LAKE HURON BASIN

EASTERN UPPER PENINSULA RIVER BASINS
MICHIGAN

WATER QUALITY DATA
1965 SURVEY

Clean Water Series LHBO-16-A

U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
Great Lakes Region

EASTERN UPPER PENINSULA RIVER BASINS
MICHIGAN

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JANUARY 1969

U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
Great Lakes Region
Lake Huron Basin Office
U.S. Naval Air Station
Grosse Ile, Michigan
48138

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INTRODUCTION

The water quality data contained in this report are the results of field investigations and other studies conducted in 1965 and 1966 to provide information for a water pollution control plan for the Lake Huron Basin. The Lake Huron Basin Study is a part of the Great Lakes-Illinois River Basins Project, directed by the Great Lakes Region, Federal Water Pollution Control Administration (FWPCA) and under authority of Public Law 84-660 (33 U.S.C. 466 et seq.).

> Sec. 3. (a) The Secretary shall, after careful investigation, and in cooperation with other Federal agencies, with State water pollution control agencies and interstate agencies, and with the municipalities and industries involved, prepare or develop comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary condition of surface and underground waters. In the development of such comprehensive programs due regard shall be given to the improvements which are necessary to conserve such waters for public water supplies, propagation of fish and aquatic life and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses. For the purpose of this section, the Secretary is authorized to make joint investigations with any such agencies of the condition of any waters in any State or States, and of the discharges of any sewage, industrial wastes, or substance which may adversely affect such waters.

Total water quality planning begins in the headwaters of the individual river basins and continues downstream through the major tributaries to and including the Great Lakes. The extent and complexity of the Great Lakes and tributaries are shown on Figures 1, 2, and 3.

Water quality standards for interstate waters (Lake Huron) have been adopted by the State of Michigan and approved by the Secretary

of the Interior. Intrastate standards for Michigan are being implemented by the Michigan Water Resources Commission. These standards will form a basis for long-range plan for controlling pollution and maintaining water quality for Lake Huron and its tributaries.

ACKNOWLEDGMENTS

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State Agencies - Michigan Water Resources Commission
Michigan Department of Public Health

Federal Agencies - U.S. Department of Commerce
Weather Bureau
Office of Business Economics
Bureau of Census

U.S. Department of the Interior
Bureau of Commercial Fisheries
Bureau of Sport Fisheries and Wildlife
Bureau of Outdoor Recreation
Geological Survey

For further information, contact the following:

Lake Huron Basin Office
Federal Water Pollution Control Administration
U.S. Naval Air Station
Grosse Ile, Michigan 48138

Michigan Water Resources Commission
Stevens T. Mason Building
Lansing, Michigan 48926

Michigan Department of Public Health
3500 N. Logan
Lansing, Michigan 48914

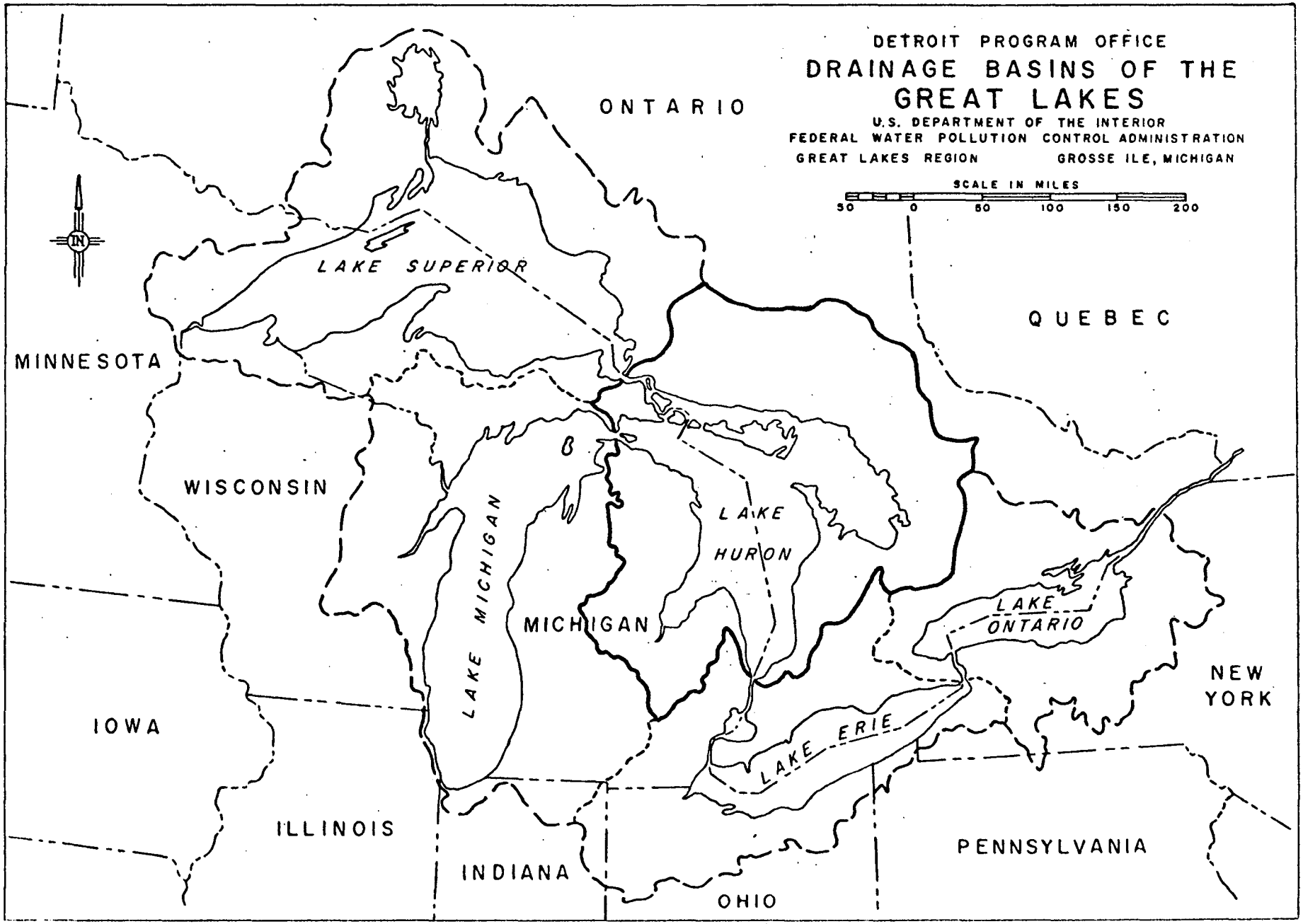
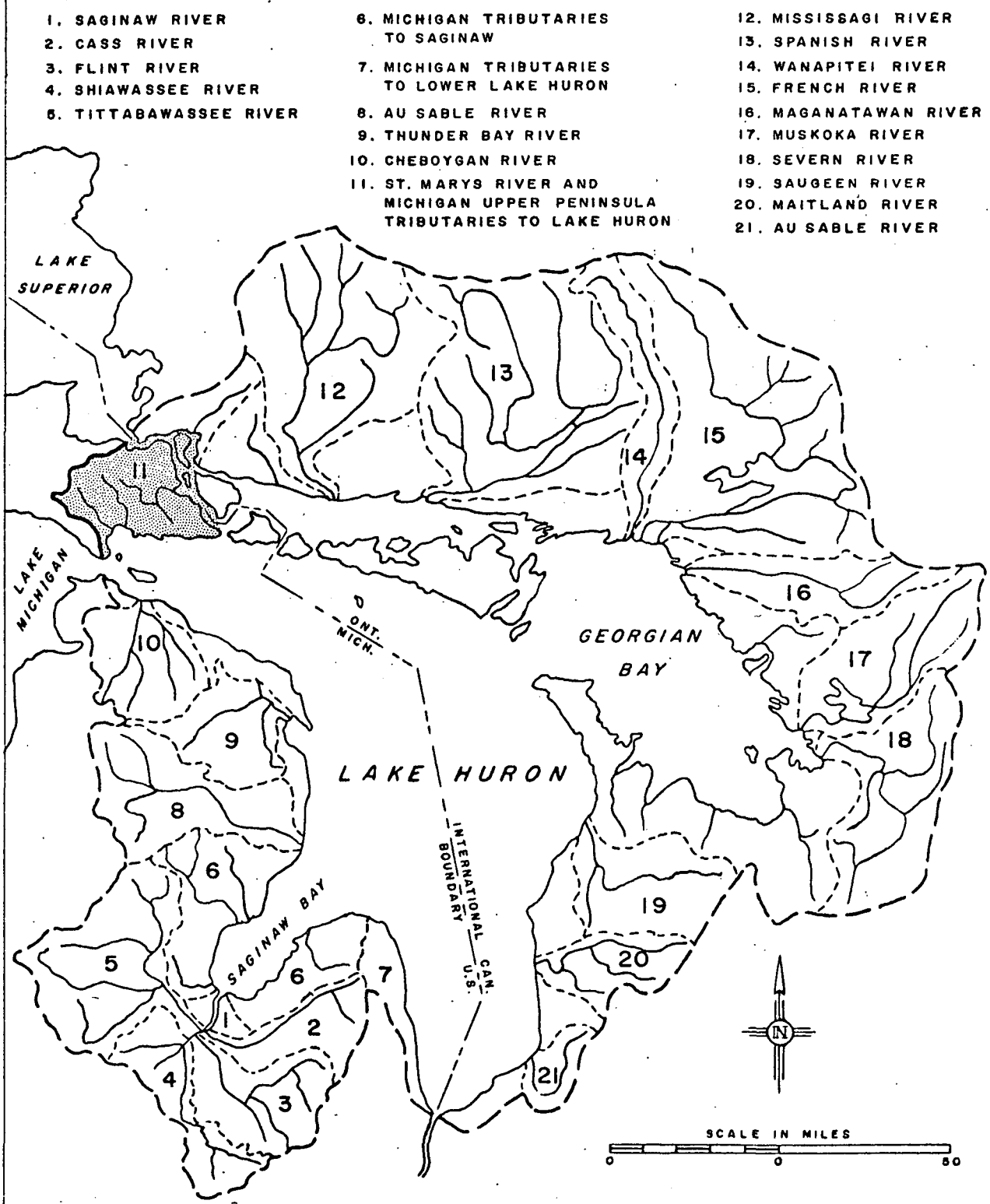

DETROIT PROGRAM OFFICE
DRAINAGE BASINS OF THE GREAT LAKES
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION
GROSSE ILE, MICHIGAN
SCALE IN MILES
50 0 50 100 150 200
IN
ONTARIO
LAKE SUPERIOR
QUEBEC
MINNESOTA
WISCONSIN
LAKE MICHIGAN
LAKE HURON
MICHIGAN
LAKE ONTARIO
NEW YORK
IOWA
LAKE ERIE
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA

FIGURE 1



DETROIT PROGRAM OFFICE

LAKE HURON BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION GROSSE ILE, MICHIGAN

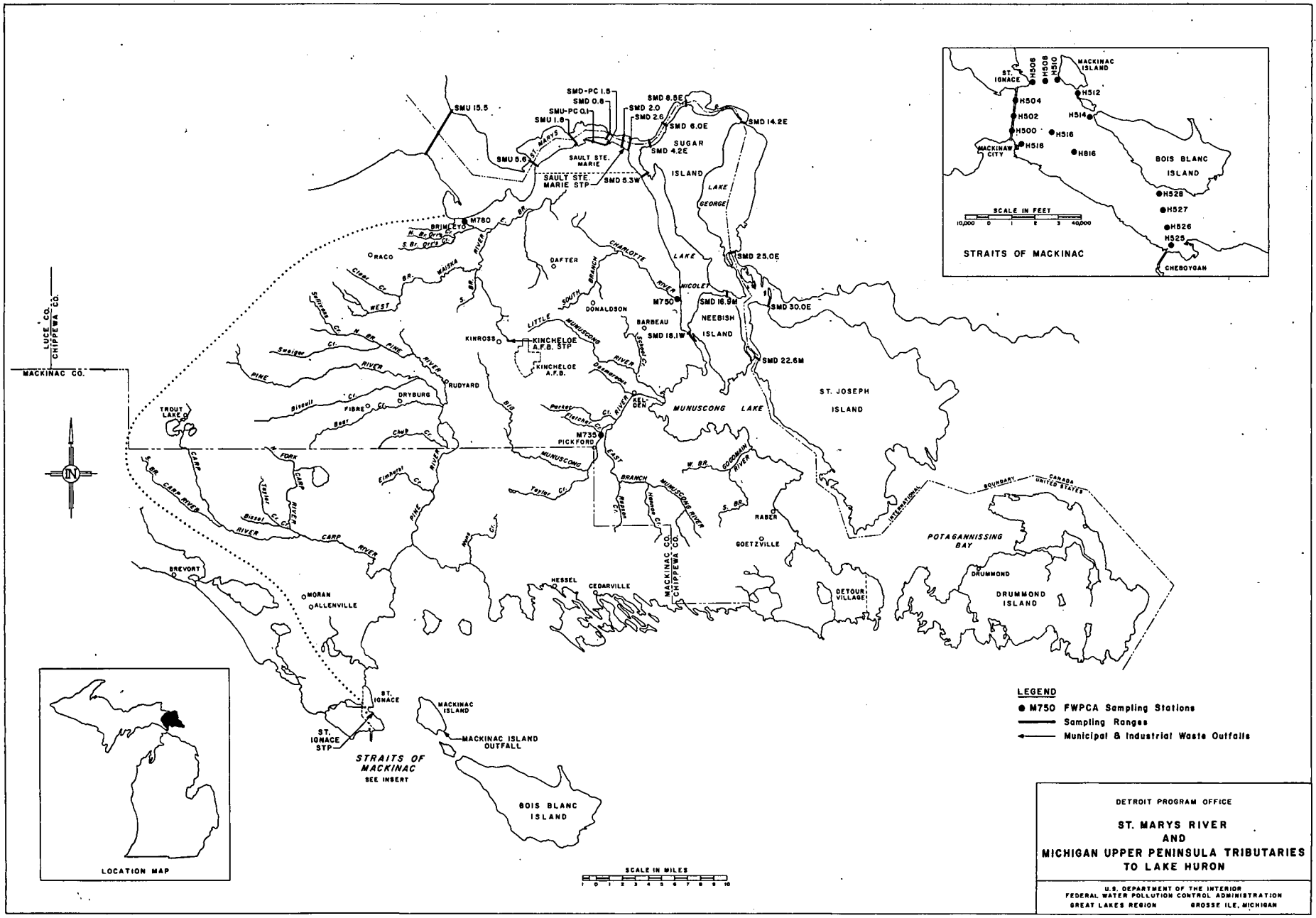

SMU 15.5
SMD-PC 1.5
SMD 0.8
SMU-PC 0.1
SMU 1.8
SMD 2.0
SMD 2.6
SMD 6.8E
SMD 6.0E
SMD 14.2E
SMU 5.6
SAULT STE. MARIE
SMD 4.2E
SAULT STE. MARIE STP
SMD 5.3W
SUGAR ISLAND
LAKE GEORGE
M780
BRIMLEY
RACO
DAFTER
CHARLOTTE RIVER
LAKE NICOLET
SMD 25.0E
DONALDSON
M750
SMD 16.9M
NEEBISH ISLAND
SMD 30.0E
KINROSS
KINCHELOE A.F.B. STP
BARBEAU
SMD 18.1W
KINCHELOE A.F.B.
SMD 22.6M
RUDYARD
DRYBURG
TROUT LAKE
MUNUSCONG LAKE
ST. JOSEPH ISLAND
KELDEN
PICKFORD
M735
RABER
GOETZVILLE
POTAGANNISSING BAY
DRUMMOND
DRUMMOND ISLAND
BREVORT
MORAN
ALLENVILLE
HESSEL
CEDARVILLE
DETOUR VILLAGE
ST. IGNACE
ST. IGNACE STP
MACKINAC ISLAND
MACKINAC ISLAND OUTFALL
STRAITS OF MACKINAC
SEE INSERT
BOIS BLANC ISLAND
LUCE CO.
CHIPPEWA CO.
MACKINAC CO.
CANADA
UNITED STATES
INTERNATIONAL BOUNDARY
LOCATION MAP
SCALE IN MILES
0 1 2 3 4 5 6 7 8 9 10
H506
H508
H510
H504
H512
H502
H514
H500
H516
H518
H816
H528
H527
H526
H525
CHEBOYGAN
MACKINAW CITY
SCALE IN FEET
10,000 0 1 2 3 4 0,000
STRAITS OF MACKINAC
LEGEND
M750 FWPCA Sampling Stations
Sampling Ranges
Municipal & Industrial Waste Outfalls
DETROIT PROGRAM OFFICE
ST. MARYS RIVER AND MICHIGAN UPPER PENINSULA TRIBUTARIES TO LAKE HURON
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION GROSSE ILE, MICHIGAN

FIGURE 3

GENERAL DESCRIPTION

Area Description

The drainage area of the Upper Peninsula tributaries to the St. Marys River and Lake Huron, as defined for this report, includes the eastern portions of Chippewa and Mackinac Counties, the United States islands located in the St. Marys River and the Straits of Mackinac (see Figure 3). The drainage basins in the area include the Waiska, Charlotte, Munuscong, and Gogomain Rivers which are tributary to the St. Marys River and the Carp and Pine Rivers which are tributary to the north shore of Lake Huron. The major islands are: Sugar, Neebish, and Drummond (United States) and the St. Joseph (Canadian) in the St. Marys River, and the Bois Blanc, Mackinac, and Les Cheneaux Islands in Lake Huron.

