nutrients into surface and groundwater, and maintains or improves the chemical and biological condition of the soil. All sources of plant nutrients such as organic wastes, commercial fertilizers, soil reserves and crop residue are included.

Nutrient management must rely on current soil test recommendations for all fields. Soil tests must be taken at least every three years, or more often, depending on the crop rotation. Procedures for accurate soil testing are available from the Ohio Cooperative Extension Service.

Where manures, sludges or other organic wastes will be used, it is recommended the wastes be analyzed to determine the nutrient content. Manure should be tested least once per year.[6]

A) Phosphorus Management

Phosphorus is the nutrient of major concern, any land having a Bray P-1 Phosphorus level in excess of 60 pounds per acre for row crop and small grain rotation and 90 pounds per acre for speciality crop and forages in rotation, should have no additional phosphorus fertilizer applied until soil test levels are reduced below this level by crop removal (Exhibit 2). An exception is for starter row fertilizer. The Cooperative, Extension Service has "Best Management Practices" information sheets that detail the quantities of starter fertilizer that should be used.

Bray P-1 and Bray P-2 are common testing methods used to measure the amount of phosphorus in the soil. Bray P-1 determines the amount of readily available phosphorus that can be found in the soil. Bray P-2 measures the water soluble phosphates and other phosphates that become available later. Bray P-1 is the most accepted measure for agricultural phosphorus use recommendations.

B) Nitrogen Management

Apply nitrogen as close as possible to the time the crop will utilize the nitrogen, using split applications as necessary. Fall application of nitrogen is discouraged. Plant grass cover crops to tie up excess nitrogen and other nutrients for recycling of nutrients to the next crop (Exhibit 2).

Exhibit 2
Recommended Phosphorus and Nitrogen Management

PHOSPHORUS RECOMMENDED FOR CORN

Soil Test Value	Yield Goal (bu/A) 120	150	180
Lb P/A	Lb P_2O_5/A		
10	75	100	110
20	65	80	90
30-60	45 (1)	60 (1)	70 (1)
70	25	40	50
80	20	20	30
90	0	0	20
100	0	0	0

(1) Crop Removal Rate

Source - Ohio Agronomy Guide (12th Edition)

PHOSPHORUS RECOMMENDED FOR SOYBEANS

Soil Value	Yield Goal (bu/A) 40	60	80
Lb P/A	Lb P_2O_5/A		
10	55	70	85
20	45	60	75
30-60	35 (1)	50 (1)	65 (1)
70	25	40	55
80	20	30	45
90	0	20	35
100	0	0	25

(1) Crop Removal Rate

Source - Ohio Agronomy Guide (12th Edition)

NO YIELD INCREASE FROM APPLIED PHOSPHORUS WHEN BRAY P TEST IS ABOVE

	Lb P/A
Corn	40
Soybeans	30
Wheat	60

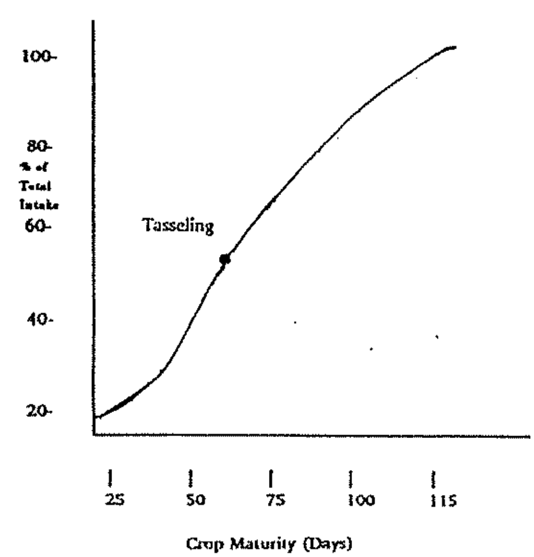
NITROGEN RECOMMENDED FOR CORN

Previous Crop	Yield Goal (bu/A) 120	150	180
	Lb N/A (1)		
Forage Legume	60	110	150
Grass Crop	65	170	200
Soybeans	85	190	200
Continuous Corn	115	200	200

(1) add 50 Lb N/A for low organic matter or poor drainage

Source - Ohio Agronomy Guide (12th Edition)

NITROGEN UPTAKE IN CORN



NITROGEN CARRY OVER VARIES

Zero nitrogen produced 12 bu/A one year and 132 bu/A the next year in the same plots. Normal yield was 60 bu/A continuous corn.

Research Northwest Branch OARDC

Pest Management - Agricultural pest infestation should be managed to reduce adverse effects on plant growth but be environmentally acceptable. The principles of an Integrated Pest Management (IPM) program should be applied when managing pest infestations.

1. Use crop rotations, crop varieties resistant to target pest(s) and adjustment of planting dates to help control weed, insect and disease problems.

2. Consideration of pesticide characteristics such as solubility, toxicity, persistence and adsorption is desirable. The relationships to site characteristics such as soil leaching potential,[4] geology, depth to water table, proximity to surface water, and topography should be considered to determine the potential impact on water quality.

3. The pesticides listed with a "groundwater advisory" on the label have been identified as having a significant impact on surface and groundwater. Application on soils with a high leaching potential or where soil loss is greater than 5 tons per acre should be restricted.

Pesticides with "Groundwater Advisory"

Common Name	Trade Name
Alachlor	Lasso EC, Lasso MT, Arena, Lariat, Bullet, Bronco
Metolachlor	Dual, Bicep, Prelude, Turbo
Atrazine	AAtrex, Atrazine, Lariat, Bullett, Bicep, Extrazine II, Prozine, Sutazine, Marksman, Laddock, Buctril+Atrazine
Cyanazine	Bladex, Extrazine II
Simazine	Princep, Simazine
Metribuzin	Sencor, Lexone, Salute, Turbo, Preview
Clopyralid	Stinger

A listing of soils with high leaching potential or apparent high seasonal water table can be acquired at the local county Soil Conservation Service Office.

Stream Bank Protection - Banks of streams should be stabilized and protected against scour and erosion by vegetative or structural means to reduce sediment loads and pollution. Vegetative means are preferred and should be encouraged over structural means to protect stream banks.

Livestock should be excluded from streams and stream banks to prevent soil compaction and loss of vegetation. In addition, livestock exclusion from streams will prevent manure deposition in the stream.

Restoration and Protection of Riparian Corridors - Strategies to restore and protect riparian corridors vary with site specific conditions and landowner acceptance. A prudent first step toward restoration requires a reteat of agricultural practices from the waterway. In time, natural succession will establish woody vegetation along the waterway. Mowing a filter strip between the woody vegetation buffer and the adjacent land use will allow access to the waterway. The mowed filter strip will also eliminate conflict between the woody buffer strip and adjacent land use.

Protection of the waterway channel from excessive erosion may mandate various bank stabilization efforts as described in this section. Care should be taken in addressing erosion and deposition problems to avoid disturbing the woody buffer strip to leave it as intact as possible.

Technical assistance and cost sharing practices are available from acting agencies identified in this section. These agencies can offer strategies and support to restore and protect riparian corridors in a more timely manner than natural succession alone permits. Landowners are encouraged to request agency assistance.

Waste Management Systems - Waste generated by agricultural production or processing should be managed in a manner that prevents or minimizes degradation of air, soil and water resources. See Nutrient Management.

Structural Erosion Control - Structural applications for land management to reduce erosion such as, Grade Stabilization Structures, Water and Sediment Control Basins, should be applied where needed.

Additional Recommendations:

Maintenance of drainage channels is important in agricultural production in NW Ohio. Periodic cleaning of sediment from open ditches is necessary to allow removal of excess surface and subsurface water and provide optimum growing conditions. Without proper maintenance, streambank erosion could add significant volumes of sediment (1 - 10% of total sediment yield), and cropland could revert back to its swampy nature, reducing the potential for successful conservation tillage methods.

The opportunity to practice sustainable agriculture is encouraged. Sustainability should be approached with efficient use of purchased and natural resources, continued profitability and minimum adverse effect on the environment.

Government programs affecting agriculture should be more flexible, to allow variability in cropping without penalty to the farmer enrolled in government programs. Rotations without loss of base yields should be available to farmers in sensitive areas like the Maumee River Basin.

Increased educational efforts will be necessary to achieve water quality goals in the Maumee Basin. Information regarding environmental issues and technical application should be understood by producers and consumers alike. Agencies need to address public concerns on water quality using public media, scheduling seminars and conducting demonstrations. Land users need to be informed of latest technical information and methods.

In addition, it is recommended that certification be required of all commercial fertilizer applicators in the Maumee Basin.

3.5.3 Who Should Act?

Ohio Soil & Water Conservation Districts within the Maumee Basin will be the major implementation agency utilizing phosphorus reduction goals indicated in Table 1. The determination of phosphorus savings per county will take into consideration six parameters: conservation tillage, small grain acreage, hay acreage, grassed waterways, CRP acreage and set-aside acreage. Soil & Water Conservation Districts should consider all practices in relation to its ability to reduce phosphorus loading and adjust it's county program accordingly.

Other federal, state and local agricultural agencies have been requested to address water quality within their present programs.

3.5.4 Estimated Costs

Estimated costs for technical, administrative and cost-share to implement in 18 counties: $1,750,000 per year.

> $900,000 per year cost share with landowners/operators;
> $450,000 per year staff technical assistance;
> $250,000 per year monitoring;
> $150,000 per year educational efforts.

Additional Savings to Agriculture and Industry

The largest portion of sediment comes from row-crop agriculture to produce off-site erosion. A 1983 unpublished survey by the Division of Soil & Water Conservation, Ohio DNR, estimated off-site soil erosion costs in Ohio at $160 million. In 1988, the Ohio Alliance for the Environment estimated the annual cost of removing sediment from Ohio's lakes, streams waterways harbors and water treatment plants at $162 million. Regional Ohio USDA estimates showed the average downstream costs per ton of gross erosion to be $3.13 for Ohio (averaged from the Corn Belt, the Great Lakes States and the Northeast). Multiply this by the average annual erosion, 68.7 million tons/ year (1985) gives an annual estimated cost of more than $215 million.

Dredging costs for the Toledo Harbor estimated 1991, $4.15/cubic yard. Annual dredging removes 850,000 cu. yds. resulting in a cost of $3.528 million.

Local water treatment plants indicate costs of water treatment equals about $60/ million gallons of water and may increase as much as 58% during heavy sediment flow. Some communities have been able to reduce costs by 25% utilizing water from reservoirs, when replenishment can occur during a period of relative low sedimentation. Construction of the Bowling Green reservoir cost $2.247 million, and estimates of costs for the City of Defiance for 180 days storage is $5.83 million.

3.5.5 Potential Funding

Federal 319 funds will be used to enhance the phosphorus reduction efforts in the Maumee Basin. A total of $3.5 million have been awarded to various agencies for water quality and phosphorus reduction in the Lake Erie Basin. All Soil & Water Conservation Districts in the Lake Erie Basin have received a $2000 grant to establish a steering committee for planning its county's phosphorus reduction strategy. The Soil Conservation Service has added additional support by providing five staff water quality coordinators in the Lake Erie Basin. Three of the five are assigned to the Maumee Basin to work on water quality programs. This increases federal assistance by $212,000. Additional water quality gains have occurred in counties involved in the Conservation Action Project, Defiance, Fulton, Henry, Lucas and Wood Counties.[4] The project involves representative from agribusiness and private industry and encourages conservation tillage adoption through agricultural fertilizer dealers.

$109,000 in State funds were approved to begin a six-year Manure Nutrient Management program in Fulton County. The Fulton Soil and Water Conservation District will be working with livestock farms to reduce phosphorus runoff and phosphorus buildup on cropland. Other State funded nonpoint source projects include placing two nonpoint pollution educators to develop a natural resource management program and a reestablishment and management of a streamside forested buffer containing an endangered species of mussel. State funds for these three projects totaled $21,600.

National Set-Aside Great Lakes Funds totaling $641,000 were received for implementation of nonpoint source activities in the Maumee River basin. The activities were designed to address the agricultural runoff concerns raised in the Remedial Action Plans (RAP) of the Maumee River.

3.5.6 Time Line for Implementation

Implementation will vary according to the recommended Best Management Practice (BMP). Some BMPs will produce immediate results, some may require one to two growing seasons to be integrated into an agricultural operation.

Grant periods have a specified period to initiate a comprehensive water quality program. Soil & Water Conservation Districts that do not receive an outside grant can address their water quality strategy on a limited basis with present staff. However, full implementation would require additional funding.

REFERENCES:

1. *Lake Erie Agro-Ecosystem Program: Sediment, Nutrient and Pesticide Export Studies;* Water Quality Laboratory, Heidelberg College. 1987

2. *Phosphorus Savings for Lake Erie Basin from Agriculture,* Baker, Logan, Burris, et al. 1989

3. Best Management Practices listed in *Soil Conservation Service Technical Guide Standards and Specifications;* copy in each County Soil & Water Conservation District office in Ohio.

4. A listing of Ohio soils with a high leaching potential is contained in the *Soil Conservation Service Technical Guide.*

5. *Conservation Action Project* (CAP) initiated in 1988 with four counties in NW Ohio, to reduce water pollution though better use of conservation tillage and improved fertilizer management. Added another county to project in 1990.

6. Amended Substitute House Bill Number 88, 119th Ohio General Assembly; and *Ohio Livestock Manure & Wastewater Management Guide,* Ohio State University, 1992.

3.6 CONTAMINATED STREAM SEDIMENTS

3.6.1 Description of the Problem

Toxic discharges have been linked to sediment toxicity in the lower Maumee River and Bay. A fish consumption advisory is in effect for carp and channel catfish from Lake Erie because of PCB contamination. PCBs are relatively insoluble and are strongly adsorbed on soils and sediments. The magnitude of this contribution to the problem is unknown. These toxic sediments are a potential source of contamination of aquatic biota.

Sediments in the lower Maumee River (the Toledo Harbor) are heavily polluted with such conventional pollutants as organic solids and metals as the result of past municipal and industrial discharges (IJC, 1983, Appendix A: Areas of Concern). Sediment quality was one of the reasons the lower Maumee River was designated as an Area of Concern.

A recent study of sediment toxicity in Western Lake Erie and the Maumee River (Giesy, et al., 1988) showed that sites exhibiting sediment toxicity were usually associated with point source discharges, especially between river miles 1 and 3.5. "The effluents discharged by outfalls associated with these locations are a potential source of contaminants for the water column and sediments in downstream areas of the Maumee River (the Toledo Harbor) and the nearshore area of the western basin of Lake Erie" (Giesy, et al., 1988, p.69).

"Permit applications are the most important source of information on the types and quantities of toxic materials discharged by industries" (Willis and Foran, 1986, p. iv). However, the *Investigation Report* (p. 70) reveals that 40% of the National Pollution Discharge Elimination System (NPDES) permits were not current as of January 1, 1988. About 13% of the permits are noted to be problem dischargers. The toxicity of industrial discharges under NPDES permits in the Toledo area has not been reviewed for the RAP, nor are we certain that information for such a review exists.

3.6.2 RAP Recommendations

Recommend that toxic discharges that contaminate sediments be eliminated within the AOC. Establish the proposed RAP monitoring program (see 2.3.8) which would address sediment toxicity within the AOC. Based on the monitoring results, further studies might be necessary to adequately characterize the affected area. These studies should follow the protocol of Thomas, R.L. (no date given) in "A Protocol for the Selection of Process-Oriented Remedial Options to Control In-Situ Sediment Contaminants" published by the IJC.

The protocol of Thomas, R.L. cited above will be used to determine the appropriate remedial actions for areas identified as having toxic sediments. These consist of three general approaches: 1) leaving the sediment alone; 2) in-situ inactivation; and 3) removal.

The monitoring program must oversee the monitoring results and make decisions about appropriate remedial actions. The probability of improved sediment quality is high if proper remedial actions are carried out.

In addition, Ohio EPA should develop one computer database that includes all of the relevant information on discharges of pollutants by watershed. This database should be compatible with the US EPA computer database Permit Compliance System. This database should include the following information and should be accessible by any of these categories:

name of discharger, NPDES permit number, receiving water body and river mile, compliance status, pollutants limited in current permit, Standard Industrial Classification Code, active or inactive discharger, outfalls in use, discharge monitoring report data, permit application data (including priority pollutant loading and concentration information), permit status including expiration date, type of discharger (e.g. municipal or industrial), and discharge monitoring requirements.

This database should be accessible at the OEPA district offices and at the Central Office in Columbus.

We applaud the establishment of the watershed based permit process within Ohio EPA. This will allow permits to be due during the same timeframe with wasteload analysis being conducted. Our AOC must be first priority watersheds in this new permit program and such analysis must include concentration and mass loading of pollutants including toxins.

Recommend that POTWs and industries, including industries that discharge to POTWs, with the potential for discharging toxic materials be required to perform whole-effluent toxicity testing following methods developed by the US EPA's Complex Effluent Toxicity Testing Program. Based on the approach taken to identify significant sources by the US EPA, such monitoring should be required of significant dischargers. This monitoring should not be limited to whole-effluent toxicity testing however. It should include information that identifies specific substances that are causing any toxic effects. Methods and schedules for the elimination of the discharge of persistent toxic substances need to be developed and established.

Recommend that Ohio EPA require that dischargers fund or perform necessary studies to supply these data so that they are available at the time that the permit is derived. If dischargers are unwilling to perform fate, transport and effect studies, Ohio EPA should make conservative assumptions regarding these processes. These assumptions must include no degradation or loss of materials, additivity of toxicity, and other appropriate assumptions.

Recommend that NPDES permits contain concentration and mass limits for pollutants of concern. At a minimum, all dischargers of zinc, chromium, iron, copper, mercury, cadmium, lead or nickel should immediately have permits modified to contain limits for these substances, since their present concentrations violate US EPA water quality criteria in the river, or IJC criteria for Lake Erie.

Recommend that Ohio EPA develop a process for determining whether discharged substances are at "levels of concern" and, therefore, need to be regulated. This process should include considerations for determining the impacts of loadings from several dischargers and the joint action/joint effects of combinations of contaminants. This process must consider also the impacts of discharged pollutants on Lake Erie. During the water quality standard development process, Ohio EPA should use US EPA water quality criteria to identify problem pollutants and priorities for controlling discharges of these pollutants.

Once Ohio EPA issues permits that include limits for toxic pollutants, the agency should immediately take enforcement action against dischargers who fail to meet all permit requirements. If Ohio EPA issues a permit with a scheduled abatement program or with final permit limits that are not immediately effective but are to be achieved at some later date, then Ohio EPA should have a tracking system that monitors compliance milestones while the discharger works to meet final permit limits.

3.6.3 Who Should Act?

Ohio EPA
RAP Implementation Committee

3.6.4 Estimated Cost

Computer, software and training for one office of Ohio EPA - $15,000

Extra effort by Ohio EPA on NPDES program in the AOC, the cost is unknown but based on the number of noncurrent permits in the AOC a 50% increase would be required.

3.6.5. Potential Funding Source

Ohio EPA budget
US EPA grant
Special appropriation by State of Ohio
Dischargers/Responsible Parties

3.6.6 Time Line for Implementation

Recommendations should be implemented within 1 year of their adoption by Ohio EPA.

3.7 DREDGED DISPOSAL

3.7.1 Description of the Problem

The agricultural land of the Maumee River drainage basin provides approximately 1.2 million cubic yards of sediment in runoff annually. This material must be dredged from the Toledo Harbor for commercial navigation. Maintenance dredging of Toledo Harbor is performed annually to maintain the depth of the shipping channel. This dredging produces between 800,000 and 1,000,000 cubic yards of dredged material annually.

From 1960 to 1985, about 90 to 95% of the material was placed in one of the confined disposal facilities (CDF) in the Maumee Bay. In September 1984, the Corps of Engineers proposed to change operations to open lake disposal of about 60% of the dredged material from the Maumee Bay portion of the channel (and upper 2 miles of river channel) due to cleaner sampling results. The remainder of the more polluted materials was to be placed in the CDF.

US EPA found that portions of the material were suitable for open lake disposal with the following stipulation:

> *"Potentially adverse impacts of open-water disposal should be minimized by locating the open-water disposal sites in areas where the sediment will remain in-place and where biological productivity is relatively low."*

In response to concerns by the City of Toledo that their water intake was being affected by open-lake disposal of dredge material, the OEPA began to phase out this practice in 1987 by stipulating in their 401 Water Quality Certification the amount of material that could be disposed in the lake. No open-lake disposal of dredge material from Toledo Harbor will occur after 1991.

There are several effects of open water disposal that are not in accordance with the IJC's guidelines on the disposal of dredged materials. These effects may have negative impacts on the AOC. These include erosion of deposited sediment at the disposal site, local degradation of the benthic ecosystem, increased turbidity and heavy metal concentration in excess of water quality standards, and decreased water quality at the City of Toledo's water intake.

In addition, the AOC suffers from a limited volume of available confined storage capacity remaining in the existing CDFs. The amount of capacity remaining in Facility No. 3 (the large confined disposal facility presently in use) is 1 million cubic yards. A new CDF proposed adjacent to Facility No. 3 would provide an additional 9 million cubic yards of capacity. The remaining capacity in the Toledo area is 10 million cubic yards, or roughly 10 years for all of the sediments dredged from the channel.

CDFs are expensive to construct and environmentally destructive of nearshore fish habitat. About 5% of Maumee Bay has already been filled in by CDFs.

3.7.2 RAP Recommendations

Recommend that our disposal practices be in accordance with the guidelines set down by the IJC and the mandates of the State of Ohio 5-year plan. The local community believes that because of the detrimental effects upon the Maumee Bay ecosystem stated above, the practice of open-lake disposal of dredged sediments should be eliminated. We see this meaning that the entirety of sediments dredged from the shipping channel of the Maumee River and Bay shall be confined in such a manner that maximizes its safe confinement and/or reuse potential and minimizes the destruction of bottom lands in the Maumee River and Bay.

Our immediate effort must be directed toward drafting and implementing in cooperation with the Corps of Engineers an approved Long Term Management Strategy (LTMS) for sediment disposal. This plan should account for the desired disposal of all sediments for a minimum of twenty-five (25) years.

At this time, we see the LTMS consisting of three strategies: confinement projects, recycling programs, and other management strategies involving dredging techniques and source prevention. This list is not exhaustive and should not prelude any additional projects that may present themselves in the future.

CONFINEMENT PROJECTS

Expansion of Port Authority Facility No. 3 - The COE intends to construct an extension to Facility No. 3 at the mouth of Maumee River. This extension will be bounded on the northeast and southeast sides by the existing 242 acre CDF, on the south side by the Port Authority CDF, and on the west and northwest sides by a 4,265 long dike to be built to a top elevation of 23.5 feet above the LWD elevation of 568.6 feet (IGLD, 1955). The new CDF would occupy about 176 acres of Maumee Bay and will provide about 162 acres of disposal area.

Reconstruction of Woodtick Peninsula The reconstruction of Woodtick Peninsula, which lies approximately 2 miles north of the river mouth in the north Maumee Bay, has been a high priority to the local community for many years. This land mass, which acts as a barrier to northeast storms for hundreds of acres of submerged wetlands immediately behind the peninsula, and substantial residential and recreational investment along the Ottawa River, has been almost entirely eroded away. This reconstruction could provide 6 to 9 million cubic yards of capacity for dredged sediments. It is hoped that federal funding for this project via the COE's anticipated Great Lakes Environmental Action Plan (Great LEAP) will begin this work in the near future.

Upland Sites - In conjunction with the Woodtick restoration, a plan has been devised to continue a sediment slurry pipeline to the north and west of Woodtick to a site in Erie Township, Monroe County, Michigan. Approximately 28 million cubic yards of river and bay sediments could be used in constructing a recreational complex centered around a ski hill. Continued effort must be spent in identifying other potential sites and uses for confining dredged sediments.

Expanding the Capacity at the Present Facility No. 3 - Raising the dikes at Facility No. 3 (including the future expansion) by 15 feet would provide an additional 22 million cubic yards of capacity at the present disposal site.

RECYCLING PROGRAMS

Recycling of Sediment and Creation of Nu-Soil - Much effort has gone into producing a marketable top-soil dressing by combining dredged sediments with wastewater treatment sludge and spent lime sludge. Although to date, little material has been produced and used, several potential large scale applications offer promise for the future. These include: capping of landfills, fill and dressing for large highway projects, and cover for state and local parks.

Mining of Island 18 - With the acceptance and wide-scale usage of recycled sediment and Nu-Soil, mining of this material out of Island 18, an abandoned CDF, may become economically feasible. In addition, the COE has surveyed Island 18 and found an additional 500,000 cubic yards of capacity.

OTHER MANAGEMENT STRATEGIES

Dredging and Disposal Procedures - We should work closely with the COE and in particular the Waterways Research Station to perfect more efficient methods of dredging and disposal that will help alleviate many of the current problems experienced with the AOC. Items for further consideration include: sediment traps, longarde tubes, land formation, improvements in hopper dredge operation, hydrocyclones, and bottom and beach nourishment.

Sediment Erosion Prevention - The Dredged Disposal Subcommittee fully endorses the recommendations of the Agricultural Runoff Subcommittee. Our work has only addressed the symptoms of the erosion problem. Not until the people in the Maumee River basin implement an effective agricultural erosion management plan will the actual cause of our dredging problems be reduced.

Open Lake Disposal - If disposal capacity in the future is unavailable, open lake disposal and/or additional confined disposal facilities may be considered if they meet all federal, state and local standards.

3.7.3 Who Should Act?

A Memorandum of Agreement (MOA) committee, consisting of the US Army Corps of Engineers, TMACOG, Toledo-Lucas County Port Authority, OEPA and the City of Toledo has for the past few years been working together on many aspects of the dredging problem on the Maumee River and Bay. These efforts include planning, funding of studies, implementing the OEPA five-year plan and public education.

This group is the core in conceptualizing and then implementing the Long Term Management Plan (LTMP) for dredging in the AOC. However, the group needs to be expanded to take into consideration all public and private interests affected by the LTMP.

