Areawide Water Quality Management Plan

CHAPTER 1 -14
VOLUME 1

northeastern illinois planning commission
400 West Madison Street, Chicago, Illinois 60606 (312) 454-0400

TABLE OF CONTENTS

		Page
CHAPTER ONE - INTRODUCTION		
1.01	PUBLIC LAW 92-500	1-1
1.02	SECTION 208	1-4
1.03	RELATED ELEMENTS OF PUBLIC LAW 92-500	1-4
	a. Section 101(e) - Public Participation	1-4
	b. Section 201 - Local Facilities Planning	1-5
	c. Section 301 - Effluent Limitations	1-6
	(1) PL 92-500 Requirements	1-6
	(2) PL 95-217 Amendments	1-6
	d. Section 303 - Statewide Planning	1-7
	e. Section 402 - National Pollutant Discharge Elimination System	1-8
1.04	CONTENTS OF AREAWIDE WATER QUALITY MANAGEMENT PLANS	1-8
	a. USEPA Guidelines - Emphasis	1-8
	b. Scope	1-10
1.05	AREAWIDE PLANNING IN NORTHEASTERN ILLINOIS	1-11
	a. The Commission's Planning Program	1-11
	b. Relationship to Comprehensive Planning	1-14
CHAPTER TWO - A FRAMEWORK FOR PLANNING		2-1
2.01	INTRODUCTION	2-1
2.02	GOALS	2-2
2.03	OBJECTIVES	2-2
CHAPTER THREE - DESCRIPTION OF THE REGION		3-1
3.01	PHYSICAL CHARACTERISTICS	3-1
	a. Geography	3-1
	b. Waterways	3-2
	c. Geology	3-4
	d. Soils	3-5
	e. Critical Environmental Areas	3-6
	f. Climate	3-6

TABLE OF CONTENTS (CONT.)

		Page
3.02	SOCIO-ECONOMIC CHARACTERISTICS	3-8
	a. Population	3-9
	b. Land Use	3-11
	c. Economy	3-13
	d. Agriculture	3-15
	e. Water Supply	3-17
CHAPTER FOUR - OVERVIEW OF AREAWIDE WATER QUALITY		4-1
4.01	FRAMEWORK FOR ASSESSING WATER QUALITY	4-1
	a. Measurements of Water Quality	4-1
	b. State Stream Designations	4-2
	c. In-stream Water Quality Standard	4-2
	(1) Additional Qualitative Criteria	4-3
	(2) Proposed IEPA Changes	4-5
	(3) Proposed Commission Changes	4-5
	d. Stream Segment Classifications	4-9
	e. Public Health	4-9
	(1) Bacteriological Quality	4-9
	(2) Viruses	4-11
	(3) Water Quality and Disease	4-12
	f. Other Criteria	4-13
	(1) Aquatic Habitat	4-13
	(2) Aesthetics	4-14
4.02	WATER QUALITY MODELING	4-15
	a. Simulation Methodology	4-15
	b. Commission Model	4-16
	c. Modeling Results	4-18
	(1) Point Source Discharges	4-18
	(2) Subsurface Flows	4-18
	(3) Surface Runoff	4-18
4.03	ASSESSMENT OF CURRENT CONDITIONS	4-19
	a. Rivers and Streams	4-19
	b. Inland Lakes	4-19
	c. Lake Michigan	4-21
	d. Groundwater	4-21
	(1) Landfills and Old Dumps	4-24
	(2) Deep Well Disposal	4-24
	(3) Abandoned Wells	4-24
	(4) Septic Systems	4-25
	(5) Waste Lagoons	4-25
	(6) Disposal of Residuals	4-25
	(7) Pollution from Surface Streams	4-25

TABLE OF CONTENTS (CONT.)

		Page
	e. Bottom Deposits	4-26
	f. Toxic Substances	4-26
	(1) Heavy Metals	4-27
	(2) Pesticides	4-28
	(3) PCBs	4-29
	g. Boundary Conditions in Interstate Streams	4-29
4.04	CURRENT FISHABILITY CONDITIONS	4-32
	a. Water Quality Impacts on Fish	4-32
	(1) Dissolved Oxygen (DO)	4-32
	(2) Ammonia Nitrogen	4-32
	(3) Temperature	4-33
	(4) Toxicity	4-33
	b. Other Impacts on Fish	4-34
	(1) Silt	4-34
	(2) Drainage	4-34
	(3) Drought	4-34
	(4) Pollution	4-34
	(5) Dams and Impoundments	4-35
	(6) Temperature	4-35
	c. Current Fish Habitats and Populations	4-35
	(1) Chicago Sanitary and Ship Canal	4-36
	(2) Des Plaines River	4-36
	(3) DuPage River	4-36
	(4) Fox River	4-36
	(5) Hickory Creek	4-36
	(6) Kankakee River	4-36
	(7) Kishwaukee River	4-37
	(8) Lake Michigan	4-37
	(9) Little Calumet River	4-37
	(10) North Branch, Chicago River	4-37
	(11) Salt Creek	4-37
4.05	MAJOR WATER QUALITY PROBLEMS IN THE REGION	4-37
	a. Priorities	4-37
	b. Major Problems	4-38
	(1) Combined Sewer Overflows	4-38
	(2) Treatment Plants	4-38
	(3) Urban Stormwater Runoff	4-38
	(4) Agricultural Runoff	4-38
	(5) Soil Erosion	4-39
	(6) Bottom Sediments	4-39
	(7) Unsatisfactory Septic Systems	4-39
	(8) Hydrologic Modification	4-39
	(9) Low Flow Conditions	4-40
	(10) Boundary Conditions	4-40
	(11) Poor Operation of Treatment Facilties	4-40
	c. Summary	4-41

TABLE OF CONTENTS (CONT.)

		Page
CHAPTER FIVE - POLLUTION FROM POINT SOURCES		5-1
5.01	INTRODUCTION	5-1
5.02	AREAWIDE OVERVIEW OF POINT SOURCES	5-1
	a. Municipal Type Wastewater Treatment	5-1
	(1) Assessing Current Conditions	5-1
	(2) Future Wasteloads and Volumes	5-4
	(3) Publicly-Owned Facilities	5-4
	(4) Privately-Owned Public Utilities	5-6
	b. Other Point Sources	5-7
	(1) Industrial Discharges	5-7
	(2) Miscellaneous Wastewater Treatment Facilities	5-7
	(3) Agricultural Discharges	5-8
	(4) Water Treatment Plant Residuals	5-8
	(5) Cooling Water Discharges	5-9
5.03	AREAWIDE POINT SOURCE ISSUES	5-9
	a. Combined Sewer Overflows	5-9
	(1) Recommendations	5-13
	b. Excess Wastewater Flows	5-13
	(1) Facility Planning Steps	5-14
	(2) Sewer Rehabilitation Studies	5-14
	(3) Limitations on Grants for Combined Sewer Problems	5-15
	(4) MSDGC Service Area Studies	5-15
	(5) Recommendations	5-15
	c. Operation and Maintenance	5-16
	(1) Industrial Waste Loads	5-16
	(2) Infiltration and Inflow	5-16
	(3) Equipment/Unit Design	5-17
	(4) Operator Capability	5-17
	(5) Monitoring Data	5-17
	(6) Equipment Maintenance	5-17
	(7) Sludge Processing and Disposal	5-17
	(8) Conclusion	5-18
	(9) Recommendations	5-18
	d. Privately Owned Discharges: Miscellaneous Plants and Public Utility Systems	5-19
	e. Treatment of Industrial Wastes in Municipal Systems	5-20
	(1) Pretreatment	5-20
	(2) User Charges	5-21
	(3) Industrial Cost Recovery	5-21
	(4) Advantages of Joint Treatment	5-21
	(5) Disadvantage of Joint Treatment	5-22
	(6) Summary	5-22
	(7) Recommendations	5-22

TABLE OF CONTENTS (CONT.)

		Page
	f. Industrial Wastewater Treatment Plant Effluent Standards	5-23
	(1) PL 95-217 Changes	5-24
	(2) Recommendations	5-26
	g. Treatment Standards	5-26
	h. Phosphorus	5-27
	(1) Definition of Eutrophication	5-27
	(2) Causes of Eutrophication	5-28
	(3) In-stream Water Quality Standards	5-28
	(4) Effluents Standards	5-29
	(5) Sources of Phosphorus	5-29
	(6) Phosphorus in Detergents	5-29
	(7) Removal of Phosphorus in Treatment Plants	5-30
	(8) Impact of Phosphorus Ban on Water Quality	5-30
	(9) Costs of Low Phosphate Detergents	5-31
	(10) City of Chicago Ban	5-31
	(11) Staff Opinion	5-31
	(12) Revised Finding	5-32
	(13) Recommendations	5-32
5.04	AREAWIDE PLANNING FOR POINT SOURCE CONTROL	5-32
	a. Local Facilities Planning	5-32
	b. Needs Analyses	5-34
	c. Areawide Issues	5-36
	d. Recommendations	5-38
5.05	MANAGEMENT OF MUNICIPAL POINT SOURCE DISCHARGES	5-44
	a. Existing Management System	5-44
	b. Alternatives to the Existing Management System	5-46
	(1) The County-Wide Management Alternative	5-47
	(2) The Areawide Authority Management Alternative	5-47
	(3) The Subregional Authority Management Alternative	5-48
	c. Assessment of Management Alternatives	5-48
	(1) County-Based Management	5-48
	(2) Regional Wastewater Management	5-49
	(3) Subregional Wastewater Management	5-49
	d. Recommendation	5-50
5.06	REGULATION OF POINT SOURCE DISCHARGES	5-51
	a. The Existing Regulatory Program	5-51
	b. The Recommended Regulatory Program for Publicly-Owned Facilities	5-52
	(1) Recommendations	5-54
	c. The Recommended Regulatory Program for Privately-Owned Facilities	5-54
	(1) Recommendations	5-55
	d. Regulation of Other Point Sources	5-56

TABLE OF CONTENTS (CONT.)

		Page
5.07	ENERGY REQUIREMENT	5-58
	a. Energy Used in Treatment of Wastewaters	5-58
	b. Energy Used in Sludge Treatment	5-59
	c. Energy Used in Collection Systems	5-60
	d. Recommendations	5-60
5.08	WATER CONSERVATION AND REUSE OF EFFLUENTS	5-61
	a. Water Conservation	5-61
	b. Reuse of Effluents	5-63
	(1) Municipal Reuse	5-63
	(2) Industrial Reuse	5-63
	(3) Agricultural Reuse	5-64
	(4) Recreational Reuse	5-64
	(5) Reuse in Groundwater Recharge	5-64
	(6) Innovative and Alternative Technologies	5-65
	c. Recommendations	5-66
5.09	ALTERNATIVE METHODS OF WASTEWATER TREATMENT	5-66
CHAPTER SIX - POLLUTION FROM NONPOINT SOURCES		6-1
6.01	INTRODUCTION	6-1
6.02	LAND USE RUNOFF SAMPLING PROGRAM	6-1
	a. Total Suspended Solids	6-4
	b. Total Solids	6-4
	c. Dissolved Solids	6-4
	d. Soluble Phosphorus	6-4
	e. Ranking of Nonpoint Source Concentrations	6-5
	f. Total Pollutant Loads	6-5
6.03	BEST MANAGEMENT PRACTICES	6-7
6.04	POLLUTANTS IN URBAN STORMWATER RUNOFFS	6-7
	a. Sources and Types	6-7
	b. Accumulation, Decay and Removal	6-8
	c. Soil Erosion	6-9
	d. Miscellaneous Sources	6-9
	e. Management of Urban Stormwater	6-10
	(1) Control of Drainage Network	6-10
	(a) Stormwater Detention	6-11
	(b) Increased Infiltration	6-12
	(c) Performance Zoning	6-12
	(1) Lake County Study	6-13
	(d) Soil Erosion Control	6-13

TABLE OF CONTENTS (CONT.)

		Page
	(2) Keeping Pollutants Out of the Drainage Network	6-14
	(a) Ordinances and Regulations	6-14
	(b) Municipal Practices	6-15
	(c) De-Icing Practices	6-15
	(3) Removing Pollutants from Urban Stormwater	6-15
	(4) Regulations	6-16
	(5) NPDES Permits	6-17
	(6) Management Alternatives	6-18
f.	Problems	6-19
	(1) Pollutant Loads	6-19
	(2) Management	6-20
	(3) Ordinances and Regulations	6-20
g.	Commission Findings	6-21
h.	Intent of the Recommended Program	6-22
i.	Recommendations	6-25
6.05	AGRICULTURAL RUNOFF	6-32
a.	Characteristics of Agricultural Pollutants	6-32
	(1) Sediment	6-33
	(2) Nutrients	6-34
	(3) Pesticides	6-36
	(4) Organic Materials	6-38
b.	Problems	6-39
	(1) Sediment	6-39
	(2) Nutrients	6-40
	(3) Pesticides	6-40
	(4) Feedlot Runoff	6-40
	(5) Nitrates	6-41
c.	Potential Strategies	6-41
d.	Best Management Practices	6-42
e.	Soil Erosion BMP's	6-42
	(1) Conservation Tillage	6-42
	(2) Crop Rotation	6-43
	(3) Contouring	6-43
	(4) Contour Strip Cropping	6-43
	(5) Cover Crops	6-43
	(6) Pasture and Hayland	6-43
	(7) Terraces	6-44
	(8) Diversions	6-44
	(9) Water and Grade Control Structures	6-44
	(10) Grassed Waterways	6-44
	(11) Field Borders	6-44
	(12) Critical Area Planting	6-44
	(13) Streambank Protection	6-44

TABLE OF CONTENTS (CONT.)

		Page
	f. Water Quality Modeling Results	6-45
	g. Control of Livestock Wastes	6-45
	h. Control of Agricultural Chemicals	6-47
	i. Existing Management System	6-48
	(1) Agricultural Conservation Program	6-49
	(2) Soil and Water Conservation Districts	6-49
	(3) Extension Service	6-50
	(4) State Legislation	6-50
	(5) Public Law 95-217	6-50
	(6) NPDES Permits	6-51
	j. Alternative Management Strategies	6-51
	(1) Voluntary Program	6-52
	(2) Regulatory Program	6-54
	(3) Direct Public Action	6-55
	k. Recommendations	6-56
	(1) Overview	6-56
	(2) Intent of Recommended Program	6-57
	(3) Details of Recommended Program	6-58
6.06	SEPTIC WASTES	6-63
	a. Characteristics	6-63
	b. Use of Septic Systems in the Region	6-64
	c. Management and Regulation of Septic Wastes	6-65
	d. Technical Problems	6-67
	e. Management Problems	6-70
	f. Recommendations	6-71
6.07	SURFACE WASTE DISPOSAL	6-78
	a. Introduction	6-78
	b. Sanitary Landfills	6-79
	c. Regulations	6-80
	d. Recommendations	6-81
6.08	AIR DEPOSITION	6-82
	a. Characteristics and Impact on Water Quality	6-83
	b. Recommendations	6-86
6.09	OTHER NONPOINT SOURCES	6-86
	a. Mining	6-86
	(1) Recommendation	6-88
	b. Forestry	6-88
	c. Hydrologic Modifications	6-88
	(1) Recommendations	6-90
	d. Marine Activities	6-91
	e. De-Icing Agents	6-92
	(1) IDOT Salt Application Rates	6-92
	(2) IDOT Sampling Program	6-92
	(3) USEPA Guidelines	6-94
	(4) Other Considerations	6-94
	(5) Salt Storage	6-94

TABLE OF CONTENTS (CONT.)

		Page
CHAPTER SEVEN - DISPOSAL OF RESIDUAL WASTES		7-1
7.01	CHARACTERISTICS OF RESIDUAL WASTES	7-1
	a. Wastewater Treatment Plant Sludges	7-2
	b. Septage	7-3
	c. Water Treatment Plant Sludge	7-3
7.02	ALTERNATIVE METHODS OF DISPOSAL	7-4
	a. Land Application	7-4
	b. Land Reclamation	7-6
	c. Public Use	7-6
	d. Landfills	7-6
	e. Other Methods	7-7
	(1) Incineration	7-7
	(2) Composting	7-8
	(3) Pyrolisis	7-8
	(4) Lagoons	7-8
	f. Water Treatment Plant Residues	7-8
	g. Septage	7-10
7.03	EXISTING AND PROJECTED VOLUMES	7-11
7.04	CURRENT SLUDGE DISPOSAL PROGRAMS	7-12
	a. Cook County	7-13
	b. DuPage County	7-14
	c. Kane County	7-14
	d. Lake County	7-15
	e. McHenry County	7-15
	f. Will County	7-16
	g. Summary of Disposal Methods	7-17
7.05	AREAWIDE PROBLEMS	7-18
7.06	AREAWIDE PLANNING	7-21
7.07	RECOMMENDATIONS	7-22
CHAPTER EIGHT - THE AREAWIDE MANAGEMENT FRAMEWORK		8-1
8.01	INTRODUCTION	8-1
	a. The Need for a Management Framework	8-1
	b. Designation of Management Agencies	8-2
8.02	THE EXISTING MANAGEMENT SYSTEM	8-3
8.03	ALTERNATIVE MANAGEMENT FRAMEWORKS	8-4
	a. Alternatives Considered	8-6
	b. Assessment of Alternatives	8-7

TABLE OF CONTENTS (CONT.)

		Page
8.04	RECOMMENDED AREAWIDE MANAGEMENT FRAMEWORK	8-9
	a. Overview	8-9
	b. Local Management Agencies	8-11
	c. Countywide Water Quality Committees	8-14
	- Major Countywide Coordinating Responsibilities	8-16
	- Organization of Countywide Water Quality Committees	8-19
	- Management Advisory Committees	8-22
	- The Legal Basis for Countywide Water Quality Committees	8-24
	- Designation of Interim Coordinating Bodies	8-27
	- Relationships to Drainage Basins	8-29
	- Staffing and Technical Support	8-32
	d. The Northeastern Illinois Planning Commission	8-34
	- Areawide Advisory Groups to the Commission	8-34
	- Illinois-Indiana Bi-State Commission	8-39
	- The State of Illinois	8-40
8.05	FUNCTIONS OF THE AREAWIDE MANAGEMENT FRAMEWORK	8-44
	a. Management Programming and Certification	8-44
	b. Water Quality Monitoring	8-52
	c. Coordination	8-54
	d. Enforcement	8-58
8.06	FINANCIAL MANAGEMENT	8-61
	a. Sources of Funds	8-61
	b. Management and Allocation	8-62
	c. Recommendations	8-64

APPENDIX

Recommended 208 Water Quality Management Agencies for Northeastern Illinois		8-64
CHAPTER NINE - THE COSTS AND FINANCING OF WATER QUALITY MANAGEMENT		9-1
9.01	INTRODUCTION	9-1
9.02	COSTS AND FINANCING OF POINT SOURCE CONTROLS	9-4
	a. Overview	9-4
	b. The Costs of Point Source Controls	9-5
	c. Sources of Funding	9-8
	d. Availability of Non-Local Funds to Finance Point Controls	9-15
	e. Adequacy of Local Point Source Control Funding	9-27

TABLE OF CONTENTS (CONT.)

		Page
9.03	COSTS OF URBAN STORMWATER POLLUTION CONTROL	9-32
	- Overview	9-32
	- Street Cleaning	9-33
	- Local Regulation of New Development	9-34
	- The Public Costs of Development Regulation	9-35
	- Funding for the Enforcement of Water Quality	9-37
	- Related Development Controls - Recommendations	9-38
	- The Private Costs of Development Regulation	9-38
	- The Costs of Land Acquisition	9-39
	- The Costs of Land Preparation	9-39
	- Costs of Financing	9-41
	- Post - Development Costs - Public and Private Maintenance Programs	9-41
	- Erosion and Sedimentation Control	9-41
	- Stormwater Detention	9-42
9.04	COSTS AND FINANCING OF AGRICULTURAL POLLUTION CONTROL	9-43
	- Overview	9-43
	- Costs	9-43
	- Funding Sources	9-43
	- ASCS	9-45
	- FWPCA (PL 95-217)	9-45
	- State of Illinois	9-46
	- Adequacy of Funding Sources	9-46
	- Utilization of Resources	9-47
9.05	COSTS AND FINANCING OF THE ON-SITE DISPOSAL REGULATORY PROGRAM	9-49
	- Cost of the Regulatory System	9-49
	- County by County Costs	9-52
CHAPTER TEN - CONTINUING PLANNING PROGRAM		10-1
10.0	INTRODUCTION	10-1
10.1	CONTINUING ACTIVITIES FOR PLAN IMPLEMENTATION	10-2
	a. Plan Implementation Monitoring	10-2
	b. Preparation of Annual Implementation Progress Report	10-4
	c. Annual Plan Review and Revision	10-4
	d. Project and Permit Reviews	10-5
	e. Technical Assistance to Management Agencies	10-13
	f. Water Quality Monitoring	10-13
	g. Update of Forecasts of Population, Employment and Land Use	10-14
	h. Continued Water Quality Modeling	10-15

TABLE OF CONTENTS (CONT.)

		Page
10.2	FILLING GAPS IN THE PLAN	10-16
	a. Completion of Initial Plan	10-16
	b. Development of a Five-Year Work Program	10-17
	c. Organization of Countywide Water Quality Committees	10-18
	d. Preparation of First-Year Countywide Implementation Programs	10-19
	e. Organization of Advisory Committees, Public Information and Public Participation Programs	10-19
	f. Draft Amendments to Illinois Commerce Commission Act	10-21
	g. Draft Amendments to IPCB, IEPA, and Illinois Department of Public Health Regulations	10-22
	h. Draft Model County Water Quality Committee Agreement	10-22
	i. Draft Amendments to Wastewater Treatment Authority Enabling Acts to Include On-Site	10-23
	j. Draft Model Local Ordinances for Stormwater Detention and Soil Erosion and Sedimentation Control and Surface Runoff	10-24
	k. Toxics, Pesticides and Heavy Metals	10-25
	l. Develop a Detailed Plan for Disposal of Septage	10-25
	m. Completion and Re-examination of 201 Facilities Plans	10-26
	n. Develop Detailed Recommendations for Extension of Sewer Service to New Development Within Projected Service Areas	10-27
	o. Develop Detailed Recommendations for Extension of Sewer Service to Problem Septic Areas	10-27
10.3	FINANCING MANAGEMENT AND CONTINUING PLANNING	10-28

FIGURES

No.		Page
1-1	Map of Six County Area	1-2
1-2	Map of Drainage Basins in Northeastern Illinois	1-12
3-1	Major Waterways in Northeastern Illinois	3-2a
4-1	Water Use Designations of Illinois Waterways	4-4
4-2	NIPC and IEPA Stream Segments in Northeastern Illinois	4-10
5-1	MSDGC Tunnel and Reservoir Plan	5-11
5-2	Industrial Discharge Standards	5-25
6-1	Potential Soil Loss in Northeastern Illinois	6-35
8-1	General Framework for Management Coordination and Continuing Planning	8-11
9-1	Costs and Sources of Funding for Major Plan Elements (in $ Millions)	9-3

TABLES

No.		Page
1-1	Drainage Basin Characteristics	1-13
1-2	Elements of the Comprehensive General Plan For Northeastern Illinois	1-15
3-1	Predominant Soil Unit Characteristics for Northeastern Illinois	3-7
3-2	Average Monthly Temperature and Precipitation for Northeastern Illinois (Values for Period 1941-1970)	3-8
3-3	Population in Northeastern Illinois, 1950-1970; Forecasts for 1980-2000	3-10
3-4	Existing and Preliminary Land Use Forecasts, Northeastern Illinois	3-12
3-5	Total Employment by County, 1970-2000	3-14
3-6	Manufacturing Employment by County, 1970-2000	3-14
3-7	Acres In Agricultural Use, 1976	3-16
3-8	Cash Receipts and Percent Share Generated by Major Crops and Livestock Categories, Northeastern Illinois, 1964 and 1974	3-16
3-9	Estimated Livestock Concentrations	3-17

TABLES (CONT.)

		Page
4-1	Water Use Designations of Illinois Waterways	4-3
4-2	Illinois In-Stream Water Quality Standards	4-6
4-3	Number and Surface Acreages of Lakes in Northeastern Illinois	4-20
4-4	Publicly Owned Lakes in Northeastern Illinois (Greater than 20 acres in size)	4-22
4-5	Land Use Water Quality Sampling - Summary Data - Heavy Metals	4-30
4-6	Wisconsin Contributions of Pollutants to the Fox River	4-31
4-7	Total Ammonia (in mg/l) Necessary to Generate .02 mg/l Un-ionized Ammonia	4-33
5-1	Categories of Point Source Discharges	5-2
5-2	Major Municipally-Owned Wastewater Systems	5-6
5-3	Summary of Needs Analysis Study Areas	5-36
6-1	Land Use Water Quality Sampling - Summary Data	6-2
6-2	Ranking of Non-Point Sources, Based on Maximum and Mean Concentrations of Selected Pollutants	6-6
6-3	Comparison of Pollutional Impacts: Conventional vs. Performance Zoning	6-14
6-4	Estimated Gross Soil Erosion in Illinois	6-33
6-5	Fertilizer Applications	6-36
6-6	Herbicide Applications	6-37
6-7	Insecticide Applications	6-38
6-8	Impacts of Selected Agricultural Best Management Practices Percent Change	6-46
6-9	Land Conservation Practices	6-53
6-10	Comparison of 1977 Agricultural Conservation Program Allocations with Estimated Annual BMP Need	6-54
6-11	Summary of Septic Tank Usage in Northeastern Illinos	6-65
6-12	Estimates of Future Septic Tank Usage	6-66
6-13	Septic Systems in Problem Areas	6-70
6-14	Recommended Management Framework for Septic System Regulation	6-75
6-15	Summary of National and Illinois Ambient Air Quality Standards	6-83
6-16	Air-to-Land Loadings From Dustfall and Precipitation	6-85
6-17	Comparative Tonnages of Sodium Chloride Applied to State Maintained Highways in Northeastern Illinois	6-92
6-18	Chloride Concentrations	6-93
6-19	USEPA Guidelines for Snow Removal - Chemical Application Rates	6-95

TABLES (CONT.)

		Page
7-1	Typical Chemical Composition of Raw Digested Sludge	7-2
7-2	Estimated Current (1976) Sludge Generation, Northeastern Illinois	7-12
7-3	Estimated Future Sludge Generation, Northeastern Illinois	7-12
7-4	Areawide Summary of Sludge Disposal Practices	7-18
8-1	Existing Agencies with Authority for General Management	8-5
8-2	Summary of Assessment of Alternative Management Systems	8-8
8-3	Designated Management Agencies and Responsibilities	8-11
9-1	Total Capital Requirements, Point Source Controls, 1978 - 2000 ($ Million, 1977)	9-6
9-2	Total Operations, Maintenance and Replacement Requirements, Point Source Controls 1978-2000	9-10
9-3	Wastewater Revenue Systems, Thirteen Largest Municipal Systems in Northeastern Illinois	9-12
9-4	Projected Capital Funding Requirement, MSDGC Facilities Plan ($ Million, 1977)	9-16
9-5	Projected Capital Funding Requirements and Sources, Local Improvements Related to MSDGC Facilities Plan ($ Million, 1977)	9-19
9-6	Projected Capital Funding Requirements and Sources, Facilities Plans Other Than MSDGC ($ Million, 1977)	9-20
9-7	Local Capital Funds and Financing Costs (20 Years at 7 percent,($ Million, 1977)	9-21
9-8	Federal and State Construction Grants and Shortfall Projected to 1987 ($ Million, 1977)	9-23
9-9	Projected Average Annual Cost of Point Source Controls, Per Household, in Dollars, and Percentage Increase Over Current Average Annual Wastewater Charge	9-30
9-10	Estimated Annual Street Cleaning Costs	9-33
9-11	Average Annual Costs of Phased Agricultural Best Management Practices	9-44
9-12	Areawide Agricultural BMP Costs Compared to Available Resources ($ Million, 1977)	9-48
9-13	Costs of Alternative On-Site Disposal Regulatory Programs in McHenry County	9-54
9-14	Costs of Recommended Septic Regulatory Program, Cook County	9-55
9-15	Costs of Recommended Septic Regulatory Program, DuPage County	9-56
9-16	Costs of Recommended Septic Regulatory Program, Kane County	9-57
9-17	Costs of Recommended Septic Regulatory Program, Lake County	9-58
9-18	Costs of Recommended Septic Regulatory Program, McHenry County	9-59
9-19	Costs of Recommended Septic Regulatory Program, Will County	9-60
10-1	First Year Cost Summary - Continuing Planning Program	10-3
10-2	County Shares of $100,000 Matching Share	10-37

THE SIGNIFICANCE OF THIS PLAN 10

There has been no other plan like this one in the regional planning program for northeastern Illinois. Although this areawide plan for clean water is an element of the Comprehensive General Plan for Northeastern Illinois (CGP), its significance to the region is greater in some ways than the significance of other regional plan elements.

Plans prepared and adopted by the Northeastern Illinois Planning Commission (NIPC) are basically advisory. Local governments and institutions are encouraged to consider them as guidelines but are not required to accept them as policy. Regional plans are influential not by virtue of the authority they carry but because of the insight they reflect and their basic worth to policy-makers in the region.

The policies set forth in regional plans are among the criteria used by NIPC, as a designated metropolitan clearinghouse, to evaluate federal grant applications. But here, too, NIPC's role is advisory. The funding decisions of federal authorities can overrule the recommendations of a regional agency.

This areawide water quality plan has the basic characteristic of other regional plans but it will carry more authority because it is not only a plan adopted by NIPC. It also will be certified annually, by the Governor of Illinois, as an element of the state's water quality program, and by the U.S. Environmental Protection Agency (USEPA) as an acceptable program for implementing the Federal Water Pollution Control Act.

Unlike other regional plans, therefore, this plan is enforceable. It can be enforced through the incorporation of its policies into the regulations of the Illinois Pollution Control Board and the policies of the Illinois Environmental Protection Agency. It can be enforced indirectly by the USEPA, which will require that all subsequent federal grant applications for wastewater management planning and treatment plant construction be in conformance with the plan.

NIPC's position is that the region, particularly officials of local government, should be fully aware of the potential significance of this plan. The commission does not intend for this plan to be dependent upon state and federal authority for its implementation, however. The recommendations and the management system for implementing recommendations stress voluntary implementation by existing units of local governments as the preferred way of improving the quality of our waterways.

This plan outlines an initial attempt by the people of the region to comply with the very high water quality goals established by Congress in 1972. The need for national consistency in pollution control efforts is recognized.

However, the Commission urges the Congress and the U.S. Environmental Protection Agency (USEPA) to further consider their goals in light of this Commission's findings regarding the difficulty of complete achievement and extremely large economic burden this would involve. Further, the Commission requests that this region, and others throughout the country, be authorized and assisted in conducting more detailed investigations of the specific benefits to be achieved by means of various levels of water quality improvement so as to compare these to the associated costs. The results of such investigations should then be considered by Congress in reevaluating the national goals.

THE ORGANIZATION OF THIS PLAN

This plan has two major divisions, each of which contains several component chapters.

Part I of the plan is written from an areawide perspective and, in essence, outlines the complete areawide plan for controlling water pollution in northeastern Illinois. It discusses findings, presents conclusions, and outlines strategies for the major areas required to be covered in an areawide plan: point source pollution, nonpoint source pollution, disposal of residual wastes and management. Part I also sets forth the goals and objectives for the plan and its implementation, outlines the continuing planning program and provides an assessment of the environmental impact of the plan:

Part II, in which the same areas of concern are covered in succeeding chapters from the perspective of individual drainage basins, is an enlargement of Part I. Part II differs from Part I also in level of detail and specifity. In a sense, Part II picks up where Part I leaves off.

The decision to take this approach to the organization of the initial areawide plan was based primarily on several factors:

First, the recommended technical and management strategies in this plan originated to a large extent in plan alternatives developed, tested and evaluated on a basin-by-basin basis.

Second, the size and complexity of the region is such that the scope of problems and solutions in a given basin in northeastern Illinois is likely to exceed the scope of some complete areawide plans prepared elsewhere in the country.

Third, most strategies must be implemented at something less than an areawide level. Therefore, to the extent that this plan can provide specific solutions to specific problems at the basin, or even sub-basin level, it becomes more useful to those charged with its implementation.

Both Part I and Part II are organized according to the major functional areas covered in this plan. The scale at which the functional organization is imposed is different in each division, however. Part I contains 10 chapters and

each, in general, contains a complete areawide treatment of one functional area. Part II contains 12 chapters dealing with individual basins, plus an Environmental Assessment. Within each of the 13 basin chapters the organization is again according to functional areas. The organization of each chapter in Part II is nearly parallel to the overall organization of Part I.

PLAN OVERVIEW

This Areawide Water Quality Management Plan involves three principal functional programs: control of point source discharges; control of stormwater pollution from urbanized areas; and control of pollution associated with stormwater runoffs from agricultural areas. Residual wastes are discussed but no plan is proposed at this time.

Improvements to publicly owned collection and treatment systems are all developed by local units of government under Section 201 of Public Law 92-500. The impact of 208 planning on these 201 plans is minimal, as described in various places throughout the plan document. The question of separate industrial wastewater treatment plants was by-passed for two principal reasons: the inability to get substantive (privileged) information on future production volumes from the industries; and more importantly, the still emerging and controversial effluent standards which are being developed by USEPA.

The selection of urban stormwater pollution controls was left to local units of government, with target reductions in organic pollution, as measured by biochemical oxygen demand (BOD), of 25 percent in areas already urbanized and 50 percent in areas to be urbanized in the future, based on 1976 surface loadings. (In the Lake Michigan Basin a 50 percent target reduction is established because of the sensitive nature of the Lake.) The choice of practices to be employed rests with each local unit of government and will involve a mixture of practices ranging from accelerated street sweeping and catch basin cleaning through stormwater detention basins, performance zoning, and other programs which will reduce surface loadings, reduce the contribution of pollutants to storm sewers, or permit natural processes to attenuate pollutional loadings. Street sweeping with vacuum type sweepers was costed in order to show the general magnitude of costs involved. It was recognized that these costs would be reduced by benefits generated through other techniques and practices. In some instances, these benefits would be at no additional cost; i.e. stormwater detention basins are constructed to control the rate of stormwater runoff and are directly related to drainage and flood control benefits. Abatement of water pollution would be a derivative benefit.

Agricultural controls are designed to slow down the movement of water, enhancing groundwater recharge,

decreasing erosion, and reducing the introduction of pollutants into the region's water bodies. Selection of the Best Management Practices (BMP's) will be done by Soil and Water Conservation Districts on a farm-by-farm basis. Among the long list of agricultural BMP's, which have been espoused by the U. S. Department of Agriculture over the past forty years to control soil erosion, only the techniques which would materially reduce runoff velocities and quantities of stormwaters were selected and costed. Some tilled lands having severe topographical conditions and adverse soil types were recommended for conversion to grassland areas.

In 10 of the 12 basins the basic elements of information were integrated by one of the most sophisticated water quality models available, one based on the continuous simulation of meteorological, natural and manmade factors impacting on water quality and quality. Cost data for stormwater controls were developed from two staff papers: "Preventive and Corrective Measures for Controlling Agricultural Pollution" and "Preventive and Corrective Measures - Urban Stormwater Pollution."

It is recognized that effluent standards for point source discharges have been developed over the years to maintain water quality in receiving streams during low flows, and a body of literature backed by actual experience is available. However, PL 92-500 has introduced new facets, involving recreation, fish and wildlife enhancement. There are many unresolved issues which are begging solutions. With respect to recreational use, the fecal coliform counts formerly used to evaluate suitability for recreational purposes are now being challenged. With respect to fish, questions relating to the toxicity of ammonia have emerged since it is the un-ionized component which is toxic. Varying impacts under different pH values and temperatures have been determined under controlled conditions.

There is very little actual experience on the impacts of stormwater runoffs, on cause and effect relationships, and on the effectiveness of possible controls.

For these and other reasons, the Northeastern Illinois Planning Commission's 208 Areawide Water Quality Management Plan is considered to be very conservative in its recommendations.

The Commission believes that the emerging state-of-the-art in controlling non-point sources of pollutants, the total costs involved in attempting to meet the goals initially established by PL 92-500, and the general attitude of both the public and elected officials concerning relative priorities and public expenditures all coincided to confirm that only a pragmatic plan was acceptable. This is such a plan.

CHAPTER 1

Introduction

CHAPTER ONE
INTRODUCTION

1.01 PUBLIC LAW 92-500

This plan for reducing water pollution in northeastern Illinois has it origins in the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500), an ambitious law aimed at "restoring and maintaining the chemical, physical and biological integrity of the nation's waterways." (This Act was further amended in December 1977 by Public Law 95-217, also known as "The Clean Water Act.") One major feature of this PL 92-500 (Sections 101a(5) and 208) is the requirement that areawide plans be prepared for controlling water pollution, from all sources, in urban-industrial areas like northeastern Illinois. Officially, these plans are called Areawide Water Quality Management Plans.

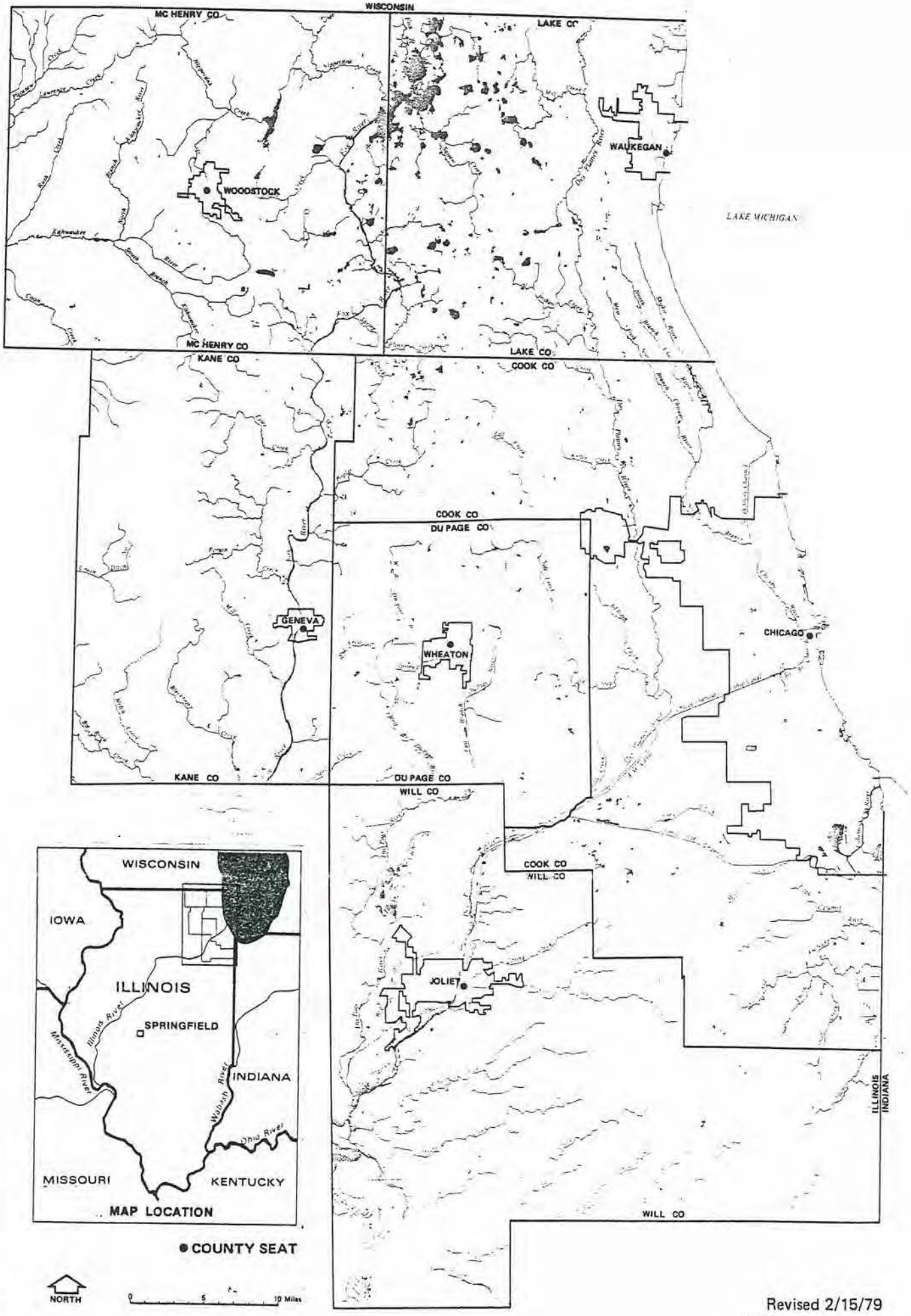
Authority for implementing Public Law 92-500 rests with the USEPA. Protection Agency (USEPA). Responsibility for preparing Section 208 plans, however, has been assigned to the states. In many cases, governors have delegated this responsibility to regional agencies. One such agency is the Northeastern Illinois Planning Commission, which sought and received designation in the spring of 1975 as the areawide planning agency for northeastern Illinois. With the designation, the Commission accepted responsibility for preparing an initial areawide clean water plan for Cook, DuPage, Kane, Lake, McHenry and Will counties. (See Figure 1-1) The Commission has been working toward this objective since the areawide planning effort officially began in July, 1975.

Public Law 92-500 sets a lofty target for the nation: desirable chemical, physical and biological conditions are to be restored and maintained in all groundwaters, rivers, streams, lakes and oceans. To move the nation toward this goal, Congress included several interim objectives in Public Law 92-500.

The interim objectives, particularly those setting effluent limitations were as ambitious as the law itself. For example, operators of major wastewater treatment systems - industries and local governments - were given difficult targets for upgrading their systems in line with available technology. Municipal treatment plants were required to have secondary treatment capabilities by 1977 and tertiary, or advanced, systems by 1983. Targets for industrial treatment systems were even more stringent.

As early as 1975, the National Commission on Water Quality (NCWQ), established to monitor Public Law 92-500, was reporting that the nation would need more time to reach some of the interim objectives. Top officials of the USEPA began expressing the same view in 1976, suggesting that the timetables were unrealistic. And late in 1977, some of the

FIGURE 1-1: MAP OF SIX COUNTY AREA



Revised 2/15/79

timetables were changed by Congress. For example, communities making reasonable, but thus far unsuccessful, efforts to meet the 1977 secondary treatment objectives were given until 1983. Extensions also were authorized for industrial dischargers. The 1985 objective, elimination of pollutant discharges, was retained but there is now general recognition that "zero discharge" will be difficult to achieve in this century, if at all.

The basic intent of Public Law 92-500 is sound, and it has been incorporated in goal of this areawide plan. Interim objectives, set by Public Law 92-500 and subsequent amendments, also have been incorporated. areawide plan. However, the Commission does not anticipate that all interim objectives will be attained in northeastern Illinois as quickly as national policy requires. The severity of the problems affecting some waterways, the magnitude of the resources that will be required to solve them, and the complexity of social, political and economic factors, all make it unlikely that the federal timetable will be met in this region.

Another point that should be recognized in reading and assessing this areawide plan is that the state of the art in water pollution control, in some respects, is not far advanced. A sophisticated and effective technology has been developed for the treatment of sewage, and for dealing with most other water quality problems that can be solved with "structural" solutions. This is not the case, however, with respect to such "nonpoint" sources as urban and agricultural stormwater runoff. At this point, it is not possible to offer one definitive strategy to the region for the control of pollution from nonpoint sources. There are uncertainties with respect to the causes and impacts of some pollutants known to come from nonpoint sources and there are disagreements, even among experts, as to the most effective strategies for controlling and eliminating these sources. With respect to cost-effectiveness and the overall economics of nonpoint source control, the state of the art is even less advanced.

This is not to say that the provisions of Public Law 92-500 or supporting federal regulations are in any sense "optional". As has been demonstrated in recent enforcement actions initiated by the USEPA Protection Agency and by the outcome of recent court decisions in the case of the City of Milwaukee and U. S. Steel Corporation, the standards set by Public Law 92-500 are enforceable.

The Commission is not counseling that northeastern Illinois be lax in its approach to water quality management. Water quality problems should not be avoided and the implementation of the strategies likely to evolve and improve in the future, should not be delayed.

1.02 SECTION 208

One component of the national water quality strategy laid out in Public Law 92-500 is planning. The law requires that plans for restoring and maintaining water quality be prepared at the local, areawide, state and interstate levels. Section 208 contains the principal discussion of areawide planning.

The required scope and contents of an areawide plan are discussed in more detail in a later section of this chapter. In general, however, an acceptable areawide plan should provide realistic strategies for solving most, if not all, of a region's water quality problems. In addition, governmental, political and financial processes for implementing these strategies should be outlined in detail. An areawide plan, in other words, should explain not only what needs to be done to control water pollution, it also should explain how it can be done and by whom and at what cost. That is the general intent of Section 208 and the Commission has strived to be consistent with that intent in preparing this plan.

1.03 RELATED ELEMENTS OF PUBLIC LAW 92-500

a. Section 101(e) - Public Participation

The involvement of a wide spectrum of the public in areawide planning, has been one of the central features of this plan. It is described in general at this point because an understanding of the public's role is part of the context in which the plan should be read, judged and implemented.

The Commission took seriously the mandate of Congress, as expressed in Section 101(e) of Public Law 92-500 and in the supporting directives of USEPA, that there be significant public participation in areawide planning. Even without such guidance, it was clear from the outset that an extraordinary participation effort would be needed in this region if an implementable plan were to be developed. Northeastern Illinois probably is as diverse culturally, and as complex politically, as any metropolitan area. To the extent that "implementability" means the reconciliation of fragmented and conflicting interests in support of the plan, the task of implementability is as formidable in northeastern Illinois as it is likely to be anywhere.

The Commission identified four segments of the public as essential participants in areawide planning: local governments, professionals and technicians in fields related to water quality, public and special interest organizations and concerned citizens. Efforts were made to involve all four of these "publics" at critical points throughout the planning period, beginning with the development of the original work program and continuing through the public hearing on the final draft of the areawide plan.

b. Section 201 - Local Facilities Planning

Prior to the start of areawide planning in this region, much activity in both the public and private sectors was being directed at controlling water pollution. Some of the most important efforts were underway at the local government level through "Local Facilities Planning," a program authorized in Section 201 of Public Law 92-500.

Under Section 201, local governments can receive federal assistance in planning, designing and constructing wastewater treatment systems. Federal grants are available for up to 75 percent of eligible costs. (PL 95-217 authorized 85 percent grants for innovations or alternative processes and techniques.) When 208 planning began in July, 1975, about 75 units of local government were already planning, designing, building or operating wastewater treatment systems under the provisions of Section 201.

The basic relationship between local facilities planning and areawide planning is specified in USEPA guidelines for areawide planning. The guidelines state that while the areawide plan is being prepared, all Section 201 planning already underway is to proceed. Neither ongoing local 201 plans nor funding schedules for previously approved local facilities are to be altered by the areawide plan. Even after USEPA approval of the initial areawide plan, all local facilities plans underway at the time of approval generally will be allowed to proceed. They will be subject to change only if the areawide plan demonstrates that changes would reduce costs or result in major improvements in environmental impact. After the areawide plan has been approved, however, all subsequent local facilities planning must conform to the areawide plan.

Although the Commission followed federal guidelines on local and areawide planning, the relationship between the two programs has been questioned frequently. Participants have expressed the view that one purpose of an areawide plan should be to question the merits of existing local plans, regardless of their status. In addition, current population forecasts for some local facilities planning areas are different than the actual forecasts used in past years for the preparation of local facilities plans. (The population forecast issue is critical to the relationships among local facilities plans, the areawide plan and other parts of the comprehensive regional planning program. See "Relationship to Comprehensive Planning" later in this chapter.)

The Commission held to the approach of incorporating existing local facilities plans as "givens" in the initial areawide plan. However, acceptance of local plans was done critically and each local plan, regardless of its status was carefully reviewed. Of particular concern, as indicated above, are differences between current population forecasts and the forecasts upon which individual local facilities plans are based.

In communities where no local facilities planning had been done, the Commission worked with consultants, local officials and citizens to prepare an abbreviated local facilities plan called a "Needs Analysis." Needs analyses have been incorporated into the areawide plan and also are discussed in the appropriate basin chapters in Part II.

c. Section 301 - Effluent Limitations

Much of the reassessment of Public Law 92-500 discussed earlier in this chapter focused on the requirements set forth in Section 201. Section 301 sets targets, expressed in terms of levels of treatment to be achieved by specific dates, for municipal and industrial wastewater treatment plants.

Public Law 92-500, as approved in 1972, set these targets, which generally have been referred to as the "interim objectives" of the act:

(1) PL 92-500 Requirements

(a) By July 1, 1977, point sources other than publicly-owned treatment plants (basically industrial dischargers), were to have the "best practicable control technology currently available" for the industry as determined by the administrator of the USEPA.

(b) By July 1, 1977, publicly-owned wastewater treatment plants were to have the "best practicable control technology" (interpreted to mean secondary treatment).

(c) By July 1, 1983, industrial dischargers were to have the "best available technology economically achievable."

(d) By July 1, 1983, publicly-owned works were to have the "best available technology" (interpreted to mean some form of advance waste treatment).

As indicated earlier in this chapter, success in meeting the interim objectives varied across the country, but generally was far less than necessary to comply with the required deadlines. Northeastern Illinois was in complete compliance with the secondary treatment objective for publicly-owned plants on July 1, 1977, for example, but nationwide several thousand plants were not in compliance.

(2) PL 95-217 Amendments

The interim objectives were a primary focus of the evaluation and reconsideration of Public Law 92-500 that led to its amendment by PL 95-217 (the Clean Water Act of 1977) late in 1977. The amendments included these changes:

(a) The deadline for industrial plants to have "best practicable control technology" was extended, providing certain conditions are met, to April, 1979.

(b) The secondary treatment deadline for publicly-owned plants was extended to July 1, 1983, if federal funds have not been made available or if construction cannot be completed. Industries which planned to tie into these facilities have also had their deadlines extended.

(c) The original July 1, 1983 deadline for "best available technology" by industrial discharges was extended to different degrees for different discharges. Such technology must be applied to conventional and toxic discharges by July 1, 1984; 1987 for "nonconventional nontoxic" discharges.

(d) Section 306, entitled "National Standards Performance", requires all new industrial dischargers of the 27 listed industrial categories to meet New Source Performance Standards" (NSPS) based on Best Available Demonstrated Control Technology (BDCT).

One of the stated intentions of this areawide plan (See Chapter Two) is compliance with all limitations set in Section 301 or its amendments.

d. Section 303 - Statewide Planning

Another element of Public Law 92-500 that is related to areawide planning is Section 303. This requires states to conduct continuing water quality planning in addition to their other responsibilities for water pollution monitoring and control. Planning under Section 303 is based on major river basins lying partly or entirely within a state.

Areawide plans are required to be consistent with basin plans prepared at the state or interstate level. One function of areawide planning, however, is to test the social and economic feasibility of water quality standards established in state plans. Areawide plans can propose revisions to these standards where appropriate.

Basin planning in Illinois had proceeded through Phase One of the program and a series of background reports had been completed when areawide planning began in northeastern Illinois. Continued planning by the Illinois Environmental Protection Agency EPA under Section 303 was supplanted, in a sense, by the statewide 208 planning program started in 1976. This resulted from a Federal court order, Natural Resources Defense Council v. Train, (D.C.D.C. 1975) 396 F. Supp 1386. The areawide plan for northeastern Illinois, one of three designated areas in Illinois, will become an element of the state 208 plan as part of state compliance with Public Law 92-500.

e. Section 402 - National Pollutant Discharge Elimination System

An important element of any water quality plan for an urban-industrial area is an effective system for controlling the quality of effluent from industrial and municipal wastewater treatment plants and other point sources. Such a system is provided by the National Pollutant Discharge Elimination System (NPDES). This system, covered by Section 402 of the Act, requires the operator of any point source of pollution discharging wastes into a navigable waterway, to obtain a permit. In Illinois, the IEPA is the permit authority. To qualify for an NPDES permit, the discharger must satisfy the permit authority that its effluent will not violate water quality standards for the receiving stream. It is possible for an interim permit to be granted when effluent quality is unsatisfactory, provided the discharger has agreed to a schedule for bringing effluent quality up to standard.

NPDES permits are the primary enforcement tools available for controlling point source pollution and are a major component of the point source strategies outlined in this plan.

a. USEPA Guidelines: Emphasis 1.04 CONTENTS OF AREAWIDE WATER QUALITY MANAGEMENT PLANS

In the course of the 208 planning program, the USEPA has issued a number of regulations, guidelines and memoranda. As the USEPA has gained more experience and sharpened its own perceptions, additional guidance has come from both formal and informal sources. In the course of over three years, the Commission has developed an understanding of the requirements and expectations inherent in its responsibilities as an areawide planning agency. The Commission has perceived the points of emphasis discussed below as those that are of primary concern to USEPA, and has conducted planning activities accordingly. In all cases, the Commission's own concerns and priorities as a regional planning agency are consistent with USEPA's.

(1) Implementability. USEPA wants planning agencies to produce plans that are implementable. Plans also are to be cost-effective as well as politically acceptable. In line with these objectives, Section 208 requires planning to go beyond the development of technical solutions for water quality problems and consider how solutions can be put into action.

(2) Integrated planning. In order to improve chances of implementation, 208 plans must have two integrated components: a technical element and a management element.

In its technical component, an areawide plan will resemble most other plans, identifying problems, establishing goals and objectives, examining alternatives and recommending solutions. But, the plan also must contain a second element, a management system which specifies who will take the action necessary to deal with pollution problems, how much it will cost and where the money will come from.

(3) Comprehensiveness. Section 208 requires that all significant water quality problems be addressed in a single plan. The plan must outline strategies (technical and management) for eliminating pollution from both point and nonpoint pollution sources, for protecting groundwater, and for disposing of residual wastes.

(4) Continuing Planning. The initial areawide plan must establish a continuing planning process which provides for regular evaluation and updating of the plan itself and also for an ongoing assessment of progress toward implementation.

(5) Local Involvement. USEPA sees Section 208 as an opportunity for local governments to solve their own water quality problems. As one senior USEPA official told the Commission's 208 Steering Committee in 1976: "...federal regulations emphasize that these (208) plans are local ones, that they be put together by local people, that they be managed by local people for their own future."

(6) Public Participation. Not only is the USEPA concerned that units of local government within the planning area be given an opportunity to help shape the plan, the Agency also emphasizes the participation of environmentalists, representatives of public and special interest groups, members of related technical professions and other concerned citizens. Participation is to be part of the development and adoption of the initial plan and also part of the continuing planning program.

(7) Innovation. Although billions of dollars have been committed to the construction of wastewater treatment plants and other "structural" solutions to water quality problems, USEPA views Section 208 as an opportunity to explore what might be viewed as innovative and more comprehensive solutions to water quality problems. With cost-effectiveness as the guiding principle, and within the constraints of existing local facilities plans, areawide planning agencies are required to explore "nonstructural" clean water strategies. An example of such a strategy would be the use of treated effluent or residual wastes as agricultural fertilizers. Along the same lines, USEPA is looking to areawide plans for improved management systems that in themselves might represent more cost-effective approaches to controlling water pollution.

(8) Institutional Arrangements. Although implementation and management are emphasized, USEPA is not looking to Section 208 "...as the mechanism to reorganize state and local government." The USEPA approach to the institutional or management aspect of planning is that each level of government - local, state and federal - has a role in planning and implementation. Increased cooperation and coordination among local governments, and between local and state governments is viewed as essential. However, "radical changes in traditional authorities and relationships are not required...water quality management arrangements should be feasible and practical extensions of existing institutional situations." This approach has been stressed in the management implementation programs proposed in this plan.

(9) Land Use and Development. While it is not the intent of Section 208 to usurp local authority over growth and development policies (according to USEPA), land use control is seen as an essential ingredient in the water quality management program. Plans are required to explore the relationships between land use and water quality and they also should recommend land use controls that local governments can use in achieving water quality goals. Whenever possible, existing land use plans should be reflected in the areawide clean water plan, although these plans may have to be updated to reflect adequate concern for water quality.

b. Scope

According to Section 208 and USEPA guidelines, a completed plan must include these major features:

1. Identification of anticipated municipal and industrial treatment works to be constructive over a 20-year period. The inventory is to include analysis of alternative treatment methods and the necessary wastewater collection and urban stormwater runoff systems.
2. Establishment of construction priorities and time schedules for treatment works expected during the five-year period following the approval of the 208 Plan.
3. Establishment of a regulatory program to implement the waste treatment management requirements of Section 201(c) of PL 92-500. Regulate the location, modification, or construction of any facilities in the area which result in discharges. And, ensure adequate pretreatment of industrial or commercial wastes introduced into any treatment works.
4. Identification of nonpoint sources of pollution related to urban runoff, agriculture, silviculture, subsurface excavations, mining, construction and hydrologic modifications, and identification of procedures and methods (both structural and

nonstructural) to control these sources to the extent possible.

5. Identification of problems which cannot be solved at the present time because of budgetary or time limitations or other constraints.

6. Methods to dispose of residual wastes in a manner which will protect ground and surface water quality.

7. Identification of measures to carry out the plan, together with an analysis of the measures' costs, financing, and time requirements.

8. An analysis of the economic, social, and environmental impacts of the plan.

9. Identification of the organizational structure to implement the plan, including recommendations regarding the management agencies necessary to construct, operate and maintain the facilities required by the plan.

10. Certification confirming consistency with other plans and confirming public participation in the planning and plan adoption process.

11. Comments and recommendations made by appropriate local governing bodies on the initial plan.

12. A program describing the continuing planning process for reviewing and updating the initial plan and for monitoring progress in implementing the plan, including the nature of the work required, the agencies to perform the work, the staffing, costs and sources of funding.

1.05 AREAWIDE PLANNING IN NORTHEASTERN ILLINOIS

a. The Commission's Planning Program

Since it began in 1975, 208 planning has been the largest element of the regional planning program. Greater resources have been committed to this project than to any other in the 21-year history of the Commission.

Because of the magnitude, complexity and potential for political and environmental controversy that was perceived in areawide planning, the Commission sought maximum involvement of institutions and individuals outside the Commission. Not only was a large public participation program attempted, much of the technical work on the project was conducted by other governmental agencies, consulting firms and individual experts from throughout the country.

Another basic concept of the planning program is that it has been organized around the major drainage basins that lie entirely, or partly, within the six-county planning area (See Figure 1-2 and Table 1-1).

The scope of the project also made organizational changes necessary within the Commission at both the staff and Commission levels. Responsibility for providing policy guidance for the project was assigned by the Commission to a new standing committee, called the 208 Steering Committee.

FIGURE 1-2: MAP OF DRAINAGE BASINS IN NORTHEASTERN ILLINOIS

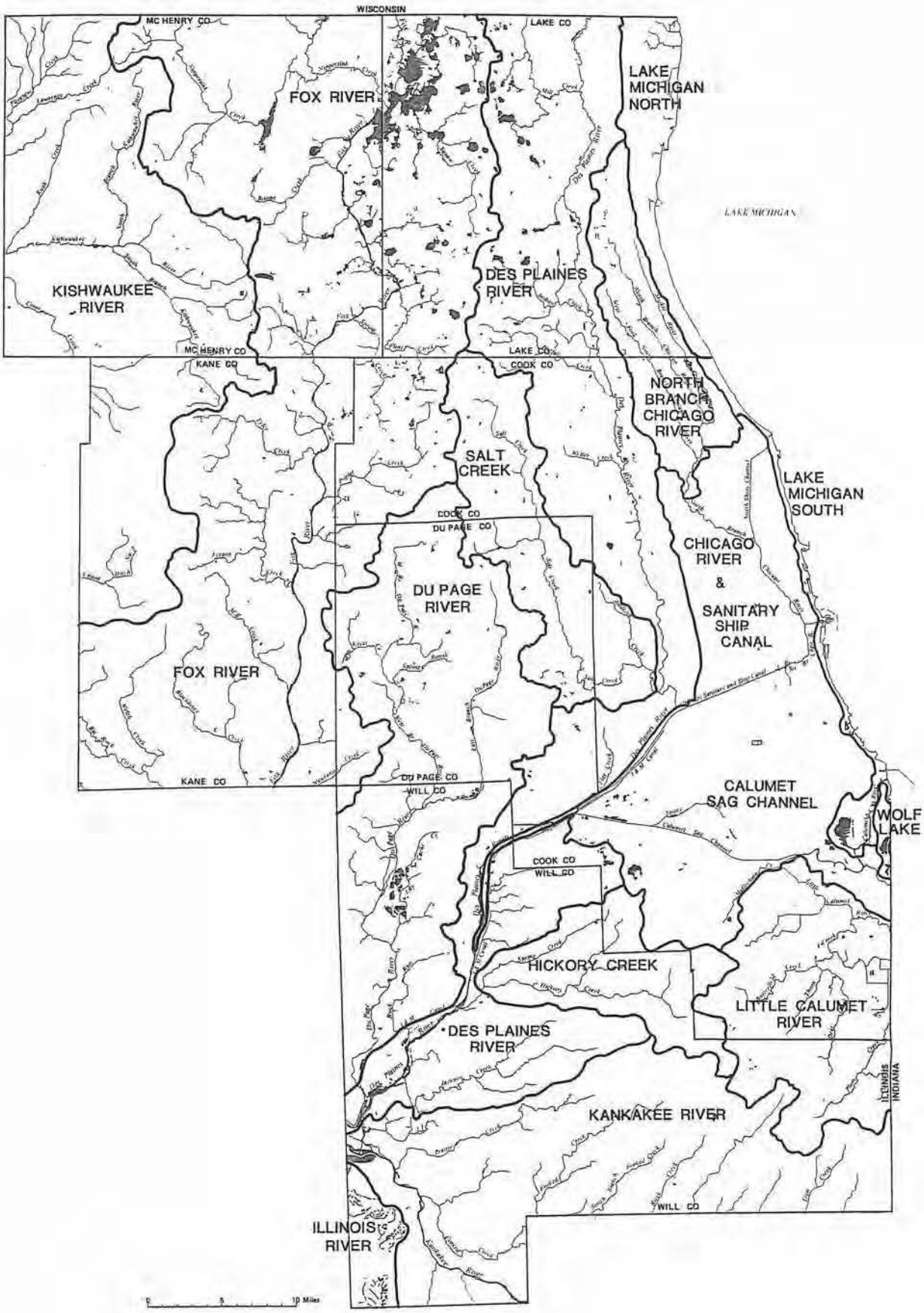


TABLE 1-1: DRAINAGE BASIN CHARACTERISTICS

Basin	Counties Involved	Area (sq.mi.)	Tributary Basins	Tributary To:
Chicago Sanitary and Ship Canal	Cook, Will	422	Little Calumet, North Branch Chicago River	Lower Des Plaines
Du Page River	Cook, Du Page, Will	324		Lower Des Plaines
Fox River	Cook, Du Page, Kane Lake, McHenry	918		Illinois River
Hickory Creek	Cook, Will	102		Lower Des Plaines
Kankakee River	Will	371		Illinois River
Kishwaukee River	McHenry, Kane	424		Rock River
Lake Michigan North	Lake	59		Lake Michigan
Lake Michigan South	Cook	17		Lake Michigan
Lower Des Plaines River	Cook, Du Page, Will	261	CS & SC, Upper Des Plaines, Hickory Creek, Du Page	Illinois River
Little Calumet River	Cook, Will	171		Chicago Sanitary and Ship Canal
North Branch Chicago River	Cook, Lake	93		Chicago Sanitary and Ship Canal
Salt Creek	Cook, Du Page, Lake	134		Upper Des Plaines
Upper Des Plaines River	Cook, Du Page, Lake	361	Salt Creek	Lower Des Plaines

R Jan. 4/79

This committee generally met twice monthly and prepared regular reports on the progress of the project for the Commission. Most members of the Steering Committee also have taken an active role in field activities in connection with areawide planning. Some have served on "Local Steering Committees" established in each of the six counties. More details on the committee structure for the project is provided in the discussion of public participation in the supplemental materials.

At the staff level, the Commission reorganized its permanent staff and added new staff members whose skills were required for the development of the areawide plan. The consulting executive director of the Commission was made project manager and the Commission's chief engineer was named technical director. Senior personnel also were

assigned lead roles in management planning, field activities and public participation.

b. Relationship to Comprehensive Planning

The Commission has regarded areawide clean water planning as part of the ongoing regional planning effort for which the Commission was given a mandate by the Illinois General Assembly in 1957 (See Table 1-2). The areawide plan will be a "functional element" of the Comprehensive General Plan for Northeastern Illinois (CGP).

As an element of the CGP, the 208 plan will become an important tool that can be used by the Commission and by local and county governments in making decisions that affect water quality. The 208 plan also will serve as the standard against which the Commission, as the official "metropolitan clearinghouse" for the region, can assess the water quality impacts of projects for which federal grants are sought by local governments or other institutions. As a metropolitan clearinghouse, the Commission is responsible for submitting an advisory opinion on all grant applications of regional significance, in accordance with the provisions of Circular A-95 of the Federal Office of Management and Budget.

The areawide plan replaces the Regional Wastewater Plan adopted in 1971 (and updated periodically) as the water quality component of the CGP. Furthermore, federal water quality policies and federal policies for planning in land use and related areas stress the need for compatible and mutually supporting water quality and comprehensive planning programs. Such a relationship is a stated objective of this plan. Full integration of the areawide plan into the comprehensive planning program will take place during the continuing planning process.

One method of encouraging consistent planning in all areas is to use the same forecasts in all plans. In general, this areawide plan is based on population forecasts approved by the Commission in 1976, the same forecasts on which all elements of the CGP are based. These forecasts, prepared for the region in coordination with local governments, have been used to develop forecasts of land use, land cover, wasteloads and factors necessary to the water quality planning effort.

At about the time that 1976 population forecasts were being questioned, the Commission began to address another issue of significance to the areawide clean water plan - urban growth management. Concerned by evidence that many older urban and suburban communities were declining while outlying suburbs were experiencing rapid growth, the Commission began to examine some of the basic assumptions and policies of the CGP. The underlying concern is that current trends toward dispersal with declining population and employment opportunities in older urban communities with growth and expansion in outlying suburbs, may not be in the

TABLE 1-2: ELEMENTS OF THE COMPREHENSIVE GENERAL PLAN FOR NORTHEASTERN ILLINOIS

COMPREHENSIVE GENERAL PLAN

Approved 1968, Updated in 1976 and 1977

FUNCTIONAL PLANS

Regional Wastewater Plan
Approved 1971, Updated 1974, Amended Periodically

Regional Open Space Plan
Approved 1971, Scheduled to be Updated 1978-1979

1995 Transportation System Plan
Approved 1974, Year 2000 Plan in Preparation

Regional Overbank Flooding and Stormwater Drainage Plan
Approved 1976

Regional Solid Waste Management Policy Plan
Approved 1976

Regional Water Supply Plan
Approved 1978

Regional Land Use Policy Plan
Approved 1978

Regional Residential Policy Plan
Approved 1978

Areawide Water Quality Management Plan
Scheduled for Approval in 1979

R Jan. 4/79

best long-term interests of the region as a whole. As a result, planning policies were revised in June, 1978 in order to place greater emphasis on the conservation of existing neighborhoods and communities.

Assuming that such a policy shift will have implications for the way federal and state resources are allocated in the region, local facilities plans that call for large capital investments to serve newly developed areas probably would warrant re-examination.

Although these matters are far from resolved, they have raised some new concerns in areawide planning and heightened

concern for an issue that already was somewhat troublesome: the validity of the population forecasts and other assumptions in local facilities planning.

As indicated earlier, the Commission has accepted ongoing local facilities plans as given; they are reviewed, but not changed, in this initial areawide plan. However, the Commission believes that local facilities plans should receive considerable attention in the early stages of the continuing planning program. This attention should focus on recent population forecasts, on new urban growth strategies and on any other evidence that may suggest changes in the phasing of construction, design capacities and other elements of local plans. Other aspects of this plan that would influence, or be influenced by a shift in the region's philosophy on urban growth management, also need to be monitored closely in the continuing planning program. Processes by which these concerns can be addressed after certification of the initial areawide plan are described in Chapter Ten.

CHAPTER 2

Framework for Planning

CHAPTER TWO
A FRAMEWORK FOR PLANNING

2.01 INTRODUCTION

The purpose of this plan is the elimination of water pollution in northeastern Illinois wherever it is possible to do so. Pursuant to this, a number of goals and objectives have been developed.

Goals represent ultimate aspirations toward which management actions are directed. They describe an end state to be strived for, even though not necessarily attainable. Goals will be attained, if at all, only through the development and implementation of realistic and effective plans. Even then, steady improvement in water quality, not a dramatic turn-around, is the best that the people of northeastern Illinois should expect as a result of this plan. The process of cleaning up the region's rivers and streams will be long and gradual.

To provide guidance for such a process, goals need to be supported by objectives, both in water quality and in related areas. Objectives set the targets that must be achieved in pursuit of the goals. Objectives also provide mileposts against which progress can be measured over time.

In establishing goals and objectives for clean water planning, this Commission drew from several sources:

a. Federal laws and policies, primarily Public Law 92-500, as amended, and related regulations and guidelines,

b. State laws and policies, including the State of Illinois Environmental Protection Act, rules and regulations of the Illinois Pollution Control Board (IPCB) and policies of the Illinois Environmental Protection Agency (IEPA),

c. Regional plans and policies as expressed in the Comprehensive General Plan (CGP) and supporting functional plans,

d. Aspirations of the prople of the region, as reflected in local documents or suggestions from participating public officials, technicians and other citizens.

The result is a framework that integrates a variety of authorities and concerns and provides some insurance that this plan will be compatible with other plans that affect the region. This framework also recognizes that areawide water quality management planning is not a single-purpose program. It will affect more than water quality, creating impacts on institutional arrangements, land use, development, taxation, governmental financing, the economy, recreation, culture and aesthetics, not to mention the basic quality of life.

2.02 GOALS

a. Restoration and maintenance of the chemical, physical and biological integrity of the region's waters.[1]

b. Elimination, by 1985, of all pollutant discharges into the region's waterways.[2]

c. Water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for human recreation wherever attainable, by July 1, 1983.[3]

d. Elimination of all discharges of wastes or pollutants into Lake Michigan.[4]

2.03 OBJECTIVES

a. Maintenance of present levels of quality in all waterways in which water quality is better than state standards, in accordance with the IPCB's Chapter 3, Rule 208.[5]

b. Elimination of all discharges of toxic pollutants in toxic amounts.[6]

c. Compliance with appropriate effluent standards established by the USEPA and the State of Illinois, as soon as it is technologically and financially possible to achieve compliance until recommendations for changes are developed in the course of 208 planning efforts.

d. Compliance, with in-stream water quality standards of the State of Illinois, except that for dissolved oxygen, a temporary standard be authorized accepting 5.0 mg/l for 95 percent of the time in water bodies classified for General Use.

e. Compliance, in all underground waters, with Illinois standards for General Use and Public Food Processing Water Supplies, except where standards are violated as a result of natural conditions.[7]

f. Reduction of urban and rural stormwater runoff, and pollution carried into waterways by runoff, by all practical means.

g. Provision of Best Management Practices for all nonpoint sources of pollution according to the implementation schedules recommended in this Plan.

h. Introduction of wastes into wastewater systems only when such wastes can be adequately treated without adversely affecting the systems.[8]

i. Reduction, by all practical means, of wastewater volumes in the region.[9]

j. Cost-effective operation of all technical and management components of the region's wastewater system.

k. Regionalization of wastewater treatment systems wherever economies of scale can be achieved and

benefits of regionalization outweigh negative impacts.[10]

l. Assignment of costs for wastewater collection and treatment primarily to those generating the need for such service.[11]

m. Assignment of management and implementation responsibilities to general purpose units of local government, wherever possible, in order to insure maximum accountability to the electorate.

n. Participation of all implementing agencies, directly or by representative, in the continuing development of areawide policies for water quality management.

o. Reliance on local governments to implement the plan, with state or federal sanctions to be imposed only when local governments fail to meet their responsibilities as primary management agencies.

21. Equitable assignment of all costs for water pollution control.

q. Basinwide consistency in: regulatory and performance standards for water water quality; performance under these standards; and enforcement of these standards.

r. Consideration, in all decisions on water quality planning and implementation, of environmental impacts of proposed actions.

s. Reduction, to a minimum, of adverse environmental impacts that cannot be avoided as a result of the implementation of this areawide plan.

t. Compatibility among local, county, areawide and state plans for air, water, land and other resources.

u. Incorporation of uniform forecasts of population, employment and land use, based on the CGP, into areawide clean water planning and all other elements of the regional planning program.

v. Consistency, in areawide planning and implementation with the CGP and supporting functional plans of the Northeastern Illinois Planning Commission.

w. Flexibility in the water quality management system sufficient to respond to changing conditions, problems and opportunities.

x. Adequate funding for implementation of the areawide plan and for the continuing planning program established by the plan.

y. Citizen involvement in continuing planning for water quality management.

Chapter Two - References 153

1. Public Law 92-500, "Federal Water Pollution Control Act, As Amended," (33 U.S.C. 466 et. seq.), Section 101(a). 155
2. Ibid., Section 101(a)(1). 158
3. Ibid. Section 101(a)(2). 161

4.	Resolution of the Board of Commissioners, Metropolitan Sanitary District of Greater Chicago, February 20, 1975.	163 164
5.	Illinois Pollution Control Board, "Rules and Regulations," Chapter 3, Rule 208.	166 167
6.	Public Law 92-500, Section 101(a)(3).	169
7.	Illinois Pollution Control Board, Chapter 3, Rule 207.	172
8.	Northeastern Illinois Planning Commission, "Regional Wastewater Plan, Chicago, 1974.	175
9.	Ibid.	177
10.	U.S. Environmental Protection Agency, "Draft Guidelines for Areawide Waste Treatment Management Planning," Washington, D.C., February, 1976.	179 180
11.	Public Law 92-500, Section 204(b).	182

CHAPTER 3

Description of the Region

CHAPTER THREE
DESCRIPTION OF THE REGION

This chapter provides an overview of the physical and socio-economic characteristics of northeastern Illinois. Emphasis is on characteristics that influence water quality or efforts to control water pollution.

In treating aspects of the region that are by nature changeable (population, for example, as opposed to climate) both current conditions and forecasted conditions for the Year 2000 are discussed. Forecasts, as discussed in Chapter One, are a necessary component of this plan because the conditions under which the water quality management program will be implemented are not the same as conditions today. Forecasts relating to population, land use and the region's economy are of particular importance because these factors will determine the amount, location and composition of wastewater flows to be dealt with in the future.

The perspective in this chapter is areawide. In cases where the unique characteristics of a basin are important, an expanded discussion will be found in the appropriate basin chapter.

3.01 PHYSICAL CHARACTERISTICS

a. Geography

This plan covers 3,740 square miles in northeastern Illinois. Included are all of Cook, DuPage, Kane, Lake, McHenry and Will counties. The region is bordered by Wisconsin on the north and Indiana on the east. It includes all of the Illinois shoreline of Lake Michigan.