The largest population center in the United States portion of the basin is Sault Ste. Marie, Michigan, with a 1960 population of 18,722. Other communities are St. Ignace (3,334) and Mackinac Island (942). The Kincheloe Air Force Base near Kinross has a population of 10,000.

Quarrying for limestone is a substantial industry in southeastern Mackinac County and on Drummond Island. Tourism, especially on Mackinac Island and Sault Ste. Marie, is a major factor in the economy of the area.

The St. Marys River, connecting Lake Superior to Lake Huron, flows easterly from Whitefish Bay to Sault Ste. Marie and thence southeasterly to Lake Huron. The river is separated into upper and lower sections by the United States and Canadian locks at St. Marys Falls. The upper

section, from Whitefish Bay to St. Marys Falls, is 15-1/2 miles long, with channel depths from 25 to 55 feet and width variations from 18,000 to 2,000 feet. The drop at St. Marys Falls varies from 18 to 24 feet.

Below the falls, the lower section of the river consists of a series of interconnected lakes, bays, and channels extending for 49 miles to De Tour Passage on Lake Huron. This distance is measured along the main vessel route through Lake Nicolet Channel passing on the west side of Sugar Island. Above Neebish Island, the main channel separates downbound traffic passing west of Neebish Island and upbound traffic passing east of the island. From below Neebish Island, the main channel passes through Lake Munuscong and into Lake Huron via the De Tour Passage. Minimum channel depths on the lower section of the river average 25 to 30 feet.

On the Canadian side of the basin, drainage into the section of the river from Lake Superior to Lake George extends from eight to ten miles inland. In the Canadian area below Lake George, drainage into the river extends 45 miles inland. Tributaries draining into the Canadian side of the St. Marys River include the Big and Little Carp Rivers, Root, Garden, Echo, Bar, and Two Tree Rivers.

The Waiska River Basin (140 square miles) is sparsely settled. Much of the land is in public ownership in Marquette National Forest and Munuscong State Forest. Raco, Brimley, Kinross, and Dafter are four small communities in the basin. Brimley State Park is located on Waiska Bay near the mouth of the Waiska River. Between the Waiska River and Charlotte River Basin are a number of minor tributaries. With the exception of Sault Ste. Marie, there are no population centers in the shoreline drainage

areas. Most of the land is in forest.

The Charlotte River Basin (60 square miles) is sparsely settled; Donaldson, with a population of 500, being the only community. Near the mouth of the river is Dunbar Forest Experiment Station of Michigan State University. From the Charlotte River Basin to the Little Munuscong and Big Munuscong River Basins, the area is sparsely settled. There are no large communities or major industries. Part of the area in the Munuscong State Forest is in public ownership.

The Little Munuscong and Big Munuscong River Basins (40 and 260 square miles) are sparsely settled. Much of the land is part of the Munuscong State Forest. Pickford, Kelden, and Barbeau are small communities in the Basin. Of these, Pickford is the largest and has a meat packing operation. A number of gravel pits are in the basin. Dukes Lake and Munuscong River Forest campgrounds are in the basin. The Kincheloe Air Force Base near Kinross is located near the headwaters of the Big and Little Munuscong Rivers, although waste effluent is discharged to the Waiska River drainage. The rivers drain to the Munuscong Lake, the west channel of the St. Marys River.

From the Big Munuscong River Basin to the outlet of the St. Marys River at De Tour Village the basin is sparsely settled. De Tour Village is the largest, with a 1960 population of 669, and is located on De Tour Passage, the western outlet of the St. Marys River. The Gogomain River with a drainage area of 40 square miles is the largest river system.

There are two main river basins in the Upper Peninsula tributary to Lake Huron - the Carp River Basin, with a drainage area of 180 square

miles, and the Pine River Basin, with a drainage area of 240 square miles. There are also a number of smaller creeks and lakes in the basin.

Much of the Carp River Basin is in the Marquette National Forest. At the headwaters of the Carp River, there is a series of lakes and ponds. The community of Trout Lake is located at the intersection of the Duluth South Shore and Atlantic Railway with the Minneapolis-St. Paul-Sault Ste. Marie Railway near these lakes and ponds. In 1960, the population of Trout Lake was about 400. There are no other communities in the Carp River Basin.

On Lake Huron, from St. Ignace to the Carp River Basin, the shoreline tributary basins are sparsely settled, with the exception of the communities of Allenville, Moran, and St. Ignace. St. Ignace is the largest community in the Upper Peninsula-Lake Huron drainage except for Sault Ste. Marie which drains to the St. Marys River. With the exception of a few isolated areas, the land is in public ownership in Marquette National Forest. Straits State Park is located at St. Ignace near the Mackinac Bridge. There are numerous lakes and small creeks in the area.

Much of the upper Pine River and its tributaries are in the Marquette National Forest. Sullivans Creek Trout Rearing Station is located near the headwaters of a tributary to the North Branch of the Pine River. Fibre, Dryburg, and Rudyard are three settlements in the basin. Rudyard is the largest of these and had a 1960 population of 1,486.

From the Pine River Basin to De Tour Village, the drainage basin is narrow, extending ten miles inland. There are numerous creeks and lakes which outlet to Lake Huron through short streams. Much of the land is in public ownership in Marquette National Forest, Munuscong State Forest,

and De Tour State Park. Gravel pits and a large quarry are operated by the U.S. Steel Corporation. Dolomite for use in manufacturing steel is quarried here and about 3-1/2 million tons were shipped in 1964 from Port Dolomite. Cedarville and Hessel are two communities in the area; the Les Cheneaux Islands ("snow islands") extend along the Lake Huron shore. There are no other settlements in the area.

Much of the land area in the Upper Peninsula tributary to Lake Huron is composed of numerous islands, both large and small. The St. Marys River below Sault Ste. Marie is divided into separate channels by the major islands (Sugar, Neebish, and Drummond in the United States and St. Joseph in Canada). The Straits of Mackinac area is also divided into passages by Bois Blanc and Mackinac Islands. Big St. Martins and St. Martins Islands are at the entrance to St. Martins Bay. Marquette Island is the largest of the Les Cheneaux Islands. In general, the land use pattern of the major islands follows that of the mainland, with much of the area sparsely populated. Much of the land on some islands is in public ownership - Munuscong State Forest on Drummond Island and Black Lake State Forest on Bois Blanc Island.

Drummond Island is the largest of the United States islands. Drummond is the only community on the island. There are no municipal collection or treatment systems. The many lakes and streams make the island an ideal resort or outdoor sports area. There are many private hunting and fishing camps. The number of homes suitable for year-round residence is increasing.

By far, the best known of the islands is Mackinac Island, long a resort area as well as the summer home for the governor of the State of

Michigan. It is the terminus of sailboat races held in Lakes Huron and Michigan. In 1960, the population of the island was 942. This number is increased considerably during the summer tourist season.

Climate

The climate of the Upper Peninsula tributaries is tempered by the proximity of Lakes Michigan, Superior, and Huron. Mean annual temperatures are about 10°F lower than that of the Lake Huron-Lake Erie region. A typical North American winter cold wave coming down from the northwest is tempered by the large body of comparatively warmer Lake Superior water. This lake effect modifies temperatures close to the Lake Superior shoreline, with warmer temperatures recorded in winter and cooler temperatures in summer than are found farther inland.

The average annual temperature at Sault Ste. Marie, Michigan for 55 years of record was 38.1°F. Extreme temperatures range from 98°F to -37°F. The average annual precipitation for 52 years of record was 29.88 inches. Most of the precipitation falls during the growing season.

In 1965, the average annual temperature for Sault Ste. Marie, Michigan was 39°F and the total precipitation was 42.96 inches. Temperature extremes were from -27°F to 87°F.

Hydrology

The St. Marys River is the outlet for Lake Superior. The total drainage area for Lake Superior, including that portion of the St. Marys River above the Falls, is 80,000 square miles. The average annual discharge of the river for the 68 year period 1900 to 1967 is 73,600 cfs

which includes 5,000 cfs diverted to Lake Superior from the Hudson Bay watershed by the Long Lake-Ogoki project in Canada.

The St. Marys River over the years has been improved for navigation. Locks were constructed to permit passage of ships. Channels, especially the lower part of the river, have been dredged for deep draft vessels. Water is also diverted for production of hydroelectric power.

In order to maintain suitable levels in Lake Superior and the St. Marys River, compensating works were constructed to maintain the Lake Superior level between 602.1 feet and 603.6 feet above sea level (IGLD*).

Maximum current velocities are generally found in the dredged navigation channels below the Falls, particularly Middle Neebish Channel, West Neebish Cut, and the Little Rapids Cut; a rise in the level of Lake Huron will reduce the current velocity.

No permanent U.S. Geological Survey long-term gaging stations are located in the Upper Peninsula Lake Huron Basin tributaries. Yields in adjacent basins which are tributary to Lakes Michigan and Superior are higher than most of the Lower Peninsula Lake Huron Basin, with an average yield of about 1 cfsm.

Sampling station locations are descibed in Table 1 and the ranges are located on Figure 4. Tributary stations are described in Table 2.

* International Great Lakes Datum

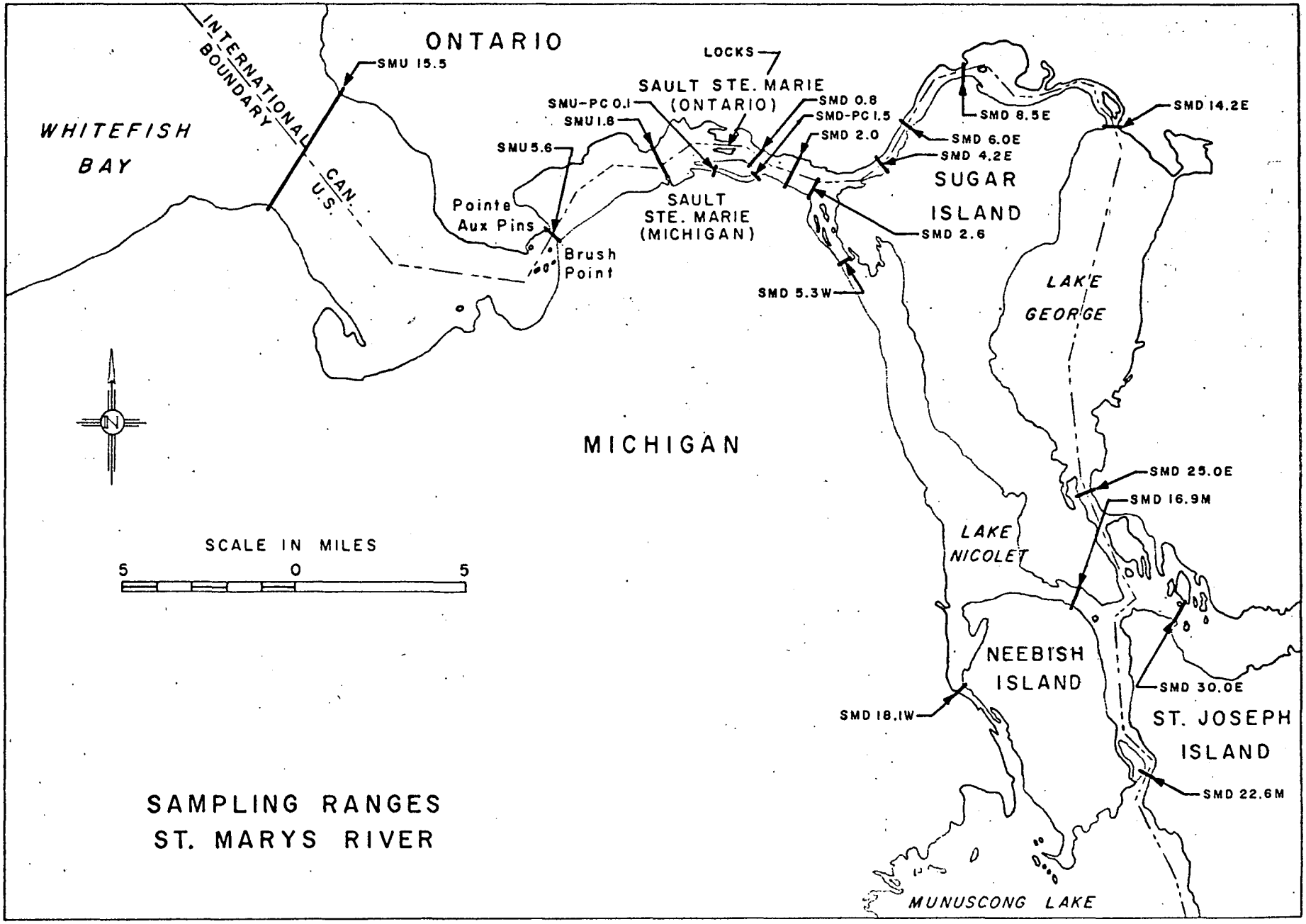

ONTARIO
INTERNATIONAL BOUNDARY
CAN.
U.S.
WHITEFISH BAY
SMU 15.5
LOCKS
SAULT STE. MARIE (ONTARIO)
SMU-PC 0.1
SMU 1.8
SMU 5.6
SMD 0.8
SMD-PC 1.5
SMD 2.0
SMD 8.5E
SMD 14.2E
SMD 6.0E
SMD 4.2E
SUGAR ISLAND
Pointe Aux Pins
Brush Point
SAULT STE. MARIE (MICHIGAN)
SMD 2.6
SMD 5.3W
LAKE GEORGE
MICHIGAN
N
SCALE IN MILES
5 0 5
SMD 25.0E
SMD 16.9M
LAKE NICOLET
NEEBISH ISLAND
SMD 30.0E
SMD 18.1W
ST. JOSEPH ISLAND
SMD 22.6M
MUNUSCONG LAKE
SAMPLING RANGES
ST. MARYS RIVER

FIGURE 4

TABLE 1. SAMPLE RANGES AND STATIONS
St. Marys River

Range	Distance from U.S. Shore (ft.)	Station No.
SMU 15.5	1,000	M62
	3,000	M63
	5,000	M64
	7,000	M65
	9,000	M66
	11,000	M67
	13,000	M68
	15,000	M69
	17,000	M70
	19,000	M71
SMU 5.6	1,000	M75
	1,300	M76
	1,600	M77
	1,900	M78
	2,200	M79
SMD 2.0	100	M109
	500	M110
	1,500	M111
	2,100	M112
	3,000	M113
	3,500	M114
	4,000	M115
SMD 5.3W	100	M129
	500	M130
	900	M131
SMD 6.0E	300	M134
	600	M135
	1,000	M136
	1,400	M137
SMD 8.5E	100	M140
	500	M142
	800	M143
SMD 16.9W	600	M165
SMD 18.1W	150	M177
SMD 25.0E	500	M189
	1,100	M190
	1,700	M191

TABLE 2. TRIBUTARY STATIONS
St. Marys River

Station No.	Location
M735	Big Munuscong River - 1.5 miles downstream from Pickford.
M750	Charlotte River - downstream from Barbeau at bridge, 500 feet north of Michigan State University Forestry School.
M780	Waiska River - one-half mile downstream from Brimley.

WATER USE

Municipal Water Supply

This sparsely populated basin has one major water user - the City of Sault Ste. Marie (Table 3). The city supplies 24,500 people and several small industries with water. St. Ignace (3,334), Mackinac Island (942), Superior Township (400), and Kinross (Kincheloe Air Force Base) are also served by public water supplies. The population that was served by public water supplies for the basin has been projected to be 34,000 by 1990 and 45,000 by 2020. Table 4 shows the projected water use. The industrial figures shown for 1990 and 2020 assume that water using industries will develop in the area.