3.7.4 Estimated Cost

Expansion of Port Authority Facility No. 3 - $12,000,000

Reconstruction of Woodtick Peninsula - $15,000,000

Upland Sites - $35,000,000

Expanding the Capacity at the Present Facility No. 3 - $20,000,000

3.7.5 Potential Funding Source

Local Share -

Port Authority
City of Toledo
City of Oregon
Affected Michigan governmental entities
Consumers Power
Non-Port Authority river businesses
TMACOG
Farm Community

State Governments -

State of Ohio
State of Michigan

Federal Government -

Corps of Engineers

3.7.6 Time Line for Implementation

The implementation of the LTMP will be driven by the mandates of the OEPA five-year plan. By 1992, we will be committed to dispose of 100% of the dredged sediments in some confined manner provided the storage capacity is available.

The first component of the LTMP will be the construction of the CDF No. 3 extension, to begin within the next year. This will be sufficient to contain the entirety of the river sediments for approximately 22 years.

It will be the goal of the MOA group to formulate an approved and funded LTMP that includes the Bay dredgings by January 1, 1991.

3.8 PACKAGE PLANTS

3.8.1 Description of the Problem

Package plants frequently discharge untreated, or incompletely-treated sewage. The common problems are:

1. Lack of operator attention for both operation and maintenance.
2. Lack of operator expertise.
3. Lack of enforcement by Ohio EPA and/or local Health Department.
4. The treatment facility is too large or too small to treat the wastewater effectively.

Wood County licenses and inspects package plants under a Contract with Ohio EPA. The contracting procedure allows local Health Departments to contract with Ohio EPA to assume the responsibility to inspect package plants under 25,000 gallons per day (gpd) in capacity. This type of contract is commonly called an "HB 110 Contract," after the bill in which this legislation was introduced.

Lucas County licenses package plants that are not operated by the County Sanitary Engineer, using health statutes.

Package plants inside the City of Toledo are out of the jurisdiction of the Lucas County Health Department, and are unregulated.

3.8.2 RAP Recommendations

Recommend that efforts continue to extend sanitary sewer service to areas of high package plant concentration.

Recommend that training of personnel to run these plants be *mandatory*. Ohio EPA regulations require all package plants 25,000 gpd or larger to have NPDES permits. In practice, this is not done. Permits are required only for package plants that are known problems; and are used as leverage to gain compliance. Having an NPDES permit means that the owner of the package plant must hire a Class I Operator, collect and analyze effluent samples, and fill out Monthly Operating Reports. This means higher operating costs, so it is in the interest of the owner to avoid being issued a Permit.

A full NPDES permit requires more monitoring than is practical for many package plants, especially smaller ones. A middle ground is needed between the full NPDES Permit, with regulation equal to a POTW, and no regulation at all.

Recommendation: Ohio EPA should issue "Package Plant Permits," to

1. Provide a way of tracking what package plants exist, and who owns and operates them.
2. Collect information on changes at the site which should require the capacity of the plant to be increased.

3. Require that someone be given the responsibility for operating and maintaining the plant; and that person participate in package plant O/M training. This training need not be equal to a Class I Operator's License.

4. Package plant permits should be simpler than NPDES Permits. This is necessary both for the owners/operators of the plants, who are usually non-technical, and to minimize Ohio EPA staff time required to issue and track the permits.

5. Flow records and other sampling data should be included in reporting, if it exists. Sampling *requirements* should include a weekly 30-minute jar settling test from the final clarifier.

Recommend that facility information be updated each time a permit is renewed. Because of the frequent changes in name, ownership, and operators which occur at package plants, this should be done more frequently than every five years, as with NPDES Permits. Pumping records, if available, should be supplied. If not, number of seats at a restaurant, number of service station bays, number of motel rooms would be used to check size. In counties whose Health Departments have HB 110 Contracts, this information should be tracked by the Health Department, and pass on to Ohio EPA.

Recommend that package plant training sessions be coordinated by Ohio EPA on the District level and participation must be mandatory for permit renewal.

Recommend that Ohio EPA issue stricter requirements for operating package plants, and require licensing and training. Permits to Install (PTIs) should be more restrictive to prevent leapfrog development.

More frequent plant inspections by Ohio EPA and/or Health Departments are needed. Package plants under present system cause local nuisance, health and water quality problems.

Extension of sewer systems is the best way to eliminate existing package plant problems. Making sure that existing plants are well operated is difficult, but necessary.

The Wood County Health Department is one of the few health departments in the state which has put a "House Bill 110" package plant inspection program into effect. One of the bill's provisions makes it impractical for many health departments, especially those in counties where recreation is a major industry. This provision precludes heath departments from charging package plant inspection fees to trailer parks, recreational vehicle parks, recreation parks, or combined park-camps. In some north coast counties, that covers *most* of the package plants — and Ottawa County is a good example — with the result that the health departments do not use HB 110. Recommend the following revision to § 3709.085 of the Ohio Revised Code:

> "3709.085 **Contract for enforcement services**
> (B)(2)
> "The board of health of a city or general health district may enter into a contract with the environmental protection agency to conduct on behalf of the agency inspection or enforcement services, for the purposes of Chapter 6111. . . . The board of health of a city or general health district may charge a fee established pursuant to section 3709.09 of the Revised Code to be paid by the holder of a permit under Chapter 6111. of the Revised Code or the owner or resident of any such dwelling located in a special sanitary district for inspections conducted by the board pursuant to a contract entered into under this division.~~, except that the board shall not charge a fee for those inspections conducted at any manufactured home park, recreational vehicle park, recreation camp, or combined park-camp that is licensed under section 3733.03 of the Revised Code.~~"

The section of text marked out should be deleted from the Revised Code.

WATERSHEDS AFFECTED

The following is a list of package plants in the Maumee River and Bay sub-drainage basins:

WATERSHED	PLANT NO.	PACKAGE PLANT NAME	CAPACITY gpd	FLOW NOW gpd
013	W-98	East Lane Mobile Manor	10000	10000
021	L-96	Fuller's Creekside Estates	100000	270000
023	L-109	McDonald's	7000	7000
023	L-107	Pee-Wee Inn	6000	0
023	L-108	Speedway Truck Stop	1500	1500
023	L-106	Standard Oil	1500	1500
025	L-105	State Line Builders Supply	2500	2500
028	L-27	National Wire of Ohio, Inc.	3500	3500
028	L-100	Toledo Edison Bayshore Plant	15000	15000
028	L-29	Shuer, Jay J., School	3000	3000
028	L-113	Bay Village Condominiums	200000	200000
028	L-99	Clay School Complex	30000	30000
028	L-22	Globe Industries, Inc.	6000	6000
028	L-24	Lakeside Trailer Park	2000	2000
028	L-25	Liquid Carbonic Corp.	1500	1500
028	L-26	Lucas County Residential Center	2000	2000
028	L-28	Oregon Municipal Building	5000	5000
028	L-31	Vargo Carry Out	2500	2500
028	L-101	Wynn Elementary School	0	0
028	L-20	Chessie System	2500	2500
028	L-19	Buckeye Pipeline	1500	1500
028	L-23	Lakefront Dock & Terminal Co.	3000	3000
028	L-30	Standard Oil Asphalt Plant	21500	21500
029	L-5	Eisenhower Jr. High School	20000	20000
044	W-55-W	Divine Word Preparatory Seminary	10000	10000
044	W-55-E	Divine Word Preparatory Seminary	5000	5000
045	W-47	Southview Estates Mobile Home Park	40000	40000
046	W-58	Henry Packing Company	4000	4000
046	W-100	Abbey Aetna	3000	3000
079	W-57	Fort Meigs State Memorial Park	5000	5000

3.8.3 Who Should Act?

Ohio EPA
Local Health Departments
Owners/Operators

3.8.4 Estimated Cost

Estimated annual cost of $250 per plant for inspections, or $7750 yearly.

3.8.5 Potential Funding Source

License fees should be charged to offset the cost of administering the permits. There should also be a per person charge for operator training. These recommendations will increase the cost of operating a package plant.

3.8.6 Time Line for Implementation

Immediately.

3.9 HOME SEWAGE DISPOSAL

3.9.1 Description of the Problem

There are over 20,000 individual home sewage disposal systems and privies in the AOC which affect ground and surface water quality. The sub-drainage basins in the Maumee River and Bay identified with high impact are: 043, 078, 028 and 029. Sub-drainage basin 045 was medium impact, with the remainder sub-drainage basins being identified as having low impact. Primarily, these are the highly urban areas which are sewered.

Conditions will continue to worsen in the high impact sub-drainage basins where densities are high and still using on-site systems. Many problems are due to the water table and soil content. Areas subject to a high water table, especially January through April, do not allow the effluent to percolate to lower subsoils. Areas of shallow bedrock or sandy soils are also less than ideal. Shallow bedrock does not allow for proper seepage, while a highly permeable sandy soil will allow percolation of effluent to occur too quickly.

On-site disposal is designed to operate as a cost-effective alternative to centralized (off-site) treatment plants. Septic tanks with soil absorption or leach fields are the most common type of home disposal system. Most on-site sewage disposal units are the traditional septic tank-soil absorption system. In a two stage process, settleable solids and other material are retained in the septic tank, while the effluent enters the soil absorption system where the soil utilizes the biodegradable material if sufficient time is provided. This leach field is attached to the septic tank and is a series of distribution pipes laid in trenches to provide for soil absorption of the fluid from the septic tank. While designed to dispose of the pollutants and pathogens in a way that avoids odor and other nuisance problems, this is not necessarily the case.

Under current practice it is the homeowner's responsibility to inspect the septage level annually, and when appropriate to contract for septage removal and disposal. Regardless of the type of effluent treatment and disposal system employed, the septic tank component of the system should be pumped out every 2 to 5 years, with most health officials recommending a 3 year cycle. This periodic pumping removes the accumulated settled solids (sludge) and partially submerged mat of floating solids (scum) which together form the septage.

Knowledge of the physical conditions and prevalent lack of homeowner on-site system maintenance, illustrates a situation in which there is a high probability that groundwater and surface water degradation is occurring frequently, if not on a continuous basis. Septic tank effluent can reach surface waters through direct discharge, from surface ponding accompanied by runoff, or by the effluent traveling over an underlying impervious layer until reaching surface water.

According to the Ohio Department of Health's Administrative Code, Home Sewage Disposal Rules, Chapter 3701-29-02(D), no household sewage disposal system or part thereof shall create a nuisance, and (E) and (F) no person shall discharge, or permit to be discharged, treated or untreated sewage, the overflow drainage or contents of a sewage tank, or other putrescible, impure, or offensive wastes into an abandoned water supply, well, spring, or cistern or into a natural or artificial well, sink hole, crevice, or other opening extending into limestone, sandstone, shale, or other rock formation, or normal groundwater table, or onto the surface of the ground, into any street, road, alley, open excavation, or underground drain.

Further (G) of this Chapter states that off-lot discharge of effluent shall not be permitted except where the installation of an on-lot disposal system is not possible within certain specified rules. In the explanation of this rule it is explained that household sewage disposal systems discharging off-site should be routinely monitored to assure satisfactory performance and that such discharge should only be permitted by a health district under the provisions of an operational surveillance program.

Currently, the local health department's role in operation and maintenance is limited to educational efforts, investigation of complaints, and enforcement of correction orders. However, changes in two activities of the existing program--pump-out records and operation permits--might accomplish the desired end while also becoming self-funded. Pump-out records are not now required, but the authority needed is found in the Ohio Sanitary Code Rule 3701-29-06. While this rule is not specific enough to require the collection of data needed for a useful inventory, a single-page inspection and inventory sheet could be designed that would be acceptable to haulers.

This change would systematically begin to set time limits for operation permits, with renewal contingent upon proof of pump-out and inspection as documented by the inventory form. Annual renewable operation permits required by the local health departments would serve multiple functions:

1. Increase maintenance compliance by homeowners,
2. Reduce the incidence of system failure,
3. Provide an incentive for hauler cooperation by increasing business,
4. Provide inventory information not otherwise available, and
5. Provide increased revenue through permit renewal charges.

As a companion program, local lending institutions could be encouraged to follow the example of V.A. and F.H.A. agencies in requiring on-site system inspection prior to property transfer. Lending institutions that are insured under the Federal Program now require inspection of sewer systems and water supplies prior to mortgage transfer.

3.9.2 RAP Recommendations

Recommend that local health departments establish a renewable operation permit and routine inspection program. Such program should require a single-page inspection and inventory sheet to be filed by septage haulers with computerization by the local health department for ease of record keeping. This change would systematically begin to set time limits for operation permits which are now non-expiring and transferable.

A pump-out/inspection inventory would allow building a data base for those systems that precede modern records as records for on-site systems installed before 1959 are incomplete. The complaint forms should be redesigned to take advantage of the inventory opportunity that complaint inspections provide. Cross-reference with pump-out records would allow "sample" monitoring of the accuracy of septage hauler's inventory reports.

Recommend that all forms, drawings, and other records be reassessed to determine if additional data that may prove useful to future, long-term management efforts could be provided. Such re-design should include computerization capability.

Recommend that the schedule of all fees be reevaluated annually to ensure that they accurately reflect the resources each activity involves and to account for inflationary factors. Income from on-site systems currently is limited to registration fees for installers, septage haulers and permit application charges. The permit application fee needs particular attention. The lack of resources limits the capacity of local health departments to routinely gather data needed for detailed assessment of current activities such as public education, operation and maintenance, and septage disposal.

Recommend that an annual inspection of all on-site household wastewater disposal systems including on-lot and off-lot systems be initiated with a yearly minimum charge of $25. While local Boards of Health could establish such renewal and inspection fee, the collection of same could become a burden to local health departments. Therefore, state enabling legislation could establish that it be collected on the tax duplicate as an assessment through the required establishment of operation and maintenance districts.

3.9.3 Who Should Act?

The Home Sewage Disposal Subcommittee of the RAP Advisory Group should in connection with sanitarians from each of the local health departments design a single-page inspection and inventory sheet to be filed by septage haulers with computerization of data by local health departments. In addition, the Subcommittee should seek state enabling legislation for the required establishment of operation and maintenance districts so that the annual renewal permit fee could be collected on the tax duplicate.

The local Boards of Health should initiate renewable operation permits and routine inspection programs within their health departments. The Home Sewage Disposal Subcommittee and the RAP Advisory Group should assist the Boards of Health with their public hearing process to establish such program.

The Ohio Department of Health should join with the Subcommittee in seeking state enabling legislation for the establishment of operation and maintenance districts.

An alternative process would be for the townships to request that the County Sanitary Engineer's Office set up sanitary sewer districts for the purpose of establishing operation and maintenance districts. If challenged in the courts, then state enabling legislation should be pursued.

3.9.4 Estimated Cost

The current 20,000 plus individual home sewage disposal systems in the AOC could produce $500,000 annually at $25 per household for the purposes as set forth in the recommendations.

3.9.5 Potential Funding Source

In early 1984, Ohio EPA established the Unsewered Area Priority List. Such funding should continue for unsewered Priority Water Quality Areas (PWQAs) for tie-ins.

Grants and/or low interest loans from Farmers Home Administration should continued to be pursued for eligible low income areas where tie-ins or wastewater collection and treatment systems should be installed.

3.9.6 Time Line for Implementation

Implementation should be within 1 year of the adoption of the RAP recommendations.

3.10 LANDFILLS AND DUMPS

Old landfills and dumps have been identified as a significant source of contamination to the waters of the AOC. The clean-up of these sites will be an important element in the restoration of water quality, sediment quality and biological communities in some stream segments.

Ohio EPA Division of Emergency and Remedial Response Section (DERR) is charged with the discovery, prioritization, and oversight of remediation of uncontrolled, unregulated, or abandoned hazardous waste sites. A great many of these sites are old landfills, municipal or industrial dumps, or dumping areas which were used by the public without official operation or sanction.

The *Investigation Report* contains several lists of old industrial sites and old dumps which have been identified. Those sites which are believed to pose a problem have been added to the Ohio EPA Master Sites List and a Preliminary Assessment (PA) has been performed. Those sites for which a PA has not been performed will be scheduled for one.

The PA is the first step in the corrective action process and is a relatively quick and low cost effort to determine the extent of contamination at a site, the likelihood of release, and the resultant danger to public health. A PA includes a thorough historical search of the ownership and variety of activities at a site, assembly of any existing analytical data or past reports to regulatory agencies, current activity (if any), potential pathways of release through surface or groundwater, air, or soils, and similar information. Ultimately, a PA assigns a status of "No Further Remedial Action Planned" (NFRAP), which indicates that either hazardous conditions do not exist at the site or it is completely regulated by other programs, or attaches a "high" or "low" priority ranking.

Under federal aegis, a Screening Site Inspection (SSI) and subsequent Listing Site Inspection (LSI) assign Hazard Ranking Scores (HRS) to sites in an effort to quantify the risk to public health so that the most severe problems can be more easily identified and given first and most effective attention. A sufficiently high HRS places a site on the National Priority List (NPL) for federal oversight and possible assignment of Superfund cleanup money. Although there are quite a few NPL sites in Ohio, none of these are within 100 miles of Toledo. However, future investigations may result in the placement of sites in this area on the NPL.

Once a site rises to the top of the priority list, Ohio EPA identifies the responsible party(ies) and initiates a set of Findings and Orders to direct the site clean-up. The responsible parties are invited to sign a consent agreement with the Agency to follow an Ohio EPA schedule of compliance. If the party(ies) decline then court action to require compliance is begun.

The key points of the process are: Remedial Investigation/Feasibility Study; Remedial Design/Remedial Action; Selection of Remedy; Actual clean-up; and on-going operation and maintenance.

A two-step Remedial Investigation and Feasibility Study (RI/FS) fully elaborates the extent of work which will be necessary to remediate the site to the extent that will best protect public health and the environment. After review and approval of the RI/FS by Ohio EPA, a general method of remedy is officially selected.

The next steps, Remedial Design and Remedial Action (RD/RA), spell out the specified details of exactly how the remedy will be implemented and carry out the delineated activities. After that work is done, the remedy may require many years of Operation and Maintenance (O&M) tasks such as long-term pumping and treating of contaminated groundwater.

3.10.1 Description of the Problem

The *Investigation Report* listed 25 closed dumps and 22 various closed impoundments in the Maumee River watershed. Following the investigative work, the Millard Avenue Overpass site west of Duck Creek was discovered, with "high" impact due to polynuclear aromatic hydrocarbons (or coal tars) found at a depth of 6 to 15 feet.

The Landfills and Dumps Subcommittee identified 14 closed dumps or old industrial sites for attention:

SITE NAME	CURRENT KNOWN STATUS
Manhattan Dump now known as Miracle Park 2020 Manhattan Blvd. 21 to 34 acres, closed in 1976. Deeded to Toledo in 1976	Demolition Dump had underground fires from alumina oxide powder, but no fire hazard today; past leachate migration, none at present; has vegetative cover, but closure status is uncertain.
Treasure Island Landfill Manhattan, New York & Counter Streets 150 acres, closed 1965	Industrial & Municipal Wastes Had chemical and underground fires; but no fire hazard today; Magnesium was the cause of the fires; has a 6" to 12" clay caps. Planned to become a park. Consideration is being given to add flyash from Toledo Edison Co. to enhance such development.
South Avenue Dump at the Maumee River. 50 acres in low area. Operated 1950 to 1957. Constructed over the fill are the Anderson & Cargill Grain Elevators, Ohio Bell & Kuhlman Concrete	Mixed municipal & industrial wastes with heavy metals and organics. Cargill installed sumps 20 to 30 feet in 1983, was discharging to Maumee River, but, holding tanks are being installed in order to treat the discharge.
NL Industries aka Bunting Brass & Bronze, 715 Spencer 10 acres, 1916 to 1980, currently Eagle-Picher Bearing Co.	Presumed storage of dross which would contain heavy metals.
Gulf Oil Refinery 2935 Front Street 2.75 acres sediments & sludges, 1953 to 1981 4 acre land farm and 4 separator ponds	Hazardous Wastes - Principal concerns are the landfarm with leaded sludge, followed by weathering area, the landfill and sludge pit areas.

Owens-Illinois, Inc. Libby Plant 27 940 Ash Street 1883 to present	In 1800s some 10,000 cubic feet of old furnaces and other waste materials are buried at the site containing arsenic and chromium.
Sun Oil of Pennsylvania 1819 Woodville Road 1940 to 1950 tank bottoms contaminated with lead disposed in 37 pits within the dikes of tank farm.	Contents of 37 pits later excavated & disposed of in onsite landfill adjacent to tank farms; monitoring wells are in place.
Union Oil Co. of CA (UNOCAL) 1840 Otter Creek Road Operated as refinery until 1967 when sold to Sohio, but still operated a petroleum products storage terminal	Concern for tank diked area to retention pond which is for oil and water separation, an NPDES permit is in preparation.
Heist Corporation 3816 Cedar Point Road In 1981, old oil sludge pit in depressed area filled in.	Problems surfaced again in 1983 with black oily sludge breaking through earth cover; problem corrected but began oozing again in 1985 - no known offsite discharge currently.
Standard Oil Co.(BP Oil) 4100 Cedar Point Road 1970s start of 5 acre landfarm for sludges, emulsions; leaded tank bottoms buried in small pits within tank farm.	Monitoring operation in place; all stormwater is collected and treated.
Westover 820 Otter Creek Road Municipal wastes, industrial sludges, solvents & paint wastes.	Leachate collection system recently installed and erosion control system being developed.
Gradel Landfill (Old Westover Landfill) 1150 Otter Creek Road municipal, industrial, commercial wastes accepted from 1969-1975. After closure, site purchased by Commercial Oil Services, Inc.	A pond way excavated atop the landfill, which induces leachate production; analytical results on leachate samples show elevated aluminum, ammonia-nitrogen and traces of organic pesticides.
Fondessy Landfill #1 Site west of Otter Creek Rd. Demolition Wastes.	Monitoring operation to be expanded.
Consaul Street Dump Operated by Toledo from 1948 to 1966, now site of Parkway Mobile Home Park.	Leachate collection system to sanitary sewer; water table within 6 feet of surface; Methane Gas Venting; ongoing Ohio Dept. of Health Study Solvents & paint sludges disposed of.

NL Industries/Doehler-Jarvis/Farley Metals Inc. 5400 N. Detroit Avenue	Past on-site storage for Plating Sludges.

The Landfills and Dumps Subcommittee identified 14 impoundments for attention:

SITE NAME	CURRENT KNOWN STATUS
Gulf Oil Co. 2935 Front Street (Ceased operation)	4 impoundments - waste treatment settling; 15 years, 0.5 acres, totaling 1 acre. 864,000 gals/day
Libbey-Owens-Ford Co. 1701 East Broadway	4 impoundments - waste treatment settling; 30 years, 21 acres total - 67 acres. Correction under NPDES permit.
Libbey-Owens-Ford Co. 1701 East Broadway	2 impoundments - waste treatment settling; 6 years, 7.5 acres, totaling 19.5 acres. Correction under NPDES permit.
Sun Oil Co. of Penn. Toledo Refinery	3 impoundments - waste treatment equalization; 29 years, 7.5 acres, total - 8.5 acres. 3,600,000 gals/day
Phillips Petroleum Co. 275 Millard Avenue	4 impoundments - wastewater settling; 10 years, 0.26 acres, total - 1/04 acres.
C.H. Heist Corp. 3805 Cedar Point Road	3 impoundments - waste storage; 7 years, 0.03 acres, total - 0.09 acres
Commercial Oil Services 3600 Cedar Point Road	3 impoundments - waste disposal; 13 years, 0.18 acres, total - 1.43 acres
Bill's Road Oil Services 3500 York Street	2 impoundments - waste disposal; 9 years, 0.12 acres, total - 0.25 acres
Fondessy Enterprises, Inc. 876 Otter Creek Road	1 impoundment - waste disposal; 11 years, 1.2 acres
Standard Oil of Ohio Toledo Refinery	2 impoundments - waste storage oil sludge; 33 years, 2 acres, total - 10 acres.
Norfolk & Western Railway Ironville Yard	1 impoundment - wastewater retention 8 years, 0.5 acres.
General Motors Corp. 1455 West Alexis Road	1 impoundment - waste treatment retention; 20 years, 0.75 acres 100,000 gals/day
Penn Central Transport. Stanley Diesel Shop 435 Emerald Avenue	1 impoundment - wastewater retention 25 years, 7 acres, 5000 gals/day.

Koppers (Toledo Coke)	1 impoundment - old benzene pit gone, contamination remains.

3.10.2 RAP Recommendations

Recommend that Ohio EPA require the necessary procedures to clean-up these sites. Remedial Investigation/Feasibility Studies should be completed for each site to fully elaborate the extent of work which will be necessary to remediate the sites to best protect the public health and the environment. Remedial Design/Remedial Action should then be prepared to spell out the exact details of the remedial actions to be implemented. Clean-up should then proceed as expeditiously as possible.

Recommend that the other sites that have been identified for possible remediation be given priority for clean-up in accordance with the previously prescribed procedures for corrective action by Ohio EPA.

Recommend that additional preliminary assessments be performed for sites that have been identified but for which there is little or no information concerning possible environmental effects.

Recommend that the owners and responsible parties for the various sites listed in the *Investigation Report* and the high priority sites listed above initiate clean-up activities as soon as possible and at minimum take interim measures to prevent leachate from entering surface waters.

Ohio EPA should be supportive of these voluntary clean-ups and/or interim actions in the AOC.

3.10.3 Who Should Act?

Ohio EPA
Responsible Parties
RAP Coordinating Committee

3.10.4 Estimated Cost

The cost to clean-up these sites is unknown, but is expected to be in the millions of dollars.

3.10.5 Potential Funding Source

Superfund
Responsible Parties

3.10.6 Time Line for Implementation

Immediately

3.11 LEAKING UNDERGROUND STORAGE TANKS

3.11.1 Description of the Problem

In the November 1984 reauthorization of the federal Resource Conservation and Recovery Act of 1976, Subtitle I was added to the Act to regulate USTs for petroleum products and hazardous substances.

According to the State Fire Marshall registry there are 2834 USTs for Lucas County, 879 for Wood County and 284 for Ottawa County. Because USTs are associated with business and industry, it appears that they are found in higher concentrations in areas of greater population. The Ohio EPA Office of Emergency Response reports that since 1978 there have been 50 reported leaks for Lucas County, 22 for Wood County and 12 for Ottawa County and that about 75% of these leaks have come from tanks at gas stations.

The RAP Advisory Committee in its deliberations of the water quality impact from USTs stated that watersheds in the core area of the City of Toledo should be rated suspected high impact, with the ring adjacent being suspected medium impact, and the outer ring in the more rural areas being suspected low impact.