Aside from the Lake and its shoreline, the region is not known for any spectacular physical features but it has certain natural characteristics that are varied and interesting.

Along Lake Michigan, running from Indiana to Winnetka (about 8 miles north of Chicago) and extending about 15 miles inland, is a low plain known as the Chicago Lake Plain Area. The plain is broken only by a few low ridges, one of which serves as a "continental divide" between the Great Lakes and the Mississippi River drainage basins. Its effect has been altered by urbanization, however, and by a system of channels, locks and dams built in the late 19th Century to reverse the flow of the Chicago River. The river once flowed into Lake Michigan (carrying sewage into Chicago's water supply) but now flows to the west into the Chicago Sanitary and Ship Canal and eventually into the Mississippi.

The shoreline plain is bordered by a large crescent-shaped area that includes rolling hills, broad ridges, lakes, swamps and wetlands. It is higher than the shoreline

plain, with frequent elevations above 900 feet (the elevation at the Lakefront is 580 feet).

Farther to the west is the Fox River Valley, which runs north to south, generally following the boundary between Lake and McHenry counties and then the boundary between Kane and DuPage counties. In and beyond the Fox Valley is most of the region's remaining farmland, some of it among the best in the nation. Prime agricultural lands also are found in southern Will County in the Kankakee River Basin and in areas of western McHenry and Kane counties drained by the Kishwaukee River. East of the Fox River the soils are equally good, but more and more farms are being converted to commercial and residential development.

b. Waterways

Most of northeastern Illinois lies in one of two river systems, the Des Plaines or the Fox, both of which are part of the Illinois River system. The Illinois begins about five miles west of the Will County's western border, at the confluence of the Des Plaines and Kankakee rivers, the latter of which flows into Illinois from Indiana and drains southern Will County. At Ottawa, the Illinois River is joined by the Fox. At that point, more than 80 percent of the water in the river has come from the six counties of northeastern Illinois.

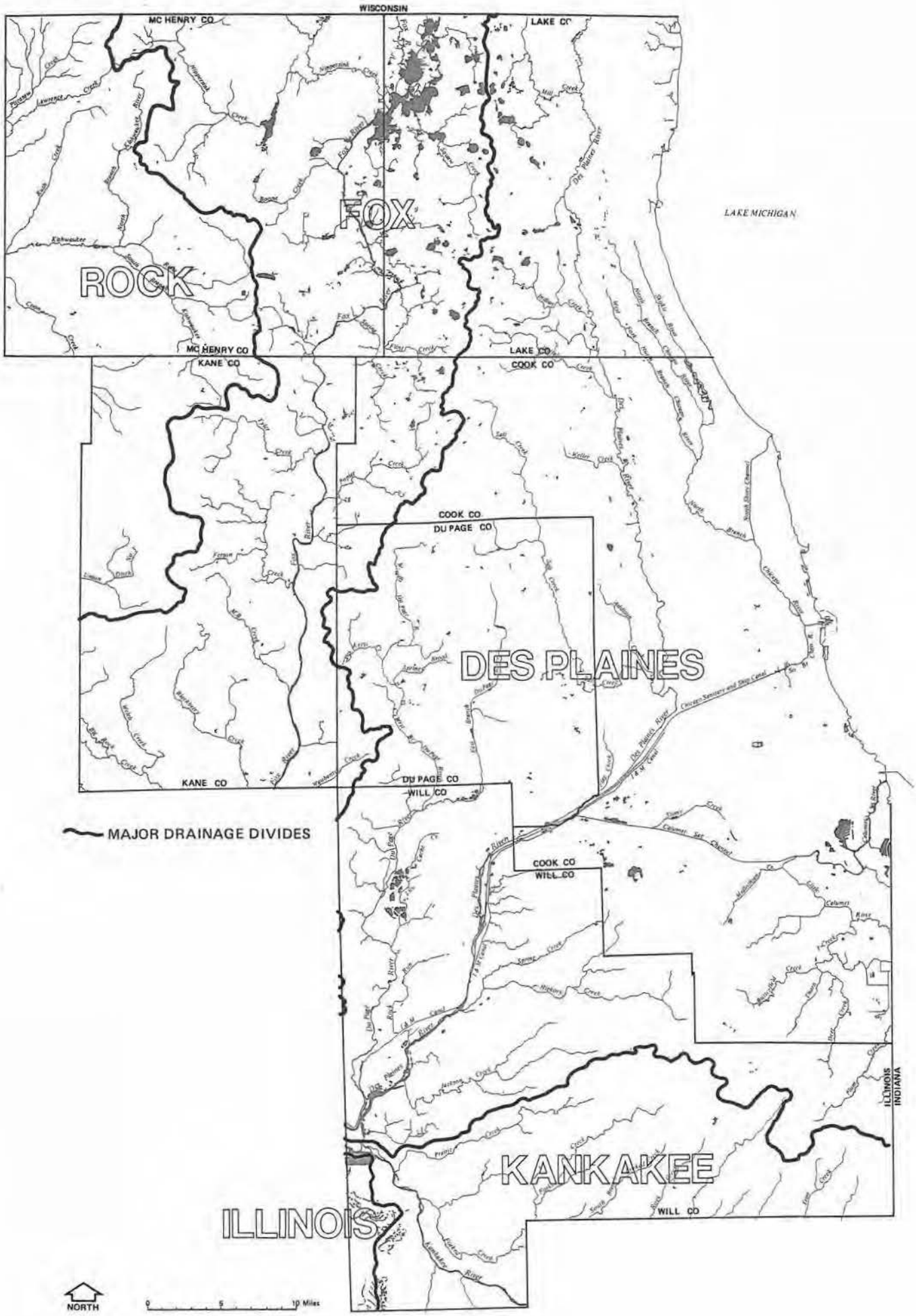
The Des Plaines and the Fox, and their tributaries, account for the bulk of the six-county network of waterways that includes 838 miles of streams and more than 36,000 acres of inland water surfaces.

The Fox is one of only three major streams in northeastern Illinois that do not flow into the DesPlaines within the boundaries of the areawide planning area. The others are the Kankakee, which meets the DesPlaines west of Will County, and the Kishwaukee, which drains western McHenry and Kane counties and eventually flows into the Rock River near Rockford, Illinois.

The other major waterways in the region (Salt Creek, Hickory Creek, DuPage River, Little Calumet River, North Branch of the Chicago River and the system composed of the Chicago River, South Branch of the Chicago River, Cal-Sag Channel, and the Sanitary and Ship Canal) all join the Des Plaines before it leaves the region.

Originally, two fairly large areas of the region drained into Lake Michigan: about 68 square miles north of Chicago and nearly 300 square miles on the south side of Chicago. A system of waterways, locks and dams has reversed the flow from most of this area so that now only small areas along the lakefront in Lake County, northern Cook County, intermittent points along the Chicago shoreline, and the Lake Calumet-Calumet River area actually contribute drainage to the Lake.

FIGURE 3-1: MAJOR WATERWAYS IN NORTHEASTERN ILLINOIS



Because so little of the region actually drains into Lake Michigan, the Lake has not dominated 208 planning. Problems with respect to the Lake are discussed and strategies are advanced for protecting the Lake as the region's primary natural resource, but areawide planning has focused primarily on inland waterways.

Drainage patterns associated with inland waterways are poorly defined in some parts of the region, particularly in the easternmost sections of the Chicago Lake Plain Area. There, urbanization, channelization and the reversal of the Chicago River have created a distortion of original natural patterns that already were complicated because of the flat terrain.

The overall flat topography of the region causes many streams to be slow-moving and even sluggish by nature. Intermittent small waterways that flow only during and after storm events are not uncommon.

Many major waterways have been channelized to some degree. Several streams are also dammed at intervals by structures that are either remnants of 19th Century mill technology or, more commonly, protection against overbank flooding. Major structures are found along the Des Plaines and the Fox, with the McHenry Dam on the Fox probably the single most significant in the region because of its importance to the "Chain of Lakes" recreational area.

Another aspect of the region's waterways that is important to areawide planning is that the headwaters for the major streams are in other states. The Fox, DesPlaines, and a part of the Kishwaukee originate in southern Wisconsin; the Kankakee and the Little Calumet originate in Indiana. As will be seen in the discussions of specific problems in these basins, significant quantities of pollutants in each of these streams, except the Kishwaukee, are generated in the states of origin.

There is great variance in the extent to which waterways are viewed as significant natural assets by the citizens of northeastern Illinois. Certainly Lake Michigan is a popular resource, recreationally and aesthetically; it also is the source of water supply for Chicago and 91 suburbs. The Fox River and the "Chain of Lakes" that has been created along its course in Lake and McHenry counties also are regarded as major recreational and scenic assets. In Cook County, and to a lesser extent in other counties, waterways and their accompanying floodplains form the basis for extensive networks of public open space, generally held by forest preserve districts. In Lake and McHenry counties, there are many subdivisions and communities built around small lakes, and, although water quality in some of these lakes has deteriorated, most are used regularly by residents for swimming, fishing and boating. Portions of the Little Calumet River, although seriously polluted, is a haven for powerboats, as are parts of the lower DesPlaines River.

In contrast to these situations, stretches of other waterways seem almost to go unnoticed by those who live near

them. Parts of the DuPage River, Salt Creek, North Branch of the Chicago River and other smaller streams suffer from anonymity. One reason undoubtedly is poor water quality, another is that land along these streams is generally privately-owned and heavily developed. It probably is safe to say that the northeastern Illinois residents who view streams like the Chicago River, the DesPlaines and the Little Calumet as eyesores outnumber those who regard such waterways as potential aesthetic and recreational assets.

c. Geology

Geology is of great importance to water quality planning in the region. Such basic features as underlying rock formations, the types of deposits found within the first few hundred feet of the surface, and the characteristics of the various soils in the region contribute to natural water quality conditions. Geologic features also determine the potential for harm to water quality as a result of certain types of activities, and affect the degree to which some pollution control strategies are possible.

Geology is a reflection of the physical environments that have existed in the region over millions of years. Of particular importance are the effects of events during the past 20,000 years, when most of the surficial materials lying between the overlying soils and the underlying bedrock were deposited. The glaciers that traveled periodically down what is now the Lake Michigan bed, retreating for the last time between 10,000 and 15,000 years ago, were responsible for many of the deposits found today.

Glacial and postglacial materials range in thickness from a few feet in the lower Des Plaines River Valley to more than 470 feet in the northwest corner of McHenry County where the highest elevations in the region are found.

The most abundant glacial deposit in northeastern Illinois is till, unsorted debris deposited by glacial ice. It generally consists of pebbles, cobbles and large boulders embedded in a matrix of clay, silt and sand.

Another common deposit is outwash. It consists of sorted and stratified sediment that was deposited not directly by glacial ice but by the large volumes of meltwater generated when the last glacier retreated.

Also common to the region are partially-sorted deposits called ablation drifts, which are generally found above till deposits. These include materials that were moved and sorted to some degree by meltwaters but not as extensively as outwash. Ablation drifts may resemble till, in that they contain poorly-sorted sand and gravel, but they contain less clay and are less dense than till.

Throughout the region there are fine-textured deposits of clay and silt, called lacustrine sediments, which were deposited at the bottoms or along the shorelines of glacial

ponds and lakes. In cases where these lakes were surrounded by till plains left in the wake of a glacial retreat, the lacustrine deposits today are found accompanied by till deposits.

Some sediments deposited in the region during glacial and postglacial periods were carried not by ice or water but by wind. Windblown sand from glacial outwash, for example, created sand dunes, especially along portions of what is now the Lake Michigan shore. More common to the region, however, are widespread deposits of windblown silt, sometimes with minor amounts of clay, known as loess.

Other postglacial materials, primarily the deposits of modern lakes and rivers, contain large amounts of organic materials along with fine and coarse sediments. Muck and peat deposits are examples.

Each type of surficial deposit in the region has some characteristics that are of potential significance to water quality.

Till, for example, is relatively impermeable. Moisture tends not to infiltrate but to run off, which means there is a risk of runoff-carried pollution to nearby surface waterways when wastes, fertilizers or certain agri-chemicals are applied above till deposits. These tendencies would be aggravated in areas where till deposits are found in combination with sloping terrain. Till deposits also tend to make an area unsuitable for septic systems because septic effluents are unable to infiltrate the impermeable deposits.

Septic systems and landfill operations also should be restricted above some of the ablation drift deposits because of the highly permeable nature of the sand and gravel these deposits contain. There is little risk that wastes will be carried off by surface runoff but there can be a risk that wastes will infiltrate groundwater supplies.

As part of its research for areawide planning, the Commission contracted with the Illinois State Geological Survey for an analysis, which included detailed maps, of the water quality significance of the surficial geology of the region. The interpretive maps evaluate such things as the suitability of areas for septic tank usage, deposition of wastewater effluents, and disposal of other waste materials.

d. Soils

Also of importance, as indicated by the above discussion, are soils, the materials within about six feet of the earth's surface. Soils also vary in permeability and are a factor in determining whether certain practices represent a hazard to surface or ground waters. Analysis of soil conditions needs to go a step beyond analysis of surficial geology, however, because soil particles themselves can be a pollutant. Sediment, in fact, is the greatest single pollutant of the nation's rivers and streams.

Not only can soil particles be carried into waterways, but some particles have qualities which tend to make them transporters of certain organic and chemical pollutants.

Table 3-1 lists the soil types found most frequently in northeastern Illinois and describes the qualities of each soil type that could have impacts for water quality.

e. Critical Environmental Areas

Although northeastern Illinois is populous and highly urbanized, the region retains several natural features that warrant special attention in long-range planning. The Commission refers to areas where such features are found as "critical environmental areas" and gives high priority in regional policies and plans to protecting and preserving them.

Certain areas have been placed in the "critical environmental" category because they contain sensitive environments. Included are: wetlands, groundwater recharge areas, forests, prairies, ravines, bluffs and areas that provide wildlife habitat.

Other areas are designated as "critical" because they represent potential environmental hazards. Included are flood plains and areas prone to serious soil erosion.

The term "critical environmental area" also is used by the Commission to focus attention on the valuable natural resources of the region, including waterways, reservoirs and potential reservoir sites, deposits of mineral resources and prime agricultural lands.

The consideration each area should receive in water quality planning varies according to the features and the location of the area. The Commission's objective in preparing this plan has been to achieve water quality objectives in ways that are compatible with the protection of critical environmental areas.

f. Climate

Climate has fundamental effects on water quality. Precipitation, temperature, solar radiation and cloud cover exert a variety of influences on waterways, ranging from the basic relationship of water levels and flows to rainfall, to the more complicated relationship between sunlight and the biological constituents of a stream.

The climate of northeastern Illinois is characterized as "humid continental." Precipitation, during the period of 1941-1970, averaged 34.44 inches per year at the official recording station at Midway Airport in Chicago. June and July are the months of greatest precipitation, with each month accounting for an average of four inches of rainfall. Skies are clear or partly cloudy an average of 197 days per

TABLE 3-1: PREDOMINANT SOIL UNIT CHARACTERISTICS FOR NORTHEASTERN ILLINOIS

Soil Unit	Soil Color	Soil Texture	Permeability	Drainage	Subsoil Texture	Underlying Materials	Agricultural Usage Limitations	Approximate Percentage of Prime Agri. Land	Development Usage Limitations
Fox-Dresden-Casco	brown	loam	mod-rapid	well	loam	sand and gravel	E, D, LF	12	S, E, ST
Warsaw-Rodman-Lorenzo	brown	loam	moderate	well	loam	sand and gravel	E, D	50	S, E, ST
Volinia-Selma-Lomax	brown	loam	moderate	excessive	loam	sand	WE, D, W	80	W, S, P
Maumee-Watseka-Plainfield	black	loamy sand	rapid	excessive	sand	sand	W, WE, D	30	S, W
Zurich-Grays-Wauconda	gray	silt loam	moderate	moderate	clay loam	silt loam	W, E, LF	90	S, W, ST
Drummer-Brenton-Proctor	brown	silt loam	moderate	moderate	clay loam	loam	W, E	100	W, S, P
Miami-Kidder-McHenry	gray-brown	loam	moderate	well	clay loam	loam	E, ST, LF	40	ST, S, SS
Drummer-Saybrook-Lisbon	dark gray	silt loam	moderate	moderate	clay loam	loam	W, E	80	W, S, SP, SS
Ringwood-Griswold	brown	loam	moderate	well	clay loam	sandy loam	E, W	85	S, W, ST
Morley-Markham-Ashkum	gray	loam	slow	moderate	silty clay	clay loam	E, W, LF	60	ST, SP, SS, W, HC
Elliot-Ashkum-Beecher	dark gray	silt loam	slow	moderate	silt loam	clay loam	W, E	85	W, SP, CS, SS
Milford-Martinton	black	silt loam	mod. slow	poor	silty clay	calcareous sediment	W	95	W, HC, P, SP, SS
Symerton-Andres-Ashkum	black	silt loam	moderate	moderate	clay loam	clay loam	E, W	95	W, SP, SS
Nappanee-Peotone-Del Rey	dark gray	silt loam	slow	well	silt loam	calcareous sediment	W, T, LF, E	50	W, SP, HC, P
Frankfort-Bryce-Montgomery	dark brown	silt loam	slow	poor	silty clay	calcareous sediment	W, T, LF, E	5	W, SP, HC, P
Romeo-Joliet	black	loam	moderate	poor	loam	limestone	W,STN, FL	60	W, SH, FL, SS
Otter-Huntsville-Millington	black	loam	moderate	moderate	loam	loam	FL, W	95	W, FL
Fox-Wauconda-Sawmill	dark gray	silt loam	moderate	poor	loam	sand	W, FL, E	75	W, FL
Houghton-Lena	black	muck/peat	rapid	poor	muck/peat	sand/silt	HWT, W	0	W, P, S, HWT, LS

USAGE LIMITATION CODES

CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION
CS	Clayey Subsoil	D	Drouthiness	E	Erosion	FL	Flooding
HC	Heavy Clayey Subsoil	HWT	High Water Table	LF	Low Fertility	LS	Low Strength
P	Ponding	S	Seepage	SH	Shallowness to Bedrock	SP	Slow Percolation
SS	Shrink-Swell	ST	Steepness	STN	Stoniness	T	Soil Tilth
W	Wetness	WE	Wind Erosion				

year. Prevailing winds are from the northwest in the winter and the southwest in the summer.

Lake Michigan has a strong influence on the region's climate and even causes modest differences in climate within the six county area. There generally is less rainfall along the Lake than further inland, and temperatures tend to be cooler in the summer and warmer in the winter along the Lake.

3.02 SOCIO-ECONOMIC CHARACTERISTICS

The quality of the water resources in an area often is a significant factor in the settlement of the area. Certainly that has been the case in northeastern Illinois. The relationship between water and urban development has another dimension, however; urbanization is a major cause of the degradation of water quality. This second dimension is perhaps the single most important water quality issue addressed in areawide planning in northeastern Illinois.

Existing and future water quality in the region is the result of a combination of natural conditions and human activities. In the basins most affected by urbanization, human-related factors are likely to be the primary influence

TABLE 3-2: AVERAGE MONTHLY TEMPERATURE AND PRECIPITATION NORTHEASTERN ILLINOIS (Values for the Period of 1941 to 1970)

Months	Temperature (F)	Precipitation (inches)
	Chicago (Midway)	Chicago (Midway)
January	24.3	1.85
February	27.4	1.59
March	36.8	2.73
April	49.9	3.75
May	60.0	3.41
June	70.5	3.95
July	74.7	4.09
August	73.7	3.14
September	65.9	3.00
October	55.4	2.62
November	40.4	2.20
December	28.5	2.11
Yearly Average	50.6	34.44

Source: *Climate of Illinois;* U.S. Department of Commerce

governing water quality conditions. Yet, in all basins, physical factors (such as water depths, flow volumes and velocities, and soils and geologic materials) also exert an influence.

a. Population

The region's population has grown steadily since the middle of the 19th Century, reaching the 7 million mark about 1970. The period of most accelerated growth was 1950-1970, which coincided with a postwar "boom" in suburban development. The effects of this combination of trends can be seen in Table 3-3. The region's population has increased by nearly 2 million since 1950; the population of the City of Chicago declined by about 250,000 during the same period. Population growth in suburban Cook County and in DuPage County, has been very rapid. The number of people in Cook County outside of Chicago more than doubled between 1950-1970; the population of DuPage County more than tripled during the same period. Substantial growth, while not as spectacular, was recorded in Kane, Lake and Will counties, and to a lesser extent, in McHenry County.

To help assess future conditions, the Commission worked with municipal and county governments during 1975-76 to prepare population forecasts for the region.

In forecasting, future population was estimated by assessing birth rates, migration and other factors; examining present and anticipated trends; and then interpreting all of this information in light of regional plans and policies for growth and development. The Commission also is responsible, by agreement with the Illinois Bureau of the Budget, for disaggregating periodic population forecasts prepared for the region by the State of Illinois. The state forecasts serve as the upper limit within which NIPC forecasts for counties, townships and municipalities generally must fall. Historically, forecasts have been considered mutually acceptable when NIPC totals and state totals are within 5 percent of each other at the county level.

Population forecasting for northeastern Illinois during the 1970s has been characterized by successive reductions in projected population levels. Because of declining birth rates, trends toward more growth in the "Sun Belt" with less in the Midwest, and other factors, local population forecasts have been reduced steadily in the past decade. Until 1977, reductions had been relatively gradual. In the summer of 1977, however, the Illinois Bureau of the Budget informed the Commission that state projections for the region were being revised drastically downward. The state now is projecting a Year 2000 population of nearly a million less than had been forecast in 1976.

As of the beginning of 1978, the Commission had not taken a position on the new state forecasts but continued to

use 1976 forecasts in its work program, including areawide planning. During 1979, the Commission plans to consult with the Bureau of the Budget, and with local governments, in revising the 1976 forecasts.

As they stand, the 1976 forecasts (Table 3-3) indicate that two important trends will continue throughout the rest of this century. First, the region will continue to grow; second, there will be a tendency for growth to be more evident in suburban areas than in older cities. The overall rate of growth, as projected in the 1976 forecasts, is not expected to be as dramatic as it was during the 1950-1970 period. The disparity in relative rates of growth in the suburbs and in the older cities, however, is forecast to be even more significant than in the past. This is another aspect of the 1976 forecasts that has caused the Commission some concern. During late 1977 and early 1978, the Commission generated widespread discussion among its members and throughout the region of the influence that suburban development is having on the decline of older communities. The discussion focused not only on the decline in population and certain types of economic activity in Chicago, but in older suburban communities like Joliet and Waukegan and others which also seemed to be stagnating while smaller communities around them flourished with new development.

TABLE 3-3: POPULATION IN NORTHEASTERN ILLINOIS, 1950-1970; FORECASTS FOR 1980-2000

	Actual			Forecast		
	1950	1960	1970	1980	1990	2000
City of Chicago	3,620,962	3,550,404	3,369,357	3,030,000	3,027,000	3,022,000
Suburban Cook County	887,830	1,579,321	2,124,409	2,476,300	2,733,000	3,000,100
Du Page County	154,599	313,459	490,822	651,300	829,400	987,100
Kane County	150,388	208,246	251,005	303,500	376,700	433,600
Lake County	179,097	293,656	382,638	470,400	593,900	700,100
McHenry County	50,656	84,210	111,555	147,200	185,500	240,500
Will County	134,336	191,617	247,825	356,400	459,600	553,000
Total	5,177,868	6,220,913	6,977,611	7,435,100	8,205,100	8,925,400

Source: U.S. Census Reports, 1950-1970 and NIPC Forecasts, 1980-2000

b. Land Use

Equally important to water quality are existing and forecasted land use patterns in the region. Changes in total population have an effect on water quality but so do changes in the spacial distribution of the population. As stated above, the impact of urbanization on water quality is a major issue, perhaps the single most important issue, in areawide planning in northeastern Illinois. Consequently, past decisions about land use and development, wherever they were made in the governmental spectrum, are largely responsible for the types, volumes and locations of pollutants now being generated. By the same token, future decisions about land use and development will be important to the region's efforts to restore and maintain desirable water quality. Another important component of the foundation for the areawide plan, therefore, is an assessment of existing land use and a forecast of future land use patterns.

The purpose here is to convey a general understanding of current and forecasted land use. Land use patterns and issues in each drainage basin are treated in appropriate chapters in Part II.

Table 3-4 summarizes trends in selected land use and illustrates the current situation in the region. Historical data, from 1964 and 1970, are presented for the entire region. Data for 1975 is available only for areas outside the City of Chicago.

The past 10 years have seen major changes in land use in the region. As would be expected, these changes parallel changes in population patterns. There have been overall increases in the amount of land used for residential, commercial and industrial purposes; concomittantly, the most dramatic increases in all of these categories have taken place outside the City of Chicago. Note, for example, the great increases in residential land usage in suburban Cook and DuPage counties from 1964 to 1975. Both areas also recorded significant increases in population during the same general period.

The single most noticeable shift in land use during the period covered by Table 3-4 was in the amount of previously vacant and agricultural land developed for residential, commercial and industrial use. There was an overall loss of 317 square miles of agricultural land in the region between 1964 and 1975; during the same period there was an increase of 185 square miles in the amount of suburban residential land.

Based on 1976 population forecasts, the Commission has prepared forecasts of land use for 1980, 1990 and 2000. The City of Chicago is not included in the forecasts in Table 3-4, but it is not likely that significant changes in land use within the city will take place over the next quarter-century. The forecast categories do not coincide precisely with the categories in Table 3-4; several categories that

TABLE 3-4: EXISTING AND PRELIMINARY LAND USE FORECASTS, NORTHEASTERN ILLINOIS

	Year	Suburban Cook (excluding) Chicago	Du Page	Kane	Lake	McHenry	Will
Total Acres		466,700	212,500	333,500	299,400	391,500	540,000
Residential	1970	122,400	44,500	24,800	32,900	14,900	23,200
	1980	133,100	54,300	28,700	40,400	17,200	31,700
	1990	141,500	70,900	32,900	46,400	20,200	38,600
	2000	149,900	81,000	35,900	50,900	24,000	45,000
Commercial	1970	26,100	14,700	5,900	5,700	600	6,000
	1980	30,400	17,600	7,500	8,300	1,400	7,100
	1990	32,700	21,500	8,300	9,500	2,200	7,600
	2000	36,500	23,600	8,700	11,700	2,400	8,200
Industrial	1970	13,500	1,700	1,700	2,100	600	1,800
	1980	14,300	4,800	1,800	2,100	600	2,300
	1990	15,200	5,500	2,000	2,300	900	2,500
	2000	15,400	6,200	2,200	2,600	900	2,700
Other Land Uses	1970	77,950	33,200	13,950	25,900	18,750	67,800
	1980	79,750	31,800	14,150	26,400	19,450	69,200
	1990	80,850	38,100	14,550	26,100	19,150	70,400
	2000	80,050	38,600	15,150	27,500	19,950	71,100
Vacant/ Agricultural	1970	154,200	102,500	280,600	202,600	346,100	423,200
	1980	113,800	77,000	266,700	180,700	334,000	381,400
	1990	101,100	42,900	261,100	173,600	330,200	372,600
	2000	89,500	29,500	256,900	185,200	325,400	364,700
Regional Open Space	1970-2000	68,400	14,900	4,400	14,500	4,700	11,800
		91,200	32,600	12,500	25,800	13,000	42,100
Water	1970-2000	4,150	1,000	2,150	15,700	5,850	6,200

Note: Forecasts have not been accepted by NIPC for technical use and public distribution.
They are, however, directly related to the population forecasts which were accepted by NIPC in August, 1976.

have been identified in the statistics on past and current land use are included together in the "other" category in the forecasts.

c. Economy

Northeastern Illinois has long been one of the major economic centers of the nation. In terms of value added by manufacturing, the region's output during the early 1970s exceeded that of more than 40 individual states. Yet, even though the region's manufacturing capacity is tremendous, less than one of every three workers is employed in manufacturing, a statistic that illustrates another important facet of the region's economy: it is extremely diverse. Another measure of this diversity is the fact that more than half of the land in the region, despite the extent of urban and industrial development, still is devoted to agriculture. Not only are the region's farmlands expansive, they are among the finest in the nation, producing farm products valued at more than $261 million in 1974.

An economic environment of such large scale, combined with the diversity and accompanying complexity found in northeastern Illinois, generates many factors important to water quality planning.

From a water quality standpoint, manufacturing is the most important type of economic activity. About half of all the wastewater generated in northeastern Illinois comes from industrial sources, either as effluent discharged directly from industrial treatment facilities or as wastewater that is conveyed to publicly-owned facilities for treatment and discharge. Through prior studies and wastewater treatment plant inventories, the Commission staff had identified 115 industrial facilities in the six county region which discharged effluents into surface waters. This was a surprisingly low number, given the magnitude of the industrial base and the large number of industrial facilities, including power plants, transportation and even agriculturally related installations having discharges.

Early in the 208 program, the staff initiated studies designed to assist in forecasting industrial wastewater loads. It was soon found that future water demands and resulting wastewater loads would be extremely difficult to forecast. Authoritative literature noted that significant inter- and intra- industry variations existed in requirements for water. The difficulty is compounded by continual changes in product lines and production technology. It is expected that there will be changes in water use in manufacturing because of the need to minimize costs involved in meeting the requirements of Public Law 92-500. The major change is expected to be in the form of expanded use of recycled, treated effluents in place of self-supplied or purchased once-through water. Since the USEPA has indicated that advance treatment of industrial

TABLE 3-5: TOTAL EMPLOYMENT BY COUNTY, 1970-2000

	1970	1980	1990	2000
Northeastern Illinois	3,174,800	3,615,400	3,937,200	4,257,000
Cook County	2,697,400	2,948,200	3,134,400	3,334,600
City of Chicago	1,857,300	1,911,300	1,993,300	2,078,300
Suburban Cook	840,100	1,036,900	1,141,100	1,256,300
Du Page County	137,500	224,900	306,100	346,800
Kane County	102,000	125,700	137,100	152,700
Lake County	118,600	167,600	194,700	235,800
McHenry County	35,900	45,000	51,000	57,000
Will County	82,700	104,000	113,900	130,100

R Jan. 4/79

discharges will be necessary, economics are expected to favor greater recycling.

Early staff research showed that, because of Public Law 92-500, many industries already had undertaken water and wastewater conservation programs. In-plant studies were being used to identify production lines which could use less water, recycling and reuse opportunities, and waste products that could be recaptured and reused. The net result is a general trend toward decreasing wastewater flows despite increasing industrial output.

TABLE 3-6: MANUFACTURING EMPLOYMENT BY COUNTY, 1970-2000

	1970	1980	1990	2000
Northeastern Illinois	944,500	999,600	1,042,200	1,104,400
Cook County	797,500	808,400	834,600	872,600
City of Chicago	499,000	483,500	496,400	517,000
Suburban Cook	298,500	324,900	338,200	355,600
Du Page County	26,900	54,100	62,200	68,600
Kane County	36,900	40,300	41,600	47,600
Lake County	39,300	43,800	47,300	51,900
McHenry County	15,900	17,800	18,900	21,100
Will County	28,000	35,200	37,600	42,600

R Jan. 4/79

An attempt was made to obtain forecasts of future wastewater flows by direct inquiries to industrial dischargers in northeastern Illinois. This was an element of an industrial wastewater survey conducted for the Commission by an outside consultant. Responses were poor, principally because industries either did not know or were reluctant to reveal information they considered privileged. In addition, it was found that among the initial list of 115 industrial dischargers, a number had already made plans to connect to nearby municipal systems. A modest number of effluents consisted of cooling water discharges, while others were surface runoffs related to storm events. Point source discharges emanating from plant processes were surprisingly few. Staff Paper No. 27 "Analysis of Industrial Waste Treatment Plants" may be consulted for details.

Given all of the foregoing, the areawide plan makes no attempt to forecast future wastewater volumes or effluent standards for other than publicly-owned treatment works. Accordingly, current information on wastewater characteristics (including both process and housekeeping wastewaters) is shown for industries and for the nearly 200 small independent commercial and institutional treatment plants found in the six-county area. This information is presented in the basin chapters in Part II.

Continuing increases in manufacturing will be accompanied by decentralization of industrial activity in the region. Note in Table 3-6 that the proportion of the region's manufacturing employees who work in Chicago, although it remains large, will be less in the year 2000 than in 1970. Proportionate increases of significant magnitude are forecast in suburban Cook County and in each of the other five counties. The possibility that industrial wastewaters will be generated in areas not now required to accomodate industrial effluent is apparent. This is an issue that needs to be addressed in the planning of local wastewater facilities.

d. Agriculture

Farming and related agribusiness activities have been a mainstay of the economy of northeastern Illinois since the first settlement of the region. Agriculture is not the factor in the region that it once was, but it is still a major activity that accounts for more than 70 percent of the land use in three of the region's six counties. Even more dramatic evidence that agriculture is still viable in this region is the statistic that more land (more than 1.2 million out of 2.4 million acres) is used for agriculture than for all other purposes combined.

What does the future hold? NIPC forecasts indicate that in every county, agricultural acreage will decrease over the rest of this century as the amount of land utilized

TABLE 3-7: ACRES IN AGRICULTURAL USE*, 1976

COUNTY		Acres (In 100's)										% of County Acres In Agri
		Total County	Non Agri Use	Agricultural Use								
				Row Crops			Other				Total	
				Corn	Soy Beans	Total	Grains	Hay & Pasture	Other	Total		
COOK	ACRES	6,058	5,409*	279	216	495	46	108		154	649	10.7
	%			43.0	33.2	76.2	7.2	16.7		23.8		
DU PAGE	ACRES	2,130	1,574	296	194	490	40	26		66	556	26.1
	%			53.3	34.8	88.1	7.3	4.6		11.9		
KANE	ACRES	3,332	736	1,639	650	2,289	61	246		307	2,596	77.8
	%			63.1	25.0	88.2	2.3	9.5		11.8		
LAKE	ACRES	2,989	1,525	279	279	558	145	761		906	1,464	49.0
	%			19.1	19.1	38.2	10.0	52.0		61.9		
MC HENRY	ACRES	3,923	1,050	1,599	515	2,114	110	650		759	2,873	73.2
	%			55.7	17.9	33.6	3.8	22.6		26.4		
WILL	ACRES	5,412	1,483	2,103	1,433	3,536	100	291		391	3,929	72.6
	%			53.5	36.5	90.0	2.5	7.4		9.9		
REGIONAL TOTALS	ACRES	23,844	11,777	6,195	3,287	9,481	502	2,082		2,583	12,067	50.6
	%	100.0	49.4	51.3	27.2	78.6	4.2	17.3		21.4		

*Non-agricultural townships in Cook County were omitted in the survey but are included in the non-agricultural acreage total.

TABLE 3-8: CASH RECEIPTS AND PERCENT SHARE GENERATED BY MAJOR CROPS AND LIVESTOCK CATEGORIES, NORTHEASTERN ILLINOIS, 1964 AND 1974

	Value ($1,000)		Percent Share	
	1964	1974	1964	1974
Crops				
Corn	23,596	64,125	17.0	24.5
Soybeans	14,591	47,555	10.5	18.2
Wheat	2,341	6,524	1.7	2.5
Oats	1,274	1,514	0.9	0.6
All Other	32,789	56,296	23.6	21.5
Livestock & products				
Cattle	22,521	24,059	16.2	9.2
Hogs	9,472	15,529	6.8	5.9
Eggs	2,888	8,403	2.1	3.2
Milk products	26,852	28,576	19.4	10.9
All Other	2,303	9,338	1.7	3.6
All Crops	74,591	176,014	53.8	67.2
All Livestock & products	64,036	85,905	46.2	32.8
Total crops and livestock	138,627	261,919	100.0	100.0

for housing and other development increases. However, as indicated by data in Table 3-4 (which is based on forecasts that aggregate vacant and agricultural land in one category), large areas of the region will remain under cultivation in the year 2000, particularly in Kane, Lake, McHenry and Will counties.

Agricultural data for the region also illustrate the diversity of the region's agricultural economy. Table 3-8 for example, shows that corn and soybeans are the principal crops, accounting jointly for more than 75 percent of total agricultural land use in the region. Land that is devoted to small grain or hay crops, or used as pasture, is found less frequently but still accounts for a total of more than 250,000 acres. When statistics on livestock production (Table 3-9) are considered, it becomes clear that the region's agricultural economy is as diverse as one would expect to find in a Lower Great Lakes region with an abundance of prime farmland. Water quality plans, therefore, must consider potential pollution from many agricultural sources.

e. Water Supply

The protection of the region's water supply, which historically has been abundant and a factor in the economic development of the region, is a major long-range concern of areawide planning. It is possible, theoretically, to remove contaminants from water regardless of how polluted it has become. However, a policy of allowing water resources to become polluted, on the assumption that water can be treated

TABLE 3-9: ESTIMATED LIVESTOCK CONCENTRATIONS

County	Dairy Cows	Beef Cattle	Poultry	Horses	Fur Bearing	Sheep Goats	Swine
Cook	150	340		670		125	
Du Page	190	280		665	2,500		350
Kane	6,080	13,675		730		150	25,615
Lake	2,075	1,200	1,030,000	1,825		250	1,350
McHenry	19,880	11,740	55,500	620	27,500	1,166	25,835
Will	3,002	6,027	132,500	465		60	10,200
Regional Totals	31,377	33,262	1,218,000	4,975	30,000	1,751	63,350

Note: These figures are not intended to report animal inventories. They represent data based on concentrations on individual farm tracts above certain prescribed minima.

prior to use, would be short-sighted and ill-advised with respect to economics and public health.

The region's potable water comes from two sources: Lake Michigan and groundwater aquifers.

Lake Michigan is the source of domestic water supply for about 5 million people living in Chicago and 91 other communities. The Lake supplies about 80 percent of the region's total public water supply needs.

Groundwater is less significant in terms of population served, but more significant in terms of area served. Groundwater is currently the only source of water supply for residents in DuPage, Kane, McHenry and Will counties. It also supplies parts of Cook and Lake counties.

Groundwater is drawn from four aquifer systems:

(1). Sand and Gravel Aquifers underly about half the region at depths ranging from a few feet to more than 400 feet. They are found in all counties and in 1974 supplied about 11 percent of the groundwater used.

(2). The Shallow Dolomite Aquifer is used by many municipalities, particularly in DuPage County and in southern and northwestern Cook County. It supplied about 32 percent of the region's groundwater needs in 1974.

(3). The Cambrian-Ordovian Aquifer, located in deep sandstone is the most heavily pumped groundwater source in the region. It supplied 57 percent of the region's groundwater in 1974. For 20 years the amount of water taken from this aquifer in the region has exceeded the aquifer's natural recharge capacity. From 1966 to 1975 water levels in wells in the Cambrian-Ordovician Aquifer dropped at a rate of about 10 feet per year.

(4). The Mt. Simon Aquifer, the deepest in the region, also is located in sandstone. Its potential as a source of water supply is limited by its depth and by the fact that it often produces brackish water that requires costly treatment.

Changes in the region's use of its water supplies will be necessary in the next few decades if reasonable rates of growth are to be accomodated in suburban communities whose wells are being rapidly depleted as their population increases. The most definitive proposals are those found in the Commission's "Regional Water Supply Plan," which was approved in June, 1978. The plan, which calls for more communities to use Lake Michigan water in the future, also raises the possibility that the Fox and Kankakee Rivers could supply parts of the region by the end of this century.

CHAPTER 4

Overview of Areawide Water Quality

CHAPTER FOUR
OVERVIEW OF AREAWIDE WATER QUALITY

4.01 FRAMEWORK FOR ASSESSING WATER QUALITY

a. Measurements of Water Quality

The most basic and popularly applied index of water quality probably is appearance; if water looks polluted, most likely it is. However, water may appear pristine when in fact it is polluted. Visual inspection is far from sufficient when it is necessary to have thorough assessments of water quality from which problems identified, plans can be formulated, and decisions about expenditures and regulatory measures made. Quantitative measures must be applied to determine levels of specific contaminants. Results then can be compared to established standards based on the intended use of the water body. Measurements and standards typically involve chemical, physical, biological and radiological parameters.

The federal Water Quality Act of 1965 authorized states and the federal government to establish water quality standards for interstate waters. These were to be designed to protect public health or welfare and enhance the quality of water, with consideration given to the use and value of those waters for public supplies, fish and wildlife, recreation, agriculture, industry, and other purposes.

Most of the standards which have been established are based on precise, quantitative chemical analyses, although some qualitative physical and biological determinations are also involved. Most standards are expressed in terms of physical and chemical units of measurement. Physical standards relate to such characteristics as temperature, acidity-alkalinity (pH), color and turbidity, each of which has unique units of measurement. Measurements of chemical constituents are expressed in terms of the concentrations which are present, usually in milligrams per liter (mg/l), parts per million (ppm), or parts per billion (ppb). The presence of disease-causing pathogens is determined by measuring microbiological organisms which serve as "indicators" of pathogens.

Water pollution is assessed more often by evaluating chemical constituents than by evaluating biological conditions. The quantification of chemical effects, while it requires sophistication and rigid quality control, is relatively simple compared to lengthy biological surveys involving inventories and analyses of the numbers, genera and species of plant and animal life associated with different levels of pollution. Biological assessments are favored by many, however, because they show the combined effects over time of pollution in the stream. Chemical and physical analyses can show only the conditions within a specific water sample taken at a certain time and place.

All three types of analysis - chemical, physical, and biological - are essential to a thorough evaluation of conditions in a waterway, the capacity of the waterway to support aquatic life, and the suitability of the waterway for various uses.

b. State Stream Designations

The degree to which a waterway should be described as having inadequate water quality must be related to its, desired use,

Every waterway contains some contaminants and foreign substances that, strictly speaking, represent pollution. However, if all this "pollution" were removed, nothing could survive in the water. It is also possible for a stream to be too polluted for some uses but satisfactory for others. It is neither possible, nor useful, to label some waterways "polluted" and the rest "clean." A framework incorporating both uses and conditions is necessary.

In Illinois, part of this framework is provided by a system of stream use designations. These designations, applied to every stream in the state, specify the level and type of use for which the quality of water in the stream is to be protected. Designations are made in three categories:

1. General Use, Protected for Public and Food Processing Water Supply
2. General Use, Not Protected for Public Use and Food Processing Water Supply.
3. Secondary Contact and Indigenous Aquatic Life

As indicated by Table 4-1, the Illinois Pollution Control Board has placed almost every waterway in the state into one of the three designation categories. The only exceptions are Lake Michigan, which is in a separate category that has the highest water quality standards, and groundwater, which also is subject to special standards. The lowest water quality standards are those established for "Secondary Contact..." waterways. Only waterways in parts of northeastern Illinois where urban and industrial development are heaviest have been designated in the "Secondary Contact" category (see Figure 4-1). The discussion in the next section provides more details on the state water quality standards that apply to each designation category.

c. In-stream Water Quality Standards

Specific standards, generally expressed in terms of acceptable concentrations of specific contaminants or indicators of pollution, have been set by the state for all waterways.

TABLE 4-1: WATER USE DESIGNATIONS OF ILLINOIS WATERWAYS

SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE

- Chicago Sanitary and Ship Canal
- Cal Sag Channel
- Little Calumet River (between its junction with the Grand Calumet River and its junction with the Cal Sag Channel)
- Calumet River
- Grand Calumet River
- Lake Calumet
- South Branch, Chicago River
- North Branch, Chicago River (from its confluence with the North Shore Channel and its junction with the South Branch)
- North Shore Channel
- Des Plaines River (from its confluence with the Sanitary and Ship Canal to the point where it passes beneath Interstate Highway 55)

GENERAL USE, NOT PROTECTED FOR PUBLIC AND FOOD PROCESSING WATER SUPPLY

- Little Calumet River (portions not covered above)
- Chicago River (portions not covered above)

SPECIAL CATEGORY

- Lake Michigan

SPECIAL CATEGORY

- Groundwater

GENERAL USE, PROTECTED FOR PUBLIC AND FOOD PROCESSING WATER SUPPLY

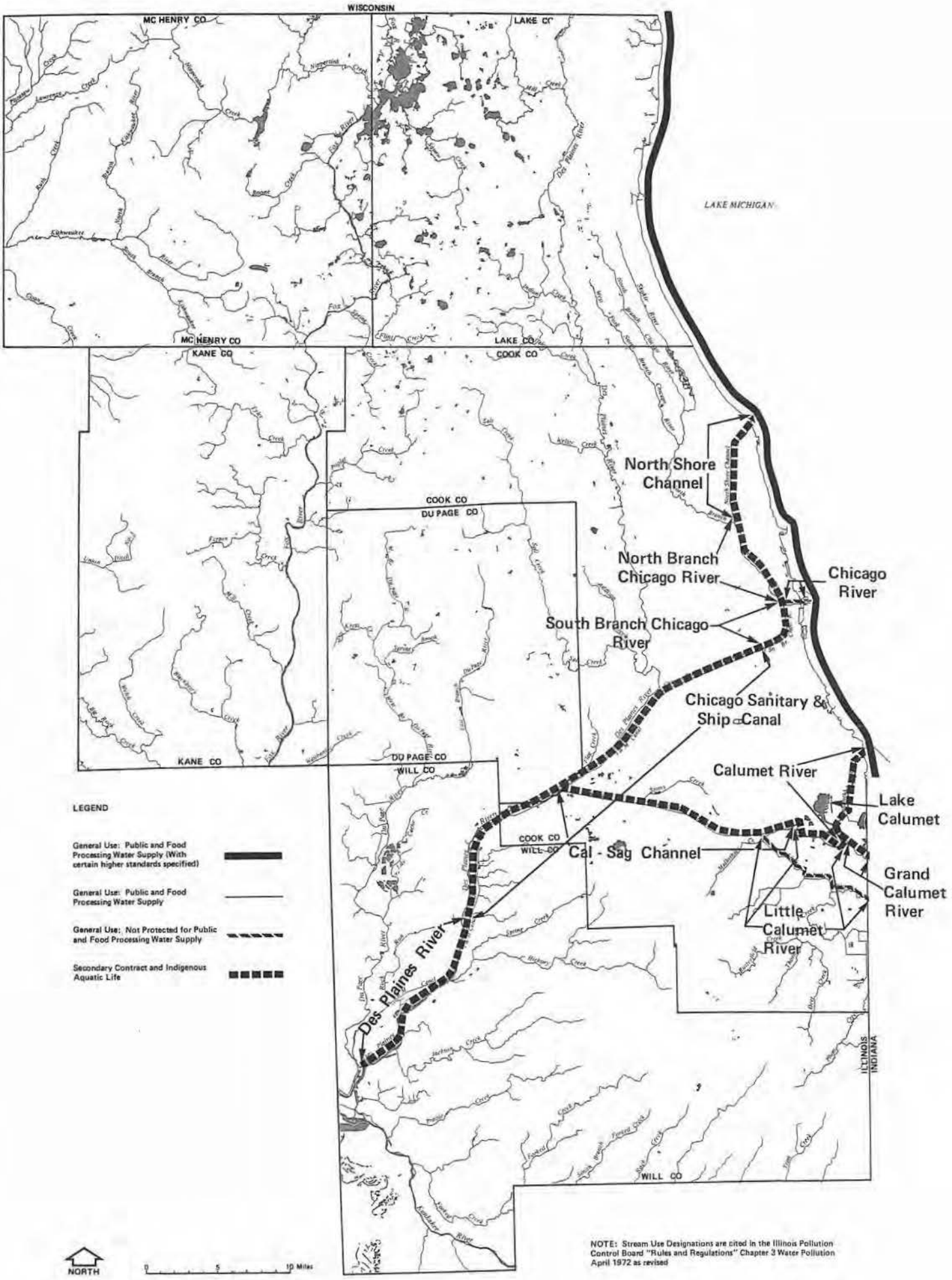
- All other waterways in the state

R, Jan 9, 1979

(1) Additional Qualitative Criteria: In addition to these standards, which are described in Table 4-2, the state has established these additional qualitative criteria:

(a) Nondegradation Criteria: With certain exceptions, as permitted by Rule 208 in Chapter 3, IPCB Rules and Regulations, "Water Pollution," waters with existing quality that exceeds established standards at the time such standards are adopted, shall be maintained at existing high quality levels.

FIGURE 4-1: WATER USE DESIGNATIONS OF ILLINOIS WATERWAYS



(b) General Criteria (For Secondary Contact/Indigenous Aquatic Life Waterways): Waters are to be free from unnatural sludge or bottom deposits, floating debris, visible oil, odor, unnatural plant or algae growth, and unnatural color or turbidity.

(c) General Criteria (For All Other Waterways): In addition to satisfying all criteria in (b) above, all other waterways also are to be free of matter in concentrations or combinations that are of unnatural origin or that are toxic or harmful to any form of life.

(2) Proposed IEPA Changes: Some established standards are under review by the IPCB as a result of a petition filed in May, 1977, by Illinois EPA, which is seeking the following modifications:

(a) That the fecal coliform standard be eliminated, except in certain cases involving public water supply intakes or proximity to bathing beaches.

(b) That standards for "Secondary Contact..." waterways be changed as follows: Arsenic - 1.0 mg/l instead of 0.25 mg/l; Barium - 5.0 mg/l instead of 2.0 mg/l.

(c) That for toxic substances not now listed in the "Secondary Contact..." standards, the maximum concentration should be one-half of the 96-hour median tolerance limit for native fish or essential fish food organisms.

(d) That standards for suspended solids be replaced by a standard of 1000 mg/l for total dissolved solids. Existing standards for both suspended solids and total dissolved solids would be deleted if the IEPA proposal were approved.

(3) Proposed Commission Changes: It is the Commission's judgment that a more fundamental revision in the state's approach to in-stream water quality standards is called for. With respect to dissolved oxygen (DO), the IPCB has adopted the following current standards:

(a) For all waters of the state, except as otherwise noted, DO shall not be less than 6.0 mg/l during at least sixteen hours of any twenty-four period, nor less than 5.0 mg/l at any time.

(b) For secondary contact and indigenous aquatic life water bodies, DO shall be not less than 4.0 mg/l at any time.

TABLE 4-2: ILLINOIS IN-STREAM WATER QUALITY STANDARDS

Part I

PARAMETER	GENERAL	PUBLIC AND FOOD PROCESSING WATER SUPPLY(1)	SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE	LAKE MICHIGAN	UNDERGROUND WATERS(2)
BIOLOGICAL					
Fecal Coliforms per 100 ml.	200(3)	200(3)	1000(4)	20(5)	200(3)
CHEMICAL					
Ammonia Nitrogen (as N)	1.5	1.5	2.5/4.0(21)	0.02	1.5
Arsenic (total)	1.0	0.1	0.25	0.1	0.1
Barium (total)	5.0	1.0	2.0	1.0	1.0
Boron (total)	1.0	1.0		1.0	1.0
Cadmium (total)	0.05	0.010	0.15	0.010	0.010
Carbon Chloroform Extract(6)		0.7		0.7	0.7
Chloride	500.0	250		12.0	250
Chromium		0.05		0.05	0.05
Chromium (total hexavalent)	0.05	0.05	0.3	0.05	0.05
Chromium (total trivalent)	1.0	1.0	1.0	1.0	1.0
Copper (total)	0.02	0.02	1.0	0.02	0.02
Cyanide	0.025	0.025	0.025	0.025	0.025
Dissolved Oxygen	6/5(7)	6/5(7)	3/2(8)	(9)	6/5(7)
Fluoride	1.4(10)	1.4		1.4	1.4
Fluoride (total)			15.0		
Foaming Agents		0.5		0.5	0.5
Iron (total)	1.0	0.3	2.0	0.3	0.3
Iron (dissolved)			0.5		
Lead (total)	0.1	0.05	0.1	0.05	0.05
Manganese (total)	1.0	0.05	1.0	0.05	0.05
Mercury (total)	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel (total)	1.0	1.0	1.0	1.0	1.0
Nitrate-Nitrogen		10		10.0	10.0
Nitrite-Nitrogen		1		1.0	1.0
Oil (Hexane Solubles or equivalent)		0.1	15.0	0.1	0.1
Phenols	0.1	0.001	0.3	0.001	0.001
Phosphorus (as P)	0.05(11)	0.05(11)		0.007	0.05(11)
Selenium (total)	1.0	0.01	1.0	0.01	0.01

FOOTNOTES

(1) These standards shall be met at any point at which water is withdrawn for treatment and distribution as a potable supply or for food processing. Waters shall be of such quality that with treatment consisting of coagulation, sedimentation, filtration, storage and chlorination, or other equivalent treatment processes, the treated water shall meet in all respects both the mandatory and the recommended requirements of the Public Health Service Drinking Water Standards - 1962. Other contaminants that will not be adequately reduced by the treatment processes noted above shall not be present in concentrations hazardous to human health.

(2) Standards to be met except due to natural causes.

(3) Based on a minimum of 5 samples taken over not more than a 30-day period, fecal coliforms shall not exceed a geometric mean of 200 per 100 ml., nor shall more than 10% of the samples during any 30-day period exceed 400 per 100 ml.

(4) Based on a minimum of 5 samples taken over not more than a 30-day period, fecal coliforms shall not exceed a geometric mean of 1000 per 100 ml., nor shall more than 10% of the samples during any 30-day period exceed 2000 per 100 ml.

(5) Based on a minimum of 5 samples taken over not more than a 30-day period, fecal coliforms shall not exceed a geometric mean of 20 per 100 ml.

(6) This parameter is determined by using an improved miniaturized sampler and extraction technique.

(7) Shall not be less than 6.0 mg/l during at least 16 hours of any 24-hour period, nor less than 5.0 mg/l at any time.

(8) Shall not be less than 3.0 mg/l during at least 16 hours in any 24-hour period, nor less than 2.0 mg/l at any time, and after 12/31/77 shall not be less than 4.0 mg/l at any time.

(9) Shall not be less than 90% of saturation except due to natural causes.

(10) Shall not apply to waters of the State which: (a) receive effluent from the mines and mills of the fluorspar mining and concentrating industry, and (b) have been designated by the Illinois State Water Survey as streams which once in ten years have an average minimum seven-day low flow of zero. Such waters shall meet the following standard with regard to fluoride: 5 mg/l.

(11) Shall not exceed 0.05 mg/l in any reservoir or lake, or in any stream at the point where it enters any reservoir or lake.

Note: All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

TABLE 4-2: ILLINOIS IN-STREAM WATER QUALITY STANDARDS

Part II

PARAMETER	GENERAL	PUBLIC AND FOOD PROCESSING WATER SUPPLY(1)	SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE	LAKE MICHIGAN	UNDERGROUND WATERS(2)
CHEMICAL (Cont'd)					
Silver			0.1		
Silver (total)	0.005	0.005		0.005	0.005
Sulfates	500.0	250		24.0	250
Toxic Substances	(12)	(12)		(12)	(12)
Zinc	1.0	1.0		1.0	1.0
Zinc (total)			1.0		
PESTICIDES					
Aldrin		0.001		0.001	0.001
Chlordane		0.003		0.003	0.003
DDT		0.05		0.05	0.05
Dieldrin		0.001		0.001	0.001
Endrin		0.0005		0.0005	0.0005
Heptachlor		0.0001		0.0001	0.0001
Heptachlor Epoxide		0.0001		0.0001	0.0001
Lindane		0.005		0.005	0.005
Methoxychlor		0.1		0.1	0.1
Parathion		0.1		0.1	0.1
Toxaphene		0.005		0.005	0.005
(13)		0.02		0.02	0.02
(14)		0.01		0.01	0.01
PHYSICAL					
pH	6.5-9.0(15)	6.5-9.0(15)	6.0-9.0(15)(17)	7.0-9.0(15)	6.5-9.0(15)
Temperature	(16)	(16)	93°F/100°F	(18)	(16)
Total Dissolved Solids	1000.0	500	3500(19)	180.0	500
Total Suspended Solids			15.0(20)		
RADIOACTIVITY					
Gross Beta pCi/l	100	100		100	100
Radium 226 pCi/l	1	1		1	1
Strontium 90 pCi/l	2	2		2	2

FOOTNOTES

(12) Any substance toxic to aquatic life shall not exceed one-tenth of the 48-hour median tolerance limit (48-hr. TLm) for native fish or essential fish food organisms.

(13) 2, 4 - Dichlorophenoxyacetic acid (2, 4 - D).

(14) 2, 4, 5 - Trichlorophenoxyproprionic acid (2, 4, 5 - TP or Silvex).

(15) The acceptable range, except for natural causes.

(16) See Illinois Pollution Control Board Rules and Regulations, Chapter 3, "Water Pollution."

(17) Temperature shall not exceed 93°F (34°C) more than 5% of the time, or 100°F (37.8°C) at any time.

(18) Omitted.

(19) Shall not be increased more than 750 mg/l above background concentration levels unless caused by recycling or other pollution abatement practices, and in no event shall exceed 3500 mg/l at any time.

(20) Solids other than those contained in deoxygenating wastes.

(21) 2.5 mg/l April - October; 4.0 mg/l November - March.

Note: All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

R. Jan. 9, 1979

The minimum standards of 5.0 and 4.0 mg/l DO are thus to be met 100 percent of the time.

Results of water quality modeling by the Commission, described in Chapters Eleven and Thirteen through Twenty-One, show that it is not possible to meet this 100 percent level of compliance. Historically, these standards were based on low-flow conditions which would pertain for seven continuous days and occur on an average of only once in ten years. Longer periods of low flow may, of course, occur occasionally. More importantly, the standards did not take into account the adverse impacts of wet weather flows, when significant amounts of pollutants may be introduced by such sources as storm sewers draining urbanized areas or by agricultural runoffs. Computer modeling indicated that 100 percent compliance with standards would not be achieved in most basins during wet weather conditions, even with substantial control of nonpoint sources. This is particularly true with respect to the General Use dissolved oxygen standard.

Dissolved oxygen concentrations are an important gauge of existing water quality and of the ability of a water body to support a well-balanced aquatic community. DO standards have been established both for aesthetic purposes (to avoid anaerobic conditions with their attendant odors) and to protect aquatic life. The latter is the more critical requirement.

The USEPA document "Quality Criteria for Water" recognizes 5.0 mg/l DO as the minimum concentration to maintain a desirable fish population. The report points out, however, that a number of other factors determine whether a water body can support a given type of aquatic life. Some of these are not related to DO or other water quality factors. The report also notes that fish vary in their precise oxygen requirements according to their species, age, level of activity, nutritional state, and water temperature. And, fish can temporarily evade or survive oxygen concentrations considerably below those considered suitable for a thriving population.

In light of the above factors, the Commission recommends that the state revise its water quality standards as follows:

1. A dissolved oxygen standard of 5.0 mg/l should be maintained for General Use water bodies in northeastern Illinois. Attainment of this level 95 percent of the time should be deemed full compliance with the standard.

2. In the development of new water quality standards, the IEPA is urged to include allowances for excursions from fixed numerical standards, expressing tolerances as allowable extreme limits which may be accepted for prescribed conditions or durations.

3. This Commission will assist the IEPA in preparing the necessary submittals to the Pollution Control Board for changes in standards. Additionally, as part of the continuing planning process, the Commission will assist the IEPA in the future classification of water bodies in the region for designated uses.

4. Where no feasible solution can be developed to meet the above objectives, the problems will be identified and recommended for further study in the continuing planning program. It was deemed advisable to take this conservative approach at this time rather than to recommend changes in stream classifications and/or related water quality standards.

d. Stream Segment Classifications

For planning purposes, the IEPA has divided the entire waterway system of the state into 14 hydrolog units that generally conform to major river basins. Each of these 14 units has been further divided into segments (see Figure 4-2). There are two types of segments. Type A segments generally identify major tributary sub-basins within a hydrological unit. Type B segments identify portions of the main stem of the principal river in the unit, plus minor tributary sub-basins.

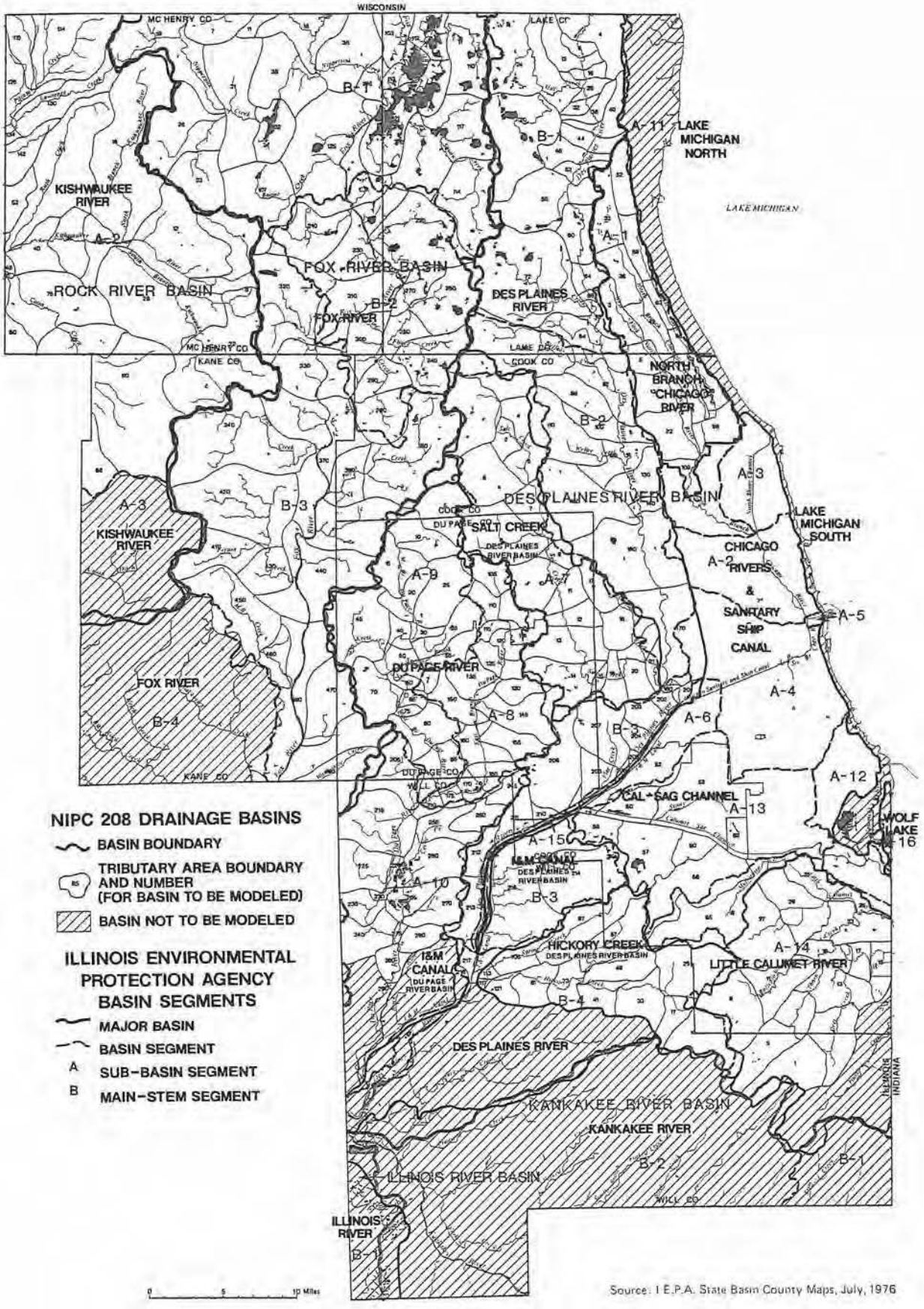
With respect to water quality in rivers and streams, the IEPA classifies each segment either as "water quality limited" or as "effluent limited." All waterways in the state at the present time are classified as "water quality limited" for one or more parameters. This means that water quality fails to completely meet applicable standards. It also means that water quality will fail to meet applicable standards if only minimum statutory limits are applied to all effluent discharges. If there were any segments classified as "effluent limited," it would mean that water quality is meeting and will continue to meet standards, or that water quality will meet standards after minimum statutory limits have been applied to effluent discharges.

e. Public Health

Some elements of the system of classifications and standards relate to public health. These are discussed below, along with other public health aspects of the issue. More information on these subjects can be found in the Commission's 208 Staff Paper No. 9: "Biological and Chemical Water Pollutants of Local Concern."

(1) Bacteriological Quality: The bacteriological quality of water affects the health of those who use waterways for recreation or other purposes, and is a concern expressed

FIGURE 4 - 2: NIPC AND IEPA STREAM SEGMENTS IN NORTHEASTERN ILLINOIS



Source: I.E.P.A. State Basin County Maps, July, 1976

frequently by public participants in areawide planning. Bacteria in water originate from many sources, including soil (commonly a rich source), and the excrement of wildlife, domestic animals, and humans.

Public health programs generally focus only on the possible presence of pathogenic bacteria, those capable of inducing disease. Actual measurement of the pathogens themselves is difficult and expensive. Thus, the accepted practice is to measure "indicators" which generally are not disease-producing themselves. Fecal coliform organisms are the principal indicators of the possible presence of pathogenic bacteria. Fecal coliforms are bacteria that live in the intestinal tracts of warm-blooded animals, including humans. The presence of fecal coliform organisms in water samples, in large quantities, is reason to suspect that pathogenic bacteria, which also can be transmitted in animal and human waste, may be present.

Bacteriological quality was not incorporated in the water quality modeling efforts of the 208 program. Uncertainties associated with bacterial growth and die-away in surface waters indicated that reliable results could be obtained only if extensive, long-term data on past and present water quality were available for calibration and testing of the model. Unfortunately, such data were not available in time to be used in the planning effort.

The Commission did initiate a limited bacteriological sampling program in cooperation with several county health departments. The purpose was to assess the suitability of various waterways for swimming, from the standpoint of enteric bacteriological disease risk. However, the sampling program did not yield conclusive results, and plans for additional analyses were terminated.

Such experiences in the analysis of bacteriological conditions are not uncommon and contribute to an ongoing debate among water quality authorities over where and how bacteriological studies should be conducted and the appropriateness of bacteriological standards.

As noted previously, the IEPA has proposed that standards for fecal coliform be modified substantially. The IEPA does not consider the presence of fecal coliforms to be a reliable indicator of other types of contamination or of threats to public health. The agency notes that fecal coliforms often come from natural sources, and that their presence does not predict or correlate with the incidence of waterborne illness among swimmers or other users.

(2) Viruses: Waterborne viruses, a subject that has received considerable public attention, is as complicated as the subject of bacteriology. There is a lack of information on the actual hazards posed by direct contact with waters in which viruses are present. Furthermore, there is disagreement among authorities over the extent to which any hazard exists.

Water is a potential transmitter of enteric viruses that could cause disease, but documentation for waterborne transmission exists only for infectious hepatitis virus and poliovirus. Of the 50,000 cases of infectious hepatitis reported annually in the United States in recent years only a fraction of one percent has been attributed to drinking water as a source. In those cases most were caused by sewage contamination of priavate and semi-public water supplies in which treatment was either inadequate or nonexistent. Otherwise, with the possible exception of isolated poliomyelitis outbreaks, there is no evidence of waterborne disease outbreaks in this country as a result of specific enteric viruses. Such a record, however, should not be construed as reason for relaxing public health programs or other efforts to protect water supplies from contamination.

In 1970, a special Task Force on Viruses reported its findings to the Illinois Institute for Environmental Quality. It concluded that:

> (a) The degree to which waterborne viruses present a health hazard is not known. While there is epidemiological evidence that viral diseases can be spread through water, there is no evidence that water is the primary mode of transission.
>
> (b) Existing treatment methods (secondary treatment for municipal wastewater and filtration and chlorination of potable drinking water) apparently inhibit, if not eliminate, the spread of waterborne viral diseases. Water treatment methods which meet effluent standards for bacteria apparently minimize the public health risk of waterborne viruses.

(3) Water Quality and Disease: Diseases with known causes for which the U.S. Public Health Service has reported waterborne incidents include salmonellosis, shigellosis, typhoid, cholera, hepatitis-A, and amoebic dysentery. Most waterborne illnesses have been directly traced to inadequately disinfected drinking water. The effects of swimming in polluted water, with respect to the transmission of disease, have not been defined conclusively. The primary reason, to date, is a scarcity of evidence.

A recent report by the General Accounting Office (GAO) concluded that epidemiological studies attempting to relate bacterial levels in recreational waters with levels of illness have been inconclusive. The GAO report did note that the risk of bacterial gastrointestinal infection from swimming is small. The large number of infectious organisms needed to actually infect healthy adults far exceeds the number likely to be ingested during swimming. In the case of typhoid and salmonella bacteria, the numbers likely to be ingested while swimming even in polluted water is only a fraction of the infectious dose, assuming no raw sewage or fecal particles are present.

In the case of shigellosis, while the ingestion rate required to produce disease is quite low, only one outbreak of swimming-related shigellosis had been documented by U.S. health officials as of 1975.

The GAO report further stated that epidemiolcgical studies attempting to demonstrate the differences in bacterial levels in bathing waters to levels of illness in swimmers also have been inconclusive. A cause-and-effect relationship, at the bacterial levels typically found in the United States today, is questionable considering the amount of swimming done by the public, the number of polluted beaches and "old swimming holes", and the insignificant number of illnesses related to water contact. Even marginal beaches, despite high bacterial levels, have had an extremely favorable epidemiological record.

Consistent with this general conclusion, the Illinois Department of Public Health has reported that except for a few cases at downstate Lake Shelbyville in 1972, all cases of waterborne disease in Illinois during the past ten years have been caused by contaminated private wells used for water supply. While public health always is of concern, the risk of waterborne disease does not emerge as a priority consideration for areawide planning. Considerations of public health do not seem to require water quality criteria beyond those already provided in standards set by the Illinois Pollution Control Board.

f. Other Criteria

One objective of Public Law 92-500 is the attainment of water quality that protects fish and wildlife and provides for recreation, in and on the water. This objective has sometimes been paraphrased as "fishable and swimmable" water. While the phrase is an apt one, it can lead to the assumption that achieving "fishable and swimmable" water, wherever possible, is totally within the scope of programs authorized by Public Law 92-500. Such is not the case. The law speaks to water quality, which certainly is critical to the objective. But there are many other factors, some unrelated or only peripherally related to water quality, that also determine whether a waterway is, or ever can be, "fishable and swimmable."

The purpose of the discussion that follows is to examine two areas that must be considered, in addition to water quality factors already discussed in this chapter, in assessing the potential for meeting the objective in any given waterway. Conditions in these two areas - aquatic habitat and aesthetics - influence the capacity of waterways to sustain aquatic life or attract people for recreational purposes.

(1) Aquatic Habitat: The term "habitat" refers to a place or set of conditions in which an organism or community of

organisms makes its home. Implicit is not only the preferences of a specimen or species, but requirements as well. In the absence of suitable habitat, organisms cease to flourish and propagate, and eventually decline or disappear.

Water quality is but one of many factors that determine if a stream or river can support given types of aquatic life. Other habitat factors not specifically related to water quality include: stream morphology, such as bottom and bank conditions; seasonal flow volumes; bank vegetation and shading; and water depths.

Water quality characteristics generally needed for suitable habitat include: appropriate temperatures, adequate dissolved oxygen levels, absence of toxic conditions, suitable pH, and low turbidity. Many of these factors are interdependent. For example, many toxic substances create problems only within certain pH ranges.

As a rule, other factors being equal, waters of high quality are able to support many different species of fish and aquatic life in a balanced environment, with no particular species dominating. In degraded waters there are fewer species and excessively high populations of certain species.

Some enrichment of natural waters is conducive to good habitats for aquatic life because organisms require certain dissolved gases, nutrients, and other minerals. Chemically, "pure" waters would be too sterile to support fish or other aquatic communities. Conversely, water pollutants can harm the aquatic environment by altering factors essential to aquatic life or by causing physiological or other types of changes in species.

For a stream to provide permanent suitable habitat, life requirements in that stream must be sustained over a wide range of conditions, including seasonal fluctuations in temperatures and flow rates. Some pollutants can be tolerated for a short period of time, although the habitat may be degraded severely as a result of prolonged exposure.

(2) Aesthetics: Waterways, particularly those in a natural state, have widespread aesthetic appeal. In areas like northeastern Illinois, where relief from the urban-industrial landscape for some people is rare, the aesthetic potential of waterways takes on special significance. Aesthetic values are difficult to quantify. For some, aesthetics means the absence of conditions offensive to sight or smell. Others would broaden the meaning to incorporate demands for "clean" or "pure" water for its own sake, apart from any specific use objectives. There would seem to be basic agreement, however, that aesthetic values essentially embody the beauty and overall quality of water and the life forms associated with it. Waterways are traditional focal points of active and passive recreational activity, and there is general acceptance of the concept that aesthetic integrity should be maintained and improved

where possible. As a rule, the aesthetic values of water will be enhanced as continued improvement in biological, chemical, and physical quality is achieved.

Specific USEPA criteria for aesthetic water quality values state that all waters should be free from substances that:

(a) Settle to form objectionable deposits;
(b) Float as debris, scum, oil, or other matter to form nuisances;
(c) Produce objectionable color, odor, taste, or turbidity;
(d) Injure, or are toxic, or produce adverse physiological responses in humans, animals or plants; and,
(e) Produce undesirable or nuisance aquatic life.

These criteria, essentially, have been adopted as official water quality standards in Illinois under the provisions of the IPCB's Water Pollution Rules and Regulations.

As is the case with habitat, however, other factors not directly related to water quality contribute to aesthetics. Principal among these would be land use adjacent to waterways, and the degree to which waterways are accessible to public viewing or use.

4.02 WATER QUALITY MODELING

a. Simulation Methodology

Modeling allows complex "real world" systems to be represented by various physical or mathematical techniques that permit the systems to be studied and evaluated conveniently.

Physical models generally represent systems in scaled-down replicas that behave like the original system and allow cause-and-effect relationships to be analyzed. Mathematical models use equations to represent the relationships in the system being analyzed, and offer two advantages over physical models. First, mathematical models can be used to describe systems that are too large or too complex to be represented in a physical replica. Second, mathematical models can be programmed on computers. Computerization permits analysis of future conditions and behavior within a system, because the dimension of time can be incorporated and manipulated. Such a model, known as a "continuous simulation model," can be used to the probable impacts of future events.

Computerized models are suited to the evaluation of water quality, which is basically the net effect, over time, of complex interactions among the chemical, physical, biological, climatic and hydrologic factors that influence

conditions in a waterway. Not only can existing conditions resulting from these interactions be described and evaluated, future assumptions about changes in any, or all, relevant conditions also can be tested.

The development of a computerized water quality model requires the assembly of a vast amount of data and the incorporation of these data into formulations known to be valid on the basis of physical laws or previous experience. These data describe the physical system being modeled, and when they have been incorporated into the model's existing formulations, the model can be instructed to provide a simulated description of streamflow and water quality.

Adjustments are made in the model until simulated data and actual data match satisfactorily. When this has been achieved, the model is considered to be calibrated. It can be used to simulate the future impacts of alternative plans for water quality management, thus serving as an analytical tool that permits alternative plans to be compared in considerable detail with respect to the impact they would have on water quality.

b. Commission Model

This areawide planning study incorporated a computerized continuous simulation model developed by Hydrocomp, Inc. of Palo Alto, California. This model is a four-program package capable of simulating the dynamic behavior of streamflow and water quality. Through the combined use of the various programs, hydrologic and water quality interactions can be depicted. The data input requirements for the Hydrocomp model are extensive and include information on such factors as climate, streamflow, septic systems, channel characteristics, soils, and ground cover. Information on rates of flow, volumes and contents of pollutant discharges from all types of sources also must be programmed into the model.