Water-Related Recreation

In 1965, 2,000 boats were registered by residents of the basin. Boating and fishing are popular recreational activities. Water contact sports are also popular in the basin. In addition, there are hundreds of private cabins in the area which are occupied during the summer months. The Waiska, Carp, and St. Marys (from Sault Ste. Marie to De Tour) Rivers are canoe trails recognized by the Michigan Department of Natural Resources and Michigan Tourist Council. Mackinac Island has been a mecca for conventions and tourists.

The sea lamprey is a great threat to the Great Lakes trout and salmon fishing. The State has made plantings of salmon in the Lake Huron watershed. The Michigan waters of Lake Huron, with extensive shoals, have proportionately more productive lake trout grounds than Lakes Michigan and

Superior. A more detailed discussion of basin recreation is contained in the Bureau of Outdoor Recreation publication "Water-Oriented Outdoor Recreation - Lake Huron Basin (1967)."

Commercial Navigation

The St. Marys River is the connecting link between Lake Superior and Lake Huron. The locks at Sault Ste. Marie handle all the domestic and foreign shipping between these lakes. Table 5 lists a breakdown of this waterborne commerce. Table 6 shows the tonnage and volume of passenger traffic on a yearly basis from 1955 to 1964 on the St. Marys River. The data involved are taken from the U.S. Army Corps of Engineers publication entitled "Waterborne Commerce of the United States, Calendar Year 1964." This data includes barge, ferry, and tugboat traffic during the navigation season, from March 26 to December 17. During 1964, 98,143,303 short tons of imports and exports were handled by commercial shipping on the St. Marys River.

TABLE 3. MUNICIPAL WATER SUPPLIES*
Eastern Upper Peninsula River Basins

Community	1960 Pop.	Owner	Source	Treatment
Sault Ste. Marie	18,722	M	St. Marys River 1600' of 36" intake 40' deep	1 & 2
Kinross (Kincheloe Air Force Base)	-	U.S.	Wells in drift 125' deep	-
Superior Township (Brimley)	400	T	Well in rock 400' deep	
Mackinac Island	942	P	700' of 12" intake 30' deep - Lake Huron	
St. Ignace	3,334	P	Intake 550' long, 12" dia. in 35' water Lake Michigan	

* Taken from "Data on Public Water Supplies in Michigan," Engineering Bulletin No. 4 by the Michigan Department of Public Health.

Owner Code

M = City or Village
T = Township
P = Private
U.S. = Federal

Treatment Code

1. Chlorination
2. Fluoridation

TABLE 4. PROJECTED WATER USE
(MGD)
Eastern Upper Peninsula River Basins

	1965	1990	2020
Municipal*	3.7	6.2	9.5
Industrial	-	3.0	7.5
TOTAL	3.7	9.2	17.0

* Includes water for small industries.

TABLE 5. WATERBORNE COMMERCE - ST. MARYS RIVER
1964
Eastern Upper Peninsula River Basins

Total Passages:		Passenger Traffic:	
Upbound	- 23,178	Upbound	- 232,649
Downbound	- 22,546	Downbound	- 232,153

Tonnage Breakdown (American and Canadian)

Overseas Imports	45,115
Overseas Exports	2,494,442
Canadian Imports	4,467,078
Canadian Exports	9,351,539
All Foreign	14,552,244
Lakewise	67,231,717
Internal	1,168
Total	98,143,303

Explanation of Terminology:

Overseas Exports and Imports refer to tonnage shipped to and from the St. Marys River by the United States and Canada.

Canadian Exports and Imports refer to the shipping trade of Canada.

Lakewise Shipping refers to traffic between United States and Canadian ports on the Great Lakes system.

Internal Shipping refers to traffic involving carriage on both inland waterways and the waters of the Great Lakes system.

TABLE 6. WATERBORNE COMMERCE - ST. MARYS RIVER
Eastern Upper Peninsula River Basins

Year	Traffic of Ports		Through Traffic		Total	
	Tons	Passengers	Tons	Passengers	Tons	Passengers
1955	7,980,047	164,255	111,454,216	18,911	119,434,263	183,166
1956	8,625,764	96,369	104,921,195	33,370	113,546,959	129,739
1957	7,394,024	336,426	108,382,863	54,820	115,776,887	391,246
1958	5,529,268	290,990	74,058,839	88,166	79,588,107	379,156
1959	7,016,363	480,806	67,774,859	4,826	74,791,222	485,632
1960	6,876,715	565,519	88,558,173	7,222	95,434,888	572,741
1961	7,445,206	489,333	76,772,953	6,284	84,218,159	495,617
1962	6,515,676	402,477	76,701,448	7,148	83,217,124	409,625
1963	6,737,364	623,643	81,675,826	8,398	88,413,190	632,041
1964	7,397,672	455,824	90,745,631	8,978	98,143,303	464,802

SOURCES AND CHARACTERISTICS OF WASTES

Municipal

The major source of municipal waste in the United States portion of the Upper Peninsula tributaries is Sault Ste. Marie, Michigan which discharges effluent to the St. Marys River. The communities of St. Ignace and Mackinac Island discharge effluents to Lake Huron. This report does not include industrial or municipal sources of waste from Canada.

Sault Ste. Marie, with a population of 18,000, is served by a primary sewage treatment plant having an average flow of 3.6 MGD. The highest flow occurred during April, a month of snowmelt and high rains. Forty percent of the incoming BOD_5 was removed, with an average value of 54 mg/l in the effluent. St. Ignace had a primary plant serving 3,300 people who contributed an average flow of .64 MGD. The effluent BOD_5 from the plant varied between 27 mg/l and 106 mg/l, with an average value of 50 mg/l. The highest flows occurred during August when temperature, BOD_5, suspended solids, and volatile suspended solids were highest. The effluent was chlorinated year-round. On Mackinac Island, the 900 residents have a rather unique sewer system consisting of collection lines, grinding, and dilution of the waste by pump into the lake by way of a deep submerged outfall. There are no records of effluent quality.

The Township of Trout Lake was cited during 1965 by the Michigan Water Resources Commission for the discharge of raw sewage to the waters of the Carp River. Septic tank lines had been hooked up to storm drains by a number of property owners in the community. Remedial measures were made and the individual systems were improved to prevent the illegal

bypassing of the tile field system.

Municipal waste treatment plants are described in Table 7. The information is based on 1965 records of the Michigan Department of Public Health. Prior to January 1967, all plants were required to practice disinfection from May 15 to September 15. Since that date, continuous year-round disinfection is required by Michigan Department of Public Health regulation. Effluent characteristics based on the 1965 plant operating records are also listed in Table 7, and outfall locations are shown on Figure 3.

Industrial

There were no major industries in the Upper Peninsula tributaries to Lake Huron and the St. Marys River that discharged waste water to the basin streams. The Drummond Dolomite Corporation on Drummond Island was the only source of industrial waste water in the islands. Settling ponds were used to treat solids in process water.

Federal Installations

Kincheloe Air Force Base has a secondary sewage treatment plant which serves an estimated 10,000 people and has 80 to 90 percent reduction of BOD_5 and suspended solids. Waste flow averaged .75 to .80 MGD discharged to Mud Lake, a tributary to the East Branch of South Branch Waiska River. Aircraft washings were treated by oil and grease separation. Chlorination of effluent was practiced year-round.

Other Federal installations discharging to the basin waters are the St. Marys River Project, De Tour Reef Light Station, and Mackinac Life

Boat Station. Table 8 summarizes the Federal installations and describes their treatment facilities.

TABLE 7. MUNICIPAL WASTE TREATMENT PLANTS
1965 Effluent Characteristics*
Eastern Upper Peninsula River Basins

Community/ Population Served	Type of Treatment	Percent Removal	Flow (MGD)			Temp. °F	BOD (mg/l)			Susp. Solids (mg/l)	Vol. Susp. Solids (mg/l)	pH
			Avg.	Min.	Max.		Avg.	Min.	Max.			
Sault Ste. Marie 18,000	Primary	40	3.6	2.5	5.0	52	54	38	76	48	33	7.3
St. Ignace 3,300	Primary	49	.6	.3	1.4	51	50	27	106	30	26	7.1

* Based on monthly averages of daily plant operation records submitted by plants to the Michigan Department of Public Health.

TABLE 8. INVENTORY OF WASTE WATER DISPOSAL
AT FEDERAL INSTALLATIONS
Eastern Upper Peninsula River Basins

Installation (Municipality and County)	Type of Wastes	Receiving Waters	Treatment Provided	Remarks
Kincheloe Air Force Base (Kinross; Chippewa Co.)	Sanitary 784,000 GPD	Mud Lake; Tributaries to Lake Huron	Secondary Chlorination	Sanitary waste treatment plant is currently overloaded; however, present plans call for phasing out installation activities beginning in 1969.
Sault Ste. Marie Air Force Station (Sault Ste. Marie; Chippewa Co.)	Sanitary 13,800 GPD	Ground	Septic tank; drain field	Completion of secondary treatment plant previously constructed and connection of last waste source to this system scheduled for FY 1969.
St. Marys Canal (Sault Ste. Marie; Chippewa Co.)	Sanitary 4,800 GPD	Ground	Septic tank; drain field	
St. Marys River Project (Sault Ste. Marie; Chippewa Co.)	Sanitary 4,800 GPD	St. Marys River	None	Installation presently has no waste treatment facilities; however, septic tank and tile field with discharge to ground will be installed concurrently with construction of new lock now in process.
Middle Neebish Cut Light Attendant Station (Barbeau; Chippewa Co.)	Sanitary 700 GPD	Ground	Septic tank; drain field	

TABLE 8. INVENTORY OF WASTE WATER DISPOSAL
AT FEDERAL INSTALLATIONS (cont'd)
Eastern Upper Peninsula River Basins

Installation (Municipality and County)	Type of Wastes	Receiving Waters	Treatment Provided	Remarks
De Tour Reef Light Station (De Tour; Chippewa Co.)	Sanitary 400 GPD	Lake Huron	None	Propose unmanning 1970
Mackinac Life Boat Station (Mackinac Island; Mackinac Co.)	Sanitary 980 GPD	Lake Huron	None	Mackinac will be replaced by St. Ignace Life Boat Station which will discharge waste to city sewer.
Soldiers Lake Campground (Chippewa Co.)	Sanitary	Ground	Pit Toilet	Campground capacity 170 persons.
Carp River Campground (Mackinac Co.)	Sanitary	Ground	Pit Toilet	Campground capacity 60 persons.
Foley Creek Campground (Mackinac Co.)	Sanitary	Ground	Pit Toilet	Campground capacity 60 persons.
Moran Lookout Station (Mackinac Co.)	Sanitary 100 GPD	Ground	Septic tanks; drain field	
Maple Hill Picnic Area (Mackinac Co.)	Sanitary	Ground	Pit Toilet	Area capacity 4 persons.

POPULATION AND WASTE LOAD PROJECTIONS

Demographic studies were conducted by the Great Lakes-Illinois River Basins Project, Chicago, Illinois for the Lake Huron Basin. Population trends on a national, regional, and county basis were analyzed and population projections were developed for the various areas of the basin. In 1960, approximately 1.2 million persons lived in the Lake Huron watershed - about double the 1920 population. By the year 2020, it is estimated that the population of the watershed will be approximately 3.2 million people.

The major population center in the basin is Sault Ste. Marie, with a population of 18,732 according to the 1960 census figures. For this report, analyses were made assuming that by 2020 the area will be urbanized and served by water and sewer systems. For this area the 1965 population served by sewer systems was estimated to be 21,780 and projected to be 33,000 by 1990 and 46,000 by the year 2020. These figures should not be construed to be the total population of the basin.

Table 9 shows the estimated waste flow in million gallons per day for the Upper Peninsula tributaries for the years 1965, 1990, and 2020.

Projections for BOD_5 were based on present day inventory information obtained from the Michigan Water Resources Commission, Michigan Department of Public Health, and U.S. Public Health Service. Municipal and industrial water use growth rates and BOD_5 production in terms of population were determined from studies in the Lake Michigan Basin and applied to the inventory data obtained for the Upper Peninsula tributaries.

The results of these projections are shown in Table 10. For

example, in 1965 a total of 3,432 pounds per day of BOD_5 was produced in the area, of which 43 percent was removed by treatment, leaving 1,972 pounds of BOD_5 being discharged. By the year 2020, with the same percentage of treatment, 5,830 pounds would reach the river. In order to keep the same 1965 loading on the stream, 80 percent or more removal will be necessary at that time. Figure 5 illustrates the population and municipal waste flow projections for the St. Marys River Basin (excluding the Lake Huron tributary area).

The municipal BOD load for 1965 was calculated on the basis of .17 pounds per day of BOD per person served, and the 1990 and 2020 load factors, .18 and .20 pounds per day of BOD per person.

TABLE 9. WASTE FLOW PROJECTIONS
(MGD)
Eastern Upper Peninsula River Basins

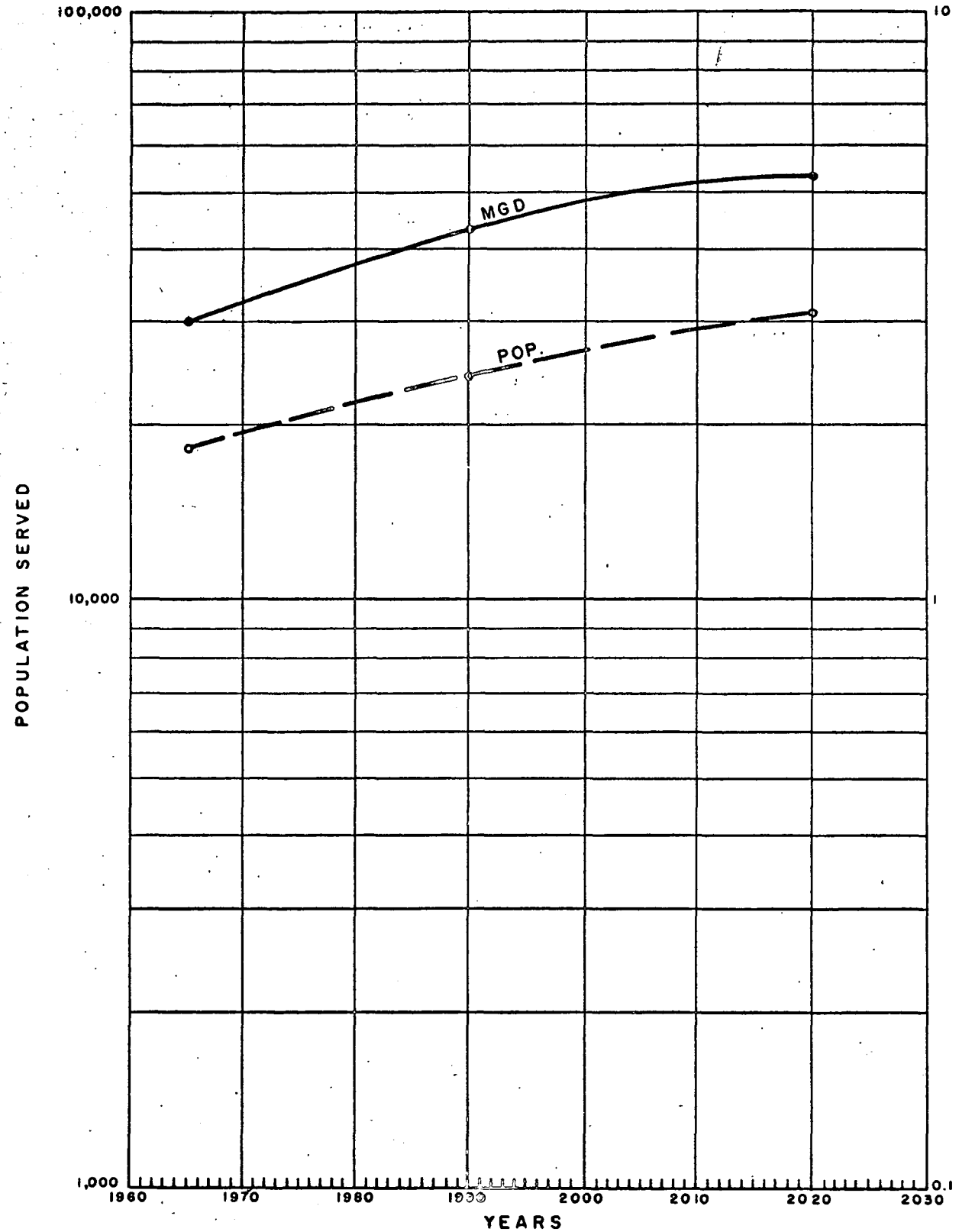
	1965	1990	2020
Municipal			
Residential	3.4	5.2	7.0
Commercial	0.7	2.0	4.5
Total	4.1	7.2	11.5
Industrial	-	2.0	5.0
Total	4.1	9.2	16.5

TABLE 10. BOD_5 PROJECTIONS
(#/day)
Eastern Upper Peninsula River Basins

Untreated BOD_5		1965	1990	2020
Municipal				
Residential		3,240	5,940	9,200
Commercial		192	532	1,200
Total		3,432	6,472	10,400
Industrial		-	10,500	25,000
Total Untreated BOD_5		3,432	16,972	35,400
Treated BOD_5	Percent Removal			
Municipal	43 (present)	1,972	3,660	5,830
	90	343	647	1,040
	95	172	324	520
	99	34	65	104
Industrial	35	-	6,825	16,250
	90	-	1,050	2,500
	95	-	525	1,250
	99	-	105	250
Total Treated BOD_5	present	1,972	10,485	22,080
	90	343	1,697	3,540
	95	172	849	1,770
	99	34	170	354

FIGURE 5

POPULATION AND MUNICIPAL WASTE FLOW PROJECTIONS FOR THE ST. MARYS RIVER BASIN



WATER QUALITY DATA

Water quality surveys of the St. Marys River were conducted by the FWPCA during 1965 and 1966. In addition, a limited number of samples were taken in 1967 from three St. Marys River tributaries - the Waiska, Charlotte, and Munuscong Rivers. Data from the latter sampling are included in this report to afford a broader view of water quality in this part of the Upper Peninsula.