Sub. H.B. 421 was enacted in August of 1989 which created among other measures the Petroleum Underground Storage Tank Linked Deposit Program to help provide low interest loans to owners of six or fewer petroleum USTs for the purpose of replacing or improving the tanks; requires the Fire Marshal to establish, by rule, requirements for financial responsibility of owners and operators of petroleum USTs for corrective action costs and compensation of bodily injury and property damage to third parties caused by releases of petroleum from UST systems; stipulates that the Fire Marshal's authority to require corrective action applies to both suspected and confirmed releases of petroleum from USTs systems; requires the Fire Marshal to adopt alternative release detection and release containment methods for areas of the state designated as being sensitive for the protection of human health and the environment; and authorizes the Fire Marshal to delegate, by rule, the authority to conduct inspections of USTs to certified fire safety inspectors of municipal corporations and townships.

3.11.2 RAP Recommendations

Recommend that the Petroleum Underground Storage Tank Release Compensation Board and the Fire Marshal give priority to AOCs with respect to any owner of six or few USTs or system with respect to the Petroleum Underground Storage Tank Linked Deposit Program.

Recommend that the Fire Marshal, by rule, designate AOCs as being sensitive for the protection of human health and the environment and adopt alternative rules regarding release containment and release detection methods for new and upgraded USTs in such areas.

In addition, the Fire Marshal in its authority to delegate by rule to certified fire safety inspectors of municipal corporations and townships the inspections of USTs that sufficient funds are passed through from the State of Ohio to adequately conduct such inspection programs.

The rules governing USTs should incorporate the following measures in the Ohio regulations:

1. All new UST tanks and upgrades should include secondary containment and interstitial monitoring.

2. All new UST system piping and upgrades should be double walled.

3. All UST overfill prevention equipment should include a high level alarm that is triggered if the shut off/flow restricter fails.

4. Compliance with installation and upgrading requirements should be confirmed and approved by an on-site field inspection of the State Fire Marshal or a State Fire Marshall certified inspector.

The probability of improved water quality is high if the proper remedial actions, arrived at through the above actions are carried out.

3.11.3 Who Should Act?

The RAP Implementation
Committee or a subcommittee should monitor the proposed rules of the Fire Marshal and the developed programs.

3.11.4 Estimated Cost

The only costs would be those of the RAP monitoring program as the remedial actions recommend that the Fire Marshal fund the certified fire safety inspectors of municipal corporations and townships.

3.11.5 Potential Funding Source

US EPA
Ohio EPA
Fire Marshal
Local governments

3.11.6 Time Line for Implementation

Immediately.

3.12 ATMOSPHERIC DEPOSITION

3.12.1 Description of the Problem

No specific information exists for the effects of atmospheric deposition of pollutants in the AOC. Acid rain does not show any harmful effects to our streams probably due to the buffering capacity of the native limestone. In fact, most streams tend to be alkaline (pH around 7.7 with Otter Creek being ten times higher at 8.7). Air quality data, noted in the *Investigation Report*, give reason to suspect potential problems from deposition. All watersheds are rated "Unknown, but suspected problem" as shown in the *Water Quality Problem Matrix*.

From 1981 through 1985 the Great Lakes National Program Office of US EPA sampled precipitation near Maumee Bay in Oregon, Ohio. The results for pH on a quarterly average showed a low of 3.6 for early 1984, with 9 quarterly averages being about 4.1. The Great Lakes Water Quality Board to the IJC states that even though the magnitude of the input has not been fully defined, the available evidence indicates that atmospheric deposition is a major pathway for contamination of the Great Lakes ecosystem.

A recent summary of the latest 1988 Toxic Chemical Inventory prepared by Toxic Action of Columbus, Ohio shows Lucas County to be sixth of ten of the hardest hit counties in Ohio related to the release of untreated toxic air pollutants. The source of this information is based on Toxic Chemical Release (TRI) inventory forms that many manufacturers are required to submit annually to OEPA under the federal Emergency Planning and Community Right-to-Know Act (Title III of the Superfund Amendments and Reauthorization Act of 1986). The raw data in the report was provided by industries themselves and entered into a computer database by Toxic Action.

The TRI forms provide information on a limited amount of the toxic pollution produced in Ohio. Only manufacturing facilities with ten or more employees are required to file TRI forms, and reports must be filed on only some 320 chemicals and chemical compounds. The threshold for reporting for chemical manufacturers and processors in 1988 was 50,000 pounds; for chemical users (anyone other than a manufacturer or processor), use of 10,000 pounds or more triggered reporting requirements.

Data for three years (1987-1989) is now available, and is included in this report as an update to the *RAP Investigation Report*. This appendix includes two summary reports of toxics released in the AOC. The first is a listing of the chemicals. It tells how much was released to each type of destination during each year, and the three year-year total. The second list is in order by the amount of chemical released. It says what industries released how much of each chemical each year. They are in order from smallest discharger to largest.

The TRI database leaves much to be desired. On the other hand, it *is* the only source of toxics data that exists. The inventory does not include releases from gasoline stations, dry cleaners, commercial waste treatment facilities and incinerators, warehouses, coal-fired electricity generating stations and many other facilities exempt from the law including motor vehicles, a major source of air emissions. To date, neither US EPA nor OEPA has audited the TRI forms industries have submitted to assure their accuracy.

Clean Air Act emissions standards exist for none of the ten air pollutants discharged without treatment in Ohio in the greatest amounts. They are: ammonia; xylene/xylene (mixed isomers); 1,1,1-trichloroethane; aluminum oxide; chlorobenzene; glycol ethers; acetone; dichloromethane; hydrogen fluoride; and methyl ethyl ketone. The actual health and environmental effects of these toxic air emissions are unknown.

Examples of carcinogens include benzene, formaldehyde, dichloromethane and aniline. Examples of mutagents include trichloroethylene, hydrogen fluoride, chloroform and styrene. Examples of developmental toxins include 1,1,1-trichloroethane, glycol ethers, methyl ethyl ketone and xylene. Examples of reproductive toxins include tetrachloroethylene, glycol ethers, chloromethane, chloroform and hydrogen fluoride.

Examples of acute toxins include ammonia, chlorine, aniline, nitric acid and cumene hydroperoxide. Examples of chronic toxins include aluminum oxide, chlorobenzene, acetone, n-butyl alcohol and dichloromethane. Examples of neurotoxins include methyl isobutyl ketone, 1,3 butadiene, methyl ethyl ketone, tetrachloroethylene and trichloroethylene. Examples of environmental toxins include Freon 113, butyl acrylate, naphthalene, phenol and diethanolamine.

Chemicals which contribute to the formation of ground-level ozone include xylene, acetone, methyl ethyl ketone, styrene, dichloromethane, n-butyl alcohol and 1,1,1-trichloroethane.

3.12.2 RAP Recommendations

Recommend that the State of Ohio provide businesses with on-site technical assistance to reduce toxic chemical releases, serve as an information clearinghouse on waste reduction, conduct educational programs on toxic chemical release reduction or elimination, thereby incorporating pollution prevention practices.

Recommend that State enabling legislation be enacted such as the "Tough on Toxics" bill, S.B. 234 and H.B. 611, known as the Toxic Chemical Release Reduction Act, or similar legislation. It would place a fee on each pound of toxic waste manufacturers release, thereby creating an economic incentive for them to cut waste. The money generated by the fee would be used primarily to provide technical assistance and matching grants to help industry reduce waste.

Toxic releases reported under the 1988 federal Toxics Release Inventory list Ohio ranks third in release of toxic chemicals with 376 million pounds, of which 136.5 million pounds were poured into the air, and the remainder discharged into the waters of the state, dumped into landfills, or injected into underground wells. Waste reduction at the source is a strategy nearly unanimously endorsed by institutions ranging from the Chemical Manufacturers Association to US EPA to Greenpeace International.

Waste reduction is a preventive approach, whose goal is to avoid creation of wastes in the first place, rather than trying to manage them afterwards. Waste reduction, because it is preventive, tends to benefit all environmental media--air, land and water.

Recommend the establishment of a major program of fellowships for engineering or industrial chemistry students, giving them training and field experience in conducting plant audits and assessing waste reduction project options, or establishment of courses for mid-career engineers and chemists to introduce them to this new waste management strategy.

Support initiatives by industrial and academic research institutions to develop consumer and construction products that contain fewer toxic constituents.

Recommend the creation of a new leadership entity within Ohio government that could use plant chemical use and discharge data to identify the greatest industrial waste reduction needs in the state, set priorities for the most effective expenditure of monies, and focus on technical assistance.

Recommend creating a state office with specific responsibility for waste reduction, separate from environmental offices dealing with regulatory functions, to deal with "pollution prevention pays". Such waste reduction office should have broad authority to establish overall state goals for waste reduction and weigh the best focus for technical and financial assistance and public education programs.

Recommend that hazardous waste generating facilities for purposes of their own planning conduct periodic audits, develop plans and document their accomplishments in waste reduction. Waste reduction plans and progress reports are needed if companies are to move ahead in a purposeful way.

The data base in Ohio, if it is to be useful for setting waste reduction goals and assessing progress, must contain information covering at least two areas:

1) the amount and movement of specific chemicals as well as facts on waste reduction technologies available to specific industries; and

2) data are also needed on the amount of individual chemicals entering plants, the amounts consumed in production and the amounts leaving in product.

Recommend that Permits-to-Install state estimated air emissions and computerized data base of this information be established, so that new sources can be properly modeled in context with existing sources. This should be done on an airshed basis.

Ohio Technology Transfer Organization (OTTO) agents, as the official waste minimization information system for the state, need an infusion of funds to enhance and extend their training if they are to continue current educational programs.

3.12.3 Who Should Act?

Ohio General Assembly
US EPA
OEPA
Responsible Industries
RAP Implementation Committee

3.12.4 Estimated Cost

A 5 to 6 person waste reduction office with a budget of $3 to 5 million.

3.12.5 Potential Funding

Industrial fees and/or Ohio General Fund monies.

3.12.6 Time Line for Implementation

One year after enactment of H.B. 661 or similar legislation.

3.13 WATER TREATMENT PLANT SLUDGE

3.13.1 Description of the Problem

Accumulation of water treatment plant spent lime in streams can settle to form objectionable sludge deposits that will adversely affect aquatic life. Discharge of this sludge to streams has an impact in the Otter Creek watershed (028), Grassy Creek watershed (045) and Duck Creek watershed (015). Low impact to these watersheds is maintained as along as the total suspended solids are held at 30 milligrams per liter monthly average and 45 milligrams per liter daily maximum.

The spent lime is stored in lagoons. Toledo's water treatment plan has 5 impoundments, with two for the Oregon water treatment plant, and one for the Waterville water treatment plant.

3.13.2 RAP Recommendations

Recommend that land application of spent lime is the preferred reuse alternative. Currently all water treatment plants land apply all or some of the spent lime produced. Continued efforts to support land application is needed.

3.13.3 Who Should Act?

Toledo
Oregon
Waterville

3.13.4 Estimated Cost

No additional costs beyond those assumed by the local municipalities.

3.13.5 Potential Funding Source

Toledo
Oregon
Waterville

3.13.6 Time Line for Implementation

Immediately

Maumee RAP Recommendations Cost Summary for the Maumee River and Bay

Sec.	Item	CAPITAL COSTS Low	High	Median	Annual	Other
3	*MAUMEE RIVER AND BAY POLLUTANT SOURCES*					
3.1	Publicly-operated treatment works					
3.1.1	City of Toledo	$1,000,000	$5,000,000	$3,000,000		
3.1.2	City of Perrysburg	$6,200,000	$6,200,000	$6,200,000		
3.1.3	City of Oregon	$4,000,000	$4,000,000	$4,000,000		
3.1.4	Lucas County					
	Construction	$5,176,000	$9,429,000	$7,302,500		
	Sludge Handling	$2,465,000	$2,465,000	$2,465,000		
3.2	Combined Sewer Overflows					
	City of Toledo					
	Maumee East					
	Storage	$2,300,000	$55,250,000	$28,775,000		
	Treatment	$5,310,000	$10,615,000	$7,962,500		
	Downtown					
	Storage	$12,500,000	$12,500,000	$12,500,000		
	Treatment	$4,225,000	$28,830,000	$16,527,500		
	Maumee West					
	Storage	$16,650,000	$81,905,000	$49,277,500		
	Treatment	$8,107,000	$36,905,000	$22,506,000		
	City of Maumee	$3,600,000	$3,600,000	$3,600,000		
	City of Perrysburg	$10,000,000	$11,000,000	$10,500,000		
3.3	Industrial Dischargers					
3.3.1	Conrail - Emerald Ave.	Unknown				
3.3.2	Libbey-Owens-Ford					
	East Toledo	$1,758,000	$1,758,000	$1,758,000		
	Rossford	$102,000	$102,000	$102,000		
3.3.3	BP Oil	Unknown				
3.3.4	Sun Oil Co.	$20,000,000	$20,000,000	$20,000,000		
3.4	Urban Runoff					
	City of Toledo	$600,000	$600,000	$600,000		
	Sylvania, Maumee, Perrysburg, Rossford, and Oregon	$600,000	$600,000	$600,000		
3.5	Agricultural Runoff				$1,750,000	
3.6	Contaminated stream sediments					
	Office set-up	$15,000	$15,000	$15,000		
3.7	Dredge disposal	$12,000,000	$35,000,000	$23,500,000		
3.8	Package Plants				$7,750	
3.9	Home sewage disposal - user fee annually				$500,000	
3.10	Landfills and Dumps: Over	$100,000,000	$100,000,000	$100,000,000		
3.11	Leaking Underground storage tanks monitoring				$15,000	
3.12	Atmospheric Deposition	$3,000,000	$5,000,000	$4,000,000		
3.13	Water Treatment Plant Sludge No additional cost beyond those assumed by local municipalities					
3	Total - Maumee River and Bay Sources	$219,608,000	$430,774,000	$325,191,000	$1,372,750	$0

4.0 SWAN CREEK WATERSHED RECOMMENDATIONS FOR POLLUTANT SOURCES

Chapter 4 deals specifically with recommendations for the thirteen water quality problem areas identified. The *Water Quality Problem Matrix* assessed the impact of the problems identified in the *Investigation Report* on each stream in the AOC.

The land area, or the watershed, that Swan Creek drains is 205 square miles. Its headwaters rise in Henry, Fulton and western Lucas Counties. Over 200 miles of creeks and ditches drain the watershed. Swan Creek itself is only about 40 miles long. The major streams that feed Swan Creek are the Ai Creek, the Blue Creek and the Blystone Ditch.

Swan Creek watershed can be divided into three major reaches, or parts, based on the dominant stream regime within each reach. In the upstream reach from river mile 19 in Monclova Township to the headwaters, or source, the channel is stable. The banks are low (15 to 25 feet) with indistinct valleys and floodplains. This reach is primarily in agricultural use.

The middle reach is that area between river miles 19 and 6. Here the creek is actively eroding its channel. The banks are high (35 to 45 feet or more) and unstable and are intermixed with distinct floodplains. Bedrock in the channel at river mile 19 prevents the extension of this erosion upstream. The major problems are urbanization with the filling in of the floodplains and destruction of wetland areas. The water quality is *fair* but does not meet the goals of the Clean Water Act. The cause is ill-functioning septic tank systems, storm runoff, agricultural runoff loading, and the erosive forces of the stream itself.

The land use in the middle reach is primarily residential. Land areas included are Monclova and Springfield Townships in Lucas County and the City of Toledo. Tributaries to Swan Creek which have extensive floodplain lands are Wolf Creek, Blystone Ditch, Stone Ditch, Cairl Creek, Drennan Ditch and Heilman Ditch. These floodplains, or bottom lands as they are sometimes called, have been mapped. The elevation of the 100-year base flood has been detailed in the 1983 Flood Insurance Rate Maps developed under the Federal Emergency Management Agency. Such maps also describe the base flood elevations and the flood hazard factors.

The lower reach, from river mile 6 (CSX Railroad Bridge) to the mouth in downtown Toledo, is actively silting in its channel. The banks are 35 to 45 feet and intermixed with floodplain areas. This lower reach is under the backwater influence from the Maumee River. The level of Lake Erie prevents the lower reach from naturally deepening itself. The major problem is extremely poor water quality.

The lower reach is highly urbanized with little vacant land left to build upon. The land use is residential, commercial and industrial. Within this reach are two major open space areas. The first is Highland Park between South Avenue and the creek, with the second being Sterling Field. This playing field is within a beautiful ox bow, or bend, in the creek and lies between two major streets, Hawley and Collingwood.

This lower reach is neither swimmable nor fishable according to public health standards. Contributing to the pollution are the 10 overflow regulator outlets, industrial discharges to the sanitary sewer system, people dumping motor oils down the storm sewer grates, and urban storm runoff which carries fertilizers from lawns and street debris. All of this can reach the creek and degrade the water quality.

From Champion Street (river mile 3.9) to the mouth the water quality is rated as *poor.*

The worst areas are from Hawley Street (river mile 2.6) to Collingwood Boulevard (river mile 1.2) with zinc, lead, arsenic, nickel and chromium found in the water and the bottom sediments. Creosote has been found in sediments at Hawley Street.

Fish tissue sampling conducted on carp taken at St. Clair Street in 1986 showed 5.9 parts per million (ppm) of PCBs from the body composite. The U.S. Food and Drug Administration Health Standards for PCBs in fish is 2.0 ppm for the edible portion. Polychlorinated biphenyls (PCBs) are highly stable man-made organic substances and are acutely toxic to organisms. PCBs are banned today as they are carcinogenic.

The sub-drainage basins included for Swan Creek watershed by name and number are as follows:

007	Ai Creek
008	Swan Creek above Ai Creek
075	Harris Ditch
038	Blue Creek
040	Blue Creek at mouth and Mosquito Creek
039	Swan Creek above Blue Creek
009	Wolf Creek above Cairl Ditch
042	Cairl Ditch
041	Swan Creek above Wolf Creek
011	Wolf Creek at mouth
010	Swan Creek at Toledo
012	Swan Creek at the mouth

Six subcommittees were involved with the development of the recommendations for pollutant sources. They are as follows: Public & Industrial Dischargers; Agricultural Runoff; Dredge Disposal; On-Site Sewage Disposal; Landfills & Dumps; and Water Quality/Water Uses.

4.1 PUBLICLY-OPERATED TREATMENT WORKS

The National Municipal Policy is US EPA's response to the Clean Water Act's mandate that all publicly owned sewage treatment works (POTWs) be in compliance with conditions in their permits no later than July 1, 1988. The Policy reads in part where there are extraordinary circumstances that preclude compliance by July 1, 1988, EPA will work with states and affected municipal authorities to "ensure these plants are on enforceable schedules for achieving compliance as soon as possible thereafter...."

Ohio EPA decided all compliance schedules that extend past the July 1, 1988 deadline must be established in an order enforceable by a court of law. Therefore, any municipal treatment plant that misses the compliance deadline must be referred to the Ohio Attorney General's Office, which represents Ohio EPA in obtaining these orders. Once the judicial orders are filed, Ohio EPA must assure that all compliance schedule deadlines are met. The Attorney General retains the responsibility for enforcing the terms of the orders if violations occur.

We applaud the establishment of the watershed based permit process within Ohio EPA. This will allow permits to be due during the same timeframe with wasteload analysis being conducted. However, such analysis must include concentration and mass loading of pollutants including toxins.

This subsection deals with wastewater treatment plants discharging to the Swan Creek watershed. The Village of Swanton is the only POTW in the watershed.

4.1.1 VILLAGE OF SWANTON

The Village of Swanton's facility is in compliance with its NPDES permit throughout most of the year. The plant has a design capacity of 0.92 million gallons per day (mgd) and discharges effluent to Ai Creek. This effluent is disinfected with chlorine prior to discharge. The sludge is treated by aerobic digestion and land applied under an approved sludge management plan. However, due to combined sewers within the collection system, the NPDES permit contains a schedule for the elimination of these overflows. (See 4.2.2).

4.2 COMBINED SEWER OVERFLOWS

As communities started to develop, rain water was collected and conveyed to streams. As the population increased sanitary waste from homes and businesses tied into these storm sewers. Since these sewers collected both storm and sanitary flow the term "combined sewer" was adopted. Around 1920 the Ohio Department of Health required cities to collect these separate discharge points and convey them to a central discharge point through interceptor sewers.

During dry weather all discharge is conveyed to a treatment plant. When a storm occurs these combined sewers will surcharge the interceptor system. Relief points were establish to prevent the flows during storm events from overloading the interceptor sewers. These relief points are mechanical devices called "regulators".

The regulators control the amount of flow from the combined sewers to the interceptor sewers. A float mechanism causes a gate to close if the water level rises in the combined sewer. This action isolates the combined sewer from the main interceptor. The excess flow in the combined sewer then overflows a weir and discharges to the stream. Hence the term "combined sewer overflow (CSO)".

This method proved to be satisfactory until environmental concerns began to focus on the conditions of receiving streams. Combined sewer overflows are but one of many contributors that impact water quality. CSOs are a source of biological oxygen demand, oil, grease, bacteria, settlable solids and flotables which effect the stream aesthetics and their usages.

This subsection deals with CSOs discharging to the Swan Creek watershed by the City of Toledo, Village of Swanton and the Village of Whitehouse.

4.2.1 CITY OF TOLEDO

4.2.1.1 Description of the Problem

Combined sewers can have a dramatic impact on water quality. Toledo's CSO system on Swan Creek contains 10 overflows. The *Update of Combined Sewer Overflow Study 1986* reviewed the water quality of Swan Creek and it was determined that corrective action was required. A cost benefit analysis determined that pipeline storage and separation was appropriate to abate combined sewer overflow.

4.2.1.2 RAP Recommendations

Recommend that Toledo proceed with its plan for the CSO abatement projects as follows:

Project	Type of Construction	Estimated Construction Costs	Estimated Completion Date
Phase 3 & 4	Tunnel	$9,000,000	June 1991
Phase 5	Tunnel	$8,000,000	1993
Phase 6 & 7	Tunnel	$12,000,000	1994
Phase 8	Separation	$2,000,000	1995

4.2.1.3 Who Should Act?

City of Toledo
Ohio EPA

4.2.1.4 Estimated Cost

$31,000,000

4.2.1.5 Potential Funding Source

City of Toledo Sewer Rates
Ohio EPA Grants
US EPA Grants

4.2.1.6 Time Line for Implementation

Follow the schedule proposed by the City of Toledo.

4.2.2 VILLAGE OF SWANTON

4.2.2.1 Description of the Problem

The Village of Swanton wastewater treatment plant is a trickling filter plant with tertiary treatment provided by sand filters. The plant has a design capacity of 0.92 mgd and discharges effluent to Ai Creek which eventually joins Swan Creek. This effluent is disinfected with chlorine prior to discharge.

The plant is in compliance with its NPDES permit throughout most of the year. However, due to combined sewers within the collection system, infiltration and inflow cause occasional loading problems at the plant. Twenty-four overflows and four regulators are present within the collection system. The NPDES permit contains a schedule for the elimination of these overflows.

4.2.2.2 RAP Recommendations

Recommend that the Village of Swanton move forward to eliminate all CSOs.

4.2.2.3 Who Should Act?

Ohio EPA
Village of Swanton

4.2.2.4 Estimated Cost

Unknown at this time.

4.2.2.5 Potential Funding Source

Ohio EPA Grant
Village of Swanton

4.2.2.6 Time Line for Implementation

A General Plan for the correction and control of the infiltration and inflow into the sanitary sewer collection system and minimization of collection systems overflows is due by November 14, 1990.

4.2.3 VILLAGE OF WHITEHOUSE

The old CSOs have been converted to storm sewers since the Whitehouse treatment plant has been connected to the Maumee River wastewater treatment plant. The Village of Whitehouse is going from house to house making sure that all homes are connected to the sanitary sewer system.

4.3 INDUSTRIAL DISCHARGERS

There are no problem dischargers to the Swan Creek watershed at this time.

4.4 URBAN RUNOFF

The problem description and RAP recommendations presented in Chapter 3 are applicable to the Swan Creek watershed. (See 3.4)

4.5 AGRICULTURAL RUNOFF

The problem description and RAP recommendations presented in Chapter 3 are applicable to the Swan Creek watershed. (See 3.5)

4.6 CONTAMINATED STREAM SEDIMENTS

The lower reach of Swan Creek has contaminated stream sediments. The problem description and RAP recommendations presented in Chapter 3 are applicable to the lower reach of Swan Creek. (See 3.6)

4.7 DREDGED DISPOSAL

4.7.1 Description of the Problem

As described in Section 4.0, the bottom sediments in the lower reach of Swan Creek are grossly polluted, especially between river miles 3 and 0.5, with heavy metals and organics from past discharge practices. Creosote has been found in sediments at Hawley Street (river mile 2.6). It is believed that dredging out these toxic sediments will improve the dissolved oxygen in the water, thus increasing the amount of aquatic life in this reach of the creek. The resident fishery is probably restricted to suckers, carp, bullhead and various forage species. Northern Pike annually migrate upstream from the Maumee River to spawn in the upper portion of Swan Creek and its tributaries.

4.7.2 RAP Recommendations

The Swan Creek Task Force with assistance from the administration of the City of Toledo has investigated dredging Swan Creek from its mouth to the dam at South Street. The Division of Streets, Bridges and Harbor has done a preliminary study to determine the costs involved in the dredging of this segment. With the completion of the pipeline storage in 1996 as discussed in section 4.2.1, dredging to an average depth of 2 feet could remove most of the contaminated bottom sediment, but as a part of any final determination as to depth, core samples should be taken. This is particularly important as Toledo's Combined Sewer Overflow Study indicates the thickness of soft sludge to be over 2 feet in depth starting below river mile 2, or at an undetermined depth, to the Monroe Street Bridge near the mouth.

The quantity of dredging needed to be done was calculated from a Federal Insurance Administration report prepared in the early 1980's which provided a stream bed profile. Although the creek profile has changed in 10 years, it was found to be the best information available on which to base the project cost. The amount of dredged material was calculated using the average end area method.

The amount of material proposed to be removed from the Anthony Wayne Trail to the dam at South Street was calculated to be 94,000 cubic yards. It is estimated to cost $10 per cubic yard for upland disposal of the dredging. The total cost for the project to provide a 40 feet wide channel with 1 foot on 10 foot side slopes would be $940,000. This premise was based not on the depth of the contaminated sediments, but to provide navigation for boats up to 20 feet long needing less than 2 feet deep water to operate in.