The model was used in 10 of the 12 drainage basins in Northeastern Illinois studied during the initial program: North Branch of the Chicago River, Chicago River/Sanitary and Ship Canal/Cal Sag Channel, Little Calumet River, Hickory Creek, DuPage River, Fox River, Kishwaukee River, Salt Creek, and the Upper and Lower Des Plaines River Basins. It was not used for Lake Michigan Basin-North because modeling of the complex interactions of Lake Michigan was not feasible in this project given the time and financial resources available. Neither was the model used in the Kankakee River Basin, because the vast majority of the basin is located outside northeastern Illinois.

In each basin, the waterways to be modeled were divided into "reaches" from two to eight miles in length. For each reach, the Hydrocomp model was used to simulate the flow and pollutant loadings coming from upstream reaches, point sources, surface runoff, and groundwater. Physical, chemical

and biological reactions occurring within a reach also were simulated for a variety of climatic and hydrologic characteristics.

The data were then processed to develop the probable magnitude, frequency and duration of water quality standards violations within a particular reach. In addition, the relative contributions of pollutants from various sources were assessed.

Changes in land use and point source conditions for the Year 2000 were then introduced and resultant water quality data, simulated for the Year 2000, were developed for specific parameters: stream flow, biochemical oxygen demand (BOD), ammonia, nitrates and nitrites, phosphorous, chlorophyll a, temperature, and dissolved oxygen.

The model was used, to evaluate alternative water quality management strategies developed for each basin in conjunction with participants in the areawide planning process.

Basically then, the Hydrocomp model served two purposes in the program. As just discussed, it was an analytical tool for the evaluation of the effects of various water quality management plans. And, as indicated previously, it provided a description of existing water quality in the region. It was this description, summarized below, that provided a starting point for the development of specific plan alternatives.

In the initial 208 program, the water quality model was calibrated using instream water quality data collected at 48 sites throughout the NIPC region. Intensive sampling was conducted at these sites to determine daily and diurnal variations in water quality. In the calibration process, parameters were adjusted in the model so that the model simulation results reflected the measured water quality. In addition, other data sources have usually compared favorably with modeling results, indicating a generally reliable calibration. It is recognized that additional work is necessary to verify modeling results on a more localized basis.

Further work also needs to be done to more precisely define the extent of water quality problems. For example, the frequency and duration of dissolved oxygen excursions below 5 mg/l need to be investigated in a number of stream reaches; the causes, whether real or mathematical, need to be determined. The modeling analysis needs to be checked, and it undoubtedly will be improved by the use of data not available during the initial 208 program. "For these reasons, using the model or its results for purposes other than those intended in this plan could be inappropriate or misleading. The above limitations should be viewed in the context of using the model in the 208 planning process." The continuing planning program has as one of its objectives, improvement in the reliability of the model.

A more detailed description of the modeling process can be found in 208 Staff Paper No. 3: "Water Quality Modeling,"

and in Staff Paper No. 22: "Nonpoint Source Pollution from Land Use Activities."

c. Modeling Results

The discussion that follows is a brief summary of information that is reported in greater detail for the 10 basins in which the model was used, in the appropriate chapters in Part II of this areawide plan.

The model was instructed to portray existing water quality from two perspectives: (1) An analysis of instream conditions, expressed in terms of pollutant concentrations and in terms of the frequency and duration of violations of state standards, and (2) the contribution of specific pollutants to the stream from discernible point sources, and from subsurface flows and surface runoff from various land-cover areas.

(1) Point Source Discharges: from treatment plants and other sources are frequently of lower quality relative to that of the receiving waterway. The effects of point source discharges vary widely throughout the region, but in general, increases in BOD, ammonia and phosphorous were simulated downstream of point source discharges. Increases in these parameters are most significant during dry weather, when the receiving streams have low flows and reduced capacity for dilution. With the exception of excess wastewater flows and combined sewer overflows, the flows from point sources tend to be stable, fluctuating as a result of weather conditions, with some seasonal and diurnal variations.

Municipal wastewater treatment plants and combined sewer overflows are the point sources making the greatest contribution of pollutants to rivers and streams, with combined sewer overflows representing the single most serious threat to water quality, in certain basins. It was found, for example, that although the low-flow effects of treatment plant effluent are serious in many stream reaches, the effects of combined sewer overflows are more serious, even though such overflows occur during wet weather when natural dilution capacity is highest.

(2) Subsurface Flows: are more variable than point source discharges and are generally of high quality. Although they contribute nitrates, particularly in agricultural areas, subsurface flows generally are the most beneficial source of stream flow. Groundwater serves to dilute the pollution introduced in other flows.

(3) Surface Runoff: is highly variable and pollution from this source is associated with meteorological rather than with continuous flows. The effect on streams is most serious during the initial stages of a runoff event when

pollutants that have accumulated on the land since the last storm are carried into streams in high concentrations. Violations of standards caused by surface runoff tend to be of short duration, particularly in upstream segments, where the time needed for the impacts of a runoff event to pass is the shortest.

4.03 ASSESSMENT OF CURRENT CONDITIONS

a. Rivers and Streams

The existing water quality of rivers and streams in the region is the central concern of the areawide planning effort. At an areawide level, however, it is difficult to generalize about instream water quality. A great deal of information has been developed, under varying circumstances and over varying periods of time. In a few cases, clear conclusions can be drawn on the basis of available information. More often, interpretations and conclusions must be directed at specific basins, at specific waterways, or even at specific stream segments. Discussion of water quality conditions in specific rivers and streams, appears in the basin chapters that make up Part II of this areawide plan.

Analysis of water quality problems in individual basins is based on the accumulation and assessment of information from many sources, three of which are most significant:

(1) Water quality sampling programs conducted throughout the region by the Illinois EPA;

(2) Water quality sampling programs conducted by the Commission in order to establish a consistent data base for the areawide planning program; and

(3) The simulation of existing conditions in the water quality model. Simulation results are examined in detail in individual basin chapters, for those basins in which the model was used.

The focus in the discussion that follows is on significant aspects of water quality that can be evaluated fairly and usefully from an areawide perspective.

b. Inland Lakes

Northeastern Illinois contains more than 700 natural lakes and 4,000 man-made lakes and ponds. They range from small ponds of one-tenth of an acre to the 1,700-acre Fox Lake. Most are small and shallow, with median depths of seven or eight feet. Some lakes, such as the natural glacial lakes of Lake County, are fed primarily by

groundwater. Others are sustained from tributary surface runoff and incidental surface precipitation. In the case of the Fox Chain-of-Lakes system, the lakes are part of a larger stream regime.

Table 4-3 provides a summary of inland lakes and associated surface acreages in northeastern Illinois.

The region's inland lakes have considerable recreational, aesthetic and economic value but most are beset by many problems. Excessive and conflicting recreational use, restricted access, and in some cases, periodic flooding, are among the factors that tend to diminish the values of lakes to the region's citizens. The greatest problem, however, is water quality degradation, particularly eutrophication.

Eutrophication is caused by excess fertilization or nutrient enrichment of surface waters. The condition is manifested by large, recurrent growths of aquatic plants and algae. These can degrade water quality and impinge upon use of the water bodies. Nearly all lakes undergo eutrophication, the process being accelerated by everyday human activities.

With the exception of relatively new lakes, such as those formed in sand and gravel pits, stone quarries or borrow pits, eutrophication is an existing or developing problem for every lake in the region. In addition to excessive weed and algae growth, eutrophic lakes are characterized by reduced populations of game fish, large but stunted populations of other species, high turbidity, and sedimentation. Winter fish kills are common, particularly in the shallow water bodies. All of these conditions affect public use and enjoyment.

Primary responsibility for controlling pollution of publicly owned lakes rests with the State of Illinois. Under Section 314 (a) of Public Law 92-500, the state is required to identify eutrophic conditions in all publicly-owned lakes, which in Illinois, means all lakes with public

TABLE 4-3: NUMBER AND SURFACE ACREAGE OF LAKES IN NORTHEASTERN ILLINOIS

County	NATURAL		ARTIFICIAL	
	Number	Surface Acreage	Number	Surface Acreage
Cook	132	1,268	1,115	5,844
Du Page	111	243	465	981
Kane	6	39	459	751
Lake	119	10,563	700	3,043
McHenry	67	1,971	633	2,003
Will	284	1,337	674	2,574
Total	719	15,421	4,046	15,196

access (according to the definition of the Illinois Department of Conservation). The Illinois EPA has completed an initial inventory in northeastern Illinois and determined all "significant" (greater than twenty acres) publicly-owned lakes in the region to be "noticeably eutrophic" to some degree. A listing of these lakes is given in Table 4-4.

The water quality problems of inland lakes and ponds have not received great attention in areawide planning because of their large number and the fact that most problems and remedial solutions are very site-specific. An overview of inland lake problems and potential corrective measures was developed, however, in 208 Staff Paper No. 5: "Water Quality Problems of Inland Lakes" (1976). Moreover, the IEPA has undertaken a specific program to deal with inland lake problems, including those in northeastern Illinois, and similar efforts in areawide planning would be duplicative. Current IEPA plans call for the identification of those lakes which are most seriously affected by eutrophication and other water quality problems. An analysis of applicable restoration and protection measures will follow. A comprehensive program for the state subsequently will be proposed, including specific remedial measures for individual lakes. Implementation of recommended programs will follow, to the extent funds are available.

c. Lake Michigan

The water quality of Lake Michigan is generally good, particularly in open waters. In a 1976 report to Congress, the USEPA identified only three areas in the Lake as having significant water quality problems: Green Bay, the Milwaukee Harbor and the Indiana Harbor Ship Canal. Overall, the most serious problem known to exist in the Lake is contamination from polychlorinated biphenyls (PCBs) and pesticide residues. Tissue samples from Lake Michigan fish continue to produce evidence of these substance, with frequent samples producing levels in excess of federal standards. A detailed analysis of Lake Michigan water quality off Illinois is included in Chapter Eleven, which deals with the Lake Michigan Basin-North. Staff Paper No. 11 "Lake Michigan Water Quality Trends and Monitoring Programs in Illinois s Waters" contains a summary of all current monitoring programs.

d. Groundwater

All groundwater naturally contains dissolved solids, and possesses other basic characteristics such as temperature and taste. The quality of groundwater depends upon its environment, movement, depth and source. In different aquifers and at different places in the region,

TABLE 4-4: PUBLICLY OWNED LAKES IN NORTHEASTERN ILLINOIS (Greater Than 20 Acres in Size)

COOK COUNTY

- Wolf Lake
- Calumet Lake
- Consumers Quarry
- Great Lakes Quarry Lake
- Lake Opeaka
- O'Hare International Airport Lake

Chicago Park District

- Douglas Park Lagoon
- Humboldt Park Lagoon
- Jackson Park Lagoon
- Marquette Park Lagoon
- Washington Park Lagoon

County Forest Preserve Lakes

- Bakers Lake
- Bergman Slough
- Big Bend Lake
- Crabtree Lake
- E.J. Beck Lake
- Longjohn Slough
- McGuinnis Slough
- Maple Lake
- Powderhorn Lake
- Saganashkee Slough
- Sauk Trail Lake
- Shoefactory Lake
- Skokie Lagoons
- Spring Lake
- Tampier Lake
- Wampum Lake

DU PAGE COUNTY

- Bederman Lake
- Blackwell Lake
- Churchill Lagoon
- Mallard Lake
- Pratt's Wayne Woods Lake & Ponds

KANE COUNTY

- Mastodon Lake
- Mighell Park Lagoon

LAKE COUNTY

- Dead River Slough
- Turner Lake
- Bangs Lake
- Butler Lake
- Diamond Lake
- Lakewood Forest Preserve Lakes
- Lake Linden
- Round Lake

Fox Chain of Lakes

- Bluff Lake
- Lake Catherine
- Channel Lake
- Fox Lake
- Grass Lake
- Lake Marie
- Nippersink Lake
- Petite Lake
- Pistakee Lake
- Redhead Lake

MC HENRY COUNTY

- Lake Defiance
- Crystal Lake
- Lily Lake

WILL COUNTY

- Des Plaines Game Farm Lake
- Des Plaines Conservation Area (Grant Creek)

major contrasts in quality can be found, but in general, the quality of groundwater is much higher than that of surface streams. Indeed, most groundwater is normally acceptable for potable use without extensive treatment. This has been a major factor in its widespread development for public and industrial water supply purposes.

Grcundwater in northeastern Illinois usually is high in minerals associated with "hardness," and central or home softening often is necessary. Naturally high concentrations of total dissolved sclids are also encountered, although objectionable levels generally are restricted to the lower reaches of the Mt. Simon aquifer (See Chapter Three for more information on the region's aquifers and other elements of the water supply system). Iron also is found extensively in grcundwater pumped from the shallow aquifers and is a result of natural geologic conditions. Hydrogen sulfide gas is a problem for a number of water supplies, particularly those which draw from the shallow dolomite aquifer. Radioactivity and barium levels higher than established standards also have been recorded from a number of deep well supplies.

Documented cases of groundwater pollution in the region have been rare and locally isolated. The most publicized cases have been traceable to equipment failure, flooding of poorly sealed well casings, or to operational difficulties and inadequacies.

The vulnerability of groundwater to pollution depends largely on the characteristics of the overlying materials. For example, sand and gravel filter out most contaminants, but other materials, such as fractured dolomite, provide no filtration, and may allow polluted waters to move freely for great distances. The risk of polluting the deep sandstone aquifer from activities in the region is slight because of the impermeable shale above the aquifer. Some pollution of deep aquifers could occur in the recharge areas to the west and north of the region, but the potential for harm to water supplies in northeastern Illinois is remote because of the long distances the water travels through the ground before it reaches the region.

Incidents of bacteriological pollution have been found in places where shallow wells and concentrated septic disposal systems exist too closely together, or where shallow wells are located adjacent to polluted streams.

Adequate information is not available at this time, however, to define the current extent or severity of the problem. High bacterial counts sometimes found in water samples from private wells frequently are caused by imprcper well construction or inadequate maintenance. Such problems are site specific, and do not indicate general contamination.

The shallow dolomite aquifer is susceptible to pollution from storm runoff or floodwater that passes over land where pollutants have been deposited. These materials can become dissolved or be carried in suspension by the

runoff, and may not be completely filtered out as the water percolates through soil and geologic materials. Any marked increase in the turbidity of water pumped from dolomite wells after a rainstorm is cause to suspect possible contamination.

Direct intrusion of heavily-polluted floodwaters into wells is a problem in developed floodplain areas. On a number of occasions, residents of flooded areas have had to initiate emergency purification measures or temporarily abandon private wells and use other sources.

No original research on groundwater pollution was conducted as part of the areawide planning program. Available information on the quality of groundwater was reviewed, however, and a search was conducted for records of groundwater pollution problems, suspected contamination of public wells, and other health hazards. All information studied is summarized in 208 Staff Paper No. 12: "Groundwater Quality." Results of this work make it clear that the quality of water in the region's aquifers is adequate and not polluted. This does not mean that the protection of groundwater supplies should cease to be a major concern.

There are certain conditions that create the potential for groundwater pollution if proper precautions are overlooked. Some of these conditions are described below:

(1) Landfills and Old Dumps: Leachates from sanitary landfills and old garbage dumps can contain concentrated organic and inorganic pollutants. Risks of groundwater pollution are greatest when a high water table and permeable soils are present at the waste disposal site. Generally, the effect is localized around the site, but groundwater problems have developed in cases where the pumping influence of domestic wells has caused movement of polluted groundwater toward the wells.

(2) Deep Well Disposal: In some areas of the country, large quantities of liquid industrial wastes have been disposed in deep injection wells. This practice is not yet used in northeastern Illinois, but it could be considered in the future as a result of Public law 92-500 provisions that require elimination of waste discharges to surface water. If such proposals are made for the region, they should be carefully evaluated before they are attempted. The potential for groundwater contamination from deep well injection is serious in an area like northeastern Illinois unless site selection, design and operation are handled correctly.

(3) Abandoned Wells: Improperly sealed abandoned wells provide direct conduits through which pollutants can enter aquifers. With abandoned shallow wells, the primary concern is that polluted surface runoff might enter through the well bore or along the well casing. In the case of deep wells,

not only must the bore and casing be sealed, additional seals must be provided to confine water to the aquifer in which it occurs, thus preventing the upward or downward movement of water between different aquifer units.

(4) Septic Systems: Soils and surficial geologic conditions are the most important factors in determining whether a site is suitable for septic systems. Soils must be adequately drained. There should be no interference from high groundwater tables or impervious strata located immediately below the level of the system's absorption field. Septic systems should not be located where they can cause well contamination, such as in areas where there is surficial fractured dolomite close to the surface. State regulations require that septic tanks be at least 50 feet from water wells, and absorption fields at least 75 feet from wells, with greater distances preferred where possible.

In low density, rural areas, the dispersion of septic systems tends to minimize the concentration of pollutants in any unit of receiving groundwater. In more dense areas, such as when several septic systems are installed in a subdivision of small lots, the potential for problems is much greater.

(5) Waste Lagoons: Waste stabilization lagoons have been one of the most commonly utilized treatment systems in the country. They are popular with small communities because of low construction and operating costs. They have also been used successfully in the treatment of industrial wastes that are amenable to biological stabilization. Lagoons pose a potential threat to groundwater quality because the contents may leach downward to the groundwater table. The risk can be minimized, however, by adherence to design and construction techniques which prevent downward movement of the waste materials. Frequent inspection and timely correction of identified problems also are needed to ensure continued successful operation.

(6) Disposal of Residuals: Residual sludges from wastewater treatment plants and septic disposal systems contain highly concentrated pollutants, some of which are soluble and can be readily leached to groundwater. Sludges normally are disposed on agricultural lands, or in specially-designed and permitted sanitary landfills. Unless these sites are selected properly, however, groundwater can become contaminated. See Chapter Seven for further discussion and plan recommendations on sludge disposal.

(7) Pollution from Surface Streams: Contaminated surface waters can pollute shallow aquifers, particularly during flood events, when polluted waters may overflow and seep downward over adjacent floodprone land. This may also occur when wastewater effluents are discharged from treatment plants into dry or intermittent stream beds. Shallow

pumping wells near polluted streams also can induce the recharge of contaminated water into the aquifers.

Beyond the discussion above, protection of groundwater is a consideration throughout this areawide plan. Particularly important in this regard are discussions of surface waste disposal practices, land application of treated effluent, disposal of residuals, and control of pollution from nonpoint sources.

e. Bottom Deposits

The sediments on the bottom of a lake or stream contain high concentrations of organic matter in various stages of decay. The microorganisms that serve as the agents for this decomposition use significant amounts of dissolved oxygen from the overlying waters, and are a major factor in low levels of dissolved oxygen in many of the region's streams. In some places the problem has become so severe that fish cannot survive and gas bubbles rise to the surface from the decomposition taking place in the bottom sediments.

The pollutant parameter used to describe this process is sediment oxygen demand (SOD). To provide background information for the areawide plan, measurements of SOD were taken at 21 deep-water sites and 89 shallow-water sites over the course of several months. Some sediment samples were analyzed for biochemical and chemical oxygen demand (BOD and COD); all were analyzed for total solids and total volatile solids. Details of the sampling program are provided in 208 Staff Paper No. 14: "Water Quality Sampling and Analysis in the 208 Program." Results are presented in Staff Paper No. 29: "Sediment Oxygen Demand Studies of Selected Northeastern Illinois Streams."

Only one of the 89 shallow-water locations at which conditions were analyzed was assessed as being "clean," with 10 others assessed as being "relatively clean." At all locations, conditions generally ranged from "slightly degraded" to "heavily polluted." In some locations, bottom deposits resemble the sludges generated by wastewater treatment plants.

Information on the results of analysis of bottom deposits in specific basins can be found in the appropriate chapters in Part II of this plan.

f. Toxic Substances

About 30,000 chemical substances are manufactured in the United States and about 1,000 new chemicals are developed each year. Many of them enter the environment in the course of their intended use; others, such as polychlorinated biphenyls (PCBs), as manufacturing byproducts that are discharged into streams with industrial wastewater. Many of these chemicals, primarily those that

are toxic, create health and environmental hazards. Among toxic substances generally given greatest consideration in water quality planning are PCBs; heavy metals, such as copper, cyanide, lead and mercury; and insecticides such as mirex, aldrin, dieldrin and DDT.

Analysis of the potential for environmental damage from a substance should focus on:

1. The toxicity and persistence of the substance
2. The ways it enters the environment
3. The biological and chemical pathways it follows in the environment
4. The impacts it creates on the environment

National environmental policies recognize the threat from toxic substances. The Toxic Substances Control Act of 1976 is aimed at preventing toxic materials from being released to the environment. Public Law 92-500 states clearly: "It is the national policy that the discharge of toxic substances in toxic amounts shall be prohibited. Accordingly, the elimination of such discharges in northeastern Illinois is an objective of this plan (See Chapter Two).

However, control of toxic substances is not easy, even after their danger has been established by research and their impact on the environment has been determined. For one thing, sources are often diffuse and hard to ascertain. Mercury, for example, enters the environment via several modes, including as an agricultural pesticide. However, evidence actually linking mercury from agricultural sources to water pollution is considered questionable by some experts. Furthermore, the history of the issue is characterized by the wide use of toxic substances, often for many years, before their harmful effects are uncovered. The story of DDT is one familiar example; PCBs, which were used for 40 years before they were identified as a health hazard in 1968, are another.

In considering toxic substances and water quality, consideration must be given not only to the complexity of the substances themselves, but also to the conflicting issues that surround their use. In some cases, an outright ban on the manufacture and/or use of a substance is appropriate, particularly where acceptable substitutes are available. In other cases, where the substance itself is economically essential, solutions must address themselves to insuring that the use of the substance is controlled so that environmental risks are eliminated. And in many cases, the effectiveness and enforcement of controls, once they are established, also must be considered.

(1) Heavy Metals: Stream sampling programs conducted over the years by the Illinois EPA have indicated frequent, and widespread violations of state instream standards for copper

and lead. Violations of mercury standards, although less frequent, also have been common. There is no significant difference in levels of copper concentration in samples from urban and rural areas. This suggests that natural "background" conditions may be responsible for high copper levels and that control strategies may not be effective in eliminating violations of the copper standard. Concentrations of heavy metals in excess of standards may represent a threat to fish and other aquatic life, but sufficient evidence one way or another is lacking. In the Commission's analysis of stormwater runoff from various types of land use, the mean concentrations of copper and lead were in excess of state standards at some sites. Mean concentrations of chromium, mercury, cadmium, zinc and nickel were within standards in all cases, although there were incidents when concentrations exceeded standards in individual samples. These results are summarized in Table 4-5.

(2) Pesticides: Concentrations of pesticides in the inland waterways of the region, as indicated by the presence of pesticide residues in the tissue of fish that live in these waterways, do not appear to be cause for concern. For example, of 50 fish specimens from inland waterways sampled in a recent IEPA program, only one had a concentration of DDT in excess of U.S. Food and Drug Administration (FDA) tolerance levels.

In Lake Michigan, fish samples have shown higher pesticide concentrations, although DDT levels have declined significantly since DDT was banned. In general, only Lake Trout tissue samples produce pesticide concentrations in excess of FDA tolerance levels. In all cases, concentrations for heptachlor epoxide and dieldrin, other pesticides for which the IEPA has tested, are well within FDA limits.

As part of this areawide planning study, the Illinois Natural History Survey conducted a limited water and sediment sampling program for pesticides. The purpose was to identify and measure the presence of common pesticides which are in current use or which might be residuals of pesticides used in the past.

Samples were collected at six sites, four of which drained areas having predominantly agricultural upstream land uses, and two of which drained areas having upstream land uses which are principally residential. Sampling occurred in mid-December, 1977, with one sediment and one water sample being taken at each site. Samples were analyzed for 24 pesticide compounds. Only two pesticides were found to be present in waterways or sediment: dieldrin and heptachlor epoxide. Analyses for 22 other pesticides showed either they were not present in the water and sediment, or were present only at very minute levels, below the current limits of laboratory detection.

Of the water samples, dieldrin was the only compound present (at 3 of 6 sites) in concentrations above detectable limits. Sample dieldrin concentrations recorded were: 40 parts per trillion (ppt), 2 ppt, and 2 ppt. The 40 ppt level is in excess of the USEPA recommended criterion which calls for concentrations below 3 ppt. There are no Illinois "General Use" water quality standards for these two pesticides.

Of the sediment samples, 5 of the 6 stations reported concentrations of dieldrin and heptachlor epoxide above detectable laboratory limits. None of the other 22 compounds were present. No standards or generally accepted-criteria have been promulgated for pesticides in sediment.

Recent actions by the USEPA in suspending the production and use of dieldrin and heptachlor should result in gradual decreases in concentrations of these chemicals in the environment.

(3) PCBs: All PCB concentrations in the tissue of fish from inland waterways that were sampled by the IEPA were well within FDA limits. Most samples of Lake Michigan fish also had PCB concentrations well within tolerance levels; the exceptions were Lake Trout, in which excessive levels were found frequently.

Levels in Lake Michigan waters are known to be high in some places, as in the bottom deposits of the Waukegan Harbor, where significant PCB concentrations are found. In the harbor, the source of the PCBs was an industry that ceased its PCB discharge in 1971. The issue of PCB removal is the subject of litigation at present.

The presence of PCBs in inland waterways and sediment also was investigated by the Natural History Survey, in connection with the pesticide sampling program described above. Water samples from 3 of the 6 sites showed PCB levels in excess of the USEPA instream PCB criterion of 1 ppt. Two of the 6 sediment samples had PCB concentrations above laboratory detection limits, but one of these may have been an erroneous reading. No official standards have been adopted for PCBs in either water or sediment.

Provisions of the Toxic Substances Control Act, which resulted in cessation of U.S. production of PCBs in January, 1979, and further calls for the prohibition of all processing and distribution (except for specially-approved, closed-systems uses) by July, 1979, will have a beneficial impact. Primary concern will then be focused on PCBs in actual use or inventory, and those present in waters or sediments as a result of prior discharges.

g. Boundary Conditions in Interstate Streams

Northeastern Illinois receives significant flows, and significant volumes of some pollutants, in waterways that

TABLE 4-5: LAND USE WATER QUALITY SAMPLING – SUMMARY DATA – HEAVY METALS

LAND USE TYPE	STATISTICS	PARAMETERS All units are expressed in micrograms per liter (μg/l) unless otherwise noted.						
		Zinc (mg/l) *	Cadmium	Copper	Total Chromium	Nickel	Lead	Mercury
Agricultural	No. of Events	13	13	13	13	13	13	13
	No. of Analyses	37	37	37	37	37	37	37
	Maximum	0.25	3.4	89	50	84	55	0.6
	Minimum	0	0	1	0	1	0	0
	Mean	0.06	0.5	16	16	20	11	0.1
Commercial	No. of Events	9	9	9	9	9	9	9
	No. of Analyses	27	27	27	27	27	27	27
	Maximum	1.87	3.3	64	200	78	1070	0.4
	Minimum	0.06	0.2	9	2	4	23	0
	Mean	0.31	1.1	26	51	19	337	0.1
Highway	No. of Events	6	6	6	6	6	6	6
	No. of Analyses	18	18	18	18	18	18	18
	Maximum	1.14	5.8	130	46	93	2470	0.3
	Minimum	0.03	0.2	9	12	6	38	0
	Mean	0.43	2.2	56	28	28	800	0.2
Forest	No. of Events	1	1	1	1	1	1	1
	No. of Analyses	2	2	2	2	2	2	2
	Maximum	0.07	6.4	6	17	19	5	0.2
	Minimum	0.03	2.5	5	15	17	5	0.2
	Mean	0.05	4.5	6	16	18	5	0.2
Industrial (Light)	No. of Events	14	14	14	14	14	14	14
	No. of Analyses	37	37	37	37	37	37	37
	Maximum	0.44	82	62	72	50	4630	0.7
	Minimum	0.03	0	2	1	0	1	0
	Mean	0.16	7.3	18	20	12	465	0.1
Residential (Low Density)	No. of Events	23	23	23	23	23	23	23
	No. of Analyses	63	63	63	63	63	63	63
	Maximum	1.50	4.4	61	80	179	2030	1.8
	Minimum	0	0	0	1	0	6	0
	Mean	0.13	0.9	18	20	18	186	0.2
Residential (High Density)	No. of Events	10	10	10	10	10	10	10
	No. of Analyses	28	28	28	28	28	28	28
	Maximum	0.39	3.0	54	48	84	580	0.7
	Minimum	0.01	0	3	1	1	8	0
	Mean	0.10	0.65	16	22	27	135	0.2
Ravine	No. of Events	7	7	7	7	7	7	7
	No. of Analyses	19	19	19	19	19	19	19
	Maximum	0.41	2.1	150	45	62	570	0.4
	Minimum	0.02	0.3	1	0	5	13	0
	Mean	0.20	1.0	45	21	39	242	0.2

*mg/l = μg/l x 1000

R Jan 4/79

enter the region from southeastern Wisconsin and northwestern Indiana. Waterways that have interstate significance are:

Lake Michigan: Common to all three states

Fox River: Flows into Illinois from Wisconsin

DesPlaines River: Flows into Illinois from Wisconsin

Piscasaw Creek: Originates in Wisconsin and flows into the Kishwaukee River in Illinois

Kankakee River: Flows into Illinois from Indiana

Grand Calumet, Little Calumet Rivers: Flow into Illinois from Indiana

Wolf Lake: Lies on the Illinois-Indiana border and receives drainage from both states

Nippersink Creek: One branch originates in Wisconsin and flows into the Fox River in Illinois.

With the exception of Plum Creek, which flows into Indiana and then back into Illinois, none of the waterways in the region flow into adjoining states.

Current and projected water quality conditions in interstate waterways are important to areawide planning, and available data on water quality at state boundaries is discussed in detail in later chapters dealing with specific drainage basins. The relative impacts of flows from other states vary according to the point in Illinois at which evaluations are made. At the point where a stream crosses the state line, the impact of pollution from the upstream state is of great significance. Farther downstream, the effects of pollution from the state of origin are less noticeable. This point is illustrated in Table 4-6, which examines the relative impact of Wisconsin-generated pollution on the Fox River at two points. One, at Johnsburg, is only a few miles inside the Illinois border; the other, at the Kane-Kendall County Line, is many miles downstream.

TABLE 4-6: WISCONSIN CONTRIBUTIONS OF POLLUTANTS TO THE FOX RIVER (In percent of total)

Measuring Point	Share of total drainage area	Share of Total Flow	Contributions of Pollutants			
			BOD	NH_3	NO_2+NO_3	P
Johnsburg	72%	69%	89%	36%	44%	46%
Kane-Kendall Line	50%	46%	72%	12%	13%	23%

R Jan 4/79

4.04 CURRENT FISHABILITY CONDITIONS

One of the objectives set forth in Public Law 92-100 is the attainment by July 1, 1983, wherever possible, "of water quality which provides for the protection and propagation of fish, shellfish and wildlife..." As discussed earlier in this chapter, however, water quality is but one of many factors that determine whether or not a given waterway can support a healthy and balanced population of fish and other species. In the discussion that follows, factors that are influencing the "fishability" of rivers and streams in northeastern Illinois are discussed. The extent to which each of these factors, including water quality, is affecting fish populations in each drainage basin is evaluated to the extent possible.

a. Water Quality Impacts on Fish

As a group, fish are tolerant and adaptable organisms that can withstand considerable degradation of their natural habitat. Changes in fish population can be observed as water quality conditions are modified, however. Generally, the water quality changes of most significance occur with respect to these factors: dissolved oxygen levels, ammonia nitrogen levels, temperature, pH, and toxicity. These factors are described below:

(1) Dissolved Oxygen (DO): Without adequate dissolved oxygen in their habitat, fish will eventually die. The critical level in a particular situation will be influenced by several factors. For example, fish vary in their oxygen requirements according to species, age, activity, temperature, and general nutritional condition. A DO level of at least 5.0 milligrams per liter is considered necessary, on a long-term basis, for sustaining a balanced and healthy population. However, fish can survive at much lower DO levels, at least for a while. DO levels not only affect the health of fish; they influence the aquatic insects and animals upon which fish feed. Because there are so many variables to consider, it is not yet possible, despite much research, to define conclusively the relationship between a given fish species and DO levels. State standards call for minimum levels of 5.0 mg/l, which, as noted above, is considered adequate for a good fish habitat.

(2) Ammonia Nitrogen: When ammonia dissolves in water, some of it reacts to form ammonium ions, which contain un-ionized ammonia (NH_3) and ionized ammonia (NH_4^+). The NH_3 is toxic to fish. The degree of toxicity will vary according to temperature and pH.

The state standard for ammonia nitrogen is a maximum of 1.5 mg/l. As noted above, however, the toxicity of ammonia

to fish is a function of the levels of NH_3, not total ammonia. The accepted criterion for NH_3 is .02 mg/l, the maximum concentration considered safe for the protection of freshwater fish. The relationship of total ammonia to NH_3 is a function of temperature and pH. The nature of this relationship is illustrated by Table 4-7.

The table shows that when both temperature and pH are low, total ammonia concentrations can become very high before there is a danger that NH_3 concentrations will exceed .02 mg/l.

However, note in Table 4-7 that if pH reaches 9.0 as temperature reaches 30 degrees centigrade, it takes only .045 mg/l of total ammonia to produce NH_3 concentrations of .02 mg/l. Almost half the ammonia, in other words, is in the un-ionized state and therefore toxic to fish. What this means is that an assessment of violations of the state's 1.5 mg/l standard for total ammonia is not an adequate test of the suitability of ammonia levels for fish. The combined impacts of temperature and pH also must be considered.

(3) Temperature: The regulations of the Illinois Pollution Control Board (IPCB) state that water temperatures in lakes and streams should not exceed 60 degrees (15 degrees centigrade) in the winter or 90 degrees (32 degrees centigrade) in the summer.

(4) Toxicity: Based on results of laboratory experiments, it has been possible to develop toxicity indices for various fish species. Each index incorporates parameters for specific pollutants or pollutant indicators, including: ammonia, cadmium, chromium, nickel, arsenic, boron, mercury, silver, cyanide, copper and others. Here, too, state instream water quality standards are not an accurate measure of the degree to which a given parameter will have toxic effects on a given specie. There are cases where cyanide levels that are well within state standards are found to

TABLE 4-7: TOTAL AMMONIA (in mg/l) NECESSARY TO GENERATE .02 mg/l UN-IONIZED AMMONIA

Temperature (centigrade)	pH				
	6.5	7.5	8.0	8.5	9.0
15°	2.3 mg/l	2.3 mg/l	.75 mg/l	.25 mg/l	.093 mg/l
30°	7.9 mg/l	.81 mg/l	.27 mg/l	0.099 mg/l	.045 mg/l

R Jan.4/79

contribute significantly to the toxicity index. By the same token, some pollutants can occur in excess of state standards but not contribute significantly to the toxicity index.

b. Other Impacts on Fish

The best available information on other factors which impact on fish populations in northeastern Illinois is from a report by the Illinois Natural History Survey (INHS). The report is titled: "Illinois Streams: a Classification Based on Their Fishes and an Analysis of Factors Responsible for the Disappearance of Native Species."

In the INHS report, five factors were identified as being responsible for adverse impacts on various fish species or populations. These factors are described below, in order of their significance as determined by the INHS.

(1) Silt: Excessive siltation ranks first as a cause of adverse impacts. It is identified by the INHS as the principal cause for the elimination of two native species and the decimation of fourteen others. The loss of water clarity, the subsequent disappearance of aquatic vegetation, and the deposition of silt over substrates that were once bedrock, rubble, gravel or sand, are the factors involved. Feeding and spawning sites, as well as general habitats, have been reduced.

(2) Drainage: Drainage of natural lakes, sloughs, swamps, and prairie marshes ranks second as a threat to fish populations. Drainage has been responsible for reductions in the range of 13 native species.

(3) Drought: The drying up of stream systems during drought periods ranks third in importance and is responsible for reducing the range of 12 species. Since 1930, the water table has fluctuated widely. During severe late summer and fall droughts, streams that once flowed continuously now dry up. Some relatively large rivers are reduced to medium or small streams. The effects of drought periods have been particularly devastating on fish that inhabit headwaters and creeks.

(4) Pollution: Industrial, domestic and agricultural pollutants, other than silt, have caused two species to disappear and five others to be seriously depleted. All of the streams and lakes in Illinois have been affected to some degree by pollution, but the most serious impacts have occurred in streams and lakes in northeastern Illinois and in the Illinois River. Fish kills have occurred repeatedly when toxicants such as anhydrous ammonia and cyanide have been accidently or deliberately dumped into streams. In most cases, the streams are repopulated in two or three years, but some species cannot return once the original population has been eliminated. The relevation that water pollution ranks only fourth among the principal threats to fish is rather surprising. However, many fishes are remarkably resistant to pollution as long as their basic physical habitat and breeding areas remain intact.

(5) Dams and Impoundments: The construction of dams to create mainstream impoundments is responsible for severe reductions in four species of riffle-inhabiting fishes. The variety in an area's fish population is directly related to the number of different habitats that are available. When a free-flowing stream is impounded, the riffles are eliminated and the bottom quickly becomes covered with silt. Only fish that can adapt to the new environment can survive.

(6) Temperature: The cutting of trees and other vegetation that afford shade, the reduced flow of cold natural springs, plus low water levels during summer droughts, result in higher water temperatures. No data on specific impacts of stream temperatures are available, but according to the INHS, temperature offers the most likely explanation for some fish losses in the state.

c. Current Fish Habitats and Populations

As part of the areawide planning project, the Commission conducted fish surveys in various rivers and streams. The data from these surveys were processed by the Illinois Natural History Survey. The most surprising finding has been the identification of a significant variety and abundance of fish and species in locations where chemical analyses indicated depressed oxygen levels or the presence of excessive ammonia.

As noted earlier in this chapter, many waterways in northeastern Illinois are incapable of sustaining balanced fish and aquatic life populations due to factors quite independent of water quality. Many smaller streams are subject to severe seasonal fluctuations in water levels and flows, including periods of zero flow, and obviously are incapable of furnishing dependable aquatic habitat. Many shallow water bodies are affected by periodic winter kills during severely cold months when ice thickness and overlying snow depths are substantial. Physical changes as a result of channelization and other drainage measures also have been severe, and on many streams these conditions are both controlling and irreversible. Sedimentation problems are also serious in many basins. Thus, even if water quality were to be greatly improved, many waterways could offer only marginal to poor habitat due to adverse bottom or bank conditions.

It is worth noting that certain waters in northeastern Illinois are believed to support fish species classified as "threatened" by the Illinois Endangered Species Protection Board. Threatened species are defined as any specie which is not now in danger, but is likely to become in danger of extinction as a breeding specie in Illinois within the foreseeable future.

In the inland waters, the black-nosed shiner is believed to occur in the Kankakee River, in the Kishwaukee

River and several of its tributaries, as well as in a few glacial lakes in Lake County. The pugnose shiner reportedly has been found in three glacial lakes in northwestern Lake County.

Three other threatened species (longnose sucker, lake whitefish, and lake sturgeon) have been infrequently recorded in the Illinois waters of Lake Michigan.

Following is a summary assessment of existing fish and aquatic life habitat conditions in the principal water bodies considered in areawide planning.

(1) Chicago Sanitary and Ship Canal: This system is a combination of altered natural waterways and man-made channels. Habitat is severely degraded, and the few organisms present are mostly pollution-tolerant species.

(2) Des Plaines River: As the river flows south and west through the region, habitat generally degrades with distance traveled downstream, with game fish species gradually surrendering to rough fish varieties. Degradation is particularly severe along the middle and lower reaches, where habitat is marginal to poor. Principal causes of the degradation are industrial and domestic pollution and channel and bank modifications.

(3) DuPage River: Prior to intensive urbanization, the DuPage River was known to maintain a balanced and diverse fish and aquatic life community. Habitat now, however, must be classified as poor along the mainstem and along both the East and West branches.

(4) Fox River: The Fox River system still offers adequate habitat for desirable fish and aquatic life species, although aquatic species have suffered as a result of the effects of urbanization in the basin. Generally, conditions deteriorate the further downstream one travels from the Illinois-Wisconsin line. There are more than 100 species in the Fox Basin, but much of the diversity is accounted for by the unusual habitats afforded by the clear, well-vegetated lakes in the basin, and the gravel-bottom creeks and spring-fed streams. The variety of habitat and species in the Fox River itself is less impressive. Overall, fish conditions in the Fox system range from good to excellent.

(5) Hickory Creek: The habitat status of Hickory Creek is considerably better than most other streams in the region. Overall, conditions can be described as excellent, although poor habitat conditions are found. Species diversity is very high, and unusual species can be found.

(6) Kankakee River: This river offers excellent fish and aquatic life habitat. Species diversity is high, and the river maintains stable populations of game fish and other high-level species.

(7) Kishwaukee River: Habitat along the Kishwaukee River is regarded as good to excellent. Certain reaches, however, have been impaired as a result of dredging and channelization.

(8) Lake Michigan: Lake Michigan is unique among the waters of northeastern Illinois. It continues to offer high quality habitat, as evidenced by its diverse fish and aquatic life population.

(9) Little Calumet River: The Little Calumet River affords poor habitat for fish and aquatic life, both along its mainstem and in most of its tributaries. The extensive channelization in the basin has greatly impaired habitat.

(10) North Branch, Chicago River: The North Branch system drains a predominantly urbanized area, and habitat conditions generally are poor. Extensive channel modifications have had significant negative effects in the basin.

(11) Salt Creek: Habitat in Salt Creek has been seriously degraded as a result of the intensive urbanization which has occurred in the watershed. Existing conditions are poor.

4.05 MAJOR WATER QUALITY PROBLEMS IN THE REGION

a. Priorities

The task of identifying the region's most serious water quality problem, and proceeding from there to identify other major problems in order of their seriousness, is formidable. Essential to developing such a list would be the establishment of reasonably objective criteria for determining which problems are most serious. The criteria applied, here, in that regard, are these:

1. The volume and seriousness of the pollution reaching the waters of the region as a result of the problem.

2. The relative severity of the impacts, locally and downstream, created by the pollution associated with the problem.

If the only consideration were elimination of the water quality problems in order of the severity of their impact on waterways, the listing below would represent the Commission's priorities. Obviously the utility of the listings is limited to the extent that it serves to place the region's water quality problems in perspective. Certainly it is not intended to serve as a sequential agenda for implementation of the areawide plan or the continuing planning program. In moving from an assessment of problems

to formulation of strategies, as this plan does in subsequent chapters, factors beyond impact on water quality must be considered. Among these would be federal and state regulations, present and planned uses of waterways, the availability of grants and other sources of funding, the aspirations of local governments, and the differences that will emerge as these problems are viewed subjectively by any number of participants reflecting varied interests.

b. Major Problems

(1) Combined Sewer Overflows: These represent the most severe water quality problem in northeastern Illinois. The problem associated with the 375 square mile combined sewer area of the Metropolitan Sanitary District of Greater Chicago, in and adjacent to the City of Chicago, is in itself one of the major problems in the region. Water quality simulation has shown that wherever combined sewer systems exist in the region, they are major sources of pollution. Overflows generally take place only a few times each year, but the impacts are acute and long-lasting.

(2) Treatment Plants: In northeastern Illinois all municipal type westwater plants have secondary treatment capabilities and a high percentage already have tertiary treatment facilities. Discharges from these plants, therefore, are not the water quality threat they would be in areas where fewer local, state and federal resources had been applied to improving wastewater treatment. Persistent problems are noted throughout the region, however, as a result of overflows from sewers and plants during wet weather. Many older sewer systems receive excessive infiltration and inflow. During storms, the total load on treatment facilities becomes so great that partly-treated or untreated wastes must be discharged to waterways. Even if such discharges are infrequent, their severity can be sufficient to inflict long-term damage. It also should be noted that even when effluent standards are met, treatment plant discharges have significant adverse impacts in some cases.

(3) Urban Stormwater Runoff: Stormwater drained from areas with large expanses of impervious surfaces, including roads, streets, parking lots, roofs and sidewalks, all generate large quantities of polluted stormwaters which are discharged into lakes and streams. The effects are varied and widespread but, as shown by water quality simulation, are of significance in all areas that are urbanized or expected to become urbanized.

(4) Agricultural Runoff: Runoff from tilled lands rates a high priority, especially when considering the extensive agricultural activities in the region, particularly in

McHenry, Kane and Will Counties, and giving due recognition to the large cattle raising operations, mainly in open pastures. Of particular concern are the effects of ammonia, organics, nutrients, pesticides, and sediment on water quality.

(5) Soil Erosion: Eroded materials, from construction sites and croplands, are known to be contributing large volumes of sediment and associated pollutants to rivers and streams and also to Lake Michigan, where tons of soil are eroded from shoreline bluffs. Erosion is most important, relatively speaking, in rural areas where many other types of problems may be absent, and in developing areas wnere specific construction sites are not being managed properly.

(6) Bottom Sediments: These materials generate severe oxygen demands on overlying waters. These deposits also contain a variety of pollutants, including toxics, that become resuspended in the water as a result of turbulence created by boats, barges, and ships. Such problems occur in major rivers, in the region's canal system, in many inland lakes, and in the marinas and port facilities on Lake Michigan. In cases where deposits have been allowed to accumulate too deeply, barge traffic and other navigation important to the region's economy has been restricted. The problem is compounded by the postponement of maintenance dredging in harbors and channels, sometimes because funds are not available and at other times because of controversies over disposal of dredged material. It is recognized that dredging is only a short-term solution, however, unless coupled with other pollution abatement programs.

(7) Unsatisfactory Septic Systems: These are another serious threat to the regin's water quality. Six percent of the region's population depends on septic systems for the disposal of wastewaters and large numbers of these systems are unsatisfactory for one or more reasons. The impacts on water quality are often overshadowed by the health hazards associated with such unsatisfactory systems and by the obnoxious public nuisances created in a number of places. The problem is complicated by certain political and institutional aspects, as well by technical and economic issues. For example, septic systems often serve low-income areas where the ability to finance local corrective measures is absent. In other locations, extensions of municipal sewers to replace septic systems would be dependent on annexation. Furthermore, costs for extending sewer systems are often extremely high because of the distances involved, low densities and adverse topography.

(8) Hydrologic Modifications: Particularly dams and stream channelization often have serious negative impacts on aquatic habitats, resulting in reductions of certain fish

species. One typical impact of channel modification is the elimination of desirable substrate conditions due to siltation. Flow velocities and depths are altered, also. Drainage of natural lakes and swamps has resulted in the reduction in the range of numerous fish species due to loss of habitat. Dams and impoundments tend to reduce flow velocities, cause increased sedimentation, promote algal growth, and often result in impaired dissolved oxygen conditions relative to free-flowing reaches.

(9) Low-Flows: Conditions in waterways during dry weather help illustrate both the success and shortcomings of the region's treatment plants. Dissolved oxygen conditions are often satisfactory in may streams during dry weather when treatment plant discharges comprise the major pollutant load. However, there are major exceptions, including the Chicago Sanitary and Ship Canal System, the North Branch, the Little Calumet, the Des Plaines, and the East Branch DuPage, where dry weather dissolved oxygen concentrations are often low. These conditions are generally due to excess point source pollutant loadings relative to the limited assimilative capacity of the streams. Also contributing are high levels of sediment oxygen demand (SOD). Ammonia concentrations are generally high in dry weather conditions except in streams, such as the Fox River and Hickory Creek, where there is sufficient flow to dilute point source discharges.

(10) Boundary Conditions: The quality of the region's waters is influenced by the pollutants in streams flowing from Indiana and Wisconsin. The Fox and DesPlaines River basins in Wisconsin represent essentially unurbanized areas, and pollutant contributions from these areas are significant but not alarming. However, the Grand Calumet and Little Calumet River Basins in Indiana contain wastewater treatment plant effluents from large cities, combined sewer overflows, urban stormwater drainage, and industrial effluents from highly urbanized areas. Pollution from these sources has serious impacts on Illinois waterways. In contrast, the Kankakee River Basin in Indiana is largely an agricultural area and pollution entering Illinois is not as severe.

(11) Poor Operation of Treatment Facilities: Operation and maintenance of existing facilities have been cited as problems by the USEPA and by the General Accounting Office. Surveys by both agencies have revealed that nationwide, one-third of all treatment plants appear to be failing to meet their design criteria for suspended solids. While it is possible only to generalize about the operation and maintenance of plants in this region, it is safe to assume that correctable problems exist in many of the region's several hundred plants. The effectiveness of many plants is impaired by excessive infiltration and inflow, improper

treatment of unfamiliar industrial wastes, inadequate training for plant operating personnel, and other problems.

c. Summary

Northeastern Illinois has most of the problems typically associated with water pollution in metropolitan areas. The region is fortunate, however, in that many of its most serious problems, those associated with point sources, are under control or will be under control when existing plans are completed and implemented. This is not to say that solutions are easy to find or easy to implement, however, only that they are available. Major capital investments, including a multi-billion dollar investment just to eliminate combined sewer problems in Cook County, face the region in years ahead.

Pollution from nonpoint sources must be labeled as a problem for which solutions are not yet definitive. Strategies are available, but their effectiveness and their acceptability in the region have yet to be tested in many cases. In other instances, as in the control of soil erosion, corrective measures known for many years have been largely rejected, for many complex reasons, by those in a position to implement them. It cannot be assumed that such situations will be changed easily by the findings or recommendations in this plan.

The problems associated with pollution generated in other states, particularly in the Indiana portion of the Calumet Basin, also will be difficult to eliminate.

With respect to many other problems, however, the development and implementation of solutions appears to be possible, although certainly dependent on the attitudes and priorities of citizens and institutions in the region. Causes and sources of pollution are known, or can be determined in the future through the continuing planning program. Preventive and corrective measures can be designed; required resources, governmental actions and citizen committments can be identified; and a course of action can be outlined within the policies and recommendations set forth in areawide planning.

CHAPTER 5

Pollution from Point Sources

CHAPTER FIVE
POLLUTION FROM POINT SOURCES

5.01 INTRODUCTION

A point source is a specific structure from which pollutants are discharged. Most often, a point source is a pipe - one coming from a wastewater treatment plant. But, ditches, channels, sewers, tunnels, ships and boats may also be point sources. And, as point sources are generally defined, so are wastewater discharges from feedlots and stormwater runoffs from industrial yards.

The categories into which point sources have been divided in the areawide plan are listed in Table 5-1.

The most common point sources are municipal-type wastewater treatment plants. This category includes all facilities treating domestic wastewater from municipalities and subdivisions. Usually these facilities are owned publicly, by a municipality, county or sanitary district. Some are owned by subdivisions, utilities or land developers.

Significant characteristics of all point sources in northeastern Illinois are described in the basin chapters that comprise Part II of this plan. In this chapter, point source issues and problems of areawide significance are discussed and appropriate recommendations of an areawide nature are presented.

5.02 AREAWIDE OVERVIEW OF POINT SOURCES

a. Municipal Type Wastewater Treatment

There are 157 "municipal type" wastewater treatment plants in the region, including 84 operated by municipal governments, 28 by private utilities, 26 by sanitary districts, 17 by county governments and 2 by homeowners associations. In general, it can be said that these plants represent a treatment system that is relatively advanced. The region is one of the few in the country in which secondary treatment levels are being met or exceeded in all wastewater treatment effluent. This does not mean that the region's municipal-type plants are uniformly effective. The quality of effluents,, and their impacts on waterways vary according to several factors.

(1) Assessing Current Conditions: A complete assessment of a municipal-type system would require that several questions be considered. Some are technical; others relate to the institutional and political environment in which a treatment plant operates. Among pertinent questions are these:

TABLE 5-1: CATEGORIES OF POINT SOURCE DISCHARGES

Municipal-Type Wastewater Treatment Plants	Other Point Sources
—Publicly-owned facilities	—Industrial Wastewater Treatment Facilities
—Privately-owned facilities	—Miscellaneous Wastewater Treatment Facilities
	—Industrial Stormwater Discharges
	—Agricultural Point Sources (Feedlots)
	—Cooling Water Discharges
	—Water Supply Treatment Facilities

--What degree of treatment is involved, i.e. secondary, tertiary or advanced? 62, 63

--What type of sewer system exists? Separate, combined, or both? 66

--Is there excessive infiltration and/or inflow in the system? 69

--Do industries pretreat wastewaters before discharging to the municipal system? 71, 72

--How is sludge disposed of? 75

--Is more than one drainage basin involved in the collection of wastewater and/or discharge of effluent? 77, 78

--Is there any plant capacity available for new development? 81

--What is the political attitude regarding future growth and development? 83, 84

--How much residential, industrial, commercial and institutional growth is anticipated? 86, 87

--Are there septic systems which need to be phased out due to unsatisfactory performance?

--Does the community or agency have a high enough state priority number which will allow federal or state funding of wastewater plant expansion/upgrading in the near future?

--Are there intergovernmental agreements involved? If so, what is their status?

--What are the rates for wastewater service and how are they computed?

--Which agencies are involved in planning, design and construction of the facility?

--Are there health hazards in the service area due to the inadequate treatment of wastewaters?

--Are future expansions of existing wastewater treatment plants or the construction of new facilities capable of utilizing alternative or innovative wastewater treatment processes?

Such questions provided a basis for analyzing municipal-type plants in each drainage basin. Details developed through the study of the plants in each basin are provided in appropriate chapters in Part II of this plan. The purpose here is to describe major systems and facilities and to examine areawide issues and problems.

As noted above, all municipal-type plants in the region have secondary treatment capabilities. In addition, all municipal-type plants have chlorination facilities. Thirty-four percent have tertiary filters, 14.5 percent have tertiary "polishing ponds" but no filters, and 18 percent have some type of lagoon or pond.

With respect to the current requirements of Public Law 92-500, therefore, the region's wastewater treatment facilities are in reasonably good standing. All facilities are meeting the July 1, 1977 requirements for secondary treatment; several already are in compliance with the July 1, 1983 requirement for "best practicable" treatment, which is generally interpreted as advanced, or tertiary, processing.

With respect to effluent quality, nearly all plants normally surpass the federal secondary treatment criteria of 30 mg/l of BOD and 30 mg/l of suspended solids. Only about a dozen plants, in fact, have NPDES permits authorizing 30/30 discharges. All others have permits requiring effluent quality that meets or exceeds the basic Illinois secondary effluent requirement of 20/25. Some plants are operating under permits that call for 10/12 or even 4/5 discharges.

The state requires phosphorous removal at all plants discharging into Lake Michgian, and at most plants discharging into the Fox River basin. Very few plants, however, have facilities to remove another of the prevalent nutrients, ammonia-nitrogen.

(2) Future Wasteloads and Volumes: Information on projected wasteloads and volumes from each municipal-type wastewater treatment plant was required for the water quality model to depict future conditions. In preparing projections of loads and volumes, the Commission followed a standard methodology and relied whenever possible on information in local 201 facilities plans. In cases where plans were incomplete, where information was missing or judged to be inadequate, the Commission sought additional information, or made necessary assumptions.

Projections of waste loads (in pounds per day) and waste volumes in millions of gallons per day (MGD) were computed for each Facility Planning Area (FPA). These projections were presented in the Commission's "Assesments of 201 Plans" and are contained in tables included in each of the basin chapters in Part II.

There has been no attempt to forecast maximum daily loads for "other" point sources as has been done for municipal-type facilities. Federal regulations require the determination of maximum daily loads for all stream segments designated as "water quality limited," and this designation has been applied by the Illinois EPA to all waterways in northeastern Illinois. The responsibility for determining daily loads does not rest with areawide planning agencies, however, except where it has been specifically delegated by the state. No such delegation has been made by the Illinois EPA.

(3) Publicly-Owned Facilities: The largest wastewater treatment authority in northeastern Illinois is the Metropolitan Sanitary District of Greater Chicago (MSDGC). The District serves about 860 of the 3,700 square miles in the six-county area, including the City of Chicago and 120 other communities. Wastewater from 5.5 million people, plus a nondomestic wastewater load having a population equivalent of 5.5 million additional people, is treated by the District. On the average 1.43 billion gallons of sewage wastes and 1,000 tons of organic solids are processed per day. To accomplish this task the District maintains the largest wastewater treatment plant in the world, plus six other plants and 26 pumping stations. It also owns and operates 485 miles of intercepting sewers ranging from 12 inches to 27 feet in diameter. The District oversees more than 71 miles of navigable waterways and channels, and owns a great deal of property along inland waterways.

The North Shore Sanitary District (NSSD) is located along Lake Michigan in Lake County. It extends from the Wisconsin border on the north to the Cook County line on the south. It serves an area between the Lake and The Tri-State Tollway (Interstate Highway 94), excluding the Deerfield area. The 100-square mile service area includes 11 communities and several military facilities. Approximately 220,000 people are located in the area as well as a number of sizable industries.

The Sanitary District of Bloom Township is located in southern Cook County and northeastern Will County. It serves five municipalities and a total area of 21.9 square miles. The 1975 population in the area was 80,000.

The Sanitary District of Elgin is located in north central Kane County along the Fox River. Its three plants serve 40.5 square miles and about 78,000 people. In addition, it provides wastewater service to the MSDGC Poplar Creek area in northwestern Cook County under a contractual agreement. That area contains 35 square miles and a population of 35,000.

The Aurora Sanitary District is located in southeastern Kane and northern Kendall counties. Thus, part of its service area is outside the six-county region. The District serves an area of about 64 square miles (in Kane County) as well as four municipalities. The 1975 population was about 112,200 people.

The Hinsdale Sanitary District located in southeastern DuPage County serves an area of 25.5 square miles with a 1975 population estimated at 45,000.

The Downers Grove Sanitary District, also located in southeastern DuPage County, serves about 50,000 people and an area of 20.5 square miles.

The Wheaton Sanitary District is located in central DuPage County. It serves an area of about 16.5 square miles and in 1975 served an estimated 49,800 people.

These eight sanitary districts serve a combined area of about 1,108 square miles, about 30 percent of the six-county area, and 87 percent of the region's total 1975 population of slightly more than 7 million. The impact of these seven districts on the region's areawide point source program is significant.

While dozens of municipalities treat wastewater, only six operate treatment plants with capacities of 5 MGD or greater. Some pertinent information on these facilities is shown in Table 5-2.

Collectively, the larger sanitary districts and municipal systems described above operate 23 plants. The 141 other municipal-type plants and septic systems serve less than 10 percent of the region's population, but 65.5 percent of the six county area. This analysis indicates that water quality management programs focused on the operation of the 23 largest municipal-type plants could be expected to have substantial impacts on the region's overall point source problems.

TABLE 5-2: MAJOR MUNICIPALLY-OWNED WASTEWATER SYSTEMS

	Plant Capacity (MGD)	1975 Population Served	Planning Area (sq. miles)
Joliet (2 Plants)	32.5	82,000	75
Naperville	10.0	30,900	47
St. Charles	8.0	17,300	12.0
Glen Ellyn	6.7	26,000	11.0
Elmhurst	6.0	51,000	10.0
Totals	63.2	207,200	155.0

(4) Privately-Owned Public Utilities: There are 28 privately-owned municipal-type wastewater plants in the region which provide wastewater services as public utilities. Numerically, these 28 represent 17 percent of all treatment facilities, although their average wastewater flows tend to be much smaller than the average flow from publicly-owned plants. Present flows at the privately-owned range from .004 to .8 MGD; design capacities range from .04 to 3.0 MGD.

These public utilities include neighborhood and subdivision type systems. They usually serve unincorporated residential areas, although some are located in incorporated municipalities. They treat normal domestic wastes through the same processes used at publicly-owned plants. In many newly-developed areas far from established municipal sewer systems, privately-owned systems provide the only available service. Residents of these areas otherwise would have to rely upon septic systems for waste treatment.

As public utilities, privately-owned treatment systems are regulated by the Illinois Commerce Commission with respect to franchise areas and rates. They must also comply with IEPA design and IPCB effluent quality standards. No privately-owned systems are eligible for either state or federal grants.

b. Other Point Sources

(1) Industrial Disharges: Industries generate a wide range of wastewaters, including relatively clean rinse or coooling waters as well as highly polluted industrial process wastewaters carrying organic or mineral matters, or corrosive, toxic, flammable or explosive substances. Some industrial wastewater is so objectionable it should not be admitted to public sewage treatment systems. Other wastewater can be treated easily and safely in municipal systems, although in many cases, it must be pretreated by the industry.

In northeastern Illinois there are only 48 industries treating their own process wastewater and discharging into waterways. Twenty-four of these discharges are in the Lower DesPlaines River Basin. A much greater number of industries, therefore, are conveying their process wastewaters to publicly-owned systems for treatment.

Industrial discharges to publicly-owned treatment works have the potential to cause significant operational problems. In varying quantities, these discharges can carry the full spectrum of industrial pollutants, many of which are incompatible with the typical municipal-type treatment systems. Some substances interfere with the chemical or biological processes essential to the operation of the system; others are virtually unaffected by to the processes used in the typical conventional treatment facility. Examples of noncompatible pollutants are oil and grease, heavy metals, phenols, cyanide, extremes in pH and temperature, and certain materials that usually pass through municipal plants substantially unchanged.

Industrial discharges to municipal plants also can contain toxic or hazardous materials, and pollutants like the chlorinated hydrocarbons, which are bioaccumulative or persistent in the environment. Other components of industrial wastewater are known or suspected carcinogens or mutagens, or are toxic at high concentrations in the aquatic environment.

Surface runoff from plant sites or areas of general industrial activity can carry a variety of pollutants, particularly oils, greases and assorted solids, that accumulate as a result of industrial operations. Leaks and spills often are contributing factors, although some accumulations are the result of poor housekeeping over an extended period. In some cases, areas of plant sites become saturated with pollutants, which are flushed into collection systems by rainfall. Treatment of these wastewaters usually involves settling to remove solids and skimming to remove oil and grease.

(2) Miscellaneous Wastewater Treatment Facilities: Miscellaneous wastewater treatment plants are usually small facilities, often privately-owned, which serve specialized

institutions like trailer parks, schools, country clubs, motels, restaurants, commercial establishments or industries. The wastewaters from these facilities generally contain only sanitary and some housekeeping wastes, with constituents similiar to those encountered in wastewater treated by municipal plants. However, the unusual intermittent flow patterns encountered in these facilities create treatment problems. It is usually desirable, therefore, to phase out smaller miscellaneous plants and divert the flows to municipal plants.

Within the region, there are about 170 miscellaneous dischargers. The Fox River Basin contains more than 40 of these, while the DuPage River Basin and the Upper and the Lower DesPlaines River Basins each contain more than 20 discharges. Particular problems with miscellaneous treatment facilities are discussed in appropriate chapters dealing with individual drainage basins.

(3) Agricultural Discharges: The only point sources associated with agriculture are runoff discharges from large livestock feedlots, of which there are about half a dozen in operation in northeastern Illinois. These facilities are required to obtain NPDES permits and to satisfy specified effluent criteria for animal feeding operations. No permit is required for operations that discharge only in the event of unusually heavy (25-year, 24-hour) storms.

Raw livestock wastes contain high concentrations of solids and chemical oxygen demand (COD), and lesser concentrations of BOD, nitrogen, phosphorous and potassium. Livestock wastes also are sources of infectious agents which can transmit diseases to other animals, and, in rare occasions, to man.

In estimating the potential for pollution from livestock wastes, it is necessary to assess the location, number of animals, and especially feedlot management procedures. Pollution is more the result of livestock production techniques and animal waste management practices than it is dependent on the number of head being raised.

There may be isolated situations in which feedlots which are too small to automatically require discharge permits under current regulations nevertheless constitute a localized point source problem. Such problems will be pursued on as "as-needed" basis during the continuing planning program and permits will be issued where appropriate.

(4) Water treatment Plant Residuals Plants that treat domestic water supplies, whether from wells or surface waters, use a number of chemical and physical processes to remove impurities, which can include pathogenic organisms, suspended and dissolved solids and various chemical constituents. Residuals from these processes include

sludges and backwash waters, both of which require treatment before they can be discharged to waterways.

In northeastern Illinois there are about 20 water treatment plants that discharge residual waste products.

(5) Cooling Water Discharges: Electric power plants, large office buildings, and some industrial operations require large volumes of water to cool equipment. The water used picks up heat and discharges of large volumes of high-temperature cooling water to streams may result in temperature increases that impair beneficial uses or damage the aquatic environment. Even the value of water as an industrial coolant is impaired by excessive water temperatures.

Heat causes the oxygen-carrying capacity of waterways to be decreased. High temperatures also lead to such undesirable conditions as the development of anaerobic zones, the putrefaction of sludge deposits, and the growth of sewage fungi.

If cooling waters are used in a "non-contact" operation, and the water itself does not interact with other products used in processing, temperature is normally the only associated pollution problem. Discharges of "contact" cooling water, however, also can lead to pollution problems from oil, grease, solids or organic materials picked up in the cooling process.

Characteristics of all "other point source" dischargers in the region are presented in basin chapters in Part II.

5.03 AREAWIDE POINT SOURCE ISSUES

a. Combined Sewer Overflows

Many older communities in the region have combined sewer systems, with stormwater and domestic wastewater flowing through the same collection system to a treatment facility. Major combined sewer systems are within the MSDGC, and sanitary districts serving Aurora, Elgin, Waukegan, and Villa Park. Other combined sewer systems are found in a number of other communities such as Joliet, Lombard and Batavia.

Combined sewers are a problem to the extent that the volumes they carry exceed treatment plant capacities during high flow periods. As is the case when plant capacity is exceeded as a result of excess wastewater flows, part of the flow must be diverted around the plant, or released directly from the combined sewer system into a waterway. This "overflow" usually is not treated prior to discharge.

The impact of combined sewer overflows on water quality depends on the river basin involved and on the volumes, strengths, frequencies and durations of the overflows. In the Fox River Basin, for example, at a downstream point near

the south Kane County line, combined sewer overflows account for only 2 percent of the existing biochemical oxygen demand (BOD) on an annual load basis. In the Upper Des Plaines Basin, near Riverside, the BOD load from combined sewers is 26 percent. In the North Branch of the Chicago River near Niles, the BOD load is 29 percent. These figures, generated by the water quality model during the basin planning process, point out the need for site-specific analysis of combined sewer overflow impacts.

Overall, however, the impacts are so severe that the Commission considers combined sewer overflows to be the most significant water quality problem in the region. This judgment is based primarily on an assessment of the effects of combined sewer overflows within the MSDGC. Within the 375-square mile combined sewer area in and adjacent to Chicago, combined sewer overflows occur approximately 100 times per year. In each of these overflows, untreated wastewater is discharged into waterways. During unusually heavy storms, stream flows become so large that the inland waterways cannot accomodate them and the overflows. To relieve the burden, some of the combined sewer overflow is allowed to flow into Lake Michigan. Thus, polluted water is discharged into the area's major water supply source.

Control of combined sewer overflows is necessary in only a few FPAs. In those where combined sewers are a problem, this can be one of the most complicated and expensive aspects of local facilities planning.

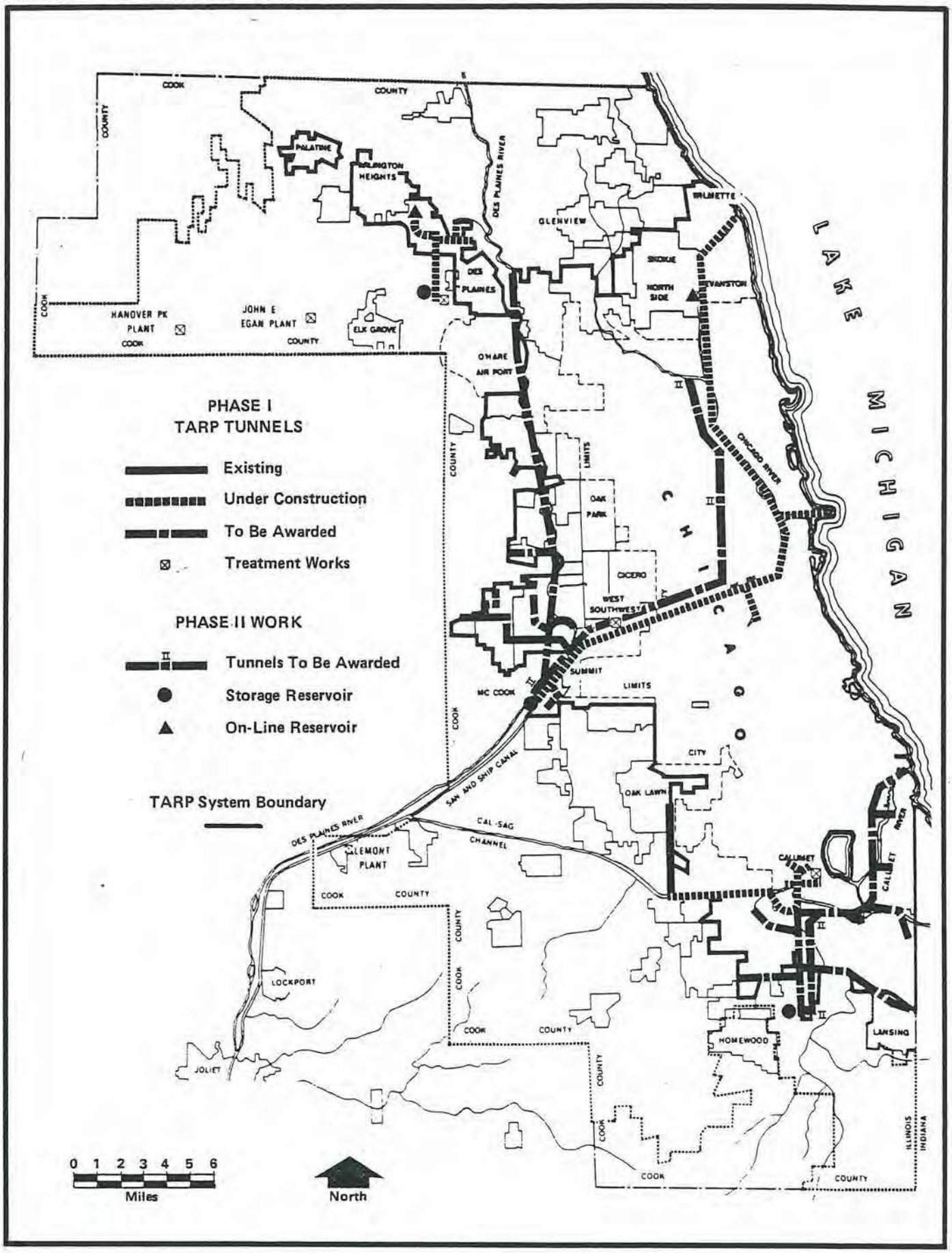
Control of combined sewer overflows is a major element of local facilities planning in the MSDGC. The District's strategy to eliminate overflow is the Tunnel and Reservoir Plan (TARP), a system that includes 125 miles of tunnels and 126,000 acre-feet of storage in three underground reservoirs. (see Figure 5-1)

The project has two phases. Completion of the first phase will reduce the number of overflows to about ten per year, and will reduce the total BOD in waterways by about 90 percent. Phase II would reduce the number of overflows to about four every 25 years and would remove about 99.8 percent of the BOD.

Phase I projects are directed at water quality improvements. Phase II includes three reservoirs and supplementary tunnels that are projected to reduce flood damage costs by 65 percent. Funding for the reservoirs and tunnels included in Phase II is still under consideration at the federal level.

As of May, 1977, the MSDGC had estimated that the TARP would cost $2.6 billion. In January 1978, the General Accounting Office, in a draft report on the TARP, estimated total costs at $7.3 billion. This estimate included costs for upgrading and expanding the MSDCG wastewater treatment plants, costs of upgrading existing sewer systems in Chicago and 52 suburbs within the TARP service area ($1.4 billion), and interest expected to accrue during a 20-year construction period ($1.7 billion).

FIGURE 5-1: MSDGC TARP SYSTEM



Local sewer improvements, while they are essential to the overall success of TARP, are not the financial responsibility of the MSDGC. Improvements to local community sewers in order to take advantage of the TARP system's capacity will probably have to be financed, at least in part, by the affected municipal governments. Grants are available under PL 92-500 for the elements or proportional shares related to water quality improvement. However, costs associated with stormwater or flood control benefits must be borne by those programs, if any, and/or local governments. The fact that these local government costs are reflected in the GAO estimates, and not in the MSDGC estimates, accounts for much of the discrepancy in the figures. It should be understood that the success of TARP, as a total system, depends on the eventual funding and completion of local sewer projects.

Because of the uncertainties over funding, the actual impact that TARP will have on combined sewer overflows will remain unclear until financial issues are resolved and commitments are made. As an element of the facilities plan of the MSDGC, the TARP is generally regarded as a "given" in this areawide plan as are all other local facilities plans, and is incorporated as an element of the areawide plan for point source control

Near the end of the public participation period, information was brought to the attention of the Commission that certain economies might be generated in the design of the remaining elements of the TARP and of local sewer improvements. This will be evaluated by the MSDGC during the continued planning period and necessary changes which are justified will be processed by the District in connection with its annual facility plan update.

Other proposed local solutions to combined sewer problems in the region reflect different approaches. Whereas the MSDGC hopes to control overflows with a system of underground tunnels and reservoirs that allow for storage and delayed treatment of combined sewer flows using existing treatment plants, the sanitary districts of Elgin and Aurora are considering separate treatment facilities for combined sewer flows. The City of Joliet is proposing to separate its storm sewers from its sanitary sewer system. Batavia, which has some combined sewers, plans to expand its facilities to handle additional wet weather flows. Lombard plans to convey normal wastewater flows to the Glenbard regional wastewater treatment plant. When that step has been completed, the existing Lombard plant will be used only for the treatment of combined sewer flows that exceed the capacity of the interceptor to the Glenbard plant. Villa Park is separating its sewers.

(1) Recommendations:

(a) By July 1, 1980 appropriate local treatment authorities should develop plans for controlling combined sewer overflows.

b. Within the MSDGC service area, communities having combined sewers in all or portions of their corporate limits will seek Federal grants, initiate and/or complete by July 1, 1981 Sewer System Evaluation Studies as required by 40 CFR 35.927, and the supplementary studies necessary to determine what facilities will be necessary to optimize local sewer system in order to take advantage of the TARP capacity.

The elimination of combined sewer overflows must be given the highest possible priority by local authorities and funding agencies. Specific recommendations, based on local facilities plans, are contained in appropriate basin chapters. In addition, details of local plans for combined sewers (when available) can be found in the assessments of local facilities plans, which are among the supplemental materials to this areawide plan.

b. Excess Wastewater Flows

Infiltration and inflow, two types of flows that exert significant demand for "excess" treatment capacities in municipal-type plants, are problems for many wastewater treatment agencies. Infiltration occurs when groundwater enters a sewer system through defective pipes, pipe joints or manhole walls. Inflow describes water that enters a sanitary sewer system through direct, sometimes unauthorized connections from extraneous sources. Typical sources of inflow are home downspouts; cellar, yard and foundation drains; open manhole covers; cooling water discharges from industry; and cross connections from storm sewers.