During 1965, samples were collected over two 2-week periods - July-August and August-September. In 1966, samples were collected in the period August 15-26.

Figure 4 shows the sampling ranges and Table 1 lists the stations in each range.

Tables 11 to 23 list the average results for 1965 and 1966 at certain upstream (SMU) and downstream (SMD) ranges from the Soo Locks at the St. Marys Falls. Range comparisons are shown in Tables 24 and 25. Approximate mileage along the navigation channel from the Soo Locks is the number following SMU and SMD (see Figure 4).

The following water quality parameters were measured in 1965: dissolved oxygen (DO); percent saturation; biological oxygen demand (5-day BOD); ammonia, organic, nitrate, and nitrite nitrogens; total phosphate; total solids; chlorides; phenol; pH; water temperature; sodium; potassium; calcium; magnesium; sulfate; total hardness; conductivity; total and fecal coliforms; and fecal streptococci. In 1966, only river parameters were measured: water temperature; phenol; kjeldahl and nitrate nitrogen; total phosphate, chloride; and total coliforms.

Phenol values upstream of the Soo Locks at SMU 5.6 were slightly lower in 1965 and 1966 than they were at downstream range SMD 2.0 (Tables 12, 13, 20, and 21). During the same periods, phenol levels at SMU 5.6 ranged from <2 µg/1 to 14 µg/1, whereas downstream of the Soo Locks at SMD 2.0 concentrations ranged from <2 µg/1 to 78 µg/1 (Figure 5). Average concentrations at the upstream location during a 1964 International Joint Commission survey had ranged from 5 µg/1 to 7 µg/1, while at SMD 2.0 the phenol levels ranged from 6 µg/1 to 93 µg/1. The consistently higher values have been observed along the Canadian shore. Downstream at SMD 8.5E (Tables 16 and 23) in the east channel formed by Sugar Island, average phenol concentrations during 1965 (8 to 13 µg/1) and 1966 (10 to 13 µg/1) were much higher than in the west channel at SMD 5.3W. At the latter range, average concentrations during the 1965 and 1966 samplings did not exceed 4 µg/1. At SMD 25.0E (Table 19) the phenol level decreased from 1965 to 1966, ranging from <2 µg/1 to 7 µg/1. The level decreased further at the outlets from Lake Nicolet (SMD 18.1W and 16.9M; Tables 17 and 18) until its concentration ranged somewhat lower than at SMU 15.5 (Whitefish Bay).

Dissolved oxygen average values in 1965 at SMU 5.6 (10.0 mg/1 - 98 percent saturation) was similar to that observed at SMD 2.0 (9.9 mg/1 - 95 percent saturation). Dissolved oxygen values at other downstream ranges (SMD 5.3W and SMD 8.5E) showed no significant variation from ranges previously cited. Some degree of supersaturation was observed at the outlets for Lakes George and Nicolet (SMD 25.0E, SMD 16.9M, and SMD 18.1W) where percent saturation maximum values of 114, 104, and 102 respectively

were obtained.

Total phosphate concentrations in 1965 ranged from <.04 mg/l at all stations to .5 mg/l at SMD 2.0. The four ranges sampled in 1966 - SMU 5.6, SMD 2.0, SMD 5.3W, and SMD 8.5E - had a lower range of phosphate levels than in 1965.

Chloride average values throughout the ranges in 1965 and 1966 were similar to those reported for 1964 by the International Joint Commission.

Average range values for total solids in 1965 ranged from 52 mg/l to 67 mg/l. The highest values were noted at the outlets for Lakes George and Nicolet where average concentrations ranged from 60 mg/l at SMD 25.0E to 67 mg/l at SMD 16.9M.

Total coliform densities in 1966 were lowest upstream of the Soo Locks at SMU 5.6. Density values at this location ranged from 10 to 30 organisms/100 ml (Tables 20-23). Equally low values were observed during 1965. The greatest densities were observed at SMD 2.0 in 1966 where average values ranged from 70 organisms/100 ml at station M111 to 7,300 organisms/100 ml at station M109. The highest values in this instance were encountered at points nearest both shores, whereas midstream densities averaged less than 500 organisms/100 ml. The greatest densities during the 1965 sampling were also encountered at SMD 2.0, although values ranged somewhat lower.

At Ranges SMD 5.3W and SMD 8.5E, total coliform average values for 1966 stations ranged from 80 to 5,000 organisms/100 ml and 710 to 1,700 organisms/100 ml of sample, respectively. Values for 1965 stations at these Ranges were lower at SMD 5.3W, 20 to 30 organisms/100 ml (see

Figure 6), and similarly lower at SMD 8.5E, 320 to 440 organisms/100 ml.

Fecal coliform and fecal streptococci density measurements were made only during the 1965 samplings. Average fecal coliform and fecal streptococci densities were heaviest at SMD 2.0 where they ranged from 46 to 129 organisms/100 ml and 19 to 32 organisms/100 ml, respectively. Densities of these two parameters were low at other ranges, averaging less than 50 organisms/100 ml. Their presence adds confirmation to the warm blooded animal origin of the elevated total coliform densities at SMD 2.0.

Ranges SMU 15.5, SMD 6.0E, SMD 16.9M, SMD 18.1W, and SMD 25.0E were sampled in 1965 only. Total coliform densities at these ranges were well below the acceptable limits as were fecal coliforms and fecal streptococci.

The Waiska, Charlotte, and Munuscong Rivers were sampled in 1967 on two occasions - July 25 and July 29. The following water quality measurements were made: dissolved oxygen; biological oxygen demand (5-day BOD); ammonia, organic, and nitrate nitrogen; total and total soluble phosphate; total and suspended solids; chlorides; conductivity; temperature; pH; and total coliforms. Station locations are listed in Table 2 while values for the parameters measured are shown in Table 26.

Low dissolved oxygen levels were present in the three rivers. Extremely low dissolved oxygen was observed in the Charlotte River where values ranged from 4.5 to 4.8 mg/1 (51 - 54 percent saturation). Levels in the Waiska River ranged from 6.7 to 6.9 mg/1 (75 - 77 percent saturation). Levels in the Munuscong River are of the same magnitude as those

found in the Waiska River.

The BOD_5 values were low for all three stations - 1 to 4 mg/l. Nutrients were at levels usually associated with algal growths. Total phosphate levels were lowest on the Waiska River (.1 mg/l) and somewhat higher on the Charlotte (.2 mg/l) and Munuscong (.2 to .3 mg/l) Rivers. Nitrate nitrogen values ranged from .2 mg/l on the Waiska River to .4 mg/l on the Charlotte River. High total solids levels were present in the Munuscong River, ranging from 280 to 300 mg/l. Lower levels were observed on the Charlotte (180 to 200 mg/l) and Waiska (85 to 120 mg/l) Rivers.

Chloride levels were lowest on the Waiska River (1 to 2 mg/l) and highest on the Charlotte River (12 to 13 mg/l).

Phenol levels at all stations were comparatively low, ranging from <1 ug/l to 6 ug/l.

Temperature values were fairly constant on the three tributaries, ranging from 20.0°C to 21.5°C.

The range of pH values observed were within acceptable limits for the most part, although a low value of 6.6 was encountered on July 25 on the Charlotte River.

Coliform densities on the Munuscong River ranged from 10,000 to 20,000 organisms/100 ml, which is above the recommended body contact limits. Lower density values (700 to 1,500 organisms/100 ml) prevailed on the Waiska River. The two values from the Charlotte River indicated the densities to be within the recommended body contact levels.

Biology

Biological samples were collected from the St. Marys River during the period July 28-29, 1965 at the following six Ranges: SMU 5.6, SMD 5.3W, SMD 8.5E, SMD 25.0E, SMD 16.9M, and SMD 18.1W (see Figure 3).

No attached algae or rooted aquatic plants were observed. An oily fibrous bottom material was found on the north side of the river at Range SMD 8.5E, downstream from the Sault Ste. Marie, Ontario sewage treatment plant. This atypical material was confined to one localized area. In the area of the Canadian Locks, thousands of cast mayfly skins were observed. The larvae of these insects are sensitive to polluted waters. Table 27 lists the results of the physical observations made during this study.

Benthic fauna populations ranged from 31 per square foot at SMU 5.6 to 422 per square foot at SMD 18.1W. Although pollution-tolerant forms comprised the greatest number of benthic organisms at SMD 18.1W, many pollution-sensitive burrowing mayflies were also collected (Table 28).

Plankton algal populations in the St. Marys River appeared to be small, averaging less than 400/ml. The total numbers of phytoplankton collected ranged from 330/ml at SMU 5.6 to 610/ml at SMD 8.5E. No blue-green algae or other nuisance species were found during this brief survey. Table 29 lists the phytoplankton populations.

Analyses of the benthic fauna and phytoplankton collections indicated that the water entering and leaving the St. Marys River was unenriched. The water was clear and devoid of excessive numbers of plankton algae. Growths of attached algae were insignificant and the standing crop of benthic organisms was moderate and composed of desirable fish food organisms.

KEY
FOR
WATER QUALITY TABLES

Station-Location shown on Figure 4.

Chemical Parameters - all results milligrams per liter (mg/l) (exceptions noted)

Phosphate - reported as phosphate (PO_4)
Total Phosphate - includes ortho, poly, biological, and organic.
Total Soluble Phosphate - includes soluble ortho, soluble poly, and soluble organic.

Vol. Susp. Solids - Volatile Suspended Solids.

Phenol - reported as micrograms per liter (µg/l).

pH - measure of hydrogen ion activity - acidic (0), alkaline (14), neutral (7).

% Saturation - reported as percent.

Total Iron - reported as micrograms per liter (µg/l)

Total Hardness - reported as Calcium Carbonate ($CaCO_3$)

Conductivity - micromhos per centimeter (µmhos/cm)

Microbiological Parameters - values obtained by membrane filter technique, unless otherwise noted.

Median values shown in Average column

Total Coliform)
Fecal Coliform) reported as organisms/100 ml
Fecal Streptococcus)

Total Plate Count - number of bacteria/ml

Michigan Water Resources Commission reported values in terms of MPN/100 ml (most probable number/100 ml).

TABLE 11. WATER QUALITY DATA
St. Marys River - 1965
Range SMU 15.5 - M62

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	1	.12	-	-
Organic Nitrogen	1	.14	-	-
Nitrate Nitrogen	1	.1	-	-
Nitrite Nitrogen	0	-	-	-
Total Phosphate	1	.04	-	-
Total Sol. Phosphate	0	-	-	-
Total Solids	1	48	-	-
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	1	1	-	-
Phenol	6	-	<2	3
pH	1	8.0	-	-
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	7	16.0	13.5	17.5
% Saturation	0	-	-	-
Total Iron	0	-	-	-
Sodium	1	1	-	-
Potassium	1	2.4	-	-
Calcium	1	12	-	-
Magnesium	1	3	-	-
Sulfate	1	3	-	-
Total Hardness	1	44	-	-
Conductivity	1	90	-	-
Total Coliform	1	2	-	-
Fecal Coliform	1	<2	-	-
Fecal Strep	1	<2	-	-
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M63

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-	Temperature (°C)	7	15.5	12.0	17.5
Biochemical Oxygen Demand	0	-	-	-	% Saturation	0	-	-	-
Ammonia Nitrogen	1	.05	-	-	Total Iron	0	-	-	-
Organic Nitrogen	1	.22	-	-	Sodium	1	1	-	-
Nitrate Nitrogen	1	.1	-	-	Potassium	1	3.5	-	-
Nitrite Nitrogen	0	-	-	-	Calcium	1	13	-	-
Total Phosphate	1	<.04	-	-	Magnesium	1	3	-	-
Total Sol. Phosphate	0	-	-	-	Sulfate	1	9	-	-
Total Solids	1	52	-	-	Total Hardness	1	44	-	-
Suspended Solids	0	-	-	-	Conductivity	1	90	-	-
Vol. Susp. Solids	0	-	-	-	Total Coliform	1	2	-	-
Chloride	1	1	-	-	Fecal Coliform	1	<2	-	-
Phenol	7	-	<2	5	Fecal Strep	1	2	-	-
pH	1	7.9	-	-	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand					Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M64

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	1	.11	-	-
Organic Nitrogen	1	.14	-	-
Nitrate Nitrogen	1	.1	-	-
Nitrite Nitrogen	0	-	-	-
Total Phosphate	1	<.04	-	-
Total Sol. Phosphate	0	-	-	-
Total Solids	1	61	-	-
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	1	1	-	-
Phenol	11	-	<2	5
pH	1	7.8	-	-
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	7	15.5	11.5	17.5
% Saturation	0	-	-	-
Total Iron	0	-	-	-
Sodium	1	1	-	-
Potassium	1	2.4	-	-
Calcium	1	12	-	-
Magnesium	1	3	-	-
Sulfate	1	11	-	-
Total Hardness	1	44	-	-
Conductivity	1	90	-	-
Total Coliform	1	2	-	-
Fecal Coliform	1	<2	-	-
Fecal Strep	1	<2	-	-
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M65

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	1	.11	-	-
Organic Nitrogen	1	.14	-	-
Nitrate Nitrogen	1	.1	-	-
Nitrite Nitrogen	0	-	-	-
Total Phosphate	1	<.04	-	-
Total Sol. Phosphate	0	-	-	-
Total Solids	1	55	-	-
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	1	1	-	-
Phenol	7	-	<2	4
pH	1	7.8	-	-
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	7	15.5	11.0	17.5
% Saturation	0	-	-	-
Total Iron	1	400	-	-
Sodium	1	1	-	-
Potassium	1	2.2	-	-
Calcium	1	12	-	-
Magnesium	1	3	-	-
Sulfate	1	3	-	-
Total Hardness	1	43	-	-
Conductivity	1	90	-	-
Total Coliform	1	22	-	-
Fecal Coliform	1	14	-	-
Fecal Strep	1	<2	-	-
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M66

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	1	.14	-	-
Organic Nitrogen	1	<.05	-	-
Nitrate Nitrogen	1	.2	-	-
Nitrite Nitrogen	0	-	-	-
Total Phosphate	1	<.04	-	-
Total Sol. Phosphate	0	-	-	-
Total Solids	1	59	-	-
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	1	1	-	-
Phenol	11	-	<2	7
pH	1	7.8	-	-
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	7	15.0	10.0	17.0
% Saturation	0	-	-	-
Total Iron	1	600	-	-
Sodium	1	1	-	-
Potassium	1	2.4	-	-
Calcium	1	12	-	-
Magnesium	1	3	-	-
Sulfate	1	3	-	-
Total Hardness	1	44	-	-
Conductivity	1	90	-	-
Total Coliform	1	6	-	-
Fecal Coliform	1	<2	-	-
Fecal Strep	1	<2	-	-
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M67

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	1	.09	-	-
Organic Nitrogen	1	.10	-	-
Nitrate Nitrogen	1	.2	-	-
Nitrite Nitrogen	0	-	-	-
Total Phosphate	1	<.04	-	-
Total Sol. Phosphate	0	-	-	-
Total Solids	1	61	-	-
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	1	1	-	-
Phenol	7	-	<2	4
pH	1	8.0	-	-
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	7	15.0	9.0	17.5
% Saturation	0	-	-	-
Total Iron	1	200	-	-
Sodium	1	1	-	-
Potassium	1	2.2	-	-
Calcium	1	12	-	-
Magnesium	1	3	-	-
Sulfate	1	3	-	-
Total Hardness	1	44	-	-
Conductivity	1	90	-	-
Total Coliform	1	18	-	-
Fecal Coliform	1	8	-	-
Fecal Strep	1	<2	-	-
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M68