The ownership of the creek bottom in this reach has been claimed by the State of Ohio and federal government because the lower reach from the Maumee River to South Street is controlled by the level of Lake Erie and can be considered part of Lake Erie. Before a final report is completed on the costs of the project, a determination must be made to make certain that even though the project will not involve any shore line work that the riparian owners cannot recover damages.

This project should be supported as the recreational use of this reach can be improved significantly by dredging as well as improved water quality. In addition, the project will improve residential property values. With improved water quality and stream flow, this restoration will allow the creek to clean itself up. Once stream sediments have been contaminated with metals, they remain unless they are washed away by stream currents or are removed by dredging or are covered over.

This disposal of contaminated sediments will have to be in a confined disposal facility (See 3.7). It is presumed that the sand bar areas at the mouth are also contaminated and that the wood pilings in the water near Erie Street will also have to be removed as a part of this dredging project.

4.7.3 Who Should Act?

City of Toledo
Ohio EPA
ODNR
US Army Corps of Engineers
Responsible Parties
Swan Creek Task Force
RAP Coordinating Committee

4.7.4 Estimated Cost

$940,000

4.7.5 Potential Funding Source

City of Toledo
US Army Corps of Engineers
ODNR
Responsible Parties

4.7.6 Time Line for Implementation

Follow the schedule proposed by the Swan Creek Task Force

4.8 PACKAGE PLANTS

4.8.1 Description of the Problem

Package plants frequently discharge untreated, or incompletely-treated sewage. The common problems are:

1. Lack of operator attention for both operation and maintenance.
2. Lack of operator expertise.
3. Lack of enforcement by Ohio EPA and/or local Health Department.
4. The treatment facility is too large or too small to treat the wastewater effectively.

Lucas County licenses package plants that are not operated by the County Sanitary Engineer, using health statutes. Package plants inside the City of Toledo are out of the jurisdiction of the Lucas County Health Department, and are unregulated.

4.8.2 RAP Recommendations

Recommend continued efforts to extend sanitary sewer service to areas of high package plant concentration.

Recommend that training of personnel to run these plants be *mandatory*. Ohio EPA regulations require all package plants 25,000 gallons per day (gpd) or larger to have NPDES permits. In practice, this is not done. Permits are required only for package plants that are known problems; and are used as leverage to gain compliance. Having an NPDES permit means that the owner of the package plant must hire a Class I Operator, collect and analyze effluent samples, and fill out Monthly Operating Reports. This means higher operating costs, so it is in the interest of the owner to avoid being issued a Permit.

A full NPDES permit requires more monitoring than is practical for many package plants, especially smaller ones. A middle ground is needed between the full NPDES Permit, with regulation equal to a POTW, and no regulation at all. Recommendation: Ohio EPA should issue "Package Plant Permits," to:

1. Provide a way of tracking what package plants exist, and who owns and operates them.

2. Collect information on changes at the site which should require the capacity of the plant to be increased.

3. Require that someone be given the responsibility for operating and maintaining the plant; and that person participate in package plant O/M training. This training need not be equal to a Class I Operator's License.

4. Package plant permits should be simpler than NPDES Permits. This is necessary both for the owners/operators of the plants, who are usually non-technical, and to minimize Ohio EPA staff time required to issue and track the permits.

5. Flow records and other sampling data should be included in reporting, if it exists. Sampling *requirements* should include a weekly 30-minute jar settling test from the final clarifier.

Recommend that facility information be updated each time a permit is renewed. Because of the frequent changes in name, ownership, and operators which occur at package plants, this should be done more frequently than every five years, as with NPDES Permits. Pumping records, if available, should be supplied. If not, number of seats at a restaurant, number of service station bays, number of motel rooms would be used to check size. In counties whose Health Departments have HB 110 Contracts, this information should be tracked by the Health Department, and passed on to Ohio EPA.

Recommend that package plant training sessions be coordinated by Ohio EPA on the District level and that participation be mandatory for permit renewal.

Recommend that Ohio EPA issue stricter requirements for operating package plants, and require licensing and training. Permits to Install (PTIs) should be more restrictive to prevent leapfrog development.

More frequent plant inspection by Ohio EPA and/or Health Departments are needed. Package plants under present system cause local nuisance, health, and water quality problems. Extension of sewer systems is the best way to eliminate existing package plant problems. Making sure that existing plants are well operated is difficult, but necessary.

The following is a list of package plants in the Swan Creek watershed by sub-drainage basins:

WATERSHED NO.	PLANT NO.	PACKAGE PLANT NAME	CAPACITY gpd	FLOW NOW gpd
007	L-63	Ohio Gas Co.	2000	2000
007	L-65	Valleywood Golf Club	12500	12500
007	L-62	Oak Openings - Fallen Timbers Service Plaza	150000	110000
007	L-61	Arrowhead Trailer Park	35500	35500
009	L-37	Oak Terrace	100000	100000
009	L-48	Holland Shopping Center	5000	5000
009	L-56	Springfield Saloon	6000	6000
009	L-45	Stonehedge (formerly Glengary)	9000	9000
009	L-53	Oak Openings Industrial Park	180000	110000
009	L-15	Highway Patrol Post	1500	1500
009	L-16	Monclova School (New)	5000	5000
009	L-60	Woodside Terrace Trailer Park	80000	80000
009	L-40	Burroughs Corporation	4000	4000
009	L-14	Chateau Estates	36000	36000
009	L-47	Holland Amoco (Station #00648)	2000	2000
009	L-51	Neville Funeral Home	8000	8000
009	L-57	Sun Oil Company	1500	1500
011	L-58	Stairs Apts.	18000	18000
038	L-33	Peaceful Acres Trailer Park	12500	12500
039	L-64	Swanton School	6000	6000
039	L-97	Sisters of Notre Dame (AKA Lial Convent)	17500	17500
040	L-98	Toledo House of Correction (AKA Welfare Farm)	40000	40000
041	L-50	Monclova Care Center	8000	8000
041	L-59	Villa West	15000	15000
041	L-43	Elizabeth Scott Nursing Home	15500	11000
041	L-17	Monclova School (Old)	8500	8500
042	L-102	Ohio National Guard	28500	28500

4.8.3 Who Should Act?

Ohio EPA
Local Health Departments
Owners/Operators

4.8.4 Estimated Cost

Estimated annual cost of $250 per plant for inspections, or $8750 yearly.

4.8.5 Potential Funding Source

License fees should be charged to offset the cost of administering the permits. There should also be a per person charge for operator training. These recommendations will increase the cost of operating a package plant.

4.8.6 Time Line for Implementation

Immediately.

4.9 HOME SEWAGE DISPOSAL

The sub-drainage basins in the Swan Creek watershed identified with high impact are: 007, 008, 009, 041, and 011. Sub-drainage basins with medium impact are: 075, 038, 040, 039, and 042. Sub-drainage basins with low impact are: 010 and 012. The problem description and RAP recommendations presented in Chapter 3 are applicable to the Swan Creek watershed. (See 3.9)

4.10 LANDFILLS AND DUMPS

Old landfills and dumps have been identified as a significant source of contamination to the waters of the AOC. The clean-up of these sites will be an important element in the restoration of water quality, sediment quality and biological communities in some stream segments.

Ohio, the Ohio EPA Division of Emergency and Remedial Response Section (DERR) is charged with the discovery, prioritization, and oversight of remediation of uncontrolled, unregulated, or abandoned hazardous waste sites. A great many of these sites are old landfills, municipal or industrial dumps, or dumping areas which were used by the public without official operation or sanction.

The *Investigation Report* contains several lists of old industrial sites and old dumps which have been identified. Those sites which are believed to pose a problem have been added to the Ohio EPA Master Sites List and a Preliminary Assessment (PA) has been performed. Those sites for which a PA has not been performed will be scheduled for one.

The PA is the first step in the corrective action process and is a relatively quick and low-cost effort to determine the extent of contamination at a site, the likelihood of release, and the resultant danger to public health. A PA includes a thorough historical search of the ownership and variety of activities at a site, assembly of any existing analytical data or past reports to regulatory agencies, current activity (if any), potential pathways of release through surface or groundwater, air, or soils, and similar information. Ultimately, a PA assigns a status of "No Further Remedial Action Planned" (NFRAP), which indicates that either hazardous conditions do not exist at the site or it is completely regulated by other programs, or attaches a "high" or "low" priority ranking.

Under federal aegis, a Screening Site Inspection (SSI) and subsequent Listing Site Inspection (LSI) assign Hazard Ranking Scores (HRS) to sites in an effort to quantify the risk to public health so that the most severe problems can be more easily identified and given first and most effective attention. A sufficiently high HRS places a site on the National Priority List (NPL) for federal oversight and possible assignment of Superfund cleanup money. Although there are quite a few NPL sites in Ohio, none of these are within 100 miles of Toledo. However, future investigations may result in the placement of sites in this area on the NPL.

Once a site rises to the top of the priority list, the Ohio EPA identifies the responsible party(ies) and initiates a set of Findings and Orders to direct the site clean-up. The responsible parties are invited to sign a consent agreement with the Agency to follow an Ohio EPA schedule of compliance. If the party(ies) decline then court action to require compliance is begun.

The key points of the process are: Remedial Investigation/Feasibility Study; Remedial Design/Remedial Action; Selection of Remedy; Actual clean-up; and on-going operation and maintenance.

A two-step Remedial Investigation and Feasibility Study (RI/FS) fully elaborates the extent of work which will be necessary to remediate the site to the extent that will best protect public health and the environment. After review and approval of the RI/FS by Ohio EPA, a general method of remedy is officially selected.

The next steps, Remedial Design and Remedial Action (RD/RA), spell out the specified details of exactly how the remedy will be implemented and carry out the delineated activities. After that work is done, the remedy may require many years of Operation and Maintenance (O&M) tasks such as long-term pumping and treating of contaminated groundwater.

4.10.1. Description of the Problem

The *Investigation Report* listed 9 closed dumps and 1 closed impoundment in the Swan Creek watershed. Following the investigative work, 6 closed dumpsites were identified and are listed as follows:

> South Avenue at Woodsdale Avenue at the site of the Bethel Lutheran Church. Church was erected on the site in 1953. Known to have demolition and household wastes from around the neighborhood.
>
> 1401 to 1463 Western Avenue, household and commercial wastes. Closed in 1930.
>
> Chester Street to the creek, household and commercial wastes. Operated from 1948 to 1955.
>
> Louie Street to the creek, household and commercial wastes. Operated from 1920 to 1955.
>
> South side of Swan Creek and west of Champion Street to the creek, household and commercial wastes, about 10 acres. Operated from 1945 to 1950.
>
> Five acre site on the west side of Irwin Road north of Angola Road. Operated from 1948 to 1952. (This is sand country and some wet prairies.)

The Lands and Dumps Subcommittee did not identify any of the closed dumpsites or impoundment areas for attention at this time.

4.10.2 RAP Recommendations

Recommend that Ohio EPA require the necessary procedures to clean-up dump sites. Remedial Investigation/Feasibility Studies should be completed for each site to fully elaborate the extent of work which will be necessary to remediate the sites to best protect the public health and the environment. Remedial Design/Remedial Action should then be prepared to spell out the exact details of the remedial actions to be implemented. Clean-up should then proceed as expeditiously as possible.

Recommend that the other sites that have been identified for possible remediation be given priority for clean-up in accordance with the previously prescribed procedures for corrective action by Ohio EPA.

Recommend that additional preliminary assessments be performed for sites that have been identified but for which there is little or no information concerning possible environmental effects.

Recommend that owners and responsible parties for the various sites listed in the *Investigation Report* initiate clean-up activities as soon as possible and at minimum take interim measures to prevent leachate from entering surface waters.

Ohio EPA should be supportive of these voluntary clean-ups and/or interim actions.

4.10.3 Who Should Act?

Ohio EPA
Responsible Parties

4.10.4 Estimated Cost

Unknown at this time.

4.10.5 Potential Funding Source

Superfund
Responsible Parties
RAP Implementation Committee

4.10.6 Time Line for Implementation

Immediately

4.11 LEAKING UNDERGROUND STORAGE TANKS

The problem description and RAP recommendations presented in Chapter 3 are applicable to the Swan Creek watershed. (See 3.11)

4.12 ATMOSPHERIC DEPOSITION

The problem description and RAP recommendations presented in Chapter 3 are applicable to the Swan Creek watershed. (See 3.12)

4.13 WATER TREATMENT PLANT SLUDGE

Ohio EPA has just approved a new one million gallon per day water treatment facility on Swan Creek for the Village of Swanton. They will retain the current 100,209,400 gallon reservoir which has water storage for 1500 days. With this new facility, a sludge lagoon will be constructed to store spent lime. This facility will be available for use in the fall of 1991 at which time the spent lime will no longer be discharged to Swan Creek.

Maumee RAP Recommendations Cost Summary for the Swan Creek Watershed

Sec.	Item	CAPITAL COSTS Low	High	Median	Annual	Other
4	*SWAN CREEK WATERSHED POLLUTANT SOURCES*					
4.1	Publicly-operated Treatment Works	none				
4.2	Combined Sewer Overflows					
	City of Toledo	$31,000,000	$31,000,000	$31,000,000		
	Village of Swanton	Unknown				
	Village of Whitehouse	Unknown				
4.3	Industrial Dischargers	None				
4.4	Urban Runoff	See 3.4				
4.5	Agricultural Runoff	See 3.5				
4.6	Contaminated Stream Sediments	See 3.6				
4.7	Dredged Disposal	$940,000	$940,000	$940,000		
4.8	Package Plants				$6,750	
4.9	Home Sewage Disposal	See 3.9				
4.10	Landfills and Dumps	Unknown				
4.11	Leaking Underground Storage Tanks	See 3.11				
4.12	Atmospheric Deposition	See 3.12				
4.13	Water Treatment Plant Sludge	Unknown				
4	Total Swan Creek Pollutant Sources	$31,940,000	$31,940,000	$31,940,000	$6,750	$0

5.0 OTTAWA RIVER WATERSHED RECOMMENDATIONS FOR POLLUTANT SOURCES

Chapter 5 deals specifically with recommendations for the thirteen water quality problem areas identified. The *Water Quality Problem Matrix* assessed the impact of the problems identified in the *Investigation Report* on each stream in the AOC.

The land area, or the watershed, that the Ottawa River and its tributaries drain is over 178 square miles (Ohio - 133 squares miles; Michigan - 45 square miles). Its head-waters rise in northeastern Fulton County where it is known as Ten Mile Creek. It drains northwest Lucas County and portions of Lenawee and Monroe Counties north across the state line in Michigan. At the City of Sylvania at the confluence of the North Branch of Ten Mile Creek, it forms the Ottawa River. It continues flowing south and eastward through suburban and urban Toledo to Point Place where it empties into the north Maumee Bay in the State of Michigan. The total stream length is 41 miles.

Ottawa River watershed can be divided into three major reaches, or parts, based on the dominant stream regime within each reach. The upstream Ten Mile Creek reach from the headwaters, or source, to the City of Sylvania at river mile 22, has a stable channel. The banks are low (15 to 25 feet) with indistinct valleys and floodplains. The headwaters of the North Branch of Ten Mile Creek is the Big Ravine Drain originating in Riga Township, Lenawee County, Michigan. The confluence is in Whiteford Township, Monroe County, Michigan. This area is very flat with indistinct floodplains. Both headwater areas are primarily in agricultural land use.

In addition to agriculture there is continued residential development within the City of Sylvania, western Sylvania Township, and the Villages of Metamora and Berkey. The gradient here is a gradual 4.3 feet drop per mile. The major tributary to Ten Mile Creek is Prairie Ditch which flows through Secor Metropark.

The second, or middle reach, is that area between river miles 22 and 5. The banks are high (35 to 45 feet or more) and unstable and are intermixed with distinct floodplains. However, bedrock can be found in the channel from river mile 22 at the confluence of the North Branch of Ten Mile Creek in the City of Sylvania to river mile 15 within Wildwood Preserve Metropark. The major problems are urbanization with the filling in of the flood-plains, urban runoff, and destruction of wetland areas.

The water quality is marginally *good* in the vicinity of Centennial and Old Post Roads, but at Sturbridge Road (river mile 18.5) it declines to *fair* downstream from here to Secor Road at the entrance to the University of Toledo (river mile 11). Hill Ditch and Heldman Ditch are tributary to the Ottawa River just west of Secor Road. Downstream from the University of Toledo to Stickney Avenue (river mile 5) the middle reach water quality is *poor*.

The land use in the middle reach is residential, commercial and industrial. Within this reach are a number of open space areas: Wildwood Preserve, the floodplain lands in the Village of Ottawa Hills, Ottawa Park and Willys Park. The area from South Cove Boulevard (river mile 9) and downstream, however, is primarily industrial. This segment is neither swimmable nor fishable according to public health standards. Contributing of the pollution are two miles of wall-to-wall dumps which filled-in the floodplains and channelized the Ottawa River on both sides years ago.

A biological classification profile of the Ottawa River stream bed by Jones & Henry Engineers for the *Ten Mile Creek Facilities Report* shows the segment from North Cove (river mile 7.4) to Lagrange Street (river mile 6.2) to be highly polluted and toxic.

The third and last reach, the lower reach, from Stickney Avenue (river mile 5) to the mouth, is under the backwater influence from the Maumee Bay. The level of Lake Erie prevents the lower reach from naturally deepening itself. The major problem is extremely poor water quality. This segment is neither swimmable nor fishable according to public health standards.

The worst areas are from Lagrange Street (river mile 6.9) to Stickney Avenue (river mile 4.9) with cadmium, chromium, copper, lead, zinc and arsenic found in the water and the bottom sediments. However, fish tissue sampling conducted in 1986 taken at US 24A (river mile 1.6) showed 12.0 parts per million (ppm) in largemouth bass and 25.4 ppm in carp of PCBs from the body composite. The U.S. Food and Drug Administration Health Standards for PCBs is 2.0 ppm for the edible portion. Polychlorinated biphenyls (PCBs) are highly stable man-made organic substances and are acutely toxic to organisms. PCBs are banned today as they are carcinogenic.

Primarily, this segment along the river is in industrial use, but becomes more residential at about river mile 2 with marinas above and at the mouth. This area is important for non-contact recreation such as sailing and power boating. Boating is mostly restricted to the area down stream from Suder Avenue due to difficulty of getting large boats past that point. The primary boating lanes are down stream from Suder Avenue to the north Maumee Bay.

The Ottawa River was one of the most important water skiing areas in the region, however, water skiing and other contact activities no longer occur to any large extent due to severe water pollution. The City of Toledo has posted the area near the Dura Landfill advising persons to avoid contact with the water, sediment and fish.

The sub-drainage basins included for the Ottawa River watershed by name and number are as follows:

001	Ten Mile Creek above Prairie Ditch
002	Prairie Ditch
003	Ten Mile Creek above North Branch
006	Ten Mile, North Branch at mouth
004	Ottawa River at Toledo
202	Hill Ditch
005	Ottawa River at mouth and Sibley Creek

Six subcommittees were involved with the development of the recommendations for pollutant sources. They are as follows: Public & Industrial Dischargers; Agricultural Runoff; Dredge Disposal; On-Site Sewage Disposal; Landfills & Dumps; and Water Quality/Water Uses.

5.1 PUBLICLY-OPERATED TREATMENT WORKS

There are no publicly-operated treatment works in the Ottawa River watershed.

5.2 COMBINED SEWER OVERFLOWS

As communities started to develop, rain water was collected and conveyed to streams. As the population increased sanitary waste from homes and businesses tied into these storm sewers. Since these sewers collected both storm and sanitary flow the term "combined sewer" was adopted. Around 1920 the Ohio Department of Health required cities to collect these separate discharge points and convey them to a central discharge point through interceptor sewers.

During dry weather all discharge is conveyed to a treatment plant. When a storm occurs these combined sewers will surcharge the interceptor system. Relief points were established to prevent the flows during storm events from overloading the interceptor sewers. These relief points are mechanical devises called "regulators".

The regulators control the amount of flow from the combined sewers to the interceptor sewers. A float mechanism causes a gate to close if the water level rises in the combined sewer. This action isolates the combined sewer from the main interceptor. The excess flow in the combined sewer then overflows a weir and discharges to the stream. Hence the term "combined sewer overflow (CSO)".

This method proved to be satisfactory until environmental concerns began to focus on the conditions of the receiving streams. CSOs are but one of many contributors that impact water quality. CSOs are a source of biological oxygen demand, oil, grease, bacteria, settlable solids and flotables which effect the stream aesthetics and their usages.

This subsection deals with CSOs discharging to the Ottawa River by the City of Toledo.

5.2.1 CITY OF TOLEDO

5.2.1.1 Description of the Problem

There are 6 overflows from the combined sewer area to the Ottawa River. The City of Toledo investigated the impact on water quality and has taken corrective action to minimize these discharges. Under various contracts the following work has been performed to abate combined sewer overflow:

1. The Ten Mile Creek Interceptor was constructed to relieve sewers located in West Toledo.
2. Tide gates were installed on all regulator outfalls to prevent dry weather discharge. Prevailing winds would force streams to flow up the outfalls resulting in sanitary overflows.
3. The weir on the regulators were raised to match the mean lake level to assist in keeping the streams out of the sewer system.

5.2.1.2 RAP Recommendations

Recommend that the Ottawa River be the next priority for CSO abatement when the scheduled Swan Creek work is finished. Although there has been improvement, particularly in reduction of fecal coliform counts, the CSOs still have a severe impact on water quality.

Recommend that the City of Toledo continue to monitor its regulators and recommend corrective action. A cost effective analysis should be selected to provide the maximum benefit for the cost, or as required to meet water quality standards.

Recommend that Ohio EPA review the recommended corrective action and comment on same.

5.2.1.3 Who Should Act?

City of Toledo
Ohio EPA

5.2.1.4 Estimated Cost

Capital costs of alternatives are as follows:

Separation - $78,165,000
Storage - $1,090,000 to $41,500,000
Treatment - $30,900,000 to $106,800,000

All costs have been adjusted to reflect 1989 dollars. Treatment reflects primary treatment prior to discharge to the receiving stream (swirl concentrators).

5.2.1.5 Potential Funding Source

City of Toledo Sewer Rates
Ohio EPA Grants
US EPA Grants

5.2.1.6 Time Line for Implementation

A recommended corrective action plan should be completed within three years after approval of this proposal and if corrective measures should be required, as outlined in 5.2.1.2, implementation should be completed with 17 years.

5.3 INDUSTRIAL DISCHARGERS

The National Pollutant Discharge Elimination Systems (NPDES) is the major mechanism to regulate discharges from point sources (municipal and industrial). All dischargers must obtain a permit from Ohio EPA. These permits may contain compliance schedules requiring the source to reduce pollutants step by step over a specified period of time. The NPDES permit requires monitoring of the discharges on a continuing basis. Violation of the compliance schedule or any requirements in the permit is a violation of the Clean Water Act and enforceable by fines or court action. The permit program is the key to enforcement of the entire Act, and one of the most important areas for citizen participation and involvement.

For industrial dischargers that were classified as categorical industries, such as petrochemical, aluminum forming, pesticides, etc..., these industries had to comply with federally promulgated Best Available Treatment Regulations by July 1, 1984.

The 1987 Clean Water Act emphasized the importance of controlling toxic substances discharged to surface waters. To achieve this, the Act required Ohio to develop a list of streams which are impaired due to the discharge of toxic substances from point sources. This list is known as the 304(l) list. These point sources must be put on aggressive schedules to bring them into compliance with discharge limits that will eliminate adverse impacts on the streams.

These schedules and limits (individual control strategies) were accomplished by issuing new or modified NPDES permits. Ohio EPA included 25 entities on the list and developed individual control strategies by February 1989. The Ohio EPA has also begun to issue water quality based effluent permits with toxicity limits and toxicity monitoring requirements.

The permittees must take corrective actions if their effluent fails toxicity tests. Ohio EPA tracks the results and takes appropriate actions if a discharger does not initiate the necessary steps to identify the source of toxicity and then eliminate the toxicity. All dischargers are required by the Toxics Control Strategy to comply with the Water Quality Standards in their permits prior to or no later than June 13, 1993.

Ohio EPA has announced its intention to gradually adopt a process to review and reissue all wastewater pollutant discharge permits within specific hydrologic drainage basins or water sheds within the same year. The change is being made because of the importance of evaluating water quality issues in the permitting process. Development of additional pollution control requirements often calls for detailed site specific knowledge of the water quality in the receiving water. The current schedule for renewal of permits was developed independent of a geographic or watershed framework and makes the collection and evaluation of adequate monitoring data inefficient or impossible given resource constraints. The basis for the regulation of these wastewater discharges is the NPDES permits which by law can be issued for no longer than 5 years.

The process of switching from the present permit renewal system to the new watershed approach will require adjustments to the expiration dates of NPDES permits. US EPA Region V administrator concurs with the value of a watershed approach to permit renewal and agreed to allow adjustments to the expiration dates of NPDES permits. Some dischargers will be given short term permits (1 to 3 years) with the present limits. Some dischargers will have their permits renewed early.

The following industries have been problem dischargers to the Ottawa River with each being dealt with separately:

5.3.1 GENERAL MILLS

5.3.1.1 Description of the Problem

Effluent has shown violations of BOD, suspended solids and pH limits. BOD has shown some improvement. The problem comes from organic matter from the air pollution control equipment on the roof. This material is washed off the roof by rain, and results in a high-BOD wastewater.

5.3.1.2 RAP Recommendations

Recommend that Ohio EPA issue Findings and Orders or refer to the Attorney General for enforcement action. General Mills should study the problem and follow Best Management Practices to reduce BOD in the roof stormwater runoff problem. If Best Management Practices does not reduce BOD to permit levels then a pretreatment system must be installed or approval of the City of Toledo to accept the runoff into the sanitary sewer system.

5.3.1.3 Who Should Act?

General Mills
Ohio EPA
City of Toledo

5.3.1.4 Estimated Cost

Unknown

5.3.1.5 Potential Funding Source

General Mills

5.3.1.6 Time Line for Implementation

No longer than 2 years.