Excess wastewater flows, although the costs of handling in municipal-type systems often are not apparent to the public, are a functional liability to many communities, particularly those with old sewer pipes still in use. There is, first of all, the cost of treating what may amount to millions of gallons of water from excess flows, a cost that should be measured not only in dollars but in consumption of energy and other resources, also. Secondly, the loss of treatment plant capacity, to the extent that beneficial types of growth and development must be restricted as a result, can represent another substantial "cost."

In terms of environmental impacts, excess wastewater flows can seriously reduce the effectiveness of even the most advanced treatment systems. During periods when excess flows are high, during and after major storms, for example, the total load on a treatment system can become so great

that part of the load must be diverted around the treatment plant. This is known as a bypass, and when it occurs, wastewater that includes raw sewage sometimes has to be discharged to waterways with no treatment or only primary treatment.

(1) Facility Planning Steps: In order to qualify for construction grants related to wastewater system improvements, regulations issued after the enactment of Public Law 92-500 require grant applicants to follow certain procedures called "steps." Step One covers facility planning, a process in which alternative solutions are developed and other related actions are taken to identify necessary treatment plant and sewer improvements. Upon approval of the results, Step Two is authorized, which covers the preparation of detailed plans and specifications. Upon the approval of the Step Two plans, the applicant is authorized to proceed to Step Three, which involves actual implementation of plans for construction or rehabilitation.

According to Title 40, Code of Federal Regulations (40CFR 35.917(c)), the formalities of step-by-step planning may be waived if the facilities planning started before May 1, 1974. There are provisos, however, and one of them relates to excess wastewater flows. No waiving of facility planning requirements will be made unless the grant applicant can show that the treatment works for which grant assistance is sought will not be subject to excessive infiltration or inflow.

(2) Sewer Rehabilitation Studies: Studies to determine the need for measures to eliminate excessive infiltration and inflow involve a series of sequential actions. First, an analysis is conducted to determine the extent to which there is excessive infiltration and/or inflow in the sewer system. If excess flows are found, the next step is a Sewer System Evaluation Survey (SSES). This involves a detailed examination of the sewer system to identify locations and causes of the infiltration and/or inflow. There also must be an assessment of the measures needed to reduce excess flows, and an estimate of the costs of implementing these measures. There must next be an analysis, from the standpoint of cost-effectiveness, to determine the advisability of correcting the excess flow problem as opposed to allocating a portion of plant capacity for the treatment of the excess flows. If corrective measures are justified to remedy all or part of the identified excess flow problems, a sewer rehabilitation project may be authorized as part of Step Three of the facilities planning project.

In separate (as opposed to combined) sewer areas, it is possible for local governments to receive federal grants

covering up to 75 percent of the costs of rehabilitating sewer systems to eliminate excess flows.

(3) Limitations on Grants for Combined Sewer Problems: In combined sewer areas, grant procedures are more complicated because combined sewers, in addition to pollution abatement, provide local stormwater drainage and may be essential to local flood control. According to the USEPA Program Guidance Memo PG-61, dated December 16, 1976, USEPA rehabilitation and/or construction grants for combined sewers will be made available only to cover the cost of improvements needed for purposes of pollution abatement. However, the SSES studies themselves are fundable by USEPA, as are any concurrent special studies of combined sewer overflows and sewer backups.

(4) MSDGC Service Area Studies: Within the MSDGC combined sewer area, an initial study of infiltration and inflow has been conducted and excess wastewater flows were found to exist in numerous parts of the system. It was determined that a large number of SSES studies were needed, and that some of these studies were necessary in every municipal and sanitary district system connected to the MSDGC. This work is the responsibility of individual local units of government.

(5) Recommendations: These recommendations are intended to convey the Commission's concern that excessive flows are adding significantly to the cost of wastewater treatment in the region and represent a major financial burden to the wastewater treatment agencies and the taxpayers. The recommendations are also intended to emphasize that local preventive and corrective measures are necessary in connection with the combined sewer overflow controls being installed under other facility plan elements.

(a) Within the MSDGC service area, communities and sanitary districts having separate sewers will seek Federal grants, initiate and/or complete by July 1, 1981 Sewer System Evaluation Studies as required by 40 CFR 35.927.

(b) Subject to assigned priorities and the availability of Federal or State grants, all other municipalities and sanitary districts will expeditiously complete their facility plans, to include Infiltration/Inflow Studies, and Sewer System Evaluation Studies (as required). Implementation of corrective and/or preventive measures will be scheduled as elements of Step III construction activities.

It is recognized that completion of the various sewer system evaluations will depend upon the timely provision of grants to local agencies by the USEPA and IEPA.

c. Operation and Maintenance

Adequate operation and maintenance (O & M) of treatment plants are essential for efficient and effective treatment. Proper O&M also serves to reduce future construction and equipment replacement costs. Inadequate attention to O&M, on the other hand, can result in plants failing to meet the water pollution abatement objectives for which they were designed.

Despite the recognized importance of O&M, a number of chronic problems persist which are directly attributable to poor operating procedures. Section 210 of Public Law 92-500 requires the USEPA to conduct annual surveys to determine the O&M efficiency of treatment facilities constructed with federal grants. Over the past four years, the survey has found consistently that approximately one-third of the facilities sampled failed to meet design criteria for BOD removal, and nearly one-half failed to meet design criteria for total suspended solids removal. The USEPA concluded that many of the plants with substandard performance could be improved if greater attention were given to O&M.

A number of factors that contribute to plant O&M problems are discussed below. Several of these were cited in a recent U.S. General Accounting Office report which was severely critical of the lack of attention being given to O&M needs at federally-funded treatment plants.

(1) Industrial Waste Loads: Many treatment plant operating personnel are not familiar with the chemical composition of influent industrial wastes, or with the effects that certain waste components and combinations can have on treatment efficiencies. As a result, it often is difficult to anticipate and prevent plant upsets and other problems associated with exotic industrial loads. To avoid these problems, operating agencies are encouraged to complete and maintain local industrial waste inventories, and to adopt and enforce industrial waste control ordinances. In many instances, upgrading the technical skills of plant personnel also would assist in preventing this type of problem.

(2) Infiltration and Inflow: Excessive infiltration and inflow are often major contributing factors to poor plant operation. Hydraulically, the most significant effects of these excess flows are: the washout of biomasses (from activated sludge systems); reduced detention times, with corresponding decreases in treatment efficiencies; and general increases in suspended solids in the final effluents.

(3) Equipment/Unit Design: Design deficiencies range from outright errors, to failure to provide for routine O&M needs, to poor equipment choices. Design consultants must understand local conditions and operational factors, and tailor their designs to meet particular needs. Among the deficiencies noted in federal surveys were the lack of ready access to repair or service equipment, read gages, or take samples; the inability of equipment to be adjusted or varied according to loads; and the lack of instrumentation within normal working areas, forcing personnel to make long and often hazardous walks to take readings.

(4) Operator Capability: Many treatment plants, surveys have shown, are operated by personnel who are not adequately trained. The problem is aggravated by newer, more sophisticated treatment processes. Inefficient plant operation and maintenance has been linked directly to inadequate staffing or low salary levels at treatment plants.

A recent survey by the Water Pollution Control Federation (WPCF), covering 15 cities of various sizes, found that qualified personnel can be hired and retained at treatment plants if adequate salaries are offered. Some cities have overcome salary and recruitment problems by establishing training and career development programs.

Small communities seem to have more frequent problems with respect to treatment plant personnel because salaries often are not competitive. As a result, turnover is high and efficiency suffers.

The WPCF survey also found that there was a particular shortage of qualified operating personnel at the "skilled craftsman" level, just below the certified operator and management levels. Personnel at the "skilled craftsman" level must have communications skills, and specialized knowledge in mathematics and chemistry, in addition to a basic understanding of treatment plant operation.

(5) Monitoring Data: Laboratory techniques are often deficient, particularly at smaller treatment plants. In some cases, the frequency of sampling and reporting is less than adequate for accurate monitoring and control. In others, testing procedures do not conform with approved laboratory methods.

(6) Equipment Maintenance: Attention to necessary maintenance and repair needs is often less than desirable. As a result, problems and operating difficulties which could have been averted develop as a result of neglect or delay, and unwarranted replacement costs must be incurred.

(7) Sludge Processing and Disposal: This continues to be a major problem for many treatment plants. Issues include a lack of understanding on the part of plant personnel of the

operation of digestion facilities, design errors, and poor equipment maintenance.

(8) Conclusion: The more sophisticated treatment systems and reliable service anticipated in this areawide plan will require highly-trained operating staffs and strict compliance with existing operator certification requirements of IEPA.

(9) Recommendations

(a) Countywide water quality committees, with assistance from their technical advisory committees, should provide a forum in which combined experience and resources can be directed at operation and maintenance problems.*

*Countywide water quality committees are the primary management coordination mechanisms proposed in this plan. Details on their composition and recommended functions are presented in Chapter Eight of this report.

Many professional treatment plant operators in the region already consult regularly on technical aspects of plant operation and maintenance. The continuation and expansion of such professional consultation should be encouraged by countywide committees. The Commission, with assistance from technical advisors at the areawide and county levels, should consider sponsoring technical seminars on plant operation and maintenance. Leadership roles in these seminars could be assumed by experienced and highly-trained plant operators from the region.

(b) Operators of treatment plant laboratories should familiarize themselves with approved lab procedures and carefully evaluate their own methods. Technical assistance from state and federal agencies should be sought where upgrading is necessary.

(c) The Illinois EPA, in consultation with its statewide advisory committee, should evaluate the adequacy of O&M requirements for federally-funded treatment plants.

In the course of this IEPA evaluation, there should be time allowed for input from treatment plant operators in northeastern Illinois. These participants also should be given the opportunity to review and comment on any recommendations made to USEPA as the result of such a study.

(d) The IEPA, in cooperation with countywide water quality committees, should conduct an areawide comparative study of salary levels for treatment plant

personnel, including an assessment of training and experience.

d. Privately Owned Discharges: Miscellaneous Plants and Public Utility Systems

To the extent that the public acquisition or phaseout of privately-owned public utility systems and miscellaneous plants (both domestic and industrial) is recommended in local facilities plans, these recommendations are incorporated into the areawide plan. However, it is likely that large numbers of these dischargers will remain in operation in the future. Opportunities for consolidation with municipal-type systems, particularly for industrial dischargers, are rare, although those opportunities should be explored where they exist. An areawide study of industrial dischargers indicated that only eight plants in the region are in a position that might make consolidation worth considering. Even in these eight cases, additional feasibility studies are necessary.

What is most likely to happen to reduce the number of miscellaneous discharges is that individual treatment facilities will be offered the opportunity to join municipal-type systems as these systems are expanded to accomodate projected growth. Wherever possible, consolidation into publicly-owned, municipal-type systems should be encouraged. Maintenance of acceptable effluent quality, and resultant compliance with water quality standards, requires professional operation of treatment facilities. In the case of miscellaneous plants, particularly small facilities, treatment plant operation often represents an additional duty for an employee whose primary duties are in other areas. Consolidation would have the additional effects of reducing the overall costs of wastewater treatment, in most cases, and reducing the total amount of energy consumed in treatment processes.

The development of new privately-owned facilities should be considered only when public alternatives are not practical. Aside from reducing the potential for operating and maintenance problems, the provision of wastewater by a public agency increases the likelihood that this essential service will be effectively coordinated with other services necessary for urban development. With the extension of sewer services provided by a general purpose government such as a county or municipality (either on their own or as part of a larger sanitary district) wastewater service can be integrated with the community's overall development policy. This is less likely when a private entity is the sole service provider.

e. Treatment of Industrial Wastes In Municipal Systems

In general, the greater the volume and strength of industrial wastes, the greater the likelihood for difficulties in the treatment process. But, problems can develop from several specific sources.

Municipal treatment plant operators, as noted above, may not be familiar with the unusual demands of industrial constituents. Even where systems have the design capability to treat industrial wastewaters, treatment may be ineffective because industrial wastes are considerably more complex and varied than normal domestic wastewaters. The arrival of industrial wastewater at inopportune times (during periods of low domestic wastewater flow, for example, when normal municipal wastes cannot serve to dilute the industrial flow) also can create treatment difficulties.

(1) Pretreatment: The level of pretreatment required before industrial wastewater can be accepted by a municipal system depends on the size of the municipal treatment system, the magnitude of the industrial discharge relative to the total flow into the treatment plant, the nature and the strength of the industrial flow, and the type and effectiveness of treatment provided. Sewage treatment authorities who are meeting their NPDES Permit requirements for an incompatible pollutant have the flexibility, under existing guidelines, to reduce or eliminate the necessity for pretreating that particular pollutant. On the other hand, if there is a problem with effluent quality for a particular pollutant, and the industry discharging that pollutant is a "major contributor," different criteria pertain. According to USEPA regulations a "major contributor" is an industry that has a flow of 50,000 gallons or more per day; accounts for 5 percent or more of the total flow in a public system; contributes toxic pollutants in toxic amounts; or creates other significant impacts alone or in combination with other dischargers.

Under such conditions, pretreatment is required under federal regulations for incompatible pollutants. Compatible pollutants, not subject to federal pretreatment standards, include BOD; suspended solids; fecal coliform bacteria; chemical oxygen demand; total organic carbon; phosphorous and nitrogen compounds; and, fats, oils, and greases of animal or vegetable origin. Local governments, however, can set maximum allowable levels for compatible pollutants so that the municipal system is not overloaded.

Under Section 402(b) (8), as amended by PL 95-217, NPDES permits for publicly owned treatment works must include the identification of pollutants from significant industrial dischargers to that system In addition, a program must be established to ensure compliance with national pretreatment standards.

(2) User Charges: Municipalities are required by federal regulations to levy user charges on industries that are tied in to the public system. These charges may be assigned to individual contributors, or a set charge can be assigned to a user class composed of contributors with similar characteristics. In either case, an industry pays in proportion to the load it generates and the demands it places on the system.

(3) Industrial Cost Recovery: In addition to paying for their share of operating and maintenance costs, industries share in the capital cost of the publicly-owned facilities in which their wastewaters are treated. Local governments receiving federal grants for wastewater facilities must develop an Industrial Cost Recovery (ICR) system to recover that portion of the facility cost attributable to the need to treat industrial wastewater. However, PL 95-217 has established an eighteen-month moratorium on the collection of Industrial Cost Recovery charges. It also calls for a twelve-month study of the efficiency and need for such charges. Industrial users who reduce their total consumption of water shall have their costs reduced in proportion to the flow of reductions.

(4) Advantages of Joint Treatment: There are advantages to industry in joint treatment systems, even though pretreatment requirements may be stringent. Whether these advantages extend into financial areas, however, depends on may factors. The ICR system lets industry realize significant savings from joint treatment, because capital costs for wastewater treatment (represented by its share of the cost for public facilities) can be paid in interest-free dollars over an extended period of time. Generally, ICR costs are repaid on an incremental basis, along with whatever user charges are levied. The financial advantages are greatest when no pretreatment is required, obviously, because no manpower or space needs to be allocated to wastewater treatment.

(5) Disadvantages of Joint Treatment: However, there are potential drawbacks to joint treatment from an industry viewpoint. Wastewater-generating operations may have to be monitored more closely in order to prevent accidental discharges or spills than they would be if on-site treatment were provided. There must be safeguards to insure that chemicals used do not contain components that would be incompatible or detrimental to the publicly-owned treatment system.

Unless an industry adequately forecasts its future requirements at the time that a joint treatment contract is written, it may limit its expansion capabilities. Similarly even if adequate capacity is provided, the municipality or

sanitary district may have problems raising funds or obtaining grant approvals. The result might be a postponement of a planned treatment plant expansion and a concurrent limiting of the industry's planned expansion.

(6) Summary: Overall, there is no single areawide approach to industrial wastewater treatment that can be applied throughout northeastern Illinois. Each situation involving industry and municipal-type wastewater treatment must be evaluated individually.

A comprehensive study conducted for the Commission in 1976, as part of the areawide planning effort, examined the potential for industries that now treat their own wastes to convert to joint treatment through public treatment systems. The results of this study, which should be considered as a preliminary analysis, indicate that only eight of the region's industries are in a position that makes it practical and advantageous for them to seek joint treatment. In reaching this conclusion, Commission consultants considered relevant factors from both the municipal and the industry perspective. The study is reported in detail in the Commission's 208 Staff Paper No. 27: "Analysis of Industrial Wastewater Treatment."

Under earlier regulations of the USEPA pertaining to industrial effluents, standards had been established for different classes of industries. Thus, for pollutants normally treated at municipal wastewater plants, such as BOD, suspended solids, ammonia, to mention a few, it was not uncommon to find nearby industrial treatment plants having effluent standards significantly different from those being met by adjacent municipal authorities. This inequitable situation has since been eliminated by changes in Federal regulations. Both industrial and municipal plants will now meet the same standards.

(7) Recommendations:

(a) Operators of publicly-owned treatment plants should maintain current inventories of all significant industrial wastes being conveyed to their plants for treatment.

Officials responsible for the operation of publicly-owned treatment systems are in the best position to assess the impact of pretreated industrial wastes on their facilities. Inventories of industrial discharges should be maintained, and there should be close coordination between local officials and industry officials to insure that adequate pretreatment levels are maintained and problems are corrected. Monitoring and coordination efforts need to be directed not only at the constituents in industrial discharges but also at the manner in which discharges take place. Pollutants that may be handled satisfactorily under

normal conditions may create an imbalance in the treatment process if they are discharged in unusually large "slugs."

(b) Operators of municipal type wastewater systems will cooperate in the pretreatment program mandated by sections 307 (b) and (c) of PL 92-500 (as amended) as described in 40 CFR 403, dated June 24, 1978. As the USEPA issues pretreatment standards for nondomestic wastes, including general discharge prohibitions and standards applicable to specific industrial categories, operators of publicly-owned treatment works will insure that the reports required by 40 CFR 403.12 (b) are submitted to them by industrial users of the public systems.

c. Problems that develop with respect to pretreatment agreements should be resolved by local treatment authorities and industry.

f. Industrial Wastewater Treatment Plant Effluent Standards

Section 306 Public Law 92-500 requires the USEPA to establish national effluent standards for non-publicly owned treatment works. Effluent limitations and guidelines for new sources must be developed for 28 categories of industrial discharges identified for Public Law 92-500. Because of the broad differences that exist in discharges within each industrial category, however, the USEPA has developed more than 500 subcategories. Guidelines and standards must be established for each of these.

These effluent standards, to the extent they are available, are to be used as guidelines in writing NPDES permits. In this way, there will be a uniformity of requirements on a nationwide basis for each different classification of industries.

According to Public Law 92-500, all industries were to have achieved "Best Practical Control Technology Currently Available" by July 1, 1977. This technology was determined to be the average of the best existing waste treatment methods within each industrial category or subcategory. The law also required that the "Best Available Technology Economically Achievable" was to be utilized by 1983. This technology was to be based on the best control and treatment measures that have been developed or are capable of being developed within the industrial category or subcategory. As discussed below, however, certain requirements have been modified as a result of the 1977 amendments to Public Law 92-500.

A third level of treatment requirements apply to discharges that started operation after the publication of the above regulations. These sources apply the "Best Available Demonstrated Control Technology," which may involve processes, operating methods or other alternatives.

Where practical, a standard permitting no discharges of pollutants may be applied.

Another measure to achieve uniformity in the application of the guidelines and standards, has been initiated recently by USEPA. Raw waste loads and effluent discharge standards are to be established on a per-unit basis related to floor area, units of production, raw materials consumed, or other factors reflecting volumes and characteristics of the wastewater generated.

(1) PL 95-217 Changes: The Clean Water Act Amendments of 1977 (PL 95-217) made a number of significant changes to the requirements in PL 92-500 pertaining to industrial discharges (see Figure 5-1). The 1977 act began the National policy of focusing attention on toxic pollutants. The USEPA was given authority to rigidly regulate discharge of such pollutants under Section 301 or 307 of the amended act. Section 301, as amended, establishes the date for meeting effluent limitations as July 1, 1984. Under Section 307 compliance is required within one year of the date the standards are established. This choice of effluent standards or categorical national limitations complicates discussion of industrial discharges. However, increased regulation of conventional pollutants is to be tempered by economic reasonableness. The term "non-conventional pollutants", was also introduced by the amendments, as differentiated from "toxic" and "conventional" pollutants.

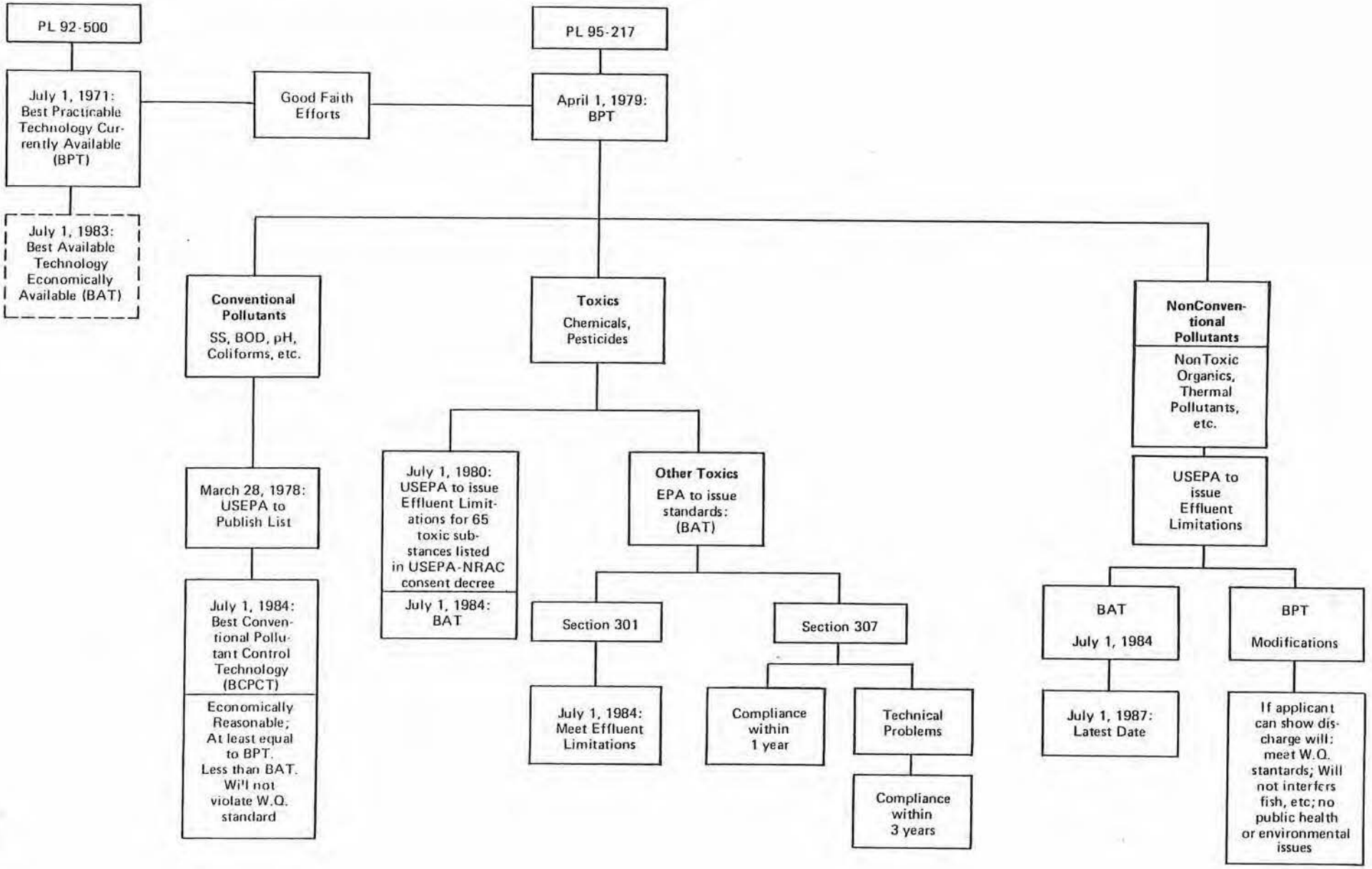
Sections 307(a) (1), (2) and (3) of PL 92-500 on toxic pollutants were rescinded and replaced by new language. All toxic pollutants listed in Table 1, House Public Works and Transportation Committee Print 95-30 must comply with effluent limitations which require the application of Best Available Technology (BAT) by July 1, 1984. The effluent limitations must be established for each toxic pollutant by July 1, 1980. The USEPA Administrator is granted authority to add or delete pollutants from the reference list.

The USEPA Administrator may also publish supplementary regulations for any specific toxic or hazardous material in order to control sludges or waste disposal or drainage from plant areas.

By March 28, 1978 the USEPA Administrator was to have published a list of conventional pollutants. These are to be subject to effluent limitations which require the applicants to use Best Conventional Pollution Control Technology (BCPCT) by July 1, 1984. These limitations will be based on the cost of attaining such reductions, giving due consideration to energy requirements and other appropriate factors. These controls will improve on the Best Practicable Controls (BPC) in effect since July 1, 1977.

Section 301 now also covers unconventional pollutants, which are not specifically identified. They are substances for which toxic standards are not applicable, and include such items as non-toxic organics and thermal discharges.

FIGURE 5-2: INDUSTRIAL DISCHARGE STANDARDS



R. Jan. 9, 1979

Best Available Technology (BAT) must be achieved not later than 3 years after the limitations have been established by the Administrator, or July 1, 1984, but no later than July 1, 1987.

Section 307 (b) (1) revises pretreatment requirements of waste water discharges into publicly owned treatment works. Industrial discharges must comply with effluent standards applicable to toxic substances. However, if the municipal system is able to remove the toxic substances and the municipal sludge is not adversely affected, pretreatment requirements may be revised. Violations of pretreatment requirements must be reported by the operator of the publicly owned system to the USEPA Administrator who may initiate court actions against the discharger.

Industries treating their own wastes who were unable to meet the July 1, 1977 deadlines for Best Practicable Technology (BPT) may be granted a waiver until April 1, 1979. A showing of good faith efforts and evidence of commitment to actual compliance is necessary.

(2) Recommendations:

(a) Permit compliance by direct industrial dischargers should be monitored closely by the IEPA.

(b) The IEPA should take steps to insure satisfactory performance by industrial wastewater treatment plants.

The IEPA should develop training and performance standards for industrial treatment plant personnel. The IEPA also should conduct regular sampling and analysis of the effluent from all industrial treatment plants in order to monitor compliance with NPDES requirements.

g. Treatment Standards

The key technical issue in evaluating any point source discharge is whether the discharge interferes with the achievement of instream water quality standards. A basic objective of this plan is to meet a 5.0 mg/l dissolved oxygen temporary standard 95 percent of the time in water bodies classified for General Use.

As the Commission examined the water quality problems in certain drainage basins, it found that in some cases it would be necessary for treatment plants to produce effluent that was better than that required by state standards. This situation arose in some stream segments where a high percentage of the total flow originated from treatment plant discharges, for example.

In these situations, alternatives to the basic state effluent standard (10 mg/l BOD and 12 mg/l suspended solids) were considered in the course of developing and testing

alternative basin plans. In some cases, alternative plans incorporated the assumption that certain plants would produce effluent with 4 mg/l of BOD and 5 mg/l of suspended solids by the year 2000. Other alternative plans assumed that there would be post-treatment aeration at certain plants, that phosphorous removal would be required at selected plants where downstream reservoirs are being adversely affected, or that ammonia levels in effluent would be reduced so as to comply with the IPCB standards. With respect to ammonia, the IPCB requires levels no greater than 1.5 mg/l after the effluent has mixed with existing stream flow. This standard applies to General Use streams.

The Commission recognizes that consideration of such severe standards, particularly the possibility of "4 and 5" standards for BOD and suspended solids, runs contrary to some positions expressed by the IEPA. The extent to which the Commission is recommending that more stringent treatment standards be enforced in the region is made clear in the recommended plans for individual drainage basins. See the appropriate chapters in Part II of this areawide plan.

h. Phosphorus

As the result of expressed public interest, the Commission staff included in the initial draft of the Areawide Plan a recommendation calling on all municipalities and counties to enact ordinances by July 1, 1980 banning the sale of high phosphate home laundry detergents. However, comments received after the initial draft was printed and circulated generated considerable information attesting to the fact that such a ban would have little or no impact on water quality and would generate higher consumer costs.

The proposed ban had been discussed previously at at Water Resources Technical Advisory Committee meeting where the conclusion was reached that such a ban would serve no useful purpose. Furthermore, in response to interest expressed by the Areawide Planning Advisory Committee, a special study was made by an outside consultant to evaluate the relative advantages of removing phosphorus in treatment plants versus the use of low phosphate detergents. One of the consultant's conclusions was that the ban *per se* and the removal of phosphorus in treatment plants would serve no purpose until all other sources of phosphorus were brought under control. Accordingly, the previous plan recommendation was then dropped. The text that follows discusses this subject.

(1) Definition of Eutrophication: Eutrophication describes a process whereby lakes and other contained water bodies become enriched with dissolved plant nutrients, such as phosphates. Resultant conditions involve cyclical dissolved oxygen content in the waters, both diurnally and seasonally, associated with the growth of nuisance aquatic weeds and

algae. The latter, when conditions are favorable, will reproduce rapidly and cover the surface with large floating colonies called blooms. The presence of these algae blooms adversely affects aesthetics, particularly since they consume dissolved oxygen and create odors when they die. They also affect water based recreation, water supply, fish and aquatic wildlife. Discharges from these confined water bodies introduce the algal growths downstream and generate secondary problems in those areas, particularly where the algae collect in quiescent waters.

(2) Cause of Eutrophication: While there are different types of rooted aquatic weeds and algae, their growth depends on a number of factors. It has been found that phosphorus, nitrogen and carbon are among the most critical factors which may limit growth. In a study of several northeastern Illinois lakes, it has been determined that soluble phosphorus is the limiting factor except in one, where it is nitrogen. If concentrations of these elements can be kept below the critical limits, excessive weed growth and algal blooms will not develop. Other factors which influence growth include the penetration of light, depths of the water bodies, pH, temperature, and the presence or absence of a wide variety of other chemicals. Light is necessary because of the photosynthesis that is involved. Turbid waters, for example are usually free of algae. (The presence of inhibitors, i.e., other pollutants, may also be a factor in turbid waters.) Submerged weeds and algae are obviously influenced by the ability of light to penetrate the overlying waters. Temperature changes can cause lake stratification and influence water currents. More importantly, in the inland waters of northeastern Illinois, the weeds and algae die in the fall and their decomposition may seriously impact on dissolved oxygen in the water, further aggravating the eutrophic conditions.

(3) Instream Water Quality Standards: Table 4-2, in Chapter Four, describes the water quality standard for phosphorus (expressed as P) in Lake Michigan as 0.007 mg/l. In any other reservoirs or lakes, or in any stream at the point where it enters a reservoir or lake, the instream standard is 00.5 mg/l. In this connection, it should be noted that the critical concentration above which weed and algal growth will be stimulated varies, because it is the dissolved phosphorus which is actually used in plant growth. However, a concentration of 0.02 mg/l is usually taken by most authorities as the limit necessary to control algae. In late 1976, the IEPA petitioned the IPCB that Rule 203(c) in Chapter 3, "Water Pollution" be rescinded. This rule established the general standard of phosphorus as P as not in excess of 0.05 mg/l in any reservoir or lake, or in any stream at the point where it enters a reservoir or lake. Final action on this recommendation is still pending. See

par. (4) below for the proposed manner by which phosphorus is to be controlled.

(4) Effluent Standards: Par. 407 of the Illinois Pollution Control Board Regulations, Chapter 3, "Water Pollution" says that no effluent discharged into Lake Michigan shall contain more than 1.0 mg/l of phosphorus as P. It also says that in the Fox River Basin no effluent from any source exceeding a Population Equivalent of 1500 or more shall contain more than 1.0 mg/l of phosphorus as P. Coincidental with its recommendation for rescinding Rule 203(c), as noted above, the IEPA recommended the adoption of a new provision, Rule 407c. This will say that no effluent from any source which discharges into a lake or reservoir with a surface area of twenty acres or more, or to any tributary to such a lake or reservoir, whose untreated waste load is 1,500 or more Population Equivalent, shall contain more than 1.0 mg/l of phosphorus as P. Final action on this is still pending. The significance of this proposed rule is that it will apply throughout Illinois, not just to the Fox River Basin.

(5) Sources of Phosphorus: Phosphorus is contained in the effluents from wastewater treatment plants, in urban and agricultural stormwater runoffs, and in the effluents from some industrial wastewater treatment plants. It is also present in the air pollutants that fall out or wash out from the atmosphere. Where there are large bodies of relatively shallow water, the impacts from air pollution may be significant in relation to the inputs of phosphorus from other sources. For example, according to the PLUARG study of the Great Lakes, prepared for the International Joint Commission of Canada and the United States, the 1976 load of phosphorus on Lake Michigan was estimated as 6,350 metric tons. Of that amount, 26 percent came from the atmosphere, 30 percent from diffuse (i.e., nonpoint) sources, and the balance of about 44 percent came from point sources. Of the 30 percent originating from diffuse sources, 71 percent came from agricultural areas. In that connection, it should be pointed out that the manufacture of phosphorus in 1970 was estimated as follows: 77 percent utilized in agricultural fertilizers and animal feeds; 13.5 percent in detergents; 6.8 percent in industrial uses, 1.4 percent in pharmaceutical and food products; and the balance utilized for miscellaneous other purposes. The phosphorus in wastewater treatment plants comes from two principal sources: that which is contained in human waste products and that contained in detergents. Studies indicate that about 2/3 of the total is contributed by detergents.

(6) Phosphorus in Detergents: There are various types of detergents available. The most common are those used for home laundry purposes. In the recent past, the concentration of phosphorus has been about 8.5 percent, down from a previous average of about 11 percent. Where

phosphate bans have been enacted, only traces of phosphorus are permitted with the limiting concentration being 0.5 mg/l. Dishwasher compounds are another type of detergent. These usually contain 13 percent phosphorus. Industrial and institutional type detergents used for specific purposes have varying concentrations. In hospitals and food processing plants, because of required hygienic conditions, detergents having high concentrations of phosphorus are used. The amounts of all these products employed for their assigned functions varies with the hardness of the water, the temperature of the water, the degree of whiteness in clothes, or the degree of cleansing required. Wherever phosphate bans have been enacted, they have been either limited to home laundry products, or if all encompassing, actual enforcement has been limited to the home laundry products alone.

(7) Removal of Phosphorus in Treatment Plants: The phosphorus in raw wastewaters undergoing processing in treatment plants may be reduced by several techniques. The usual process is by chemical precipitation using various metal ions such as calcium lime, alum or ferric chloride. If calcium lime is used, the amount required is independent of the amount of phosphorus present, and depends on alkalinity. The amounts of chemicals required are based on bench scale tests. The quantities of sludges generated by these chemical precipitations are produced in great quantities and their disposal is a significant part of the total cost. The April 1978 issue of the Water Pollution Control Federation Journal contained an article where over 800 plants were surveyed in connection with a national lake eutrophication survey. In 709 plants without phosphorus bans or phosphorus removal facilities, the median per capita phosphorus load in the effluent was 1.0 Kg/year. For 25 Indiana plants having a phosphorus ban, the per capita load was 0.5 Kg/year. And, in 33 plants which removed phosphorus the load in the effluent averaged 0.4 Kg/capita/year. As noted, about a 50 percent reduction in phosphorus resulted from the ban or by treatment. However, the salient conclusion was that there are relatively few lakes where a 50 percent reduction in phophorus (by ban or treatment) will provide adequate protection against weed and algae growths.

(8) Impact of Phosphorus Ban on Water Quality: Consistent with literature surveys, the concentrations of soluble phosphorus found in the Commission's land use stormwater runoff sampling program showed that agricultural lands contributed the highest values. Tables 6-2 contains a ranking of selected pollutants, including soluble phosphorus, from these sites. Given the high concentrations originating in agricultural lands and in stormwater runoffs from urbanized areas as well, the professional opinion is that control of phosphorus at point sources by phosphate bans, or by removal through treatmetn processes, would serve

no purpose. Only when all sources are controlled, such that concentrations of soluble phosphorus in the water bodies will be below the critical levels, then benefits will accrue in the control of algae.

(9) Costs of Low Phosphate Detergents: Evidence has been submitted in connection with the public hearings, or brought to the attention of the staff in subsequent events, all of which describe the adverse economic impacts of low phosphate detergents. These can be summarized as follows: the use of higher amounts of low phosphate detergents to obtain the desired degree of whiteness; the use of additional equipment and/or products to soften the laundry waters; using higher temperature washwaters; and, the decreased life of cotton products when detergents are used which contain sodium carbonate, the present substitute for phosphate compounds. Testimony submitted by three leading manufacturers of washing machines have also been brought to our attention, describing increased service calls and higher repair bills associated with the use of low phosphate detergents containing sodium carbonate rather than phosphates as the "builders." The letter increase the activity of the detergent's surfacant capabilities i.e., the physical action which allows the wash solution to penetrate between soil particles and fabric surfaces, detaching the soil. They also soften hard waters by sequestering the calcium ions that cause hardness, and dissolve the precipitates of hardness ions.

(10) City of Chicago Ban: In 1972, the City of Chicago enacted an ordinance banning the sale of phosphate detergents. (Both the USEPA and the Great Lakes Basin Commission have asked all states bordering the Great Lakes to enact similar regulations.) A number of communities in northeastern Illinois have also passed ordinances banning all detergents containing phosphates, or just those products used in home laundries. In late 1977, a survey was made by the Commission staff of the leading manufacturers of detergents sold in the greater Chicago market area. It was found that since warehouse space is at a premium, logistics have required only one type of detergent (low phosphate) to be stocked. While some high phosphate detergents were found in stores where communities had not enacted bans, the conclusion was reached that a de facto ban on home laundry phosphate detergents already exists throughout most of the six-county area.

(11) Staff Opinion: Given all of the foregoing, the conclusions of the staff were that there is a negative benefit-cost relationship with respect to the use of low phosphate detergents for home laundry purposes. Furthermore, water quality benefits will not accrue until all sources of phosphorus are controlled so as to bring the concentrations below the critical levels necessary to

sustain weed and algal growth. Accordingly, the earlier recommendation for the enactment of phosphate ban by municipal and county governments was withdrawn by the 208 Steering Committee.

•(12) Revised Finding: However, in late December, 1978, based on information presented principally by the League of Women Voters, the 208 Steering Committee voted to reinstitute a modified plan recommendation pertaining to the banning of high phosphate home laundry detergents.

(13) Recommendations:

(a) All municipalities and counties should consider enacting ordinances that ban the sale of high phosphate home laundry detergents.

If and when these ordinances are enacted, they will be an extension of the de facto ban which generally exists in northeastern Illinois as the result of the City of Chicago ban.

The information which is available to local units of government when considering the cost effectiveness of such a ban is that described in paragraphs (9) and (11) above.

(b) Section 407(b) of Chapter 3 "Water Pollution" of the Illinois Pollution Control Board Rules and Regulations should be modified to read: No effluent from any point source which is tributary to the Chain of Lakes and whose untreated waste load is 1,500 or more population equivalents shall contain more than 1.0 mg/l of phosphorus as P after the date this plan goes into effect. Point sources below McHenry Dam not immediately tributary to a lake or reservoir need not provide phosphorus removal after that date.

The above recommendation does not affect the State instream water quality standard of 0.05 mg/l total phosphorus for streams as they enter a lake or reservoir.

5.04 AREAWIDE PLANNING FOR POINT SOURCE CONTROL

a. Local Facilities Planning

As noted previously, Section 201 of Public Law 92-500 provides for federal grants for the construction, expansion and upgrading of publicly-owned wastewater collection and treatment systems. In order to qualify for such funding, units of local government must undertake a series of actions collectively called "Local Facilities Planning" and individually classified as "Steps." Step One involves the preparation of a "Facility Plan," which develops alternative solutions and then outlines a recommended plan, which must be cost-effective and environmentally sound. Following

state and USEPA approval of Step One, the local government completes Step Two, which involves the preparation of detailed engineering drawings, plans and specifications. After these have been approved, Step Three, actual construction, is authorized.

Planning boundaries, an important aspect of local facilities planning, are aligned according to Facilities Planning Areas (FPAs) established by the Illinois EPA. Each FPA includes one or more population centers, or municipal wastewater treatment systems, in an area where coordinated studies and plans are considered necessary for the development of the most cost-effective system. If there is more than one unit of local government within the FPA, local governments are encouraged to enter into joint agreements for local facilities planning. Within each FPA, there is a "lead agency," which will be either the only local government in the FPA or the unit of government with the major interests or involvement in wastewater treatment. FPA boundaries are not inflexible, and can be changed in order to improve cost-effectiveness or make the planning effort more politically acceptable.

Because of the large number of variables involved, each local facilities study and plan is unique, according to the particular technical, environmental and political issues involved in the FPA. It is difficult, therefore, to assess Section 201 planning from an areawide, as opposed to a basin, perspective. However, there are several broad observations that can be made:

(1) Plans in most FPAs reflect an expectation of future growth. These expectations reflect population and land use forecasts for the FPA. In some cases these forecasts are several years old, however, and not consistent with more recently-adopted, or pending, areawide forecasts. (See related discussion in Chapters One and Three).

Investments in upgrading or expanding treatment plants, contemplated on the basis of anticipated growth, should be considered carefully in such situations to prevent the creation of an excessive future tax burden.

(2) In most FPAs, efforts are underway to improve sewer systems to reduce infiltration and inflow. The success achieved through these efforts will have an important impact on treatment plant capacity.

(3) Small communities in the early stages of facilities planning generally face two problems: they have low state priority numbers, and the 25 percent local funding share represents a tremendous potential burden for local taxpayers.

(4) The establishment of FPAs has influenced the management of the region's wastewater treatment system. In several cases, the FPA concept is bringing previously separate agencies together for wastewater

planning. When this planning determines that a regional system would be best for the particular FPA, the involved agencies must continue to cooperate in overall management of the system.

(5) Intercommunity disputes or other political controversies are not uncommon in facilities planning in the region, often dragging on for years. While disputes are underway, eventual costs of design and construction escalate and needed water quality improvements sometimes are postponed.

The ongoing aspects of facilities planning cited above will become even more important after the areawide water quality management plan has been approved by the USEPA, because federal grants for publicly-owned treatment works will only be made for projects in conformity with the areawide plan. No National Pollution Discharge Elimination System (NPDES) permit governing the discharge of pollutants to a waterway may be issued for any point source which is in conflict with the approved areawide plan.

As discussed in Chapter One, the Commission has incorporated the results of previous local facilities planning into this areawide plan. This approach is consistent with federal guidelines. However, the areawide plan is based on population forecasts prepared in 1976, whereas many local facilities plans are based on forecasts prepared in 1974 or earlier. In some cases, wasteloads and volumes built into local plans appear too high in light of 1976 forecasts. Where this is the case, the design features themselves have not been changed, only the timing for their implementation. These changes are significant only to the modeling process, however, and do not affect the Commission's commitment to incorporate ongoing local plans into the areawide plan.

The Commission prepared a series of reports assessing the status of each local facilities planning effort underway in the region. These reports, which are more detailed than is appropriate for an areawide discussion, were published as "Assessments of 201 Plans." They are considered as supplemental materials to the areawide plan. Summaries of specific situations covered in these assessments are included in the discussion of wastewater treatment in individual drainage basins.

b. Needs Analyses

Progress in Illinois with respect to Section 201 studies has been so advanced that most local governments have received either federal or state grants to initiate local facilities planning and thus qualify for construction grants. In a few parts of the region, however, priorities assigned to grant applications were so low that no funds were allocated for local facilities planning prior to the start of areawide planning. In others, no applications had

been submitted. In all these areas, abbreviated local facilities plans called "Needs Analyses" were prepared by the Commission. Funds for this work were provided by the Illinois EPA. The objectives were to expedite the preparation of formal local facilities plans at a later date and to provide information needed for the development of the water quality model or the fulfillment of federal requirements. Table 5-3 lists the FPA's and communities for which Needs Analyses studies were done.

The information generated for each Needs Analyses study satisfied the needs of areawide planning and provided a base for the management of state and federal construction grants programs in the future. Each analysis determined the basic wastewater collection and treatment facilities needed for the 20-year areawide planning period. Also included were preliminary identifications of associated costs and the most cost-effective configuration for wastewater treatment facilities.

Needs Analyses studies are only abbreviated versions of Step One facilities plans, and conclusions are viewed as preliminary and tentative. In most cases, the need for the type of detailed planning normally conducted under Section 201 grants has not been eliminated by the Needs Analyses. The extent of additional effort required under subsequent grants will vary from one community to another.

The Illinois EPA will not fund future efforts that duplicate Needs Analysis studies. However, the Agency has acknowledged that more planning under Section 201 will be necessary for many communities. The fact that a Needs Analyses has been prepared will not prevent approval of subsequent grants for Step One studies or for the construction of wastewater facilities. Communities seeking to do additional planning to fill the gap between the results of the Needs Analyses and Step One requirements can apply for supplementary Step One grants to complete this work.

The areas and communities studied in the Needs Analyses vary greatly with respect to levels of urbanization and status of existing wastewater systems. At one extreme was a heavily urbanized area in Dupage County which included the large community of Elmhurst which has its own wastewater collection and treatment system. Most of the other FPAs studied were associated with small communities or unincorporated areas that use septic systems. In a number of cases, the absence of intergovernmental agreements for joint wastewater planning and management was a major issue. In two areas of McHenry County, results of the Needs Analyses studies probably will lead to the establishment of new FPAs that are less intergovernmental in nature than the FPA that would be replaced. The current McHenry FPA could be replaced by two FPAs, one including the city of McHenry and McCullom Lake, the other including only the community of McHenry Shores. The Southeast McHenry FPA could be replaced by three smaller FPAs that would include, respectively,

TABLE 5-3: SUMMARY OF NEEDS ANALYSIS STUDY AREAS

FPAs		
Beecher	Pingree Grove	Sunnyside
Bolingbrook	Plainfield	Symerton
Burlington	Richmond	Wasco
Elmhurst	Southeast McHenry	Wayne
Gilberts	Spring Grove	Wonder Lake
McHenry		

A needs analysis also was prepared for the community of Bannockburn, where no FPA has been designated.

Algonquin, Cary and Oakwood Hills, and Crystal Lake and Lakewood.

c. Areawide Issues

(1) Population Forecasts: As discussed in Chapters One and Three, the Commission is recommending that population projections be carefully reviewed by local officials and by the Illinois EPA prior to any future decisions with respect to plant expansion. The changing nature of population forecasts for some parts of the region may not warrant any changes in the ultimate design capacities of the proposed systems. But, new forecasts may suggest that plant expansion or sewer improvement ought to be "phased-in" over a longer period of time than originally proposed.

Section 204(a) (5), as amended by PL 95-217, says that population projections in 208 plans shall be determined on the basis of the latest information available from the U.S. Department of Commerce or from the State. The USEPA Administrator has authority to determine which "latest information" to use. If there is a conflict with 208 projections, the Administrator is to accept the 208 data.

(2) Plant Expansion, Upgrading, and Consolidation: Plant expansions, upgrading and consolidation are topics that often dominate local and subregional discussions of local facilities planning. Decisions with respect to these

aspects of developing a wastewater treatment system are expensive because the construction and expansion of facilities represents a major capital investment for almost any community. On the other hand, well-conceived consolidated programs can result in significant savings for tax-payers. Such decisions must take into consideration a number of related issues, including population and land use forecasts, and effluent limitations for waterways scheduled to receive discharges.

Guidelines for cost effective analyses include procedures for forecasting population growth, estimating wastewater flows, determining staging periods for phasing construction and for providing additional plant capacity beyond that justified by cost effectiveness studies. Potential grantees must develop wastewater flow reduction programs and evaluate the cost effectiveness of various water conservation measures, including: water saving devices; changes to laws or codes; and, water rate structures. If a community has a population under 10,000, and if its per capita waste load is less than 70 gallons per capita per day, it is exempted from these requirements.

(3) Interceptor Sewer Extensions: Interceptor sewer extensions are another important aspect of local facilities planning that must be closely related to population and land use forecasts. Not only should projections be considered, however, so should local aspirations for growth and development and, hopefully, adopted regional policies for land use management. Interceptors can serve to encourage development in areas where development may not be desirable from a local or regional standpoint.

The extension of wastewater service to unincorporated areas using septic systems also has been a difficult issue in some parts of the region. Municipalities generally refuse to extend sewers into an area unless the area agrees to annexation. The municipal argument is that residents of unincorporated areas do not have a right to benefit from wastewater service provided by the municipality unless they accept, and help pay for, the full range of municipal services. The prospect of higher taxes, however, frequently causes the residents of unincorporated areas to resist annexation. The result can be a situation like that in the West Chicago FPA, where heavily-developed areas, well within the range of municipal sewer service, remain unincorporated and continue to use malfunctioning septic systems. At present, negotiation must be relied upon for the solution to such problems, because Illinois statutes provide that no area can be annexed to a municipality unless residents of the area agree.

d. Recommendations:

(1) In the planning period before the Areawide Plan is approved by the USEPA, all 201 plans underway on a current or subsequently approved priority list should proceed expeditiously through completion, State certification and approval by the USEPA. Water Quality planning agencies are expected during this period to utilize and incorporate (not duplicate) the 201 funded information.

(2) After the Water Quality Management Plan has been completed and the management agency or agencies identified by the plan have been approved by the state and USEPA, all facilities plans underway at the time the plan is approved will be expeditiously completed by the agencies which received the Step 1 grant through State certification and USEPA approval. An exception to this basic policy covers situations where the Water Quality Management Plan clearly justifies a change in regional treatment levels or an alternative approach on the basis of substantially lower costs or major changes in projected environmental impacts.

In accordance with USEPA guidelines, the Commission has deferred to local governments that have prepared, or are in the process of preparing, local facilities plans for wastewater collection and treatment. The guidelines state that these planning efforts will proceed unless the areawide water quality management plan justifies a change in treatment levels or methods on the basis of substantially lower costs or major improvements in environmental impacts.

It is assumed that all local facilities planning programs currently underway will proceed expeditiously to completion. This will include the detailed development of management-related elements such as intergovernmental agreements on system construction and ownership, capacity allocations, schedules, operation and maintenance, future service boundaries, funding responsibilities, and the establishment of an adequate user charge and industrial cost recovery system.

As has been discussed, however, the Commission has not interpreted federal guidelines as precluding the formulation of assessments of ongoing local facilities plans. Nor has it been interpreted as precluding the consideration of alternatives to local plans. Therefore, when changes appeared to be warranted on the basis of water quality conditions or other evidence developed through areawide planning, such findings were discussed with the responsible units of local government. Where these changes were acceptable to local governments responsible for facilities planning, they were incorporated in the areawide plan. Where they were not acceptable, they have been listed as

issues for further discussion in the continuing planning process.

(3) The Commission should assist appropriate units of local government in settling unresolved issues with respect to local facilities planning.

Local facilities plans represent the major elements of the areawide plan for controlling point sources. Therefore, conflicts or problems that are likely to impede the effectiveness of the areawide plan should be resolved as soon as possible. The Commission, as the areawide planning agency, is in a position to assist local governments in resolving local facilities planning problems. The Commission is not in a position to mandate solutions, but should offer to serve as a mediator, or provide technical assistance, at the request of local governments involved in a particular issue, or at the request of the IEPA. Countywide water quality committees, or expanded Local Steering Committees serving as interim water quality committees, should be consulted as necessary. Chapter Eight contains more information on the role of the countywide

(4) Major facilities planning issues that cannot be resolved at the local level should be referred to IEPA for consideration at appropriate points in the funding and permit-issuing processes.

In cases where environmental, technical, economic or political factors constrain any change in existing local plans and no agreement can be reached, the proposed change would be referred to the Illinois EPA for consideration and possible arbitration.

(5) Local facility planning initiated after certification of the initial areawide plan must be in conformance with the plan.

Local facilities planning which will begin after approval of the initial areawide water quality management plan, must conform to the recommendations and programs outlined in the areawide plan. Variations from the areawide plan must be reviewed by countywide water quality committees, and by the Commission, prior to final review and approval by IEPA for construction funding. The IEPA will assume the responsibility for establishing deadlines for the completion of local facilities plans consistent with present capacity limitations, NPDES permit requirements, priority assignments and available funding.

(6) By July 1, 1979 the Commission should prepare revised subregional population forecasts in cooperation with county governments. Revisions should reflect the

most current regional forecasts from the State of Illinois.

(7) Where new forecasts indicate the need for a re-examination of population assumptions in ongoing local facilities plans, the Commission should make appropriate recommendations to the local management agencies involved.

As noted previously, new state population forecasts for northeastern Illinois are more conservative than those used in current local facilities plans. After the Commission has completed its study of the state forecasts, and made new county-by-county allocations, it may become clear that population forecasts in some approved local facilities plans are seriously inaccurate. In such cases, revisions to local facilities plans will be suggested according to the process described above.

The IEPA is committed to approving funding, consistent with the state's priority system, to local facilities plans that have been approved. Even in cases where original population forecasts prove to be unrealistic, the IEPA is not in a position to call for revisions in the basic components of the facilities plan.

Local management agencies are authorized to amend their own local facilities plans, however, on the basis of recommendations from IEPA or the Commission. As an alternative to amendments in facilities plans, particularly where implementation may be so far along that amendments are not possible, the design period for facilities should be extended. For example, a facility designed to meet needs in the year 2000 on the basis of previous forecasts, may be assigned a 2010 design year on the basis of new forecasts.

(8) The Commission, in response to requests from local management agencies, should assist in resolving conflicts related to FPA boundaries.

Where changes to facilities planning area (FPA) boundaries have been recommended and accepted by the local governments involved, such changes have been incorporated into this areawide plan. In some cases, negotiations with respect to FPA boundaries still are in process among local governments; the Commission does not anticipate becoming involved unless invited to do so by the parties in the FPA. Where appropriate, the Commission may assist in the resolution of boundary questions by providing technical data and studies for consideration by local units of government. The Illinois EPA has responsibility for determining FPA boundaries and should regard the relevant information presented in this plan as factual background to consider in its decisions.

(9) Facilities planning should be closely coordinated with local government planning and decision-making with respect to growth and development.

All treatment plants are expected to provide adequate capacity for their service areas for the duration of their design periods. To ensure this adequacy, development control programs for the municipalities and counties of each FPA should consider, and be committed to, the utilization of available treatment capacity. In cases in which the agency with development control authority is not the treatment agency, a formal intergovernmental agreement should be developed, setting forth the treatment capacity in each plant to be made available to each municipality during the design period. Reallocations within an FPA may be made upon mutual agreement among all affected participants.

Additional capacity, over that provided for the design period, may be added, provided that the agency requesting such additional capacity bears all costs for the design, construction, operation and maintenance; and the additional effluent discharge is judged by the continuing planning process to be satisfactory for water quality purposes. The provision of any additional capacity should be made contingent upon consistency with local and regional land use planning objectives.

(10) Unresolved disputes over treatment plant consolidations should be settled with the assistance of countywide water quality committees and guidance provided by the areawide plan.

In some cases, facility plans being prepared by local units of government have not been completed because it has not been possible to reach an intergovernmental agreement on phaseouts and consolidations of publicly-owned plants. These situations have been identified in the plan, and information and recommendations are included to assist local governments in their negotiations.

(11) Wastewater services should be provided by publicly-owned, municipal-type systems except where considerations of cost effectiveness dictate otherwise.

It is recognized that some areas of existing development which are now utilizing individual on-site septic disposal systems will not be served by municipal-type systems in the foreseeable future, due to their distance from such systems or other factors. Recommendations regarding continuing septic system usage are contained in Chapter Six.

(12) Incorporation of existing miscellaneous and privately-owned point source discharges into municipal-type systems should be encouraged wherever practical.

No NPDES permit should be issued for the expansion of an existing miscellaneous or privately-owned point source discharge in the absence of a showing by the applicant that incorporating into a municipal-type system cannot be practically accomplished within a reasonable period of time or if the proposed expansion is inconsistent with local land use plans.

(13) New medium and high-density development in the region should take place in areas where municipal-type sewer service is existing or planned. An exception concerns instances where an industrial plant will process its own wastewaters, the effluents of which will meet all applicable regulatory and permit requirements and will not adversely affect water quality in the receiving stream.

(14) Municipal-type wastewater service required to serve future growth within service areas identified for the year 2000 should be provided only by treatment authorities designated in this plan, except where this is not practical or cost-effective.

(15) In any application for issuance or amendment of an NPDES permit, each designated treatment authority should delineate its projected five-year service area for which treatment capacity is in place or under construction consistent with agreed regional population forecasts.

The delineation of five-year service areas should be done in agreement with local governments responsible for land use regulatory and/or provision of wastewater collection service within the facilities planning area. In the event that the local agencies are unable to reach agreement on the five-year service area, IEPA may defer issuance of the permit until agreement is reached, or it may delineate the service area.

(16) No NPDES permit should be issued for municipal-type wastewater service within the five-year service area delineated in the permit, other than to the treatment authority. Exceptions may be based on a finding by IEPA that the proposed facility (1) is the most cost-effective means of providing service or (2) is an interim facility pending extension of service by the treatment authority, or is intended to serve on isolated location and that it is consistent county, and regional land use plans.

(17) When any NPDES permit is due for renewal, the applicant should include a description of steps to provide wastewater service to the service area delineated in the permit.

If the IEPA finds that the treatment authority has failed to extend service to any portion of the projected service area, it may continue the delineation of the service area in the permit or may amend the service area to allow the issuance of NPDES permits in the area to which service has not been extended.

(18) At least every five years, the year 2000 service areas delineated in the areawide plan should be revised to reflect existing development and facilities, existing population forecasts, intergovernmental agreements on service area boundaries, and other relevant factors.

(19) No NPDES permit should be issued for municipal-type wastewater service outside the five-year service area, but within the year 2000 service area, without review and comment on the permit application by the treatment authority, the countywide water quality committee, and the Commission, and unless the development to be served is consistent with municipal, county, and regional land use plans.

(20) Whenever an NPDES permit is issued to an agency other than the treatment authority for wastewater service outside the five-year service area but within the year 2000 service area, the IEPA should require that the design and construction of the treatment system be such as to permit eventual connection to the treatment authority's system.

The IEPA may require that the facility be constructed or altered on an interim basis pending extension of service by the treatment authority.

(21) No NPDES permit should be issued for municipal-type wastewater service outside a year 2000 service area unless (1) the development to be served is consistent with municipal, county, and regional land use plans, and (2) the area to be served is unacceptable for the use of on-site disposal systems.

(22) The state priority system, administered by IEPA, should determine areawide priorities for local facilities planning, design and construction grants.

(23) The construction of new interim treatment plants or expansion/upgrading of plants to be phased out is discouraged.

Federal regulations for the implementation of Public Law 92-500 require an inventory of all municipal, industrial, and agricultural point source discharges, and a

statewide ranking of municipal discharges according to these factors:

--the pollution load represented by the discharge,

--the adequacy of the existing treatment facility for treating the existing load,

--the water quality of the receiving waterway.

Based on the statewide municipal ranking, the IEPA maintains a priority list for the allocation of construction grant funds under Section 201. Each proposed facility carries a priority number, which reflects its position in the municipal ranking.

Section 216 was added by PL 95-217, concerning priorities of 201 grants. The new legislation states that the determination of priority to be given each category of projects in the construction of publicly owned treatment works shall be made solely by the State. Considerations for the assignment of priority will include the severity of the pollution problem, population factors, and other related criteria needed to meet the requirements of the Act. At least 25 percent of the funds allocated to each State in any fiscal year must be obligated for "pipe-related" projects if they are on the State's priority list and if they are otherwise eligible. These "pipe-related" projects include: major sewer rehabilitation; new collector sewers; new interceptors and appurtenances; and, correction of combined sewer overflows.

The Commission recommends that the state priority system be incorporated into the areawide plan. Priority numbers assigned by the state, therefore, will represent the relative priorities of publicly owned wastewater facilities projects proposed in the region. This system should be monitored and maintained by the IEPA, in consultation with the Commission and countywide water quality committees.

5.05 MANAGEMENT OF MUNICIPAL POINT SOURCE DISCHARGES

a. The Existing Management System

The most obvious observations about the existing system for wastewater management in northeastern Illinois is that it is extensive and complex. Eighty-four municipalities, 26 sanitary districts, and 2 counties own and operate wastewater treatment plants. In addition, 130 municipalities and 26 sanitary districts own and operate wastewater collection systems, relying on the facilities of other agencies for treatment. Finally, there are 39 privately-owned public utility companies in the region which provide municipal-type service.

This proliferation of wastewater agencies is partly the result of Illinois law, which authorizes a variety of public agencies to provide wastewater services. All of the general purpose units of local government -- municipalities, townships and counties -- have such authority. In addition, several types of special purpose government can collect and treat wastewater. Sanitary districts, for example, may be organized under any one of five separate enabling acts. Public water districts, surface water protection districts, river conservancy districts, and drainage districts also are authorized to treat wastewater, although none do so in northeastern Illinois. State statutes also authorize two or more units of government to join together, through a formal intergovernmental agreement, to jointly exercise any authority which any one of them alone possesses.

Parts of northeastern Illinois receive all wastewater service from a single entity. Such unified service is most commonly provided by municipal governments. Elsewhere, two or even three agencies may be involved in the collection, transmission, treatment and discharge of wastewater. In cases where more than one agency is involved in a wastewater treatment arrangement, the participants may be bound together through special state legislation; this is true in most of the large, multi-community sanitary districts. In other cases, the agencies may bind themselves together through contractual agreements specifying the services to be provided by one party in exchange for a fee to be paid by the other. A third possibility is an intergovernmental agreement establishing a separate multi-community authority to provide wastewater treatment. Glen Ellyn and Lombard, for example, have established such an authority, and it has been considered in other areas.

Financial arrangements for municipal-type wastewater service are equally varied and complex. The sources of local funding used in the region include ad valorem taxes, general purpose funds, revenue sharing, service charges, surcharges and connection fees. Local sewer construction, and sometimes treatment plant construction, may be funded by private developers under the requirements of local subdivision ordinances and preannexation agreements. The funds used to plan, constuct, and operate any given treatment system might come from one, several, or all of the above sources.

State and federal grants to local agencies to aid in the capital costs of plant construction have been a significant source of funds in recent years.

Section 201 (b) (1) of PL 92-500 established the requirement of "user charges". These are designed to assure that each recipient of waste treatment service will pay its proportionate share of the cost for operating and maintaining the system, and include an allowance for replacements. Under PL 95-217, if an ad valorem system for assessing these charges was in effect when PL 95-217 was enacted (i.e.: December 28, 1977), and if the system

distributed costs equitably to each user class, the method may be continued. The change also requires a procedure to be followed to inform the users of their payments allocated to waste treatment services.

Industries discharging to publicly owned treatment works must, in addition to user charges, also pay for that portion of the cost of construction which is allocable to the treatment of industrial wastes. Under PL 95-217, this "cost recovery" requirement may be waived for small dischargers whose daily flow rate is 25,000 gallons per day or less of sanitary wastes. An exception to this rule covers situations where the discharge interferes with, contaminates or reduces the utility of the sludge. In such cases, cost recovery charges will be assessed. More significantly, the 1977 amendments have established an 18-month moratorium on the collection of payments of these industrial cost recovery charges. In the interim, the USEPA has been directed to complete a twelve month study of the efficiency and need for such a system.

b. Alternatives to the Existing Management System

Given present circumstances, it is difficult to conceive of a simple, uniform and unified management system to which several hundred units of local government could or would accomodate themselves willingly. The central question the Commission raised in the development of a workable areawide strategy for wastewater management, therefore was: How much does the existing state of affairs need to be altered to produce a management framework that will achieve the objectives of the areawide plan?

In analyzing possibilities, and formulating the recommended strategy discussed later in this section, four criteria were given highest priority:

1. Technical capability: the wastewater management system must be capable of operating all necessary treatment facilities efficiently and effectively.

2. Legal feasibility: the system should rely as much as possible on the existing legal authority of existing agencies. New legislation should be minimal, although it should not be ruled out where it is necessary.

3. Managerial feasibility: the potential for management conflicts should be minimized, but there should be adequate provisions for resolving conflicts that do occur. Waste management activities, wherever possible, should be conducted at the same geographic and governmental level (but not necessarily to the same units of government) as other portions of the areawide program.

4. Political feasibility: the management system should be acceptable to citizens and to policy-making bodies of existing governmental agencies. The system should be directly accountable to the electorate to the extent possible.

After several months of analysis, and discussions with governmental officials and citizens throughout the region, the Commission selected three alternative approaches to areawide wastewater management and explored the pros and cons of each in detail. Two of the Commission's Staff Papers should be consulted for complete discussions of the alternatives and processes by which they were developed and evaluated: Staff Paper No. 8: "Implementing the 208 Clean Water Program: Background Information for the Selection of a Management System," and Staff Paper No. 21: "208 Management Options: Alternative Institutional Frameworks for Water Quality Management."

The discussion below, a summary analysis of each of the alternatives that were fully considered, is based primarily on information contained in Staff Paper No. 21.

(1) The County-Wide Management Alternative: There are at least three separate types of agencies under which a county-wide waste management program could be set up: (1) a public works department under the supervision of the county board; (2) a county-wide sanitary district; or (3) a separate county wastewater board. Only the last of these would require new state legislative authorization. Whichever agency is selected, it would assume primary responsibility for county-wide policy-making, planning and possibly funding. Beyond this, there would be several alternatives for the ownership and operation of the treatment facilities themselves. The county agency might own the facilities serving unincorporated areas with existing agencies continuing to serve incorporated communities. Selected existing municipal systems might also be transferred to the county agency. Or, the county agency could assume ownership of all treatment facilities and major interceptors, with only the local collection systems retained by existing local agencies.

(2) The Areawide Authority Management Alternative: A regional waste management authority could be created, consisting of representatives of subregional management sectors or of major levels and units of government. This regional authority might be assigned complete responsibility for the construction and operation of all new plants and interceptors. Some or all existing plants would be transferred to the authority, either because the present owner wished to be free of the responsibility, or because the authority determined the transfer to be necessary.

As a variation, there could be a more limited regional authority which would neither own nor operate facilities.

Its authority would be limited to overall regional policy-making and planning for locally-owned and operated facilities. Even the more limited form of regional authority, however, would assume responsibility for allocating funds from federal and state grant programs among the local operating agencies.

(3) The Subregional Authority Management Alternative: Waste management programs would be organized on the basis of the FPAs which have already been created for local facilities planning. Where a single public agency is presently responsible for waste treatment in an FPA, it would be designated in the areawide plan as the waste management agency. In instances where more than one agency is involved, it would be necessary to designate a single lead agency for planning of the facilities (as is presently required under the Section 201 program) and develop a coordinated program for management. This coordination would be achieved either through service contracts and other types of formal intergovernmental agreements, or by the creation of a new, FPA-wide treatment authority. In either case, the agencies involved would have to reach agreement on the ownership of facilities, the allocation of future capacity, waste load allocations to the streams, the payment of construction and operating costs, and other detailed matters.

Depending upon local circumstances, numerous arrangements for the ownership and operation of the existing facilities are possible, including: (1) the retention of ownership and operating responsibilities by all present owners, (2) the retention of ownership by present owners with some responsibilities for operation transferred to other agencies through contractual agreements; (3) the consolidation of ownership and operation under a single existing agency; and (4) consolidation under a new FPA-wide treatment authority.

c. Assessment of Management Alternatives

(1) County-Based Management: Under a new system of county-wide waste management agencies there would be little doubt that the planning and operation of treatment facilities could be done at a scale large enough to be cost-effective. This approach also has the advantage of utilizing jurisdictional boundaries which are clearly defined and traditionally accepted. Where county public works departments are already in place, new agencies would not have to be created. Assuming that a coordinated program could be achieved within each county, any additional coordination between the six counties needed to achieve areawide objectives would be relatively uncomplicated.

However, there are some clear disadvantages to the county government approach. In some counties, the

establishment of a countywide wastewater management program would require new agencies, the rearrangement of responsibilities of existing agencies, or both. In such cases, this alternative would be limited in terms of political feasibility.

The technical and economic benefits of a large-scale county wastewater program also might be outweighed, in some counties, by the logistical problems of operating isolated facilities from a single, centralized management agency. Finally, depending upon the balance between county and local ownership which is selected, this alternative may decrease accountability to the local electorate.

(2) Regional Wastewater Management: Under a regional wastewater management agency, facilities could be even more easily designed at the optimum size for purposes of economy and technical efficiency. There would be no limitations resulting from the size of the management area. Financially, it would be possible to allocate the limited resources of northeastern Illinois for the maximum water quality improvement. The potential for conflicts in management between treatment systems, or between the wastewater treatment operations and the rest of the areawide water quality program, would be minimized.

However, this alternative has some severe limitations. A completely new type of agency would have to be created under new state legislative authorization. If this agency is assigned the responsibility for daily operation, a major transfer of facilities, financial obligations and personnel would be necessary. The logistical problems of managing a system of dispersed facilities, already mentioned as a disadvantage of the county-based alternative, would be even more severe under a regional waste management system. This approach also rates low in terms of political feasibility, in that it places the least reliance on existing agencies. This problem would be reduced, however, if a more limited regional authority were created as a policy making, planning and funding agency, with operation assigned to existing agencies.

(3) Subregional Wastewater Management: Measured against the previously mentioned criteria, this alternative has several distinct advantages. By organizing on the basis of FPA's, it would be possible to operate at a scale large enough to manage an arrangement of facilities determined to be cost-effective under current facility planning procedures. It would also be possible to utilize existing agencies, which already possess all of the required legal authorities. Where more than one agency is involved in a subregion or FPA, intergovernmental agreement techniques are available. Problems of financial capacity are no worse under this alternative than under any other, although the complexity of financial arrangements may be greater when several agencies are involved in a single FPA. The subregional management

system is politically more feasible than the more centralized alternatives in that it involves fewer alternatives in existing institutional arrangements. Finally, this alternative is more directly accountable to local citizens and elected officials.

There are some technical and managerial limitations associated with the subregional alternative, however. Boundaries of FPAs are subject to dispute in many areas. Furthermore, FPAs are limited in size and it could be difficult to coordinate the water quality effects of the wastewater management decisions made by each separate subregional management system. Larger management areas may be more appropriate in this regard.

This alternative also involves many different agencies, and presents many opportunities for conflict both within and between subregional management areas. This places a heavier burden on the general management portion of the areawide system to provide mechanisms for conflicts resolution. Finally, in relying on relatively independent subregional programs, it may become more difficult to coordinate wastewater management activities with other portions of the areawide management program (e.g., agricultural and urban stormwater runoff) which are most effectively dealt with at a different scale than FPA's.

d. Recommendation

(1) Management of municipal wastewater systems should be organized on the basis of those units of local government which own their own sewer systems and/or operate wastewater treatment systems. Such units should be designated as management agencies under the Areawide Plan.

On the whole, the county-based and areawide approaches are relatively equal with respect to technical and managerial feasibility, and both offer advantages over the subregional approach with respect to these particular criteria.

With respect to legal feasibility, the county and subregional systems would require little modification to existing legislation. The regional approach would require major new state legislation, however, which must be regarded as a liability.

It is with respect to political feasibility that the subregional approach offers significant advantages over either of the two or more centralized approaches. As indicated earlier, high priority is being given to implementability of the areawide plan, and the Commission places great emphasis on the potential for political acceptance of major areawide strategies. Because the subregional approach has distinct advantages in this regard, and because it also has the capacity to bring about the

improvements in the region's wastewater management system that are necessary for attainment of water quality objectives, it is the approach recommended in this plan. The recommendations in Chapter Eight should be consulted for an explanation of the overall management framework, of which the strategy recommended here is but one element.

5.06 REGULATION OF POINT SOURCE DISCHARGES

a. The Existing Regulatory Program

Section 208 of Public Law 92-500 requires the initial areawide plan to establish a program to regulate the location, modification and construction of all facilities, publicly or privately-owned, that could generate wastewater discharges to waterways within the planning area. Originally, this provision was interpreted by USEPA to encompass only those facilities directly responsible for such discharges; in other words, point sources such as those described earlier in this chapter. More recent federal regulations, however, have expanded the definition of "facilities," as the term is used in Section 208, to include any activity, or change in land use, that might result in any "new or deleterious discharge directly or indirectly into navigable waters."

The NPDES permit program is currently the primary mechanism for the regulation of point sources. An NPDES permit is issued to all point sources of water pollution by the IEPA. The permit, renewable every five years, requires the holder to meet state effluent standards and other discharge limitations necessary to improve water quality.

The effectiveness of the NPDES system would be improved if the system were coordinated with measures to control factors that are indirectly related to the quality of point discharges. One such factor is the relationship between urban development and water quality.

In several basins, computer simulation of future conditions showed that major population increases over the rest of this century would mitigate the beneficial effects of improved levels of wastewater treatment. Effluent quality would be improved as treatment processes become more advanced, but the effect on instream water quality would be nullified by projected large increases in wastewater flows.

Total pollutant loads could be greater than ever in the year 2000, even if substantial improvements in treatment facilities were made over the next 20 years. With the potential for further deterioration in water quality, even when local facilities planning and construction keep pace with population growth, the possibility that population growth may outstrip facilities improvements is cause for serious concern.

To protect against this possibility, local facilities plans are based on population projections, which in turn are

based on local plans and policies for growth and development. As has been discussed at several points, population forecasts for northeastern Illinois are generally being reduced. However, in some growing suburban areas, there exists the possibility that population growth in a community could occur more rapidly than anticipated in the forecasts on which local facilities plans are based.

One of the functions of the wastewater management system outlined above, and in Chapter Eight, is to provide safeguards, beyond those already offered by local facilities plans themselves, against growth that exceeds the available capacity of a wastewater system or of the stream receiving the effluent from a treatment plant. Intergovernmental agreements, for example, are recommended as a way of coordinating the development plans for all municipalities in an FPA, and relating them to plans for wastewater service. Such agreements not only provide coordination, they serve to strengthen the commitments of individual communities to their own development plans. They also provide a mechanism for assuring that future capacity for wastewater collection and treatment in an FPA, and for assuring that improvements to the wastewater system are scheduled properly with respect to forecasted growth.

Allocations, formally agreed upon, protect the rights of all participants in an FPA. Combined with accurate schedules, they assure even the smallest communities that capacity will be available to meet the need generated by future growth. To be most effective, allocations and schedules should be long-range, extending over the entire 20-year areawide planning period.

As has been indicated, however, intergovernmental agreements capable of meeting the objectives just described are rare in northeastern Illinois. The future development of such agreements is encouraged by this areawide plan, but it is not guaranteed. Available incentives for persuading local governments to establish formal intra-FPA agreements on service areas, growth allocations or scheduling of facilities improvements, are considered inadequate.