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	1	.11	-	-
Organic Nitrogen	1	.06	-	-
Nitrate Nitrogen	1	.1	-	-
Nitrite Nitrogen	0	-	-	-
Total Phosphate	1	<.04	-	-
Total Sol. Phosphate	0	-	-	-
Total Solids	1	54	-	-
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	1	1	-	-
Phenol	7	-	<2	6
pH	1	7.9	-	-
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	7	15.0	9.5	17.5
% Saturation	0	-	-	-
Total Iron	1	100	-	-
Sodium	1	1	-	-
Potassium	1	2.2	-	-
Calcium	1	13	-	-
Magnesium	1	3	-	-
Sulfate	1	3	-	-
Total Hardness	1	44	-	-
Conductivity	1	90	-	-
Total Coliform	1	2	-	-
Fecal Coliform	1	<2	-	-
Fecal Strep	1	<2	-	-
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M69

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-	Temperature (°C)	7	15.0	9.5	17.5
Biochemical Oxygen Demand	0	-	-	-	% Saturation	0	-	-	-
Ammonia Nitrogen	1	.07	-	-	Total Iron	1	600	-	-
Organic Nitrogen	1	<.05	-	-	Sodium	1	1	-	-
Nitrate Nitrogen	1	.1	-	-	Potassium	1	2.2	-	-
Nitrite Nitrogen	0	-	-	-	Calcium	1	12	-	-
Total Phosphate	1	.04	-	-	Magnesium	1	3	-	-
Total Sol. Phosphate	0	-	-	-	Sulfate	1	2	-	-
Total Solids	1	55	-	-	Total Hardness	1	43	-	-
Suspended Solids	0	-	-	-	Conductivity	1	90	-	-
Vol. Susp. Solids	0	-	-	-	Total Coliform	1	2	-	-
Chloride	1	1	-	-	Fecal Coliform	1	<2	-	-
Phenol	11	-	<2	7	Fecal Strep	1	<2	-	-
pH	1	7.9	-	-	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand					Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M70

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-	Temperature (°C)	7	15.0	9.5	17.5
Biochemical Oxygen Demand	0	-	-	-	% Saturation	0	-	-	-
Ammonia Nitrogen	1	.07	-	-	Total Iron	1	200	-	-
Organic Nitrogen	1	<.05	-	-	Sodium	1	1	-	-
Nitrate Nitrogen	1	.1	-	-	Potassium	1	2.3	-	-
Nitrite Nitrogen	0	-	-	-	Calcium	1	13	-	-
Total Phosphate	1	<.04	-	-	Magnesium	1	3	-	-
Total Sol. Phosphate	0	-	-	-	Sulfate	1	3	-	-
Total Solids	1	57	-	-	Total Hardness	1	44	-	-
Suspended Solids	0	-	-	-	Conductivity	1	90	-	-
Vol. Susp. Solids	0	-	-	-	Total Coliform	1	2	-	-
Chloride	1	1	-	-	Fecal Coliform	1	<2	-	-
Phenol	6	-	<2	5	Fecal Strep	1	<2	-	-
pH	1	8.0	-	-	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand					Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 11. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 15.5 - M71

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	1	.13	-	-
Organic Nitrogen	1	<.05	-	-
Nitrate Nitrogen	1	.1	-	-
Nitrite Nitrogen	0	-	-	-
Total Phosphate	1	<.04	-	-
Total Sol. Phosphate	0	-	-	-
Total Solids	1	57	-	-
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	1	1	-	-
Phenol	7	-	<2	6
pH	1	8.1	-	-
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	7	15.0	9.5	17.5
% Saturation	0	-	-	-
Total Iron	1	200	-	-
Sodium	1	1	-	-
Potassium	1	2.4	-	-
Calcium	1	13	-	-
Magnesium	1	3	-	-
Sulfate	1	3	-	-
Total Hardness	1	44	-	-
Conductivity	1	90	-	-
Total Coliform	1	2	-	-
Fecal Coliform	1	<2	-	-
Fecal Strep	1	<2	-	-
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 12. WATER QUALITY DATA
St. Marys River - 1965
Range SMU 5.6 - M075

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	9.8	9.3	10.0
Biochemical Oxygen Demand	6	-	<1	7
Ammonia Nitrogen	6	.12	.07	.19
Organic Nitrogen	6	.09	<.05	.14
Nitrate Nitrogen	6	.1	<.1	.1
Nitrite Nitrogen	0	-	-	-
Total Phosphate	5	-	<.04	.2
Total Sol. Phosphate	0	-	-	-
Total Solids	5	58	50	76
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	6	2	1	2
Phenol	10	-	<2	14
pH	5	8.0	7.9	8.2
Chemical Oxygen Demand	8	7	3	17

Parameters	NS	Avg.	Low	High
Temperature (^{o}C)	13	16.0	14.5	19.0
% Saturation	4	98	93	102
Total Iron	0	-	-	-
Sodium	6	2	1	2
Potassium	6	1.1	<.2	2.3
Calcium	5	13	12	13
Magnesium	6	3	2	3
Sulfate	6	4	3	5
Total Hardness	6	45	40	50
Conductivity	6	90	90	90
Total Coliform	6	49	12	150
Fecal Coliform	6	8	<2	36
Fecal Strep	6	3	<2	10
Total Plate Count $20^{o}C$	0	-	-	-
Total Plate Count $35^{o}C$	0	-	-	-

NS = Number of Samples

TABLE 12. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 5.6 - M076

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	10.0	9.8	10.3
Biochemical Oxygen Demand	7	-	<1	8
Ammonia Nitrogen	6	.07	<.05	.09
Organic Nitrogen	6	.07	<.05	.10
Nitrate Nitrogen	6	.2	.1	.3
Nitrite Nitrogen	0	-	-	-
Total Phosphate	5	-	<.04	.07
Total Sol. Phosphate	0	-	-	-
Total Solids	5	57	50	64
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	6	2	1	2
Phenol	10	-	<2	8
pH	5	8.0	8.0	8.0
Chemical Oxygen Demand	8	7	3	17

Parameters	NS	Avg.	Low	High
Temperature (°C)	13	15.5	13.5	17.5
% Saturation	4	98	95	101
Total Iron	0	-	-	-
Sodium	6	2	1	2
Potassium	6	1.0	<.2	2.3
Calcium	5	13	12	13
Magnesium	6	3	3	3
Sulfate	6	3	2	4
Total Hardness	6	46	42	52
Conductivity	6	90	90	90
Total Coliform	6	7	2	230
Fecal Coliform	6	<2	<2	30
Fecal Strep	6	2	<2	10
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 12. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 5.6 - M077

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	10.2	10.0	10.4	Temperature (°C)	13	15.0	12.5	17.5
Biochemical Oxygen Demand	7	-	<1	1	% Saturation	4	99	97	103
Ammonia Nitrogen	6	.07	<.05	.09	Total Iron	0	-	-	-
Organic Nitrogen	6	.09	<.05	.14	Sodium	5	2	1	4
Nitrate Nitrogen	6	.1	<.1	.2	Potassium	5	1.3	<.2	2.2
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	12	13
Total Phosphate	5	-	<.04	.1	Magnesium	6	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	5	3	2	4
Total Solids	5	55	46	59	Total Hardness	6	46	43	52
Suspended Solids	0	-	-	-	Conductivity	6	90	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	5	6	2	28
Chloride	6	2	1	4	Fecal Coliform	6	<2	<2	<2
Phenol	10	-	<2	9	Fecal Strep	6	<2	<2	<2
pH	5	7.9	7.7	8.0	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	8	6	1	13	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 12. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 5.6 - M078

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	3	9.9	9.3	10.2	Temperature (^{o}C)	13	14.5	11.5	17.0
Biochemical Oxygen Demand	6	-	<1	1	% Saturation	4	96	89	102
Ammonia Nitrogen	6	.12	<.05	.33	Total Iron	0	-	-	-
Organic Nitrogen	5	.09	<.05	.17	Sodium	6	2	1	2
Nitrate Nitrogen	6	.2	.1	.4	Potassium	6	1.0	<.2	2.4
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	12	13
Total Phosphate	5	-	<.04	.1	Magnesium	6	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	6	3	2	4
Total Solids	5	53	46	58	Total Hardness	6	46	43	52
Suspended Solids	0	-	-	-	Conductivity	6	90	90	90
Vol. Susp. Solids	0	-	-	-	Total Coliform	6	5	<2	50
Chloride	6	1	1	2	Fecal Coliform	6	<2	<2	<2
Phenol	10	-	<2	5	Fecal Strep	6	<2	<2	4
pH	5	8.0	7.8	8.1	Total Plate Count 20^{o}C	0	-	-	-
Chemical Oxygen Demand	8	5	2	12	Total Plate Count 35^{o}C	0	-	-	-

NS = Number of Samples

TABLE 12. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 5.6 - M079

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	10.1	9.4	10.7	Temperature (^{o}C)	13	14.5	11.0	17.0
Biochemical Oxygen Demand	7	-	<1	1	% Saturation	4	96	90	102
Ammonia Nitrogen	4	-	<.05	.08	Total Iron	0	-	-	-
Organic Nitrogen	4	-	<.05	.12	Sodium	6	2	1	3
Nitrate Nitrogen	6	.1	.1	.2	Potassium	6	1.1	<.1	2.4
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	12	13
Total Phosphate	5	-	<.04	<.04	Magnesium	6	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	6	3	2	4
Total Solids	5	54	48	62	Total Hardness	6	44	43	48
Suspended Solids	0	-	-	-	Conductivity	6	90	90	90
Vol. Susp. Solids	0	-	-	-	Total Coliform	6	12	2	72
Chloride	6	1	1	2	Fecal Coliform	6	<2	<2	8
Phenol	10	-	<2	6	Fecal Strep	6	<2	<2	2
pH	5	8.0	7.8	8.2	Total Plate Count 20^{o}C	0	-	-	-
Chemical Oxygen Demand	8	4	2	7	Total Plate Count 35^{o}C	0	-	-	-

NS = Number of Samples

TABLE 13. WATER QUALITY DATA
St. Marys River - 1965
Range SMD 2.0 - M109

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	1	10.3	-	-
Biochemical Oxygen Demand	10	-	<1	1
Ammonia Nitrogen	5	.08	.06	.11
Organic Nitrogen	5	.08	.05	.13
Nitrate Nitrogen	6	.1	<.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	5	-	<.04	.5
Total Sol. Phosphate	0	-	-	-
Total Solids	5	56	52	61
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	7	1	1	2
Phenol	14	-	<2	5
pH	5	8.0	8.0	8.2
Chemical Oxygen Demand	11	5	1	7

Parameters	NS	Avg.	Low	High
Temperature (^{o}C)	17	15.5	12.5	18.0
% Saturation	1	99	-	-
Total Iron	0	-	-	-
Sodium	7	2	1	2
Potassium	7	-	<1	2
Calcium	5	13	12	13
Magnesium	7	3	3	3
Sulfate	7	3	2	4
Total Hardness	7	46	43	52
Conductivity	7	90	90	90
Total Coliform	7	2,400	250	3,500
Fecal Coliform	6	89	40	140
Fecal Strep	6	32	20	68
Total Plate Count 20^{o}C	0	-	-	-
Total Plate Count 35^{o}C	0	-	-	-

NS = Number of Samples

TABLE 13. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 2.0 - M110

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	1	10.0	-	-
Biochemical Oxygen Demand	10	-	<1	4
Ammonia Nitrogen	6	.07	<.05	.10
Organic Nitrogen	6	.10	<.05	.15
Nitrate Nitrogen	6	.1	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	5	-	<.04	.1
Total Sol. Phosphate	0	-	-	-
Total Solids	5	56	51	68
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	7	1	1	2
Phenol	14	-	<2	5
pH	5	7.9	7.9	8.0
Chemical Oxygen Demand	11	5	0	9

Parameters	NS	Avg.	Low	High
Temperature (°C)	17	15.5	12.5	18.0
% Saturation	1	96	-	-
Total Iron	0	-	-	-
Sodium	7	2	1	2
Potassium	7	-	<1	3
Calcium	5	13	13	13
Magnesium	7	3	2	3
Sulfate	7	3	1	4
Total Hardness	7	45	44	49
Conductivity	7	90	90	90
Total Coliform	7	980	90	1,400
Fecal Coliform	6	46	2	320
Fecal Strep	6	19	4	74
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 13. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 2.0 - M111

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	1	10.2	-	-	Temperature (^{o}C)	17	15.0	12.5	18.0
Biochemical Oxygen Demand	10	-	<1	1	% Saturation	1	97	-	-
Ammonia Nitrogen	7	.14	<.05	.54	Total Iron	0	-	-	-
Organic Nitrogen	7	.11	<.05	.24	Sodium	7	2	1	3
Nitrate Nitrogen	6	.1	<.1	.2	Potassium	7	-	<1	2
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	12	13
Total Phosphate	5	-	<.04	<.04	Magnesium	7	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	6	3	2	5
Total Solids	5	52	43	58	Total Hardness	7	46	44	56
Suspended Solids	0	-	-	-	Conductivity	7	90	90	90
Vol. Susp. Solids	0	-	-	-	Total Coliform	7	60	4	140
Chloride	7	1	1	2	Fecal Coliform	6	2	<2	4
Phenol	15	-	<2	8	Fecal Strep	6	4	2	8
pH	5	8.0	7.9	8.0	Total Plate Count 20^{o}C	0	-	-	-
Chemical Oxygen Demand	10	5	4	6	Total Plate Count 35^{o}C	0	-	-	-

NS = Number of Samples

TABLE 13. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 2.0 - M112

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	1	10.0	-	-
Biochemical Oxygen Demand	9	-	<1	2
Ammonia Nitrogen	7	.13	<.05	.35
Organic Nitrogen	6	.09	.05	.13
Nitrate Nitrogen	6	.1	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	5	-	<.04	<.04
Total Sol. Phosphate	0	-	-	-
Total Solids	5	61	51	80
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	7	1	1	2
Phenol	14	-	<2	10
pH	5	8.0	7.8	8.1
Chemical Oxygen Demand	9	5	3	7

Parameters	NS	Avg.	Low	High
Temperature (°C)	17	15.0	12.0	17.5
% Saturation	1	95	-	-
Total Iron	0	-	-	-
Sodium	7	2	1	2
Potassium	7	1.0	<.2	2.4
Calcium	5	13	12	13
Magnesium	7	3	2	3
Sulfate	7	4	2	6
Total Hardness	7	48	43	74
Conductivity	7	90	90	100
Total Coliform	7	70	4	150
Fecal Coliform	6	3	<2	10
Fecal Strep	6	<2	<2	10
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 13. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 2.0 - M113

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	1	9.9	-	-
Biochemical Oxygen Demand	10	-	<1	1
Ammonia Nitrogen	5	.12	<.05	.21
Organic Nitrogen	6	.09	.05	.14
Nitrate Nitrogen	6	.2	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	5	-	<.04	.06
Total Sol. Phosphate	0	-	-	-
Total Solids	5	58	50	76
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	6	2	1	3
Phenol	13	9	2	21
pH	5	8.0	7.9	8.0
Chemical Oxygen Demand	10	6	5	10

Parameters	NS	Avg.	Low	High
Temperature (°C)	17	15.0	12.0	17.5
% Saturation	1	94	-	-
Total Iron	0	-	-	-
Sodium	6	2	1	2
Potassium	6	1.5	.3	2.4
Calcium	5	13	13	13
Magnesium	6	3	3	3
Sulfate	5	4	2	4
Total Hardness	7	46	43	50
Conductivity	7	90	90	90
Total Coliform	7	130	30	460
Fecal Coliform	6	15	2	48
Fecal Strep	6	12	2	26
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 13. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 2.0 - M114

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	1	9.9	-	-
Biochemical Oxygen Demand	10	1	1	2
Ammonia Nitrogen	6	.44	.08	1.11
Organic Nitrogen	4	.10	<.05	.16
Nitrate Nitrogen	6	.1	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	5	-	<.04	.04
Total Sol. Phosphate	0	-	-	-
Total Solids	5	59	55	62
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	7	2	1	2
Phenol	15	30	17	50
pH	5	8.0	7.8	8.1
Chemical Oxygen Demand	11	9	6	13

Parameters	NS	Avg.	Low	High
Temperature (^{o}C)	17	15.0	12.0	18.0
% Saturation	1	94	-	-
Total Iron	0	-	-	-
Sodium	7	2	1	2
Potassium	7	1.4	.2	2.7
Calcium	5	13	13	13
Magnesium	7	3	3	3
Sulfate	7	5	4	7
Total Hardness	7	45	44	48
Conductivity	7	90	90	100
Total Coliform	7	340	50	960
Fecal Coliform	6	100	<2	200
Fecal Strep	6	28	2	50
Total Plate Count 20^{o}C	0	-	-	-
Total Plate Count 35^{o}C	0	-	-	-

NS = Number of Samples

TABLE 13. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 2.0 - M115

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	1	9.3	-	-
Biochemical Oxygen Demand	10	2	<1	5
Ammonia Nitrogen	6	.56	.30	.89
Organic Nitrogen	7	.09	<.05	.17
Nitrate Nitrogen	5	.2	.1	.3
Nitrite Nitrogen	0	-	-	-
Total Phosphate	4	-	<.04	.08
Total Sol. Phosphate	0	-	-	-
Total Solids	4	59	43	69
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	6	2	1	2
Phenol	14	53	39	78
pH	4	8.0	7.6	8.2
Chemical Oxygen Demand	10	11	6	14*

Parameters	NS	Avg.	Low	High
Temperature (°C)	17	15.5	12.5	18.0
% Saturation	1	89	-	-
Total Iron	0	-	-	-
Sodium	6	2	1	3
Potassium	6	1.4	.2	3.0
Calcium	4	13	13	13
Magnesium	7	3	3	3
Sulfate	6	6	4	10
Total Hardness	6	46	43	56
Conductivity	6	100	100	100
Total Coliform	7	1,400	120	1,900
Fecal Coliform	6	130	2	190
Fecal Strep	6	29	14	46
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

* one value of 40 not used in computing data.