5.3.2 DOEHLER JARVIS PLANT #2

5.3.2.1 Description of the Problem

The effluent is made of cooling water for the air conditioners, groundwater and storm-water runoff. The effluent has been contaminated with oil and grease, suspended solids and pH violations. There have been observations of a milky white color in the discharge.

5.3.2.2 RAP Recommendations

Recommend that Ohio EPA initiate enforcement action. Doehler Jarvis must identify the sources of the contaminants and eliminate them or the effluent must be pretreated before being discharged to the Ottawa River.

5.3.2.3 Who Should Act?

Doehler Jarvis
Ohio EPA

5.3.2.4 Estimated Cost

Unknown

5.3.2.5 Potential Funding Source

Doehler Jarvis

5.3.2.6 Time Line for Implementation

No more than 2 years.

5.4 URBAN RUNOFF

The problem description and RAP recommendations presented in Chapter 3 are applicable to the Ottawa River watershed. (See 3.4)

5.5 AGRICULTURAL RUNOFF

The problem description and RAP recommendations presented in Chapter 3 are applicable to the Ottawa River watershed. (See 3.5)

5.6 CONTAMINATED STREAM SEDIMENTS

The lower reach of Ottawa River has contaminated stream sediments. The problem description and RAP recommendations presented in Chapter 3 are applicable to the lower reach of the Ottawa River. (See 3.6)

5.7 DREDGED DISPOSAL

5.7.1 Description of the Problem

As described in section 5.0 the bottom sediments in the middle and lower reaches of the Ottawa River are grossly contaminated. While various organizations over the years have wanted the mouth of the Ottawa River dredged for navigation purposes, no plan of action has been developed to consider the removal of the contaminated sediments. It is believed that dredging out these toxic sediments would improve the dissolved oxygen in the water, thus increasing the amount of aquatic life in this segment of the creek.

Starting with river mile 8.8 at Monroe Street the bottom sediments are highly polluted with the toxicity increasing at North Cove Boulevard (river mile 7.4) to Lagrange Street (river mile 6.2). At this point the toxicity drops off and is merely highly polluted. The problems relate to heavy metals, organics, PCBs, and other contaminates from leaking landfills, industrial discharges to the sanitary sewer system, people dumping motor oils down the storm sewer grates, and urban storm runoff which carries fertilizers from lawns and street debris. All of this can reach the river and degrade the water quality.

Ottawa River channel was reconstructed during the construction of the I-75 expressway system back in the 1950s between river miles 8.4 to 5.5. Here the thickness of sludge accumulation averages four feet or more according to the *Ten Mile Creek Facilities Report* prepared by Jones & Henry Engineers for the City of Toledo.

Congress in 1970 authorized dredging a six-foot channel from Suder Avenue to the Lost Peninsula in Michigan and an eight-foot channel from there to the Toledo ship channel. The project has languished and in the interim, the Corps has changed its policy to concentrate on dredging of commercial ship channels, assigning low priorities to recreational harbors and channels. The costs have risen from $3,700,000 to $10,000,000 with the Corps requiring a $2,500,000 local share. There are also difficulties in finding a suitable site to dispose of polluted dredgings.

5.7.2 RAP Recommendations

A task force, similar to the Swan Creek Task Force associated with the administration of the City of Toledo, should be appointed to investigate the potential of dredging out these contaminated bottom sediments. However, such investigation should be coordinated with section 5.10, Landfills and Dumps, as there are extensive dumpsites (Dura, North Cove, Tyler, Stickney, DuPont) leaching to the river.

As a part of any final determination as to depth, core samples need to be taken. The disposal of contaminated sediments will have to be placed in a confined disposal facility (See 3.7). The quantity of dredging needed to be done will have to be calculated with rough estimates provided from stream bed profiles.

The ownership of the creek bottom in the lower reach could be claimed by the States of Ohio and Michigan as this segment is controlled by the level of Lake Erie and can be considered part of Lake Erie. Therefore, an action would of necessity include these two governmental entities.

5.7.3 Who Should Act?

City of Toledo
Ohio EPA
ODNR
US Army Corps of Engineers
Responsible Parties
RAP Implementation Committee
Recreational and Environmental Groups

5.7.4 Estimated Cost

Over $10,000,000

5.7.5 Potential Funding Source

City of Toledo
US Army Corps of Engineers
ODNR
MDNR
Responsible Parties

5.7.6 Time Line for Implementation

Immediately

5.8 PACKAGE PLANTS

5.8.1 Description of the Problem

Package plants frequently discharge untreated, or incompletely-treated sewage. The common problems are:

1. Lack of operator attention for both operation and maintenance.

2. Lack of operator expertise.

3. Lack of enforcement by Ohio EPA and/or local Health Department.

4. The treatment facility is too large or too small to treat the wastewater effectively.

Lucas County licenses package plants that are not operated by the County Sanitary Engineer, using health statutes. Package plants inside the City of Toledo are out of the jurisdiction of the Lucas County Health Department, and are unregulated.

5.8.2 RAP Recommendations

Continue efforts to extend sanitary sewer service to areas of high package plant concentration.

Training of personnel to run these plants should be *mandatory*. Ohio EPA regulations require all package plants 25,000 gallons per day (gpd) or larger to have NPDES permits. In practice, this is not done. Permits are required only for package plants that are known problems; and are used as leverage to gain compliance. Having an NPDES permit means that the owner of the package plant must hire a Class I Operator, collect and analyze effluent samples, and fill out Monthly Operating Reports. This means higher operating costs, so it is in the interest of the owner to avoid being issued a Permit.

A full NPDES permit requires more monitoring than is practical for many package plants, especially smaller ones. A middle ground is needed between the full NPDES Permit, with regulation equal to a POTW, and no regulation at all. Recommendation: Ohio EPA should issue "Package Plant Permits," to

1. Establish a system for maintaining a current inventory of package plants, based in the District Office of Ohio EPA. Track what package plants exist, and who owns and operates them.
2. Collect information on changes at the site which should require the capacity of the plant to be increased.
3. Require that someone be given the responsibility for operating and maintaining the plant; and that person participate in package plant O/M training. This training need not be equal to a Class I Operator's License.
4. Package plant permits should be simpler than NPDES Permits. This is necessary both for the owners/operators of the plants, who are usually non-technical, and to minimize Ohio EPA staff time required to issue and track the permits.
5. Flow records and other sampling data should be included in reporting, if it exists. Sampling *requirements* should include a weekly 30-minute jar settling test from the final clarifier.

Facility information should be updated each time a permit is renewed. Because of the frequent changes in name, ownership, and operators which occur at package plants, this should be done more frequently than every five years, as with NPDES Permits. Pumping records, if available, should be supplied. If not, number of seats at a restaurant, number of service station bays, number of motel rooms would be used to check size. In counties whose Health Departments have HB 110 Contracts, this information should be tracked by the Health Department, and passed on to Ohio EPA.

Package plant training sessions should be coordinated by Ohio EPA on the District level. Participation should be *mandatory* for permit renewal.

Ohio EPA should issue stricter requirements for operating package plants, and require licensing and training. Permits to Install (PTIs) should be more restrictive to prevent leapfrog development.

More frequent plant inspections by Ohio EPA and/or Health Departments are needed. Package plants under present system cause local nuisance, health, and water quality problems. Extension of sewer systems is the best way to eliminate existing package plant problems. Making sure that existing plants are well operated is difficult, but necessary.

The following is a list of package plants in the Ottawa River watershed by sub-drainage basins:

WATERSHED NO.	PLANT NO.	PACKAGE PLANT NAME	CAPACITY gpd	FLOW NOW gpd
001	L-35	Corbett Gentry (Private Residence)	1500	1500
001	L-36	Richfield Center Market	1000	1000
001	L-41	Crissey Elementary School	6000	6000
001	L-38	Spencer-Sharples School	15000	0
003	L-76	Courts of Sylvania (new owner)	2000	2000
003	L-82	The Shed	2500	2500
003	L-69	Briarfield Rest Home	15000	15000
003	L-71	Centennial Manor	30000	30000
003	L-79	Garden Court South Apartments	3000	3000
003	L-81	Golden Garden Tavern & Restaurant	8000	8000
003	L-83	Home Cafe	3500	3500
003	L-85	Oak Tree (Shopping Center)	8500	8500
003	L-86	Reichert Stamping	8000	8000
003	L-87	Robintech	1500	1500
003	L-90-A	Swiss Aire Chalet Condo, North Plant	12000	12000
003	L-90-B	Swiss Aire Chalet Condo, Middle Plant	6000	6000
003	L-90-C	Swiss Aire Chalet Condo, South Plant	6000	6000
003	L-92	Toledo Concrete Pipe Company	1500	1500
003	L-95	Whiteford Elementary School	10000	10000
003	L-67	Arbor Hills Middle School	18000	18000
003	L-72	Central Avenue Elementary School	12500	12500
003	L-73	Central Mobile Village Trailer Park	12500	12500
003	L-88	Second Honeymoon (Motel)	7000	7000
004	L-70	Ventura's Restaurant	7000	7000
004	L-52	Oak Grove Mobile Court	8500	8500
004	L-39	Bancroft Trailer Park	6000	6000
004	L-54	Royal Village Mobile Home Park	40000	40000
004	L-104	Mill Mfg. Co.	1500	1500
004	L-44	Twin Hills Apts.	2000	2000
004	L-49	Lincoln Green Subdivision	168000	160000
004	L-77	Design for Living	1000	1000
004	L-42	Dorr Street Elementary School	13000	13000
004	L-46	Hidden Lake	7200	7200
004	L-94	Wayside General Store	1000	1000
202	L-80	General Telephone	1500	1500

5.8.3 Who Should Act?

Ohio EPA
Local Health Departments
Owners/Operators

5.8.4 Estimated Cost

Estimated annual cost of $250 per plant for inspections, or $8750 yearly.

5.8.5 Potential Funding Source

License fees should be charged to offset the cost of administering the permits. There should also be a per person charge for operator training. These recommendations will increase the cost of operating a package plant.

5.8.6 Time Line for Implementation

Immediately.

5.9 HOME SEWAGE DISPOSAL

The sub-drainage basins in the Ottawa River watershed identified with high impact are: 002, 003, 004, 006 and 202. Sub-drainage basin 001 was medium impact, with 005 identified as having low impact. The problem description and RAP Recommendations presented in Chapter 3 are applicable to the Ottawa River watershed. (See 3.9)

5.10 LANDFILLS AND DUMPS

Old landfills and dumps have been identified as a significant source of contamination to the waters of the AOC. The clean-up of these sites will be an important element in the restoration of water quality, sediment quality and biological communities in some stream segments.

Ohio EPA Division of Emergency and Remedial Response Section (DERR) is charged with the discovery, prioritization, and oversight of remediation of uncontrolled, unregulated, or abandoned hazardous waste sites. A great many of these sites are old landfills, municipal or industrial dumps, or dumping areas which were used by the public without official operation or sanction.

The Investigation Report contains several lists of old industrial sites and old dumps which have been identified. Those sites which are believed to pose a problem have been added to the Ohio EPA Master Sites List and a Preliminary Assessment (PA) has been performed. Those sites for which a PA has not been performed will be scheduled for one.

The PA is the first step in the corrective action process and is a relatively quick and low-cost effort to determine the extent of contamination at a site, the likelihood of release, and the resultant danger to public health. A PA includes a thorough historical search of the ownership and variety of activities at a site, assembly of any existing analytical data or past reports to regulatory agencies, current activity (if any), potential pathways of release through surface or groundwater, air, or soils, and similar information. Ultimately, a PA assigns a status of "No Further Remedial Action Planned" (NFRAP), which indicates that either hazardous conditions do not exist at the site or it is completely regulated by other programs, or attaches a "high" or "low" priority ranking.

Under federal aegis, a Screening Site Inspection (SSI) and subsequent Listing Site Inspection (LSI) assign Hazard Ranking Scores (HRS) to sites in an effort to quantify the risk to public health so that the most severe problems can be more easily identified and given first and most effective attention. A sufficiently high HRS places a site on the National Priority List (NPL) for federal oversight and possible assignment of Superfund cleanup money. Although there are quite a few NPL sites in Ohio, none of these are within 100 miles of Toledo. However, future investigations may result in the placement of sites in this area on the NPL.

Once a site rises to the top of the priority list, the Ohio EPA identifies the responsible party(ies) and initiates a set of Findings and Orders to direct the site clean-up. The responsible parties are invited to sign a consent agreement with the Agency to follow an Ohio EPA schedule of compliance. If the party(ies) decline then court action to require compliance is begun.

The key points of the process are: Remedial Investigation/Feasibility Study; Remedial Design/Remedial Action; Selection of Remedy; Actual clean-up; and on-going operation and maintenance.

A two-step Remedial Investigation and Feasibility Study (RI/FS) fully elaborates the extent of work which will be necessary to remediate the site to the extent that will best protect public health and the environment. After review and approval of the RI/FS by Ohio EPA, a general method of remedy is officially selected.

The next steps, Remedial Design and Remedial Action (RD/RA), spell out the specified details of exactly how the remedy will be implemented and carry out the delineated activities. After that work is done, the remedy may require many years of Operation and Maintenance (O&M) tasks such as long-term pumping and treating of contaminated groundwater.

5.10.1 Description of the Problem

The *Investigation Report* listed 12 closed dumps and 5 various impoundments for the Ottawa River watershed. The Landfills and Dumps Subcommittee identified 11 of the closed dumps and old industrial sites for attention:

SITE NAME	CURRENT KNOWN STATUS
King Road Landfill 3535 King Road, 44 acres Operated by Lucas County from 1954 to 1976	Groundwater contamination from leachate migration containing metals--cadmium, chromium, lead; enforcement action pending
Owens-Illinois, Inc. Technical Center 1700 North Westwood	Chromium and lead sludges; test borings performed show no contamination discovery
Owens-Illinois, Inc. Hilfinger Site 1800 North Westwood Hilfinger landfilled electroplating & metal finishing wastes.	Soil had been contaminated by heavy metals chromium, arsenic, cadmium, nickel, zinc. Clean up completed with polyethylene liner and monitoring wells. Currently a parking lot. Closed in late 1970s.
South Cove Blvd.	
Willys Park	Part of North Cove Blvd. AMC investigation.

North Cove Landfill North Cove & Drexel Dr. Operated by AMC from 1941 to 1970. Industrial residues. Now owned by Chrysler Corp.	During installation of a sanitary sewer west of site in 1979, hydrocarbon fumes were encountered. Groundwater sampling indicating presence of hydrocarbons and low boiling solvents. Chrysler, ODOT, and Toledo are planning to conduct a remedial investigation/ feasibility study.
Sheller-Globe Corp. Armored Plastics Lint & Dura Avenues	Solvent portion believed to have evaporated leaving only residue. Approx. 100 drums of paint residues disposed.
Tyler Street Dump Operated by Toledo Located end of Tyler Street north of river.	Leachates to Ottawa River Municipal & Industrial Wastes
Stickney Avenue Dump Owned by AMC. Located southeast of river.	Leachates to Ottawa River composed of low conventional pollutants and organics Industrial solvents and sludges.
Dura Dump, 55 acres Operated by Toledo Opened in 1952, Closed in 1980.	Leachates to Ottawa River containing PCBs, organics. Under investigation with a remedial action plan in progress. Enforcement is pending. Municipal, Industrial & Demolition Wastes.
DuPont Waste Lagoon Matzinger Road	Lagoon filled in. Site drainage patterns unknown, but no discharge to river. 2% formaldehyde solution.

The Landfills and Dumps Subcommittee identified 2 of the impoundment areas for attention:

SITE NAME	CURRENT KNOWN STATUS
Northern Ohio Asphalt Paving, 7920 Sylvania	1 impoundment: wastewater settling 2 years; 0.25 acres, 144,000 gals/day
Royster Co., Inc. Creekside Avenue	1 impoundment: wastewater retention 28 years; 2 acres. Surface runoff pond was developed to collect discharge.

5.10.2 RAP Recommendations

Along the Ottawa River, there are several landfills and old industrial sites along both banks of the river (North Cove, Dura, Stickney, Tyler Street, DuPont, etc.). This area is so concentrated that it is difficult to assess the affects of an individual site/source of contamination on the Ottawa River where sediment contamination, water quality degradation, degradation of the biological community and fish tissue contamination have all been observed as problems.

Recommend that each site/source of contamination be addressed through Ohio EPA corrective action procedures to remediate the sites. However, it is also recommended that the Ottawa River/aquatic habitat be separated from the individual site/source clean-up activities. The Ottawa River should be addressed as a separate clean-up project with responsibility for clean-up allocated to all of the contributing sources.

Recommend that Ohio EPA require the necessary procedures to clean-up these sites. Remedial Investigation/Feasibility Studies should be completed for each site to fully elaborate the extent of work which will be necessary to remediate the sites to best protect the public health and the environment. Remedial Design/Remedial Action should then be prepared to spell out the exact details of the remedial actions to be implemented. Clean-up should then proceed as expeditiously as possible.

Recommend that the other sites that have been identified for possible remediation be given priority for clean-up in accordance with the previously prescribed procedures for corrective action by Ohio EPA.

Recommend that preliminary assessments be performed for sites that have been identified but for which there is little or no information concerning possible environmental effects.

Recommend that owners and responsible parties for the various sites listed in the *Investigation Report* and the high priority sites listed above initiate clean-up activities as soon as possible and at minimum take interim measures to prevent leachate from entering surface waters.

Recommend that Ohio EPA support these voluntary clean-ups and/or interim actions.

5.10.3 Who Should Act?

Ohio EPA
Responsible Parties
City of Toledo
Lucas County

5.10.4 Estimated Cost

Dura Landfill Remediation - $35,000,000

Remediation costs for the listed landfills are unknown but will run into millions of dollars.

5.10.5 Potential Funding Source

Responsible Parties
Superfund

5.10.6 Time Line for Implementation

Immediately

5.11 LEAKING UNDERGROUND STORAGE TANKS

The problem description and RAP recommendations presented in Chapter 3 are applicable to the Ottawa River watershed. (See 3.11)

5.12 ATMOSPHERIC DEPOSITION

The problem description and RAP recommendations presented in Chapter 3 are applicable to the Ottawa River watershed. (See 3.12)

5.13 WATER TREATMENT PLANT SLUDGE

There are no water treatment plants in the Ottawa River watershed.

Maumee RAP Recommendations Cost Summary for the Ottawa River Watershed

Sec.	Item	CAPITAL COSTS Low	High	Median	Annual	Other
5	*OTTAWA RIVER WATERSHED POLLUTANT SOURCES*					
5.1	Publicly-operated Treatment Works	None				
5.2	Combined Sewer Overflows					
	City of Toledo					
	Storage	$1,090,000	$41,500,000	$21,295,000		
	Treatment	$30,900,000	$106,800,000	$68,850,000		
5.3	Industrial Dischargers					
	General Mills	Unknown				
	Doehler Jarvis Plant #2	Unknown				
5.4	Urban Runoff	See 3.4				
5.5	Agricultural Runoff	See 3.5				
5.6	Contaminated Stream Sediments	See 3.6				
5.7	Dredged Disposal	$10,000,000	$10,000,000	$10,000,000		
5.8	Package Plants				$8,750	
5.9	Home Sewage Disposal	See 3.9				
5.10	Landfills and Dumps	$100,000,000	$100,000,000	$100,000,000		
5.11	Leaking Underground Storage Tanks	See 3.11				
5.12	Atmospheric Deposition	See 3.12				
5.13	Water Treatment Plant Sludge	None				
5	Total Ottawa River Watershed Sources	$141,990,000	$258,300,000	$200,145,000	$8,750	$0

6.0 DIRECT LAKE ERIE TRIBUTARIES RECOMMENDATIONS FOR POLLUTANT SOURCES

Chapter 6 deals specifically with recommendations for the thirteen water quality problem areas identified. The *Water Quality Problem Matrix* assessed the impact of the problems identified in the *Investigation Report* on each stream in the AOC.

The sub-drainage basins included for the other direct tributaries to Lake Erie by name and number are as follows:

031 Lake Erie Watershed #2
032 Little Cedar Creek and Cedar Creek
033 Crane Creek
034 Lake Erie Watershed #3
035 Lake Erie Watershed #4

The Maumee Bay State Park, the Cedar Point National Wildlife Refuge, and the Coolie Canal Marina at Anchor Point Road, are all located in sub-drainage basin 031 in Jerusalem Township, Lucas County, Ohio.

The Metzger Marsh Wildlife Area (558 acres) is located in sub-drainage basin 034 in Jerusalem Township, Lucas County, Ohio.

Magee Marsh Wildlife Area State Reservation (1,821 acres) is located in sub-drainage basin 035 in the vicinity of Turtle Creek Bay in Ottawa County, Ohio. Turtle Creek watershed is 28.66 square miles with its headwaters in Wood County. Turtle Creek is 9.5 miles long and its average fall is only 1.8 feet per mile, with the land use primarily in agricultural production.

Cedar Creek drainage area (032) is about 50 square miles with two tributaries, Little Cedar Creek and Dry Creek, both being intermittent streams. Cedar Creek itself is only 8.5 miles long and its average fall is only 0.9 feet per mile. Ward's Canal is located at the mouth of Cedar Creek.

Dry Creek drains about 10 square miles, primarily in Ottawa County, with a length of 11.5 miles and its average fall is 3 feet per mile. Little Cedar Creek drains over 2 square miles with its headwaters in Wood County. It is 2.5 miles long and has an average fall of 3 feet per mile.

The Cedar Creek watershed (032) is impacted by non-point pollutants such as agricultural crop production, silviculture, and on-site waste treatment systems according to *Ohio Nonpoint Source Assessment*, Ohio EPA, 1988.

Crane Creek drainage area (033) is about 54 square miles with four tributaries: Ayers Creek, Little Crane Creek, Henry Creek and Two Root Creek (Packer Creek), with the latter three being intermittent streams. Crane Creek itself is only 12.7 miles long and its average fall is 1.9 feet per mile. In the vicinity of its mouth is the Crane Creek State Park and the Ottawa National Wildlife Refuge in Lucas County.

Ayers Creek drains 3.85 square miles, primarily in Ottawa County, with a length of 0.6 miles and its average fall is only 1.76 feet per mile. Little Cedar Creek drains 2.32 square miles in Ottawa County, with a length of 3.5 miles and its average fall is 5.7 feet per mile. Henry Creek drains 7.87 square miles, primarily in Wood County, with a length of 9 miles and its average fall is 3.9 feet per mile. Two Root Creek drains 6.62 square miles in Wood County with a length of 8 miles and its average fall is 3 feet per mile.

The Crane Creek watershed (033) is impaired by non-point pollutants such as agricultural crop production, silviculture, and on-site waste treatment systems according to *Ohio Nonpoint Source Assessment*, Ohio EPA, 1988.

Six subcommittees were involved with the development of the recommendations for pollutant sources. They are as follows: Public & Industrial Dischargers; Agricultural Runoff; Dredge Disposal; On-Site Sewage Disposal; Landfills & Dumps; and Water Quality/Water Uses.

6.1 PUBLICLY-OPERATED TREATMENT WORKS

There are no publicly-operated treatment works in these sub-drainage basins.

6.2 COMBINED SEWER OVERFLOWS

There are no combined sewer overflows in these sub-drainage basins.

6.3 INDUSTRIAL DISCHARGERS

The National Pollutant Discharge Elimination Systems (NPDES) is the major mechanism to regulate discharges from point sources (municipal and industrial). All dischargers must obtain a permit from Ohio EPA. These permits may contain compliance schedules requiring the source to reduce pollutants step by step over a specified period of time. The NPDES permit requires monitoring of the discharges on a continuing basis. Violation of the compliance schedule or any requirement in the permit is a violation of the Clean Water Act and enforceable by fines or court action. The permit program is the key to enforcement of the entire Act, and one of the most important areas for citizen participation and involvement.

For industrial dischargers that were classified as categorical industries, such as petrochemical, aluminum forming, pesticides, etc..., these industries had to comply with federally promulgated Best Available Treatment Regulations by July 1, 1984.

The 1987 Clean Water Act emphasized the importance of controlling toxic substances discharged to surface waters. To achieve this, the Act required Ohio to develop a list of streams which are impaired due to the discharge of toxic substances from point sources. This list is known as the 304(l) list. These point sources must be put on aggressive schedules to bring them into compliance with discharge limits that will eliminate adverse impacts on the streams.

These schedules and limits (individual control strategies) were accomplished by issuing new or modified NPDES permits. Ohio EPA included 25 entities on the list and developed individual control strategies by February 1989. The Ohio EPA has also begun to issue water quality based effluent permits with toxicity limits and toxicity monitoring requirements.

The permittees must take corrective actions if their effluent fails toxicity tests. Ohio EPA tracks the results and takes appropriate actions if a discharger does not initiate the necessary steps to identify the source of toxicity and then eliminate the toxicity. All dischargers are required by the Toxics Control Strategy to comply with Water Quality Standards in their permits prior to or no later than June 13, 1993.

Ohio EPA has announced its intention to gradually adopt a process to review and reissue all wastewater pollutant discharge permits within specific hydrologic drainage basins or watersheds within the same year. The change is being made because of the importance of evaluating water quality issues in the permitting process. Development of additional pollution control requirements often calls for detailed site specific knowledge of the water quality in the receiving water. The current schedule for renewal of permits was developed independent of a geographic or watershed framework and makes the collection and evaluation of adequate monitoring data inefficient or impossible given resource constraints. The basis for the regulation of these wastewater discharges is the NPDES permits which by law can be issued for no longer than 5 years.

The process of switching from the present permit renewal system to the new watershed approach will require adjustments to the expiration dates of NPDES permits. US EPA Region V administrator concurs with the value of a watershed approach to permit renewal and agreed to allow adjustments to the expiration dates of NPDES permits. Some dischargers will be given short term permits (1 to 3 years) with the present limits. Some dischargers will have their permits renewed early.

The following industry has been a problem discharger to Cedar Creek:

6.3.1 CONRAIL - STANLEY YARDS

6.3.1.1 Description of the Problem

There was a major spill from this facility in 1988 and some small spills since. The spills contaminate Cedar Creek and Ohio EPA's Emergency Response Team has responded.

6.3.1.2 RAP Recommendations

Recommend that the company submit an approved Spill Prevention, Control and Countermeasure (SPCC) plan outlining better management of storage facilities, use and disposal of waste oils and diesel fuel.