There basically are two actions that could be taken with respect to an FPA where major issues, potentially of critical importance to water quality, are left unresolved. Funding for further facilities planning, design, or construction could be suspended. As an alternative or additional measure, a ban on further connections to the sewer system could be imposed. Both these actions would have to be taken by the IEPA, and in the case of a sewer ban, also by the IPCB.

b. The Recommended Regulatory Program for Publicly-Owned Facilities

The Commission recommends that the management framework for publicly-owned wastewater systems be supported by a

regulatory program capable not only of correcting problems, but capable also of anticipating and preventing problems so that the need for such actions as funding cutoffs or sewer bans is minimized. The recommended program, which is outlined below, is based on the NPDES permit system and on authorities already vested in local governments or state agencies.

There are four general regulatory powers, possessed by all public wastewater treatment authorities in northeastern Illinois, that could be applied as needed: (1) the authority to regulate tributary sewer systems; (2) the authority to use any feasible method to prevent treated sewage from polluting rivers, streams or lakes; (3) the authority to pass ordinances to accomplish any of the objectives to sewage treatment and discharge, and to impose fines and penalties to enforce them; and (4) the authority to impose surcharges on industrial effluent. The powers, in effect, give designated wastewater treatment agencies the authority to consider water quality in making determinations to provide, expand, or deny service.

For example, the authority to regulate tributary sewer systems permits a treatment authority to refuse to extend additional service to any area, if such an extension would contradict the authority's NPDES permit or otherwise contradict the 208 water quality plan. In all the enabling acts for sanitary districts in northeastern Illinois, there is language similar to that found in Section 283.2 of the legislation for the North Shore Sanitary District. Section 283.2 gives the NSSD board "the power and authority to regulate, limit, extend, deny or otherwise control any connection to such sewer tributary to the sanitary district sewer system by any person or municipal corporation regardless of whether the sewer into which the connection is made is directly under the jurisdiction of the district or not." Such language, in conjunction with the district's general authority to use any feasible method to prevent treated sewage from causing water pollution, should be relied upon by publicly owned wastewater treatment authorities to refuse to extend service to future users whenever it might threaten implementation of the 208 water quality objectives.

One objective of the 208 planning process described in Chapter Two is to assure that the local land use planning and decision-making process incorporates water quality considerations more effectively. Wastewater treatment authorities should assure that service extensions are consistent with local, county and regional land use plans, and that wastewater treatment service is denied where it would be inconsistent with local, county and regional land use planning and decision-making.

Both the IEPA and the IPCB have authority to impose sewer bans. The IEPA "critical review" list informs treatment authorities when a sewer is approaching hydraulic capacity or a sewage treatment plant is approaching design

capacity. The IEPA may also place sanitary districts or other wastewater treatment authorities on a "restricted status" list. This prohibits future sewer connection permits when a sewer has reached hydraulic capacity or a treatment plant has reached design capacity. The IPCB may temporarily ban all new sewer connections in a service area, after a hearing, in order to eliminate a specific water pollution problem. The IPCB ban lasts until the water pollution problem has been corrected. This IEPA/IPCB sewer ban authority should continue to be an important regulatory measure for the control of water pollution.

(1) Recommendation:

> (a) All wastewater treatment authorities placed on the IEPA critical review list should apply for new or revised local facility planning and construction grants (under Section 201), except if an interim treatment plant is involved, or if the deficiency can be corrected by non-structural methods.

Whenever a treatment authority is placed on the critical review list, the IEPA should reassess the status of any construction grant program for the facility. If the treatment authority has a local facilities plan in effect, or is in the process of preparing one, it should be required to reconcile the critical review situation with its local facilities plan. The IEPA should require the treatment authority to file a new or amended planning application in order to eliminate the problem. A treatment authority placed on critical review, which does not have a local facilities plan in effect or in preparation, should be required to submit a formal local facilities planning application to eliminate the problem which caused the critical review designation.

c. The Recommended Regulatory Program for Privately-Owned Facilities

A different regulatory strategy is recommended for privately owned, municipal-type plants which discharge directly into rivers and streams. The basic management strategy recommended for these facilities is that they be phased out of operation wherever feasible. The development of new privately-owned facilities is discouraged. They should be constructed only where it is not possible to extend publicly-owned services.

The existing state environmental and public utility regulatory programs provide the basis on which a phase-out of private plants could be accomplished, where it is cost-effective and otherwise feasible to do so. However, state programs in these areas should be better coordinated. They also should be more consistent with respect to objectives.

The NPDES permit procedures apply to every wastewater treatment facility, privately owned and publicly owned, which discharges directly into a waterway. Every treatment plant must obtain an NPDES permit when a new discharge is proposed, and every time new or increased discharges are added. A privately-owned plant, depending upon its reserve capacity, also may have to obtain a new NPDES permit to expand its service at an existing plant.

Those privately owned wastewater treatment systems, which provide service to other private individuals for a fee, are classified as public utilities and, as such, are subject to Illinois Commerce Commission (ICC) regulation. Before any public utility can construct new facilities, it must have a certificate of "convenience and necessity" from the ICC. Nothing in existing ICC standards for wastewater treatment utilities, however, allows the ICC to consider areawide water quality consideration in determining the need for a new privately-owned treatment plant. Even though these privately owned wastewater treatment facilities need both ICC and IEPA approval before they can operate, there is no rationale for relying on one state agency to provide a check on another; relying on the IEPA, for example, to counter inappropriate decisions by the ICC. Improved coordination and consistency would eliminate the possibility that the ICC would approve a new or expanded privately-owned plant only to have the same plant disapproved later by the IEPA on the basis of the areawide water quality plan. The following actions are recommended to provide the needed consistency.

(1) Recommendations:

(a) The ICC should be required to give notice to the IEPA and local land use control authorities whenever it receives an application for certification of a new privately-owned wastewater treatment system, or an application for a revision to an existing certification, including changes in the franchise area of an existing system.

(b) The IEPA and local land use control authorities should review the proposed facility for consistency with the 208 plans. The local land use authority should be given a 30-day period during which it may comment on the proposed action and transmit any such comments to the IEPA. An IEPA finding of consistency, expressed in the form of intent to issue necessary permits, should be a prerequisite to ICC issuance of a certificate of convenience and necessity.

The above requirements will insure consistency in the positions of the two agencies and local units of government with respect to new facilities.

An additional area in which coordination will be important is the ICC's rate approval authority. The IEPA should make the ICC fully aware of any changes in treatment and discharge requirements which will require plant improvements which can only be financed by the utility by increasing the rates it charges its customers. The IEPA can be of assistance to the ICC in its evaluation of the reasonableness and necessity of requested rate changes.

d. Regulation of Other Point Sources

The USEPA has issued NPDES permits for a number of "other" point source discharges in northeastern Illinois (permit issuance did not become a responsibility of the Illinois EPA until late 1977). Each permit contains specific effluent limitations which are based on standards set by the IPCB but vary considerably for various dischargers. An evaluation of permit compliance, therefore, would require an extensive monitoring and sampling effort directed at individual dischargers and even at individual effluent constituents. No such effort has been possible within the areawide planning program, and historical data that is available is inadequate for assessing the permit compliance of most dischargers. It would be desirable, of course, for all dischargers to comply with all standards, at all times, under all operating conditions, but to expect that this type of performance could be achieved would be unreasonable.

Wastewater flows from "other" point sources vary considerably in volume and quality, and even under normal operating conditions, totally effective treatment is difficult. Unanticipated spills and accidents, unauthorized discharges of toxic and hazardous materials, and the adverse impacts of wet weather flows also contribute to the difficulty.

The impossibility of total compliance is recognized in state regulations, which emphasize average performance over time, allow some variations in effluent quality, and tolerate violations of numerical standards within prescribed limits.

Subsequent studies of "other" point sources should focus on discharges related to wet weather flows. Miscellaneous plants generally handle very small flows, and should not pose a significant environmental threat so long as they perform satisfactorily with respect to their permit requirements.

Industrial wastes, as discussed above, can interfere with the operation of publicly-owned plants, hinder the achievement of satisfactory effluent quality, and add to the difficulties of sludge disposal. An inventory and analysis of industrial discharges to publicly-owned plants would be useful in assessing the extent to which any of these types of problems exist in specific situations.

The existing NPDES permit program for other sources generally is adequate to deal with water quality problems associated with these sources. Exceptions exist with respect to those agricultural point sources and urban stormwater point sources that have been identified in the preliminary regulations issued by the USEPA for the general area permit program. The recommended regulatory program for these types of point source is outlined in Chapter Six.

Under the 1977 amendments to Public Law 92-500, wastewater treatment authorities must enforce pretreatment standards established by the USEPA, upon notice from the USEPA that the standards have been violated. If the treatment authority does not correct the pretreatment violation within 30 days, the USEPA may take the treatment authority to court in order to correct the violation.

The NPDES permits issued by the IEPA also require wastewater treatment authorities to assure that industrial users comply with federal pretreatment requirements and with state standards for mercury and cyanide. Wastewater treatment authorities are subject to IPCB action if they do not effectively enforce pretreatment requirements. No change in these provisions is recommended.

In sum, the general authority of each public wastewater treatment authority in northeastern Illinois, reinforced by the standards and/or the intervention of state and federal agencies, is sufficient to enable wastewater authorities to fulfill their responsibilities for proper pretreatment.

The location of new individual industrial point sources may have important secondary impacts on water quality in addition to the obvious direct impact on a particular stream. The location of new industrial discharges may stimulate new growth in adjacent communities, which in turn may seriously alter the allocations and schedules in the NPDES permits for wastewater treatment systems.

Except as permitted by Rule 208, IPCB regulations prohibit lowering of water quality which already is better than required by established standards. Even without projecting future increases in direct industrial discharges, the areawide planning process has identified some streams and rivers in which water quality will not reach required instream quality levels. New industrial discharges to those rivers and streams may not be permissible. The only alternative may be to locate industrial dischargers, which cannot be connected to publicly owned wastewater treatment facilities, in basins with high water quality. Through the continuing planning program, the Commission, in conjunction with the IEPA, may have to develop a regulatory program to control the secondary impacts of new industrial discharges.

5.07 ENERGY REQUIREMENTS

It has been estimated that the energy consumed in wastewater collection and treatment is less than 1 percent of the total energy produced in the United States. However, more stringent pollution control standards have resulted in more sophisticated technology for removing impurities. New methods often are more energy-intensive than earlier treatment processes, and the energy demands of wastewater treatment systems will continue to increase.

In the course of the wastewater treatment process, energy is consumed in the operation of treatment facilities, in the operation of off-site collection and conveyance facilities, and in the manufacture of equipment, chemicals and other materials used in wastewater systems.

a. Energy Used in Treatment of Wastewaters

Wastewater treatment processes utilized in northeastern Illinois are classified in these categories: primary, secondary, tertiary, advanced, and sludge treatment.

Primary treatment involves these separate processes: influent pumping, screening, comminution, grit removal and primary sedimentation. Pumping is the most energy-intensive component of the process, and attempts to reduce energy consumption should focus on proper siting and design of the treatment facility and the selection of energy-efficient pumping equipment. Other energy reductions may be possible through efficient design of the equipment used in grit chambers and primary sedimentation basins to remove solids.

Secondary treatment facilities in northeastern Illinois are of four types: activated sludge, rotating bio-discs, trickling filters and stabilization lagoons. The activated sludge process is by far the most energy-intensive because of the power required to transfer oxygen to wastewater in order to remove BOD. This process also generates much more sludge than the other three processes and leads to associated increases in energy consumption for sludge treatment. Studies have indicated that energy requirements in the activated sludge process are lowest when systems are operated to sustain the highest possible growth rate of micro-organisms. Lower growth rates are accompanied by increased oxygen demand and the need for more aeration, which is another energy-intensive part of the activated sludge process. Modifications such as tapered aeration can reduce the demand for aeration while sustaining high organism growth rates.

Other secondary treatment alternatives (trickling filters, bio-discs or stabilization lagoons) require much less energy. None of these systems requires aeration and all generate less sludge than the activated sludge process. They can be attractive alternatives for secondary wastewater

treatment, provided they meet effluent standards and are competitive in terms of economics and performance.

Chlorination of wastewater treatment plant effluent is currently required for all municipal plants in Illinois. This process generates a high energy demand because the production of chlorine is energy intensive. The major technical alternative to chlorination involves the use of ozone, which in general can be competitive with respect to energy consumption, with chlorine. The IEPA is currently conducting research into the elimination of disinfection requirements.

Effluent regulations for northeastern Illinois have resulted in increased use of tertiary wastewater treatment processes for removing BOD and suspended solids beyond the secondary level. It has been estimated that there waste treatment technologies can increase plant energy demands by as much as fifteen times those of primary-secondary levels.

Advanced treatment is a term usually applied to the removal of nutrients, such as phosphorus and ammmia. Processes for phosphorus removal generates significant quanities of sludge, the treatment and disposal of which are energy intensive. Processes for reducing ammmia in effluents are especially energy intensive.

Tertiary and advanced waste treatment can be eliminated if land application of secondary effluent is possible. Land application systems also have high energy demands resulting from transmission and distribution pumping. But, these demands are offset by other factors. First, because wastes will not be discharged to a waterway, low-energy lagoons can often provide sufficient secondary treatment prior to land application. Second, the nutrients contained in the effluent can be reclaimed as partial fertilizer substitutes for raising crops, thereby reducing energy use in production of chemical fertilizers. Third, the energy value of the crops can be applied as a credit towards the total energy budget of the system. These factors may vary from site to site within the region.

Good design also can reduce wastewater treatment energy requirements. Maximum use of gravity flow should be applied in routing wastewaters through a treatment facility.

b. Energy Use in Sludge Treatment

In northeastern Illinois sludge usually is treated by anaerobic digestion followed by dewatering through vacuum filtration or air drying. Disposal is by land application, either in landfills or by surface spreading. The anaerobic digestion process requires minimal amounts of energy, and major energy requirements are for pumps, thickening equipment, and heat for the digestors. Aerobic digestion, used infrequently, is highly energy-intensive because oxygen must be supplied in sufficient quantities to stabilize all biological matter. Energy is also needed for aerators and

sludge pumps. Vacuum filtration consumes large amounts of energy as water is separated from sludge solids. Air drying relies on solar energy and wind to perform this same function, and is preferable from an energy standpoint.

Options for reducing energy consumption in sludge treatment obviously center around the selection of anaerobic digestors and air drying beds. Methane gas generated by anaerobic digestion can also be recovered and used as a fuel to heat plant facilities and even generate electricity.

In existing aerobic digestors it has been estimated that mechanical aerators can reduce energy consumption by 25 percent. Existing anaerobic plants can reduce heating requirements by keeping the influent sludge as thick as possible. Stabilized sludges can be disposed of by land application without dewatering.

c. Energy Used in Collection Systems

The major energy use in wastewater collection is for pumping, and the selection of efficient pumps is important in reducing energy demands. Sewer designs which utilize gravity flow as much as possible, and minimize the need for lift stations, also help reduce energy demands. The energy benefits of deeper gravity sewers requiring greater energy for installation must be weighed against those of force mains, which have a lower initial energy cost but a higher continuing energy requirement.

The reduction of infiltration and inflow to existing collection systems can greatly enhance energy conservation. Little energy is required to reduce these excess flows, but their elimination can cut energy demands at pumping stations and in wastewater treatment facilities.

Regionalization of wastewater treatment facilities may have positive or negative energy impacts. The energy requirements of individual plants must be compared to the energy required to transport wastewaters to a central plant. The replacement of small, low energy plants with an energy-intensive regional system obviously could have a negative overall energy impact. However, the consolidation of energy inefficient plants into a well-designed facility can result in energy savings through economies of scale, particularly if gravity transportation can be utilized.

d. Recommendation

(1) The design and operation of present and future facilities should carefully consider the energy implications of wastewater collection and treatment.

Although many options are available to reduce energy requirements in wastewater treatment, their selection is often precluded by other factors such as economics,

reliability, pollution control regulations, and institutional restraints. However, energy impacts will continue to become more important as finite fuel supplies dwindle and energy costs rise.

(2) Measures to reduce energy consumption in wastewater collection and treatment will be studied further during the continuing planning program for areawide water quality management.

5.08 WATER CONSERVATION AND REUSE OF EFFLUENTS

a. Water Conservation

It has been estimated that 60 to 70 percent of all potable water used is discharged to the natural drainage system as wastewater. Clearly, a general reduction in the use of water will contribute to a reduction in the volume of wastewater that must be processed through treatment plants. The importance of water conservation in pollution control is noted in Public Law 92-500, which directed the USEPA to investigate methods for reducing sewage volumes. Facilities planning regulations now require an evaluation of alternative flow and waste reduction measures, including nonstructural methods.

Water conservation has been an issue of importance in northeastern Illinois since 1967, when the U.S. Supreme Court limited the amount of water Illinois could divert from Lake Michigan to 3,200 cubic feet per second until such time as..."all feasible means reasonably available...have been employed...to conserve and manage the water resources of the region..."

This constraint, coupled with dwindling groundwater supplies in many suburbs, has resulted in what amounts to a water shortage, and has highlighted the need for the conservation of the region's water resources from a water supply standpoint.

Some communities have received specific water conservation incentives from the Illinois Department of Transportation, Division of Water Resources, the agency that issues allocation permits for the use of Lake Michigan water. Within six months of receiving a permit, commmunities that are potential users of Lake Michigan waters must enact ordinances to provide for the metering of all new water supply services, and ban the flushing of sewers with potable water except where pressure devices are used. Communties also must mandate the installation of water-saving fixtures in all new construction and in the repair or replacement of existing fixtures. Recipients of lake water allocations also must adopt a comprehensive water conservation plan.

Communities not seeking to use Lake Michigan water are not required to adopt conservation measures but some have

done so, with the support of such organizations as the Northwest Municipal Conference and the DuPage Mayors and Managers Conference.

More detailed information on conservation and other flow and waste reduction measures is contained in Staff Paper No. 4: "Flow and Waste Reduction Measures."

Various requirements of Public Law 92-500 are causing industries to make vigorous efforts to reduce volumes and concentrations of pollutants in their discharges. Of most influence are effluent standards for on-site treament, and the systems for user charges and Industrial Cost Recovery assessments that apply when industrial wastes are treated by a publicly-owned plant that has been financed in part by federal funds.

Industry's response to these requirements has included extensive studies to determine where in-plant processes were generating excessive amounts of water or pollution. In some cases, volumes of water have been reduced and steps have been taken to lower pollutant concentrations. In some plants, dramatic reductions have resulted from processes that use raw waters which are subsequently treated as wastewater, and then reused. This areawide plan can add little to the state of the art of water conservation by "other" point source discharges. The extent to which conservation practices are expanded will depend on many factors, including some relevant economic issues. Higher costs are projected in the purchase of potable water from adjacent municipal systems, for example. The costs of obtaining raw water from company wells, which have continuously decreasing levels, also will increase. These factors, dictate that reductions in water consumption, and subsequent reductions in wastewater volumes, should be investigated by industry.

The impact of water conservation programs on wastewater collection and treatment is difficult to assess. Some conservation measures reduce usage only in functions that do not influence wastewater flows, such as lawn sprinkling and street and hydrant flushing. However, practices such as metering, installation of water conserving fixtures and devices, and improved programs for leakage detection could lead to at least a 15 percent decrease in water usage.

Although total wastewater flows may be reduced by conservation measures, maximum flows would be affected only slightly, because they are influenced by such factors as stormwater infiltration and inflow and peak daily water usage. Wastewater treatment facilities should be designed for maximum daily flows, and the impact of water conservation on design capacities of sewage treatment and collection facilities may be minimal. Operating and maintenance costs that are dependent upon volume would be reduced, however, by reductions in average flows.

Another potential impact of water conservation programs would be an increase in the concentrations of pollutants during low flow periods. This could require process

modifications within sewage treatment facilities to insure adequate treatment of the stronger wastewaters.

Where significant reductions in flows may be generated, this may result in slower velocities in sewers with the concurrent disposition of solids and the generations of anaerabic conditions. Increased odor problems associated with hydrogen sulfide gases and pipe corrosion as well as sewer clogging are other possible results.

b. Reuse of Effluents

A conservation practice widely discussed in northeastern Illinois, and of interest to several of the major public interest organizations involved in areawide planning, is the reuse of effluent. The subject is discussed in greater detail in 208 Staff Paper No. 20: "Wastewater Treatment Processes and Cost Estimating Data."

Effluents from wastewater treatment plants frequently are suitable for a variety of indirect or direct uses. Indirect reuse refers to programs in which the effluent is comingled with naturally occuring water resources before being used, as in groundwater recharge. Direct reuse of effluent refers to the utilization of wastewater as a raw water source with no comingling with natural water supplies.

Reuse possibilities exist in five categories: municipal programs, industrial processing, agriculture, recreation, and groundwater recharge.

(1) Municipal Reuse: Effluent can be used in several ways by municipal government. Watering and irrigation programs for public lawns, parks and golf courses can rely partly or totally on effluent. Examples of these types of programs can be found throughout northeastern Illinois. The North Shore Sanitary District is exploring the possibility of using the effluent from its Clavey Road plant to water five nearby golf courses. Both Bensenville and the Hinsdale Sanitary District have considered reusing distilled wastewater plant effluent for municipal water supply. Bensenville's plant effluent already is being used to irrigate local golf courses. Direct reuse of wastewater treatment plant effluent for public water supply is illegal in Illinois, however, and it is not likely to be considered seriously in northeastern Illinois because of the availability of alternate sources, high costs, health concerns and aesthetic objections.

(2) Industrial Reuse: Industries may reuse treated wastewater for cooling, feeding boilers and, if problem contaminants have been removed, in manufacturing processes. Public health concerns are largely eliminated when closed systems are employed. The major drawback to industrial reuse of municipal wastewater effluent, however, is cost. Transmission costs, coupled with the cost of treating

effluent to the required degree, even for cooling purposes, frequently makes it more expensive to reuse wastewater than it is to draw from other sources of supply in the region. At present, no major industries in northeastern Illinois are using treated municipal effluent as a source of raw water supply.

(3) Agricultural Reuse: The feasibility of using treatment plant effluent for agricultural purposes is determined largely by the types of crops to be grown. It is illegal in many states to use sewage effluent to irrigate truck crops such as fruits and vegetables which may be eaten without cooking, although Illinois presently has no specific prohibition against this practice.

Irrigation with effluent may be suitable for field crops, like corn and soybeans that are not grown for direct human consumption, and for pastures and forests. Because most agricultural activities are conducted in relatively undeveloped areas, there are likely to be high costs involved in transporting effluent to fields. Consequently, there presently are no agricultural operations in the region utilizing treated wastewater as a water source, although there are examples of large operations that incorporate treated sludge in fertilization programs (See Chapter Seven).

(4) Recreational Reuse: Wastewater effluent can be used as a source of water for man-made lakes, or as a source of water for augmenting the flow in the headwaters of selected streams in order to increase the recreational potential of downstream segments. The region has an abundant supply of natural lakes, (although public access to many of these is limited or prohibited). To the extent that manmade lakes have been developed for public use, they generally have become popular very quickly, often as part of multi-purpose projects that frequently are associated with drainage control and flood prevention. Suitable sites for these types of developments are not common, however, even setting aside the possibility that sites could be found close to wastewater treatment plants. Furthermore, it has been demonstrated by experience and by the water quality model that such lakes would be subject to excessive algae growth unless the level of nutrients contained in the effluent were carefully controlled.

It should be noted that under Section 201(g) (6) (added by PL 95-217), no construction grant will be made after September 30, 1978 unless the applicant has analyzed the potential recreation and open space opportunities in the planning of proposed treatment works.

(5) Reuse in Groundwater Recharge: Intensive development of groundwater resources in northeastern Illinois has resulted in declining water levels and considerable interest in the artificial recharging of aquifers. One source of water for

recharge could be highly treated municipal wastewater treatment plant effluent.

There are three principal methods of direct artificial recharge: surface spreading; seepage pits; and injection wells. Seepage pits and injection wells are adaptable to highly urbanized areas; surface spreading could be used in rural areas.

Except in the case of injection wells, recharge programs depend on the following factors:

(1) Surficial geologic deposits that readily receive, filter and transmit the recharged water to an underlying aquifer.

(2) An active cone of depression (a decline in the water level of an aquifer), resulting from withdrawals in excess of natural recharge. In the absence of such a situation, recharging will merely result in the creation of water-logged areas.

(3) A source of water, near the recharge area, that is free of pollutants that could threaten the safety of the aquifer.

Treated effluent is being used to replenish groundwater supplies in a number of areas, particularly in arid regions, but also on Long Island. Within northeastern Illinois, the MSDGC has received a grant to undertake an experimental recharge project using highly treated effluent from its John E. Egan plant. The City of Naperville has expressed interest in a similar project.

(6) Innovative and Alternative Technologies: The Clean Water Act of 1977, which amended PL 92-500, and its legislative history emphasized innovative and alternative technologies. Section 201(g) (5) was designed to achieve the greater use of systems involving the reclamation and reuse of water, the productive recycling of wastewater constituents, the recovery of energy and the elimination of discharges of pollutants. Under the new provisions, innovative or alternative processes or techniques may qualify for 85 percent grants, as compared to the standard 75 percent grant level. And, if the innovative system fails, under certain conditions Federal percent grants will be available for the replacement or modification of the treatment works. Finally, in the required cost effectiveness analyses of alternative plans, compared to the most economical one, a cost differential of as much as 15 percent will be allowed in favor of innovative or alternative concepts. The above provisions highlight the major thrust of the future construction grants and related programs.

c. Recommendations

(1) Municipal governments that furnish potable water to industries and other large users should study the possibility for the reuse of effluents from municipal wastewater treatment plants as a substitute for part of the water supply required by these major users. Industries that are responsible for their own water supply systems should undertake the same type of studies.

(2) Industries that treat their own wastewater should explore opportunities to recycle and reuse the treated effluent, at the same time studying possibilities to extract residuals that might be of use in the basic plant processes.

(3) Where cooling water discharges to the region's water bodies cannot be eliminated, users should explore opportunities for the reuse of the cooling waters in ways that take advantage of the heat energy those waters contain.

(4) Municipal and county governments should implement programs to reduce water usage and help reduce wastewater flows at publicly and privately-owned treatment plants.

Steps that local governments could take in this regard include water-pricing policies, the modification of building codes to require water-conserving plumbing fixtures, the requirement that all new development be metered, and the development of public education programs that stress the benefits of water conservation.

(5) Wastewater treatment plant designers and operating agencies are encouraged to utilize innovative and alternative technologies which provide for the reclaiming and reuse of wastewater treatment plant effluents in the productive recycling of wastewater constituents, the recovery of energy, and the elimination of discharges of pollutants.

5.09 ALTERNATIVE METHODS OF WASTEWATER TREATMENT

Wastewater treatment most often involves the collection of raw sewage and other wastes in sewers and the conveyance of these wastes to a treatment plant. There, pollutants are removed by a combination of primary, secondary, tertiary and advanced processes, all of which take place in the treatment plant. Sludges created in the process are treated to remove major contaminants, and then the treated sludge is disposed of in a landfill or in a land application program. The

process just described is generally known as "conventional" treatment. Without exception, it is the type of wastewater treatment that is underway in northeastern Illinois.

There are other alternative methods of wastewater treatment, however. These differ from conventional methods primarily to the extent that "nonstructural" treatment methods are substituted for some of the mechanical, chemical or biological processes that take place in the conventional treatment plant.

As the terminology, "alternative methods of wastewater treatment" is generally used, it refers to the application of wastewater effluent, after it has received primary or secondary treatment, directly to land surfaces. Among the advantages of this type of treatment is that the wastewater can be used to provide moisture and nutrients to crops and grasslands, while effluent discharges and sludge production are eliminated or reduced.

There are three basic methods of land treatment: irrigation, overland flow, and infiltration-percolation. Irrigation is the most popular, and is used by many communities in dry areas of the country. Irrigating wastewater is applied to lands either by spraying, flooding or by flowing through ridges and furrows. Waste treatment occurs as the wastewater passes through soils. Excess surface flows are collected and discharged to local water bodies. Subsurface drainage systems may also be installed to monitor, collect, store and finally discharge the heated effluents.

In overland flow, wastewater flows across sloping surfaces of land planted with vegetation. Treatment is achieved through bacteria on the surface of vegetation breaking down contaminants in the flow.

Infiltration-percolation is like irrigation, in that it involves passing wastewater through soils. However, the treated water is allowed to percolate into the groundwater, and is not collected as in the irrigation process. Soils used must be capable of transmitting wastewaters in a manner that allows the required treatment to be achieved.

The exploration and development of alternative methods of wastewater treatment have received considerable attention since the passage of Public Law 92-500. Emphasis on the study and implementation of alternative methods is contained primarily in Section 201, which includes several provisions directed at encouraging municipalities and sanitary districts seeking grants for local facilities planning and construction to thoroughly investigate alternatives to conventional treatment. Particularly important is Section 201(g), which prohibits the USEPA from making any grants unless the applicant has demonstrated that "alternative waste management techniques have been studied and evaluated, and the works proposed for grant assistance will provide for the application of the best practicable treatment technology over the life of the works." This provision affects only those local facilities grant applications submitted after

June 30, 1974, however. About 25 FPAs in northeastern Illinois are affected, as the rest had submitted their applications before the provision became effective.

Even greater emphasis was given to alternative methods by the Clean Water Act of 1977, which offers bycentives to encourage local governments to explore alternative methods more seriously. The previous law required local governments to explore all methods, but to base their facilities plans on the methods shown to be the most cost-effective. The federal government then would provide 75 percent of the cost of the treatment works. Under provisions of the new law, however, the USEPA may make grants for 85 percent of the cost for projects where "...any eligible treatment works or significant portions thereof (would be) utilizing innovative or alternative wastewater treatment processes and techniques."

The new law also gives the administrator of the USEPA the discretion to make 85 percent grants "in the public interest" even when the innovative or alternative methods may not be the most cost-effective of the methods studied by the applicant. This discretion is limited, however, to situations where alternative methods will not increase the cost of treatment by more than 15 percent over the life of the system.

Reflecting the impetus of the new law, alternative methods are being given high priority by USEPA. No grant will be made after September 30, 1978 unless the applicant has satisfactorily demonstrated that innovative and alternative waste treatment processes and techniques have been studied. The requirement covers alternatives for the reclaiming and reuse of water; the elimination of the discharge of pollutants; the utilization of recycling techniques; land treatment; or, any other new or improved method of waste treatment management, including the confined disposal of pollutants so as not to migrate to cause water or other environmental pollution.

While there is no doubt that the focus of national policy has changed, it should not be expected that there will be any dramatic change in the practice of wastewater treatment in northeastern Illinois. In all but 25 communities, local facilities planning has progressed so far that plans are not subject to the provisions of the Clean Water Act of 1977.

Other communities generally are committed to conventional treatment programs, based on studies which showed that alternative methods were not practical or cost effective. Studies prepared by local governments in the course of local facilities planning, for example, invariably indicate that conventional treatment is the most cost-effective strategy.

There are a number of reasons why land application is considered to be ill-suited to most wastewater treatment programs in northeastern Illinois. Among these most often cited are the high cost of land, in quantities that would

make land treatment worthwhile; the general absence of appropriate soils and surficial geologic deposits; the presence of high groundwater tables; and the variability and nature of the region's climate. In addition, public opinion is largely against land treatment programs. The subject of land treatment evokes much the same public response as the subject of sanitary landfills: "If you must do it, do it somewhere else." The simple need to locate wastewater treatment facilities near populated areas, in order to keep the costs of collection and transportation as low as possible, works against the cost-effectiveness of land treatment. Conveyance routes to move raw wastewater or effluent to places where treatment areas could be obtained at a reasonable cost, away from people, would be long and extremely costly.

Some earlier studies have evaluated the potential for land treatment in this region quite thoroughly. The best-known was the Chicago-South End Lake Michigan report (C-SELM) prepared by the U.S. Army Corps of Engineers. One alternative investigated in this report was the land treatment of wastewater from the DesPlaines River Basin, and areas of Illinois and Indiana within the Lake Michigan basin, at five large sites on the perimeter of the region. A second alternative involved a combination of biological and land treatment. Public reaction in outlying areas, where land treatment sites were proposed, was extremely negative and both alternatives were rejected.

It is doubtful, barring some unforseen change in national policy beyond that which emerged in 1977, that land treatment will in the foreseeable future be more widely accepted in northeastern Illinois. The fact that the region already has made a substantial commitment through more than 70 ongoing local facilities plans to conventional treatment programs works against the implementation of alternative methods on anything but a limited localized scale.

CHAPTER 6

Pollution from Nonpoint Sources

CHAPTER SIX
POLLUTION FROM NONPOINT SOURCES

6.01 INTRODUCTION

It has been estimated that 50 percent or more of the nation's water quality problems are caused by pollution from "nonpoint sources," generalized discharges that cannot be pinpointed to specific points of origin. Types of nonpoint sources known to have the potential for causing pollution are: urban and agricultural stormwater runoff, runoff from construction activities, disposal of residuals from wastewater and water treatment processing, hydrologic modifications, mining and other extractive industries, effluent from septic filter fields, leachates from dumps or sanitary landfills, and air pollution.

Among pollutants generated by nonpoint sources, those of greatest concern are sediment, pesticides, toxic metals, nutrients, pathogens, BOD, suspended and dissolved solids, and toxic organic compounds.

The effects of nonpoint source pollution are difficult to quantify. One reason is the extreme diversity of the sources, which vary in their basic nature and with location. Monitoring and evaluation are difficult, because most nonpoint sources are intermittent and random.

In some locations, nonpoint sources affect water quality more than point sources, however, and pollution abatement programs in such areas will fail to achieve desired results unless nonpoint sources are properly controlled. Results of water quality modeling and sampling programs indicate that such situations are common in northeastern Illinois. While it had been expected that pollution concentrations would be most serious during periods of low stream flow, when dilution is least, results show clearly that many problems are most serious during periods of high flow after rains, when the effects of stormwater runoff are greatest. Specific data in this regard are provided in the water quality modeling discussion included in the basin chapters of Part II of this plan where the model was used.

6.02 LAND USE RUNOFF SAMPLING PROGRAM

Additional insight into the relative seriousness of nonpoint sources can be gained from an examination of the data compiled by the Commission is its land use runoff sampling program. The results of that program are described in Table 6-1, which summarizes the results of the land use sampling program for conventional pollutants. The results of the land use sampling program for heavy metals were presented in Chapter Four.

TABLE 6-1: LAND USE WATER QUALITY SAMPLING – SUMMARY DATA

NIPC SITE NUMBERS	LAND USE TYPE	STATISTICS	PARAMETERS[1]					
			ph (units)	Alkalinity	Hardness	Total Suspended Solids	Volatile Suspended Solids	Total Solids
1 – 4	Agricultural	No of Events	14	14	14	14	14	14
		No of Analyses	168	28	14	168	168	168
		Maximum	9.7	244	351	6100	1	6398
		Minimum	6.5	40	162	5	882	428
		Mean	7.6	144	280	762	99	1136
5 – 6	Commercial	No. of Events	12	12	12	12	12	12
		No. of Analyses	146	24	12	142	142	142
		Maximum	8.5	188	616	2938	164	4218
		Minimum	6.8	19	57	26	4	420
		Mean	7.6	71	293	386	44	1242
7	Highway	No. of Events	7	7	7	7	7	7
		No. of Analyses	83	13	7	82	82	82
		Maximum	8.2	306	1412	1432	160	5904
		Minimum	6.5	56	147	10	3	822
		Mean	7.7	130	578	266	47	2097
8	Forest	No. of Events	1	1	1	1	1	1
		No. of Analyses	6	1	1	6	6	6
		Maximum	7.8	289	580	51	13	1070
		Minimum	7.7	289	580	20	3	1006
		Mean	7.8	289	580	34	7	1046
9 – 10	Industrial (Light)	No. of Events	14	14	14	14	14	14
		No. of Analyses	170	29	13	169	169	169
		Maximum	8.7	227	339	3222	262	3956
		Minimum	6.6	25	49	8	3	166
		Mean	7.7	90	165	302	36	634
11 – 14	Residential (Low Density)	No. of Events	27	27	27	27	27	27
		No. of Analyses	325	54	25	323	323	325
		Maximum	8.4	267	350	6470	532	6736
		Minimum	6.4	27	46	23	2	144
		Mean	7.6	75	148	513	54	818
15 – 16	Residential (High Density)	No. of Events	11	11	11	11	11	11
		No. of Analyses	132	22	11	132	132	132
		Maximum	8.5	342	315	3484	302	4220
		Minimum	6.5	32	75	25	9	356
		Mean	7.6	97	160	797	68	1074
17 – 18	Ravine	No. of Events	7	7	7	7	7	7
		No. of Analyses	84	14	7	84	84	84
		Maximum	8.1	238	398	4240	346	4738
		Minimum	6.7	75	147	56	12	406
		Mean	7.6	121	250	1076	97	1364

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited.

(3) Analysis by IEPA.

TABLE 6-1: LAND USE WATER QUALITY SAMPLING – SUMMARY DATA (Continued)

PARAMETERS[1]									
Dissolved Oxygen	BOD_5[2]	BOD_{20}[2]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Flow (cfs)	Chemical Oxygen Demand[3]
14	14	14	14	14	14	14	14	14	14
0	84	14	168	168	168	168	168	144	24
	36	82	12.9	1.9	23.5	1.54	126	32	276
	3	7	0.1	0.1	0.3	0.02	3	0.1	14
	13	29	2.9	0.4	4.2	0.27	23	7.5	122
12	12	12	12	12	12	12	12	12	12
0	92	11	146	146	146	146	146	134	12
	53	118	4.5	1.3	3.1	2.18	89	88	301
	7	21	0.8	0.1	0.3	0.02	3	0.5	36
	22	55	2.0	0.5	1.6	0.24	15	14.6	168
7	7	7	7	7	7	7	7	7	7
0	42	7	83	83	83	83	83	83	9
	29	47	3.7	0.9	3.4	0.13	13	89.1	310
	2	10	0.1	0.1	0.4	0.02	3	0.0	42
	14	23	1.2	0.4	1.1	0.07	7	16.2	128
1	1	1	1	1	1	1	1	1	1
0	6	1	6	6	6	6	6	6	0
	5	25	0.6	0.1	0.4	0.06	12	4.9	
	1	25	0.2	0.1	0.1	0.04	10	4.5	
	2	25	0.5	0.1	0.2	0.04	11	4.7	
14	14	14	14	14	14	14	14	14	14
4	99	14	169	169	169	169	168	169	20
7.6	38	72	3.6	1.3	3.9	1.48	69	89	157
6.2	6	14	0.5	0.1	0.1	0.01	1	0.0	46
7.0	14	36	1.4	0.4	1.2	0.19	11	9.8	78
27	27	27	27	27	27	27	27	27	27
5	189	27	325	324	325	324	325	313	35
9.0	80	132	8.0	2.3	6.8	0.65	402	155	308
7.2	2	19	0.4	0.1	0.1	0.01	1	0.0	34
8.1	17	54	1.7	0.5	1.4	0.14	17	13.1	104
11	11	11	11	11	11	11	11	11	11
0	72	10	132	132	132	130	132	120	18
	41	74	7.4	2.2	3.0	0.69	98	25	270
	6	20	1.3	0.1	0.2	0.04	5	0.0	44
	16	37	2.1	0.5	1.1	0.23	27	3.5	117
7	7	7	7	7	7	7	7	7	7
0	46	7	84	84	84	84	84	51	4
	43	70	9.0	1.2	2.0	0.46	172	7.5	337
	3	12	0.6	0.1	0.2	0.04	7	0.3	74
	14	33	2.9	0.3	0.8	0.12	31	2.2	174

Table 6-1 provides a general overview of the extent to which concentrations of pollutants or pollutant indicators, are being carried in stormwater runoff from various types of land uses. The data in the table were developed through analysis of stormwater samples collected during storm runoff events at 18 sites throughout the region. The sites were selected to be representative of most significant land uses encountered in the region. More information on technical rationale and methodology in the sampling program is available in 208 Staff Paper No. 14: "Water Quality Sampling and Analysis in the 208 Program."

With respect to the results of the program, as shown in Table 6-1, these observations can be made:

a. Total Suspended Solids (TSS)

The highest maximum concentration, somewhat unexpectedly, was found in stormwater draining from low density residential areas (6,470 mg/l), with agricultural runoff having the next highest maximum concentration (6,100 mg/l), and the ravines which drain into Lake Michigan the third highest (4,240 mg/l). Forested areas had the lowest maximum concentration (51 mg/l). The highest mean value (1076 mg/l) was found in the ravine runoffs.

b. Total Solids (TS)

The highest maximum value was found in the runoffs from low density residential areas (6,736 mg/l), with agricultural runoff next (6,388 mg/l), and highway runoff being the third highest (5,904 mg/l). Forested areas had the lowest maximum concentration (1,070 mg/l). The highest mean value (2097 mg/l) was found in highway runoffs.

c. Dissolved Solids

Readings for total solids also include suspended solids. By subtracting the latter from the former, the dissolved solids concentrations are found. The runoff from highways had the highest maximum concentration of dissolved solids, (4,472 mg/l), followed by commercial areas (1,280 mg/l), and forested areas (1,019 mg/l). The lowest maximum concentration was found in the low density residential areas (266 mg/l). The highest mean value (1831 mg/l) was found in the highway runoffs.

d. Soluble Phosphorus

The highest maximum values of soluble phosphorus concentrations were found in the runoff from commercial

areas (2.18 mg/l), with agricultural runoff next (1.54 mg/l). The ravines draining into Lake Michigan had the lowest maximum concentration (0.46 mg/l). The highest mean value (0.27 mg/l) was found in the agricultural runoffs.

e. Relative Ranking of Nonpoint Source Concentrations

Table 6-2 relates seven pollutant parameters to eight categories of land use. Opposite each land use category are numbers indicating the relative "ranking" of that category with respect to each of the pollutant parameters. For each land use and each pollutant, two values are given. The first, identified as the "max," value, represents the highest concentration of the pollutant that was found in all the samples of runoff from that particular land use. The second, identified as the "mean" value, represents the mean concentration of the pollutant when the results of all samples from that particular land use were considered. At the bottom of the table, the highest and lowest concentration for each parameter in the entire sampling program are presented. Obviously, the ranges are quite broad, and Table 6-1 should be consulted for the actual values recorded.

The overview provided by Table 6-2 does offer some insights into the relative significance of various pollutants and various land uses. For example, runoff from commercial areas had the highest maximum concentrations of soluble phosphorous and cadmium. Runoff samples from commercial areas also had the highest mean values for ammonia, BOD, and cadmium.

Low-density residential areas had the highest maximum concentrations of ammonia, BOD, and total suspended solids. The mean value for ammonia also was the highest in samples from low-density residential areas.

Highway runoff had the highest mean concentrations of copper and lead, but the highest maximum readings for these parameters were in runoff from ravine and light industry sites, respectively.

Agricultural areas had the highest mean concentrations of soluble phosphorous. The highest maximum reading for phosphorous was found in the runoff from commercial areas.

f. Total Pollutant Loads

As to the total amounts of these pollutants entering lakes and streams, the acreages represented by the different land uses would have to be taken into account. For example, while the runoff from the Lake Michigan ravines showed the highest maximum concentration of copper, and the highest mean concentration was found in sampling from an interstate highway, both areas are relatively small. On the other hand, large land areas are involved in agricultural, and

TABLE 6-2: RANKING OF NONPOINT SOURCES, BASED ON MAXIMUM AND MEAN CONCENTRATIONS OF SELECTED POLLUTANTS

Land Use \ Pollutant		Ammonia Nitrogen		Soluble Phosphorus		BOD_5		Cadmium		Copper		Lead		Total Suspended Solids	
		Max	Mean	Max	Mean	Max	Mean	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Agriculture		3	2*	2	1	6	7	3	7*	3	6*	7	7	2	3
Commercial		4*	1*	1	2	2	1	1	1	4	3	4	3	6	5
Highway		6	2*	7	7	7	4*	5	2	2	1	2	1	7	7
Forest		7*	4	8	8	8	8	8	7*	8	6*	8	8	8	8
Light Industrial		4*	2*	3	4	5	4*	7	5*	5	4*	1	2	5	6
Low Density Residential		1	1*	5	5	1	2	2	5*	6	4*	3	5	1	4
High Density Residential		2	1*	4	3	4	3	4	3	7	6*	5	6	4	2
Ravines		7*	3	6	6	3	4*	6	4	1	2	6	4	3	1
(1) Ranges	Highest Value	2.3	0.5	2.18	0.27	80	22	200(2)	51(2)	150(2)	56(2)	4,630(2)	800(2)	6,470	1,076
	Lowest Value	0.1	0.1	0.06	0.04	5	2	17(2)	16(2)	6(2)	6(2)	5(2)	5(2)	51	34

*Tied Values

(1) Units are milligrams per liter unless noted

(2) Micrograms per liter

even modest mean concentrations in individual samples indicate that the total contributions over time would be significant. This will become more clear in the basin Chapters in Part II, where total pollution loads from various land uses are included in discussions of the results of simulation programs run on the water quality model.

6.03 BEST MANAGEMENT PRACTICES

Federal guidelines stipulate that "Best Management Practices" (BMP's) be employed to prevent or control nonpoint sources of water pollution. Best management practices are actions that are considered to be practical and cost-effective ways to prevent or reduce pollution from nonpoint sources. In recommending BMP's, federal guidelines do not impose specific standards, such as the effluent limitations applicable to point source discharges. BMP's are structural or non structural controls, including land use management steps found to be technically, economically and politically feasible for controlling water pollution. Selection of BMPs for a given source has to be dependent on local conditions, and there needs to be more flexibility in their selection than there is in identifying controls for point sources.

The opportunity for the application of BMPs is likely to be greater for new, or potential, sources than for existing sources. Certainly the range of choice among BMPs is likely to be broader where problems are not yet present than in situations where long-standing problems must be corrected.

6.04 POLLUTANTS IN URBAN STORMWATER RUNOFFS

a. Sources and Types

Urban runoff is the result of precipitation flowing over various surfaces in developed areas. The urban environment generates pollution from natural and human activities, and precipitation flushes it through the collection systems to the receiving waters. Rain and snow wash pollutants out of the air. They also pick up dissolved and suspended materials from streets, sidewalks, lawns, roofs, parking lots and other urban surfaces. Research on stormwater quality has shown that volumes of certain pollutants in urban runoff greatly exceed volumes found in the effluents from wastewater treatment plants. Urban runoff, therefore, can prevent the achievement of in-stream water quality standards, even where wastewater treatment is adequate.

Pollutants are carried by urban stormwater in solution or as suspended particulates. The combination of all the various pollutants in any one locale is determined by such

factors as land use, population density, drainage system configuration, climate, public works practices, street surfaces, public attitudes toward sanitation, soil and geologic conditions, and others. The major sources of pollutants carried by urban stormwater are: airborne pollutants - solids, nitrogen, phosphorus, sulfur and metals; vegetative-related wastes - organics, nutrients, and pesticides; transportation wastes - hydrocarbons, metals, sulfur, and nitrogen; and snow and ice control chemicals - salts and metals.

The pollution load in urban stormwater is largely composed of pollutants that have been deposited on urban streets, which are a depository for many waste materials. Adjacent areas draining to these streets may also be significant sources of pollutants. These same streets often are an essential component of the stormwater collection system.

The accumulated materials are as diverse as the urban environment that produces them. They include: street surfacing materials; bird and animal droppings; grass clippings, tree and yard refuse; soil materials, truck spillages; construction site wastes; products of transportation activities; roofing materials; snow and ice control chemicals, fertilizers, pesticides and deposits of air pollution fallout.

b. Accumulation, Decay and Removal

A number of studies have shown that measurements of street surface pollutants provide a valid estimate of potential water pollution. However, the relationship of pollutant buildup to the actual pollution experienced in any runoff event is not always clear.

Soon after a rain event or a street sweeping, materials rapidly accumulate again on street surfaces. After a number of days, however, the rate of buildup slows and a more or less constant amount of materials is present after about two weeks. The greatest percentage of these materials will be located within a few feet of the roadway curb.

Street materials are deposited in a broad range of sizes. The smaller particles are of greatest significance from a water quality standpoint, however, because studies have shown the majority of all pollutants are associated with the smaller sized particles. They are more easily picked up by stormwater, and their characteristics tend to make them more eligible as "transporters" of other pollutants.

Street surface materials can be removed by surface runoff, including rainfall and snowmelt; wind currents; or by being blown away by moving traffic or picked up by tires. They also can be removed intentionally by street cleaning, which is discussed later in this chapter.

c. Soil Erosion

In addition to materials from streets and other impervious surfaces, urban stormwater also carries soils and other materials that are eroded, transported or deposited by the action of wind, snow, ice or gravity. Normally, soil particles are protected from erosion by vegetation and vegetative residue. But, when human actions remove protective vegetation in an area, the rate of erosion can be increased dramatically. Removal of the protective cover allows the forces of water and wind to act more directly and forcefully on the exposed soils. In urban areas, this type of situation most frequently develops from large-scale construction activities.

Sediment is the most significant construction-related pollutant, but other pollutants also may be discharged. Among these are pesticides, soil additives, plant nutrients, construction and transportation chemicals, construction materials, and general refuse. Once urban land uses are established, relative stability with respect to erosion is regained. The period of actual construction, therefore, is the most significant from the standpoint of erosion and sedimentation.

d. Miscellaneous Sources

Among other sources of stormwater-related pollution in urban areas are leachates and surface runoff from landfills and septic tanks, which can add nutrients, dissolved solids, pathogens, oxygen-demanding materials and heavy metals to surface runoff.

Catch basins also can be a major source of pollution during the initial stages of a runoff event, when materials collected from earlier runoff events are flushed, releasing organics solids, heavy metals and other pollutants. Catch basin effectiveness is directly related to the capture efficiency, detention time, and frequency of cleaning.

Sanitary wastes can also add to the runoff pollution load, either from combined sewer overflows or by illegal connections from the sanitary systems to the stormwater systems. Significant contributions of BOD, nitrogen, phosphorous and solids may be added to stormwater from these sources.

Commercial and industrial activities also may add appreciable amounts of pollutants to runoff as a result of improperly designed or maintained storage sites or containers, accidental spills, illegal dumping or discharges into storm sewers, or air emissions. Categorizing industrial and commercial pollution is extremely difficult because of the multitude of sources and activities involved in the industrial sector, as well as the complexity of the hydrologic regime.

e. Management of Urban Stormwater

There are basically three ways to reduce urban stormwater pollution: (1) by controlling the design, construction, operation and maintenance of the drainage network; (2) by preventing pollutants from entering the drainage network; and (3) by treating stormwater to remove pollutants before the stormwater reaches a waterway.

The existing system for urban stormwater management in northeastern Illinois utilizes all three methods to some degree.

(1) Control of the Drainage Network: The responsibility for design, construction, operation and maintenance of urban stormwater drainage systems is highly fragmented. Many government agencies either construct their own drainage systems or regulate the construction of such systems by private individuals. Included are municipalities, counties, drainage districts, forest preserve districts, park districts, and state and local highway departments. Sanitary districts may also become involved, indirectly, by requiring local governments within their jurisdiction to adopt stormwater detention ordinances as a condition for receiving treatment services. Additional oversight is provided by the Illinois Department of Transportation's Division of Water Resources, which issues construction permits for stormwater outfalls.

There are a number of drainage districts which deal with specific water-related problems in particular locations. Drainage districts were created to fund, construct, and maintain the tiles and ditches needed to make wet land suitable for agricultural use. As the region has developed, however, urbanization has overtaken some of these drainage districts and their facilities have become part of the urban drainage network.

Some forest preserves and park districts become involved in urban stormwater management in order to fulfill their primary purposes of conservation and recreation. In addition to providing drainage systems for their own facilities, park and forest preserve districts increasingly are joining other agencies in multi-purpose projects which affect water resources. For example, the Cook County Forest Preserve District and the Tinley Park Park District are playing key roles in the implementation of floodwater management plans in their respective drainage basins.

Projects undertaken by township, county, and state highway agencies often involve extensive stormwater drainage facilities. These agencies are responsible for maintaining and upgrading, when necessary, any stormwater facilities they construct.

In general, the governmental units with greatest control over the design and construction of the urban stormwater drainage network are municipalities and counties. Both, at times, are responsible for constructing storm

sewers. Municipalities and counties exert their greatest impact, however, through subdivision ordinances. These ordinances typically include a requirement that a storm drainage system be installed in every new subdivision, a prohibition against combined storm and sanitary sewers, and standards for the design and construction of storm sewer systems.

Subdivision ordinances also influence the amount of impervious surface in new developments. The degree of imperviousness, in turn, affects both the quantity and quality of runoff moving through the drainage system. A typical ordinance will contain requirements concerning lot size, for example, and the size, location and materials for streets and sidewalks. Imperviousness also is influenced by zoning ordinances, which govern such features as building size, placement, and parking lot requirements.

(a) Stormwater Detention: A feature of most subdivision regulations, with respect to stormwater, is that developers have been required to move water off their sites as quickly as possible. Traditionally, the objective has been to prevent flooding on the site, with little consideration being given to the impact of the increased runoff on areas downstream. Within the last decade, however, there has been increased recognition of the potential for downstream problems. As a result, many sanitary districts, municipalities, and counties have added stormwater detention regulations to their development controls.

Stormwater detention regulations generally require new developers to ensure that the rate of runoff from the developed site will not exceed that which would have occured prior to development. However, literal compliance with this objective is not possible, and a prescribed maximum rate of runoff is established. Although intended primarily to control the runoff rate, detention also can affect the runoff quality. In combined sewer systems, for example, detention can reduce wet-weather overloading of treatment plants. Detention areas also act as a "catch basin" for sediment and other pollutants and, by reducing the velocity of stormwater reaching waterways, detention helps reduce stream bank erosion downstream.

A typical detention ordinance would specify the size and type of development covered, the amount of detention required, and the design methods and procedures to be used. Where stormwater detention ordinances do not exist, the general drainage requirements of subdivision ordinances may be used to encourage the construction of detention facilities. For example, an ordinance may state that a development must be designed so as to "prevent harm" to neighboring properties as a result of changes in drainage patterns. Furthermore, state law requires a certification that the construction of a subdivision will not result in a harmful deposition of surface water on adjoining property.

(b) Increased Infiltration: Measures to increase infiltration can be incorporated into the drainage network in order to divert some surface flows to the subsurface drainage system. The basic objective is to keep urban runoff volumes close to natural levels, thus reducing pollutant loadings to surface waterways.

Increased infiltration also helps maintain dry weather (base) stream flows and recharge shallow groundwater supplies. Infiltration can be increased with seepage pits and basins, dutch drains, seepage beds, and lawn aeration. One problem associated with infiltration, however, is groundwater contamination. Some areas with extremely permeable soils and little or no capacity to naturally remove pollutants are not suitable for accepting polluted stormwater runoff. Regulations regarding these techniques generally specify design criteria and suitability, and should be consulted.

It also is possible to replace conventional concrete and asphalt pavements with porous asphaltic pavements or with precast, hollow lattice blocks and bricks. These innovative surfaces increase infiltration, decrease runoff, and ultimately decrease pollution loads to streams. However, there is only limited experience with porous pavements in this region. There may be problems associated with their installation in a cold climate due to the stresses associated with freezing and thawing, which will adversely affect asphaltic-type pavements and the subgrades under these types of pavements as well as under the hollow concrete blocks or pavements.

(c) Performance Zoning: In the past, local zoning and subdivision regulations have usually contained uniform standards which encourage the development of residential lots spread uniformly across entire parcels of land, each lot occupied by a separate structure. Recently, there has been increasing recognition on the part of both local officials and developers that this type of development is not necessarily the most efficient or attractive possible. One alternative to the detailed standards now included in most ordinances is a "performance" based zoning and subdivision process. Using such mechanisms as planned unit development regulations, the developer of a parcel of land is permitted much greater flexibility in the detailed design of his site, as long as the end product "performs" according to the overall requirements of the community regarding density, efficiency, open space, and the provision of basic public services. Structures may be clustered on the parcel, rather than being spread evenly on individual, standard-sized lots, thus reducing the length of roads, sidewalks, and drives, and, in turn the amount of impervious surface. In some cases, the developer may be permitted to incorporate natural drainage swales to replace some curbs, gutters, and storm sewers. Ideally, the result of this performance based approach is a well-designed development, which performs

according to the community's standards, is more attractive to potential home-buyers, reduces the developer's costs, and simultaneously reduces the quantity or improves the quality of urban stormwater runoff.

An obvious strategy that can be applied to the development of large sites is the minimizing of impervious surfaces such as roadways and parking areas.

Ground swales and grass waterways also can be incorporated into the development. These swales and vegetative filter strips reduce sediment loadings in surface runoffs. Swales are gently sloping drainage channels or depressions which redirect runoff, reduce flow velocities, increase percolation, increase plant utilization of waterborne nutrients, and provide temporary storage. Filter strips are grassy areas which filter the sediment out of runoff waters. These provide storage and reduce the velocity of stormwater runoff. They also increase infiltration, and act as deposition sites for suspended particulates.

It is difficult to quantify the effects that performance zoning principles can have when used in planned unit developments. Virtually all the information available deals with increased infiltration, reduced runoff volumes, and the delay and reduction of peak stormwater flows, rather than with water quality impacts.

(1) Lake County Study: In order to better estimate the water quality benefits of performance zoning, the Commission's water quality model was used in a special study in Lake County. The subject of the study was a small watershed for which the Lake County Department of Planning, Zoning, and Environmental Quality prepared 14 different land development schemes. Five plans featured conventional zoning and development practices, with densities ranging from 0.23 to 7.94 dwelling units per acre. The other proposals utilized planned unit development and performance zoning techniques over the same range of densities. Model simulation was carried out for a three year period, using climatological data for Waukegan, on the North Branch of the Chicago River. Constituent loads for BOD, ammonia, phosphorous, nitrate and oxygen demand were calculated for each development scheme as well as existing conditions. A summary of the average loadings for all the various development schemes is presented in Table 6-3.

The development schemes utilizing performance zoning created less oxygen demand than those using conventional zoning. More detailed analyses showed the degree of imperviousness to be the most important factor in determining the oxygen demand. From a water quality viewpoint, decreasing the paved surfaces and increasing infiltration results in better quality water.

(d) Soil Erosion Control: A problem closely related to stormwater runoff, soil erosion, is another issue receiving

TABLE 6-3: COMPARISON OF POLLUTIONAL IMPACTS: CONVENTIONAL VS. PERFORMANCE ZONING

	BOD	Ammonia NH_3	Nitrate NO_3	Phosphorous PO_4	Oxygen Demand
Existing Conditions	5.22	0.78	4.67	0.26	7.30
Conventional Zoning	10.18	1.75	3.63	0.29	16.18
Performance Zoning	7.37	1.23	4.19	0.27	11.60

greater attention from local governments. In recent years, more communities have enacted erosion and sediment control ordinances designed to minimize erosion generated by land disturbance activities..

A number of general measures also can be used to reduce and control erosion and confine sediment on-site. Soil maps should be consulted to establish development suitability and identify potentially troublesome areas. Development plans should include site-specific erosion control measures to minimize soil and vegetation disturbance. Runoff from upland areas should be diverted around disturbed sites and reduced in volume and velocity, to the extent possible. Sediment should be trapped on-site to eliminate discharges to receiving waters.

Typically, erosion and sedimentation control ordinances require the developers, utilities or contractors to submit a plan for controlling erosion during construction. Once the plan has been approved, a site development or building permit is issued. Inspections are conducted to ensure that the plan is being implemented.

Erosion control ordinances usually specify the size and types of development covered; activities (such as agriculture) which are exempt; the contents of the site development plan; the erosion control standards against which the site development plan is to be evaluated; the criteria for controlling or limiting land disturbance activities.

(2) Keeping Pollutants Out of the Drainage Network: In developed areas the opportunity to influence the layout of the drainage system in order to prevent stormwater pollution has passed. An alternative is to eliminate or reduce potential pollutants before they can enter the drainage system.

(a) Ordinances and Regulations: One broad strategy for reducing potential stormwater pollutants is the public regulation of private activities. Anti-litter ordinances, regulations that prohibit the discharge of pollutants into storm sewers, animal control ordinances or ordinances regulating the transport of materials in open-bodied trucks,

and control on the use of pesticides and other toxic chemicals are examples of this approach.

(b) Municipal Practices: Another common strategy is direct action by government agencies to remove potential pollutants from the urban environment before they enter the drainage system. Municipalities, for example, provide "housekeeping" services that serve to reduce the pollutants carried by urban runoff. Street cleaning, although it is generally viewed as an aesthetic chore, is one such service. The cleaning of catch basins and storm sewers, done to maintain the effectiveness of the drainage system, is another. Too often, however, housekeeping programs are low among a community's priorities. They tend to be provided infrequently and only when personnel and funds can be diverted from other work.

As a result, streets may be cleaned only once annually in some communities; once daily in parts of others. Equipment and operating procedures also vary from one community to the next. Mechanical sweepers are more common than vacuum sweepers capable of picking up small particles of urban litter with high pollution potential. There are similar variations in catch basin cleaning practices. In some municipalities catch basins are cleaned by men with shovels; in others, specialized vacuum equipment is used.

(c) De-Icing Practices: Modification of existing road de-icing programs, a subject of considerable debate, also is an area where there is potential for the reduction of urban stormwater pollution. Municipal, township, county and state highway departments currently share responsibilities for de-icing.

Potential environmental damage from de-icing chemicals can be reduced if straight, flat stretches of road are not salted, if efficient spreading equipment is used, and if crew members are well-trained. In the long run, the use of road chemicals could be reduced by improved pavements, better roadway design, or tires and vehicles designed to respond more safely on snow and ice. Substitute materials, chiefly sand and cinders, can be used but they are less desirable from an auto safety standpoint. These materials also tend to increase suspended soils loadings in stormwater runoff.

(3) Removing Pollutants from Urban Stormwater: If potential pollutants cannot be removed from the urban environment prior to storm events, the only way to prevent the pollutants from reaching waterways is to remove them from the stormwater before it reaches the streams. Structural and mechanical measures, some very expensive, would be required. Swirl concentrators or detention facilities could be constructed within existing drainage systems. The funding, construction, operation and maintenance of such facilities would be the responsibility of government

agencies. In areas undergoing major development, however, it is possible that developers could be required to install such measures in order to comply with subdivision and zoning regulations.

On the whole, however, removal of pollutants in stormwater is regarded as the least practical alternative. Collection and treatment of separate stormwater is generally a difficult and expensive approach; so much so that USEPA has placed capital funding priorities for stormwater-related pollution control programs at a low level. The basic policy was established in USEPA Program Guidance Memorandum PG-61, dated December 16, 1975, "Grants for Treatment and Control of Combined Sewer Overflows". Section II says that construction grants shall not be used to control pollution from separate discharges of stormwater except under unusual conditions where prescribed criteria are first met. In northeastern Illinois, the closest thing to a program for separate stormwater treatment are the various proposals to provide treatment for combined sewer flows. These proposals are discussed in the preceding chapter, and include the massive Tunnel and Reservoir Plan of the Metropolitan Sanitary District of Greater Chicago.

(4) Regulations: The urban drainage network in northeastern Illinois is as complicated and fragmented as the governmental system which constructed it. Unlike sewerage systems, which tend to be fairly unified, storm sewers often start and stop, then start again, discharging at many points into ditches, marshes, creeks, lakes and rivers, or simply into depressions, natural swales, or other sloping ground forms which convey the waters to adjacent communities or developments. It often is difficult to ascribe ownership to a system with such vagaries, let alone assign responsibility for maintenance, or afix blame for the pollution the system carries.

There is no specific municipal or county regulatory program for controlling water pollution from urban stormwater runoff. What regulation there is is developed through various ordinances for stormwater detention and scattered provisions for erosion and sedimentation control. Among the few exceptions to this pattern are the minimum stormwater detention requirements imposed by the Metropolitan Sanitary District of Greater Chicago on new developments within its service area.

Communities are not required to have ordinances for stormwater detention or for erosion and sedimentation control. In most cases there are no processes for assuring consistency among these ordinances that are adopted or for assuring that each ordinance contains the same minimum standards. One of the few exceptions can be found in the Barrington Area Council of Governments, which has promoted the development of consistent ordinances among its member municipalities. Another exception concerns soil erosion ordinances which are required by the Soil Conservation

Service whenever a project is to be implemented under the Watershed Protection and Flood Prevention Act of 1954 (PL 83-566).

With respect to such housekeeping practices as street cleaning and catch basin cleaning, municipalities set their own schedules and levels of performance. As discussed above, these programs vary throughout the region.

The only state program that approaches regulation of polluting urban stormwater is a permit program for stormwater outfalls. This program, administered by the Division of Water Resources of the Illinois Department of Transportation, is part of the comprehensive permit program for all structures constructed in the state's waterways. The permit program, however, does not give the state any authority over the volume or the quality of stormwater.

(5) NPDES Permits: There are currently no federal regulations over stormwater quality, but this situation could change in the near future. Recognizing the complexities of urban stormwater systems, the USEPA originally exempted stormwater drainage from the NPDES permit requirements (See Chapter One) for point sources. This exemption was successfully challenged in the Federal District Court for the District of Columbia in a suit brought by the Natural Resources Defense Council in 1975. Following the directive of the court, (NRDC v. Train, 396 F. Supp. 1393, 7 ERC 1881) the USEPA in February 1977 proposed regulations for issuing "general" NPDES permits in General Permit Program Areas for urban stormwater systems and to certain categories of agricultural runoff. General permits would cover owners and operators of the point sources. The "General Permit Program Areas" (GPPA's) would be determined, wherever possible, through areawide 208 planning programs and be based on existing political, institutional and geographic boundaries. Areawide planning also would be instrumental in determining the measures needed in each GPPA to reduce stormwater pollution sufficiently to achieve water quality standards. These measures would then become a condition of a five-year general permit issued by USEPA or a designated state agency.

The general permit regulations have not yet been issued in final form, but unless the original court decision is reversed, a federal stormwater permit program will be available for incorporation into the stormwater regulatory program in northeastern Illinois. Not only can the general permit system be employed, it also will be possible for the IEPA, as the NPDES permit agency for Illinois, to issue permits for specific stormwater discharges. As outlined later in this section, the Commission is recommending that federal permits be used to reinforce an areawide regulatory system that stresses voluntary action by local governments. A general permit program should be established as soon as regulations allow. However, the requirements of this program would be consistent with the recommendations of the

areawide plan. Local governments complying with their responsibilities under the plan, therefore, automatically would be in compliance with the general permit for their area. Individual permits for specific discharges would be issued only in cases where local governments clearly demonstrate an unwillingness or an inability to comply with the areawide plan. Permits could also be issued where the USEPA finds a separate storm sewer to be a significant source of pollution. In such an instance, the owner or operator would be required to apply for and obtain an individual NPDES permit.

(6) Management Alternatives: A management alternative considered, and rejected, with respect to urban stormwater management was a stronger role for soil and water conservation districts, coupled with state standards against which local actions could be assessed.

The Illinois Soil and Water Conservation Act requires that all proposed variances or amendments to county and municipal zoning ordinances, and all proposed subdivision applications, be sent to the local soil and water conservation district for its review and comment. If all districts operated on the basis of similar standards, the result would be a program that provided maximum consistency and control. At the same time, however, such a program would restrict the latitude of local governments and rank low on the scale of political acceptability. Other alternatives emerged from a seldom-used section of the Illinois Soil and Water Conservation Act, which allows the directors of a soil and water conservation district to propose land use regulations for the purpose of conserving soil and water resources, and for controlling erosion, flooding and sedimentation. However, any regulation proposed by a soil and water conservation district must be approved by public referendum, and it is unlikely that any expansion of these district's authority over new subdivisions would be approved by voters.

The Commission also considered alternatives presented by the 1977 amendments to the Illinois Soil and Water Conservation Act. Districts now are authorized to adopt soil erosion and sediment control programs for all "land disturbing activities." However, land disturbing activities, as defined, do not include subdivision plats approved by municipalities or counties. Furthermore, the amendments allow any incorporated or unincorporated city or village to remove any part of its land from a soil and water conservation district merely by passing a resolution. Attempts by soil and water conservation districts to review local subdivision proposals would likely encourage such resolutions.

The weaknesses of soil and water conservation districts would not be an obstacle in a program that involved a direct relationship between the state and local governments on erosion and sedimentation control and stormwater detention.

Such an approach was considered, but also rejected by the Commission. The IEPA and the IPCB have statewide authority to issue permits, set minimum consistent standards, and enforce regulations for the protection of water quality in all counties and local government areas. Although to date the IEPA and IPCB have adopted no regulatory programs for nonpoint sources of water pollution, a number of alternative state programs for the control of urban stormwater flows are possible.

For example, the IPCB, under the Illinois Environmental Protection Act, can set standards to be used by the IEPA in issuing permits for any source of water pollution. The IEPA, without involving local governments, could require a stormwater detention permit for every new subdivision, and require that IPCB standards be met. Such a direct state permit program for new subdivisions not only would bring a predictable and negative reaction from local governments, it would require a large increase in IEPA staff at the regional level and would add another level of development control, plus new time delays and costs, for developers.

The Commission also considered the possibility that the IPCB could issue minimum stormwater detention and erosion and sedimentation control standards with which every municipality would have to comply. The IEPA would be charged with monitoring compliance by municipalities and bringing enforcement actions before the IPCB against those municipalities which failed to enforce the provisions set by the state minimum code. Direct enforcement by the IPCB against municipalities would create serious conflicts between state and local government in the regulation of land development, a function traditionally left to local governments in Illinois.

The most appropriate state role is believed to be one of support, with state regulatory authority to be applied directly against local governments or subdivisions only where local authority proves to be ineffective.

f. Problems

(1) Pollutant Loads: Studies have shown that "shock" loads from the first rush of stormwater in a heavy rain can be 100 to 1000 times greater than the pollutant loads contributed by wastewater treatment plant effluent. In an area where discharges from wastewater treatment plants have received secondary treatment, 40 to 80 percent of the total oxygen demand in the waterway may be generated by stormwater flows. In the course of a major storm event, more than 95 percent of the total oxygen demand in a water body may be the result of the effects of stormwater, including surface runoff, storm sewer discharges, combined sewer overflows and treatment plant bypasses.

Storm sewer flows and direct surface runoff from urban areas discharge solids which settle to form benthic deposits

in waterways. These deposits can exert a heavy oxygen demand on the overlying waters.

Stormwater is also a major source of bacterial contamination, sometimes the single most significant in a drainage area. Stormwater also can be expected to contribute about 10 percent of the annual nutrient load of a stream.

In addition, much of the heavy metals and other toxic pollutants in waterways come from urban runoff. Stormwater runoff in a typical, medium-sized city can contribute 50 to 125 tons of lead and from 3 to 15 tons of mercury each year. By comparison, a large industry normally will be subject to effluent limits that restrict it to discharging no more than 90 pounds of mercury per year. Stormwater contributions of pollutants to various waterways are discussed, as part of the analysis of water quality modeling, in those chapters in Part II that pertain to basins in which the model was used as a basic analytical tool.

(2) Management: With respect to the management system for urban stormwater, there are two pervasive problems. One is fragmentation; the other is that most programs with the potential to improve stormwater quality are directed primarily at other objectives. However effective they are in providing drainage, preventing floods, or improving the appearance of urban streets, these programs generally fail to accomplish the degree of pollution control of which they are capable.

The lack of coordination in the construction of stormwater drainage systems can create an unnecessary financial burden on public agencies. Local governments sometimes must correct drainage and water quality problems that could have been avoided through better planning and design during the land development process.

(3) Ordinances and Regulations: Zoning and subdivision ordinances, as generally written, are intended to insure that private developments will provide basic facilities for residents without imposing an excessive burden on the municipality or county responsible for maintaining those facilities. These ordinances typically encourage the construction of individual structures on individual lots, served by extensive systems of sidewalks, wide curbed and guttered streets and storm sewers. Generally, neither the ordinances themselves nor the officials and boards responsible for their enforcement have considered the water quality impacts which result from the resulting increase in impervious surfaces and accelerated runoff. Some subdivision ordinances do permit ditches rather than closed sewers and not all require sidewalks; but generally such provisions are included only for limited situations such as very large lot developments.

Requirements for stormwater detention are part of the development regulation process in the majority of the

communities in the region. Flood control has been the major concern of these detention programs, however, and water quality impacts again are secondary.

Among detention ordinances, key provisions vary from community to community. It can be argued that differing detention programs are better than none at all. However, such differences can lead to a situation in which the developer of an unincorporated parcel can negotiate between two or more municipalities and the county to obtain the least stringent requirements for his site, possibly to the detriment of water quality.

Beyond provisions, there are variances in the degree to which ordinances are enforced. Effective enforcement also depends upon the availability of adequately-trained personnel, because complex problems in engineering and hydrology often are involved. Supporting such a staff, or otherwise obtaining expert assistance, can be a particular problem especially in smaller communities.

Detention regulations often produce detention basins and other structures that require continuing maintenance. The responsibility for such maintenance, however, is not always clearly defined during the development process. The result may be inoperative facilities or the imposition, at some future date, of an unexpected economic burden on subdivision residents or the local government. The same problems occur in the area of erosion and sedimentation control.

Erosion and sedimentation control ordinances are relatively new in northeastern Illinois, and there is little experience with potential management or enforcement problems. However, as in other areas, variations in key ordinance provisions among communities may deter enforcement. The size and abilities of enforcement staffs also can be a problem. Some familiarity with soils science is required, for example. Assistance from soil and water conservation districts and the U.S. Soil Conservation Service can offset this problem for the few communities that have erosion and sedimentation ordinances. However, this may not be sufficient if and when such ordinances are adopted by all municipalities and counties in the region.

g. Commission Findings

With respect to overall regulation, and notwithstanding the potential for major changes in the federal position on urban stormwater runoff, the Commission believes than an improved regulatory system, oriented toward stormwater quality in the region, is needed. To be effective, this system must satisfy two basic criteria. It must insure that stormwater flows from all new development in the region are controlled properly. It also must establish consistent minimum standards for stormwater detention and for erosion and sedimentation control.