TABLE 14. WATER QUALITY DATA
St. Marys River - 1965
Range SMD 5.3W - M129

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	2	-	9.3	9.5
Biochemical Oxygen Demand	3	-	<1	1
Ammonia Nitrogen	4	.14	.05	.29
Organic Nitrogen	4	.09	<.05	.13
Nitrate Nitrogen	5	.2	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	4	-	<.04	.3
Total Sol. Phosphate	0	-	-	-
Total Solids	4	51	45	58
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	5	2	1	4
Phenol	5	-	<2	4
pH	4	8.0	7.9	8.1
Chemical Oxygen Demand	3	5	5	5

Parameters	NS	Avg.	Low	High
Temperature (°C)	8	15.0	13.5	17.5
% Saturation	2	-	93	95
Total Iron	0	-	-	-
Sodium	5	2	1	4
Potassium	5	1.2	<.2	2.4
Calcium	4	13	12	13
Magnesium	5	3	3	3
Sulfate	5	3	2	5
Total Hardness	5	45	38	50
Conductivity	5	90	90	90
Total Coliform	5	22	2	350
Fecal Coliform	5	18	<2	24
Fecal Strep	5	2	<2	14
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 14. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 5.3W - M130

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	2	-	9.5	10.0
Biochemical Oxygen Demand	3	-	<1	1
Ammonia Nitrogen	5	-	<.05	.11
Organic Nitrogen	5	-	<.05	.16
Nitrate Nitrogen	5	-	<.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	4	-	<.04	.09
Total Sol. Phosphate	0	-	-	-
Total Solids	4	52	38	58
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	5	1	1	2
Phenol	5	-	<2	8
pH	4	8.0	7.9	8.0
Chemical Oxygen Demand	3	4	4	5

Parameters	NS	Avg.	Low	High
Temperature (°C)	8	15.0	13.0	18.5
% Saturation	2	-	94	100
Total Iron	0	-	-	-
Sodium	5	1	1	2
Potassium	5	1.3	.2	3.2
Calcium	4	12	12	13
Magnesium	5	3	2	3
Sulfate	5	3	3	4
Total Hardness	5	45	44	46
Conductivity	5	90	90	90
Total Coliform	5	30	8	260
Fecal Coliform	5	8	4	20
Fecal Strep	5	2	<2	12
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 14. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 5.3W - M131

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	2	-	9.9	10.2	Temperature (°C)	8	15.0	13.0	18.5
Biochemical Oxygen Demand	3	-	1	1	% Saturation	2	-	96	102
Ammonia Nitrogen	3	-	<.05	.24	Total Iron	0	-	-	-
Organic Nitrogen	3	.08	.05	.12	Sodium	5	1	1	2
Nitrate Nitrogen	5	.1	.1	.2	Potassium	5	1.1	<.2	2.2
Nitrite Nitrogen	0	-	-	-	Calcium	4	13	12	13
Total Phosphate	4	-	<.04	<.04	Magnesium	5	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	5	4	3	10
Total Solids	4	53	49	60	Total Hardness	5	46	44	49
Suspended Solids	0	-	-	-	Conductivity	5	90	90	90
Vol. Susp. Solids	0	-	-	-	Total Coliform	5	20	2	58
Chloride	5	1	1	2	Fecal Coliform	5	<2	<2	4
Phenol	5	-	<2	3	Fecal Strep	5	2	<2	4
pH	4	8.0	7.9	8.3	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	3	5	4	5	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 15. WATER QUALITY DATA
St. Marys River - 1965
Range SMD 6.0E - M134

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	2	-	.05	.20
Organic Nitrogen	2	-	.06	.16
Nitrate Nitrogen	2	-	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	2	-	< .04	.09
Total Sol. Phosphate	0	-	-	-
Total Solids	2	-	44	55
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	2	-	1	1
Phenol	0	-	-	-
pH	2	-	8.0	8.2
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	2	-	13.0	15.0
% Saturation	0	-	-	-
Total Iron	0	-	-	-
Sodium	2	-	2	2
Potassium	2	-	<.4	<.4
Calcium	2	-	13	13
Magnesium	2	-	3	3
Sulfate	2	-	3	4
Total Hardness	2	-	44	54
Conductivity	2	-	90	90
Total Coliform	2	-	60	130
Fecal Coliform	2	-	6	16
Fecal Strep	2	-	< 2	2
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	

NS = Number of Samples

TABLE 15. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 6.0E - M135

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-	Temperature (°C)	2	-	13.0	15.0
Biochemical Oxygen Demand	0	-	-	-	% Saturation	0	-	-	-
Ammonia Nitrogen	2	-	.16	.17	Total Iron	0	-	-	-
Organic Nitrogen	2	-	.06	.17	Sodium	2	-	2	2
Nitrate Nitrogen	2	-	.2	.2	Potassium	2	-	<.4	<.4
Nitrite Nitrogen	0	-	-	-	Calcium	2	-	13	13
Total Phosphate	2	-	<.04	<.04	Magnesium	2	-	3	3
Total Sol. Phosphate	0	-	-	-	Sulfate	2	-	3	4
Total Solids	2	-	51	55	Total Hardness	2	-	48	52
Suspended Solids	0	-	-	-	Conductivity	2	-	90	90
Vol. Susp. Solids	0	-	-	-	Total Coliform	2	-	30	60
Chloride	2	-	1	2	Fecal Coliform	2	-	10	16
Phenol	0	-	-	-	Fecal Strep	2	-	<2	2
pH	2	-	7.9	8.0	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand					Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 15. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 6.0E - M136

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	2	-	.09	.30
Organic Nitrogen	2	-	<.05	.05
Nitrate Nitrogen	2	-	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	2	-	<.04	<.04
Total Sol. Phosphate	0	-	-	-
Total Solids	2	-	50	52
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	2	-	1	2
Phenol	0	-	-	-
pH	2	-	7.7	7.9
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	2	-	13.0	15.0
% Saturation	0	-	-	-
Total Iron	0	-	-	-
Sodium	2	-	2	2
Potassium	2	-	<.4	<.4
Calcium	2	-	13	13
Magnesium	2	-	3	3
Sulfate	2	-	4	5
Total Hardness	2	-	44	54
Conductivity	2	-	90	90
Total Coliform	2	-	190	200
Fecal Coliform	2	-	12	34
Fecal Strep	2	-	12	42
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 15. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 6.0E - M137

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	2	-	.16	.44
Organic Nitrogen	2	-	.05	.15
Nitrate Nitrogen	2	-	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	2	-	<.04	.04
Total Sol. Phosphate	0	-	-	-
Total Solids	2	-	51	55
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	2	-	2	3
Phenol	0	-	-	-
pH	2	-	7.7	7.9
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	2	-	13.0	15.0
% Saturation	0	-	-	-
Total Iron	0	-	-	-
Sodium	2	-	2	2
Potassium	2	-	<.4	<.4
Calcium	2	-	13	13
Magnesium	2	-	3	3
Sulfate	2	-	3	5
Total Hardness	2	-	48	56
Conductivity	2	-	100	100
Total Coliform	2	-	170	170
Fecal Coliform	2	-	32	44
Fecal Strep	2	-	6	6
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 16. WATER QUALITY DATA
St. Marys River - 1965
Range SMD 8.5E - M140

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	3	10.0	10.0	10.0
Biochemical Oxygen Demand	3	1	<1	1
Ammonia Nitrogen	5	.11	.05	.15
Organic Nitrogen	5	.10	<.05	.14
Nitrate Nitrogen	5	.1	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	4	-	<.04	.3
Total Sol. Phosphate	0	-	-	-
Total Solids	4	56	53	60
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	5	1	1	2
Phenol	5	8	4	13
pH	4	8.0	7.9	8.0
Chemical Oxygen Demand	4	7	6	7

Parameters	NS	Avg.	Low	High
Temperature (^{o}C)	8	14.5	12.5	17.5
% Saturation	3	96	90	100
Total Iron	0	-	-	-
Sodium	5	2	1	3
Potassium	5	-	<.2	2.3
Calcium	4	13	13	13
Magnesium	5	3	2	3
Sulfate	4	4	4	6
Total Hardness	5	45	38	48
Conductivity	5	90	90	90
Total Coliform	5	420	20	680
Fecal Coliform	5	16	<2	38
Fecal Strep	5	6	<2	14
Total Plate Count 20^{o}C	0	-	-	-
Total Plate Count 35^{o}C	0	-	-	-

NS = Number of Samples

TABLE 16. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 8.5E - M142

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	3	9.8	9.7	9.9
Biochemical Oxygen Demand	3	1	1	1
Ammonia Nitrogen	4	.18	<.05	.32
Organic Nitrogen	5	.11	.06	.15
Nitrate Nitrogen	5	.2	.1	.3
Nitrite Nitrogen	0	-	-	-
Total Phosphate	4	-	<.04	.3
Total Sol. Phosphate	0	-	-	-
Total Solids	4	55	51	59
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	5	1	1	2
Phenol	5	13	8	18
pH	4	7.9	7.8	8.0
Chemical Oxygen Demand	4	8	8	8

Parameters	NS	Avg.	Low	High
Temperature (^{o}C)	8	14.5	12.5	18.0
% Saturation	3	97	94	100
Total Iron	0	-	-	-
Sodium	5	2	1	3
Potassium	5	-	<.2	2.3
Calcium	4	13	12	13
Magnesium	5	3	2	3
Sulfate	5	5	3	12
Total Hardness	5	44	44	46
Conductivity	5	90	90	90
Total Coliform	5	440	40	1,100
Fecal Coliform	5	30	8	50
Fecal Strep	5	4	2	18
Total Plate Count 20^{o}C	0	-	-	-
Total Plate Count 35^{o}C	0	-	-	-

NS = Number of Samples

TABLE 16. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 8.5E - M143

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	3	9.4	9.2	9.8	Temperature (°C)	8	14.5	12.5	18.0
Biochemical Oxygen Demand	3	1	1	2	% Saturation	3	95	88	100
Ammonia Nitrogen	5	.24	.05	.41	Total Iron	0	-	-	-
Organic Nitrogen	5	.09	<.05	.14	Sodium	5	2	1	3
Nitrate Nitrogen	5	.2	.1	.2	Potassium	5	-	<.2	2.2
Nitrite Nitrogen	0	-	-	-	Calcium	4	13	12	13
Total Phosphate	4	-	<.04	.07	Magnesium	5	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	4	4	4	5
Total Solids	4	56	53	61	Total Hardness	5	47	44	49
Suspended Solids	0	-	-	-	Conductivity	5	90	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	5	320	80	1,400
Chloride	4	2	1	3	Fecal Coliform	5	36	< 2	100
Phenol	5	13	7	21	Fecal Strep	5	2	< 2	6
pH	4	7.9	7.8	8.0	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	4	7	7	8	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 17. WATER QUALITY DATA
St. Marys River - 1965
Range SMD 16.9M - M165

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	10.2	9.9	10.4	Temperature (°C)	10	15.0	14.0	17.5
Biochemical Oxygen Demand	3	-	<1	1	% Saturation	4	101	98	104
Ammonia Nitrogen	6	.14	<.05	.32	Total Iron	0	-	-	-
Organic Nitrogen	5	.10	.06	.18	Sodium	5	1	1	2
Nitrate Nitrogen	6	.2	.1	.3	Potassium	5	-	<.2	2.2
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	12	14
Total Phosphate	5	-	<.04	<.04	Magnesium	7	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	7	3	3	4
Total Solids	5	67	53	94	Total Hardness	7	46	44	52
Suspended Solids	0	-	-	-	Conductivity	7	90	90	120
Vol. Susp. Solids	0	-	-	-	Total Coliform	7	20	2	130
Chloride	6	1	1	2	Fecal Coliform	6	6	<2	10
Phenol	7	-	<2	3	Fecal Strep	6	3	<2	14
pH	5	7.6	6.3	8.2	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	4	4	4	4	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 18. WATER QUALITY DATA
St. Marys River - 1965
Range SMD 18.1W - M177

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	10.0	9.6	10.3	Temperature (°C)	10	15.0	14.0	17.5
Biochemical Oxygen Demand	3	1	1	1	% Saturation	4	98	93	102
Ammonia Nitrogen	7	.10	.05	.22	Total Iron	0	-	-	-
Organic Nitrogen	7	.10	<.05	.24	Sodium	5	2	1	2
Nitrate Nitrogen	6	.2	.1	.3	Potassium	5	.8	<.2	2.0
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	13	13
Total Phosphate	5	-	<.04	.1	Magnesium	7	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	5	6	2	7
Total Solids	5	63	52	84	Total Hardness	7	46	43	52
Suspended Solids	0	-	-	-	Conductivity	7	90	90	90
Vol. Susp. Solids	0	-	-	-	Total Coliform	7	320	20	700
Chloride	7	1	1	2	Fecal Coliform	6	19	4	34
Phenol	7	-	<2	4	Fecal Strep	6	5	2	14
pH	4	8.0	7.4	8.2	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	4	5	5	5	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 19. WATER QUALITY DATA
St. Marys River - 1965
Range SMD 25.0E - M189

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	9.7	9.0	11.0	Temperature (°C)	10	17.0	15.0	18.0
Biochemical Oxygen Demand	3	1	1	1	% Saturation	4	102	94	114
Ammonia Nitrogen	6	.21	<.05	.46	Total Iron	0	-	-	-
Organic Nitrogen	5	-	<.05	.14	Sodium	5	2	1	2
Nitrate Nitrogen	6	.2	.1	.3	Potassium	5	-	<1	2
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	13	14
Total Phosphate	5	-	<.04	.08	Magnesium	7	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	6	4	4	5
Total Solids	5	63	52	75	Total Hardness	7	47	44	52
Suspended Solids	0	-	-	-	Conductivity	7	90	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	7	88	2	870
Chloride	6	1	1	2	Fecal Coliform	6	<2	<2	6
Phenol	6	-	<2	3	Fecal Strep	6	<2	<2	14
pH	5	8.1	7.9	8.4	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	4	7	7	7	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 19. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 25.0E - M190

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	9.5	9.0	9.9	Temperature (°C)	10	16.0	15.0	18.0
Biochemical Oxygen Demand	3	1	1	1	% Saturation	4	98	94	102
Ammonia Nitrogen	7	.20	.11	.30	Total Iron	0	-	-	-
Organic Nitrogen	6	-	<.05	.14	Sodium	4	2	1	2
Nitrate Nitrogen	6	.2	.1	.3	Potassium	4	-	<1	1
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	13	13
Total Phosphate	5	-	<.04	<.04	Magnesium	6	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	6	4	4	5
Total Solids	5	56	49	74	Total Hardness	7	45	44	48
Suspended Solids	0	-	-	-	Conductivity	7	90	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	7	80	2	590
Chloride	6	1	1	3	Fecal Coliform	6	2	<2	4
Phenol	7	-	<2	3	Fecal Strep	6	<2	<2	2
pH	5	8.0	7.9	8.2	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	4	7	6	8	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 19. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 25.0E - M191