6.3.1.3 Who Should Act?

Ohio EPA
Conrail

6.3.1.4 Estimated Cost

Unknown

6.3.1.5 Potential Funding Source

Conrail

6.3.1.6 Time Line for Implementation

No more than 2 years.

6.4 URBAN RUNOFF

The problem description and RAP recommendations presented in Chapter 3 are applicable to these sub-drainage basins. (See 3.4)

6.5 AGRICULTURAL RUNOFF

The problem description and RAP recommendations presented in Chapter 3 are applicable to these sub-drainage basins. (See 3.5)

6.6 CONTAMINATED STREAM SEDIMENTS

The problem description and RAP recommendations presented in Chapter 3 are applicable to these sub-drainage basins. (See 3.6)

6.7 DREDGED DISPOSAL

This problem is not applicable to these sub-drainage basins.

6.8 PACKAGE PLANTS

6.8.1 Description of the Problem

Package plants frequently discharge untreated, or incompletely-treated sewage. The common problems are:

1. Lack of operator attention for both operation and maintenance.
2. Lack of operator expertise.
3. Lack of enforcement by Ohio EPA and/or local Health Department.
4. The treatment facility is too large or too small to treat the wastewater effectively.

Wood County licenses and inspects package plants under a Contract with Ohio EPA. The contracting procedure allows local Health Departments to contract with Ohio EPA to assume the responsibility to inspect package plants under 25,000 gallons per day (gpd) in capacity. This type of contract is commonly called an "HB 110 Contract," after the bill in which this legislation was introduced.

Lucas County licenses package plants that are not operated by the County Sanitary Engineer, using health statutes. The Ottawa County Health Department inspects all package plants related to campgrounds and recreational areas.

6.8.2 RAP Recommendations

Recommend continued efforts to extend sanitary sewer service to areas of high package plant concentration.

Recommend that training of personnel to run these plants be *mandatory.* Ohio EPA regulations require all package plants 25,000 gpd or larger to have NPDES permits. In practice, this is not done. Permits are required only for package plants that are known problems; and are used as leverage to gain compliance. Having an NPDES permit means that the owner of the package plant must hire a Class I Operator, collect and analyze effluent samples, and fill out Monthly Operating Reports. This means higher operating costs, so it is in the interest of the owner to avoid being issued a permit.

A full NPDES permit requires more monitoring than is practical for many package plants, especially smaller ones. A middle ground is needed between the full NPDES permit, with regulation equal to a POTW, and no regulation at all. Recommendation: Ohio EPA should issue "Package Plant Permits" to

1. Establish a system for maintaining a current inventory of package plants, based in the District Office of Ohio EPA. Track what package plants exist, and who owns and operates them.
2. Collect information on changes at the site which should require the capacity of the plant to be increased.
3. Require that someone be given the responsibility for operating and maintaining the plant; and that person participate in package plant O/M training. This training need not be equal to a Class I Operator's License.
4. Package plant permits should be simpler than NPDES Permits. This is necessary both for the owners/operators of the plants, who are usually non-technical, and to minimize Ohio EPA staff time required to issue and track the permits.
5. Flow records and other sampling data should be included in reporting, if it exists. Sampling *requirements* should include a weekly 30-minute jar settling test from the final clarifier.

Recommend that facility information be updated each time a permit is renewed. Because of the frequent changes in name, ownership, and operators which occur at package plants, this should be done more frequently than every five years, as with NPDES permits. Pumping records, if available, should be supplied. If not, number of seats at a restaurant, number of service stations bays, number of motel rooms would be used to check size. In counties whose Health Departments have HB 110 Contracts, this information should be tracked by the Health Department, and passed on to Ohio EPA.

Recommend that package plant training sessions be coordinated by Ohio EPA on the District level and participation be mandatory for permit renewal.

Recommend that Ohio EPA issue stricter requirements for operating package plants, and require licensing and training. Permits to Install (PTIs) should be more restrictive to prevent leapfrog development.

More frequent plant inspections by Ohio EPA and/or Health Departments are needed. Package plants under present system cause local nuisance, health, and water quality problems. Extension of sewer systems is the best way to eliminate existing package plant problems. Making sure that existing plants are well operated is difficult, but necessary.

The following is a list of package plants in these sub-drainage basins:

WATERSHED NO.	PLANT NO.	PACKAGE PLANT NAME	CAPACITY gpd	FLOW NOW gpd
031	L-7	Gulish Villa	7000	7000
031	L-1	Anchor Point Marina (AKA Condo Marine Properties)	10000	10000
031	L-2	Butch & Denny's Bait & Sporting Goods	1500	1500
031	L-3	Cooley Canal Yacht Club	4000	4000
031	L-4	Country Inn	2000	2000
031	L-6	Flying Bridge Restaurant	6000	6000
031	L-8	Jack's Cardinal Supermarket	1000	1000
031	L-9	Lakemont Landing	6000	6000
031	L-11	Professional Mechanical Service	1500	1500
031	L-12	Wolf Creek Sportsman's Association	2000	2000
032	W-56	Five Points Trailer Park	7000	7000
032	O-2	Allen Park Mobile Court	5000	11700
032	W-17	Berman's Supper Club/Christmas Shop	12000	12000
032	L-10	Our Lady of Mt. Carmel	4000	4000
032	W-33	Rudolph/Libbe Inc.	1500	1500
032	W-54	Bayer Trailer Park	12500	12500
032	W-59	Lime City School	1840	0
032	W-60	Perrysburg Township Police & Ambulance Building	1500	1500
032	W-27	Lusher Trailer Court	2000	2000
033	W-28	Metcalf Airport	1500	1500
033	W-26	Total Oil Station	1500	1500
033	O-7	Wayside Inn	3500	3500
033	W-23	Great Lakes Diesel Co.	1500	1500
033	W-97	Leisure Village Mobile Home Park	4000	4000
033	O-4	Lutheran Home of Mercy	32500	32500
033	W-78	R & L Truck & Trailer Services	1500	1500
033	W-40	Wagoner Apartments	5000	5000
033	W-94	795 Fuel Stop (Total Oil & Arxon Motel)	12000	12000
033	W-91	Sohio (Closed)	1500	0
033	W-87-N	Wood-Lake Trailer Park	15000	15000
033	W-87-S	Wood-Lake Trailer Park	9000	9000
033	W-61	Perrysburg Estates MHP, SS35	25000	25000
033	O-5	Guardian Industries	2000	2750

6.8.3 Who Should Act?

Ohio EPA
Local Health Departments
Owners/Operators

6.8.4 Estimated Cost

Estimated annual cost of $250 per plant for inspections, or $8250 yearly.

6.8.5 Potential Funding Source

License fees should be charged to offset the cost of administering the permits. There should also be a per person charge for operator training. These recommendations will increase the cost of operating a package plant.

6.8.6 Time Line for Implementation

Immediately.

6.9 HOME SEWAGE DISPOSAL

The sub-drainage basins identified with high impact are: 031, 032, 033 and 034. Sub-drainage basin 035 was identified as having medium impact. The problem description and RAP recommendations presented in Chapter 3 are applicable to these sub-drainage basins. (See 3.9)

6.10 LANDFILLS AND DUMPS

Old landfills and dumps have been identified as a significant source of contamination to the waters of the AOC. The clean-up of these sites will be an important element in the restoration of water quality, sediment quality and biological communities in some stream segments.

Ohio EPA Division of Emergency and Remedial Response Section (DERR) is charged with the discovery, prioritization, and oversight of remediation of uncontrolled, unregulated, or abandoned hazardous waste sites. A great many of these sites are old landfills, municipal or industrial dumps, or dumping areas which were used by the public without official operation or sanction.

The Investigation Report contains several lists of old industrial sites and old dumps which have been identified. Those sites which are believed to pose a problem have been added to the Ohio EPA Master Sites List and a Preliminary Assessment (PA) has been performed. Those sites for which a PA has not been performed will be scheduled for one.

The PA is the first step in the corrective action process and is a relatively quick and low-cost effort to determine the extent of contamination at a site, the likelihood of release, and the resultant danger to public health. A PA includes a thorough historical search of the ownership and variety of activities at a site, assembly of any existing analytical data or past reports to regulatory agencies, current activity (if any), potential pathways of release through surface or groundwater, air, or soils, and similar information. Ultimately, a PA assigns a status of "No Further Remedial Action Planned" (NFRAP), which indicates that either hazardous conditions do not exist at the site or it is completely regulated by other programs, or attaches a "high" or "low" priority ranking.

Under federal aegis, a Screening Site Inspection (SSI) and subsequent Listing Site Inspection (LSI) assign Hazard Ranking Scores (HRS) to sites in an effort to quantify the risk to public health so that the most severe problems can be more easily identified and given first and most effective attention. A sufficiently high HRS places a site on the National Priority List (NPL) for federal oversight and possible assignment of Superfund cleanup money. Although there are quite a few NPL sites in Ohio, none of these are within 100 miles of Toledo. However, future investigations may result in the placement of sites in this area on the NPL.

Once a site rises to the top of the priority list, the Ohio EPA identifies the responsible party(ies) and initiates a set of Findings and Orders to direct the site clean-up. The responsible parties are invited to sign a consent agreement with the Agency to follow an Ohio EPA schedule of compliance. If the party(ies) decline then court action to require compliance is begun.

The key points of the process are: Remedial Investigation/Feasibility Study; Remedial Design/Remedial Action; Selection of Remedy; Actual clean-up; and on-going operation and maintenance.

A two-step Remedial Investigation and Feasibility Study (RI/FS) fully elaborates the extent of work which will be necessary to remediate the site to the extent that will best protect public health and the environment. After review and approval of the RI/FS by Ohio EPA, a general method of remedy is officially selected.

The next steps, Remedial Design and Remedial Action (RD/RA), spell out the specified details of exactly how the remedy will be implemented and carry out the delineated activities. After that work is done, the remedy may require many years of Operation and Maintenance (O&M) tasks such as long-term pumping and treating of contaminated groundwater.

6.10.1 Description of the Problem

The *Investigation Report* listed 3 closed dumps for these sub-drainage basins. The Landfills and Dumps Subcommittee identified 2 of the closed dumps in Crane Creek watershed for attention:

SITE NAME	CURRENT KNOWN STATUS
Millbury Village	Leachate problem; solid wastes
Asman Dump State Route 795 and Fostoria Road	Leachate problem; solid and hazardous waste

The *Investigative Report* listed 8 various impoundments for the Crane and Cedar Creek watersheds. The Landfills and Dumps Subcommittee identified 1 impoundment for attention:

SITE NAME	CURRENT KNOWN STATUS
Chesapeake & Ohio Railway Walbridge, Ohio	1 impoundment - wastewater retention 9 years; 0.12 acres; clay liner

6.10.2 RAP Recommendations

Recommend that Ohio EPA require the necessary procedures to clean-up these sites. Remedial Investigation/Feasibility Studies should be completed for each site to fully elaborate the extent of work which will be necessary to remediate the sites to best protect the public health and the environment. Remedial Design/Remedial Action should be prepared to spell out the exact details of the remedial actions to be implemented. Clean-up should then proceed as expeditiously as possible.

Recommend that the other sites that have been identified for possible remediation be given priority for clean-up in accordance with the previously prescribed procedures for corrective action by Ohio EPA.

Recommend that preliminary assessments be performed for sites that have been identified but for which there is little or no information concerning possible environmental effects.

Recommend that owners and responsible parties for the various sites listed in the *Investigation Report* and the high priority sites listed above initiate clean-up activities as soon as possible and at minimum take interim measures to prevent leachate from entering surface waters.

Recommend that Ohio EPA be supportive of these voluntary clean-ups and/or interim actions.

6.10.3 Who Should Act?

Ohio EPA
Responsible Parties

6.10.4 Estimated Cost

The costs to clean-up these sites are unknown.

6.10.5 Potential Funding Source

Responsible Parties
Superfund

6.10.6 Time Line for Implementation

Immediately

6.11 LEAKING UNDERGROUND STORAGE TANKS

The problem description and RAP recommendations presented in Chapter 3 are applicable to these sub-drainage basins. (See 3.11)

6.12 ATMOSPHERIC DEPOSITION

The problem description and RAP recommendations presented in Chapter 3 are applicable to these sub-drainage basins. (See 3.12)

6.13 WATER TREATMENT PLANT SLUDGE

There are no water treatment plants in these sub-drainage basins.

Maumee RAP Recommendations Cost Summary for Direct Lake Erie Tributaries

Sec.	Item	CAPITAL COSTS Low	High	Median	Annual	Other
6	*DIRECT TRIBUTARIES TO LAKE ERIE - POLLUTANT SOURCES*					
6.1	Publicly-operated Treatment Works	None				
6.2	Combined Sewer Overflows	None				
6.3	Industrial Dischargers Conrail - Stanley Yards	Unknown				
6.4	Urban Runoff	See 3.4				
6.5	Agricultural Runoff	See 3.5				
6.6	Contaminated Stream Sediments	See 3.6				
6.7	Dredged Disposal	None				
6.8	Package Plants				$8,250	
6.9	Home Sewage Disposal	See 3.9				
6.10	Landfills and Dumps	Unknown				
6.11	Leaking Underground Storage Tanks	See 3.11				
6.12	Atmospheric Deposition	See 3.12				
6.13	Water Treatment Plant Sludge	None				
6	**Total - Lake Erie Direct Tributaries Sources**	**$0**	**$0**	**$0**	**$8,250**	**$0**

<u>Toxics Release Inventory</u>

Industrial Chemicals
Released to the Environment
in the Lower Maumee Area of Concern

1987 - 1989

The Toxics Release Inventory (TRI) is a database of chemicals that industries release into the environment. Industries report to US EPA what quantity (pounds) of each chemical they release to the air, to water, or to land. The database is collected under Title III of SARA, the *Superfund Amendment and Reauthorization Act.* Data for three years (1987-1989) is now available, and is included in this report as an update to the *RAP Investigation Report.*

This appendix includes two summary reports of toxics released in the AOC. The first is a listing of the chemicals. It tells how much was released to each type of destination during each year, and the three-year total. The second list is in order by the amount of chemical released. It says what industries released how much of each chemical each year. They are in order from smallest discharger to largest.

<u>Data limitations</u>

The TRI database leaves much to be desired. On the other hand, it *is* the only source of toxics data that exists. With all its limitations, it is much better than complete ignorance.

The point is to keep the limits in mind when using the database. A big number is not necessarily a signal to "push the panic button." It may be a signal to ask further questions, however:

1. Why is such a large amount of this chemical being released? Is the data correct?
2. Where is it going? Are appropriate steps being taken to protect the public from exposure?
3. What is the relative danger of this chemical?

Here's an example of why the data should be used with caution. Some industries found the TRI data forms confusing at first. In Lucas County, Coulton Chemical Corporation reported the following Sulfuric Acid releases off site:

1987... ....1,400,000 pounds
1988... ....1,300,000 pounds
1989... ....0 pounds

Coulton accepts used sulfuric acid from other industries, such as the BP Refinery in Oregon. Coulton recycles the chemical, and returns it for reuse. In 1987 and 1988, these were incorrectly reported as off site releases. In 1989, the reporting method was corrected.

In all likelihood, there are similar cases we are unaware of. *Numbers from this database should be confirmed before taking further action.*

We have not changed this or any other entry in the database. The data presented here is "the official record."

What the TRI Database Doesn't Say

Some chemicals are more dangerous than others. Some cause cancer, some are poisonous, and others, like acids, are dangerous because they are physically destructive to animal tissue. Some toxics are dangerous only when other chemicals are *also* present. This is why adding up the total amounts of all toxics is not very meaningful. The relative danger of different toxics will be addressed in more detail later in this narrative.

The scope of the TRI database is limited. It covers only large manufacturing industries with Standard Industrial Code (SIC) numbers from 20 to 39. Besides small dischargers, governmental, utility, and many other types of facilities are left out. It also ignores mobile sources: cars and trucks.

The TRI database can be geographically misleading. The release destination of a chemical may not be very close to the industry that produced it. The "POTW" destination is a good example. The largest municipal treatment plant in the AOC is Toledo's Bay View facility. Its service area covers Lucas County west to I-475, East Toledo, Rossford, the west half of Northwood, and part of Perrysburg Township. Any chemical released in this area actually enters the environment at the treatment plant in Point Place.

Releases to deep-well injection probably enter the environment near Vickery, in Sandusky County, about 36 miles from downtown Toledo. Chemicals from anywhere in the AOC may go to the Envirosafe Hazardous Waste Facility in Oregon.

The most important question the TRI database does not answer is: *"To what concentrations of these chemicals is the public being exposed?"* It is *concentration,* not total quantity, that determines the public's risk. In some cases this information exists, and in others, it doesn't.

Consider the water cycle. Wastewater treatment plants test and limit the concentrations discharged into surface waters. Water treatment plants test and limit the concentrations of chemicals allowed in drinking water before we drink it.

The air cycle doesn't match this pattern. Dischargers must monitor what they release into the air, but there are no limits for many chemicals. On the human consumption side, there is little monitoring. Ambient air testing covers only the "conventional" parameters: Lead, Nitrogen Dioxide, Ozone, Carbon Monoxide, Sulfur Dioxide, and Particulates.

Ambient air quality is a concern for water quality. What's in the air may come down with the rain water. Are the Maumee AOC's contaminated stream sediments partly the result of atmospheric deposition?

Prioritizing the Toxics

With industry using so many different types of chemicals, it would be good to know which ones were more dangerous than others. The International Agency for Research on Cancer (IARC, an agency of the World Health Organization) has developed such a priority system for carcinogens.

The IARC carcinogenicity hazard index system is given below. The "rating" factor gives a scale of risk. Each category is considered to be ten times more likely to cause cancer than the category below.

Hazard Index	Rating	Evidence of Carcinogenicity
1	100	Sufficient Evidence of Carcinogenicity
2A	10	Limited evidence
2B	1	Insufficient evidence
3	0.1	No evidence

US EPA has a similar rating system, using hazard index codes for "A," "B1," "B2," and "C" for the same categories. A partial listing of US EPA index ratings and alternate chemical names is included at the end of this narrative.

A detailed study is needed to assess the risk hazards for the many chemicals, and prioritize according to danger level. The Detroit-Windsor / Port Huron-Sarnia Air Pollution Advisory Board issued a *Report to the International Joint Commission* addressing these issues in December, 1990, covering these questions for Southeast Michigan. It concluded that: *"There is sufficient information on air toxic chemicals in the Region to conclude that there is a significant enough public health issue to require additional abatement and preventative measures..."* [page 1].

Detroit and Toledo are similar cities, in terms of industrial base and development. There is every reason to suspect that if there is an air pollution problem in Detroit from toxic chemicals, Toledo probably has similar problems. An assessment of Toledo air quality should be performed to determine whether chemicals pose health risks to residents. And if they do, which chemicals should receive priority in abatement efforts.

Notes on TRI Database Chemicals

A listing of TRI database chemicals released from AOC industries is given in Table A-1. See the following notes where there is an asterisk (*) in the IARC field:

1. The TRI database often lists a metal and "compounds" of that metal as separate entries. Unless IARC specifically says so, the hazard index does not apply to both.
2. There are different ways of naming many organic compounds. Some of these alternate names are listed. Where we are unaware of alternate names, we may be leaving out IARC ratings.
3. IARC gives "Aluminum production" an index of 1.
4. Chromium *metal* and *trivalent* compounds have an IARC index of 3. *Hexavalent* compounds have an index of 1.
5. IARC lists both *ortho-* and *para-* Dichlorobenzene with index ratings of 2B. Is 1,4-Dichlorobenzene the same as either of those?

Table A-1

MAUMEE AREA OF CONCERN
Toxic Release Inventory Chemicals
and their IARC and EPA
Carcinogenicity Hazard Index Ratings

Chemical Name	IARC	EPA	Alternate Name
1,1,1-Trichloroethane	3		
1,2,4-Trimethylbenzene			
1,2-Butylene Oxide			
1,2-Dibromoethane			
1,2-Dichloroethane	2B		Ethylene Dichloride
1,3-Butadiene	2B		
1,4-Dichlorobenzene	*		
2,4-D			
2,4-Dimethylphenol			
2-Phenylphenol			
Acetaldehyde	2B		
Acetone			
Acrylic Acid	3		
Aluminum (Fume or Dust)	*		
Ammonia			
Ammonium Sulfate			
Anthracene	3		
Antimony			
Antimony Compounds			
Arsenic	1	A	
Arsenic Compounds	1	A	
Asbestos (Friable)	1	A	
Barium			
Barium Compounds			
Benzene	1	A	
Beryllium Compounds	2A		
Biphenyl			
Butraldehyde			
Butyl Acrylate	3		
Butyl Benzoyl Phthalate			
Cadmium Compounds	2A	B1	
Carbon Disulfide			
Chlorine			
Chlorophenols	2B		
Chromium	3	A	
Chromium Compounds	3*	A	
Cobalt Compounds			
Copper			
Copper Compounds			
Cresol (Mixed Isomers)			
Cumene			
Cyclohexane			
Dibenzofuran			
Dibutyl Phthalate			
Dichloromethane			
Diethanolamine			
Dimethyl Sulfate	2A		
Epichlorohydrin	2A	B2	
Ethylbenzene			
Ethylene	3		
Ethylene Glycol			
Formaldehyde	2A	B1	
Freon 113			
Glycol Ethers			
Hydrochloric Acid			
Hydrogen Cyanide			
Hydrogen Fluoride			
Lead	2B		
Lead Compounds	2B		
Maleic Anhydride			
Manganese			
Manganese Compounds			
Mercury Compounds			
Methanol			
Methyl Acrylate	3		
Methyl Ethyl Ketone			
Methyl Isobutyl Ketone			
Methyl Methacrylate	3		
Methyl Tert-Butyl Ether			
Methylenebis (Phenylisocyanate)			
Molybdenum Trioxide			
N-Butyl Alcohol			
Naphthalene			
Nickel			
Nickel Compounds	1		
Nitric Acid			
P-Phenylenediamine	3		
Phenol			
Phosphoric Acid			
Phthalic Anhydride			
Polychlorinated Biphenyls	2A	B2	
Propylene	3		
Quinoline			
Sec-Butyl Alcohol			
Selenium Compounds	3		
Silver			
Styrene	2B	B2	
Sulfuric Acid			
Tert-Butyl Alcohol			
Tetrachloroethylene	2B		Perchloroethylene
Thallium			
Toluene			
Trichlorfon	3		
Trifluralin			
Vanadium (Fume or Dust)			
Vinyl Acetate	3		
Xylene (Mixed Isomers)			
Zinc (Fume or Dust)			
Zinc Compounds			

Total Industrial Releases of Toxic Chemicals, 1987-1989

1,1,1-Trichloroethane Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	60,856	53,693	1,071	115,620
Stack Air	18,199	58,650	25,600	102,449
Total Air	79,055	112,343	26,671	**218,069**
Water	0	0	0	0
Injection	0	0	0	0
POTW	1,250	502	9	1,761
Land	0	750	0	750
Off Site	47,487	11,084	12,700	71,271
Total Releases	127,792	124,679	39,380	**291,851**

1,2,4-Trimethylbenzene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	15,750	19,000	12,000	46,750
Stack Air	250	190	170	610
Total Air	16,000	19,190	12,170	**47,360**
Water	250	100	0	350
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	16,250	19,290	12,170	**47,710**

1,2-Butylene Oxide Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	1	1	2
Stack Air	0	0	0	0
Total Air	0	1	1	**2**
Water	0	0	0	0
Injection	0	0	0	0
POTW	250	0	0	250
Land	0	0	0	0

Off Site	250	0	0	250
Total Releases	500	1	1	502

1,2-Dibromoethane Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	0	0	250
Stack Air	0	0	0	0
Total Air	250	0	0	250
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	250	0	0	250

1,2-Dichloroethane Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	0	0	250
Stack Air	0	0	0	0
Total Air	250	0	0	250
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0.
Total Releases	250	0	0	250

1,3-Butadiene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	1,555	500	500	2,555
Stack Air	0	0	0	0
Total Air	1,555	500	500	2,555
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0

Total Industrial Releases of Toxic Chemicals, 1987-1989

Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	1,555	500	500	2,555

1,4-Dichlorobenzene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	7,500	7,400	5,005	19,905
Stack Air	0	0	0	0
Total Air	7,500	7,400	5,005	**19,905**
Water	0	0	0	0
Injection	0	0	0	0
POTW	6,800	7,600	6,990	21,390
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	14,300	15,000	11,995	41,295

2,4-D Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	250	250	750
Stack Air	189	1,381	1,537	3,107
Total Air	439	1,631	1,787	**3,857**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	400	0	0	400
Off Site	0	0	1,168	1,168
Total Releases	839	1,631	2,955	5,425

2,4-Dimethylphenol Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0

Total Industrial Releases of Toxic Chemicals, 1987-1989

Injection	0	0	0	0
POTW	0	0	0	0
Land	0	250	0	250
Off Site	0	250	0	250
Total Releases	0	500	0	**500**

2-Phenylphenol Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	5	10	10	25
Stack Air	20	30	15	65
Total Air	25	40	25	**90**
Water	0	0	0	0
Injection	0	0	0	0
POTW	1,300	2,000	875	4,175
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	1,325	2,040	900	**4,265**

Acetaldehyde Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	3,200	2,800	2,500	8,500
Stack Air	0	0	0	0
Total Air	3,200	2,800	2,500	**8,500**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	3,200	2,800	2,500	**8,500**

Acetone Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	12,500	11,699	919	25,118
Stack Air	12,500	43,250	6,805	62,555
Total Air	25,000	54,949	7,724	**87,673**

Water	0	10	47	57
Injection	0	0	0	0
POTW	0	81	478	559
Land	0	0	0	0
Off Site	20,000	9,060	1,237	30,297
Total Releases	45,000	64,100	9,486	118,586

Acrylic Acid Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	250	265	765
Stack Air	0	0	415	415
Total Air	250	250	680	**1,180**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	250	250	319	819
Total Releases	500	500	999	1,999

Aluminum (Fume or Dust) Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	750	3,523	4,273
Stack Air	87,720	130,250	12,250	230,220
Total Air	87,720	131,000	15,773	**234,493**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	250	250
Land	0	250	32,658	32,908
Off Site	0	0	0	0
Total Releases	87,720	131,250	48,681	267,651

Ammonia Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	33,673	15,400	7,525	56,598