The Commission finds that a comprehensive program is necessary of technical, management and regulatory strategies to reduce pollution to rivers, streams and lakes from urban stormwater runoff. This program for the initial areawide plan includes the implementation of recommended Best Management Practices incorporating the following basic elements:

(1.) The development and enforcement of adequate, standardized soil erosion control ordinances in all municipalities and counties,

(2.) The development and enforcement of adequate stormwater detention ordinances in all municipalities,

(3.) Improvements in local public service programs (street cleaning, catch basin cleaning, and other "housekeeping activities") directed at improving the quality of urban stormwater runoff and minimizing pollution of surface waterways,

(4.) Increased application of performance zoning concepts in residential subdivisions and planned unit developments,

(5.) Assignment of primary responsibility for the control of pollution from urban stormwater to existing units of local government, within their existing scope of authority,

(6.) An areawide program with state support, to ensure consistency and effectiveness among all local government actions to reduce urban stormwater pollution,

(7.) Application of general stormwater permit authority, likely to be issued to the IEPA under proposed regulations of the USEPA, as soon as possible in northeastern Illinois. General permit requirements should be consistent with areawide plan recommendations. In the future, where it is clear that units of local government are not implementing their portion of the areawide plan, or where general permit requirements are being violated, the general permit should be rescinded and NPDES permits for specific stormwater discharges should be issued by IEPA.

h. Intent of the Recommended Program

The discussions that follow describe the intent of the program and provide specific details of the recommended program which is designed to reduce urban stormwater pollution with a minimum of institutional change. Local

governments, particularly municipalities, are being challenged to use their existing authority to implement the recommendations of the areawide plan. If, over a reasonable course of time, it is clear that local governments are unable or unwilling to take necessary steps to control urban stormwater pollution, the state would exert its stormwater permit authority to encourage local government action. In a sense then, there are two phases to the recommended program. The first would emphasize voluntary actions by local governments within the areawide framework provided by this plan and by general permit requirements. The second phase would involve the issuance of specific permits for individual discharges. In each phase, local governments would have the responsibility for action, but their freedom to take action without state intervention or sanction is diminished in the second phase. Conscientious attempts by local governments to comply with areawide plan recommendations on a voluntary basis will mitigate the role of state agencies.

The overall purpose of the program is to achieve substantial reductions in pollution to rivers and streams from urban stormwater runoff. It is intended to achieve a 25 percent reduction in the amount of BOD carried into waterways by urban stormwater runoff from areas that are urbanized at the time the initial areawide plan is approved. In addition, the program is intended to ensure that BOD loadings from areas which will undergo urbanization between 1976 and the year 2000 will be 50 percent lower than the BOD loadings from areas that are now urbanized. The central concept is that it is possible to achieve higher levels of stormwater quality in areas not yet developed than in areas where problems created by earlier urbanization now must be corrected.

An exception to the above policy concerns urbanized areas draining directly into Lake Michigan. Here, a 50 percent reduction in BOD is recommended because of the unique position of the Lake as a source of water supply and as a site having regional and interstate importance for recreation. The results of Commission instream and ravine (land use runoff) sampling programs summarized in Table 6-2 ranked the concentrations of pollutants measured during runoff events from 18 sites, grouped under seven different types of land uses. With the land classification having the highest concentrations of a particular pollutant rated 1, ravines had the highest (i.e., worst) rating for mean concentrations of total suspended solids. (They also rank near the top for several other pollutants.) Since Lake Michigan forms a cul-de-sac within the drainage systems of the Great Lakes, the flushing time (i.e., the time it takes for water to be completely replaced) is very long. Clearly, there is a great potential for the long term buildup of persistent pollutants...not easily broken down by natural processes. None of the other water bodies in the region are used for potable water supply purposes, and their flushing

times are brief. Based on the foregoing, a higher degree of "cleansing" was deemed advisable for urbanized areas draining into the Lake.

Biochemical oxygen demand (BOD) is being used as the central pollutant index for urban stormwater because, of the parameters for which conditions have been simulated on the computerized water quality model, it is the parameter most often associated with urban runoff.

In modeled basins the water quality model will be important in evaluating the effectiveness of implementation efforts because it will allow the Commission and countywide water quality committees to monitor progress, as reflected in BOD loadings to urban stormwater runoff. Results of future simulations will indicate areas where BOD loadings are not being reduced, or are not being reduced sufficiently. Such results will provide a basis for an evaluation of the efforts being made by local governments and other management entities within such areas.

In order to bring about desired reductions in BOD loads, local governments, working closely with county committees, should select and implement management practices to reduce pollution in runoff from existing urbanized areas. Specific practices, to be employed in a given area should be selected according to the nature of the area and the types of stormwater management problems being encountered. The adequacy of the practices selected will become apparent as BOD loading factors are monitored in the future.

The 25-50 percent reduction would have to apply to basins or subbasins. The relative contributions to water quality by individual communities could be evaluated in a general manner by the county water quality committees. Factual information on street sweeping, catch basin cleaning, soil erosion controls, and other practices could be evaluated in a general way by reviewing frequencies, operating instructions, ordinances, acres or street curb miles involved, etc. The fact that each community is asked to work toward specific reductions of 1976 loads will require that credit be given to those units of government which were more advanced in their preventive-corrective measures in that year. With a lower initial base load, the percentage reductions called for by the plan will translate into smaller tonnages of pollutants to be kept out of the waterways. The countywide water quality committees and the Commission should share the critical role of evaluating performance and efforts of local governments. State decisions with respect to permit requirements should be based on close coordination with the countywide committees and the Commission.

In summary, the recommended program emphasizes voluntary action by local governments, support and oversight from countywide committees and the Commission, and "backup" regulatory action by the state only where necessary.

i. Recommendations

1. Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should develop and enforce adequate erosion and sedimentation control ordinances. All such local ordinances should be consistent with minimal areawide standards set forth in the model ordinance.

This recommendation is especially important in areas where a high level of development and construction activity is forecast. It is in these areas where erosion and associated pollution problems, will be most severe unless adequate controls are imposed.

As part of the continuing planning program, the Commission should work with countywide water quality committees to develop consensus on the essential provisions of model ordinances for the control of erosion and sedimentation. These models should be revised as necessary by county committees, to fit circumstances within a given county. Modifications should not be such that minimal water quality provisions are not satisfied, however. In many communities where ordinances will be upgraded, additional and more specialized enforcement personnel will be required. Wherever possible, the added costs of this enforcement should be passed on to the private sector through higher permit and inspection fees. This added private cost should be compensated by a streamlining of the development review process, in attempts to stabilize or reduce costs to the developer.

2. Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should adopt and enforce adequate stormwater detention ordinances. These ordinances should include provisions which clearly establish long-term responsibilities for maintenance of detention facilities. All such local ordinances also should be consistent with minimal areawide standards set forth in this model ordinance.

The continuing maintenance of permanent detention structures can present difficult problems for both public agencies and private landowners. Often, sufficient detention and a reduction of urban stormwater pollution can be provided by designing playing fields, parking lots, or rooftops to hold water during runoff periods. It is also possible to lay out the individual lots in residential subdivisions so that each of them provides a small portion of the total detention required in the development. For example, swales and constrictor pipes can be installed in the backs of lots to temporarily hold water during storm events. These types of detention measures require relatively little maintenance, usually no more than the

mowing of vegetation. However, some assurance must be provided that the original design is not modified by future grading, filling, or the installation of buildings. Detention ordinances should provide for the necessary deed restrictions, and grading and filling permits should be required to protect against such unauthorized modifications.

Detention can also be provided by larger, wet bottomed basins. These often also have recreational and aesthetic value. Unfortunately, maintenance problems are more difficult, and eventually these may have to be drained or dredged to remove built-up sediment deposits--an expensive undertaking.

The questions of ownership and responsibility for maintenance associated with retention basins are legally, financially, and politically complex. These questions will be fully addressed during the continuing planning program in conjunction with the development of a model ordinance. However, the Commission does recommend the following general principles for detention basin maintenance:

3. Existing basins should be maintained so as to provide the full detention and pollution control benefits for which they were designed. Every effort should be made to require the agency which currently is legally responsible (e.g., individual landowners, homeowner's associations, municipalities, park districts, etc.) to perform this maintenance. However, in some instances, and as a last resort, it may be necessary for a municipality or sanitary district to step in and assume this responsibility in the interests of pollution control.

4. In future developments, the lower maintenance alternatives to wet-bottomed basins should be given serious consideration.

5. Where wet-bottomed basins are the only viable solution or where the added benefits of recreation and aesthetics are desired, local ordinances should require a clear assignment of ownership and maintenance responsibilities at the time of subdivision. These ordinances should also give preference to the centralization of wet-bottomed detention facilities to provide basins of sufficient size to be of recreational and/or aesthetic value and more efficient in terms of maintenance. Agreement should be reached on the type of maintenance which may be required and its approximate cost; and those responsible, whether a public agency or private individuals, should be informed of their responsibilities and make a definite commitment to carry them out.

6. By July 1, 1983, all municipalities and counties should implement measures to work toward a reduction of

BOD in urban stormwater runoffs from separately sewered areas. Except for areas where existing systems convey stormwaters to Lake Michigan, reductions of 25 percent of 1976 surface loadings on impervious surfaces are recommended as a target. From areas to be urbanized in the future, target reductions of 50 percent of 1976 surface loadings are recommended.

7. By July 1, 1983, Lake County and all affected municipalities should seek to achieve a 50 percent reduction in BOD found in stormwater runoffs draining into Lake Michigan from urbanized impervious surfaces.

8. In attempting to meet the above targets, the implementing agencies should work through the countywide water quality committees, developing plans and standards for implementing street cleaning and catch basin cleaning programs, performance zoning, use of porous pavement surfaces, increased vegetative cover, grassed waterways, wetland storage of stormwater, stormwater detention, sedimentation and erosion controls, and other appropriate measures to achieve the desired pollutant reductions.

9. Township and state highway organizations, the Illinois State Toll Highway Authority, and facility engineering departments at state and federal installation should participate in the programs described above by implementing accelerated and/or improved street sweeping programs for streets, roads and highways that are hydraulically connected to perennial streams or permanent lakes via stormwater conveyance systems.

10. During the period up to July 1, 1983 agencies should utilize voluntary exploratory programs, implementing techniques to control pollutants from urban nonpoint sources.

11. Local governments should improve their public service programs and housekeeping efforts in order to improve the quality of urban stormwater runoff.

As indicated earlier in this chapter, the quality of municipal housekeeping programs varies, but in general such programs are irregular, inadequately staffed and funded, and directed at objectives other than water quality improvement. However, removing pollutants from impervious surfaces is critical if urban stormwater pollution loads are to be reduced. The sources of pollutants that collect on these surfaces are extremely diverse, and for all practical purposes, beyond control.

Pollutants cannot easily be kept out of the urban environment, but a much higher percentage of such pollutants

can be removed from the environment before they are picked up by stormwater and carried into streams. Municipal governments should consider upgrading street cleaning programs so that they become more than occasional attempts at improving appearances. In general, these steps would be required, as a minimum:

- Cleaning schedules should be modified to maximize the removal of debris built up during dry periods prior to major storm events. This undoubtedly will require more complex scheduling and budgeting practices for various municipal services.

- More effective equipment should be utilized. This would require increased expenditures for new equipment such as vacuum street cleaners as well as for the maintenance of such equipment. More highly trained personnel should be hired as necessary to operate the equipment effectively.

- Operating practices should be modified to maximize pollutant removal rather than aesthetics.

- The possibility of joint purchasing or use of expensive cleaning equipment and the sharing of specialized personnel trained in its operation should be pursued, particularly by smaller communities. This would help reduce financial and administrative burdens on local governments.

In addition to making the necessary improvements in street cleaning programs, local governments, with the assistance of countywide water quality committees, should also evaluate the adequacy of their public service programs in other areas. A range of management practices is available to local governments and efforts in individual communities should incorporate practices that are most appropriate to local problems and local resources.

The focus of the recommended urban stormwater management program is not the development of carbon-copy programs in each community, but the development of effective programs in each community. To facilitate the development of such programs on an areawide basis, the Commission should proceed, during the early months of the continuing planning program, to compile appropriate technical assistance materials and make these available to countywide water quality committees as soon as possible after USEPA approval of the initial areawide plan.

The Commission also should help countywide water quality committees develop minimum housekeeping standards based on the best available technical information. These standards should be used as guidelines by each countywide committee in encouraging local government efforts and assessing performance of individual municipalities. There

should be no need for the state to develop detailed standards in an area so peculiarly of local concern and so subject to the street pattern, size and financial condition of each municipality.

However, the progress of municipalities in meeting the recommended standards should be reported by each countywide committee in its annual review of program implementation, and should be monitored by the Commission and the state as part of the program re-certification process. Where standards have not been set, or where progress in getting municipalities to adopt them has not been satisfactory, annual re-certification of the areawide plan could include a condition that certain improvements in performance will be achieved in the forthcoming year, or within another specified period.

12. Local governments should encourage the application of performance zoning concepts that contribute to the reduction of urban stormwater pollution.

Performance Zoning concepts that emphasize protection of water quality should be made known to all local governments with land use authority, and incorporated into local planned unit development (PUD) ordinances and subdivision regulations.

One study of the potential impacts of performance zoning was conducted as part of the areawide planning process (results are summarized earlier in this section). This study indicated that performance zoning could reduce loadings of some pollutants, particularly BOD, significantly. The Commission, working through countywide water quality committees, should make the results of this study available to local land use authorities and also to the development community. Technical assistance should be provided, within the scope of resources available in the continuing planning program, to local governments who wish to upgrade their regulatory programs or take other steps to encourage the implementation of performance zoning concepts. Model ordinance provisions should be developed and promulgated through countywide committees.

13. Existing units of local government should have the primary responsibility and regulatory authority for controlling urban drainage and reducing pollution from stormwater runoff.

The Commission evaluated two alternative approaches to the establishment of an areawide urban stormwater management system:

-Primary reliance on existing agencies,

-Significant transfers of responsibility between existing agencies or to a newly created agency or agencies.

The assessment of existing programs in the region has pointed out some serious inconsistencies and coordination failures between local regulatory and public works programs. It also has raised some question regarding the present technical and managerial capabilities of at least some agencies in the implementation of some programs. However, reliance on existing agencies is more desirable from legal, political and financial vantage points than a program that depends on major institutional changes or shifts in authority. Furthermore, the technical managerial problems that plague the existing system should be reduced as local governments gain a better understanding of new stormwater management techniques and their water quality benefits. However, primary reliance on the large number of existing agencies will place a great coordination burden on the areawide management framework, particularly on the countywide water quality committees and on general purpose local governments themselves.

14. Coordination, support, and monitoring of local stormwater management efforts should be provided through the areawide management framework.

Each countywide water quality committee should take steps to ensure consistency in the public service programs, ordinance, and enforcement practices both within its jurisdiction and between it and other counties. The committee and its staff should serve as a mechanism for the informal sharing of techniques and the development of intergovernmental agreements for the sharing of specialized personnel and joint purchase of equipment.

Each countywide committee also should provide opportunities for either private citizens or government officials to register their concerns over particular instances of failure to adequately enforce required local regulatory programs.

The IEPA should consider the feasibility of providing technical assistance to local governments in the areas of stormwater pollution control. Field personnel, perhaps patterned after those of the Soil Conservation Service, could advise individual communities on ordinance revisions and enforcement problems, while providing all participants with on-going assessments of program effectiveness and common problem areas.

Local governments should themselves assume some responsibility for coordination and consistency. Each existing management agency should systematically evaluate its regulatory and public service programs to determine how these programs might be modified to benefit water quality. Criteria for such evaluations would be available in the

provisions of model ordinances in the areas of performance zoning, erosion and sedimentation control and stormwater detention.

15. Once the general permit authority of the IEPA has been clarified, a general permit program should be implemented in northeastern Illinois in support of the areawide water quality management plan. The IEPA should issue NPDES permits for specific stormwater discharges only in municipalities, or unincorporated areas of counties, that fail to comply with general permit requirements.

Because there presently is no regulatory system for the management of urban stormwater flows, or an effective water quality-related management system for urban stormwater runoff, state regulatory authority should not be imposed until it can be determined whether local governments are moving effectively to develop better stormwater detention and erosion and sedimentation control ordinances.

It is recommended that state permit authority not be stringently imposed in the initial areawide stormwater management program. State authorities should develop a general permit program as soon as federal guidelines for this program have been finalized, but the general permit program should reinforce the recommendations of the areawide plan and be directed at encouraging local government action. Basically, the general permit requirements for northeastern Illinois should call for implementation of the recommendations above, with particular emphasis on the adoption of adequate ordinances throughout the region. The effectiveness of the general permit area program will depend on the coordination of the state effort with the efforts of the countywide water quality committees. These committees should work closely with the IEPA in assessing the effectiveness of the program and determining whether failure to act, on the part of county or municipal governments, requires the issuing of NPDES permits.

If any county or municipality fails to adopt appropriate stormwater detention and erosion and sedimentation control ordinances, the IEPA could step in and issue individual NPDES permits to every new subdivision in that locality. That would create a serious disincentive to any new development activity in that community.

The NPDES permit requirements would be based on state standards that should be developed by the IPCB. These standards should be consistent with the general permit area requirements which, as recommended above, should be consistent with the provisions of the areawide plan.

The IEPA should coordinate the development of the IPCB standards with the development by the countywide water quality committees and NIPC of consistent stormwater detention and erosion and sedimentation control standards for northeastern Illinois.

The IPCB standards must be ready in reserve for the IEPA if and when it determines that a general permit program has not been effective and that specific NPDES permits should be issued. The IEPA would require compliance with the stormwater detention and erosion and sedimentation control standards developed by the IPCB as a condition for issuance of the NPDES permit for a stormwater discharge.

The IPCB standards should not be directly enforceable against individual developers or local governments except in those situations in which the IEPA issues NPDES permits because the general permit program has failed to generate the necessary local regulations.

6.05 AGRICULTURAL RUNOFF

The significance of potential agricultural sources of water pollution in any basin is dependent upon the amount of agricultural activity in the basin, the proximity of agricultural lands to surface waters, such natural features as topography and soils, hydrologic considerations, and the extent to which effective resource management practices are being used by farm operators in the basin. In northeastern Illinois agricultural activity is greatest in four basins: Kankakee, Kishwaukee, Hickory Creek, and Fox River. It is practically nonexistent in three others: Chicago River/Sanitary and Ship Canal/Cal Sag Channel, North Branch of the Chicago River, and Lake Michigan-North. In other basins, agriculture is of some importance but is not a predominant land use.

Chapters in Part II of this plan will discuss problems and recommended solutions from a basin planning perspective. The purpose here is to define the agricultural pollution problems that need to be addressed in the areawide plan, and to identify management practices and other controls from which specific basin strategies can be developed.

a. Characteristics of Agricultural Pollutants

The major potential nonpoint pollutants from agriculture are sediment, nutrients (nitrogen and phosphorous), pesticides (including herbicides and insecticides), and organic materials. All of these substances are introduced to the environment in the normal course of modern agricultural operations. With the exception of pesticides and herbicides, in fact, these substances occur naturally in the environment irrespective of human activity. They are not pollutants by definition, therefore, but become pollutants when they enter streams or groundwaters and create adverse impacts on the aquatic environment or reduce the suitability of the water for specific purposes, such as domestic water supply or recreation.

(1) Sediment: Of the potential pollutants from nonpoint sources, the most serious is sediment. In areas like northeastern Illinois, sheet and rill erosion from agricultural lands represents the largest source of sediment. Erosion of gullies and streambanks also can occur, but sediment entering streams from these sources, while it can be a problem at a specific site, is minor compared to the total sediment load on streams.

Table 6-4 contains estimates of gross soil erosion from various land uses in Illinois. Agricultural lands are considered to be the source of more than 85 percent of the soil eroded in the state. Croplands alone contribute 75 percent of the total soil erosion in the state, which is significant because row crops, corn and soybeans, are the dominant agricultural land use in the region.

Estimates of the potential average annual erosion rates for soils in the northeastern Illinois region have been made by the U.S. Department of Agriculture, Soil Conservation Service, for the Commission. Figure 6-1 indicates various soil erosion rates for entire soil groups based on the use of the Universal Soil Loss Equation (USLE). The USLE can be used to predict average soil loss in tons per acre per year under various field conditions. It gives consideration to rainfall, soil characteristics, slopes, cropping systems, and such erosion control practices as contouring, strip cropping, terracing and straight row farming. The rates shown are for predominant soil types, and significant

TABLE 6-4: ESTIMATED GROSS SOIL EROSION IN ILLINOIS

Soil Erosion Source	Acres (1,000)	Erosion in Millions of Tons Annually	Percent of Total Erosion	Average Annual Loss Per Acre
Cropland	24,361	123.9	75.1	5.1
Pasture land	3,345	10.0	6.1	3.0
Woodland	3,585	5.5	3.3	1.5
Other Agricultural land	867	2.2	1.4	2.5
Gully Erosion (all lands)	---	9.3	5.6	---
Nonagriculture (rural land)	656	1.7	1.0	2.6
Federal Land	413	.5	.3	1.2
Urban and built-up land	2,451	4.9	3.0	2.0
Stream Bank Erosion	---	7.0	4.2	---
Total	35,678	165.0	100.0	

variations may occur within the generalized areas in Figure 6-1.

The USLE estimates sheet and rill erosion rates but does not calculate expected rates for gully or channel erosion. Nor do the results obtained indicate the sediment delivery to streams.

Figure 6-1 shows that erosion rates are generally highest in McHenry, Lake and Kane counties, although high rates are found in all counties. Higher erosion rates are associated with the upland till areas while lower rates are found in flatter areas along the older lake plains and outwashes. The rates given are potential ones; the implementation of agricultural "Best Management Practices," which are discussed below, can substantially reduce soil erosion even in areas with potential rates of 20 to 40 tons per acre per year.

(2) Nutrients: Plant nutrients, essential for plant growth, seldom occur naturally in soils in sufficient quantity to support current levels of agricultural production. They must be added by farmers, often in the form of chemical fertilizers.

Two nutrients, nitrogen (N), and phosphorous (P), are frequent causes of water quality problems and both are used in large quantities in northeastern Illinois, as illustrated by the data in Table 6-5. Potassium (K), the third major fertilizer component, is not known to contribute to water quality problems. Fertilizer that is "incorporated" is worked into the soil upon application; fertilizer that is not incorporated is allowed to remain on top of the soil and is more susceptible to the effects of surface water runoff and soil erosion.

Ammonia contains nitrogen and because it is toxic, has greater immediate potential for harming aquatic life than other forms of chemical nutrients. After entering a waterway, ammonia begins to convert to nitrate. Its toxicity then diminishes and it starts affecting water quality as do other nontoxic nutrients. The process by which ammonia is converted to nitrate in water is a water quality problem in itself, incidentally, because oxygen is used up by the micro-organisms that are essential to the process.

There are three basic ways for nutrients to be conveyed to a waterway: by attachment to sediment, by entering into solution with surface runoff, or by leaching into the groundwater and then flowing into a river or stream.

Phosphorous, for example, can be conveyed by eroded particles of soil contained in surface water runoff. Clay and particles of organic matter have been found to be the major transporters of phosphorous. Some forms of phosphorous are soluble and enter into solution with the surface water itself. Nitrates also dissolve in water and have a tendency to leach; that is, to filter into groundwater, sometimes moving with groundwater into rivers

FIGURE 6-1: POTENTIAL SOIL LOSS IN NORTHEASTERN ILLINOIS

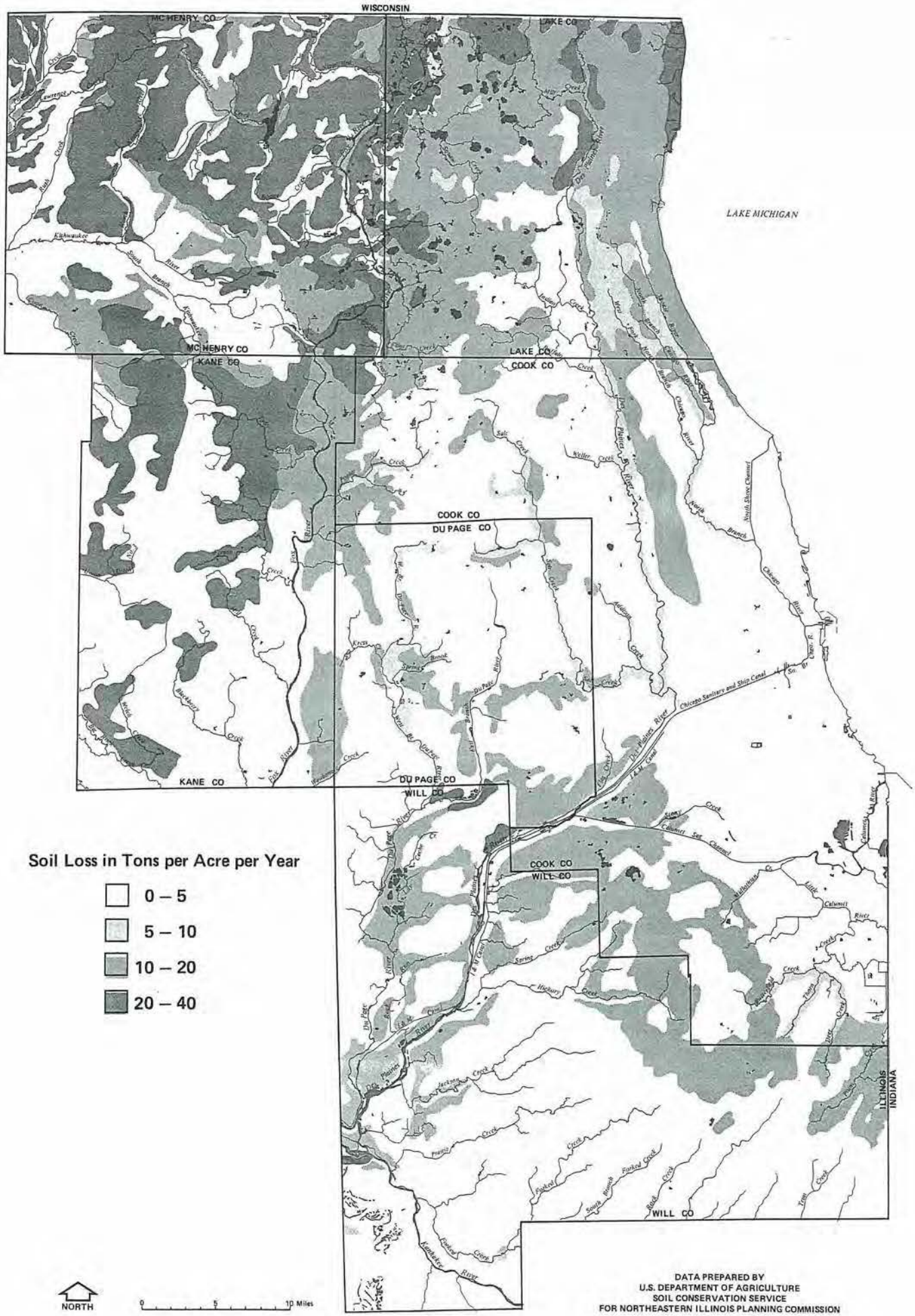


TABLE 6-5: FERTILIZER APPLICATIONS

County	Tons Applied											
	Fall						Spring					
	Incorporated			Not Incorporated			Incorporated			Not Incorporated		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Cook	329	181	148	0.7	2.8	2.8	1,112	665	637	37	46	46
Du Page	411	242	252	0.3	0.7	0.8	1,591	863	884	21	34	38
Kane	3,786	2,133	2,661	595	305	382	5,235	2,811	4,372	20	15	15
Lake	491	319	319	11	45	45	907	695	695	24	58	58
Mc Henry	2,880	1,849	2,691	294	389	619	5,854	3,903	5,218	108	350	524
Will	5,332	3,312	3,457	2.1	6.5	6.8	6,529	3,855	4,383	76	92	88
Totals	13,229	8,036	9,528	903	749	1,056	21,228	12,792	16,149	286	595	769

nitrate in water is a water quality problem in itself, incidentally, because oxygen is used up by the micro-organisms that are the key actors in the process.

There are three basic ways for nutrients to be conveyed to a waterway: by sediment, by entering into solution with surface runoff or by entering into solution, leaching into groundwater and then flowing into a river or stream.

Phosphorous, for example, can be conveyed by eroded particles of soil contained in surface water runoff. Clay and particles of organic matter have been found to be the major transporters of phosphorous. Some forms of phosphorous are soluble and enter into solution with the surface water itself. Nitrates also dissolve in water but have a tendency to leach; that is, to filter into groundwater, sometimes moving with groundwater into rivers and streams. Pollution from nitrates, then, cannot be correlated with sediment or surface runoff as can pollution from phosphorous.

Nitrogen fertilizers usually contain nitrogen in one or more forms: nitrate, ammonia, ammonium, or urea. Nitrate is the main form in which the nitrogen is taken up by plants. However, nitrates are soluble and thus readily pass through the soil and enter the ground water table. In sandy soils, they may be carried to the underlying aquifer or adjacent water bodies. Ammonia (NH_3) is a gas at atmospheric conditions, but can be compressed into a liquid, called anhydrous ammonia. The latter reacts with water in the soil to form ammonium ions (NH_4^+), which usually attach

TABLE 6-5: FERTILIZER APPLICATIONS

County	Tons Applied											
	Fall						Spring					
	Incorporated			Not Incorporated			Incorporated			Not Incorporated		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Cook	329	181	148	0.7	2.8	2.8	1,112	665	637	37	46	46
Du Page	411	242	252	0.3	0.7	0.8	1,591	863	884	21	34	38
Kane	3,786	2,133	2,661	595	305	382	5,235	2,811	4,372	20	15	15
Lake	491	319	319	11	45	45	907	695	695	24	58	58
Mc Henry	2,880	1,849	2,691	294	389	619	5,854	3,903	5,218	108	350	524
Will	5,332	3,312	3,457	2.1	6.5	6.8	6,529	3,855	4,383	76	92	88
Totals	13,229	8,036	9,528	903	749	1,056	21,228	12,792	16,149	286	595	769

and streams. Pollution from nitrates, then, cannot be correlated with sediment or surface runoff as can pollution from phosphorous.

Nitrogen fertilizers usually contain nitrogen in one or more forms: nitrate, ammonia, ammonium, or urea. Nitrate is the main form in which the nitrogen is taken up by plants. As noted, nitrates are soluble, and thus readily pass through the soil and enter the groundwater. In sandy soils, they may be carried to the underlying aquifer or adjacent water bodies. Ammonia is a gas at atmospheric conditions, but can be compressed into a liquid, called anhydrous ammonia. The latter reacts with water in the soil to form ammonium ions which usually attach themselves to clay and organic particles, thus preventing their leaching. During the growing season, soil microorganisms convert ammonia to nitrates. Nitrogen in urea is converted to ammonia, which reacts with soil water to first form ammonium ions which are then converted to nitrates.

(3) Pesticides: Pesticides have been used increasingly since World War II to control insects and weeds. There are five classes of pesticides: organic botanicals, organic phosphates, carbamates, chlorinated hydrocarbons and organometallic compounds. Each type has different properties which affect its potential for causing water quality problems. In general, however, the potential for water quality harm from a pesticide depends upon its basic toxicity, biodegradability, and the ease with which it can

enter into solution with surface water or be absorbed by sediment particles.

Both insecticides and herbicides are used in large volumes by farmers in northeastern Illinois, principally on the two major row crops, corn and soybeans. Table 6-6 reveals that more than 90 percent of agricultural herbicide applications are to corn and soybeans. A Commission survey conducted in 1976 also revealed that insecticides were applied to most of the corn crop in northeastern Illinois but used very little on other crops. Table 6-7 contains data on insecticides usage on corn crops in the region.

The purpose of applying pesticides is to control the targeted pest, be it a weed or an insect, and to the extent that these compounds enter rivers and streams or groundwater supplies they are being used inefficiently. Not only is the environment endangered, but money and time are wasted by farm operators.

The pesticide most familiar to the public is DDT, a highly toxic, now-banned insecticide in the chlorinated hydrocarbon class. Initially, one of the strongest attributes of DDT was thought to be its long-term effectiveness. Eventually, however, it was discovered that DDT tended to move away from the site of its application. It began to show up at all levels of terrestrial and aquatic ecosystems as a result of a process known as biomagnification (in which the contaminant accumulates as it moves up the food chain from one organism to another). Coho salmon in Lake Michigan, for example, have been found to have DDT levels in their tissues that exceed federal health standards.

TABLE 6-6: HERBICIDE APPLICATIONS

County	Tons of Active Ingredients							
	Corn		Soybeans		Grain		Total	
	Early	Late	Early	Late	Early	Late	Early	Late
Cook	26.29	2.55	11.03	1.00	0.16	0.08	37.48	3.63
Du Page	57.16	4.23	10.93	0.08	–	–	68.09	4.31
Kane	225.24	13.41	54.80	2.76	–	0.09	280.87	16.37
Lake	33.90	–	18.45	–	–	1.43	52.35	1.43
Mc Henry	204.39	18.95	44.27	3.88	–	0.50	248.66	23.33
Will	256.87	29.26	91.29	15.46	0.01	0.26	348.17	44.98
Totals	803.85	68.40	230.77	23.18	0.17	2.36	1,035.62	94.05

TABLE 6-7: INSECTICIDE APPLICATIONS TO CORN IN NORTHEASTERN ILL.

County	Tons of Active Ingredients Applied
Cook	8.45
Du Page	10.89
Kane	66.59
Lake	8.43
Mc Henry	56.00
Will	73.54
Total	223.90

Note: R Jan. 4/79

The DDT experience and other similar cases generated a demand for pesticides that were less persistent in the environment and more host specific; that is, the impact on the target pest was maximized and other impacts were minimized. Pesticides now in use tend to satisfy these requirements.

Even newer pesticides are toxic, however, and can damage the aquatic environment when mishandled. The improper rinsing and disposal of used pesticide containers, for example, have contributed to localized water quality problems.

Another pervasive pollutant is mercury, used in treating grain seed for pest protection. Widespread soil sampling programs have uncovered mercury in areas where treated seed has been used, but no relationship between the use of mercury-treated seed and mercury contamination has been established. In some cases, in fact, mercury content was lower in areas where mercury had been used and higher in areas where there was no record that mercury had been applied. Mercury is used not only in agriculture but also in industry, particularly in the manufacture of vinyl-chloride and chlorine-alkali compounds.

The potential sources of mercury pollution are known, but actual sources, particularly in the case of agriculture, have yet to be identified. Mercury is present in the aquatic environment, however, and the continuing debate over the source should not be an excuse for ignoring the problem.

(4) Organic Materials: The residues of nitrogen and phosphorous fertilizers are not the only nutrients of concern in water quality planning. The surface runoff from livestock feedlots or fields where manure has been applied also contains nitrogen and phosphorous and has the same

potential to harm water quality as nutrient runoff from cropland.

On pastureland, unless animals are very concentrated, potential water quality problems are less serious than the problems posed by feedlots. If an adequate forage is maintained on the grazing land, the plants themselves will retard runoff, entrap animal wastes, and utilize the nutrients the waste contain. Water quality problems can occur as a result of grazing in specific cases, however, if any of the following conditions are present:

(1) Animal concentrations are too high;

(2) Feeding and watering areas where animals concentrate and wear down vegetation are located too close to a stream or pond, or are not separated from the stream by vegetation or topography;

(3) Animals are allowed to enter streams.

Larger feedlots are considered point sources and are subject to permitting and other regulations under the National Pollutant Discharge Elimination System (NPDES). In larger feedlot operations, farmers can employ a number of systems for collecting, treating and ultimately utilizing or disposing of livestock wastes.

It is often impractical for the operator of a small feedlot to install a waste treatment system of any kind, and he is faced with the problem of disposing of raw manure. Raw wastes can be applied to fields if sufficient land is available, but the manure should be incorporated upon application, or soon afterward, to reduce the potential for runoff pollution. Deposition on frozen or steeply sloping lands also is discouraged. Properly applied, animal wastes provide nutrients for crops, and also furnish organic matter that improves soil properties and results in reduced erodability.

In all cases, soils and subsoils have the capability to accommodate wastes, even feedlot leachate. Microbes in the soil break down the wastes and reduce the polluting impact on groundwater.

b. Problems

(1) Sediment creates a number of water quality problems of which these appear to be of greatest concern in northeastern Illinois:

(a) Sediment increases the level of suspended solids in water and increases treatment costs for municipal and industrial water supplies.

(b) Sediment harms aquatic life by impairing such biological processes as photosynthesis, respiration, feeding, growth and reproduction.

(c) Sediment lessens the aesthetic appeal of water by making streams turbid.

(d) Sediment deposited in lakes can reduce the usefulness of the lake for navigation and recreation, create "mud flats" which support nuisance vegetation, and detract from the lake's beauty.

(e) Sediment can carry infectious organisms into waterways.

(f) Sediment can carry plant nutrients (phosphorous), pesticides, and heavy metals into waterways.

(g) Sediment reduces the storage capacity of reserviors.

Two things are important about the above listing. First, sediment itself is a serious pollutant. Second, sediment acts as an agent, carrying other pollutants into streams.

(2) Nutrients act in a waterway much as they do on an agricultural crop. Nitrogen and phosphorous increase the growth of aquatic weeds and algae, which exert oxygen demands on water bodies as a result of their life processes. The effects of nutrients are most serious in nonmoving or slow-moving bodies of water.

(3) Pesticides commonly identified with water quality problems no longer are used in agriculture. The residues of pesticides now being used are not showing up in water or in aquatic organisms. This could be a result of the biodegradable nature of these pesticides or their tendency not to biomagnify in the aquatic environment. It could be the result of inadequate sampling and monitoring programs, however. An assumption that no risks are attached to current pesticides usage today would be at least premature and possible erroneous.

The degradation products of formerly used chlorinated hydrocarbon pesticides continue to persist in agricultural soils and elsewhere and tend to become concentrated in organisms other than the pest at which they once were directed. Chlorinated hydrocarbon residues represent a significant, if largely hidden, environmental threat.

(4) Feedlot runoff contains objectionable constituents usually not found in cropland runoff. The suspended solids in feedlot runoff are largely organic (as opposed to the principally inorganic nature of cropland runoff) and can

become odorous and aesthetically unacceptable as they undergo decomposition. Organic solids can create a severe oxygen burden that can lead to ecological imbalance. Desirable species will be eliminated from the stream and less desirable species will increase.

(5) Nitrates contained in feedlot runoff have the same tendencies to enter into solution and leach into groundwater supplies as do nitrates applied to fields. Soil microbes cannot always provide treatment. Inorganic nitrate nitrogen, for example, tends to move below the subsoil and escape the action of microbes, thus having the potential for contributing to high nitrogen concentrations in groundwater. Organic nitrate in feedlot leachate is held by soils long enough for stabilization to take place. The danger, however, is that the runoff will be so highly concentrated that it will greatly overload the soil. Studies indicate that nitrogen pollution should be expected in the water table beneath and near unprotected feedlots.

c. Potential Strategies

Potential strategies for controlling water pollution from agricultural sources depends first on the accumulation of agriculture-related pollutants in the environment, and, second, on the conveyance of these pollutants to a waterway by stormwater runoff or groundwater, either as particles or in solution.

It follows, then, that strategies for controlling pollution from agriculture must be selected from among four broad options:

(1) The introduction of pollutants to the land surface can be eliminated or reduced,

(2) Pollutants already introduced to the land surface can be removed before they can be carried away to waterways,

(3) Surface runoff can be captured and treated, or otherwise controlled so that it does not convey pollutants to waterways,

(4) Soil erosion can be controlled so that sediment, and other pollutants carried by sediment, are not carried by surface water runoff into waterways.

In the discussion that follows, recommended general strategies and specific Best Management Practices (BMP's) considered effective and feasible for use in controlling pollution from agricultural nonpoint sources are identified and briefly described. Each of the strategies falls within one or more of the broad options described above. It is

from among these strategies and BMPs that basin-level plans have been developed to deal with specific agricultural pollution problems in the region.

d. Best Management Practices

To achieve effective control of agricultural pollution, several BMPs generally need to be incorporated into a given farm's operating procedures. It is rare that a single BMP, applied to a specific site or problem, is sufficient. There are four broad objectives at which BMPs are directed: control of erosion, reduction of runoff, management of fertilizers and animal wastes, and management of pesticides. Often, there are close relationships between BMPs directed at different objectives. For example, the introduction of conservation tillage techniques for erosion control often requires an increased application of pesticides. Thus, the net benefit to water quality may not be as great as expected.

BMPs for controlling runoff include agronomic and engineering practices which affect the volume of runoff, the peak rate, or both. A change in runoff volume will generally change the peak runoff rate in the same direction; however, peak runoff rates can be changed without affecting volume.

Runoff volume can be reduced by measures that increase infiltration, increase surface storage, or provide for the interception of rainfall by plants or residues. The first two measures are the most important.

Infiltration rates are increased by practices that result in dense vegetative cover, abundant mulch, high soil organic matter content, good soil structure, and good subsurface drainage. Management practices such as contour plowing, graded terracing, and level terracing can substantially increase surface storage. Dense vegetative cover, mulch, and cloddy surfaces also increase retention storage.

Peak runoff rates can be reduced by BMPs that increase the hydraulic resistance of the surface, decrease the land slope, or increase the length of the flow path. Such practices usually serve to reduce erosion, also.

e. Soil Erosion BMP's

BMPs for soil erosion control are directed at keeping erosion rates within levels compatible with good water quality, while preserving the productive capacity of soils. Among the most effective BMPs for erosion control are these:

(1) Conservation Tillage: In this system, the number of cultivating operations is limited to those that are essential to produce a row crop and prevent soil damage.

Programs should include three elements. First, the soil should be protected during winter with a cover crop (usually small grains) or by residues from the preceeding year's crop. Second, the number of trips over the field with farm equipment is kept to a minimum. Third, if the seedbed is prepared, the soil is left as rough as possible between the rows. All these practices promote infiltration rather than runoff of surface water. Sheet and rill erosion is decreased because protective cover is left on the field as long as possible, and soil is less disturbed and thus less susceptible to erosion. Conservation tillage does have several disadvantages, however. Pesticide use may be increased, special farm equipment is required, and yields may decrease. Furthermore, many farm operators are unfamiliar with conservation tillage practices.

(2) Crop Rotation: Soil erosion can be reduced by a cropping system in which row crops, small grains, grasses, and legumes are grown in a planned sequence. This system is particularly adaptable to farming operations needing pasture and hay. A four-year rotation of corn-corn-wheat-hay usually reduces erosion by about one-third as compared to continuous corn cultivation.

(3) Contouring: When sloping land is farmed so that plowing, land preparation, planting, and cultivation are done on the contour, the net effect is to decrease land slope and the length of slopes, thus reducing runoff, runoff velocities, and soil erosion. On moderate slopes, soil loss reductions are about 50 percent; contouring is less effective on steeper slopes.

(4) Contour Strip Cropping: In this arrangement, a strip of row crops is alternated, along the contour, with a strip of small grain or grass. Combined with a four year rotation program, contour strip cropping can reduce erosion by about 25 percent as compared with continuous row crops farmed up-and-down-slope. Again this system is most useful to operators who need hay and pasture.

(5) Cover Crops: These are crops of close-growing grasses, legumes or small grains used primarily for seasonal protection and soil improvement. Normally this crop is planted for a year or less when the major crops do not provide adequate cover.

(6) Pasture and Hayland: The planting, replanting, or reseeding of long-term stands of perennial or biennial grasses or other forage plants can provide cover that reduces soil loss to a minimum. Long-term pastures and haylands must be properly managed to prolong species life, maintain quality and quantity of forage, provide soil protection, and reduce water loss. Proper livestock grazing practices also are essential.

(7) Terraces: A terrace system is a series of earth embankments, or a ridge and channel, constructed across the slope at suitable intervals and outletted by either tiles or waterways. Terraces shorten slope lengths, divert water, and increase infiltration - all of which reduce erosion potential. Terraces may be constructed along the contour or parallel to each other. Parallel terraces are generally easier to farm and lend themselves to other practices, such as crop rotation, more readily.

(8) Diversions: These are graded channels constructed across the slope to divert water to sites where it can be used or disposed of with minimal eroding effects. They are often used to divert runoff away from potential erosion and pollution problem areas or to divert polluted water to a disposal facility.

(9) Water and Grade Control Structures: Structural measures for erosion control include: drop spillways, box inlets, chute spillways, pipe drop inlets, debris basins, ponds, and other grade control structures. These supplement vegetative practices by reducing runoff velocity, storing water, trapping sediment, reducing peak flows, and providing surface water inlets to ditches.

(10) Grassed Waterways: These are natural or constructed watercourses, with vegetative cover, designed to dispose of runoff without erosion or flooding. Grassed waterways often are used in conjunction with diversions, terraces, and other water collection practices. Among the disadvantages of this BMP are that land is taken out of production and the threat that grasses used in waterways will invade field crops.

(11) Field Borders: These are strips of perennial grasses and legumes established at field edges or along streams. They serve to allow use of heavy equipment, for travel lanes or turning, thus reducing erosion potential. Field borders also serve as filter strips to trap sediment. Again, some production capacity is lost.

(12) Critical Area Planting: Vegetation can be established in severely eroded or potentially erodible areas to stabilize soil and reduce damages from sediment and reduce runoff to downstream areas. Construction sites, dams, earth work areas, gullies, sand blowouts, and ditch bank side slopes are all candidates for this type of vegetative erosion control.

(13) Streambank Protection: Both vegetative and structural means can be used to stabilize and protect streambanks from erosion. Benefits include reduced sediment loads, prevention of loss of land, fences and other facilities, and maintenance of channel capacity.

The U.S. Soil Conservation Service technical guide is an excellent source of information concerning BMPs for erosion and sediment control. This manual contains standards and specifications for detailed planning, layout, design and construction of applicably BMPs, including many not discussed here.

f. Water Quality Modeling Results

As part of the Commission's water quality modeling program, consultants analyzed the effects of various conservation practices on surface runoff and dissolved nutrient transport from croplands and grasslands. One of the assumptions used in the analysis was that there was rotation of fields between cropland and pasture. Both cropland and pasture were assumed to be terraced; residual effects on grassland of contour plowing and conservation tillage were reflected. The BMPs that were simulated for cropland and grassland areas (in rotation) were terracing, contour plowing, terracing with contour plowing, and conservation tillage on cropland. The results of this analysis are summarized in Table 6-8. Note that the effects on nutrient transport were estimated along with the effects on runoff per se. Only dissolved nutrients were considered in the modeling analyses, not the effects of nutrients transported by sediment.

The results shown in Table 6-8 should be considered as somewhat limited, because only one rain gauge and calibration was used. Furthermore, the simulation period was only one year. Results based on only one year's data may not be typical. As noted in other studies, the percentage reduction that can be achieved by any runoff control practice varies with the amount of potential surface runoff; a particular practice may nearly eliminate runoff during a year with scant rainfall but fail to reduce runoff significantly during an extremely rainy year.

The percent changes in flow and loadings of BOD, ammonia, nitrate, and orthophosphate are given for surface flow, groundwater flow, and total flow. In general, flow and nutrient loadings were substantially decreased by the BMPs modeled for the surface flow component; the groundwater component was not changed significantly. Flow and nitrate loadings were essentially unchanged by the BMPs tested in the simulation.

g. Control of Livestock Wastes

Livestock waste control practices can be divided into three main categories: management of the facility where manure is produced; management of the manure storage and/or treatment components; and management of waste disposal, which is usually by land application. Livestock waste

TABLE 6-8: IMPACTS OF SELECTED AGRICULTURAL BEST MANAGEMENT PRACTICES % CHANGE

Grassland Treatments		Flow			BOD			NH_3			NO_3			PO_4		
From	To	S	G	T	S	G	T	S	G	T	S	G	T	S	G	T
Pasture Rotated with Cropland	Rotated Pasture with Terraces	-66	+2	-1	-62	+2	-30	-62	+3	-51	-62	+2	-3	-62	+2	-38
Pasture Rotated with Cropland	Rotated Pasture with Residual Conservation Tillage Effects	-70	0	-3	-66	0	-33	-66	0	-56	-66	0	-6	-66	0	-42
Cropland Treatments																
Straight Row Crops Rotated with Pasture	Rotated Row Crops with Terraces and Contour Plowing	-76	-1	-3	-76	-1	-17	-76	-1	-41	-76	-1	-5	-76	-1	-17
Straight Row Crops Rotated with Pasture	Rotated Row Crops with Terraces, Contour Plowing, and Conservation Tillage	-80	-1	-3	-78	-1	-18	-78	-1	-42	-78	-1	-6	-78	-1	-17
Straight Row Crops Rotated with Pasture	Rotated Row Crops with Conservation Tillage	-22	0	0	-22	0	-1	-22	0	-11	-22	0	-1	-22	0	-4

S: surface flow G: groundwater flow T: total flow

management practices and facilities are covered by the Illinois Pollution Control Board's Chapter 5 rules, entitled "Agriculture Related Pollution Regulations."

A variety of management practices can be employed in covered livestock facilities, depending on whether the facility has a solid floor, slotted floor or a flushing gutter. In all covered facilities, the site itself is generally protected from runoff, which makes storage and disposal the issues of greatest concern. Adequate manure storage areas should be provided, so that land application can take place under favorable conditions. Runoff controls should be emphasized to keep surface water away from manure storage areas, and consideration also must be given to groundwater pollution. Fractured bedrock or coarse sands and gravels are not suitable sites for manure storage areas.

Open feedlots are vulnerable to precipitation and runoff, and more extensive runoff controls are necessary at the livestock facility itself to keep uncollected wastes out of surface runoff.

Proper site selection can minimize contamination of ground and surface waters, reduce the need for storm drainage control, minimize the effects of adverse odors, and reduce land application difficulties. Regardless of the type of facility, the operation must include adequate provisions for collecting and handling liquids, solids, or slurry wastes.

Livestock wastes applied to land can enter surface runoff and threaten the aquatic environment if not applied properly. Land application is the most economical disposal method available, however, and is environmentally sound if adequately managed.

h. Control of Agricultural Chemicals

In addition to the erosion control BMPs discussed above, there are a number of recommended BMPs to control agricultural chemicals. These are directed at keeping pesticides and fertilizers out of surface runoff and therefore out of rivers and streams.

Agricultural chemicals are carried by sediment particles (in the case of pesticides) or in solution (in the case of both pesticides and fertilizers). Therefore, practices which control runoff and reduce erosion also tend to reduce losses of applied agricultural chemicals. In addition to runoff and erosion controls, specific BMPs are recommended for agricultural chemicals. A number of these are directed at protecting the aquatic environment from pesticide contamination:

--Correct pesticide application rates: application equipment should be properly calibrated, excessive treatment should be avoided, and pesticides should be used only when necessary.

--Effective pesticide placement: conscientious attention to the selection of pesticides, the application equipment used, and in the actual application, can result in maximum crop protection benefits and minimum loss.

--Proper disposal of materials and containers: excess pesticides and used containers must be disposed of properly; applicators must be properly cleaned and stored.

--Nonchemical methods: mechanical weed controls, and cultural controls (with respect to the time of planting, selection of disease resistant species, crop rotations, etc.) reduce the need for pesticides.

--Legal controls: regulations dealing with pesticide registration, sale, and use permits; licensing of applicators; prohibition of hazardous pesticides; handling, transport, and disposal of containers are advisable.

Among the BMPs effective in reducing pollution from the chemical fertilizer usage are:

--Soil testing, and the use of soil productivity information to determine nutrient needs and optimum fertilizer applications.

--Consultation with the Illinois Agronomy Handbook as a guide for fertilizer and lime needs.

--Fertilizer applications, especially nitrogen, must be properly timed.

--Fertilizers should not be applied on barren soil having more than five percent slope, unless the fertilizer is incorporated. Fertilizer should not be left on the surface without proper incorporation.

--"Build-up" applications of fertilizers should be avoided, except when soil test results indicate a need.

i. Existing Management System

To a large degree, the application of the BMPs recommended in the preceeding section is the responsibility of farm owners and operators. In applying BMPs, however, the farmer needs to relate to a large system of legislation, programs, and public agencies oriented toward technical and financial assistance, regulation, or all three. This system, which represents the existing management framework

for controlling agricultural nonpoint sources, is strongly oriented toward the control of soil erosion.

(1) Agricultural Conservation Program: One element of this framework is the Agricultural Conservation Program (ACP), which is run by the U.S. Department of Agriculture (USDA) Agricultural Stabilization and and Conservation Service (ASCS) through the offices it maintains in most counties. Under the ACP, the ASCS reimburses farmers for part of the cost of practices that conserve soil and water resources or prevent agricultural pollution.

Illinois received $8.5 million in federal funds for the ACP in 1977. As is the case each year, a state advisory committee disbursed the funds to counties, largely on the basis of conservation needs identified in a statewide study. The 1977 allocations to northeastern Illinois were: Cook and DuPage counties (combined,) $4,190; Kane County, $21,742; Lake County, $24,010; McHenry County, $23,881; Will County, $34,687.

The selection of conservation measures eligible for ACP funds involves a series of steps that begins at the national level, where a long list of eligible practices is developed by the ASCS. A state advisory committee refines and narrows this list. Then, a development group in each county further refines the list, sets county priorities and determines the cost-share which will be available for each type of project. The list of approved measures is publicized, and farm operators are encouraged to apply for assistance. The ACP share of the costs is generally 50 to 75 percent of eligible costs.

The program depends on the willingness of farm operators to participate, a factor which is variable but generally somewhat lacking. Even the small amount of ACP money available is not always completely disbursed in some counties of the region.

(2) Soil and Water Conservation Districts: Overcoming the unwillingness of farm operators to implement BMPs is a major function of the local soil and water conservation districts, assisted by technical personnel from the U.S. Soil Conservation Service. SCS conservationists, working in county or multi-county soil and water conservation districts, provide operators with information on the benefits of conservation practices and also furnish technical assistance in the preparation and implementation of farm conservation plans and practices. Soil and water conservation districts are established under state statutes but are run by locally-elected boards. Since these districts have little or no money available for actually implementing the measures they advocate, the SCS staff works with the ASCS to utilize ACP assistance. The SCS staff also advises the ASCS county executive directors in the development of their annual ACP program priorities.

(3) Extension Service: Additional technical assistance is available to farmers from University of Illinois Cooperative Extension Service, which also advises on the selection and implementation of conservation measures. Thus, in the course of a conservation program, a farmer may find himself working with staff members of two or three agencies. The primary current source of financial assistance is the ACP program, however, which makes ACP a critical element in the management of nonpoint sources.

(4) State Legislation A new factor in the control of agricultural nonpoint sources is a series of amendments to the state enabling legislation for soil and water conservation districts. This law developed from House Bill 818, was enacted by the General Assembly in July, 1977, and subsequently signed by the governor.

The law requires every soil and water conservation district to develop a soil erosion and sedimentation program that is consistent with guidelines to be developed by the Illinois Department of Agriculture. Each program must include conservation standards for various soil types and land uses, and specify criteria and techniques for implementing conservation measures.

The new law outlines a voluntary program; farmers are not required to comply with a soil and water conservation district plan and there are no penalties for failing to comply. A complaint can be filed with a soil and water conservation district against a farmer who does not comply, however. If the complaint is valid, the district then must attempt to negotiate a compliance schedule with the farmer. If the farmer refuses to agree to a compliance schedule, then the district holds a formal hearing to determine the reason for noncompliance, and passes its findings on to the Illinois Department of Agriculture. The Department of Agriculture can also hold a formal hearing to determine why the standards are not being met.

There is nothing to assure compliance even after a formal state hearing. Neither a soil and water conservation district nor the Department of Agriculture can fine or otherwise penalize a farmer who does not meet erosion and sedimentation standards or compliance schedules. The results of the formal hearings are made public, however, one aspect of the process that could cause some farmers to cooperate in their district programs.

(5) Public Law 95-217: The 1977 Amendments to Public Law 92-500 by the Clean Water Act of 1977 (PL 95-217) also will have an impact on control of agricultural pollution. As a result of the amendments, Congress has authorized $200 million for fiscal year 1979 and $400 million for fiscal year 1980 to be used by the USDA in a water pollution related cost-sharing demonstration program, similar to the ACP program. One major difference is that the farm operator would enter into a five to ten year contract to carry out

necessary conservation measures. Another difference is that the cost-share cannot be greater than 50 percent unless the main benefits of the proposed measures would be related to the improvement of off-site water quality. The USDA also is authorized to contract with local soil and water conservation districts, state soil and water conservation agencies, or state water quality agencies to administer all or part of the program. Water quality management agencies, as designated in the areawide plan, must assure adequate participation in a particular area before any contracts will be signed. An approved agricultural component of a 208 plan also must be in effect before funds will be made available. It should be noted, however, that current funds for the program (FY 1979) have been deleted by the Office of Management and Budget.

(6) NPDES Permits: The proposed general permit program of the USEPA may affect agricultural runoff control programs in some places, but not in northeastern Illinois. The "agricultural point sources" to which the general permit program would apply have been defined to include only agricultural runoff in discrete ditches or channels from the controlled application of irrigation water. That would not apply to any agricultural areas in this region. Where irrigation does exist, the excess water is absorbed through the soil into the groundwater table. It is not collected in channels or drains.

Some agricultural runoff may be subject to the extended NPDES permit program for separate storm sewers, however. Rural stormwater systems, like highway runoff drains and culverts, will be subject to the permit program if designated by the USEPA as significant contributors of pollution. Whether any systems in northeastern Illinois will be so designated has not yet been determined. If they are, some BMPs may have to be applied in agricultural areas adjacent to highway runoff collection systems. The storm flows in such systems undoubtedly will be attributable to agricultural sources as well as to highway runoff.

j. Alternative Management Strategies

There are three basic strategies by which agricultural BMPs could be implemented:

- Voluntary implementation of BMPs by landowners and operators, with or without public financial assistance.

- State or local regulations requiring the implementation of BMPs by landowners and operators, with or without public financial assistance.

- Direct implementation of BMPs by a public agency.

Each of these alternatives was evaluated in terms of technical effectiveness and legal, managerial, political and financial feasibility. The results of the evaluations are summarized below.

(1) Voluntary Program: The voluntary implementation of BMPs by landowners and farm operators would recognize that many of the most effective BMPs cannot be separated from daily operating procedures of the farm. It is safe to assume that the farm operator would be in the best position to implement such practices effectively. A voluntary program also is preferable from a legal standpoint, since no new legislation would be required and no limitations on private property rights would be established. As a rule, the social and political acceptance of any management alternative depends largely on the degree to which existing agencies and existing programs are continued. A voluntary program would represent a continuation of the central concept on which current programs are based. The existing management system attempts to encourage private implementation through relationships between the individual landowner and public agencies at the local, state, and federal levels. Some of these relationships, such as those between the ASCS and its state and county level advisory committees, are required by statute. Others, such as that between the SCS and local soil and water conservation districts, are established by formal agreement, and others are informal, based primarily on common interest and concern.

The effectiveness of this mixture of formal and informal relationships in indicated in Table 6-9 , which contains results of a study that assessed the current situation with respect to land conservation practices in the region. The table, which is discussed in more detail in 208 Staff Paper 25: "Summary of 1976 Agricultural Inventory," is based on subjective interpretations of existing conditions. Personnel involved in the study were selected (in consultation with soil and water conservation districts), for their familiarity with BMPs and with local farming operations.

As indicated in Table 6-9), the degree to which BMPs are applied varies across the region. In general, however, most farm operators are applying some soil conservation practices but very few farms have what would be considered an ideal program from a water quality management standpoint. In most cases, according to farm operators and other representatives of the farm community, the most important factor in the application of BMPs is economics.

It should be expected that a voluntary implementation program will succeed only to the extent that a landowner or farm operator can expect to receive benefits at least equal to his expenditures, both in terms of time and money. The economic benefits of a soil conservation program are related primarily to the long-term preservation of the land's agricultural productivity. However, such long-term benefits

TABLE 6-9: LAND CONSERVATION PRACTICES

County		Acres (100's)				Acres And % Of Farmland Without Drainage Tiles
		Total In Agricultural Use	Land Use Management Code			
			I	II	III	
Cook	Acres	649	7.1	425	217	11,600
	%		1.1	65.5	33.4	1,780
Du Page	Acres	556	41	118	398	5,400
	%		7.3	21.2	71.3	970
Kane	Acres	2,596		45	2,541	2,500
	%			2.1	97.9	100
Lake	Acres	1,464	100	994	370	21,800
	%		6.8	67.9	35.3	1,490
Mc Henry	Acres	2,873	107	2,735	31	6,800
	%		3.7	95.2	1.1	240
Will	Acres	3,929	123	3,392	413	3,700
	%		3.1	86.4	10.5	90
Regional Totals	Acres	12,067	378	7,715	4,006	51,800
	%	100.0	3.1	63.8	33.1	430

R Jan. 4/79

are difficult to balance against the immediate high cost to the farmer for implementing a practice. The incentive for private, voluntary expenditures for BMPs is further reduced by land ownership patterns in the region. It is common for agricultural land to be farmed by someone other than the owner. The farmer who rents or share-crops land has a limited stake in the long-term productivity of its soil. It is unrealistic to expect him to increase his production costs to preserve productivity in the future. Even the land owner may be reluctant if his land is situated in the path of future urban development and he expects the land eventually to be removed from agricultural use.

Realistically, some form of public funding is almost essential to a program that relies on voluntary implementation. At present, the only operable source for such public funds is the ACP program. However, the level of

ACP funding available is insufficient to meet soil conservation needs.

As part of the research for areawide planning, local ASCS staff members identified agricultural BMPs needed throughout northeastern Illinois. The costs of implementing all needed programs then were estimated on a county-by-county basis. When these estimates are compared to recent levels of ACP funding available to each county, the inadequacy of the ACP program's resources is apparent.

Table 6-10 reflects an assumption that, on the average, 50 percent of the cost of implementation will be borne by the landowner and 50 percent will come from ACP funds.

It can be argued that it is not appropriate to compare the total annual costs of conservation with ACP funding, since ACP is intended to be a "demonstration" program. Ideally, ACP funds should be used to demonstrate the benefits of a practice over a limited number of years. Once these benefits are established, the landowner as well as his neighbors will be convinced to continue the practice using private funds. If this concept worked in practice, the limited amount of ACP "seed" money, combined with newly authorized funds expected to eventually come under the Clean Water Act of 1977, might be sufficient. Unfortunately, experience does not support this concept. It already has been noted that, at times, even the limited amount of available ACP money has gone unspent in some counties. Several decades of advocacy by various agencies evidently have failed to convince many farmers that the benefits of conservation practices outweigh the cost, even when part of the cost is offset with public funds.

(2) Regulatory Program: State or local regulations requiring the implementation of BMPs would create an additional incentive. The appropriateness of such an

TABLE 6-10: COMPARISON OF 1977 AGRICULTURAL CONSERVATION PROGRAM ALLOCATIONS WITH ESTIMATED ANNUAL BMP NEED

County	1977 ACP Allocations			
	Actual Value	Effective Value*	Estimated Costs of Needed BMPs	Deficit
Cook/Du Page	$ 4,190.00	$ 8,380.00	$ 417,638.89	$ (409,258.89)
Kane	21,742.00	43,484.00	1,420,525.74	(1,377,041.74)
Lake	24,010.00	48,020.00	515,495.52	(467,475.52)
Mc Henry	23,881.00	47,762.00	1,335,671.00	(1,287,909.00)
Will	34,687.00	69,374.00	1,759,404.00	(1,690,030.59)

*Assumes use of ACP funds at average cost share rate of 50%.

approach is open to question, however, particularly if farmers would be required to bear all or part of the cost. There are loose precedents for such an approach, of course; industries have been required to bear the cost of pollution controls that benefit not the industry itself, but the general public. It is expected that additional costs ultimately are passed on to the public in the form of higher prices for manufactured products.

A similar system could be imposed on agricultural producers. For example, the IEPA using authority it already has under the Illinois Environmental Protection Act could require each farmer to develop a plan, consistent with certain established standards, to control potential sources of pollution. Compliance would be monitored and a complaint process established. Failure to implement BMPs would result in a penalty, which might take the form of a fine, or loss of eligibility for farm subsidy programs. For agriculture, however, even more than in industry, this type of program could have serious financial repercussions. In the agricultural market system, the individual producer does not set his own prices; he therefore has no way to pass the costs of pollution control on to the consumer. At the very least, mandatory requirements would have to be supplemented by some form of financial aid, ranging up to 100 percent of cost in some circumstances. Even with such support, however, it could safely be predicted that a mandatory program would be opposed vigorously by the agricultural community.

A mandatory program also would require the agency with enforcement responsibility, whether it was IEPA or soil and water conservation districts, to enlarge its staff. Standards would have to be developed, complaints would have to be processed, and presumably, there would even be a need for farm inspections. Associated legal costs also could be expected to increase.

In summary, the mandatory implementation of agricultural BMPs under a regulatory program would impose a financial and administrative burden on both landowners and operators as well as on public agencies. Nevertheless, a regulatory program may prove to be necessary if desired progress is not achieved via the voluntary approach within a reasonable period of time.

(3) Direct Public Action: The direct implementation of BMPs by a public agency also was considered as a management alternative, although it was clear at the outset that it would be impractical for any public agency to implement many types of BMPs. Practices such as conservation tillage and contour plowing, must be integrated into the farmer's production program. Furthermore, there is no legal basis for any public agency to intervene directly into farmers' production practices.

There are some cases in which direct public action might be appropriate and even well-received by landowners

and farm operators, however. The best opportunities would arise where a relatively small area, with a high potential for causing water pollution, could benefit from site-specific "structural" BMPs. Structural BMPs would include the construction of drop spill boxes, grassed waterways, drainage channel modifications, and possibly terraces. All these measures have a high capital cost but relatively low continuing operating costs. Also, they can be implemented independently of agricultural operations. Under such circumstances, a public agency might be able to implement BMPs for a small problem watershed more effectively and less expensively for individual landowners.

There are at least two ways that direct public implementation of BMPs could be achieved. One would be for soil and water conservation districts to establish subdistricts in which severe agricultural problems have been identified. Illinois law authorizes such subdistricts, although none have been established in northeastern Illinois. An overall plan then could be developed and required structural BMPs could be built by the subdistrict.

A second method of public implementation would rely on drainage districts, which allow landowners to join together to deal with common drainage problems. This alternative would be appropriate in areas of flat to gently rolling topography, where existing districts are still active in farmland drainage efforts. In this connection, it should be noted that these districts are specifically authorized to construct, maintain or repair drains or levees, or to engage in other drainage or levee work for agricultural, sanitary or mining purposes. Thus, the types of projects which they can execute exclude BMPs that are related to tillage, contour plowing or terracing, among others.

If the concept were extended to water quality problems, the district could implement the necessary, eligible BMPs and all members would be assessed on the basis of the relative benefits each received. Each participant's assessment would be based on the benefits to his land with respect to the preservation of soil productivity, increased land value, and other factors. Benefits which accrued outside the drainage district, in the form of improved water quality, could be covered by public funds. Both the ACP program and the 1977 amendments to the Federal Water Pollution Control Act allow a public agency, such as a drainage district, to apply for and receive cost-sharing money. These funds could be used to pay for that portion of the project resulting in off-site benefits. The same principle would hold true for soil and conservation districts.

k. Recommendations

(1) Overview: The Commission recommends that a plan for controlling soil erosion and preventing the pollution of

surface water runoff be developed for the farms in northeastern Illinois. The development of this plan should be the responsibility of the landowner and/or the farm operator, with technical assistance provided by the SCS or other public agencies. Each farm conservation plan should outline a program for the implementation of required BMPs.

The program should rely primarily on voluntary implementation within the guidelines provided in farm conservation plans. Direct public implementation of BMPs should only be pursued where circumstances are appropriate, or if voluntary measures do not produce desired results within a reasonable period of time.

Standards for the development of farm conservation plans and the implementation of BMPs should be developed as soon as possible by the Illinois Department of Agriculture and local soil and water conservation districts, as provided for in the 1977 legislation enacted as House Bill 818. These standards, as stipulated in the legislation, would be advisory. In the development of erosion control plans by the soil and water conservation districts, the ASCS county committees and the countywide water quality committees should be consulted.

Funds to support both the voluntary and the public implementation of BMPs should come from three sources: the ACP, new allocations under the Clean Water Act of 1977, and State funds to support activities called for by House Bill 818.

State regulation of agricultural practices in order to protect water quality is recommended only with respect to pesticides and disposal of animal wastes.

(2) Intent of Recommended Program: The aim of the recommended program is to protect rivers and streams through the application of BMPs wherever necessary to control soil erosion and the transport of sediment and other pollutants in surface runoff. This objective should be attained by the year 2000. By 1985, BMPs should be in place on 30 percent of the acreage where the need has been identified. By 1995, BMPs should be in place on 70 percent of such acreage. These interim targets will allow the region's progress to be assessed in the continuing planning program.

It is appropriate that the most serious agriculturally-related pollution problems be dealt with early in the program. Additionally, since financial resources for the implementation of BMPs will be limited, a prioritization of BMP target areas should be established. Accordingly, it is recommended that initial efforts be directed at those agricultural areas in the region where potential soil erosion loss rates exceed 10 tons per acre annually. Implementation of preventive and corrective measures on these lands will result in the greatest and most immediate water quality benefits in terms of sediment control and related pollutant transport. Areas where potential soil

loss rates exceed the 10 ton per acre per year level are depicted in Figure 6-1.

The recommended program is consistent with the approach recommended in Section 6.02 for control of urban stormwater as emphasis is on voluntary actions where they can be taken most effectively. In the case of urban stormwater, heavy reliance is placed on local governments. For agricultural runoff, heavy reliance is placed on the performance of landowners and farm operators. In both cases, changes to existing institutional arrangements and existing assignments of governmental authority are minimal.

The success of the program for agricultural runoff also will depend on the technical and financial assistance provided to farmers by local, State and Federal agencies. As noted above, the peculiar market position of the farmer makes it impossible for him to recover the investment that some BMPs would require. In addition, equity dictates that similar efforts be made toward BMP implementation in other parts of Illinois as well as the Midwest, in order to avoid economically disadvantaging local farmers.

(3) Details of Recommended Program:

1. Best Management Practices (BMPs) should be applied to all agricultural land where it has been determined that they are necessary to prevent excessive or unacceptable soil losses and to protect water quality.

The objective of the areawide plan is the gradual implementation of BMPs throughout the region over the rest of the century. By the year 2000, BMPs should be in place on all acreage and in all farming operations where they are necessary.

Problems have been identified in general terms in this initial plan, and are described in appropriate basin chapters. Special problem areas need to be defined more precisely, however, in the continuing planning program. Problem identification should be the responsibility of the ASCS, the Commission and other related organizations should participate in the determination of areas where BMPs are needed and their relative priorities.

2. By July 1, 1981, agricultural lands on which BMPs should be applied will be identified by appropriate soil and water conservation districts. Agencies of the U.S. Department of Agriculture and countywide water quality committees should be consulted.

3. By July 1, 1985, a comprehensive conservation plan should be prepared for each farm in northeastern Illinois which has soil erosion losses in excess of standards set by the Illinois Department of Agriculture

and soil and water conservation districts under House Bill 818.

The responsibility for preparing each farm conservation plan should rest with the farm owner or operator. The Soil Conservation Service and local soil and water conservation district staffs will assist farmers in identifying the specific acreages on which soil losses exceed standards.

4. Public agencies should provide adequate technical assistance to farmers in the preparation of farm conservation plans.

The SCS, the ASCS, the Cooperative Extension Service and local soil and water conservation districts should assist owners and operators in identifying problems, selecting appropriate BMPs, and designing implementation programs. These agencies also should keep farmers informed of technical and financial resources that may be available to assist them in plan preparation and implementation. This recommendation, for the most part, merely reinforces the types of programs already carried out by agricultural assistance agencies.

5. The resources available to the SCS in northeastern Illinois are inadequate and should be expanded. Above all, the number of professional staff members assigned by the SCS to the region should be increased.

The SCS is subject to increasing demands from the urban community, and the time that staff members can devote to agricultural issues is not sufficient to accommodate the needs of the recommended water quality program. As SCS capabilities in the region are enlarged, local soil and water conservation districts should develop their own professional staffs where they have not already done so.

6. The implementation of BMPs should take place through a voluntary program, in which primary responsibility is assigned to farm owners and farm operators. Technical and financial assistance should be provided by public agencies.

As discussed earlier in this chapter, the need for the most BMPs to be integrated into the overall operations of each farm make this approach the most practical one. Undoubtedly, the voluntary approach also will be received with greater acceptance in the agricultural community than would a program that relied on the mandated regulation of private activities. Therefore, the Commission considers the voluntary approach to be the most implementable of those considered.

Guidelines for implementation will be provided by the farmer's own conservation plan. This plan, in turn, should

be guided by standards developed by the Illinois Department of Agriculture (IDA) and local soil and water conservation districts, and by the priorities set by ASCS county committees for the ACP program. Due recognition should be given to reported water quality conditions in establishing these priorities.

7. Public agencies, principally soil and water conservation districts, should implement BMPs directly only where public action would be acceptable and more cost-effective than private action, or where necessary to supplement or replace measures taken under the recommended voluntary program.

Circumstances under which direct public implementation might be preferable where discussed earlier in this chapter. The primary responsibility for identifying such circumstances rests with soil and water conservation districts.

8. Each soil and water conservation district should be designated as a water quality management agency in the areawide plan.

The soil and water conservation districts are organized under Illinois law as units of local government with responsibility for the preparation of plans for soil erosion control, the review of proposed changes in the use of land, and the provision of technical assistance to landowners. Their governing bodies are elected by landowners within each district. Their statutory establishment and broad responsibility make it appropriate that they be designated as management agencies.

In carrying out this responsibility, it is important that their activities be closely coordinated with those of other agriculture and water quality agencies. In particular, it is essential that district programs and priorities be closely coordinated with those of the ASCS and countywide water quality committees. The ASCS will continue to have the major responsibility for the administration of federal cost-sharing funds. Existing consultative relationships should be maintained. More formalized agreements between the soil and water conservation district(s) and the countywide water quality committees should be considered as a way of assuring that their activities in combination address the most serious soil erosion problems having water quality impacts.

9. The Illinois Department of Agriculture (IDA) and soil and water conservation districts should take necessary action to ensure that House Bill 818 will be ready for implementation by July 1, 1981.

10. Standards developed for the IDA for House Bill 818 should be submitted to the IEPA, the Commission, and all countywide water quality committees for review and comment before they are adopted.

11. Adequate financial support for the implementation of farm conservation plans should be provided.

Funds to assist farmers or public agencies in the implementation of BMPs should come from three sources: the ACP, the Clean Water Act of 1977, and State funds that should be made available to support activities required by House Bill 818. Current and future cost-sharing programs should be adjusted to provide increased financial aid as incentives for implementing agricultural BMPs.

12. The ASCS, through its county committees, will provide a leadership role in establishing priorities for and disbursing public cost-sharing funds for agricultural pollution control.

The ASCS' experience in setting local priorities for distributing ACP cost-sharing funds make it the appropriate agency to serve this function. Ideally, all available funds (ACP, USEPA, Illinois Department of Agriculture) should be pooled at the county level and then disbursed according to the problem areas and priorities identified in the areawide plan. However, it will not be possible to determine the extent to which such pooling is possible until the necessary Federal regulations for the distribution of USEPA funds are issued. The Commission recommends that all agencies involved in the implementation of the areawide plan for agricultural sources, particularly the ASCS, the local soil and water conservation districts, and the countywide water quality committees, participate directly in the allocation process.

13. The progress made in the voluntary implementation of BMPs should be monitored and assessed annually by soil and water conservation districts. Regulatory action or direct public implementation should be required if progress is judged to be inadequate after a reasonable period of time. As part of the annual areawide plan implementation program, soil and water conservation districts should submit current reports on progress and on remaining problem areas to the appropriate countywide water quality committees. These reports will identify areas for which BMPs should be developed in the forthcoming year.