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	9.6	9.2	10.1	Temperature (°C)	10	11.5	15.0	18.0
Biochemical Oxygen Demand	3	-	<1	1	% Saturation	4	100	97	104
Ammonia Nitrogen	6	.18	.06	.26	Total Iron	0	-	-	-
Organic Nitrogen	5	.10	<.05	.14	Sodium	5	2	1	2
Nitrate Nitrogen	6	.2	.1	.3	Potassium	5	-	<1	2
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	13	13
Total Phosphate	5	-	<.04	<.04	Magnesium	6	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	6	7	4	20
Total Solids	5	62	53	91	Total Hardness	7	46	44	52
Suspended Solids	0	-	-	-	Conductivity	7	90	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	7	80	<2	1,100
Chloride	6	1	1	2	Fecal Coliform	6	<2	<2	4
Phenol	7	-	<2	7	Fecal Strep	6	2	<2	<3
pH	5	8.0	7.7	8.2	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	4	7	6	8	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 20. WATER QUALITY DATA
St. Marys River - 1966
Range SMU 5.6

Parameters	M075				M076				M077			
	NS	Avg.	Low	High	NS	Avg.	Low	High	NS	Avg.	Low	High
Temperature (°C)	9	17	16	18	9	17	16	18	9	17	16	18
Phenol	9	2	<1	5	9	3	<1	8	9	5	<1	9
Kjeldahl Nitrogen	9	.11	.06	.17	8	.09	.07	.12	8	.11	.08	.14
Nitrate Nitrogen	9	.1	.1	.2	9	.1	.1	.2	9	.2	.1	.3
Total Phosphate	9	-	<.025	.4	9	-	<.025	.2	9	-	<.025	<.025
Chlorides	9	1	1	2	9	1	1	2	9	1	1	2
Total Coliform	9	10	<10	70	9	30	10	90	9	20	<10	30

	M078				M079			
	NS	Avg.	Low	High	NS	Avg.	Low	High
Temperature (°C)	9	17	16	17	9	17	16	17
Phenol	9	4	<1	9	4	4	<1	7
Kjeldahl Nitrogen	7	.09	.06	.12	9	.08	.06	.15
Nitrate Nitrogen	9	.1	.1	.2	9	.1	.1	.2
Total Phosphate	9	-	<.025	<.025	9	-	<.025	<.025
Chlorides	9	1	1	2	9	1	1	2
Total Coliform	9	30	10	100	9	20	<10	80

NS = Number of Samples

TABLE 21. WATER QUALITY DATA
St. Marys River - 1966
Range SMD 2.0

Parameters	M109 NS	M109 Avg.	M109 Low	M109 High	M110 NS	M110 Avg.	M110 Low	M110 High	M111 NS	M111 Avg.	M111 Low	M111 High
Temperature (°C)	9	17	16	18	9	17	16	18	9	17	16	18
Phenol	9	4	<1	8	9	3	<1	9	9	3	<1	8
Chloride	9	1	1	2	9	1	1	2	9	1	1	2
Total Coliform	9	7,300	2,900	45,000	9	1,900	90	51,000	9	70	10	140

Parameters	M112 NS	M112 Avg.	M112 Low	M112 High	M113 NS	M113 Avg.	M113 Low	M113 High	M114 NS	M114 Avg.	M114 Low	M114 High
Temperature (°C)	9	17	16	18	9	17	16	18	9	17	16	18
Phenol	9	4	1	11	9	16	6	26	9	35	18	52
Chloride	9	1	1	2	9	1	1	2	9	2	1	2
Total Coliform	9	80	50	270	9	420	210	970	9	1,800	450	4,000

Parameters	M115 NS	M115 Avg.	M115 Low	M115 High
Temperature (°C)	9	17	16	18
Phenol	9	53	28	69
Chloride	9	2	1	2
Total Coliform	9	2,300	1,000	5,900

NS = Number of Samples

TABLE 22. WATER QUALITY DATA
St. Marys River - 1966
Range SMD 5.3W

Parameters	M129				M130				M131			
	NS	Avg.	Low	High	NS	Avg.	Low	High	NS	Avg.	Low	High
Temperature (°C)	9	17	16	18	9	17	16	18	9	17	16	18
Phenol	9	-	<1	6	9	3	<1	6	9	4	1	10
Kjeldahl Nitrogen	8	.12	.07	.30	9	.08	.06	.10	9	.09	.06	.12
Nitrate Nitrogen	9	.1	.1	.2	9	.2	.1	.2	9	.1	.1	.2
Total Phosphate	9	-	<.025	<.025	9	-	<.025	<.025	9	-	<.025	<.025
Chloride	9	1	1	2	9	1	1	1	9	1	1	2
Total Coliform	9	5,000	890	6,500	9	340	250	1,160	9	80	30	150

NS = Number of Samples

TABLE 23. WATER QUALITY DATA
St. Marys River - 1966
Range SMD 8.5E

Parameters	M140				M142				M143			
	NS	Avg.	Low	High	NS	Avg.	Low	High	NS	Avg.	Low	High
Temperature	9	18	17	18	9	18	17	18	9	18	17	18
Phenol	9	10	3	16	9	13	3	20	9	13	3	21
Kjeldahl Nitrogen	9	.21	.16	.32	9	.30	.20	.34	8	.32	.29	.36
Nitrate Nitrogen	9	.2	.1	.2	9	.2	.1	.2	9	.2	.1	.2
Total Phosphate	9	-	<.025	<.025	9	-	<.025	<.025	9	-	<.025	<.025
Chloride	9	1	1	2	9	2	1	2	9	1	1	2
Total Coliform	9	710	320	29,000	9	1,700	730	48,000	9	1,600	640	52,000

NS = Number of Samples

TABLE 24. WATER QUALITY DATA
St. Marys River - 1965
Range SMU 15.5

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-	Temperature (°C)	82	15.0	8.5	17.5
Biochemical Oxygen Demand	0	-	-	-	% Saturation	0	-	-	-
Ammonia Nitrogen	10	.10	.05	.14	Total Iron	0	-	-	-
Organic Nitrogen	10	.10	<.05	.22	Sodium	10	1	1	1
Nitrate Nitrogen	10	.1	.1	.2	Potassium	10	2.6	2.2	3.5
Nitrite Nitrogen	0	-	-	-	Calcium	10	12	12	13
Total Phosphate	10	<.04	<.04	.04	Magnesium	10	3	3	3
Total Sol. Phosphate	0	-	-	-	Sulfate	10	5	2	11
Total Solids	10	56	48	61	Total Hardness	10	44	43	44
Suspended Solids	0	-	-	-	Conductivity	10	90	90	90
Vol. Susp. Solids	0	-	-	-	Total Coliform	10	2	2	22
Chloride	10	1	1	1	Fecal Coliform	10	<2	<2	14
Phenol	80	-	<2	7	Fecal Strep	10	<2	<2	2
pH	10	7.9	7.8	8.1	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand					Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 24. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMU 5.6

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	19	10.0	9.3	10.7	Temperature (°C)	65	15.0	11.0	19.0
Biochemical Oxygen Demand	33	-	< 1	8	% Saturation	19	98	89	103
Ammonia Nitrogen	28	.09	< .05	.33	Total Iron	0	-	-	-
Organic Nitrogen	27	.08	< .05	.17	Sodium	29	2	1	4
Nitrate Nitrogen	30	.2	< .1	.4	Potassium	29	-	< 1	2
Nitrite Nitrogen	0	-	-	-	Calcium	25	13	12	13
Total Phosphate	25	-	< .04	.2	Magnesium	30	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	29	3	2	5
Total Solids	25	55	46	76	Total Hardness	30	45	40	52
Suspended Solids	0	-	-	-	Conductivity	30	90	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	29	10	< 2	230
Chloride	30	2	1	4	Fecal Coliform	30	< 2	< 2	36
Phenol	50	-	< 2	14	Fecal Strep	30	< 2	< 2	10
pH	25	8.0	7.7	8.2	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	40	6	1	17	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 24. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 2.0

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	7	9.9	9.3	10.3	Temperature (°C)	119	15.0	12.0	18.0
Biochemical Oxygen Demand	69	1	< 1	5	% Saturation	7	95	89	99
Ammonia Nitrogen	42	.22	< .05	1.10	Total Iron	0	-	-	-
Organic Nitrogen	41	.10	< .05	.24	Sodium	47	2	1	3
Nitrate Nitrogen	41	.1	< .1	.3	Potassium	47	-	< 1	3
Nitrite Nitrogen	0	-	-	-	Calcium	34	13	12	13
Total Phosphate	34	-	< .04	.5	Magnesium	48	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	45	4	1	10
Total Solids	34	57	43	80	Total Hardness	48	46	43	74
Suspended Solids	0	-	-	-	Conductivity	48	90	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	49	290	4	3,500
Chloride	47	1	1	3	Fecal Coliform	42	20	< 2	320
Phenol	99	15	< 2	78	Fecal Strep	42	14	< 2	74
pH	34	8.0	7.9	8.3	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	72	7	0	14*	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

*one value of 40 not used in computing data.

TABLE 24. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 5.3W

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	6	9.7	9.3	10.2
Biochemical Oxygen Demand	9	-	< 1	1
Ammonia Nitrogen	12	.10	< .05	.29
Organic Nitrogen	12	.09	< .05	.16
Nitrate Nitrogen	15	.1	< .1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	12	-	< .04	.3
Total Sol. Phosphate	0	-	-	-
Total Solids	12	52	38	60
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	15	1	1	4
Phenol	15	-	< 2	8
pH	12	8.0	7.9	8.3
Chemical Oxygen Demand	9	5	4	5

Parameters	NS	Avg.	Low	High
Temperature (°C)	24	15.0	13.0	18.5
% Saturation	6	97	93	102
Total Iron	0	-	-	-
Sodium	15	2	1	4
Potassium	15	1.2	< .2	3.2
Calcium	12	13	12	13
Magnesium	15	3	2	3
Sulfate	15	4	2	10
Total Hardness	15	45	43	50
Conductivity	15	90	90	90
Total Coliform	15	22	2	360
Fecal Coliform	15	6	< 2	24
Fecal Strep	15	2	< 2	14
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 24. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 6.0E

Parameters	NS	Avg.	Low	High
Dissolved Oxygen	0	-	-	-
Biochemical Oxygen Demand	0	-	-	-
Ammonia Nitrogen	8	.20	.05	.44
Organic Nitrogen	8	.09	< .05	.17
Nitrate Nitrogen	8	.1	.1	.2
Nitrite Nitrogen	0	-	-	-
Total Phosphate	8	-	< .04	.09
Total Sol. Phosphate	0	-	-	-
Total Solids	8	52	44	55
Suspended Solids	0	-	-	-
Vol. Susp. Solids	0	-	-	-
Chloride	8	2	1	3
Phenol	0	-	-	-
pH	8	7.9	7.7	8.2
Chemical Oxygen Demand				

Parameters	NS	Avg.	Low	High
Temperature (°C)	8	14.0	13.0	15.0
% Saturation	0	-	-	-
Total Iron	0	-	-	-
Sodium	8	2	1	2
Potassium	8	-	< .4	< .4
Calcium	8	-	13	13
Magnesium	8	-	3	3
Sulfate	8	4	3	5
Total Hardness	8	50	44	56
Conductivity	8	90	90	100
Total Coliform	8	150	30	200
Fecal Coliform	8	14	6	44
Fecal Strep	8	4	< 2	42
Total Plate Count 20°C	0	-	-	-
Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 24. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 8.5E

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	9	9.7	9.2	10.0	Temperature (°C)	24	14.5	12.5	18.0
Biochemical Oxygen Demand	9	1	< 1	2	% Saturation	9	96	88	100
Ammonia Nitrogen	14	.18	< .05	.41	Total Iron	0	-	-	-
Organic Nitrogen	15	.10	< .05	.15	Sodium	15	2	1	3
Nitrate Nitrogen	15	.2	.1	.3	Potassium	15	-	< .2	2.3
Nitrite Nitrogen	0	-	-	-	Calcium	12	13	12	13
Total Phosphate	12	-	< .04	.3	Magnesium	15	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	13	5	3	12
Total Solids	12	56	51	61	Total Hardness	15	45	38	49
Suspended Solids	0	-	-	-	Conductivity	15	91	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	15	420	20	1,400
Chloride	14	2	1	3	Fecal Coliform	15	30	< 2	100
Phenol	15	11	4	21	Fecal Strep	15	4	< 2	18
pH	12	7.9	7.8	8.0	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	12	7	6	8	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 24. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 16.9M

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	10.2	9.9	10.4	Temperature (°C)	10	15.0	14.0	17.5
Biochemical Oxygen Demand	3	-	< 1	1	% Saturation	4	101	98	104
Ammonia Nitrogen	6	.14	< .05	.32	Total Iron	0	-	-	-
Organic Nitrogen	5	.10	.06	.18	Sodium	5	1	1	2
Nitrate Nitrogen	6	.2	.1	.3	Potassium	5	-	< 2	2.2
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	12	14
Total Phosphate	5	-	< .04	.04	Magnesium	7	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	7	3	3	4
Total Solids	5	67	53	94	Total Hardness	7	46	44	52
Suspended Solids	0	-	-	-	Conductivity	7	90	90	120
Vol. Susp. Solids	0	-	-	-	Total Coliform	7	20	2	130
Chloride	6	1	1	2	Fecal Coliform	6	6	< 2	10
Phenol	7	-	< 2	3	Fecal Strep	6	3	< 2	14
pH	5	7.6	6.3	8.2	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	4	4	4	4	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 24. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 18.1W

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	4	10.0	9.6	10.3	Temperature (°C)	10	15.0	14.0	17.5
Biochemical Oxygen Demand	3	1	1	1	% Saturation	4	98	93	102
Ammonia Nitrogen	7	.10	.05	.22	Total Iron	0	-	-	-
Organic Nitrogen	7	.10	< .05	.24	Sodium	5	2	1	2
Nitrate Nitrogen	6	.2	.1	.3	Potassium	5	.8	< .2	2.0
Nitrite Nitrogen	0	-	-	-	Calcium	5	13	13	13
Total Phosphate	5	-	< .04	.1	Magnesium	7	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	5	6	2	7
Total Solids	5	63	52	84	Total Hardness	7	46	43	52
Suspended Solids	0	-	-	-	Conductivity	7	90	90	90
Vol. Susp. Solids	0	-	-	-	Total Coliform	7	320	20	700
Chloride	7	1	1	2	Fecal Coliform	6	19	4	34
Phenol	7	-	< 2	4	Fecal Strep	6	5	2	14
pH	4	8.0	7.4	8.2	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	4	5	5	5	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 24. WATER QUALITY DATA (cont'd)
St. Marys River - 1965
Range SMD 25.0E

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	12	9.6	9.0	11.0	Temperature (°C)	30	16.5	15.0	18.0
Biochemical Oxygen Demand	9	1	< 1	1	% Saturation	12	100	94	114
Ammonia Nitrogen	19	.20	< .05	.46	Total Iron	0	-	-	-
Organic Nitrogen	16	-	< .05	.14	Sodium	14	2	1	2
Nitrate Nitrogen	18	.2	.1	.3	Potassium	15	.8	< .2	2.2
Nitrite Nitrogen	0	-	-	-	Calcium	15	13	13	14
Total Phosphate	15	-	< .04	.08	Magnesium	19	3	2	3
Total Sol. Phosphate	0	-	-	-	Sulfate	18	5	4	20
Total Solids	15	60	49	91	Total Hardness	21	46	44	52
Suspended Solids	0	-	-	-	Conductivity	21	90	90	100
Vol. Susp. Solids	0	-	-	-	Total Coliform	21	80	< 2	1,200
Chloride	15	1	1	3	Fecal Coliform	18	2	< 2	6
Phenol	20	-	< 2	7	Fecal Strep	18	2	< 2	14
pH	15	8.0	7.7	8.4	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand	12	7	4	8	Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 25. WATER QUALITY DATA
St. Marys River - 1966
Ranges

Parameters	SMU 5.6 NS	SMU 5.6 Avg.	SMU 5.6 Low	SMU 5.6 High	SMD 2.0 NS	SMD 2.0 Avg.	SMD 2.0 Low	SMD 2.0 High	SMD 5.3W NS	SMD 5.3W Avg.	SMD 5.3W Low	SMD 5.3W High
Temperature (°C)	9	17.6	16.0	18.0	63	17.0	16.0	18.0	27	17.0	16.0	18.0
Phenol	9	2	< 1	5	63	17	1	69	27	3	< 1	10
Kjeldahl Nitrogen	9	.11	.06	.17	0	-	-	-	26	.10	.06	.30
Nitrate Nitrogen	9	.1	.1	.2	0	-	-	-	27	.1	.1	.2
Total Phosphate	9	-	<.025	.4	0	-	-	-	27	-	< .025	< .025
Chloride	9	1	1	2	63	1	1	2	27	1	1	2
Total Coliform	9	10	< 10	70	63	1,000	10	51,000	27	340	30	6,500