Total Industrial Releases of Toxic Chemicals, 1987-1989

Stack Air	450	630	362	1,442
Total Air	34,123	16,030	7,887	**58,040**
Water	18,900	28,400	11,000	58,300
Injection	0	0	0	0
POTW	544,000	95,350	456	639,806
Land	250	750	0	1,000
Off Site	750	1,200	0	1,950
Total Releases	598,023	141,730	19,343	759,096

Ammonium Sulfate Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	399,960	399,960
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	0	399,960	399,960

Anthracene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	750	3,612	897	5,259
Stack Air	0	0	250	250
Total Air	750	3,612	1,147	**5,509**
Water	0	250	0	250
Injection	0	0	0	0
POTW	250	263	263	776
Land	750	0	4,440	5,190
Off Site	250	0	20,794	21,044
Total Releases	2,000	4,125	26,644	32,769

Antimony Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989

Total Industrial Releases of Toxic Chemicals, 1987-1989

Fugative Air	53	286	250	589
Stack Air	207	389	250	846
Total Air	260	675	500	**1,435**
Water	1	251	250	502
Injection	0	0	0	0
POTW	7	255	250	512
Land	0	0	0	0
Off Site	759	22,521	22,200	45,480
Total Releases	1,027	23,702	23,200	**47,929**

Antimony Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	500	500	1,000	2,000
Stack Air	500	250	250	1,000
Total Air	1,000	750	1,250	**3,000**
Water	250	0	0	250
Injection	0	0	0	0
POTW	250	0	0	250
Land	0	0	0	0
Off Site	56,834	8,446	250	65,530
Total Releases	58,334	9,196	1,500	**69,030**

Arsenic Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	250	250	0	500
Off Site	250	250	0	500
Total Releases	500	500	0	**1,000**

Total Industrial Releases of Toxic Chemicals, 1987-1989

Arsenic Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	500	0	500
Total Releases	0	500	0	**500**

Asbestos (Friable) Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	1	1	2
Stack Air	0	0	0	0
Total Air	0	1	1	**2**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	1	1	**2**

Barium Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	423	878	4,234	5,535
Stack Air	4,076	3,830	20,420	28,326
Total Air	4,499	4,708	24,654	**33,861**
Water	22	270	434	726
Injection	0	0	0	0
POTW	483	1,638	3,890	6,011
Land	250	0	250	500
Off Site	53,333	33,439	44,595	131,367

Total Industrial Releases of Toxic Chemicals, 1987-1989

Total Releases	58,587	40,055	73,823	172,465

Barium Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	250	0	0	250
Injection	0	0	0	0
POTW	250	0	0	250
Land	250	250	0	500
Off Site	1,700	500	0	2,200
Total Releases	2,450	750	0	3,200

Benzene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	75,993	71,614	49,998	197,605
Stack Air	303,765	23,950	28,300	356,015
Total Air	379,758	95,564	78,298	**553,620**
Water	250	100	0	350
Injection	0	0	0	0
POTW	0	1,647	1,628	3,275
Land	250	250	250	750
Off Site	250	750	470	1,470
Total Releases	380,508	98,311	80,646	559,465

Beryllium Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0

Land	0	250	0	250
Off Site	0	250	0	250
Total Releases	0	500	0	500

Biphenyl Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	250	250
Stack Air	0	0	250	250
Total Air	0	0	500	**500**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	250	250
Land	0	0	250	250
Off Site	0	0	1,733	1,733
Total Releases	0	0	2,733	2,733

Butraldehyde Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	250	250
Stack Air	0	0	0	0
Total Air	0	0	250	**250**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	0	250	250

Butyl Acrylate Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	573	1,345	1,963	3,881
Stack Air	3,313	33,791	16,488	53,592
Total Air	3,886	35,136	18,451	**57,473**
Water	0	0	0	0
Injection	0	0	0	0

Total Industrial Releases of Toxic Chemicals, 1987-1989

POTW	0	0	250	250
Land	0	0	0	0
Off Site	750	750	5,059	6,559
Total Releases	4,636	35,886	23,760	64,282

Butyl Benzoyl Phthalate Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	2	2
Stack Air	0	0	0	0
Total Air	0	0	2	2
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	100	100
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	0	102	102

Cadmium Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	0
Water	250	500	250	1,000
Injection	0	0	0	0
POTW	0	250	250	500
Land	250	250	0	500
Off Site	250	1,000	1,000	2,250
Total Releases	750	2,000	1,500	4,250

Carbon Disulfide Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	0	0	250
Stack Air	3,432	3,800	0	7,232
Total Air	3,682	3,800	0	7,482

Total Industrial Releases of Toxic Chemicals, 1987-1989

Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	3,682	3,800	0	7,482

Chlorine Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	1,001	750	750	2,501
Stack Air	1,515	316	565	2,396
Total Air	2,516	1,066	1,315	**4,897**
Water	0	0	0	0
Injection	0	0	0	0
POTW	10,250	9,000	0	19,250
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	12,766	10,066	1,315	24,147

Chlorophenols Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	10	10	1	21
Stack Air	53	40	49	142
Total Air	63	50	50	**163**
Water	0	0	0	0
Injection	0	0	0	0
POTW	2,100	1,900	1,100	5,100
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	2,163	1,950	1,150	5,263

Chromium Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	367	311	250	928
Stack Air	1,136	1,018	1,850	4,004

Total Industrial Releases of Toxic Chemicals, 1987-1989

Total Air	1,503	1,329	2,100	**4,932**
Water	3	263	950	1,216
Injection	0	0	0	0
POTW	92	452	559	1,103
Land	0	0	2,600	2,600
Off Site	120,779	28,403	25,456	174,638
Total Releases	122,377	30,447	31,665	184,489

Chromium Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	250	500	750
Stack Air	2,485	2,700	500	5,685
Total Air	2,485	2,950	1,000	**6,435**
Water	250	750	0	1,000
Injection	0	0	0	0
POTW	0	250	250	500
Land	4,818	5,150	37,984	47,952
Off Site	4,101	10,200	250	14,551
Total Releases	11,654	19,300	39,484	70,438

Cobalt Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	250	250	500
Off Site	0	250	250	500
Total Releases	0	500	500	1,000

Copper Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989

Total Industrial Releases of Toxic Chemicals, 1987-1989

Fugative Air	250	500	250	1,000
Stack Air	4,950	6,700	250	11,900
Total Air	5,200	7,200	500	**12,900**
Water	0	250	250	500
Injection	0	0	0	0
POTW	500	500	250	1,250
Land	0	0	0	0
Off Site	1,630	2,000	0	3,630
Total Releases	7,330	9,950	1,000	**18,280**

Copper Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	250	3	503
Stack Air	0	291	1,836	2,127
Total Air	250	541	1,839	**2,630**
Water	750	750	0	1,500
Injection	0	0	0	0
POTW	500	500	25	1,025
Land	250	250	0	500
Off Site	250	2,798	3,301	6,349
Total Releases	2,000	4,839	5,165	**12,004**

Cresol (Mixed Isomers) Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	250	0	250
Off Site	0	250	0	250
Total Releases	0	500	0	**500**

Cumene Releases (pounds)

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AREA OF CONCERN

Total Industrial Releases of Toxic Chemicals, 1987-1989

Type of Release	1987	1988	1989	1987-1989
Fugative Air	1,000	1,600	1,000	3,600
Stack Air	250	10	10	270
Total Air	1,250	1,610	1,010	**3,870**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	1,250	1,610	1,010	**3,870**

Cyclohexane Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	23,374	6,450	4,000	33,824
Stack Air	1,250	820	470	2,540
Total Air	24,624	7,270	4,470	**36,364**
Water	250	400	0	650
Injection	0	0	0	0
POTW	0	250	0	250
Land	0	0	0	0
Off Site	250	0	0	250
Total Releases	25,124	7,920	4,470	**37,514**

Dibenzofuran Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	750	0	250	1,000
Stack Air	0	0	750	750
Total Air	750	0	1,000	**1,750**
Water	0	0	0	0
Injection	0	0	0	0
POTW	250	0	250	500
Land	750	0	1,800	2,550
Off Site	250	0	8,664	8,914
Total Releases	2,000	0	11,714	**13,714**

Total Industrial Releases of Toxic Chemicals, 1987-1989

Dibutyl Phthalate Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	250	250
Stack Air	0	0	0	0
Total Air	0	0	250	**250**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	250	250
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	0	500	**500**

Dichloromethane Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	45,190	30,963	16,961	93,114
Stack Air	83,946	79,616	69,952	233,514
Total Air	129,136	110,579	86,913	**326,628**
Water	0	0	0	0
Injection	0	0	0	0
POTW	750	250	266	1,266
Land	0	0	0	0
Off Site	16,950	17,702	31,853	66,505
Total Releases	146,836	128,531	119,032	**394,399**

Diethanolamine Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	1,000	775	2,025
Stack Air	0	0	60	60
Total Air	250	1,000	835	**2,085**
Water	0	0	0	0
Injection	0	0	0	0
POTW	42,000	120,000	38,120	200,120
Land	250	0	0	250
Off Site	0	0	0	0

Total Industrial Releases of Toxic Chemicals, 1987-1989

Total Releases	42,500	121,000	38,955	202,455

Dimethyl Sulfate Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	0	0	0

Epichlorohydrin Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	3,500	0	0	3,500
Stack Air	250	0	0	250
Total Air	3,750	0	0	**3,750**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	500	0	0	500
Total Releases	4,250	0	0	4,250

Ethylbenzene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	27,788	14,850	26,700	69,338
Stack Air	1,500	850	5,110	7,460
Total Air	29,288	15,700	31,810	**76,798**
Water	250	100	0	350
Injection	0	0	0	0
POTW	0	250	0	250

Land	250	250	0	500
Off Site	500	2,000	1,250	3,750
Total Releases	30,288	18,300	33,060	81,648

Ethylene Glycol Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	60,859	6,104	7,863	74,826
Stack Air	4,461	694	3,354	8,509
Total Air	65,320	6,798	11,217	**83,335**
Water	4	3	58	65
Injection	0	0	0	0
POTW	271,596	285,716	517,818	1,075,130
Land	0	0	0	0
Off Site	79,733	3,957	26,698	110,388
Total Releases	416,653	296,474	555,791	1,268,918

Ethylene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	44,200	31,221	16,724	92,145
Stack Air	250	0	0	250
Total Air	44,450	31,221	16,724	**92,395**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	44,450	31,221	16,724	92,395

Formaldehyde Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	8,263	7,061	15,886	31,210
Stack Air	51,403	21,261	178,323	250,987
Total Air	59,666	28,322	194,209	**282,197**
Water	0	0	2	2
Injection	0	0	0	0

POTW	39,554	36,850	86,515	162,919
Land	0	0	0	0
Off Site	7,217	3,250	5,856	16,323
Total Releases	106,437	68,422	286,582	461,441

Freon 113 Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	250	0	250
Stack Air	0	0	0	0
Total Air	0	250	0	**250**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	250	0	250

Glycol Ethers Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	62,444	114,848	137,700	314,992
Stack Air	270,952	469,003	333,929	1,073,884
Total Air	333,396	583,851	471,629	**1,388,876**
Water	82	106	28	216
Injection	0	0	0	0
POTW	23,552	228,658	23,305	275,515
Land	0	0	0	0
Off Site	32,192	12,186	10,044	54,422
Total Releases	389,222	824,801	505,006	1,719,029

Hydrochloric Acid Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	5,314	3,000	2,716	11,030
Stack Air	8,949	20,455	14,522	43,926
Total Air	14,263	23,455	17,238	**54,956**

Total Industrial Releases of Toxic Chemicals, 1987-1989

Water	250	0	0	250
Injection	0	0	0	0
POTW	299,200	26,209	12,900	338,309
Land	0	0	0	0
Off Site	499	797,000	620,994	1,418,493
Total Releases	314,212	846,664	651,132	1,812,008

Hydrogen Cyanide Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	0	0	250
Stack Air	2,860	3,000	0	5,860
Total Air	3,110	3,000	0	**6,110**
Water	250	0	0	250
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	3,360	3,000	0	6,360

Hydrogen Fluoride Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	0	0	250
Stack Air	0	250	250	500
Total Air	250	250	250	**750**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	250	250	250	750

Lead Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	679	368	661	1,708
Stack Air	7,217	4,919	7,070	19,206

Total Industrial Releases of Toxic Chemicals, 1987-1989

Total Air	7,896	5,287	7,731	**20,914**
Water	264	259	264	787
Injection	0	0	0	0
POTW	387	331	388	1,106
Land	250	250	0	500
Off Site	19,223	11,920	8,470	39,613
Total Releases	28,020	18,047	16,853	62,920

Lead Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	500	500	500	1,500
Stack Air	2,151	1,772	1,755	5,678
Total Air	2,651	2,272	2,255	**7,178**
Water	250	250	250	750
Injection	0	0	0	0
POTW	250	500	500	1,250
Land	0	0	0	0
Off Site	58,140	40,700	40,745	139,585
Total Releases	61,291	43,722	43,750	148,763

Maleic Anhydride Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	250	250	750
Stack Air	0	250	250	500
Total Air	250	500	500	**1,250**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	250	250	250	750
Total Releases	500	750	750	2,000

Manganese Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989

Fugative Air	0	0	250	250
Stack Air	0	0	0	0
Total Air	0	0	250	**250**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	250	250
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	0	500	500

Manganese Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	1,725	1,725
Stack Air	10	250	11,498	11,758
Total Air	10	250	13,223	**13,483**
Water	0	0	0	0
Injection	0	0	0	0
POTW	86	250	250	586
Land	7,000	8,000	642,435	657,435
Off Site	301	250	30,540	31,091
Total Releases	7,397	8,750	686,448	702,595

Mercury Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	250	250	0	500
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	250	0	250
Off Site	0	250	0	250
Total Releases	250	750	0	1,000

Methanol Releases (pounds)

Total Industrial Releases of Toxic Chemicals, 1987-1989

Type of Release	1987	1988	1989	1987-1989
Fugative Air	21,282	11,967	55,588	88,837
Stack Air	94,337	308,332	521,696	924,365
Total Air	115,619	320,299	577,284	**1,013,202**
Water	181	257	173	611
Injection	0	0	0	0
POTW	1,623	2,309	10,821	14,753
Land	0	0	0	0
Off Site	119,806	27,747	18,597	166,150
Total Releases	237,229	350,612	606,875	1,194,716

Methyl Acrylate Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	45	45	81	171
Stack Air	254	254	458	966
Total Air	299	299	539	**1,137**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	9,662	0	471	10,133
Total Releases	9,961	299	1,010	11,270

Methyl Ethyl Ketone Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	573,288	580,932	471,103	1,625,323
Stack Air	2,376,656	672,744	520,925	3,570,325
Total Air	2,949,944	1,253,676	992,028	**5,195,648**
Water	256	259	259	774
Injection	0	0	0	0
POTW	43,055	23,082	22,289	88,426
Land	0	0	0	0
Off Site	964,176	11,975	18,563	994,714
Total Releases	3,957,431	1,288,992	1,033,139	6,279,562

Total Industrial Releases of Toxic Chemicals, 1987-1989

Methyl Isobutyl Ketone Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	967	2,000	60,319	63,286
Stack Air	883,323	78,250	502,797	1,464,370
Total Air	884,290	80,250	563,116	**1,527,656**
Water	22	27	5	54
Injection	0	0	0	0
POTW	224	495	290	1,009
Land	0	0	0	0
Off Site	422,130	3,642	2,472	428,244
Total Releases	1,306,666	84,414	565,883	**1,956,963**

Methyl Methacrylate Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	828	1,010	1,253	3,091
Stack Air	6,815	8,310	10,307	25,432
Total Air	7,643	9,320	11,560	**28,523**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	10,090	10,090
Total Releases	7,643	9,320	21,650	**38,613**

Methyl Tert-Butyl Ether Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	32,250	4,350	0	36,600
Stack Air	1,550	2,850	0	4,400
Total Air	33,800	7,200	0	**41,000**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	500	0	500
Land	0	0	0	0
Off Site	0	0	0	0

Total Releases	33,800	7,700	0	**41,500**

Methylenebis (Phenylisocyanate) Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	253	192	445
Stack Air	0	0	0	0
Total Air	0	253	192	**445**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	0	253	192	**445**

Molybdenum Trioxide Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	0	0	250
Stack Air	0	0	0	0
Total Air	250	0	0	**250**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	17,000	0	0	17,000
Total Releases	17,250	0	0	**17,250**

N-Butyl Alcohol Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	71,219	71,333	91,414	233,966
Stack Air	475,047	1,237,400	679,878	2,392,325
Total Air	546,266	1,308,733	771,292	**2,626,291**
Water	406	693	630	1,729
Injection	0	0	0	0
POTW	3,657	6,237	5,910	15,804

Total Industrial Releases of Toxic Chemicals, 1987-1989

Land	0	0	0	0
Off Site	239,766	98,046	35,638	373,450
Total Releases	790,095	1,413,709	813,470	3,017,274

Naphthalene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	19,187	10,382	4,351	33,920
Stack Air	1,000	500	15,630	17,130
Total Air	20,187	10,882	19,981	**51,050**
Water	250	500	0	750
Injection	0	0	0	0
POTW	750	822	488	2,060
Land	3,557	1,600	1,700	6,857
Off Site	2,911	3,209	15,222	21,342
Total Releases	27,655	17,013	37,391	82,059

Nickel Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	250	750	1,250
Stack Air	0	250	500	750
Total Air	250	500	1,250	**2,000**
Water	0	0	0	0
Injection	0	0	0	0
POTW	291	275	675	1,241
Land	0	0	250	250
Off Site	1,969,750	49,850	13,750	2,033,350
Total Releases	1,970,291	50,625	15,925	2,036,841

Nickel Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	500	250	500	1,250
Stack Air	250	750	500	1,500
Total Air	750	1,000	1,000	**2,750**
Water	250	500	250	1,000
Injection	0	0	0	0

Total Industrial Releases of Toxic Chemicals, 1987-1989

POTW	0	250	250	500
Land	250	250	9,653	10,153
Off Site	1,413	250	250	1,913
Total Releases	2,663	2,250	11,403	16,316

Nitric Acid Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	250	0	250	500
Stack Air	500	250	0	750
Total Air	750	250	250	**1,250**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	250	5,750	0	6,000
Total Releases	1,000	6,000	250	7,250

P-Phenylenediamine Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	78,000	0	0	78,000
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	78,000	0	0	78,000

Phenol Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	3,393	2,765	854	7,012
Stack Air	499	596	35	1,130
Total Air	3,892	3,361	889	**8,142**

Total Industrial Releases of Toxic Chemicals, 1987-1989

Water	250	762	0	1,012
Injection	0	0	0	0
POTW	0	100	250	350
Land	250	0	0	250
Off Site	749	3,480	1,146	5,375
Total Releases	5,141	7,703	2,285	15,129

Phosphoric Acid Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	760	555	830	2,145
Stack Air	410	0	20	430
Total Air	1,170	555	850	**2,575**
Water	0	0	0	0
Injection	0	0	0	0
POTW	3,050	12,543	16,288	31,881
Land	0	0	0	0
Off Site	560,462	742,830	481,274	1,784,566
Total Releases	564,682	755,928	498,412	1,819,022

Phthalic Anhydride Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	770	617	562	1,949
Stack Air	2,189	1,409	1,236	4,834
Total Air	2,959	2,026	1,798	**6,783**
Water	243	0	0	243
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	250	1,424	1,674
Total Releases	3,202	2,276	3,222	8,700

Polychlorinated Biphenyls Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0

Total Industrial Releases of Toxic Chemicals, 1987-1989

Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	2	5,104	0	5,106
Total Releases	2	5,104	0	5,106

Propylene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	157,249	89,395	70,723	317,367
Stack Air	6,350	5,500	4,100	15,950
Total Air	163,599	94,895	74,823	**333,317**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	163,599	94,895	74,823	333,317

Quinoline Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	250	250
Stack Air	0	0	250	250
Total Air	0	0	500	**500**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	250	250
Land	0	0	1,092	1,092
Off Site	0	0	2,772	2,772
Total Releases	0	0	4,614	4,614

Sec-Butyl Alcohol Releases (pounds)

Type of Release	1987	1988	1989	1987-1989

Total Industrial Releases of Toxic Chemicals, 1987-1989

Fugative Air	0	16	14	30
Stack Air	0	0	0	0
Total Air	0	16	14	**30**
Water	0	0	0	0
Injection	0	0	0	0
POTW	250	0	0	250
Land	0	0	0	0
Off Site	250	0	0	250
Total Releases	500	16	14	**530**

Selenium Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	250	0	250
Off Site	0	250	0	250
Total Releases	0	500	0	**500**

Silver Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	250	250	0	500
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	250	250	0	**500**

Styrene Releases (pounds)

Total Industrial Releases of Toxic Chemicals, 1987-1989

Type of Release	1987	1988	1989	1987-1989
Fugative Air	37,190	21,182	20,748	79,120
Stack Air	1,639	1,784	20,451	23,874
Total Air	38,829	22,966	41,199	**102,994**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	1,500	250	1,350	3,100
Total Releases	40,329	23,216	42,549	**106,094**

Sulfuric Acid Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	1,250	1,350	4,700	7,300
Stack Air	36,802	40,102	47,760	124,664
Total Air	38,052	41,452	52,460	**131,964**
Water	250	0	0	250
Injection	0	0	0	0
POTW	474,200	433,781	203,000	1,110,981
Land	750	0	0	750
Off Site	2,198,200	1,495,316	100,901	3,794,417
Total Releases	2,711,452	1,970,549	356,361	**5,038,362**

Tert-Butyl Alcohol Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	1	1	2
Stack Air	0	0	0	0
Total Air	0	1	1	**2**
Water	0	0	0	0
Injection	0	0	0	0
POTW	250	0	0	250
Land	0	0	0	0
Off Site	250	0	0	250
Total Releases	500	1	1	**502**

LOWER MAUMEE BASIN
AREA OF CONCERN

Total Industrial Releases of Toxic Chemicals, 1987-1989

Tetrachloroethylene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	60,966	16,504	15,531	93,001
Stack Air	55,000	143,000	94,000	292,000
Total Air	115,966	159,504	109,531	**385,001**
Water	0	0	0	0
Injection	0	0	0	0
POTW	250	0	250	500
Land	10	0	0	10
Off Site	14,934	11,952	2,741	29,627
Total Releases	131,160	171,456	112,522	**415,138**

Thallium Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	0	0	0	0
Total Air	0	0	0	**0**
Water	750	750	0	1,500
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	0	0
Total Releases	750	750	0	**1,500**

Toluene Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	162,725	104,947	76,525	344,197
Stack Air	248,862	195,983	154,783	599,628
Total Air	411,587	300,930	231,308	**943,825**
Water	577	637	325	1,539
Injection	0	0	0	0
POTW	2,659	1,779	1,772	6,210
Land	250	250	0	500
Off Site	322,465	88,855	22,163	433,483

Total Industrial Releases of Toxic Chemicals, 1987-1989

Total Releases	737,538	392,451	255,568	1,385,557

Trichlorfon Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	250	250
Stack Air	0	0	336	336
Total Air	0	0	586	**586**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	198	198
Total Releases	0	0	784	784

Trifluralin Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	250	250
Stack Air	0	0	600	600
Total Air	0	0	850	**850**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0
Land	0	0	0	0
Off Site	0	0	46	46
Total Releases	0	0	896	896

Vanadium (Fume or Dust) Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	0	0
Stack Air	750	250	0	1,000
Total Air	750	250	0	**1,000**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	0	0

Land	250	250	0	500
Off Site	250	250	0	500
Total Releases	1,250	750	0	2,000

Vinyl Acetate Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	0	500	500
Stack Air	0	0	0	0
Total Air	0	0	500	**500**
Water	0	0	0	0
Injection	0	0	0	0
POTW	0	0	1,375	1,375
Land	0	0	0	0
Off Site	0	0	1,375	1,375
Total Releases	0	0	3,250	3,250

Xylene (Mixed Isomers) Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	403,214	311,420	306,704	1,021,338
Stack Air	1,202,454	1,230,562	646,201	3,079,217
Total Air	1,605,668	1,541,982	952,905	**4,100,555**
Water	612	740	112	1,464
Injection	0	0	0	0
POTW	3,227	3,279	1,005	7,511
Land	250	750	0	1,000
Off Site	344,397	117,393	38,863	500,653
Total Releases	1,954,154	1,664,144	992,885	4,611,183

Zinc (Fume or Dust) Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	944	177	528	1,649
Stack Air	3,323	2,336	6,716	12,375
Total Air	4,267	2,513	7,244	**14,024**
Water	2,512	2,116	51	4,679
Injection	0	0	0	0

Total Industrial Releases of Toxic Chemicals, 1987-1989

POTW	1,080	474	350	1,904
Land	0	0	0	0
Off Site	3,891	11,547	2,111	17,549
Total Releases	11,750	16,650	9,756	**38,156**

Zinc Compounds Releases (pounds)

Type of Release	1987	1988	1989	1987-1989
Fugative Air	0	1,000	250	1,250
Stack Air	1,100	1,290	750	3,140
Total Air	1,100	2,290	1,000	**4,390**
Water	0	500	250	750
Injection	0	0	0	0
POTW	17,250	15,300	981	33,531
Land	250	250	0	500
Off Site	926,750	752,500	619,600	2,298,850
Total Releases	945,350	770,840	621,831	**2,338,021**