A summary report should be prepared annually by each soil and water conservation district. Information on fund allocations during the previous year should be provided by the ASCS. This report should be submitted to the district

board, then forwarded to the countywide water quality committee and to the Commission, for use in the preparation of the annual update of the areawide plan. The report also should identify any shortcomings that might develop with respect to voluntary implementation so that provision for direct implementation of BMPs can be evaluated in the event that the voluntary approach proves to be unavailable after a reasonable trial period.

14. Soil and water conservation districts, with assistance from State and Federal agencies, should undertake demonstration projects based on the recommendations of the areawide plan.

This concept is discussed more fully in Chapter Ten, which deals with the continuing planning program. In general, however, districts should develop projects that will increase knowledge of the effectiveness and suitability of various BMPs and their combinations. Such projects also would allow innovative techniques to be tested without cost to individual farmers, and permit the concentration of public resources in areas where water quality problems are most severe.

The involvement of the SCS, the ASCS, the Commission and appropriate State and local agencies is essential. Without such consultation, the potential benefits of areawide, or even national significance, might be overlooked. Consultation also will avoid the possibility that implementation difficulties in one county might needlessly be duplicated in another. State and Federal funds, from the sources cited above, should be applied in the same way they would be applied for other implementation efforts.

15. The Illinois agricultural community, and associated public agencies, should encourage statewide or national studies to better define the relationships between agricultural practices and water quality.

The effects of agricultural Best Management Practices on water quality are not adequately understood. Research is being carried out, but more is needed. One study that has provided useful results is theUSEPA's "Black Creek Project" in Indiana. This demonstration project has attempted to define the role that agricultural operations play in the pollution of the Maumee River and Lake Erie. The study also is exploring practices that have the potential to reduce the pollutional load from agricultural operations. Practices for erosion control and to improve water quality which are being recommended by this study are: conservation tillage, parallel tile outlet terraces, pasture and hayland planting, animal waste holding ponds and tanks, grade stabilization structures, grass waterways, sediment control basins, streambank protection, stream-channel stabilization, and

field border establishment. More studies like the Black Creek Project are needed to better define agriculture's role with regard to water quality.

16. The IEPA should enforce the IPCB regulations which require permits for feedlots, and should use the IEPA Draft Technical Policy WPC-2, "Design Criteria for Field Application of Livestock Wastes" as a guide.

17. The countywide water quality committees in conjunction with agencies of the U.S. and Illinois Departments of Agriculture will identify localized pollution problems resulting from cattle grazing. By July 1, 1980, NIPC, as part of its continuing planning responsibilities, should recommend measures for the correction of those problems through established programs.

6.06 SEPTIC WASTES

a. Characteristics

Septic tank-absorption field systems are a common method of waste disposal in northeastern Illinois. These systems are intended to serve homes in rural and low density urban areas, where population concentrations are too low to justify an investment in sanitary sewers. Septic systems also have been used to serve isolated commercial, industrial, and institutional establishments, as well as more densely-settled areas where occupancy was seasonal, as it was originally around many lakes in the region.

Where soils and other conditions are appropriate, the septic tank-soil absorption field system is an acceptable method of waste disposal. Where conditions are unfavorable, systems can result in public health hazards, pollution of surface and groundwaters, and general nuisance conditions.

Conventional septic systems have two main components - a septic tank and a soil absorption field. The tank is used to hold and provide partial treatment of the raw wastewater. During the retention period of one day or more, greases, oils, and other floating particles rise to the top to form a scum layer, which is prevented by baffles from entering the discharge outlet. The larger, heavier solids settle to the bottom where a sludge layer develops.

Besides serving as a settling chamber and providing storage for the sludge and scum, the septic tank also digests solid materials through the action of anaerobic bacteria which feed upon the sludge. By-products of this process are soluble organic matter which is released into the effluent, and methane and carbon dioxide gases which are vented from the tank to the atmosphere.

The other component of the conventional septic system, the soil absorption field, is intended to dispose of the

clarified effluent which flows from the septic tank by filtering it through the soil and by passing it down to the underlying groundwater table. This effluent typically is high in suspended soils, soluble organic matter, and organic and ammonia nitrogen. It also may contain viruses and pathogenic bacteria if the system's users are ill.

The typical soil absorption field is a trench which evenly distributes the effluent from the septic tank through a system of perforated pipe resting on a layer of gravel. The effluent from the tank drains out through the perforations in the pipe, passes through the gravel, and is absorbed by the surrounding soil materials or is assimilated in local groundwater. The area required for the absorption field depends upon the soil conditions and the expected wastewater volume. The size of the tank depends on these same factors. The absorption field, if properly designed, constructed and maintained, is an effective physical and biological filter capable of removing pathogenic organisms and stabilizing organic substances.

b. Use of Septic Systems in the Region

Current estimates are that approximately 400,000 people are served by the 110,000 individual home septic systems in the region. In addition, there are more than 2,000 nonresidential septic systems serving the equivalent of a residential population of 20,000. These systems treat wastes from isolated commercial, recreational and industrial establishments and from some institutions. On a regionwide population basis, private on-site waste disposal might appear insignificant, because only about 6 percent of the population is served by septic systems. In certain areas, however, particularly in Lake and McHenry counties, septic systems are an important water quality consideration. (See Table 6-11).

Estimating future usage of residential septic tanks is difficult because accurate records of septic tank eliminations due to extension of sewers seldom are kept. Such estimates must be related to population forecasts and projections of future sewer service area boundaries, which in themselves represent difficult tasks. In addition, within some sewered areas, certain houses may continue to use septic systems. Various estimates of future septic system usage have been made by officials in five of the six counties in the region, however, and these are presented in Table 6-12. Overall, it is estimated that the number of people served by residential septic systems will decline from the present level of about 400,000 to about 167,000 by the year 2000.

TABLE 6-11: SUMMARY OF SEPTIC TANK USAGE IN NORTHEASTERN ILLINOIS

County	Number of Septic Systems			Population Served		
	Residential	Non Residential	Total	Residential	Non Residential (PE)	Total
Cook	11,793	167	11,960	46,203	727	46,930
Du Page	23,265	235	23,500	88,076	2,400	90,476
Kane	7,794	135	7,929	27,825	2,455	30,280
Lake	29,020	481	29,501	100,411	5,026	105,437
Mc Henry	20,399	893	21,292	67,774	6,396	74,170
Will	17,826	166	17,992	62,394	2,305	64,699
Totals	110,097	2,077	112,174	392,683	19,309	411,992

c. Management and Regulation of Septic Wastes

Responsibility for managing septic wastes is at present a joint responsibility of state and local government. Counties and municipalities are authorized to regulate the installation and maintenance of septic systems within their jurisdiction, subject to minimum standards established by the Illinois Department of Public Health.

The Illinois Private Sewage Disposal Licensing Act and Code established detailed standards and criteria for the location of septic systems, the types of systems which may be installed, and the types of tests which must be performed before installation. The code also requires licensing of contractors who install septic systems. The code is administered by the Illinois Department of Public Health, and applies uniformly throughout the state. The Act provides that county or municipal ordinances may be substituted for the state code after they have been reviewed by the Department of Public Health and found to be at least equal to the state's. The ordinances of Lake and Will counties have been so approved, and regulation and enforcement in those counties is exercised by the county health departments.

Aside from state regulations, there is generally no consistency from county to county in the management of septic systems. Five counties have health departments with some responsibility for regulating the installation of septics. In Kane County, there is no health department but the environmental division of the County Development Department, and the Building Department, each has some regulatory power over septic installation.

In Lake and Will counties, septic systems in both incorporated and unincorporated areas must obtain a permit from the County Health Department through a process that includes on-site inspection.

In DuPage County, the County Health Department issues permits in all incorporated areas and farm areas, while the County Building Department regulates septic systems in nonfarm unincorporated areas.

In Cook County every septic system in unincorporated areas, and in incorporated areas that have requested county septic regulations, must have a permit from the Cook County Health Department. Inspections of septic systems, however, are made by the Cook County Building and Zoning Department as part of its normal building permit process.

In McHenry County, all septic installations require permits which are issued by the Building and Zoning Department after the location has been identified as to soil types indicated on the soil map by the McHenry County Planning Department and the design is approved by the McHenry County Department of Health.

Municipal regulations are even more variable. Some municipalities prohibit septic systems. In others, septic systems are allowed and their location and installation are controlled by building and subdivision regulations. Some municipal controls represent an additional management and regulatory framework separate from county programs.

TABLE 6-12: ESTIMATES OF FUTURE SEPTIC TANK USAGE

County	Current	Estimated Number of Septic Systems		
		1980	1990	2000
Cook*	11,793			11,793
Du Page	23,265		10,891	6,522
Kane	7,794			8,600
Lake	29,020	22,000	19,200	12,000
Mc Henry	20,399			6,300
Will	17,826	21,000	15,600	
Totals	110,097			45,215

*Insufficient data: 1976 conditions are assumed unchanged thru 2000.

d. Technical Problems

For a variety of reasons, many of the septic systems in the region were found to be unsatisfactory in studies conducted by the Commission with assistance from county agencies. The results are described in greater detail in the appropriate basin chapters in Part II. In general, however, septic-related problems encountered in the region are the result of the following factors:

Poor soil conditions are the most common cause of septic system failures in the region. Treatment efficiency depends upon the absorptive capacity of the soils in which the absorption field is placed. If the effluent is not satisfactorily filtered as it passes through the soils and surficial geologic materials, failures will occur. Surfacing of poorly-treated wastewater, contamination of nearby wells, and plumbing system backups are typical problems created when the capacity of the soil to accept effluent is inadequate for the load generated by the system.

Soil characteristics which most often contribute to septic system failures in the region are low permeability and seasonal or permanent saturation. Many of the clay soils found in the tight glacial tills of the region have a very low permeability. Conversely, excessively high permeability can lead to groundwater and surface water pollution when the septic effluent passes through the soil too rapidly for the bacterial treatment to take place. Maps in each basin chapter indicate areas considered unsuited for septic usage.

Groundwater Levels also define the suitability of an area for septic systems. Groundwater levels that remain near the surface, or rise close to the surface after prolonged rainfall, can render a parcel unsuitable for septic use because the effluent cannot be properly absorbed if the soils are saturated. The Illinois Private Sewage Disposal Licensing Code recommends that absorption fields not be constructed in areas where the water table is less than four feet below the bottom of the trenches. Unfortunately, many systems already have been constructed in areas with high seasonal or permanent water tables and these have accounted for a large number of failures. These situations appear to be most common near recreational water bodies.

Shallow bedrock can cause septic failures because the bedrock restricts the vertical movement of septic effluent and causes it to migrate laterally without benefit of proper treatment. Additional problems occur if the surficial bedrock is fractured or creviced, allowing untreated effluent to pass through and pollute local groundwater supplies. Septic systems are not recommended over fractured surficial bedrock, or where shallow wells are in use, unless there is at least 30 feet of vertical separation between the

bottom of the absorption field and the top of the bedrock. When bedrock is solid, a minimum of four feet of separation is recommended.

Slopes in excess of 7 percent may be unsuitable for septics unless special design and installation techniques are employed. Absorption trenches must be excavated along the land contours so that the effluent flows slowly through the tile lines and is uniformly dispersed throughout the field. Otherwise, the effluent will concentrate in the lowest points of the tile system and not be distributed throughout the absorption field.

The problem of sloping terrains is more serious if there is a layer of impervious material near the ground surface. In such cases, the effluent migrates along the top of the impervious layer and eventually emerges partially treated at the surface.

Clogging refers to the accumulation of particulates, microorganisms, and metabolic residue, usually at the interface between the soil and the rock or gravel fill of the absorption field. Eventually effluent can rise to the land surface or back-up through plumbing drains.

Some studies indicate that physical and biological mechanisms are the primary causes of soil clogging in an absorption field, assuming the field has not been smeared or compacted during construction.

Flooding is another natural factor which must be considered in selecting sites for septic disposal. Septic systems in floodplains can become inoperative during floods, causing water pollution and posing a public health hazard. Although septic system development has occured in floodplain areas in the past, floodplain maps and other information are now available to assist regulatory efforts. In addition, federal, state and local authorities have taken aggressive steps recently to curtail development in floodplains.

Undersized Systems are another cause of septic problems. Flows from homes and commercial establishments are subject to fluctuations in flow volumes as well as in chemical and physical characteristics.

Severe septic problems have been experienced in subdivisions constructed from 10 to 50 years ago when lot size requirements for septic use were not very stringent. Fields were often undersized originally, and the problem increased as all adjacent lots were developed and water usage increased over the years. This problem is most severe in former resort areas where cottages have been converted for year-round occupancy and septic loads have increased beyond the capacity of the original system.

A final design consideration is that there be adequate area for the installation of additional soil absorption

field components in the event the original system fails. Too often there is no space for such a parallel system.

Siting considerations, in addition to soils and geology, are important but are often overlooked in septic system design. The septic tank manhole, for example, should be located so that it allows access by equipment for periodic pumping and cleaning. It is especially important that the servicing trucks not drive over the absorption field in order to reach the pump connection. Septic tank and soil absorption fields must be located according to the minimum requirements of the State Code. The State Department of Public Health can provide details for specific situations.

Improper Construction, Maintenance or Use are difficult to anticipate but can lead to serious problems. A frequent result of improper construction is the sealing of the pore spaces at the infiltration surface by compacting, smearing or puddling of the soil by construction equipment. Soils with a high clay content are particularly vulnerable to this type of damage during construction.

Occasionally a septic system that has been adequately designed and installed is destroyed through ignorance. For example, septic systems serving industrial plants have been ruined when parking lots were installed over the absorption fields. Systems also have been impaired or destroyed by the installation of driveways; parking on lawns over the systems; and erection of buildings, swimming pools and other structures over absorption fields.

Another cause of failure is a lack of understanding of septic system limitations by the people using them. This is particularly true of new users who have previously been accustomed to municipal-type sanitary sewers. These people often are prone to use water liberally, and need to adjust their habits to the limitations of a septic system.

Owners can do much to prevent failure of their systems by maintaining them properly, avoiding excessive water use and preventing extraneous waste materials from entering the system. When the sludge approaches the bottom of the tank baffle, as typically happens about every three years, the tank should be pumped.

Table 6-13 presents data on the estimated number of septic systems which are either experiencing problems or which are located in areas having known or suspected limitations for septic system usage. More specific information relative to this location and number of systems affected locally is presented in the individual basin planning chapters.

On the basis of data that are available, data suggests that septic problems in the region are more related to public health and aesthetic problems than to water quality problems. Overall, however, current and potential problems from septic systems (particularly those installed at times or in places where regulations were inadequate or not

TABLE 6-13: PROBLEM SEPTIC SYSTEMS

County	Number of Systems	Population Equivalent
Cook	5,934	22,263
Du Page	13,996	52,464
Kane	6,785	24,304
Lake	20,891	74,485
Mc Henry	5,799	12,588
Will	9,464	33,014

enforced), are serious enough to cause septic wastes to rank high among the region's major water quality problems (See Chapter Four).

e. Management Problems

The existing framework for managing septic systems in northeastern Illinois is not sensitive enough to the particular water quality and public health hazards which the systems can create. When individual septic systems have malfunctioned or systems in combination have impaired groundwater quality, the cause of the problem in the vast majority of cases is traceable to inadequate testing of soil conditions prior to installation and inadequate inspection during installation. There is no consistent requirement that every system installation, whether in incorporated or unincorporated areas, be closely monitored by personnel specially trained in septic system installation procedures. Once installed, there is no on-going program to monitor septic system performance, and assure proper maintenance to avoid malfunctions.

Even in those counties in which every system must have a county health department permit, the frequency of on-site inspections during installation may not be enough to ensure proper construction. Septic system installers, even though licensed, often do not understand the special construction techniques necessary to avoid future malfunctions. Furthermore, one brief inspection by a health department inspector may not catch every improper construction technique.

The fragmented nature of the system for septic management and regulation is not cause for concern, even though the Commission opposes fragmentation in some other areas of water quality management. The existing framework, in which control is shared among state, county and municipal

governments provides the best basis on which to add more effective management practices. This is not to say the framework is ideal, only better than available alternatives. Shifting all responsibility to the municipal level, for example, would make it more difficult to develop areawide consistency among municipal ordinances. And, county septic regulations still would be needed in unincorporated areas. Also, because density is an important factor in assessing possible groundwater pollution risks, septic system management should be coordinated with municipal land use planning.

Shifting total responsibility for septic installation and management to the county level also would be inappropriate. Septic system location, design and construction are related to zoning, subdivision, and building control processes that regulate such factors as density and minimum lot size. Municipalities, therefore, should continue to provide criteria for septic systems in subdivision regulations and building codes.

One alternate plan would be to shift all responsibility to the state, which would insure areawide consistency, but would eliminate those county health department programs which have the capacity to manage septic system installation if staffing were upgraded and management criteria were improved. However, such a transfer of responsibility would be contrary to Illinois Department of health policies which seek to have local problems solved by the units of governments involved. Thus, it would not be a viable solution.

It is the opinion of the Commission that, wherever practicable, the agency which gives initial approval for the installation of a septic system should continue to be responsible for ensuring proper operation and correction or replacement should the system malfunction. The best solution to many malfunctioning septic systems may well be their connection to a nearby municipal or sanitary district wastewater system. However, if these agencies were not the ones which originally approved the septic systems, they should not be expected to bear the burden of providing a solution when the systems fail.

f. Recommendations

1. Known problems associated with existing individual septic systems should be eliminated.

Counties should inspect all septic systems known to be failing, threatening public health or causing nuisance conditions. The inspection should result in the issuance of a repair permit for corrective measures to be undertaken and paid for by the system owner.

The Illinois EPA and the Illinois Department of Public Health should cooperate with local agencies to identify and

eliminate septic discharges to tile drains or ditches that are tributary to surface waterways.

2. Septic systems should be inspected by local environmental health officials prior to the transfer of ownership of properties where such systems are installed. The results of the inspections should be made known to the lending institution which is furnishing the mortgage.

Local ordinances should be enacted requiring such inspections to be made certifying the current conditions as they can be observed by trained personnel. Past histories of problems and corrective measures, if any, should also be noted in order to document seasonal, highwater or other temporal problems observed in the past. This procedure is designed to protect the unwary buyer and to document past problems (such as high water tables, flooding, etc.), which may or may not have been completely eliminated. If necessary, corrective measures may be required before the sale is consummated. The results of the inspections should be incorporated as elements of the official transfer and be recorded with the deed.

3. In areas of septic failures involving several systems, where there is no possibility of cost-effective, conventional sewer service, the failing systems should be replaced by an innovative-type on-site waste disposal or effluent transfer system connected to individual homes by connector pipes.

Innovative systems include cluster-type absorption fields wnere the effluent from several septic tanks is conveyed by gravity, but most probably by a small sized PVC (plastic) pipe to sites where the soil is better suited for absorbing the effluent. Other new concepts include mound-type absorption fields, conveyance of the effluent to lagoons or other small sized biological treatment systems, or conveyance of the effluent to a more distant conventional sewer. Under certain circumstances, it may be necessary to use the septic tank as a holding tank. By installing a grinder pump assembly, pressure sewers can be used to convey the wastes without any prior treatment to a conventional sewer.

Innovative systems, where they appear to represent the best solution to existing septic problems, could be constructed, owned and operated by a local or county government or by a private corporation formed by homeowners.

The 1977 Clean Water Act authorizes grants for privately owned treatment works serving one or more principal residences or small commercial establishments. The proviso is that these systems had to be in place on December 28, 1977, the date of enactment of PL 95-217. The regulations require that a municipality apply for the grant

on behalf of the privately owned on-site waste disposal systems, such as septic systems. The basic grant is 75 percent of eligible costs. However, where innovative or alternative systems are utilized, the Federal share may be increased to 85 percent under other sections of the Act. The corrective measures employed to eliminate problems associated with defective septic systems may qualify under either one of these two features. The State's recent enactment of HB 2928 which grants communities statutory authority to create on-site wastewater zones, will aid in the ability of local governments to obtain Federal grants to rehabilitate or replace malfunctioning septic systems.

The required local matching share could be raised by special assessment of homes tied to the innovative-type system; by creation of a "special service area," within which there would be a differential assessment and special levy for septic service; or by a contract between the homeowners and the agency disbursing the 201 funds, whereby the homeowners agree to pay the matching share on a pro-rata basis.

4. Septic management systems should be modified to allow all counties in the region to take advantage of new federal grant programs for septic systems. By July 1, 1983 special service areas should be established under sponsorship of the counties and/or local municipalities, where necessary, to qualify for Federal grants in establishing innovative or alternative systems or making other on-site improvements necessary to correct or replace malfunctioning septic systems.

Table 6-14 outlines the management framework recommended for the regulation of septic systems and the elimination of septic problems. Principal responsibility for these functions is assigned to county health departments in the five counties in which they exist. The establishment of a health department in Kane County could enhance the county's ability to implement this portion of the areawide plan. It is recognized, however, that the county may wish to retain the present assignments of responsibilities to the Building Department and the Development Department.

Strategies recommended for Lake and DuPage counties differ from those recommended for the other counties because those counties have public works departments that are empowered to own and operate wastewater systems. These departments should obtain 201 funding, construct, operate and maintain innivative-type systems required to replace malfunctioning systems in their counties. Any of the methods described above could be used to obtain the local matching share.

In parts of Cook, Kane, McHenry and Will counties where there are existing wastewater treatment authorities (municipalities or sanitary districts) these authorities should perform the same role as the county public works

departments in Lake and DuPage counties. That is, they should obtain funding, own and operate replacement innovative-type systems. In parts of these four counties where there is no treatment authority, it is recommended that replacement innovative-type systems be owned and operated by private associations. The county board should serve as the channel for 201 funds and should own and operate replacement innovative-type systems only when no association is able or willing to assume ownership.

5. Innovative-type septic systems should be required in all new developments where conditions indicate that problems could result from the installation of a series of individual systems.

The need to replace failing individual systems with innovative-type systems can be avoided if the latter are installed originally in areas that cannot accommodate several individual systems.

6. Local governments should assist homeowners who must replace, or make major modifications to existing individual septic systems.

It is recommended that appropriate local agencies take steps to obtain federal funds and to make these funds available to homeowners. The reasoning here is that the failure of a septic system is not always the result of action, or lack of action by the homeowner. Many systems fail because they were installed poorly, or in the wrong location, by the original builder or developer. To the extent that this is true, the inadequacy of past inspection practices and regulatory programs must be assigned some of the blame.

There may also be situations in which land unsuitable for septics and beyond access to a municipal-type system has nevertheless already been subdivided. The owners of such lots, having purchased them in good faith, should not be penalized by denying them the right to build. The burden should be upon the agency originally approving the platting to provide assistance and make an extraordinary effort, if necessary, to resolve the problem of adequate disposal, perhaps through an innovative-type system.

7. Permit requirements for the installation and repair of septic systems should be strengthened as necessary.

State and county codes require new septic systems to be inspected only at the point just prior to the filling of the trenches. Earlier inspections also should be mandatory so that potential problems caused by improper design, or by compaction, smearing or puddling during construction can be avoided.

TABLE 6-14: RECOMMENDED MANAGEMENT FRAMEWORK FOR SEPTIC SYSTEM REGULATION

Septic Management Strategy	Lake and Du Page Counties	Will, Kane, Mc Henry and Cook Counties Within Treatment Service Areas	Will, Kane, Mc Henry and Cook Counties Outside Treatment Service Areas
Regulate construction and maintenance of new individual systems	County Health Departments: Issue Construction permits	Appropriate County Departments: Issue Construction permits	Appropriate County Departments: Issue Construction permits
Require repair of existing malfunctioning systems	County Health Departments: Issue repair permits	Appropriate County Departments: Issue repair permits	Appropriate County Departments: Issue repair permits
Require replacement of malfunctioning system or relocation on existing site	County Department of Public Works: Channel 201 funding. County Health Departments: Issue Construction permits	Local Service Authority: Channel 201 funding. Appropriate Departments: Issue Construction permits	County Board: Channel 201 funding and create special service areas. Appropriate County Departments: Issue Construction permits
Require replacement of individual malfunctioning systems with innovative type systems	County Department of Public Works: Obtain 201 funding, construct, own and operate innovative type systems. IEPA: Construction and operating permits for systems serving 15 persons or more	Local Service Authority: Obtain 201 funding; construct, own and operate innovative type systems. IEPA: Construction and operating permits for systems serving 15 persons or more	County Board: Channel 201 funding, create special service areas; construct, own and operate innovative type systems where homeowners cannot or will not. Appropriate County Departments: Issue Construction permits. IEPA: Construction and operation permits for servicing 15 persons or more.
Require installation of new innovative type systems	County Department of Public Works: Channel 201 funding; County Health Departments: Issue Construction permits; IEPA: Construction and operation permits for systems servicing 15 persons or more	Local Service Authority: Channel 201 funding; Appropriate County Departments: Issue Construction permits IEPA: Construction and operation permits for systems servicing 15 persons or more	County Board: Channel 201 funding, create special service areas. Appropriate County Departments: Issue Construction permits. IEPA: Construction and operation permits for systems servicing 15 persons or more

R Jan.4/79

8. The qualifications of those installing and maintaining septic systems should be upgraded and certified.

The Illinois General Assembly should adopt legislation requiring an acceptable score on a formal examination as a condition for receiving a license for septic installation. Periodic re-examination should be a requirement for license renewal.

The Department of Public Health should conduct periodic workshops and seminars on septic installation and maintenance, at convenient locations in the region. Licensed installers and pumpers should be required to attend as a condition for license renewal.

9. User practices that contribute to septic system failure should be eliminated.

State and local agencies should work together to obtain and develop public information materials on septic system use and maintenance, and distribute these materials periodically to residents in areas where septics are located.

Water conservation, a desirable objective throughout the region, should be particularly encouraged in septic areas. Local governments should explore ways of offering incentives to homeowners who install acceptable water-saving devices. The installation of such devices in new homes that will be on septic systems could be required by local plumbing codes.

10. Regulatory agencies should make a better use of data on soils and surficial geology in evaluating septic system locations. In this connection, county and municipal zoning of officials should give serious consideration to the types of soil which are present in proposed subdivisions before authorizing their platting.

The Lake, Will and McHenry county septic system codes prohibit septic systems in specified soils unless engineering studies can provide a way to eliminate potential problems. The Lake County Code uses pre-determined estimates of percolation rates for all soils, and then requires on-site evaluations to verify the accuracy of the projected percolation rates. All programs should employ the best available tests for determining the capacity of soils to handle septic wastes.

11. The staffs of local agencies assigned responsibility for septic system management and regulation should be upgraded as needed.

It is obvious that the programs outlined here will require additional manpower, particularly in county health departments. If more ambitious and effective programs are to be implemented for inspecting septic systems, or for providing information and assistance to septic system users, more resources will be needed by the governmental agencies involved.

12. No county or municipality should approve a subdivision of land which is intended to be served by on-site disposal systems within the five-year projected service area of a designated wastewater treatment or collection authority until that authority has been given an opportunity to review and comment upon the proposed subdivision. This provision is intended to supplement, and not replace, existing statutes regarding the subdivision of land within one and one-half miles of any municipality.

13. Each county and municipality should adopt an ordinance prohibiting the renovation or installation of any on-site disposal system within a specified distance from a sewer with available capacity. This ordinance shall also prohibit the continued use of a malfunctioning or illegally-connected existing on-site system when a sewer with available capacity is extended to the property line. Neither of these prohibitions shall apply if the property owner has made a good-faith effort to secure connection and has been denied permission by the owner of the collection system.

14. Counties, municipalities and sanitary districts should consider enacting ordinances to cover situations where mandatory elimination of existing septic systems may cause serious economic hardships on property owners who are elderly or living on fixed incomes. Under these circumstances, the agency installing or controlling an existing sewer system may finance the capital costs which are normally assessed or borne by the property owner, including the house connection. A lien would be attached on the property for recouping those costs, plus interest, when the property is sold.

The above ordinances will give local officials essential tools to control the installation of new septic systems and to require the phase-out of septic systems that are malfunctioning or which have the potential to malfunction in the near future. It is assumed that in the interest of efficiently utilizing existing wastewater treatment capacity, a sewer would not be extended to a property line where the septic system was likely to continue to operate effectively.

The Illinois "Private Sewage Disposal Licensing Code" says that new or renovated private sewage disposal systems

shall not be approved where a public sewer system is accessible within 200 feet of a building and is available for connections. Equity dictates that such accessibility and distance should be interpreted to mean that the sewer abuts the property line, either in a public street or in a rear-yard easement.

15. The Illinois Pollution Control Board may find, on recommendation of the IEPA, the Illinois Department of Public Health, or a county or municipal authority responsible for the regulation of on-site disposal systems, that water quality problems associated with an area of failing on-site disposal systems can be corrected most cost-effectively by the removal of the systems and the provision of municipal-type wastewater service. The Board may issue an order to the owner or occupant to abate the pollution. The measures employed will be decided by the individual owners of the malfunctioning on-site disposal units.

The provision of municipal-type wastewater service should be consistent with the recommendations in Chapter 5 with respect to the extension of service to newly urbanized areas. Where the area to be served lies within the five-year service area but outside the legal jurisdiction of a designated treatment authority, service may be provided by annexation to the treatment authority. Or, a purchase-of-service agreement may be negotiated between the general purpose government exercising land use controls over the area in question and the treatment authority. Where a purchase-of-service agreement is entered into, the general purpose government may provide for payment of service, including the cost of installing necessary facilities, through the establishment of a special service area or other means.

The Board order should include a time frame by which service is to be provided. If service has not been provided by this time due to unwillingness of the treatment authority to annex the area or enter into a purchase-of-service agreement, the IEPA may issue an NPDES permit for the provision of service by an agency other than the treatment authority.

Septic systems and alternative on-site waste disposal methods are discussed in more detail in 208 Staff Paper No. 32, "On-Site Wastewater Disposal Systems."

6.07 SURFACE WASTE DISPOSAL

a. Introduction

Surface waste disposal involves the spreading or burying of solid, semi-solid or liquid waste materials on or under the ground surface. Typical waste materials

incorporated at surface disposal sites include garbage, rubbish, cinders and ashes, abandoned vehicles, street refuse, dead animals wastes from demolition and construction, industrial waste products, and toxic or hazardous substances. Disposal of residual wastes from wastewater and water treatment facilities is covered in Chapter Seven, "Residual Wastes." However, treatment plant sludges and septage pumped from septic tanks fall within the scope of this discussion in so far as their deposit take place in sanitary landfills.

b. Sanitary Landfills

Excluding the spreading of sewage sludges, septage or livestock wastes, the only authorized type of surface waste disposal in Illinois is sanitary landfilling. A sanitary landfill is a controlled facility for the disposal of solid or liquid wastes on land. Basically, landfilling consists of the following steps: (1) refuse is deposited at the working area; (2) the refuse is spread into thin layers (approximately two feet thick) and compacted by heavy equipment; and (3) the refuse layers are covered daily with earth material and further compacted. If liquid or semi-solid wastes are involved, these are spread and mixed with the refuse before the latter is compacted.

The Illinois Environmental Protection Agency (IEPA) must approve all sanitary landfill sites and other solid waste disposal facilities in the state. The design and operation of landfills is governed by regulations of the Illinois Pollution Control Board (IPCB). Illegal surface waste disposal sites include open dumps, unauthorized disposal sites and non-permitted landfill operations.

There are 30 sanitary landfills in northeastern Illinois permitted by the IEPA. Some small open dumps still exist, but their significance to water quality is unknown.

The major water quality problem associated with land disposal is pollution of groundwater and surface water from poorly designed or operated sites. When water moves through waste materials, contaminants can enter into solution. If this solution, known as leachate, migrates from a landfill site, nearby surface waters or local shallow aquifers may be polluted. Water can enter through a waste disposal site either from surface runoff or as groundwater. In open dumps water can enter the wastes directly as precipitation. In landfills, runoff may enter the wastes as infiltration through the soil cover. Groundwater may enter through sidewalls or the bottom of the landfill (if the site is located below the water table).

The quantity and composition of leachate from landfills are variable. Solid wastes frequently are able to absorb large quantities of water and no leaching will occur until saturated conditions are reached. Exceptions include instances where extraneous surface waters are introduced, or

where the groundwater flows through void spaces in the wastes. Leachate composition also varies, depending on the composition and age of the wastes in the disposal sites. High concentrations of dissolved iron, chlorides, and sodium elements are usually found in landfill leachates, as are high concentrations of dissolved solids. Leachate waters also have a high hardness content and usually exert a high biochemical oxygen demand. Furthermore, because waters can be high in bacteria content, and since the organic component of solid wastes undergo both aerobic and anaerobic decomposition, bacteriological pollution may also be introduced into the waters that pass through the wastes. Another potential source of water pollution are substances in the "special waste" category. Included here are hazardous wastes such as toxic, flammable, radioactive or explosive materials. Special wastes also include oils, which can be particularly hard to control.

It may be possible to reduce illegal discharges of waste oils by actively promoting recycling programs, as well as through stricter enforcement of sanitation and litter ordinances. Public education also is important in informing people of alternatives to promiscuous disposal. Local governments are encouraged to identify and publicize commercial facilities within their corporate limits which will accept waste oils for subsequent pickup or for refiners of these products. This subject will receive further attention under the provisions of the Resource Conservation and Recovery Act. A statewide study is about to get started by the Illinois Protection Agency.

Special wastes are generated throughout the region and handling and disposal practices vary. Some wastes are disposed of where they originate, while others require processing prior to disposal, which is usually at private specialized facilities. Containers in which such wastes originally were packaged also can be sources of pollution. In northeastern Illinois nine facilities are engaged in hazardous or special waste processing and recycling. In addition, six landfill sites are permitted to accept hazardous or other special wastes.

c. Regulations

The disposal of wastes on land is also regulated by three major federal laws, all administered by the USEPA. Public Law 92-500 gives USEPA authority to determine toxic pollutants and promulgate treatment and pre-treatment regulations specifying their removal and disposal. USEPA also has the authority to require permits for the disposal of residual wastes from treatment works, including industrial facilities. The Toxic Substances Control Act of 1976 (Public Law 94-469), gives USEPA the authority to specify chemical substances and mixtures which present an

unreasonable risk of injury to health and the environment and to regulate their disposal.

Public Law 94-580, The Resource Conservation and Recovery Act of 1976, requires USEPA to develop standards for the handling and disposal of hazardous wastes. Responsibilities for the development of standards and the operation of permit programs may be assumed by state governments. As indicated in the preceeding discussion, Illinois has chosen to accept this responsibility, and had been active in regulating the disposal of wastes on land prior to enactment of these laws. The discussion above and the recommendations that follow on this subject are framed by this existing regulatory system for surface waste disposal.

The IPCB's rules and regulations governing the design and operation of landfills, coupled with the IEPA's power to permit and inspect disposal facilities, afford the means to control water pollution from surface waste disposal sites. Leachate production and movement can be controlled, if facilities are maintained and operated properly, and water pollution problems can be prevented. Of particular value are IPCB regulations providing that no sanitary landfill can be developed or operated unless it has first been satisfactorily shown that no damage or hazard will be posed to the waters of that state. All sanitary landfills also must provide "adequate measures to monitor and control leachate."

d. Recommendations

The Commission recommends the following actions to protect surface and groundwaters from pollution by surface waste disposal facilities:

1. The Illinois Pollution Control Board and Illinois EPA should continue to regulate the siting, design, construction, and operation of surface waste disposal sites.

2. Local governments should plan ahead for surface waste disposal so that site selection can be based as much as possible on suitability rather than on availability.

Development in the region continues to decrease available land suitable for surface waste disposal. Furthermore, many existing disposal sites will no longer be available within five to ten years.

3. The State of Illinois should grant financial assistance to local governments for the purchase of suitable landfill sites for future use.

4. The Illinois EPA should establish a study group of interested governmental agencies and appropriate representatives of industry, to explore the feasibility of implementing a waste exchange program in the region.

The waste exchange concept assumes that a selected waste from one waste producer can be comingled with the selected waste of another, resulting in the "neutralization" of both, or perhaps the formation of a useful by-product. In some instances a waste product might be directly used by another firm. This procedure requires that a listing of waste producers and the characteristics and quantities of their wastes be maintained so that the information is readily available to other generators of hazardous and special wastes.

5. The Illinois General Assembly should enact appropriate state statutes, and regulations should be issued, governing the proper rinsing and final disposal or salvage of pesticide containers.

6. The federal and state governments should continue to provide technical and financial support for research and demonstration projects on recycling of residuals of all types.

7. Further efforts to identify inactive surface waste disposal sites and to monitor inactive sites where no private responsibility can be identified for potential pollution contributions should be continued by the IEPA and county public health departments.

6.08 AIR DEPOSITION

There is general agreement among experts in pollution control that air pollution is a contributing factor in water pollution, and there is increasing emphasis on the need to address air quality in studies that are ultimately directed at improving water quality. However, there is a lack of long-term, comprehensive data on the relationship between air pollution and water pollution, and to date the problem has been approached more in a qualitative, as opposed to a quantitative, manner. The Commission, in preparing this plan, has not quantified the contributions of airborne contaminants to water pollution. A comprehensive report on the subject, prepared by a consultant to the Commission, is presented in 208 Staff Paper No. 23: "Potential Contributions of Air Contaminants to Water Pollution in the Six-County Area of Northeastern Illinois." The report deals only with the potential impacts, however and it is not considered possible at this point to provide a detailed assessment of problems, or to recommend control strategies.

a. Characteristics and Impact on Water Quality

A number of constituents make their way into the air and impair air quality. Some of these are used as indices to facilitate the categorization and monitoring of air quality problems. In the same way that parameters for pollutants are used in setting water quality standards, certain indices are reflected in national and Illinois air quality standards, which are identical. These are: total suspended particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), photochemical oxidants, and non-methane hydrocarbons. These standards are used in conjunction with pollution control strategies to achieve and maintain the desired air quality. Violations of standards for short periods of time are not as significant as levels and trends in annual or seasonal averages of concentrations.

Other constituents detrimental to air quality, such as heavy metals, toxic substances, and phosphorous, are not used as air quality indices but are important to overall air quality. Improvement in air quality parameters covered in the standards will likely mean improvement with respect to

TABLE 6-15: SUMMARY OF NATIONAL AND ILLINOIS AMBIENT AIR QUALITY STANDARDS[1]

Pollutant	Time Period of Average	Primary Standard[3]	Secondary Standard[3]
Particulate Matter (TSP)	Annual Geometric Mean	75 ug/m^3	60 ug/m^3
	24 hour	260 ug/m^3	150 ug/m^3
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	0.03 ppm (80 ug/m^3)	None
	24 hour	0.14 ppm (365 ug/m^3)	None
	3 hour	None	0.5 ppm (1300 ug/m^3)
Carbon Monoxide (CO)	8 hour	9 ppm (10 mg/m^3)	Same as Primary
	1 hour	35 ppm (40 mg/m^3)	Same as Primary
Non-Methane Hydrocarbons (HC)	3 hour (6 to 9 AM)	0.24 ppm (160 ug/m^3)	Same as Primary
Nitrogen Dioxide (No_2)	Annual Arithmetic Mean	0.05 ppm (100 ug/m^3)	Same as Primary
Photo-chemical Oxidants[2]	1 hour	0.08 ppm (160 ug/m^3)	Same as Primary

[1] Illinois Air Quality Standards are identical to National Air Quality Standards.

[2] (O_x expressed as ozone.

[3] Reported at 25°C and 760 mm Hg.

ppm = parts per million

mg = milligrams = 10^{-3} gram

ug = microgram = 10^{-6} gram

Note: All standards with averaging time of 24 hours or less are not to be exceeded more than once per year.

those constituents not directly monitored. For example, reduction in particulate matter will automatically reduce associated pollutants which are absorbed and carried by the particulates.

Air contaminants enter water bodies in direct and indirect ways. Gases, liquids, and solids in the air enter water bodies directly in three ways: settling, as a result of gravity; mixing directly with water as a result of surface turbulence; and by incorporation into precipitation and subsequent deposition with rain or snow. Indirect transfers involve the same processes, with the exception of turbulence, but contaminants originally are deposited on land surfaces, then conveyed to waterways by stormwater runoff. Between the time of deposition on land, and the first storm event, physical, chemical and biological transformations of the deposited air contaminants may take place. Therefore, indirect transfers may produce contaminants which differ from those that are present in the air or transferred directly to water surfaces.

Monitoring programs indicate that present air quality in the most heavily polluted areas of the region is unacceptable from standpoints of health, environmental quality and economics. During the first half of 1976, for example, the Chicago metropolitan area failed to meet all of the primary air quality standards for TSP, SO_2 CO, photochemical oxidants, and NO_2 . The annual standard for SO_2 was met, but the 24-hour standard was not met in several locations in northeastern Illinois. Long term trends with respect to suspended particulates and sulfur dioxide are improving. However, more effective control of ozone and carbon monoxide emissions appear necessary in order to reduce excessive levels of these contaminants.

Not all air pollutants are of concern with respect to water quality. Carbon monoxide has no important impact on water, and sulfur dioxide levels are improving to the point where this pollutant should not harm water quality in the future.

High levels of nitrogen and phosphorous compounds in the air contribute these constituents to water bodies. As discussed previously, high concentrations of these nutrients degrade stream quality and aggravate eutrophication in lakes. Heavy metals, toxic substances, and other contaminants in the air also pollute waterways. Studies have indicated the qualitative nature of these problems, but no one has quantified them adequately. More research is needed, first to quantify pollutant contributions from all other point and nonpoint sources, then to determine the relative contributions of air contaminants. Control of pollutants from other sources will tend to increase the relative importances of air contaminants, and greater attention undoubtedly will be given to the underlying causes of air pollution.

Elimination of air contaminants as a source of water pollution can best be accomplished by eliminating, or

TABLE 6-16: AIR-TO-LAND LOADINGS FROM DUSTFALL AND PRECIPITATION

Parameter	Dry Deposition in Polluted Air (A_o = 100 $\mu g/m^3$) Flux, kg/ha-yr Particulate Contribution	Dry Deposition in Polluted Air (A_o = 100 $\mu g/m^3$) Flux, kg/ha-yr Gaseous Contribution	Dry Deposition in Clean Air (A_o = 50 $\mu g/m^3$) Flux, kg/ha-yr Particulate Contribution	Dry Deposition in Clean Air (A_o = 50 $\mu g/m^3$) Flux, kg/ha-yr Gaseous Contribution	Wet Deposition in Polluted Air (A_o = 100 $\mu g/m^3$) Flux, kg/ha-yr Particulate Contribution	Wet Deposition in Polluted Air (A_o = 100 $\mu g/m^3$) Flux, kg/ha-yr Gaseous Contribution	Wet Deposition in Polluted Air (A_o = 100 $\mu g/m^3$) Corresponding Rainwater Concentration, (a) mg/l	Wet Deposition in Polluted Air (A_o = 100 $\mu g/m^3$) Corresponding Rainwater Concentration, (b)	Wet Deposition in Clean Air (A_o = 50 $\mu g/m^3$) Flux, kg/ha-yr Particulate Contribution	Wet Deposition in Clean Air (A_o = 50 $\mu g/m^3$) Flux, kg/ha-yr Gaseous Contribution	Wet Deposition in Clean Air (A_o = 50 $\mu g/m^3$) Corresponding Rainwater Concentration, (a) mg/l	Wet Deposition in Clean Air (A_o = 50 $\mu g/m^3$) Corresponding Rainwater Concentration, (b)	Total Deposition in Polluted Air (A_o = 100 $\mu g/m^3$) Flux, kg/ha-yr Particulate Contribution	Total Deposition in Polluted Air (A_o = 100 $\mu g/m^3$) Flux, kg/ha-yr Gaseous Contribution	Total Deposition in Clean Air (A_o = 50 $\mu g/m^3$) Flux kg/ha yr Particulate Contribution	Total Deposition in Clean Air (A_o = 50 $\mu g/m^3$) Flux kg/ha yr Gaseous Contribution
Total Suspended Particulates	1,400	—	420	—	162	—	22	—	81	—	11	—	1,562	—	501	—
Volatile Suspended Particulates	350	—	110	—	40	—	5.5	—	20	—	2.8	—	390	—	130	—
Total Organic Carbon	250	—	76	—	42	—	6.1	—	22	—	3.0	—	295	—	98	—
Inorganic Carbon																
(HCO_3^-) (as C)	42	—	13	—	7.5	—	0.78	—	3.8	—	0.39	—	49.5	—	1.68	—
CO_2 (as C)	—	—	—	—	—	1.8	—	0.24	—	1.8	—	0.24	—	1.8	—	1.8
Total (as C)	42	—	13	—	7.5	—	0.78	0.24	3.8	—	0.39	0.24	49.5	1.8	1.68	1.8
Phosphorus																
Total (as P)	1.4	—	0.42	—	0.25	—	0.034	—	0.12	—	0.017	—	1.65	—	0.54	—
Ortho-phosphorus (as P)	0.7	—	0.21	—	0.13	—	0.017	—	0.06	—	0.0085	—	0.83	—	0.27	—
Organic Phosphorus by Difference (as P)	0.7	—	0.21	—	0.12	—	0.017	—	0.06	—	0.0085	—	0.82	—	0.27	—
Nitrogen																
NH_4-N	4.2	38	1.3	38	0.74	13	0.10	1.8	0.37	13	0.05	1.8	4.94	51	1.67	51
NO_3-N	8.4	18	2.5	18	1.5	4.1	0.20	0.56	0.74	4.1	0.10	0.56	9.9	22.1	3.24	22.1
Total Inorganic Nitrogen	13	56	3.8	56	2.2	17	0.30	2.4	1.1	17	0.15	2.4	14.8	73	4.9	73
Organic Nitrogen (as N)	9.8	—	2.9	—	1.8	—	0.24	—	0.81	—	0.11	—	11.6	—	3.71	—
Total Nitrogen (as N)	22.8	56	6.7	56	4.0	17	0.54	—	1.9	17	0.26	—	26.4	73	8.6	73
Sulfur																
Total (as S)	38	14	11	14	6.8	13	.191	1.8	3.4	13	0.46	1.8	44.8	27	14.4	27
Hydrogen Ion (equivalents/ha-yr)																
at pH 5.8	—	—	—	—	12	—	1.6×10^{-6} equivalents/liter		12	—	1.6×10^{-6} equivalents/liter		—	—	12	—
at pH 5.0	—	—	—	—	74	—	10^{-5} equivalents/liter		74	—	10^{-5} equivalents/liter		—	—	74	—

Abbreviations used in this and other tables in this report are explained in the abbreviations list in Appendix B.

Notes:

a: material due to particulates captured in rainwater

b: material due to gas transfer into rainwater

Source: NIPC Staff Paper No. 26

R Jan. 4/79

sufficiently reducing the original emissions. This is an objective of the Illinois Air Pollution Control Implementation Plan and its related Site Implementation Plan. Because certain air contaminant levels are still high, modifications and proposed revisions to the plan are now underway. New TSP and SO_2 emission regulations, revision of the implementation plan to meet the ozone standard, and re-evaluation of the implementation plan and its capability to meet the standards for all pollutants are measures being considered.

Attainment of air quality standards cannot be regarded as a guarantee that adverse impacts of air pollution on water quality will be controlled, however. A better understanding of the nature of the problem is required before the appropriateness of the air quality standards can be assessed from the standpoint of water quality.

b. Recommendation

1. As part of the continuing areawide planning program, the Commission in cooperation with the IEPA, other state water quality and state and local air quality agencies, should analyze the quantitative relationships between air quality and water quality.

6.09 OTHER NONPOINT SOURCES

a. Mining

There are a number of active mining operations in the region, nearly all involving the commercial extraction of sand, gravel, or stone for construction materials. Because sites are dispersed, the water quality impact of these mining activities is reported to be slight.

In mining operations, as found in the region, water is involved in two ways. First, it may be used in washing or other processing. Secondly, water often is encountered in mining operations as runoff from precipitation, or more extensively, as the result of operations below the groundwater table. The last mantioned waters interfere with mining activities and usually are pumped out in routine dewatering operations. As a rule, dewatering discharges to surface waters do not present a problem in northeastern Illinois, and may actually improve stream conditions by the introduction of higher quality groundwater being pumped from the quarry or pit.

Process wash waters, on the other hand, usually contain high amounts of suspended solids and other materials which may degrade water quality if discharged directly to streams. However such discharges are rare. Most facilities where process waters are employed have closed-circuit systems which recycle the waters and eliminate surface discharges.

This is consistent with federal rules and regulations which favor process water reuse.

Sand and gravel are mined extensively in northeastern Illinois, particularly in McHenry County, which led Illinois in production in 1975. The materials are used primarily as construction aggregate for building construction and roadway paving.

Limestone and dolomite are mined at several northeastern Illinois quarries, with the material used primarily in road construction and to a lesser degree in the production of cement and lime. Cook and Will counties are the leading stone-producing counties in the state. There are a few quarries in Kane and DuPage counties; none in Lake or McHenry counties.

Illinois is the third-largest producer of peat in the United States, and the majority of production is derived from operations in Cook, Kane and Lake counties.

Clay is extracted at two pits in Cook County and used in the production of common brick.

Coal was mined extensively in the Braidwood-Wilmington area of southwest Will County. However, operations have ceased and are not expected to resume. A large number of stripmine lakes exist in the area, with most being used as recreational facilities.

There are a number of small areas in Will County where exposed gob (coarse, coal preparation plant refuse) and slurry (fine refuse from coal washing) from abandoned underground coal mines present a potential water quality problem. Research conducted for the Illinois Institute for Environmental Quality has identified 15 such areas in the vicinities of Braidwood and Godley. A total of 65 problem areas were identified, with all sites exhibiting potential for surface drainage to adjacent or nearby streams. Drainage and refuse samples collected typically had low pH values characteristic of these waste materials. Several gob piles are high (as much as 80 feet), steeply sloped, and lacking in adequate vegetative cover.

Due to relatively small sizes of the areas affected, the Will County sites were assessed relatively low problem severity rankings by the researchers. Nevertheless, each area is site-specific, and should be subjected to a more detailed appraisal of problem conditions, and the need and means for conducting any necessary reclamation activities.

There is no evidence that any of the current mining operations in the region are damaging water quality except on a localized sporadic basis. State and federal regulations with respect to permits, effluent quality and waste disposal are considered to be adequate for the prevention of problems in the future.

(1) Recommendation:

(a) The IEPA should continue to study the types and volumes of pollutants associated with mining activities and their potential effects on surface and groundwater quality.

b. Forestry

Forestry activities, particularly large-scale timber cutting, can contribute to soil erosion and other problems that can harm water quality. There are no appreciable commercial activities of this type underway in northeastern Illinois, however, and forestry is not of concern in areawide planning. It is recognized that limited deforestation occurs in the course of land development and that barren construction sites are major sources of soil erosion.

c. Hydrologic Modifications

Hydrologic modifications that disturb the natural flow of surface water include: the building of dams and reservoirs, stream channelization, dredging, land reclamation, and the construction of bridges and other structures near the water. When subsurface excavations are involved, as in the construction of tunnels and wells, groundwater also may be affected. Groundwater flows or levels can be altered, or waters from different aquifers can be co-mingled.

Northeastern Illinois is a navigation center, a transfer point between inland waterways and the Great Lakes-St. Lawrence Seaway. Periodic dredging of channels and harbors is necessary order to maintain navigability and avoid economic losses due to partial ship and barge loadings.

Dredging has some pollution-control benefits to the extent that polluted bottom sediments are removed. The disposal of dredge spoil, however, must be carefully controlled so that the contaminated materials do not impair surface or groundwater quality in or near the disposal area.

Flood control activities also result in hydrologic modification, usually in the form of stream channelization, dike and levee construction, and reservoir development. Recently, flood control agencies have attempted to shift emphasis to non-structural solutions which minimize dredging and other activities that affect natural river and stream regimes.

Results of water quality modeling indicate that reservoirs and impoundments exhibit both positive and negative water quality impacts in varying degrees over time. Because of nutrients and BOD in the region's streams, during

both low and high flows, special site specific design features and operational procedures must be considered during the continuing planning program. These are necessary to avoid any potential negative water quality impacts from reservoirs constructed (or to be constructed) for flood control, recreational or other purposes.

For instream reservoirs and impoundments, consideration should be given during the continuing planning program to the enhancement of the reaeration potential to the extent feasible in the design of outlet structures governing low flow conditions. Where algae growths are anticipated, consideration should be given to safeguarding supersaturated DO concentrations. During daylight hours, when DO concentrations may be at the supersaturated level, the discharge devices or features should reduce the potential for deaeration by generating smooth, laminar flows. For nighttime discharges, when DO levels are depressed, provisions should include features which will generate turbulent flows and enhance aeration.

For off-channel reservoirs, special consideration should be given to avoiding any potential negative water quality impacts from flood control impoundments. Designs of pump-out features should make provisions for the incorporation of reaeration devices if found to be necessary at a later date. These measures must be addressed on a site by site basis with the ultimate objective of providing not less than 80 percent oxygen saturation during dewatering operations. Designs should be such as to facilitate modification by the installation of steps, blocks, or other turbulence creating devices, if found to be necessary during the continuing planning program, in the spillways or flumes conveying the pumped waters to the receiving streams.

The most frequent, and probably the most serious, impacts on streams as a result of such activities are associated with erosion and sedimentation. Some modifications, such as bridge construction and channel modification, can increase direct erosion. Others, such as dredging, cause the resuspension of existing bottom sediments, which may contain harmful heavy metals. Resuspension is accompanied by release of nutrients, increased turbidity, and possible oxygen depletion.

Agencies most often involved in hydrologic modifications are the U.S. Army Corps of Engineers, the U.S. Department of Agriculture, Soil Conservation Service and the Illinois Department of Transportation, Division of Water Resources. Local governments, corporations and individuals are involved to a more limited degree.

Current and proposed hydrologic modifications with the potential to effect water quality are addressed in individual basin chapters.

Responsibilities for the maintenance, control and improvements of water bodies in northeastern Illinois are duplicative, fragmented and contradictory, resting with governmental agencies ranging from the federal level down to

the local. Municipalities have jurisdiction over all waters within and bordering on their boundaries to a point three miles from their corporate limits. They have expressed authority to deepen, widen, cover, wall, or alter channels of water courses. If non-home rule counties adopt specific resolutions incorporating provisions of certain enabling acts, they are authorized to clean out, straighten, widen, alter, deepen or change the terminus of any ditch, drain, river, lake or natural watercourse, in their respective corporate limits. (Home rule counties have those same authorities through the Constitution.)

Sanitary districts are formed under various enabling acts. Those incorporated under the 1917 and 1936 acts of the Legislature have authority to construct dams on any stream flowing in or through their districts up to a point three miles beyond the corporate limits. They also may dredge, deepen or otherwise improve stream channels. The Metropolitan Sanitary District of Greater Chicago, created by a special act of the Legislature in 1889, has broad powers related to flood control.

The Illinois Division of Water Resources, in the Department of Transportation, exercises jurisdiction over all lakes and rivers in which "the State has rights or interests". It has numerous statutory duties related to conservation, regulation, control and use of surface waters.

The U.S. Army Corps of Engineers has responsibility for the construction and maintenance of navigational facilities authorized by the Congress, as well as for flood control and clearing and snagging projects which may be authorized.

The net result of these ambiguous and overlapping powers is that maintenance of these water bodies is often deferred to others, with only minimum actions being taken by units of government on problems which adversely affect them.

(1) Recommendations:

(a) The IPCB should issue regulations governing the proper containment of dredge spoil and requiring the filtering of excess waters before they are discharged to water bodies.

(b) Sponsors should give serious consideration to the potential negative water quality impacts of impoundments which are proposed for construction.

(c) Sponsors of dredging proposals should assess projects for any potential adverse water quality impacts.

(d) The highly fragmented authorities for stream channel maintenance and improvements should be clarified and specifically delegated by appropriate State legislation or assumed through intergovernmental

agreements or other administrative or legal procedures sponsored by countywide water quality committees.

(e) Local municipal governments should undertake or sponsor programs for the proper marking and identification of streams at road crossings so as to develop public awareness, recognition of and pride in these water bodies.

(f) Counties are encouraged to develop organizations similar to the Cook County and Lake County Clean Streams Committees, consisting of volunteers and organizational representatives who maintain surveillance over water bodies for activities adverse to water quality, flood control, recreation, fish, wildlife, and/or navigation.

(8) The feasibility of making structural changes to the low-flow impoundments on the region's streams, or actual removal of the dams, should be considered in the continuing planning program with the objective of conserving supersaturated DO concentrations and/or reducing the adverse water quality impacts of these dams during low flow periods.

d. Marine Activities

Wastes from marine activities include sanitary wastes from commercial and recreational vessels, oils and engine exhaust materials and garbage and litter. While not classified as wastes, the contents of commercial vessels, particularly oil and hazardous substances, also can harm water quality in the event of leaks, spillage, or illegal discharges.

Authority to control the discharge of marine wastes and other materials from vessels rests with various agencies at the federal, state, and local levels. Public Law 92-500 prohibits the discharge of oil or hazardous materials into or upon the navigable waters of the United States, and directs the U.S. Coast Guard to develop regulations governing the design and operation of marine sanitation devices.

The IPCB also regulates the disposal of wastes from watercraft, and the agency's rules state that no person shall dispose of any sewage or wastewater accumulated in a holding tank, or any other container on a watercraft, in such a manner that the sewage or wastewater reaches or may reach the waters of the state. Local and county ordinances also can be directed at such discharges. For example, Lake County has a general ordinance making improper disposal of marine wastes an offense punishable by a fine of up to $200 per day per violation. The City of Chicago has a similar ordinance.

Enforcement of existing regulations and ordinances is generally hampered by financial and manpower constraints. Regulatory agencies often must rely on voluntary compliance by boatowners.

To the extent that specific problems have been identified in the region, they are discussed in appropriate basin chapters.

e. De-Icing Agents

Considerable interest has been expressed relative to the water quality impact of highway de-icing compounds. During and following winter storms, large quantities of salt and other chemicals are applied to roadway surfaces to melt accumulated snow and ice. The rate of application and the cumulative total applied varies from year to year according to storm frequency and severity, budgetary factors and other considerations. Expressways, tollways, and other high traffic volume roadways generally receive the most intensive salt applications. Less heavily traveled roads and local streets may receive applications only at intersections, grades, railroad crossings, and other critical areas.

(1) IDOT Salt Application Rates: Table 6-17, extracted from Illinois Department of Transportation (IDOT) "Water Quality Manual" (May 1977), provides an indication of the average annual salt application rates on State-maintained highways in northeastern Illinois over a recent five-year period. The greater emphasis given to express-way routes is readily apparent from the figures.

(2) IDOT Sampling program: According to correspondence with the Bureau of Location and Environment, IDOT, at the present time there is no empirical formula available for adequately estimating the salt runoff from highways and its subsequent impact on ground and surface waters. As a result, it is not possible to mathematically model the effects of road

TABLE 6-17: SODIUM CHLORIDE APPLICATIONS, STATE MAINTAINED HIGHWAYS IN NORTHEASTERN ILLINOIS

Type Roadway	Tons Per Lane Mile				
	FY 72	FY 73	FY 74	FY 75	FY 76
Highways	14.6	12	10.7	10.2	11.2
Expressways	48	38.6	44.4	30.4	33.2

salting. However, since 1973, IDOT has conducted a sampling program for chloride content in waterways adjacent to highways. Data for 1976-77 from the four stream sampling sites located in northeastern Illinois, as reported by the referenced correspondence with the Bureau of Location and Environment, are presented in Table 6-18.

Sample values in excess of the State 500 mg/l chloride standard for General Use waters occurred at all three highway sites (2 through 4) during the peak December - February salting season. Values for the salt storage site (site 1) remained low except for the May - July period. It is not known whether the increase in chloride values recorded during the summer season at site 1 was attributable to runoff from the storage yard during heavy rainfall, or the result of other, unrelated conditions upstream of the sampling site. Similarly, since the method of sampling was

TABLE 6-18: CHLORIDE CONCENTRATIONS (mg/l)

Sampling Period	Sample Site Number			
	1	2	3	4
1976				
October	120	410	160	280
November	22	108	434	196
December	60	680	605	--
1977				
January	70	530	330	1,370
February	40	2,270	90	70
March	132	335	246	255
April	195	275	150	225
May	290	221	141	141
June	619	153	144	18
July	494	62	254	144
August	148	115	82	432
September	69	110	101	91

Site 1 – Unnamed stream at Ill. Rt. 23, 4 miles south of Marengo-McHenry County (receiving drainage from salt storage yard)

Site 2 – Salt Creek at Ill. Rt. 58, south of Rolling Meadows–Cook County (receiving drainage from 4-lane highway)

Site 3 – Unnamed stream at Ill. Rt. 7, north of Orland Park-Cook County (receiving drainage from 2 lane highway)

Site 4 – Illinois and Michigan Canal at I-55, 2 miles north of Channahon–Will County (receiving drainage from 4-lane freeway)

limited to the collection of monthly grab samples, variations in runoff and meltwater are not represented. There is also uncertainty with respect to the possible effects of upstream chloride sources. In summary, while the data collected to date suggests evidence of road salt-related pollution, it is not considered conclusive. Institution of an expanded sampling program (with greater sampling frequency and additional sites, coupled with detailed investigation into possible upstream chloride sources extraneous to road salt usage) is desirable. Ideally, sampling would seek to identify "background" conditions upstream of sampling sites, as well as measured chloride levels downstream of roadways to the full impact could be ascertained.

(3) USEPA Guidelines: The most feasible approach to reducing salt loading is to reduce salt application on roads. Guidelines suggested by the USEPA for salt application are given in Table 6-19. Prewetting of salt with methyl alcohol or propylene glycol has been used in order to accelerate the action of salt which, in turn, reduces total salt requirements.

(4) Other Considerations: Other mitigation measures include improved operator training, observance of recommended procedures, and installation of regulated spreading devices. Salt substitutes continue to be investigated, although none have been shown to be as effective. Some, such as sand, cinders, and other gritty materials have water quality impacts of their own since they may eventually enter streams as sediment and may also clog sewers.

(5) Salt Storage: A related potential problem pertains to unprotected salt storage yards, whose drainage during wet weather may discharge to local stream or seep downward through the ground to pollute local shallow aquifers. The IDOT has taken steps to forestall such problems by installing paved floors and protective covers at all of its salt storage sites. Many municipal, township, and county storage sites, however, are unprotected from the elements. Consideration should be given to the installation of protective inclosures or covers at exposed sites, particularly if surficial aquifers are present or storm drainage flows to adjacent streams where dilution is inadequate.

TABLE 6-19 USEPA GUIDELINES FOR SNOW REMOVAL CHEMICAL APPLICATION RATES

Weather Conditions			Application Rates (Pounds of Material per Mile of Two-Lanes of Divided)			
Temperature	Pavement Conditions	Precipitation	Multilane Divided	Two-and Three-Lane Primary	Two-Lane Secondary	Instructions
30°F and above	Wet	Snow	300 salt	300 salt	300 salt	Wait at least 0.5 hour before plowing.
		Sleet or freezing rain	200 salt	200 salt	200 salt	Reapply as necessary
25-30°F	Wet	Snow or sleet	Initial at 400 salt; repeat at 200 salt.	Initial at 400 salt; repeat at 200 salt.	Initial at 400 salt; repeat at 200 salt.	Wait at least 0.5 hour before plowing; repeat.
		Freezing rain	Initial at 300 salt; repeat at 200 salt.	Initial at 300 salt; repeat at 200 salt.	Initial at 300 salt; repeat at 200 salt.	Repeat as necessary.
20-25°F	Wet	Snow or sleet	Initial at 500 salt; repeat at 250 salt.	Initial at 500 salt; repeat at 250 salt.	1,200 of 5:1 sand/ salt; repeat same	Wait about 0.75 hour befor plowing; repeat.
		Freezing rain	Initial at 400 salt; repeat at 300 salt.	Initial at 400 salt; repeat at 300 salt.	1,200 of 5:1 sand/ salt; repeat.	Repeat as necessary.
15-20°F	Dry	Dry snow	Plow	Plow	Plow	Treat hazardous areas with 1,200 lbs. of 20:1 sand/ salt.
	Wet	Wet snow or sleet	500 of 3:1 salt/ calcium chloride.	500 of 3:1 salt/ calcium chloride.	1,200 of 5:1 sand/ salt.	Wait about one hour before plowing; continue plowing until storm ends; then repeat application.
Below 15°F	Dry	Dry snow	Plow	Plow	Plow	Treat hazardous areas with 1,200lbs. of 20:1 sand/salt.

SOURCE: U. S. Environmental Protection Agency, Manual for Deicing Chemicals -- Application Practices, EPA Doc. 670 2-74-045, Washington, D. C., 1974.

CHAPTER 7

Disposal of Residual Wastes

CHAPTER SEVEN
DISPOSAL OF RESIDUAL WASTES

7.01 CHARACTERISTICS OF RESIDUAL WASTES

Residual wastes are the waste sludges generated as a result of wastewater and water treatment processes, and the septage that accumulates in individual septic tank systems. All these residual products require some form of processing prior to their disposal or reuse because of their volume, biological instability, pathogenicity, odor, or other nuisance properties. Sludges from industrial-type wastewater treatment plants, in addition to the properties mentioned above, also may contain concentrated amounts of heavy metals or other toxic substances.

The management of residual sludges is as important as the management of the liquid wastewater effluent. Management factors include on-site treatment, handling, storage, transportation, and ultimate disposition, in a program that capitalizes on the resource value of the sludge materials and avoids any environmental or health hazards.

Sludges have varying physical and chemical characteristics. Obviously, sewage-derived sludges differ from water treatment plant residuals. Sludges produced by different plants also vary, depending upon the nature of the original wastes and the type and degree of treatment given. Short-term variations in characteristics of sludges from a single source may result from sporadic industrial waste discharges, or from inflow and infiltration during wet weather.

In June, 1976, the USEPA published a draft of a proposed technical bulletin, entitled "Municipal Sludge Management." The text recognizes the complex problems associated with the disposition of wastewater treatment plant sludges, and their significant interfaces with air, land and water resources, human and animal health, and plant growth. The bulletin is intended to provide guidance on the factors which must be considered in reviewing plans and in preparing environmental assessments associated with the treatment and disposal of sludge. It offers a ready reference and a good summary of the problems which must be evaluated.

Under Section 405(a) of PL 92-500, as amended by PL 95-217, an NPDES permit must be issued under Section 402 for the disposal of sludge if any pollutants may enter navigable waters. The requirement also applies to the removal of in-place sludge from one location and its deposit at another. Under Section 405(d) which was added by PL 95-217, the USEPA is now required to publish regulations governing the disposal and utilization of sludges.

a. Wastewater Treatment Plant Sludges

These sludges, which are by-products of any of several treatment processes, vary widely in their chemical, biological, and physical composition, reflecting the nature of the influent wastewaters and the methods of treatment employed. Table 7-1 provides a number of "typical" values and ranges for the chemical composition of raw and digested sewage sludge.

The heavy metals content of sludge is of particular concern. All wastewater treatment plant sludges contain heavy metals, but concentrations vary according to the nature of tributary wastes. Among the metals found in sludge, the following constitute potential environmental or health hazards: cadmium, chromium, copper, lead, mercury, nickel, and zinc. Relative to land application as a method of sludge disposal, it should be noted that some of the heavy metals (copper and zinc) are essential plant nutrients and are compatible in programs where sludge is applied as a fertilizer. However, too much of these metals, or excessive concentrations of metals not conducive to plant growth (such as cadmium and lead) may make the sludge toxic to plants and to animals which might consume the plants as forage or feed. This, in turn, may affect humans who may consume the animals.

Sewage sludges also contain varying amounts of nutrient materials such as phosphorus, nitrogen, potassium, along

TABLE 7-1: TYPICAL CHEMICAL COMPOSITION OF RAW DISGESTED SLUDGE

Item	Raw Primary Sludge		Disgested Sludge	
	Range	Typical	Range	Typical
Total Dry Solids (TS), %	2.0-7.0	4.0	6.0-12.0	10.0
Volatile Solids (% of TS)	60-80	65	30-60	40.0
Nitrogen (N, % of TS)	1.5-4.0	2.5	1.6-6.0	3.0
Phosphorus (% of TS)	0.8-2.8	1.6	1.5-4.0	2.5
Potash ($K_2 0$, % of TS)	0-1.0	0.4	0.0-3.0	1.0
pH	5.0-8.0	6.0	6.5-7.5	7.0
Alkalinity (mg/liter as $CaCO_3$)	500-1,500	600	2,500-3,500	3,000

with trace metals such as copper and zinc, which can aid plant growth. As shown in Table 7-1, typical percentages of phosphorus, nitrogen, and potassium are very low. In some cases, therefore, the value of sludge as a fertilizer is not worth the cost of hauling it to the application site. However, even sludge low in nutrients may be a good soil conditioner. Furthermore, alternative disposal methods are usually more expensive than land application.

Raw sewage sludges also contain pathogenic organisms, including bacteria, viruses, and intestinal worms which are usually destroyed when the sludge is processed. Nevertheless, special care in the storage, handling, treatment, and disposal of sludge is necessary so that public health is protected.

Another basic characteristic which makes the handling of wastewater sludge difficult is its high moisture content. Prior to treatment, sludge may contain more than 95 percent water. Even after processing and drying, it may be 70 percent or more water.

The volume of sludge generated by a wastewater treatment plant depends on the volume and nature of the flow into the plant and on the type and degree of treatment applied. The higher the degree of treatment, the greater the volume of sludge.

b. Septage

The sludge left in septic tanks typically contains high concentrations of BOD and suspended solids and may contain quantities of inorganic materials. Toxic substances may be present if the system serves an industrial establishment.

The biggest problem associated with septage is final disposal. Application on agricultural land is not always possible. Septage can be transported to conventional wastewater treatment plants, gradually mixed with the plant's normal wastewater flow, and processed. However, the operators of most plants do not like to accept septage for treatment for several reasons. One reason is that septage is anaerobic, while most treatment plants use aerobic processes. Operators are also reluctant to accept loads for fear that industrial waste sludges may be mixed in the same load, which could cause plant upsets.

c. Water Treatment Plant Sludge

The characteristics and amounts of sludge generated by water treatment plants depend on the quality of the raw water source and the types of processes and chemicals used in treatment. As a rule, unless the raw water sources are heavily polluted, the residues from water treatment processes are primarily inorganic, consisting of fine sand or silt plus the chemicals used in treatment. They are

stable, and can be disposed of with little risk of environmental damage.

7.02 ALTERNATIVE METHODS OF DISPOSAL

Prior to final disposal, wastewater sludges must be treated so that their disposal will not create environmental problems. Typically, wastewater sludges undergo these treatment processes:

- Thickening, to reduce the volume of sludge that must be handled in subsequent steps;

- Stabilization, to reduce odors and other offensive properties;

- Conditioning, to make the sludge more amenable to the dewatering process that follows;

- Dewatering, to remove moisture and change the sludge from a liquid to a solid or semi-solid;

- Drying, to further remove water and reduce volume.

After these processes, treatment plant operators must dispose of the treated sludges using any of several processes that fall into one of two general categories: utilization or disposal. Utilization generally is the preferred disposal method where it is technically and economically feasible, because it recognizes the value of sludge as a resource. The nutrients in sludge are returned to the environment, to improve soils or to fertilize crops, orchards, nurseries or grasslands. Utilization programs generally involve land application of treated sludge, the use of sludge in land reclamation, or the sale or giveaway of sludge to the public.

a. Land Application

Land application is the controlled distribution of liquid sludge, sludge cake or sludge products (such as compost) on the land so that soils and/or crops can benefit from the nutrients and organic matter in the sludge. When liquid sludge is applied, the soil acts as a filter separating the solids from the liquid portion and thereby treating the liquid before it reaches the groundwater. Sludge solids, including cake or compost, increase the humus content of soil and loosen the soil particles, making soil easier to work.

The presence of nitrogen, phosphorus, trace metals and heavy metals in sludge must be considered in land application programs. Nitrogen is present in sludge in both

organic and inorganic forms. A portion of the organic nitrogen will decompose to ammonium and eventually become available to plants. The inorganic nitrogen is immediately available to plants. (See Section .050.(2) for a further description of these processes.) The extent to which phosphorus in the sludge is available to plants is a function of chemical reactions within the soil. As the phosphorus in solution in the soil is depleted by plants, additional phosphorus in the soil goes into solution to maintain the phosphorus equilibrium. However, all phosphorus introduced into the soil in sludge application is taken up by plants.

The nutrient value of sludge is relatively low. Almost half of the nitrogen and potassium in digested sludge is in the liquid phase. Thus, drying and dewatering can decrease these nutrients significantly. In addition, the ratio of potassium to nitrogen and phosphorous is low in relation to crop needs. Therefore, the use of digested sludge should be accompanied by the application of supplementary potassium. The nutrient content of a digested mixture of primary and activated sludge, containing 25 percent solids by dry weight, would have a nitrogen content of between 3.5 and 6.4 percent, a phosphate content of between 1.8 and 8.7 percent and potassium content of between 0.24 and 0.84 percent.

Most sludges contain heavy metals, some of which can be toxic to plants. More importantly, these metals may be taken up by plants and concentrated to levels harmful to animals and humans consuming the plants. Cadmium is of particular concern in this regard.

A proposed USEPA regulation on cadmium will have a significant impact on the future disposal of industrial sludges, and sludges from municipal plants which process industrial wastewaters. The draft regulation was published in the Federal Register of February 6, 1978 as 40 CFR 257, and is titled "Criteria for Classification of Solid Waste Disposal Facilities." The USEPA has proposed certain limits on the annual and maximum accumulative amounts of cadmium which can be applied to a hectare of land, as well as maximum concentrations of cadmium which will be permitted in the sludges. Other criteria described limitations on the cation exchange capacities of soils on which sludges may be applied, the pH ranges, and crops which may or may not be grown under specified conditions. Where cadmium is present in sludges applied to agricultural lands, contingency plans must be prepared which are to be put into operation if cadmium levels in crops or meat products exceed those in similar products produced locally on other sites.

In Illinois, land application programs can use only stabilized sludges. Current state policies also limit sludge applications to agronomic rates, which means that the amount of nutrients applied should equal the amount required by the crop. For sludges with high trace metal concentrations, application rates are further limited by these metals.