Parameters	SMD 8.5E NS	SMD 8.5E Avg.	SMD 8.5E Low	SMD 8.5E High
Temperature (°C)	27	18.0	17.0	18.0
Phenol	27	12	3	21
Kjeldahl Nitrogen	26	.27	.16	.36
Nitrate Nitrogen	27	.2	.1	.2
Total Phosphate	27	-	< .025	< .025
Chloride	27	1	1	2
Total Coliform	27	1,500	320	52,000

NS = Number of Samples

TABLE 26. WATER QUALITY DATA
St. Marys River Tributaries - 1967
Waiska River - M780

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	2	-	6.7	6.9	Temperature (°C)	2	-	20.5	20.5
Biochemical Oxygen Demand	2	-	3	4	% Saturation	2	-	75	77
Ammonia Nitrogen	2	-	.11	.16	Total Iron	0	-	-	-
Organic Nitrogen	2	-	.18	.18	Sodium	0	-	-	-
Nitrate Nitrogen	2	-	.2	.2	Potassium	0	-	-	-
Nitrite Nitrogen	0	-	-	-	Calcium	0	-	-	-
Total Phosphate	2	-	.1	.1	Magnesium	0	-	-	-
Total Sol. Phosphate	2	-	.08	.1	Sulfate	0	-	-	-
Total Solids	2	-	85	120	Total Hardness	0	-	-	-
Suspended Solids	2	-	113	16	Conductivity	2	-	110	150
Vol. Susp. Solids	0	-	-	-	Total Coliform	2	-	700	1,500
Chloride	2	-	1	2	Fecal Coliform	0	-	-	-
Phenol	2	-	1	2	Fecal Strep	0	-	-	-
pH	2	-	7.5	7.6	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand					Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 26. WATER QUALITY DATA (cont'd)
St. Marys River Tributaries - 1967
Charlotte River - M750

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	2	-	4.5	4.8	Temperature (°C)	2	-	21.0	21.0
Biochemical Oxygen Demand	2	-	2	4	% Saturation	2	-	51	54
Ammonia Nitrogen	2	-	.10	.15	Total Iron	0	-	-	-
Organic Nitrogen	2	-	< .05	.46	Sodium	0	-	-	-
Nitrate Nitrogen	2	-	.3	.4	Potassium	0	-	-	-
Nitrite Nitrogen	0	-	-	-	Calcium	0	-	-	-
Total Phosphate	2	-	.2	.2	Magnesium	0	-	-	-
Total Sol. Phosphate	2	-	.1	.2	Sulfate	0	-	-	-
Total Solids	2	-	180	200	Total Hardness	0	-	-	-
Suspended Solids	2	-	21	36	Conductivity	2	-	200	230
Vol. Susp. Solids	0	-	-	-	Total Coliform	2	-	100	100
Chloride	2	-	12	13	Fecal Coliform	0	-	-	-
Phenol	2	-	< 1	6	Fecal Strep	0	-	-	-
pH	2	-	6.6	7.3	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand					Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

TABLE 26. WATER QUALITY DATA (cont'd)
St. Marys River Tributaries - 1967
Munuscong River - M735

Parameters	NS	Avg.	Low	High	Parameters	NS	Avg.	Low	High
Dissolved Oxygen	2	-	6.7	6.9	Temperature (°C)	2	-	20.0	20.5
Biochemical Oxygen Demand	2	-	1	2	% Saturation	2	-	74	77
Ammonia Nitrogen	2	-	.16	.18	Total Iron	0	-	-	-
Organic Nitrogen	2	-	< .05	.10	Sodium	0	-	-	-
Nitrate Nitrogen	2	-	.2	.3	Potassium	0	-	-	-
Nitrite Nitrogen	0	-	-	-	Calcium	0	-	-	-
Total Phosphate	2	-	.2	.3	Magnesium	0	-	-	-
Total Sol. Phosphate	2	-	.2	.2	Sulfate	0	-	-	-
Total Solids	2	-	280	300	Total Hardness	0	-	-	-
Suspended Solids	2	-	53	70	Conductivity	2	-	380	430
Vol. Susp. Solids	0	-	-	-	Total Coliform	2	-	10,000	20,000
Chloride	2	-	6	6	Fecal Coliform	0	-	-	-
Phenol	2	-	< 1	3	Fecal Strep	0	-	-	-
pH	2	-	8.1	8.1	Total Plate Count 20°C	0	-	-	-
Chemical Oxygen Demand					Total Plate Count 35°C	0	-	-	-

NS = Number of Samples

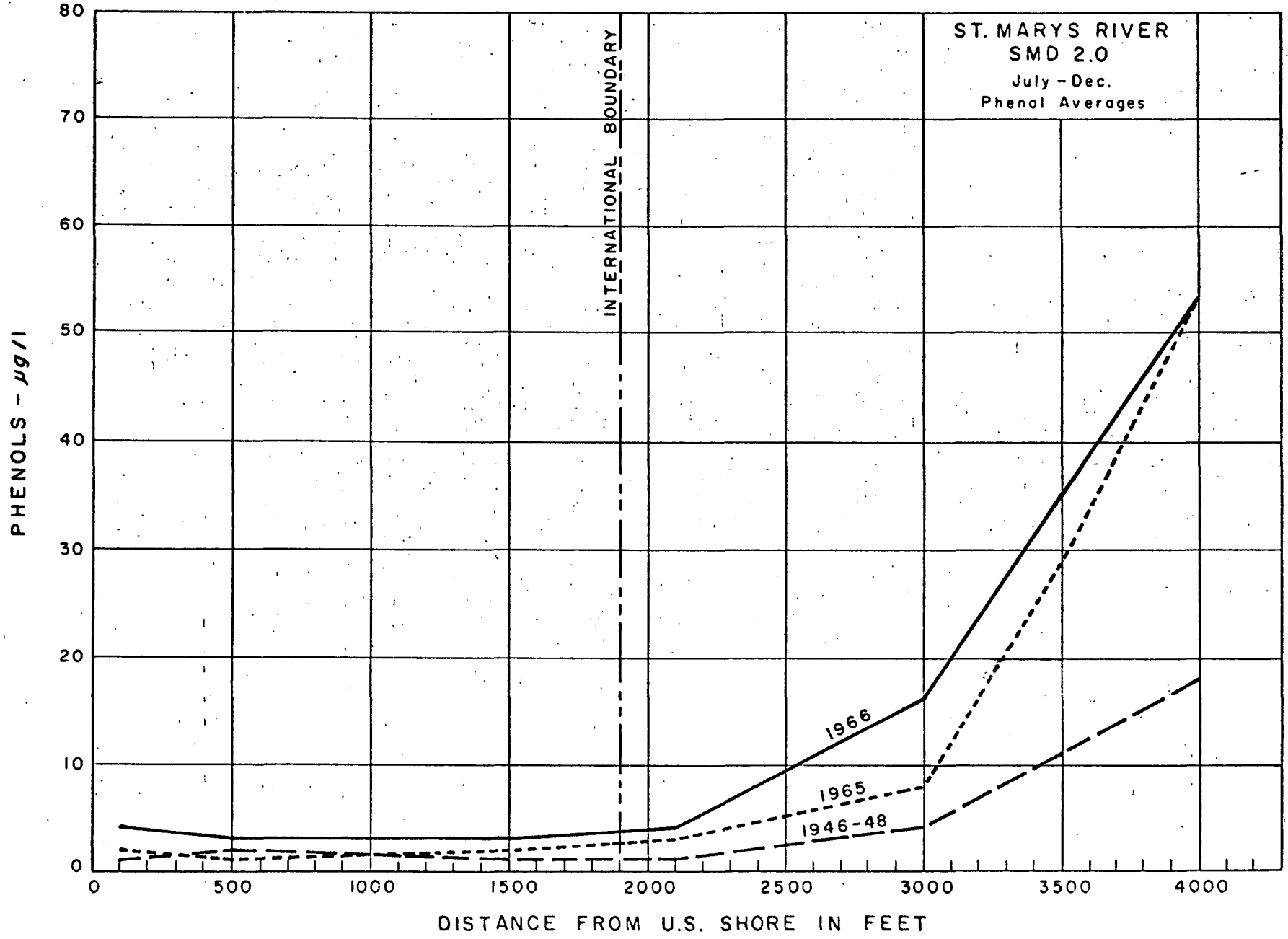

ST. MARYS RIVER
SMD 2.0
July - Dec.
Phenol Averages
INTERNATIONAL BOUNDARY
1966
1965
1946-48
PHENOLS - µg/l
DISTANCE FROM U.S. SHORE IN FEET
0
10
20
30
40
50
60
70
80
0
500
1000
1500
2000
2500
3000
3500
4000

FIGURE 6

FIGURE 7

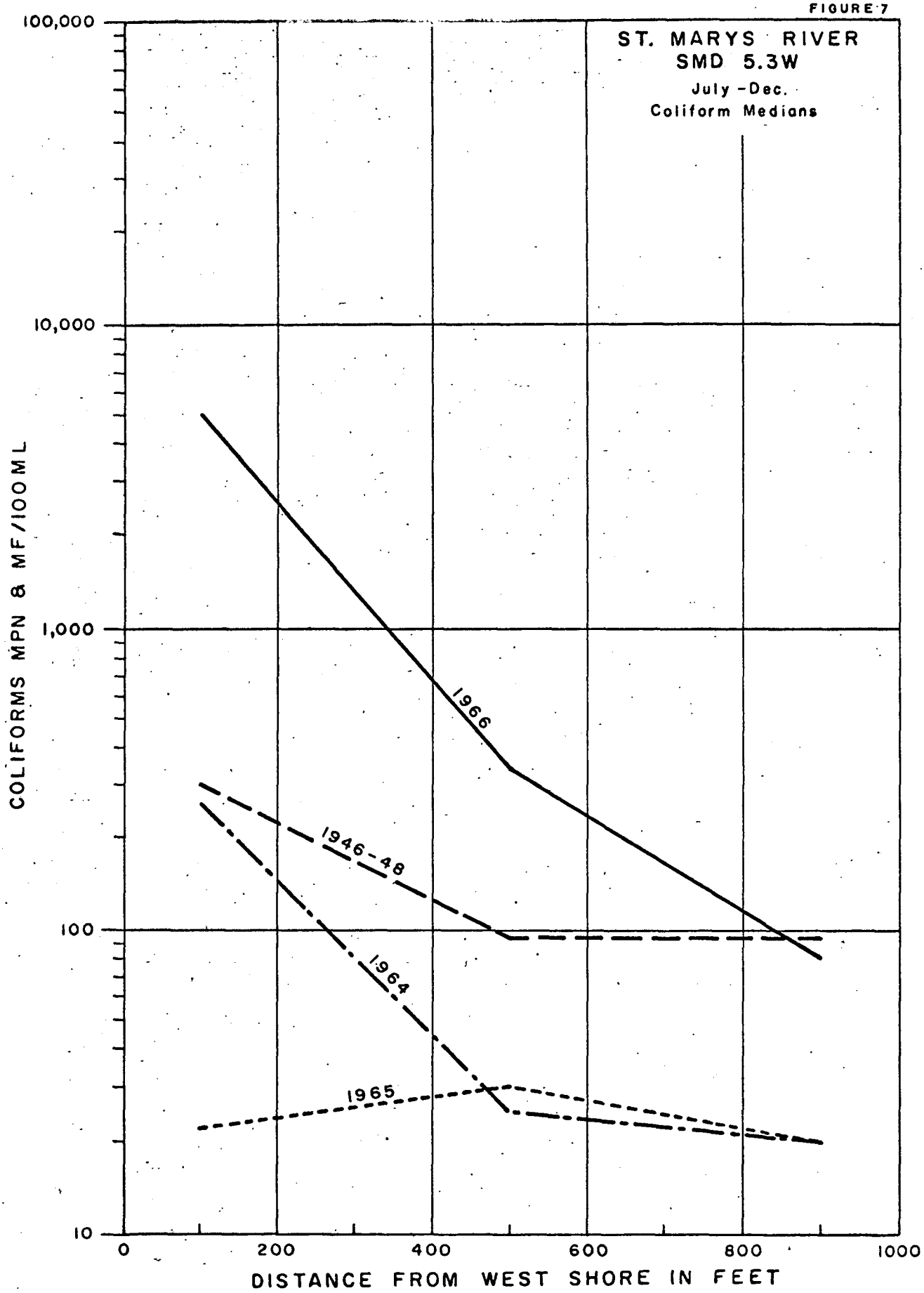

ST. MARYS RIVER
SMD 5.3W
July - Dec.
Coliform Medians
100,000
10,000
1,000
100
10
COLIFORMS MPN & MF/100 ML
1966
1946-48
1964
1965
0
200
400
600
800
1000
DISTANCE FROM WEST SHORE IN FEET

TABLE 27. BIOLOGICAL DATA - PHYSICAL OBSERVATIONS
St. Marys River
July 1965

Range	Depth (feet)	Secchi Disc (feet)	Bottom Types
SMU 5.6	-	11	Sand, gravel
SMD 5.3W	-	7	Clay
SMD 8.5E	32	11	Sand in midstream and south side. Silt and oily fibrous material on north side.
SMD 25.0E	23	8	Soft clay
SMD 16.9M	-	11	Clay
SMD 18.1W	30	3	Soft brown clay, silt

TABLE 28. BIOLOGICAL DATA - BENTHIC MACROINVERTEBRATES
St. Marys River
July 1965
(organisms/square foot)

Range	Date	Sludge-worms	Blood-worms	Leeches	Fingernail Clams	Black-flies	May-flies	Other*	Total
SMU 5.6	7/29	16	12	-	-	-	X	(a) 3	31
SMD 5.3W	7/28	6	13	-	-	23	-	(c) X	42
SMD 8.5E	7/28	11	5	14	19	-	-	(e) X, (b) 3, (f) 2	54
SMD 25.0E	7/28	20	14	1	83	-	20	-	138
SMD 16.9M	7/28	2	8	-	-	-	-	-	10
SMD 18.1W	7/28	369	27	1	1	-	21	(c) 2, (d) 1	422

* a - Ceratopogonidae
b - Turbellaria
c - Nematoda
d - Elmidae
e - Porifera
f - Isopoda

X - less than 1 per square foot.

TABLE 29. BIOLOGICAL DATA - PHYTOPLANKTON
St. Marys River
July 1965
(nos./ml)

Station	Date	Centric Diatoms	Pennate Diatoms	Green Coccoids	Blue-Green Coccoids	Blue-Green Filamentous	Green Flagellates	Brown Flagellates	Total	Predominant Genera* (10% or more)
SMU 5.6	7/29	170	80	-	-	-	80	-	330	a, f, b
SMD 5.3W	7/28	80	210	40	-	-	210	-	540	f, a
SMD 8.5E	7/28	170	150	-	-	-	270	20	610	f, a, d
SMD 25.0E	7/28	120	-	-	-	-	60	20	200	f, c, e
SMD 16.9M	7/28	100	60	-	-	-	20	20	200	a
SMD 18.1W	7/28	80	130	-	-	-	290	-	500	f, a

* Centric Diatoms
a - Cyclotella - Stephanodiscus
b - Rhizosolenia

Pennate Diatoms
c - Nitzschia
d - Synedra
e - Tabellaria

Green Flagellates
f - Unidentified

WATER QUALITY PROBLEMS

Although the water quality in the St. Marys River coming from Lake Superior is of very good quality, a number of pollution problems exist in the river after it flows past the cities of Sault Ste. Marie, Michigan and Sault Ste. Marie, Ontario.

Downstream of the Soo Locks, phenol concentrations, although much lower than in previous years, are still a problem, especially along the Canadian shore in the area of sampling Range SMD 2.0.

Elevated coliform levels in excess of acceptable limits continue to be a problem in the river along both shores below the Soo Locks and, to a degree, at the head of the channels to Lakes George and Nicolet. Other areas of the river and the two lakes demonstrated coliform levels within the acceptable limit.

On the basis of the very limited sampling carried out on the Waiska, Charlotte, and Munuscong Rivers, it appears that possible dissolved oxygen and nutrient problems exist on these rivers. The high total solids levels observed may indicate a problem, especially on the Charlotte and Munuscong Rivers. Total coliform levels ranging from 10,000 to 20,000 organisms were noted on the Munuscong River, thus indicating bacterial degradation of this stream. Bacterial pollution may also be a problem on the Waiska River, although coliform densities were much lower. No bacterial problem was indicated by the data from the Charlotte River. In the latter instance, densities on both sampling occasions were well within acceptable limits for total body contact use.

The area is largely undeveloped but contains the potential for

increasing recreational use. Careful planning of shoreline and watershed improvement is necessary to prevent the degrading of water quality by destruction of the wilderness environment and adding of pollution loads associated with increased use.