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
1,1,1-Trichloroethane				
Betco Corporation	0	0	0	**0**
Fiske Brothers Refining Co.	0	0	0	**0**
General Jarvis/Farley	250	0	0	**250**
Gerity Schultz Corporation	500	3	3	**506**
Yarder Manufacturing Co.	0	1,500	0	**1,500**
Borden, Inc. - Chemical	2,098	2,527	2,007	**6,632**
BP Oil Company - Toledo	0	0	10,500	**10,500**
Tecumseh Corrugated Box Co.	0	14,915	0	**14,915**
Manville Sales Plant 7	27,750	0	0	**27,750**
Teledyne CAE	35,650	1,434	0	**37,084**
Globe Industries, Inc.	19,000	38,250	0	**57,250**
Champion Spark Plug Company	22,650	18,850	18,850	**60,350**
Acustar-Toledo Precision	19,894	47,200	8,020	**75,114**
1,2,4-Trimethylbenzene				
BP Oil Company - Toledo	750	0	0	**750**
Sun Refinery and Marketing Co.	15,500	19,290	12,170	**46,960**
1,2-Butylene Oxide				
Gerity Schultz Corporation	500	1	1	**502**
1,2-Dibromoethane				
Sun Refinery and Marketing Co.	250	0	0	**250**
1,2-Dichloroethane				
Sun Refinery and Marketing Co.	250	0	0	**250**
1,3-Butadiene				
Sun Refinery and Marketing Co.	250	250	250	**750**
BP Oil Company - Toledo	1,305	250	250	**1,805**
1,4-Dichlorobenzene				
Lehn & Fink Products Group	0	0	5	**5**
Fresh Products, Inc.	14,300	15,000	11,990	**41,290**
2,4-D				
Anderson Lawn Fertilizer	839	1,631	2,955	**5,425**
2,4-Dimethylphenol				
BP Oil Company - Toledo	0	500	0	**500**
2-Phenylphenol				
Lehn & Fink Products Group	1,325	2,040	900	**4,265**
Acetaldehyde				
Perstorp Polyols, Inc.	3,200	2,800	2,500	**8,500**
Acetone				
American Custom Industries	500	4,100	500	**5,100**
Du Pont Toledo Plant	0	3,950	4,005	**7,955**
Manufacturers Enameling	24,000	22,000	0	**46,000**
Chrysler Motors Toledo	20,500	34,050	4,981	**59,531**

LOWER MAUMEE BASIN
AREA OF CONCERN

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
Acrylic Acid				
Du Pont Toledo Plant	0	0	249	**249**
American Cyanamid Company	500	500	750	**1,750**
Aluminum (Fume or Dust)				
National Castings Inc.	0	500	35,931	**36,431**
Hydra-Matic	87,720	130,750	12,750	**231,220**
Ammonia				
Erie Steel Treating, Inc	0	0	250	**250**
Interstate Metal Processing	0	0	308	**308**
Hydra-Matic	200	250	0	**450**
Dial Corporation	250	250	0	**500**
Lehn & Fink Products Group	0	1,280	535	**1,815**
Cardox Div. Liquid Air Corp.	7,750	7,000	7,000	**21,750**
Sun Refinery and Marketing Co.	15,000	15,000	11,000	**41,000**
BP Oil Company - Toledo	30,823	23,700	0	**54,523**
Company Company Sson	144,000	94,250	250	**238,500**
Toledo Coke Corporation	400,000	0	0	**400,000**
Ammonium Sulfate				
Interstate Metal Processing	0	0	399,960	**399,960**
Anthracene				
Toledo Coke Corporation	0	2,875	660	**3,535**
Jennison-Wright Corp.	2,000	1,250	25,984	**29,234**
Antimony				
Johnson Controls, Inc.	750	750	750	**2,250**
Diversitech General	28,500	0	0	**28,500**
Plaskon Electronics	29,084	8,446	750	**38,280**
Antimony Compounds				
Fiske Brothers Refining Co.	0	0	0	**0**
Du Pont Toledo Plant	1,027	502	0	**1,529**
Gencorp Polymer Products	0	23,200	23,200	**46,400**
Arsenic				
John A. Biewer Co. of Toledo	0	500	0	**500**
Arsenic Compounds				
BP Oil Company - Toledo	500	500	0	**1,000**
Asbestos (Friable)				
Gerity Schultz Corporation	0	1	1	**2**
Barium				
Chrysler Motors Toledo	0	250	0	**250**
BP Oil Company - Toledo	500	500	0	**1,000**
Diversitech General	1,950	0	0	**1,950**
Barium Compounds				
Johnson Controls, Inc.	0	0	0	**0**
Chrysler Motors Toledo	0	0	1,000	**1,000**
BTL Specialty Resins Corp.	0	0	1,500	**1,500**

LOWER MAUMEE BASIN
AREA OF CONCERN

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
Manville Sales Plant 7	0	0	4,456	**4,456**
Gencorp Polymer Products	0	2,750	2,750	**5,500**
Oi-Neg TV Products, Inc.	1,000	250	5,761	**7,011**
Hoosier of Ohio, Inc.	9,700	5,100	2,900	**17,700**
Manufacturers Enameling	22,000	0	26,000	**48,000**
Du Pont Toledo Plant	25,887	31,955	29,456	**87,298**
Benzene				
Toledo Coke Corporation	0	1,461	1,446	**2,907**
Chrysler Motors Toledo	16,750	1,750	1,200	**19,700**
Sun Refinery and Marketing Co.	57,250	59,100	54,000	**170,350**
BP Oil Company - Toledo	306,508	36,000	24,000	**366,508**
Beryllium Compounds				
BP Oil Company - Toledo	0	500	0	**500**
Biphenyl				
Jennison-Wright Corp.	0	0	2,733	**2,733**
Butraldehyde				
Perstorp Polyols, Inc.	0	0	250	**250**
Butyl Acrylate				
American Cyanamid Company	1,000	1,250	750	**3,000**
Du Pont Toledo Plant	3,636	3,886	8,710	**16,232**
Chrysler Motors Toledo	0	30,750	14,300	**45,050**
Butyl Benzoyl Phthalate				
Lehn & Fink Products Group	0	0	102	**102**
Cadmium Compounds				
BP Oil Company - Toledo	750	750	0	**1,500**
Gencorp Polymer Products	0	1,250	1,500	**2,750**
Carbon Disulfide				
BP Oil Company - Toledo	3,682	3,800	0	**7,482**
Chlorine				
Sun Refinery and Marketing Co.	0	0	0	**0**
Dial Corporation	250	0	0	**250**
Farley Farley /Farley	0	250	250	**500**
Gerity Schultz Corporation	500	0	0	**500**
Doehler-Jarvis/Farley II	250	250	250	**750**
BP Oil Company - Toledo	500	500	250	**1,250**
U.S. Reduction Co.	1,266	66	65	**1,397**
Sson Sson Unt-Wesson	10,000	9,000	500	**19,500**
Chlorophenols				
Du Pont Toledo Plant	3	0	0	**3**
Lehn & Fink Products Group	2,160	1,950	1,150	**5,260**
Chromium				
John A. Biewer Co. of Toledo	0	500	0	**500**
Hydra-Matic	0	750	750	**1,500**
BP Oil Company - Toledo	11,654	17,550	0	**29,204**
National Castings Inc.	0	500	38,734	**39,234**

LOWER MAUMEE BASIN
AREA OF CONCERN

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
Chromium Compounds				
Chrysler Motors Toledo	0	0	40	**40**
John A. Biewer Co. of Toledo	0	500	0	**500**
Gencorp Polymer Products	0	0	2,250	**2,250**
Du Pont Toledo Plant	4,478	5,162	0	**9,640**
Sun Refinery and Marketing Co.	0	17,260	0	**17,260**
BP Oil Company - Toledo	0	0	27,900	**27,900**
Supreme Bumpers, Inc.	117,899	7,525	1,475	**126,899**
Cobalt Compounds				
BP Oil Company - Toledo	0	500	500	**1,000**
Copper				
Lo-Temp Brazing Co.	0	0	0	**0**
Crown Cork & Seal Co., Inc.	0	0	0	**0**
Gerity Schultz Corporation	0	0	2	**2**
John A. Biewer Co. of Toledo	0	250	0	**250**
Farley Farley /Farley	250	250	0	**500**
Doehler-Jarvis/Farley II	250	250	0	**500**
BP Oil Company - Toledo	1,500	1,500	0	**3,000**
Acustar-Toledo Precision	0	0	3,678	**3,678**
U.S. Reduction Co.	0	2,589	1,485	**4,074**
Copper Compounds				
John A. Biewer Co. of Toledo	0	0	0	**0**
Acustar-Toledo Precision	3,980	4,600	0	**8,580**
Hydra-Matic	3,350	5,350	1,000	**9,700**
Cresol (Mixed Isomers)				
BP Oil Company - Toledo	0	500	0	**500**
Cumene				
Sun Refinery and Marketing Co.	1,250	1,610	1,010	**3,870**
Cyclohexane				
BP Oil Company - Toledo	5,174	1,550	1,550	**8,274**
Sun Refinery and Marketing Co.	3,200	5,120	2,920	**11,240**
Chrysler Motors Toledo	16,750	1,250	0	**18,000**
Dibenzofuran				
Jennison-Wright Corp.	2,000	0	11,714	**13,714**
Dibutyl Phthalate				
Spartan Chemical Company, Inc.	0	0	500	**500**
Dichloromethane				
Spartan Chemical Company, Inc.	0	0	500	**500**
Gerity Schultz Corporation	1,250	15	12	**1,277**
Plaskon Electronics	31,946	20,866	0	**52,812**
Chrysler Motors Toledo	7,450	21,750	35,767	**64,967**
American Cyanamid Company	43,440	28,950	27,903	**100,293**
Champion Spark Plug Company	62,750	56,950	54,850	**174,550**
Diethanolamine				
Lehn & Fink Products Group	0	0	205	**205**
BP Oil Company - Toledo	500	250	0	**750**

LOWER MAUMEE BASIN
AREA OF CONCERN

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
Hydra-Matic	42,000	120,750	38,750	**201,500**
Dimethyl Sulfate				
Coulton Chemical Corp.	0	0	0	**0**
Epichlorohydrin				
Chrysler Motors Toledo	4,250	0	0	**4,250**
Ethylbenzene				
BP Oil Company - Toledo	7,238	2,250	4,350	**13,838**
Sun Refinery and Marketing Co.	5,800	6,500	4,210	**16,510**
Chrysler Motors Toledo	16,750	2,000	0	**18,750**
Abitibi-Price Corp.	500	7,550	24,500	**32,550**
Ethylene				
Sun Refinery and Marketing Co.	250	250	250	**750**
Toledo Coke Corporation	0	19,371	4,374	**23,745**
BP Oil Company - Toledo	44,200	11,600	12,100	**67,900**
Ethylene Glycol				
Betco Corporation	0	0	0	**0**
American Cyanamid Company	0	0	500	**500**
Toledo Toledo S/Stickney Ave	500	500	191	**1,191**
Acustar-Toledo Precision	1,750	0	228	**1,978**
Lehn & Fink Products Group	275	2,160	1,400	**3,835**
Du Pont Toledo Plant	4,752	203	5,002	**9,957**
Chrysler Motors Toledo	6,450	250	11,003	**17,703**
Gerity Schultz Corporation	32,700	14,661	16,117	**63,478**
Farley Farley /Farley	17,000	18,700	31,000	**66,700**
Abitibi-Price Corp.	115,000	0	0	**115,000**
Hydra-Matic	120,000	0	122,000	**242,000**
Doehler-Jarvis/Farley II	118,226	260,000	368,350	**746,576**
Formaldehyde				
Plaskon Electronics	0	0	250	**250**
Chembond Corp.	0	0	537	**537**
Du Pont Toledo Plant	0	0	1,957	**1,957**
Borden, Inc. - Chemical	1,997	0	0	**1,997**
BP Oil Company - Toledo	11,690	12,600	0	**24,290**
BTL Specialty Resins Corp.	11,401	6,047	9,156	**26,604**
Perstorp Polyols, Inc.	29,750	27,750	30,850	**88,350**
Manville Sales Plant 1	3,628	3,508	86,579	**93,715**
Du Pont C&p Toledo Plant	20,471	15,009	71,164	**106,644**
Manville Sales Plant 7	27,500	3,508	86,089	**117,097**
Freon 113				
Spartan Chemical Company, Inc.	0	250	0	**250**
Glycol Ethers				
Betco Corporation	0	0	0	**0**
National Milling & Chemical	1,600	0	0	**1,600**
Canberra Corporation	750	750	750	**2,250**
Spartan Chemical Company, Inc.	1,250	1,485	500	**3,235**
American Cyanamid Company	2,650	3,000	750	**6,400**
Acustar-Toledo Precision	7,290	0	0	**7,290**
Kaiser Tech Toledo Plant	12,445	10,680	2,272	**25,397**
Lehn & Fink Products Group	24,300	20,000	8,125	**52,425**
Crown Cork & Seal Co., Inc.	0	0	54,100	**54,100**
Manufacturers Enameling	45,000	36,000	24,000	**105,000**
Abitibi-Price Corp.	0	42,300	63,650	**105,950**

LOWER MAUMEE BASIN
AREA OF CONCERN

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
Chrysler Motors Toledo	0	61,400	107,000	**168,400**
Hydra-Matic	0	210,000	15,000	**225,000**
Du Pont Toledo Plant	81,990	115,473	36,001	**233,464**
American National Can Company	211,947	323,713	192,858	**728,518**
Hydrochloric Acid				
American National Can Company	0	0	0	**0**
Chrysler Motors Toledo	0	0	250	**250**
Gerity Schultz Corporation	250	9	9	**268**
Spartan Chemical Company, Inc.	250	500	500	**1,250**
Borden, Inc. - Chemical	1,497	0	0	**1,497**
Canberra Corporation	1,250	750	750	**2,750**
Betco Corporation	1,200	1,400	250	**2,850**
Libbey-Owens-Ford Co.	1,765	750	750	**3,265**
Jones-Hamilton Co.	0	7,305	6,208	**13,513**
Lehn & Fink Products Group	28,000	30,200	15,400	**73,600**
Manville Sales Plant 7	280,000	750	1,116	**281,866**
Toledo Pickling and Steel	0	805,000	625,899	**1,430,899**
Hydrogen Cyanide				
BP Oil Company - Toledo	3,360	3,000	0	**6,360**
Hydrogen Fluoride				
Libbey-Owens-Ford Co.	250	250	250	**750**
Lead				
U.S. Reduction Co.	141	0	50	**191**
Sun Refinery and Marketing Co.	250	0	0	**250**
Powerlab, Inc.	250	22	0	**272**
Hydra-Matic	0	750	750	**1,500**
Johnson Controls, Inc.	60,650	42,950	42,950	**146,550**
Lead Compounds				
Powerlab, Inc.	0	0	20	**20**
Libby Glass, Inc.	0	0	250	**250**
Chrysler Motors Toledo	0	0	269	**269**
Oi-Neg TV Products, Inc.	250	250	254	**754**
Libbey-Owens-Ford Co.	0	0	1,100	**1,100**
BP Oil Company - Toledo	500	750	1,350	**2,600**
Diversitech General	4,100	0	0	**4,100**
Gencorp Polymer Products	0	2,850	3,600	**6,450**
Du Pont Toledo Plant	23,170	14,197	10,010	**47,377**
Maleic Anhydride				
American Cyanamid Company	500	750	750	**2,000**
Manganese				
American National Can Company	387	500	500	**1,387**
National Castings Inc.	7,010	8,250	685,948	**701,208**
Manganese Compounds				
Chrysler Motors Toledo	0	0	500	**500**
Mercury Compounds				
BP Oil Company - Toledo	250	750	0	**1,000**
Methanol				
Betco Corporation	0	0	0	**0**

LOWER MAUMEE BASIN
AREA OF CONCERN

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
Coulton Chemical Corp.	0	250	6	**256**
Sun Refinery and Marketing Co.	250	30	30	**310**
Borden, Inc. - Chemical	1,997	0	0	**1,997**
Chembond Corp.	0	0	2,360	**2,360**
Ave Ave Ave Ors/Stickney Ave	0	500	3,410	**3,910**
Perstorp Polyols, Inc.	1,950	2,350	2,450	**6,750**
Du Pont C&p Toledo Plant	29,133	46,904	79,675	**155,712**
Du Pont Toledo Plant	103,899	125,178	78,788	**307,865**
Chrysler Motors Toledo	100,000	175,400	440,156	**715,556**
Methyl Acrylate				
Du Pont Toledo Plant	9,961	299	1,010	**11,270**
Methyl Ethyl Ketone				
Crown Cork & Seal Co., Inc.	666	749	0	**1,415**
Walbridge Coatings	12,291	0	0	**12,291**
Du Pont Toledo Plant	9,524	11,793	11,279	**32,596**
Manufacturers Enameling	60,000	104,000	40,000	**204,000**
Kaiser Tech Toledo Plant	205,200	84,550	114,040	**403,790**
Diversitech General	1,079,500	0	0	**1,079,500**
Gencorp Polymer Products	0	1,010,400	857,700	**1,868,100**
Chrysler Motors Toledo	2,590,250	77,500	10,120	**2,677,870**
Methyl Isobutyl Ketone				
Abitibi-Price Corp.	0	0	1,000	**1,000**
Crown Cork & Seal Co., Inc.	1,865	1,199	10,500	**13,564**
Du Pont Toledo Plant	8,471	2,415	6,019	**16,905**
Kaiser Tech Toledo Plant	15,180	15,550	13,610	**44,340**
Chrysler Motors Toledo	1,281,150	65,250	534,754	**1,881,154**
Methyl Methacrylate				
Du Pont Toledo Plant	7,643	9,320	21,650	**38,613**
Methyl Tert-Butyl Ether				
Ave Ave Ave Ors/Stickney Ave	500	750	0	**1,250**
Chrysler Motors Toledo	33,300	6,950	0	**40,250**
Methylenebis (Phenylisocyanate)				
Haas Door Company	0	253	192	**445**
Molybdenum Trioxide				
Sun Refinery and Marketing Co.	17,250	0	0	**17,250**
N-Butyl Alcohol				
Gerity Schultz Corporation	0	1	1	**2**
American Cyanamid Company	1,250	750	750	**2,750**
Manufacturers Enameling	17,000	0	0	**17,000**
Kaiser Tech Toledo Plant	14,800	6,840	6,304	**27,944**
Crown Cork & Seal Co., Inc.	13,495	5,560	13,400	**32,455**
Abitibi-Price Corp.	16,150	14,300	13,800	**44,250**
Du Pont Toledo Plant	135,370	258,996	185,699	**580,065**
American National Can Company	264,980	241,262	148,596	**654,838**
Chrysler Motors Toledo	327,050	886,000	444,920	**1,657,970**
Naphthalene				
Sun Refinery and Marketing Co.	250	250	250	**750**
Gerity Schultz Corporation	0	508	472	**980**
Toledo Coke Corporation	0	8,755	2,079	**10,834**
BP Oil Company - Toledo	2,851	5,550	8,150	**16,551**

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
Jennison-Wright Corp.	7,804	1,200	11,830	**20,834**
Chrysler Motors Toledo	16,750	750	14,610	**32,110**
Nickel				
Sun Refinery and Marketing Co.	1,663	0	0	**1,663**
BP Oil Company - Toledo	1,000	750	0	**1,750**
Hydra-Matic	0	1,500	1,000	**2,500**
National Castings Inc.	0	0	10,403	**10,403**
Nickel Compounds				
Chrysler Motors Toledo	0	0	500	**500**
BP Oil Company - Toledo	0	0	1,750	**1,750**
Champion Spark Plug Company	1,250	2,000	1,500	**4,750**
Walbridge Coatings	0	41,250	10,550	**51,800**
Supreme Bumpers, Inc.	1,969,041	7,375	1,625	**1,978,041**
Nitric Acid				
American National Can Company	0	0	0	**0**
Acustar-Toledo Precision	500	0	0	**500**
Baron Drawn Steel Corporation	500	500	0	**1,000**
Chrysler Motors Toledo	0	5,500	250	**5,750**
P-Phenylenediamine				
Toledo Coke Corporation	78,000	0	0	**78,000**
Phenol				
Chembond Corp.	0	0	889	**889**
Plaskon Electronics	0	0	1,396	**1,396**
Borden, Inc. - Chemical	1,497	0	0	**1,497**
Du Pont Toledo Plant	0	4,253	0	**4,253**
BP Oil Company - Toledo	3,644	3,450	0	**7,094**
Phosphoric Acid				
American National Can Company	0	0	0	**0**
Anderson Lawn Fertilizer	0	0	0	**0**
Betco Corporation	0	0	0	**0**
Pepsi-Cola General Bottlers	0	0	0	**0**
R&r Dentsply	0	0	0	**0**
Kaiser Tech Toledo Plant	212	80	274	**566**
Canberra Corporation	250	250	250	**750**
Spartan Chemical Company, Inc.	250	500	500	**1,250**
Baron Drawn Steel Corporation	500	1,000	1,250	**2,750**
Lehn & Fink Products Group	3,220	0	400	**3,620**
Chrysler Motors Toledo	0	22,000	250	**22,250**
Vroman Foods	0	12,043	15,488	**27,531**
Sun Refinery and Marketing Co.	560,250	720,055	480,000	**1,760,305**
Phthalic Anhydride				
American Cyanamid Company	0	750	750	**1,500**
Du Pont Toledo Plant	3,202	1,526	2,472	**7,200**
Polychlorinated Biphenyls				
Gerity Schultz Corporation	2	4	0	**6**
BP Oil Company - Toledo	0	5,100	0	**5,100**
Propylene				
Gerity Schultz Corporation	750	250	251	**1,251**
Toledo Coke Corporation	0	3,445	772	**4,217**
Sun Refinery and Marketing Co.	43,100	61,500	42,100	**146,700**

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Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds 1987	1988	1989	1987-1989
BP Oil Company - Toledo	119,749	29,700	31,700	**181,149**
Quinoline				
Jennison-Wright Corp.	0	0	4,614	**4,614**
Sec-Butyl Alcohol				
Gerity Schultz Corporation	500	16	14	**530**
Selenium Compounds				
BP Oil Company - Toledo	0	500	0	**500**
Silver				
BP Oil Company - Toledo	250	250	0	**500**
Styrene				
Apacs	0	250	250	**500**
American Custom Industries	500	0	500	**1,000**
Du Pont Toledo Plant	2,899	3,191	3,486	**9,576**
American Cyanamid Company	36,930	19,775	38,313	**95,018**
Sulfuric Acid				
American National Can Company	0	0	0	**0**
Champion Spark Plug Company	0	0	0	**0**
Moore Chrome Products Co.	0	0	0	**0**
Sun Refinery and Marketing Co.	0	0	0	**0**
Whitaker Plating	0	0	0	**0**
Interstate Metal Processing	0	0	44	**44**
Chrysler Motors Toledo	250	0	0	**250**
Perstorp Polyols, Inc.	0	250	0	**250**
Gerity Schultz Corporation	250	0	15	**265**
BP Oil Company - Toledo	500	0	0	**500**
Acustar-Toledo Precision	500	0	0	**500**
Hydra-Matic	750	0	0	**750**
Johnson Controls, Inc.	250	250	250	**750**
Jones-Hamilton Co.	750	0	0	**750**
Kaiser Tech Toledo Plant	0	0	3,786	**3,786**
Walbridge Coatings	13,820	50,140	54,950	**118,910**
Supreme Bumpers, Inc.	218,690	0	0	**218,690**
Commercial Aluminum Cookware	200,000	200,000	200,000	**600,000**
Baron Drawn Steel Corporation	846,442	387,159	63,616	**1,297,217**
Coulton Chemical Corp.	1,429,250	1,332,750	33,700	**2,795,700**
Tert-Butyl Alcohol				
Gerity Schultz Corporation	500	1	1	**502**
Tetrachloroethylene				
Gerity Schultz Corporation	500	18	14	**532**
Spartan Chemical Company, Inc.	250	0	500	**750**
Toledo Clutch & Brake	13,300	7,938	9,258	**30,496**
Champion Spark Plug Company	58,700	55,200	42,750	**156,650**
Kern-Liebers USA Inc.	58,410	108,300	60,000	**226,710**
Thallium				
BP Oil Company - Toledo	750	750	0	**1,500**
Toluene				
Bowser-Morner, Inc.	0	250	0	**250**
Ave Ave Ave Ors/Stickney Ave	500	500	0	**1,000**

Toxic Chemicals Releases, 1987-1989
In Order by Three-Year Totals

Chemical Name	Total Releases to All Destinations, pounds			
	1987	1988	1989	1987-1989
Dolphin Paint & Chemical Co.	0	0	1,000	**1,000**
Diversitech General	49,000	0	0	**49,000**
Gencorp Polymer Products	0	29,700	42,850	**72,550**
Kaiser Tech Toledo Plant	27,800	35,730	35,190	**98,720**
BP Oil Company - Toledo	64,717	26,500	36,600	**127,817**
Sun Refinery and Marketing Co.	42,650	62,800	38,900	**144,350**
Manufacturers Enameling	160,450	28,000	0	**188,450**
Du Pont Toledo Plant	108,271	110,871	89,810	**308,952**
Chrysler Motors Toledo	284,150	98,100	11,218	**393,468**
Trichlorfon				
Anderson Lawn Fertilizer	0	0	784	**784**
Trifluralin				
Anderson Lawn Fertilizer	0	0	896	**896**
Vanadium (Fume or Dust)				
BP Oil Company - Toledo	1,250	750	0	**2,000**
Vinyl Acetate				
Plaskon Electronics	0	0	1,625	**1,625**
Plaskon Electronics	0	0	1,625	**1,625**
Xylene (Mixed Isomers)				
Ave Ave Ave Ors/Stickney Ave	500	500	0	**1,000**
Schindler Elevator Corporation	8,640	7,920	8,640	**25,200**
Crown Cork & Seal Co., Inc.	5,664	2,624	44,000	**52,288**
BP Oil Company - Toledo	55,702	28,950	41,100	**125,752**
Sun Refinery and Marketing Co.	51,350	73,400	46,700	**171,450**
Manufacturers Enameling	80,000	66,000	50,000	**196,000**
Kaiser Tech Toledo Plant	126,600	91,450	65,430	**283,480**
Abitibi-Price Corp.	288,950	187,300	177,550	**653,800**
Du Pont Toledo Plant	490,749	421,850	127,777	**1,040,376**
Chrysler Motors Toledo	845,999	784,150	431,688	**2,061,837**
Zinc (Fume or Dust)				
Gerity Schultz Corporation	2,088	478	401	**2,967**
Diversitech General	3,150	0	0	**3,150**
BP Oil Company - Toledo	2,743	2,100	0	**4,843**
Du Pont Toledo Plant	3,769	14,072	9,355	**27,196**
Zinc Compounds				
Fiske Brothers Refining Co.	0	0	0	**0**
Acustar-Toledo Precision	0	0	480	**480**
Oi-Neg TV Products, Inc.	250	250	251	**751**
Fiske Brothers Refining Co.	500	500	0	**1,000**
American Cyanamid Company	750	750	250	**1,750**
Hydra-Matic	0	2,800	0	**2,800**
Gencorp Polymer Products	0	3,250	3,250	**6,500**
Manufacturers Enameling	17,000	13,000	12,000	**42,000**
Walbridge Coatings	926,850	750,290	605,600	**2,282,740**