Land application has been practiced on croplands, golf courses, forested areas, and landscaping programs. Because of transportation costs, the feasibility of this method usually depends upon the proximity of potential land application sites to the treatment plant. Public acceptance of the operation also is critical.

b. Land Reclamation

Because of its high alkalinity and organic content, processed sludge is ideal for reclaiming mined-out areas. This has been demonstrated at several places, including Fulton County, Ill., the site of the MSDGC's "Prairie Plan." Other reclamation programs use stabilized and/or composted sludge as a topsoil at landfills and construction sites.

c. Public Use

Sales and give-away programs are feasible where sludge has been treated to produce a safe and publicly-acceptable end product. Give-away programs such as the MSDGC's Nu-Earth or Philadelphia's "Philorganic" programs provide an unpackaged sludge product (air dried, stabilized sludge in Chicago, composted in Philadelphia) to the general public for use as a soil conditioner. Among several marketing programs is one in Los Angeles that uses chemically fortified, composted, dewatered sludge, and one in Milwaukee that uses heat-dried, raw sludge. In both programs, sludges are fortified and processed into high value soil conditioners or fertilizers and are sold to the general public through retail outlets.

d. Landfills

There are many reasons why the utilization of sludges, although it is preferred, may not be possible. If heavy metal or toxic material concentrations are very high, as in some wastewater sludges from industrialized communities, it may not be environmentally safe to utilize the material as a resource. In other cases, there may not be enough suitable land available within reasonable distances to allow the economical operation of any application program, even if the sludge contents are suitable. In some areas, lack of public demand makes it difficult to market or even give away all of the sludge at the treatment plant or other outlets. Where reduction processes such as incineration have been used, sludges are stripped of their organic content and much of their nitrogen content. The resulting materials may be high in phosphorus and trace metals, but because they lack the beneficial qualities associated with organics and nitrogen, it usually is difficult to utilize them. In these

situations, disposal is the only alternative, and sludges generally are deposited in a landfill, either one used only for sludge, or one used for a variety of solid wastes.

Hazardous wastes should be clearly identified and segregated by type and chemical characteristics so as to prevent undesirable or dangerous reactions. It is thus necessary sometimes to detoxify these hazardous products before they are handled for disposal. This usually involves thermal, chemical, or biological processes. Chemical fixation is one such method which may involve proprietary products and methods developed by several companies. Through the admixture of neutralizing chemicals, solidification occurs within a short period of time, following which the wastes can be more readily disposed of in special or conventional landfills.

In the final analysis, it may be necessary to encapsulate the wastes in concrete, asphalt, plastic or metal containers which are then stored in safe places or buried.

Special precautions must be taken in the design and operation of landfill sites used for the disposal of sludges. In order to protect groundwater from landfill leachate containing contaminants from the sludges, several factors should be considered: landfill site typography, geology, and soil conditions. All of these can influence leachate production or the potential for leachate to enter groundwater.

In Illinois, sludge disposal is allowed only in specially-permitted facilities where site conditions and operating procedures are favorable and controllable.

e. Other Methods

Other processes for wastewater sludge disposition include incineration, composting, pyrolysis and deposition in lagoons.

(1) Incineration: Incinerators have been used widely in the past, although stricter air pollution control requirements have limited the feasibility of this method in recent years. Capital and operating costs are high, as are energy requirements. Following combustion, an ash residue must be disposed of, usually in landfills.

Multiple hearth furnaces and fluidized incinerators are the primary types used. It should be recognized that undigested sludge has a higher heat value than digested sludge, and the former can be incinerated with less supplementary fuel. If dewatered to at least 30 percent solids, the incineration process is self-sustaining after combustion is first started. Municipal sludge has a heat value of approximately 10,000 BTU's per pound of dry solids.

Incineration has the tendency to vaporize various heavy metals, pesticides, and PCB's which may be present in the sludge. Mercury and cadmium in particular may be released to the air and then subsequently returned to the earth's surface via dry fallout or wet washoff. However, sophisticated incinerators may be able to break down these pollutants and limit their reentry into the environment.

(2) Composting: In composting, sludge is converted to a humus-like material suitable for use as a soil conditioner. This practice has not been widely implemented in this country to date, and is used at only three sites in northeastern Illinois.

(3) Pyrolysis: Pyrolysis is a process by which solid organic matter is heated in an oxygen-void or oxygen-controlled atmosphere. By-products of this process include a gas and/or a liquid which may have sufficient value for use as supplemental fuel. Pyrolysis is not yet used except in pilot projects, but may eventually prove to be a feasible sludge disposal method, especially where sludges can be combined with municipal refuse.

(4) Lagoons: Lagoons are sometimes used for the ultimate disposal of sludges. They may be natural depressions which have been improved to receive the residuals, or they may be man-made. The Metropolitan Sanitary District of Greater Chicago has large lagoons near its West-Southwest and Calumet wastewater treatment plants, where sludges have been deposited over the years. While often used as permanent disposal sites, sometimes they are dredged or excavated if disposal space is available at another site to receive the aged sludge. The MSDGC has had a program to reclaim several such lagoons in order to provide space for its current production. As might be expected, extreme care must be taken to ensure that groundwater is not polluted by lagoons. Localized odor problems also have been encountered at some lagoon facilities situated near populated areas.

f. Water Treatment Plant Residues

The types and amounts of sludge generated by water treatment plants depend primarily on the raw water source, the treatment processes involved and the chemicals used. Many of the methods applicable to sewage sludges also apply to the treatment and disposal of water treatment residues.

Water treatment plant sludges usually result from chemical coagulation, lime-soda softening, iron removal, and filtration. Plants generally use filtration and either coagulation or a softening process. Generally, the sludges

from all processes are collected and combined. Until recent environmental regulations prohibited the practice, water treatment sludges generally were discharged back into surface raw water sources without treatment. Today, a number of other methods are in use, but none as yet has gained universal acceptance. At present, however, the following appear to be the most promising methods:

--Gravity thickening, in settling tanks for high quality raw waters or in separate thickeners for poorer quality raw waters;

--Chemical conditioning, generally with lime or polymers. Acid conditioning is used for coagulant recovery processes;

--Dewatering, in drying beds or lagoons if land area is available, otherwise using filter presses. Vacuum filters are generally used for lime sludges and for alum recovery from other sludges.

After the selected treatment process has been completed, water treatment sludge generally is disposed of in a sanitary landfill or discharged to a local sewer. In some cases, the sludge is thickened at the water plant and then transported or piped to a wastewater treatment plant for additional processing. The combination of processes used depends on the nature of the residual product.

There are relatively few practical methods for capturing the resource value of water treatment sludge. Sludges generated by water plants that must use high concentrations of coagulants (on the order of 100 mg/l) can act as a coagulant at a wastewater treatment plant of comparable hydraulic capacity. In order for such an operation to work, the flow of the water treatment sludge must be equalized. No slug doses can be introduced, or the balance in the wastewater plant will be destroyed.

Recently, a number of alum recovery processes have been developed for water treatment sludges. At this time, however, experience is too limited to justify immediate full-scale application.

Other possible uses of water plant sludges suggested by the American Water Works Association include:

*plasticizers in the ceramics industry

*constituents of bricks

*road stabilizing agents

*soil conditioners

*neutralizing agents for acid soils (lime sludges)

*sources of raw chemicals

None of the above proposals, however, can be applied without further research and development.

g. Septage

Septage comprises only a small fraction of the sludges generated in northeastern Illinois. The offensive nature of the material and the current lack of planning for its disposal, however, make it a matter of serious concern.

Disposal of septage is covered by the State of Illinois Private Sewage Disposal Licensing Code, which is administered by the Department of Public Health. It requires each licensed contractor engaged in sludge disposal to file with the department a statement of the place and method of disposing of domestic sewage sludge. Approved methods include:

--Conveyance to municipal sewers.

--Agricultural applications for crops that will not be eaten raw.

--Placement in sludge lagoons or drying beds.

--Incineration.

--Disposal in authorized sanitary landfills.

Under proper conditions, land application is an acceptable method of septage disposal. Use of this method is hampered, however, by the fact that it should be used only when soil and weather conditions are suitable. It is necessary, therefore, to provide storage facilities or alternate means of disposal when conditions prevent land application. Too often storage is provided at small, unsupervised sites, where operations do not always comply with environmental regulations. Many of the problems associated with this aspect of septage disposal could be overcome if there were large, well-supervised sites, perhaps with pretreatment facililties as well as storage capacity.

Septage also can be transported to wastewater treatment plants, where it is bled into the incoming raw wastewater, or mixed in during sludge treatment processes. When the former process is used, storage and pretreatment aeration facilities may be required. In both, screening and grit removal facilities are needed.

The choice between the two methods of incorporating septage is influenced by the type and size of the wastewater treatment plant. In general, processing the septage through the sludge treatment facilities appears to be the best procedure.

Special treatment plants for septage also can be constructed. Tests have shown that a high degree of treatment is possible using anaerobic-aerobic series processes. Other special processes also could be used, although the use of special plants for treating septage would be more costly than treatment at conventional wastewater treatment plants.

Additional information on the characteristics, utilization and disposal of sludge appears in the 208 Staff Paper No. 20 "Wastewater Treatment Processes and Cost Estimating Data" (April, 1977), and in 208 Staff Paper No. 30 "Regional Sludge Management Report" (March, 1978).

7.03 EXISTING AND PROJECTED VOLUMES

To obtain data needed to evaluate present and future sludge disposal practices and volumes generated, the Commission conducted an inventory of existing sludge sources, quantities, management systems, and disposal sites in the region. The sludges included in the inventory were those from municipal and industrial wastewater treatment plants, water treatment plants, and septic tanks.

Except in Cook County, the data were obtained from surveys conducted at the county level by county departments under contract with the Commission. For Cook County, the information was obtained by a private consultant through use of a questionnaire that was mailed to wastewater and water treatment officials. A detailed survey of industrial wastewater treatment plants in Cook County was not attempted, but some indication of the volume of industrial sludges generated was obtained from the operators of disposal sites. There are many industrial water softening and wastewater pretreatment plants in Cook County, however, and at least some of them dispose of their sludges on site. For this reason, the quantities reported here probably do not include all of the industrial sludges produced in Cook County.

Data on septic tank installations, for all counties except Cook, also were compiled by county agencies. Data for Cook County were compiled by the Commission. The inventories for DuPage, Lake, and McHenry counties included all septic tanks in those counties. The inventories for Kane, Will, and Cook counties included only areas in which groups of 35 or more persons (or population equivalents) were served by septic tanks. Scattered individual homes and farms, etc., were not included. Aggregate estimates of septage generated in the region were prepared on the basis of these inventories. The number of sources, and the amounts of sludge from each source are summarized in Table 7-2.

Estimates of future sludge volumes are presented in Table 7-3. More detailed information on the methodology by which the estimates were developed is contained in Staff

TABLE 7-2: ESTIMATED CURRENT (1976) SLUDGE GENERATION, NORTHEASTERN ILL.

Source	No. of Sources	Annual Quantity	
		Million Gallons	Tons, Dry Solids
Municipal Wastewater	211	3,529	279,300
Municipal Water	15	633	23,070
Industrial Wastewater	72	32	17,290
Septage	112,170	28	3,000
Total		4,222	322,660

Paper No. 30 referenced above. Estimates of future volumes were made only in terms of dry solids.

7.04 CURRENT SLUDGE DISPOSAL PROGRAMS

In the following description of current sludge management practices in the region, information is presented on a county-by-county basis in order to illustrate variations in local conditions.

TABLE 7-3. ESTIMATED FUTURE SLUDGE GENERATION, NORTHEASTERN ILLINOIS

Source	Dry Solids, (000's Tons)		
	1980	1990	2000
Municipal Wastewater	301.8	312.4	337.2
Municipal Water	26.2	31.0	33.2
Industrial Wastewater	21.9	27.3	32.1
Septage	3.6	3.6	3.6
Total	353.5	374.3	406.1

a. Cook County

Data from Cook County indicate that about 98 percent of the total sludge generated is from municipal wastewater treatment plants. About 99 percent of this wastewater sludge is stabilized by aerobic or anaerobic digestion, or by heat drying. About 40 percent is dewatered using vacuum filters or sludge drying beds. About 82 percent of the sludge from municipal water and wastewater treatment plants is applied to land, either directly or as a component of fertilizer.

Most wastewater sludge in Cook County is produced by the MSDGC, with smaller amounts being produced by the Sanitary District of Bloom Township and the Village of Homewood.

Several methods of disposal are used by the MSDGC. Sludge from lagoons at the Calumet Plant is landfilled. Sludge from the Hanover plant is applied to land at an adjacent experimental farm. Sludge from the District's Northside plant is sent to the West-Southwest Treatment Plant. There it is mixed with sludge generated at the West-Southwest Plant, treated, and disposed of (in 1977) as follows:

--Land application in Fulton County
- 38 percent (average: 162 dry tons/day)

--Disposal as "Nu-Earth"
- 30 percent (average: 130 dry tons/day)

--Heat Dried for fertilizer
- 32 percent (average: 138 dry tons/day)

Sludge from the Bloom Township plant is disposed of in an abandoned clay pit. Sludge from the Homewood plant is given away for use as a soil conditioner or deposited in landfills.

Water treatment sludges are generated at nine plants in Cook County. All of the sludge generated, except that from Park Forest, is discharged to MSDGC sewers for treatment and disposal. Sludge from Park Forest is disposed of in a sanitary landfill.

The amount of industrial sludge generated in Cook County exceeds 1,500 dry tons per year, not including sludges disposed of on-site or discharged to sewers. All industrial sludges that are not discharged to sewers are disposed of in landfills.

The largest landfill for sludge disposal in Cook County is the C.I.D. Landfill which accepts municipal sludge from the MSDGC as well as industrial sludges from many sources.

All septic tank sludge is discharged to MSDGC sewers, as required by the Cook County Health Department. A small amount probably is disposed of illegally or outside Cook County.

b. DuPage County

Data for DuPage County indicates that about 92 percent of the total sludge generated is from municipal-type wastewater treatment plants. About 85 percent of this amount is stabilized by aerobic or anaerobic digestion, and about 58 percent is dewatered on vacuum filters or sludge drying beds.

Wastewater sludges generated in DuPage County are used widely by county residents as fertilizer and soil conditioner. Removal by residents is the most widely used method of sludge disposal in the county, with 29 of the 59 sources of wastewater sludge reporting that this type of disposal program is in use.

Sludge disposal by landfills is practiced at only 6 plants; wastewater sludge from all other sources in the County is disposed of by land application. Sludge from the few industrial sources is disposed of by land application or is removed by scavenger services and deposited in landfills.

Four landfills in DuPage County accept sludge, including septage, and large amounts are exported to farms and landfills in adjacent counties.

c. Kane County

About 83 percent of the sludge generated in Kane County is from municipal treatment plants. Of that amount, about 83 percent is stabilized by aerobic or anerobic digestion, and about 82 percent is dewatered on sludge drying beds or vacuum filters.

Municipal wastewater sludge is generally removed by residents or deposited in landfills. Some, generated by smaller treatment facilities, is used in land application programs. The largest public-use program is operated by the Sanitary District of Elgin, the largest treatment authority in the County. Sludge from the St. Charles and Batavia treatment plants, is deposited in a landfill in the County. Sludge from the Carpentersville treatment plant is deposited in landfills in Cook County.

Water treatment sludge is generated at only one source, the City of Elgin Water Department treatment plant. This sludge is disposed of at a local gravel pit which serves as a landfill site.

Information regarding disposal methods and sites for industrial sludges from Kane County is incomplete. From the data available, it appears that the principal method of industrial sludge disposal is landfilling.

Overall, about 79 percent of the sludge from Kane County's municipal and industrial wastewater treatment plants is disposed of in sanitary landfills and the balance is applied to the land by individuals and onsite at some of the smaller plants.

Septic tank sludge is collected by scavengers and disposed of in landfills, on agricultural land, and at wastewater treatment plants. Some probably is disposed of illegally at other locations. Septic tank sludge comprises about 7 percent by weight of the sludge solids produced in the County.

d. Lake County

In Lake County, about 73 percent of the sludge from municipal and industrial wastewater treatment plants is stabilized by aerobic and anaerobic digestion and about 93 percent is dewatered on vacuum filters, centrifuges, or sludge drying beds.

The most common methods of sludge disposal are landfilling and removal by residents. Most of the landfilled sludge is generated by the North Shore Sanitary District (NSSD), which operates its own landfill. The municipal sludge used by the public is generated primarily by the smaller treatment plants in the County.

The Lake County Public Works Department transports sludge from several of its treatment plants to its New Century Town Treatment Plant, where the sludge is dewatered and then delivered to a private firm where it is dried, mixed with sand and peat, and sold as a soil conditioner. Some liquid sludge also is disposed of at a local nursery. The sludge from the County's remaining plants is removed by private firms and disposed of at other treatment plants.

About 83 percent of the total sludge from municipal and industrial wastewater treatment plants is disposed of in sanitary landfills. The rest is applied to the land by individuals, at farms or at nurseries.

Most industrial sludges are disposed of in landfills or by land application. The largest source of industrial sludge, Grayslake Gelatin, operates a landfill within the County. Other industrial sludges are disposed of at Lake Land Fill in Cook County, the Hillview Farm in McHenry County, and the Purves Sludge Farm in Lake County.

Septic tank sludge is collected by scavengers and hauled to the New Century Town treatment plant or to the NSSD Waukegan plant, or disposed of on agricultural land. Septic tank sludge comprises less than 2 percent by weight of the sludge solids produced in the County. Adequate disposal facilities are lacking, however, and septage disposal is a serious problem in the county.

e. McHenry County

In McHenry County, nearly all sludge from municipal wastewater treatment plants is applied to land or removed and used by residents. A small amount is composted prior to use. Most of the sludge removed by residents is from the

Lake-in-the-Hills treatment plant. Land application is the major disposal method used by other treatment authorities in the County, and several farms serve as disposal sites for municipal sludges.

Industrial sludges are disposed of by landfilling, land application, and removal by scavengers.

Most septic sludges are applied to agricultural lands; small amounts are collected by scavengers and hauled to the Terra Cotta Realty treatment plant or to the Mallard Lake Landfill in DuPage County for disposal. Other treatment plants accept septic tank sludge on an irregular basis. Septic tank sludge comprises about 25 percent by weight of the sludge solids produced in the county.

A prototypical agricultural site where municipal sludge and animal wastes are used in an intensive way is the Hillview Farm, in McHenry County near Richmond. Combined with a cattle and hog feeding operation, the facilities include a one million gallon underground storage tank, above which as many as 1,500 head of cattle are housed on slatted floors, thus permitting their wastes to immediately drop into the tank. The farm also has about 2,500 hogs. The wastes from these animals, together with such domestic and industrial sludges as are received, are combined in the underground tank. The liquid from the tank, which is applied to agricultural lands in season, is reported to contain nutrients equivalent to fertilizers which otherwise would cost between $35 and $40 per acre.

f. Will County

In Will County, about 61 percent of the sludge generated is from municipal wastewater treatment plants. About 53 percent of this is stabilized by aerobic and anaerobic digestion and about 93 percent is dewatered on vacuum filters or sludge drying beds.

The three major methods used to dispose of municipal sludge are removal by residents, land application, and landfill. The largest amounts of sludge are used by residents. Sludge disposal by land application is practiced by the smaller treatment plants, which supply sludge to farmers for agricultural use. Sludge from some larger treatment plants, including Joliet and Crest Hill, is deposited in landfills.

Almost all industrial sludges in Will County are landfilled at a privately-owned site near Joliet. According to available data, this landfill is the largest sludge disposal site in Will County. A small amount of industrial sludge is treated in lagoons or disposed of on-site.

About 54 percent of the sludge from Will County's municipal and industrial wastewater treatment plants is disposed of in landfills. About 38 percent is applied to the land or otherwise utilized.

Septic tank sludge is collected and disposed of on farm land and in landfills. Septic tank sludges comprise about 6 percent of the sludge solids produced in the County.

g. Summary of Disposal Methods

The most common thickening process is by gravity processes. Only three of the region's plants reported using dissolved air flotation, and there are no reports of centrifuges being used.

Aerobic digestion, the most commonly found stabilization process, is found at 131 treatment plants in northeastern Illinois. Anaerobic digestion is reported to be used at 59 plants. Imhoff tanks, an early form of anaerobic digestion, are used at 18 plants. About 88 percent (by weight) of the sludge generated, excluding water treatment plant sludge, is stabilized prior to disposal.

Drying beds are used at 110 plants and are by far the most common dewatering process utilized. Nineteen plants use lagoons for drying, another 19 report using vacuum filters and four report using centrifuges. No other dewatering processes were reported. About 47 percent (by weight) of wastewater sludge is dewatered prior to disposal.

Only three plants use composting as a reduction/drying process. One major MSDGC plant uses heat drying. No other reduction/drying processes were reported.

Sludge transportation methods were not specifically detailed in the data collected for the Commission, but it is known that much of the wastewater sludge (from outlying MSDGC or NSSD plants, for example) is pumped or trucked to larger, central plants for final processing and disposal. The MSDGC uses barges to haul liquid sludge to Fulton County for land reclamation, and railroads to haul heat dried sludge to Florida.

In the NSSD, tank trucks and a pipeline are used to convey liquid sludge to the District's Waukegan plant for dewatering. The dewatered sludge is then trucked to the NSSD landfill site.

Most sludge is hauled to landfills or other disposal sites by truck. Many small plants make dewatered sludge available to the public on-site or have on-site disposal programs, thereby eliminating the need for transportation.

About 69 percent of the wastewater sludge produced in northeastern Illinois is used in some way. Land application programs involve 60 wastewater treatment plants, and 55 other plants make their sludges available to the public.

An areawide summary of sludge disposal practices is presented in Table 7-4.

TABLE 7-4: AREAWIDE SUMMARY OF SLUDGE DISPOSAL PRACTICES

Methods	Dry Tons Per Year	Totals
Disposal		60,000
Landfills	35,000	
Lagoons	5,000	
Lake Michigan (water treatment plants)	20,000	
Utilization		222,000
Land Application	213,000	
Used by the Public	7,000	
Other Uses	2,000	
Transferral		41,160
Transported to other sites	41,000	
Sent to Other Treatment Plants	160	
Unknown Disposition		420
TOTAL		323,580*

*Does not agree with Table 7-2 because figures have been rounded

7.05 AREAWIDE PROBLEMS

Most of the sludge generated by wastewater treatment plants, water treatment plants and septic systems in northeastern Illinois appears to be receiving adequate treatment. This assessment is based on studies which show that nearly 90 percent of the sludge in the region is stabilized prior to disposal. With respect to sludge treatment, therefore, only localized problems need to be corrected. For example, some treatment authorities use energy-intensive processes such as vacuum filtration, aerobic digestion and air flotation in treatment operations. In some cases, it might be possible to achieve desired levels of treatment with less energy consumption by changing to other processes. The cost-effectiveness of this possibility can only be determined on a site-by-site basis.

Generally, the region's problems relate not to sludge treatment, but to the ultimate disposition of increasing volumes of sludge from all sources.

The disposal of septage is particularly troublesome. It is general knowledge, for example, that much septage is disposed of illegally, with resultant harm to the environment. While it often is difficult to discover and prosecute such actions, authorities commonly uncover evidence of sludge that has been dumped into a stream or deposited in an unauthorized area.

It is difficult to deal with illegal activities, but consideration should be given to improving the facilities available in the region for legal and safe septage disposal. As noted earlier, haulers of septage sometimes mix industrial sludges in the same loads. As a result, treatment plant operators refuse to accept the loads because of the risk that unknown materials in the industrial sludges will impede treatment plant operations. Another element of the septage disposal problem is that local governments, in general, have failed to provide adequate facilities for the disposal of septic sludge. This undoubtedly influences the number of unauthorized disposals.

An element of the residual disposal problem that is not yet receiving sufficient attention in the region is the projected 15 percent increase, by the year 2000, in the total volume of sludge generated annually. This increase will result from population growth, and also from the advanced treatment process which will become more common in the region as a result of Public Law 92-500 and this areawide plan.

Although the region has adequate disposal facilities for current sludge volumes, the long-term prospects are uncertain. Many of the landfill disposal sites now in use will be filled by the end of the century. At the same time, undeveloped land that might be appropriate for sludge disposal is becoming less available. Land that is available is expensive, and generally located at a distance from the facilities where the greatest volumes of sludge are generated.

The problem of increasing volumes, and uncertainties with respect to disposal facilities, is most serious with respect to the MSDGC, which generates most of the sludge in Cook County. For the past several years the MSDGC has transported large volumes of sludge by barge to Fulton County, Illinois as part of the "Prairie Plan." The sludge is used in a long-range program to convert mined-out areas into productive agricultural lands.

Even in larger sanitary districts and municipalities where current disposal programs are considered adequate for the next few years, long-range plans should be re-evaluated as part of the continuing areawide planning program. The installation of advanced treatment processes, as mentioned above, will result in greater sludge volumes. The problem will be complicated further where phosphorous removal systems are installed, because processes for phosphorous removal generate significant additional quantities of residual solids. While it is not possible to make a specific areawide assessment of the impacts of more advanced treatment, it is clear that the useful life of existing disposal sites will be reduced.

Ideally, all wastewater sludges should be applied to agricultural lands and other areas as soil conditioners and sources of nutrients. To the extent that such programs can be established, problems of limited landfill capacity are reduced. However, land application in agricultural areas cannot be regarded as an ultimate solution to all the region's residual disposal problems.

Because of the long winter season, alternative facilities must also be provided, preferably at larger and strategically located conventional wastewater treatment plants in order to receive septage at times when it cannot be applied to agricultural areas. Other treatment plants may need to receive septage generated in more urbanized areas which are distant from agricultural disposal sites.

The disposal of industrial sludges involves special problems for which solutions are not readily apparent. One problem is the nature of industrial sludges, which can be difficult to determine because of the reluctance of some firms to reveal what they may consider to be privileged information. Included in the category of industrial sludges are toxic, hazardous, high strength, exotic and conventional wastes. Despite the difficulties, there is a need to accurately determine the volume and the composition of sludge generated in manufacturing processes and in the treatment or pretreatment of industrial wastewater. There is a related need to more accurately identify the sources of toxic and hazardous residual waste products and their current, ultimate disposal sites.

Landfilling is suitable for most industrial sludges, and land application is suitable for many biodegradable industrial sludges. The landfills used for industrial sludge disposal are generally those used primarily for municipal solid wastes. If subregional landfills are established for municipal sludges that are unsuitable for use as a soil conditioner, these landfills should be designed to accomodate hazardous industrial sludges, also.

Substantial quantities of digested and dewatered or air-dried sludge are used by members of the public. Many small plants have active marketing or give-away programs, and the largest treatment authority, the MSDGC, dispenses large amounts of "Nu-Earth." These programs offer a suitable disposal alternative. However, some sludges are not appropriate for unrestricted use in flower gardens or landscaping projects, and consideration should be given to establishing subregional sites for their disposal. Application to agricultural land application should take place only under closely controlled conditions.

Treatment authorities that are having difficulty in disposing of dewatered or air dried sludge may find that composting increases public acceptance of the material. Because composting generally requires large land areas, and may cause some odor problems, the establishment of regional composting facilities at isolated sites should be explored. Composting should not be undertaken, however, until prototype demonstration projects have been completed successfully. Such projects are underway elsewhere in the country and could be developed on a test basis in northeastern Illinois.

Whenever land application of sludge is practiced, soil conditions and other environmental factors should be monitored. There is a danger that persistent trace elements or organic chemicals will create toxic conditions or will bioaccumulate. The preferred safeguard against such phenomena, as indicated above, would be the establishment of supervised regional sites for the disposal of toxic or hazardous sludges.

7.06 AREAWIDE PLANNING

For the areawide water quality management plan to serve as the vehicle by which water pollution control objectives are met in northeastern Illinois, the plan should recognize the significance of residuals and include a comprehensive regional program for residual disposal. Ideally, such a program, oriented toward maximum utilization of the resource value of residuals, and giving due consideration to hazardous or toxic wastes, would be included in this initial areawide plan. However, the Commission is not recommending a comprehensive regional plan for residuals at this time. This position is based on two factors:

- --the inadequacy of the time and money that the Commission was able to devote to the study of residuals in the initial plan development period,
- --recent changes in federal policy with respect to the disposal of residuals, as reflected in Public Law 94-580 (Resource Conservation and Recovery Act of 1976), and the Clean Water Act of 1977.

Public Law 94-580 governs the disposal of all solid wastes, which are defined in the law as "any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility...."

Public Law 94-580 does not apply to agricultural wastes, such as manures or crop residues that are returned to the soil as fertilizers or soil conditioners. Nor does it apply to the land application of liquid effluent from the treatment of domestic sewage. However, the law does apply to the land disposal of sludges resulting from wastewater treatment of plants. It also applies to the disposal of septic tank pumpings.

Under Public Law 94-580, statewide solid waste management plans are to be prepared. These plans are to address sludge disposal and the utilization of the resource value of sludge through land application and other means. The IEPA has applied for statewide planning funds. It is expected that policy guidance and regulatory procedures will be included in the state plan. which amended Public Law 92-500.

Under the 1977 amendments to Public Law 92-500, the USEPA is required to develop guidelines for the disposal and utilization of sludge by land disposal methods. Information on the cost of these disposal methods is to be prepared and made available. The USEPA also is to provide guidelines for incineration and other disposal methods, energy recovery, and for programs in which sludge is sold or given away.

The law requires owners and operators of publicly-owned treatment works to use or dispose of sludge in accordance with established guidelines. With respect to land disposal and land spreading, operators must comply with proposed criteria, which include: analysis of the sludge for cadmium and other toxic substances; assurance that the sludge has been appropriately stabilized; the determination of appropriate sludge application rates; and the determination of required monitoring programs.

Administrative criteria drafted to date and circulated by the USEPA as proposals, also state that treatment authorities must evaluate environmentally sensitive areas (such as wetlands, flood plains, and critical habitats) and assess their relationships to sludge disposal sites. The potential for impacts on waterways, groundwater, and groundwater recharge areas also must be studied.

In view of the factors discussed above, primarily the effects of recent legislation, the Commission recommends that the preparation of a regional sludge disposal plan be deferred until the activites mandated by Public Law 94-580 and the Clean Water Act of 1977 have been completed.

7.07 RECOMMENDATIONS

Although the preparation of an areawide sludge disposal plan is regarded as premature at this time, the region is experiencing some problems with residuals disposal. These problems may become more severe in the future as wastewater volumes increase and treatment processes become more advanced. Therefore, certain recommendations are appropriate in this initial areawide plan.

Sludge disposal in northeastern Illinois has been regarded primarily as a problem to be solved on a plant-by-plant basis. For most communities, this approach appears to be appropriate for the future. Some aspects of sludge management can be dealt with effectively on a subregional basis, however, and some of these are addressed in the recommendations that follow.

The recommendations set forth here are intended to provide guidelines for local officials with responsibilities for wastewater treatment. These recommendations also are intended to provide a foundation for the planning efforts, with respect to sludge disposal, that will take place in the continuing areawide planning program and in the statewide planning program for solid waste.

This plan includes the following recommendations:

a. Residual materials are a resource and should be utilized to the maximum extent possible in northeastern Illinois.

Treatment authorities should give highest priority to the use of sludge as a soil conditioner in agriculture, landscaping, gardening and land reclamation programs. For guidance in the development of programs for residuals utilization, it is recommended that local authorities consult the draft standards presented in the IEPA's Technical Policy WPC-3: "Design Criteria for Municipal Sludge Utilization on Agricultural Land."

b. To the extent that sludge materials must be disposed of rather than utilized, disposal should take place in sanitary landfills that have been designated by the IEPA as suitable.

c. Local authorities should ensure that maximum use is made of existing sludge management systems and disposal sites.

d. The preferred method for disposing septage is land application, and this method should be used wherever possible.

e. During periods of adverse weather, or in areas where land application is not possible, septage should be disposed of in wastewater treatment plants where special tanks can hold the septage for analysis and pretreatment aeration. Alternatively, the septage should be disposed of in approved sanitary landfills.

Specific treatment facilities should be designated by the IEPA to receive septage, on the basis of recommendations to be developed by the Commission during the continuing planning process. Procedures and criteria to be used in preparing these recommendations are described in Chapter Ten.

f. Septage that contains hazardous or toxic wastes should be deposited in landfills permitted by the IEPA as suitable for hazardous waste disposal.

g. The disposal of water treatment plant residues should be evaluated on a case-by-case basis. Potential methods include discharge to sanitary sewer systems for subsequent handling in wastewater treatment plants, as well as dewatering and disposal in sanitary landfills.

h. Sludges from industrial wastewater treatment, containing heavy metals or toxic materials in excess of limits acceptable for land application, should be disposed of in landfills that have received the appropriate state permits.

i. Sludge management should receive high priority in the statewide solid waste plan to be prepared by the IEPA under Public Law 94-580.

j. Any plan for the disposal of septage should provide for a sampling program to properly monitor the content of the septage being disposed of. At land application sites and sanitary landfills, groundwater monitoring also should be conducted.

CHAPTER 8

Areawide Management Framework

CHAPTER EIGHT: THE AREAWIDE MANAGEMENT FRAMEWORK

8.01 INTRODUCTION

a. The Need for a Management Framework

The Implementation of this areawide plan will require the efforts of more than 350 units of local government and an even larger number of private individuals and organizations. The preceding chapters of this plan have identified the specific responsibilities that various units of government must accept, and exercise, if the water quality control measures required in northeastern Illinois are to be implemented.

The designation of so many management agencies arises from a major areawide planning objective of the Commission: maximum use of the existing governmental resources of the region. Each of the designated management agencies identified in this plan possesses a portion of the legal, administrative, or financial capacity required for implementation. Many designated agencies already have effective water quality management programs, and replacement or duplication of these activities by other agencies would be unnecessary and wasteful. This is not to say that existing programs are sufficient to implement the areawide plan. Preceding chapters have recommended new programs, changes in legal authority, improved administrative practices, and more effective intergovernmental relations where such changes are essential to the attainment of water quality standards. Effecting these changes will not be simple. They can, however, be accomplished for the most part without the creation of new governmental agencies or the transfer of major authority from one level of government to another.

However, reliance on the existing governmental structure as the basis of the management system requires unprecedented areawide coordination to insure consistency and equity in the actions of the several hundred units of government and other institutions that make up the management system.

To a large extent, the areawide plan itself provides the necessary coordination. Insofar as management agencies implement their assignments under the plan, their actions will be correlated by their reference to the same objectives, standards and general recommendations. But the plan by itself is not an adequate coordinative mechanism. In formulating the initial areawide plan, it has not been possible to anticipate every particular implementation requirement. Many decisions on detailed implementation measures have been deferred to the continuing management process. Furthermore, the areawide plan will change as parts of it are implemented, as new water quality problems are identified, as knowledge of effective control strategies

increases. This is consistent with federal guidelines, which state that an areawide water quality management plan "should be a dynamic management tool rather than a rigid, static compilation of data and material."0

To satisfy this objective, there must be a coordinative areawide framework through which the implementing actions of individual designated management agencies can be monitored, their accomplishments and shortcomings assessed, and necessary corrective actions identified and agreed to. All these functions, by their nature, are beyond the capacity of individual local governments acting independently. Recognizing this, the Commission has formulated the areawide management framework described in this chapter. This framework, which is itself one of the principal recommendations of this areawide plan, is designed to fulfill these objectives:

(1) To insure that detailed water quality management decisions are consistent with the areawide plan, with applicable federal and state requirements, and with each other;

(2) To assure that implementation of water quality management programs is effectively coordinated and that conflicts among programs and actions are resolved;

(3) To provide for monitoring of the effectiveness of the plan implementation and for the enforcement of the plan as necessary;

(4) To assure that financial resources for water quality management are allocated in conformity with the requirements of the plan; and

(5) To provide for periodic review and revision of the plan, to take account of progress in implementation as well as changing conditions and opportunities.

b. Designation of Management Agencies

A majcr requirement of areawide planning, as the program is set forth in Public Law 92-500, is that management agencies must be designated by the Governor to implement the plan. This is to assure that specific agencies can be held responsible for the achievement of the goals and objectives of the plan. The designation requirement is not limited to agencies that will provide wastewater treatment or carry out other direct activities to improve water quality. According to federal regulations, all agencies responsible for carrying out any portion of a water quality management plan must be designated as management agencies. This includes, "agencies responsible for plan implementation by their own direct activities,

agencies responsible for overseeing the performance of any person or entity through regulatory or other means, and agencies that review or coordinate overall water quality management agency actions."

Consistent with this guidance, the areawide management program described in this chapter calls for the designation of the local governments responsible for direct water quality activities and for supporting or overseeing local agencies, and of the intergovernmental bodies included in the areawide management framework.

Although it is not proposed that private institutions be designated as management agencies, their efforts are essential to achievement of the plan's objectives. Industrial and commercial firms, residential developers, privately-owned utilities, homeowners groups, farmers and other citizens all will be affected in some degree by the actions of designated agencies under the areawide plan. In addition, specific supporting actions are required of the private sector in order for the plan to succeed. Assurance that these actions are taken, and that private actors receive necessary support, is a responsibility of the designated management agencies.

8.02 THE EXISTING MANAGEMENT SYSTEM

A variety of governmental agencies and intergovernmental institutions currently act to relate separate water quality management activities to each other and to broader frameworks of consistent policies and practices. These agencies and their activities have been described in several staff papers prepared as part of the areawide planning process. Major agencies and their responsibilities are described in Table 8-1.

All of the agencies and programs identified in Table 8-1 have places in an overall framework for water quality management in the region. Within this existing framework, great progress has been made in reducing point source pollution problems and in establishing standards and programs that can be applied in controlling nonpoint sources. However, attainment of the overall objectives of the Areawide Plan (see Chapter 2) and the management objectives outlined above requires that certain deficiencies in the existing framework be corrected. The most serious of these deficiencies are:

- Mechanisms for resolving conflicts among local plans and programs have been limited principally to state level regulatory actions and judicial intervention. Forums through which negotiated settlement of issues could be pursued have been limited to a few organized intergovernmental organizations.

- Adoption, administration, and enforcement of programs and regulations related to water quality management have varied widely among units of local government.

- Water quality management projects have been assessed from an areawide perspective only when they were submitted for federal funding and thus required consideration under the A-95 review process.

- State enforcement of water quality standards has been limited principally to point sources of pollution. Other major sources, notably those related to urban stormwater, have not been subjected to enforcement action, despite the existence of general statutory authority under which state enforcement proceedings could be instituted.

- Federal and state programs with potential benefits for nonpoint source control, such as the cost-sharing program of the ASCS, have not been administered with deliberate attention to their water quality implications.

The citing of these deficiencies should not be taken as an indictment of the agencies listed in Table 8-1. Limitations in technical knowledge, funding and personnel, and the demands of other problems, have prevented the existing management system from being as effective as it can be.

8.03 ALTERNATIVE MANAGEMENT FRAMEWORKS

Federal policy recognizes that different approaches to water quality management will be required in different regions. Guidelines for areawide planning cite three concepts on which an acceptable management framework could be based:

- one agency performing both planning and management;

- one planning agency and one separate management agency;

- one planning agency and multiple management agencies.

Furthermore, federal guidelines recognize that a variety of mechanisms, not just governmental consolidation, may be used to achieve a coherent areawide management process. Contracts, joint exercise of powers, delegations of responsibility, and the A-95 review process are cited as other ways of interrelating the management actions of independent agencies.

TABLE 8-1: EXISTING AGENCIES WITH AUTHORITY FOR GENERAL MANAGEMENT

Function		State	Regional and Subregional	Local
Program Supervision	– Monitoring	IEPA	NIPC Counties Sanitary Dists.	Sanitary Dists. Municipalities
	– Coordination	IEPA	NIPC Counties Sanitary Dists. Intergovt'al. Groups	Sanitary Dists. Municipalities
	– Enforcement	IPCB IEPA	Sanitary Dists. Counties	Sanitary Dists. Municipalities
Financial Management	– Financial Planning	IEPA	NIPC Sanitary Dists. Counties	Sanitary Dists. Municipalities
	– Allocation of funds	IEPA		
Continuing Planning	– Areawide	IEPA	NIPC	
	– Subregional		Counties Sanitary Dists. Intergovt'al. Groups	Municipalities Sanitary Dists. Soil and Water Cons. Dists.
	– Relate to Comp. Plng.		NIPC Counties Intergovt'al. Groups	Municipalities

Revised

Based on the Commission's experience in other areas of planning in the region, and on its knowledge of the governmental structure, it was evident at the start of areawide planning that as a starting point, the third general approach--one planning agency and multiple management agencies--was the most appropriate to governmental conditions in northeastern Illinois. This approach seemed most consistent with the Commission's objective of making maximum use of existing governmental resources.

A second premise taken as a starting point was that the objectives of areawide management and local responsiveness could best be reconciled in a multi-level management system. In such a system, responsibility for most water pollution control measures could be assigned to units of local government, within their existing authority and programs. Subregional intergovernmental bodies could be responsible for coordinating the actions of local governments, for resolving problems that went beyond local boundaries, and for reviewing and updating basin plans. An areawide management entity would monitor the region's overall progress, resolve problems that sub-regional bodies could not address, and supervise revisions of the areawide plan.

a. Alternatives Considered

At the areawide level, three alternative approaches were considered. These are described in detail in 208 Staff Paper No. 21: "208 Management Options," and summarized below.

The first approach called for a "federated" management agency. With this approach, areawide management would be assigned to a new areawide body composed of representatives of the subregional coordinating units. Organization would be by intergovernmental agreement among the designated management agencies. The federated body would set policy and coordinate implementation and management activities. As it was conceived, however, it would not be able to compel action by designated local management agencies or subregional units. Under this alternative, the areawide board could make recommendations to funding and regulatory agencies on the establishment of standards and the allocation of resources for implementing the areawide plan. The state would continue to enforce standards, allocate wastewater grants and coordinate with other states and other regions in Illinois. The Commission's role under this approach would be to provide technical support to the areawide management program and to coordinate water quality management with the rest of the regional planning program.

A second areawide alternative considered called for the Commission to oversee implementation and continuing revision of the plan. The Commission would be the areawide management agency, supported by an advisory committee of representatives from subregional management bodies, state officials, and citizens. The Commission would review water quality management actions proposed at the subregional level and resolve conflicts among subregional programs. It would advise the state on the establishment of standards and criteria, the allocation of construction grant funds, and the issuance of NPDES permits. The Commission would also organize and supervise the continuing planning process. Under this alternative, the state would retain all its current regulatory powers. State enforcement authority

would be expanded, however, to include the explicit responsibility to establish and enforce standards for nonpoint sources of pollution.

The third areawide management alternative considered involved an extensive delegation of management authority by the state to the regional level. A new areawide water quality authority would be established, by state legislation, to oversee plan implementation. The authority would be run by a policy board that included representatives of major designated management agencies, or subregional bodies. The regional authority would be authorized to resolve conflicts and to direct actions by designated management agencies. It also was envisioned, as part of this alternative, that the regional authority would allocate wastewater grants on behalf of the state, making such allocations on the basis of the adopted areawide plan. The authority also would advise the state on the issuance of NPDES permits. It would manage the annual plan review and update process, subject only to advisory review by the Commission. Local accountability would be provided through an advisory committee of representatives of local management agencies and citizens.

b. Assessment of Alternatives

The three areawide alternatives--the federated agency, the Commission as lead agency, and the regional water quality authority--were assessed in two ways. First, an assessment matrix, based on the proposed goals and objectives for areawide planning, was applied. The results of this assessment are presented in 208 Staff Paper No. 21 and summarized in Table 8-2. The first and second alternatives ranked about the same on most counts. The regional authority alternative stands out because of its high rating on its ability to insure consistency and equity.

The second assessment of the three alternatives involved a wide distribution of Staff Paper 21, with invitations to recipients to submit critiques or recommendations. The three alternatives presented in the paper were discussed with the Commission's Areawide Planning Advisory Committee, the Local Steering Committees, local officials, and technical advisors to the areawide planning project. The results of these discussions were considered by the Commission's staff in the development of a single areawide alternative that combined elements of the first two of the alternatives described above. This single alternative was described in 208 Staff Paper No. 24: "An Institutional Framework for Water Quality Management in Northeastern Illinois," which also was distributed and discussed widely. During the course of these discussions, the alternative was refined.

TABLE 8-2: SUMMARY ASSESSMENT OF ALTERNATIVE MANAGEMENT SYSTEMS

System Attribute	Inter-gov'tal Board	State/ NIPC	Regional Authority
1. Ability of the management system to assure required levels of consistency and coordination in implementation	Medium	Medium	High
2. Implementability of the management system within existing law and intergovernmental relations	High	Medium	Low
3. Implementability of the system within existing governmental structure without increasing its complexity or redundancy	Medium	Medium	Low
4. Ability of the system to impose costs of implementing the plan equitably	Low	Medium	High
5. Accountability of the system to local government	High	Medium	Low

The refined management framework was included in the draft 208 plan which was released for public review and comment in May, 1978. Also included in the plan document were three alternative management proposals prepared in response to discussion of Staff Paper No. 24.

- The League of Women Voters, the Metropolitan Housing and Planning Council, and the Barrington Area Council of Governments proposed a framework based on drainage basin forums and a new areawide water quality council.

- The Metropolitan Sanitary District proposed that it be designated as the management, planning, and coordinating body for its jurisdiction, advised by basin-oriented Management Area Advisory Committees.

- The City of Geneva proposed a framework based on drainage basin councils and an areawide council of basin representatives.

In public hearings on the draft plan, over 100 local governments, private organizations, and citizens commented on the proposed management framework and the several alternatives. Comments included both broad concerns (such as that the proposed framework represented a new level of government) and suggestions as to specific points. In addition, several additional management frameworks were proposed. The DuPage County Mayors and Managers Conference proposed substantial revisions to a countywide

intergovernmental management system. The Village of Palatine, the Sanitary District of Bloom Township, and Lake County proposed basin-oriented frameworks with flexibility for response to local intergovernmental arrangements. The Tri-Village Commission proposed a system based on existing institutional arrangements. McHenry County proposed a framework combining countywide committees and drainage basin forums. These alternatives, as well as those included in the hearing draft of the plan, are outlined in the Summary of Public Comments prepared by the Commission at the conclusion of the public hearings.

It was evident on the basis of the public hearing record that no single alternative management framework enjoyed general support. Each, however, contained features on which there was substantial agreement. A summary matrix of the various alternatives was prepared to provide a graphic portrayal of these areas of consensus. Amendments to the draft plan embodying these agreed elements were then prepared and reviewed with project participants. Some represented substantial conceptual changes from the framework included in the draft plan, while others were matters of detail or clarification. The 208 management framework described in the remainder of this chapter represents the result of this effort to consolidate the best features of the various alternatives.

8.04 RECOMMENDED AREAWIDE MANAGEMENT FRAMEWORK

a. Overview

The Commission recommends that areawide water quality management be directed through a three-level areawide system incorporating both existing and new institutions. In this system, existing units of local government will be linked through intergovernmental structures at the countywide or subcounty level and through the Commission, which will serve as the areawide coordinating body. The state of Illinois, through various agencies, will use its existing authority to set and enforce standards, issue permits and allocate wastewater grants and other resources. The recommended framework is consistent with the overall objectives of the areawide plan (See Chapter 2). It is based on five policies, each of which derives directly from plan objectives:

(1) Local governments will have the primary responsibility for implementing technical provisions of the areawide plan and for coordinating implementation efforts among themselves. Local governments also will aid in identifying and correcting deficiencies in the plan.

(2) No new level of government will be interposed between local governments and the state, or between existing units of local government.

(3) The management system will provide cooperative forums through which management agencies can communicate and reach joint decisions on management matters, resolve conflicts or refer them to higher authorities for resolution, and monitor progress in implementing the water quality plan.

(4) Ultimate legal responsibility for the attainment of areawide plan goals will continue to rest with the state. The state will delegate major responsibility to local governments by certifying the plan, but it must retain the ability to set water quality and performance standards and enforce them.

(5) The continuing plan review and revision process will maximize local government involvement.

In Table 8-3 the types of agencies comprising the management framework are identified and their responsibilities are described. The basic relationships among these agencies are depicted in Figure 8-1. It should be noted that certain agencies, particularly at the state level, act under the authority of federal laws, programs, and funding arrangements even though no federal agencies are identified in Table 8-3 as designated elements of the management framework.

In the next sections, the organization and functions of each major management element--local, subregional, regional, and state--are described in detail. In each case, specific policies and actions are recommended.

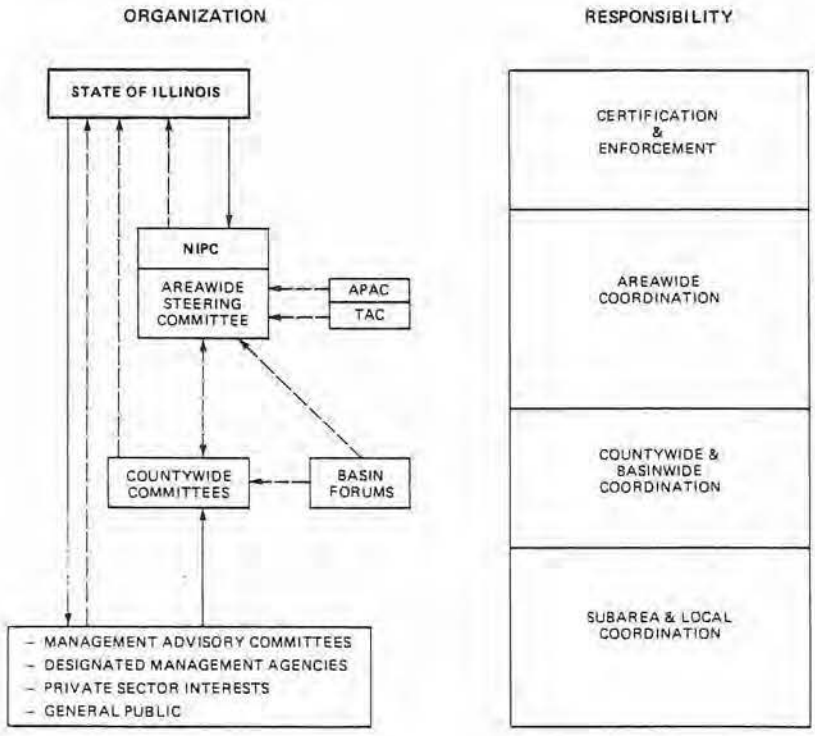
TABLE 8-3: DESIGNATED MANAGEMENT AGENCIES AND RESPONSIBILITIES

RESPONSIBILITY	DESIGNATED MANAGEMENT AGENCIES
1. Implementation of Control Strategies	
A. Wastewater treatment, pretreatment programs, other point source controls	Municipalities, sanitary districts, county departments designated as waste treatment authorities
B. Urban stormwater management	Municipalities, counties, MSD
C. Agricultural source management	Soil and Water Conservation Districts, Illinois Department of Agriculture
D. Regulation of on-site disposal systems	Counties, municipalities, Illinois Department of Public Health
2. Implementation Programming, Funding	
A. Annual implementation programs	County Water Quality Committees, NIPC
B. Coordinate implementation programs	County Committees, NIPC
C. Certify implementation programs	IEPA
D. Fund implementation activities	Local management agencies, IEPA, ASCS, SCS
3. Coordination and Enforcement	
A. Coordinate implementation activities	County Committees, NIPC
B. Water Quality monitoring	IEPA, waste treatment authorities
C. Negotiated conflict resolution	County Committees, NIPC
D. Enforcement proceedings	Local management agencies, IEPA, IPCB, courts
4. Continuing Planning	
A. Annual plan review, revision	NIPC, County Committees, with technical and public advisors
B. Develop standards, rules	IEPA, IPCB, IIEQ
C. Relate 208 to comprehensive planning	Municipalities, county planning agencies, NIPC

b. Local Management Agencies

It is recommended that more than 350 local governments be designated by the governor as management agencies. As such, these local governments will have primary responsibility for managing wastewater collection and treatment systems, and for providing the public services and regulatory controls required by the water quality strategies recommended in this plan. Agencies to be designated include the municipalities and counties (acting through one or more of their component departments), sanitary districts, townships, and soil conservation districts in northeastern Illinois. Other special purpose units of government have been designated to exercise specific responsibilities under one or more drainage basin plans. All the designated local agencies are identified in the Appendix to this chapter and in each basin chapter.

FIGURE 8-1: GENERAL FRAMEWORK FOR MANAGEMENT COORDINATION AND CONTINUING PLANNING



Revised

The general responsibilities of local management agencies, and some of the actions to be taken by them, have been discussed in preceding chapters. Additional discussion of their specific assignments, and their relationships with other agencies, will be found in the basin chapters which follow.

In addition to designation in this plan, federal regulations require that a "management agency implementation statement" be developed for each designated agency. The implementation statement must stipulate all new, modified, or critical on-going functions which the agency will perform in implementing the areawide plan. The statement must be accepted by the policy body of the designated agency as an indication that it accepts its responsibility under the areawide plan. Implementation statements will be prepared by the Commission, on the basis of this areawide plan, and submitted to designated agencies for review and endorsement.

Federal regulations state that the Regional Administrator of USEPA will not accept any management agency designation where the required implementation statement is not available. The regulations also state that local agencies may condition their acceptance of management responsibility if it is anticipated that the plan may be modified prior to final certification by the Governor. Management agencies may wish to make their acceptance effective only for a limited (one to three years) period, to assure themselves the opportunity to assess their responsibilities in light of their resources and other commitments.

It is important that implementation statements be reviewed periodically as part of the plan revision process to assure that their terms are being met and that they remain consistent with the plan. Each management agency designation should be reviewed every three years and a recommendation made to the Governor that the designation be renewed, modified, or withdrawn. Where withdrawal of a management designation is recommended, another agency must be identified to carry out the relevant portions of the plan. The triennial review and redesignation process should also be applied to agencies or bodies designated to perform coordinating and continuing planning functions, including the countywide committees and the commission. Reconsideration of any designation could be undertaken between regular triennial reviews if necessary.

County and municipal governments are being asked to assume a variety of responsibilities for both point and nonpoint source controls. In many cases, it is recommended that subordinate administrative units (i.e., county departments of public health) be responsible for particular functions. In some instances, particularly at the county level, such recommendations reflect state law providing for the establishment of these departments and agencies.

Recommendations that refer to specific administrative units are intended as guidelines rather than mandates. The designation of any local government as a management agency applies to that unit of government's principal policy body (e.g. city council or county board). The choice of particular administrative units to implement assigned responsibilities should be made by the policy body, although the recommendations of the areawide plan should receive strong consideration.

Designation as a management agency in the areawide plan does not by itself grant a unit of government any new legal status or any statutory authority it does not already possess. In some instances, local governments may be called on to undertake activities which they have not heretofore performed, but which are implicit to their constitutional and statutory enablements. Except as otherwise noted in preceding discussions, designated local management agencies can perform their assigned water quality responsibilities within the existing body of law governing their activities. By the same token, designation does not authorize them to go beyond that existing legal authority or to take actions which they otherwise could not take. Only with respect to federal construction grants for wastewater facilities does designation alter the status of any local government. Once the areawide plan has been certified by the governor and accepted by USEPA, only an agency designated in the plan as a management agency is eligible to receive grants for construction of publicly owned treatment works under PL 92-500, Sect. 201(9) (1) as amended. In some instances identified in the preceding chapters, or in basin chapters, the implementation of the areawide plan will require intergovernmental contracts or agreements among local governments. This will be true where there is a need for joint provision of services or where one government will be responsible for providing a common service. These agreements are of particular importance where there will be consolidated wastewater service, as called for in certain local facilities plans. The need for such agreement is identified in the assessments of local facility plans, which were prepared by the Commission and included in the supplemental materials in support of this plan.

Recommendations

(1) Each local government that will be responsible for implementing water quality measures identified in this plan should be formally designated by the governor as a management agency.

(2) Designation of management agencies shall be by specific notification by the state to each designated agency.

(3) Designation should be granted to each unit of government through its policy body.

(4) Designation of a management agency will be made conditional on the satisfactory completion and execution of any contracts or agreements required to implement the provisions of the areawide plan and the applicable local facilities plan.

(5) Where interagency contracts are required to implement the plan, the IEPA should approve no Step 2 funding (under Section 201) for detailed engineering in the absence of formal resolutions by the affected governments. IEPA may waive this requirement in exceptional cases where a project segment is cost-effective and can proceed prior to all parties passing required resolutions or contracts.

These resolutions should identify areas to be covered in the contract or agreement and establish a timetable for its completion.

(6) The IEPA should approve no Step 3 grant for construction until the necessary contracts or agreements have been entered into by the policy bodies of the units of government concerned. IEPA may waive this requirement in exceptional cases where a project segment is cost-effective and can proceed prior to all parties passing required resolutions or contracts.

c. Countywide Water Quality Committees

A basic premise of this plan, particularly with respect to control of nonpoint sources, is that local governments will make the commitments and take the actions that are necessary to control water pollution. That is why the plan stresses voluntary implementation with little change in institutional arrangements. That also is why the Commission recommends that new state regulatory authority, although it should be fully developed, be applied with restraint until local governments have had a chance to perform. Existing regulatory programs should, of course, continue.

To assume that reliance on voluntary implementation at the local level will be totally adequate, however, would be unrealistic. The areawide management system includes several hundred designated agencies, each unique. Within this system there always will be a wide range with respect to local priorities, local resources, local commitments to intergovernmental cooperation and local attitudes with respect to water quality. There will be conflicts. Moreover, because local agencies are participating in the implementation of plans designed to solve what are

ultimately areawide problems, there will be questions of equity to be resolved.

One way to overcome the problems created by the number and variety of management agencies would be to require all agencies to conform to one program based on one set of priorities. This probably could be accomplished through a strong state system of standards, permits, and enforcement. The Commission does not support immediate implementation of this rigid regulatory approach. Primary coordination of the implementation activities of local management agencies should come through intergovernmental bodies formed by the management agencies themselves. The spirit of the 1970 Illinois constitution, which emphasizes home rule and intergovernmental cooperation, requires that this approach be given an opportunity to succeed before more directive measures are applied. While the Commission recommends that state regulatory programs for both point and nonpoint sources be established and maintained, these should be considered secondary mechanisms for implementing the plan.

Two principal intergovernmental bodies are included in the recommended areawide management framework. Together they make up the middle tier of the three-level system. One of these bodies is the Commission. The other is an advisory intergovernmental committee to be established at the countywide scale in each county. These advisory groups, the Countywide Water Quality Committees, will be established and function in accordance with the following guiding principles:

(1) The countywide management system will function strictly in an advisory capacity to provide coordination for water quality management activities in the county area.

(2) The countywide committee should not be a new agency or a new layer of government. The countywide committee will have no regulatory authority. It will not have power to enforce water quality standards or the 208 plan. This will remain the State's responsibility.

(3) The selection of the membership of the countywide committee should be made by agreement among the elected or appointed officials of the designated management agencies within the county keeping in mind the requirements of reasonable permanency, personal interest in the objectives of the 208 program, and the ability to provide adequate technical or political input.

(4) The countywide committee is not intended to be an enforcement agency. It will not have the capacity to require compliance with the areawide plan by local governments. It will provide service to local governments and/or the general public and serve as a

forum through which local governments can improve their water quality management programs.

(5) The countywide committee will not have authority to overrule local land use decisions. It may report to local management agencies on the consistency of major proposed land use changes with the adopted 208 plan. Local elected or appointed officials will retain control over the decision-making process of implementing the 208 plan. Local units of government will retain currently vested authority to make land use and wastewater management decisions.

The proposed responsibilities of the countywide committees, the manner in which they will be established, and the possibility of creating subcounty management advisory committees are outlined in the following sections.

Major Countywide Coordinating Responsibilities

Four major coordinating responsibilities must be performed throughout each county area. Each involves a number of subordinate functions. These responsibilities are assigned to the countywide water quality committees. Where local governments choose to establish subcounty management advisory committees as outlined below, these responsibilities will be divided between the subcounty and county levels.

(1) Facilitate or assist in preparation of an implementation program by designated local management agencies in the County.

(2) Provide information and opportunities for review needed by local agencies to effectively coordinate water quality management activities.

   (a) Serve as a clearinghouse through which designated management agencies can comment on actions or proposed actions of IEPA or USEPA affecting them.

   (b) Provide a vehicle for management agency participation in water quality management and implementation of the areawide plan.

   (c) Review State and local summary reports on water quality monitoring, facilities construction and operation, and nonpoint source control implementation; and prepare an annual report on plan implementation progress in the County.

(d) Develop a system for reviewing for local management agencies the consistency of major proposed land use changes with the adopted 208 plan.

(e) Serve as a forum for the discussion of intergovernmental agreements, model ordinances, and other implementing measures required under the areawide plan.

(f) Review and comment through vehicles such as the A-95 review process on consistency of applications for facilities planning and construction grants within the County area with the adopted 208 plan and annual management program.

(3) Assist in resolving conflicts related to areawide plan implementation.

(a) Provide a forum for the voluntary resolution of differences between designated management agencies.

(b) Hear complaints alleging noncompliance by management agencies with the areawide plan or implementation program. Attempt to resolve conflicts locally; if not possible, forward complaint to IEPA for resolution of the conflict.

(c) Represent local interests and agencies in the resolution of basinwide and areawide issues.

(4) Participate in the continuing planning program.

(a) Review annually and propose necessary revisions to those basin plans that are related to the County area.

(b) Participate in the required annual review and update of the areawide plan.

(c) Participate in periodic review and revision of forecasts of population, employment, and land use.

(d) Make known the local area's concerns on such issues as equity, priorities, technical solutions, economic, social and environmental impacts, and appropriate water quality standards.

(e) Lobby for new funding programs to assist local governments in implementing required water quality management programs.

These responsibilities are described in detail in later sections of this chapter.

As is stated in the guiding principles above, the countywide water quality committees do not represent a new level of government. The committees will have not authority to direct or veto the actions of their constituent local governments. Nor will they have the authority to provide direct operating services to local governments or to the public. Each countywide committee is to be an advisory forum through which local governments can improve their own water quality management programs and assess water quality needs from an intergovernmental perspective.

Within the general guidelines contained in this plan, the management framework established in each county area will reflect the particular concerns and conditions of the local governments and private interests establishing it. The six counties vary considerably in size, governmental complexity, water quality problems, and existing planning and intergovernmental relationships. Differing water quality management coordination structures may be appropriate to these conditions. In one county, local governments may prefer to have an existing agency perform the responsibilities outlined above. In another, a new countywide intergovernmental body may be established. In a third, subcounty coordinating groups (here called Management Adviscry Committees or MACs) may be preferred, with more limited responsibilities assigned to a countywide umbrella body.

Any of these approaches or combinations of these may be consistent with the basic provisions of this plan. Effective implementation of this plan does not depend on rigid uniformity from one county area to the next. It does depend in considerable measure on the commitment of local governments to participate in the processes focused in the countywide committees. It also depends on their recognition that if a cooperative structure is not effective, implementation of the plan and attainment of water quality goals will require stronger intervention by state government.

If the local governments in a county prefer to coordinate their water quality management activities through subcounty management advisory committees and a countywide umbrella committee, it will be necessary to divide the major responsibilities outlined above between the twc levels. Preparation of implementation programs and the provisicn of review and coordination assistance are functions for which the management advisory committees might take principal responsibility. Opportunities for countywide participation in the review of proposed implementation programs and of major projects with water quality implications must be provided. The countywide body should be principally responsible for continuing planning functions, with the

involvement of the MACs. Conflict resolution may be carried on at both levels at the will of parties to the conflict.

Organization of Countywide Water Quality Committees

It is recommended that a single countywide body be identified in each county except Cook through which the basic coordinating responsibilities identified in this chapter can be performed. This body may be a countywide water quality committee, a countywide coordinating body working in conjunction with subcounty management advisory committees, or an existing agency such as a county regional planning commission. In Du Page County, the Du Page County Regional Planning Commission will be designated as the countywide coordinating body. As used in the following discussion, the term "Countywide Water Quality Committee" refers to any of these alternative forms. The management framework for Cook County is outlined below.

Each countywide committee will be created or (in the case of an existing agency) authorized by intergovernmental agreement among the designated management agencies in the county area. These agreements are discussed further below. Each committee, whether existing or newly created, should be composed predominantly of representatives of the management agencies. If the committees are to be effective and accountable for communications and coordination, the local governments responsible for implementing the plan must be substantially represented. Obviously, the committees could be unwieldy if each management agency were a member. Membership on each committee should be sufficiently broad, however, to assure that all management agencies will consider themselves adequately represented. Moreover, any management agency which is not a direct member of a committee must be assured the opportunity for effective participation in its activities.

Those who serve on the committee must be able to speak effectively on behalf of the units of government they represent. In addition, they must be able to draw upon the resources of those governments in developing common programs and in addressing issues which arise within or between counties. This requires that the members of the committee be responsible officials within their own jurisdictions, preferably elected members of principal policy bodies. Alternatively, chief appointed officials, such as village managers or sanitary district superintendents, might be appointed. Private citizens, while they should be represented on each committee, should not be appointed to represent local governments.

Major economic and environmental interests and the general public should also be represented on the county committees. It is relatively uncommon, both within the region and nationwide, for private interests to be represented on such intergovernmental bodies. There are good reasons for making an exception in the case of water

quality management, however. Many private interests will be directly constrained in their activities by the areawide plan. These include industrial and commercial dischargers, the home building industry, homeowners associations, and farm operators. Representatives of these interests also will have contributions to make to the attainment of water quality standards. Other organized groups, including environmental and conservationist organizations, represent intensive users of the region's surface waters. Finally, the general public is the ultimate beneficiary of clean water and of economies and efficiencies in the governmental processes through which these goals are attained. It is important, therefore, that they be represented directly in the management program at the county level. It is recommended that on any newly established countywide committee, the number of seats held by non-governmental representatives be between one-sixth and one-third of the total number of seats on the committee. Non-governmental representation should be reasonably balanced among interests as represented by private industry, public interest groups, and citizens.

The composition of each committee also should reflect the various drainage basin areas within the county. This is particularly important because problems and issues vary considerably from one drainage basin to another. The countywide committee, in order to address itself adequately to these variations, should include representation of designated agencies from each drainage basin area.

The composition of each committee also should reflect current institutional arrangements and intergovernmental relations. The status of inter-municipal organizations and the degree of regionalization of wastewater service, for example, are factors which vary considerably from county to county. Such variations should be reflected in the composition of each of the committees.

The Metropolitan Sanitary District of Greater Chicago acting through its elected Board of Commissioners will continue as the water quality planning, coordinating, and management agency for its jurisdiction. The District will continue to maintain and refine 208 plan elements for its jurisdiction and will submit such elements to the Commission so that the Commission may make certain that they are consistent with the adopted 208 plan for the region.

As the water quality coordinating agency, the District will perform the functions assigned in the 208 plan to the countywide water quality committees.

Portions of Cook County in the Barrington and Bloom Township areas are not served by the District. Several approaches exist for achieving water quality coordination in those areas. Local governments in one or both areas could choose to be included under the coordinating umbrella of the District as outlined above. Alternatively, the local governments could choose to organize Management Advisory Committees under the provisions applicable to the outer

counties. These MACs would probably be formed around the Barrington Area Council of Governments and the Sanitary District of Bloom Township and might include areas in adjoining counties. Each MAC would then relate to the District or to one or more of the countywide committees as provided below for purposes of overall coordinated management.

Summary of Recommendations

(1) In each of Du Page, Kane, Lake, McHenry and Will counties, a countywide water quality committee will be established or another organization will be identified as provided in this plan to assure countywide coordination of water quality management.

(2) The Metropolitan Sanitary District, acting through its Board of Commissioners, will continue as the water quality planning, coordinating and management agency for its jurisdiction. As the coordinating agency, the District will perform the functions assigned in the 208 plan to the countywide water quality committees. In its role as the water quality coordinating agency, the District will consult with management advisory committees prior to taking any major action called for by the 208 plan.

(3) The District will continue to maintain and refine 208 plan elements for its jurisdiction and will submit such plans to the Commission so that the Commission may make certain that they are consistent with the adopted 208 plan for the region.

(4) Each countywide water quality committee should be substantially representative of the designated management agencies in the county.

Representatives may be assured through direct membership or through the selection of members of the committee.

(5) The precise membership and manner of selection of each countywide committee will be determined by the management agencies in the county.

Where the countywide committee is to be newly created, its membership should be consistent with the following general guidelines:

(a) A majority of the members of the committee should be representatives of designated management agencies.

(b) The committee should include representatives of major private interests affected by water quality decisions and of the general public. These representatives should comprise between one-sixth and one-third of the committee membership.

(c) Members of the countywide committee representing management agencies should be policy board members or responsible appointed officials.

(d) Any management advisory committees established within the county should be represented on the countywide committee.

(6) Procedures of the countywide committee should provide that any management agencies not directly represented on the committee will be assured effective participation in its deliberations and decisions.

(7) The membership and manner of selection of the countywide committee will be included in the intergovernmental agreement establishing the committee or authorizing an existing agency to assume the functions of the committee.

Management Advisory Committees

It was suggested above that local governments may wish to perform some coordinating functions through Management Advisory Committees at the subcounty scale. This approach may be taken throughout a county or only in portions of it. The MAC approach can allow related groups of communities or existing intergovernmental organizations to capitalize on their existing relationships and to develop closer coordination of water quality matters than may be possible at a countywide scale. The establishment of management advisory committees is not mandatory, nor is it offered here as the preferred approach to coordination. It is an option available to local governments for achieving the management objectives of this plan.

It is important, however, to recognize the limitations of the MAC concept. Management advisory committees are not intended as a substitute for the countywide water quality committees discussed above. Even if the majority of communities within a county chose to enter MACs, some countywide entity would be necessary as a forum to address overlapping problems, to relate to countywide programs and management agencies, and to provide focus for the continuing planning program. The countywide functions performed by an umbrella committee can, however, be correspondingly reduced as MACs are established. A suggested division of responsibilities has been outlined above.

The MAC approach is also not intended as a vehicle through which individual communities may opt out of water quality coordination. While the MAC permits the division of the county area into smaller coordinating groups, a situation in which individual local governments sought designation as MACs would defeat the central purpose of this management framework: the improvement of intergovernmental coordination of water quality management activities. It is thus necessary that the number of MACs in a county be held to a reasonably small number. It is also necessary that each designated management agency which chooses not to join a MAC be linked to a countywide committee able to perform the responsibilities outlined above. Thus, while a community may choose the forum through which to participate in coordinated implementation of the plan, it cannot choose not to participate at all.

To avoid a situation in which coordinating relationships were not effective throughout a county area, all designated management agencies should initially be related to a countywide entity. As MACs are formed and agreements for the division for the responsibilities reached, jurisdiction of the countywide committee would be reduced accordingly.

Summary of Recommendations

(8) Local Management Agencies may organize subcounty management advisory committees related to a countywide umbrella group as an alternative to establishing a single countywide water quality committee.

(9) The basic responsibilities of the MACs and countywide committees must be performed throughout each county. Those management agencies which do not elect to form a MAC should be related to a countywide entity for the performance of these coordinating functions. All management agencies will be included under the countywide body until such time as they enter into a MAC agreement.

(10) The membership of each MAC ought to include representation of all designated management agencies, including designated countywide agencies with jurisdiction in the MAC area, and private interests and the public.

(11) In a county in which MACs are established, the membership of the countywide committee should be based on the guidelines above applicable to the countywide water quality committee, with the addition of representation of each MAC.

(12) There must be some reasonable limit on the number of MACs within a county. No MAC should be established which does not meet guidelines A, B, and C below. Observance of guidelines D, E, F, and G is encouraged.

(a) A MAC should include no fewer than six (6) units of general-purpose government (municipalities and counties) and should include other designated management agencies with jurisdiction in the MAC area.

(b) The area encompassed by each MAC should be compact and contiguous.

(c) No MAC area should divide the jurisdiction of a designated wastewater treatment authority.

(d) A MAC should include an entire drainage sub-basin area (e.g a major tributary to a basin defined by hydrologic modeling).

(e) A MAC which includes a designated treatment authority should also include all communities served by it.

(f) A MAC should be contiguous with an area in which an intergovernmental agreement for general-purpose planning exists.

(g) A MAC should encompass an area at least equivalent to two townships.

The Legal Basis for Countywide Water Quality Committees

There are three mechanisms by which the countywide water quality committees could be established. The first is an intergovernmental agreement under the local government article of the 1970 Illinois Constitution. The second is the existing enabling legislation for the establishment of regional councils of public officials (85 Ill. Rev. Stat. 1011). The third is new state enabling legislation which would provide specifically for the creation of water quality committees.

New legislation would have several major advantages. The first is the possibility of clearly outlining not only the structure and responsibilities of the countywide committees but also their relationships with other elements of the management framework, notably state agencies. Legislation could also avoid the danger inherent in the more voluntary approaches of some areas not being parties to the coordinative process. State legislation could permit the countywide committee to assume its responsibilities across the entire county area once a certain percentage of

designated management agencies had agreed to participate in it.

The legislative approach has certain offsetting disadvantages, however. Because more than one session of the General Assembly might be required to pass enabling legislation, full organization of the countywide committees could be seriously delayed. Further, the need to apply the same legislative language to all counties in the region may deprive the local governments of the flexibility to fit the committee concept to their own circumstances. This presents a particular problem in DuPage County, where the functions of the countywide committee will be assumed by the regional planning commission, and in any county in which management advisory committees may be established.

In view of these shortcomings, it is the Commission's judgment that each countywide committee should be established (or authorized, where an existing agency is to perform the countywide committee's functions) by intergovernmental agreement. The same approach is recommended for the formation of management advisory committees.

To help assure that the essential requirements of the management plan are met, the Commission will prepare a model agreement. This will be done in consultation with the interim committees discussed in the next session. The model agreement will address such matters as the manner in which representatives to the committees (including citizen members) will be selected, the procedures to be followed by the committees in carrying out their responsibilities, the manner in which necessary staff support is to be provided, and measures to assure accountability and public access to the committees' proceedings.

In any county in which an existing agency is to be designated, the agreement would outline its responsibilities, staffing, and other details of its water quality-related functions and would indicate concurrence by the local management agencies in its designation and their willingness to participate in its processes and advisory structures. Model provisions will also be included for the division of responsibilities between the countywide committee and any subcounty management advisory committees. The model agreement will be adaptable to the establishment of the MACs themselves.

Preparation of a model agreement will be begun by the Commission immediately upon adoption of this plan. The model agreement will be developed in consultation with the local steering committees and those existing agencies which are prospective designees as countywide committees. The model agreement will be completed within three months after certification of the management portion of the plan by the Governor. The agreement will take effect in each county upon its adoption by a majority of the designated management agencies within that county. In the event this has not occurred within six months after the transmittal of the

draft agreement to designated management agencies in each county, NIPC will assume some or all of the responsibilities of the countywide committee in that county in order to permit plan implementation to go forward until the agreement takes effect. During the nine-month period of development of the agreement, the functions of the county committee will be performed by an interim body as outlined below.

It is a basic tenet of this plan that the countywide committees are to have no authority to dictate or veto actions of their constituent local governments. The basic accountability of each local government to its citizens is thus preserved. This recognition of local autonomy cannot, however, be carried to the point of complete local freedom to participate or not participate in the water quality coordinating process.

Effective plan implementation requires that all management agencies be involved in that process. Because an intergovernmental agreement (unlike legislation) can apply only to those jurisdictions which have subscribed to it, the approach recommended here involves the risk that coordination of water quality management may not be truly areawide. To reduce this risk, it is recommended that any management agency which has not subscribed to the intergovernmental agreement within its county within three months after the effective date of the agreement be de-designated by the Governor as a management agency under the plan. Designation would be restored immediately upon the agency's entry into the agreement.

In order to provide for interaction between the Metropolitan Sanitary District, other management agencies, and the private sector, including business and local citizens groups, there will be established on a drainage basin resolution within the District's jurisdictional area, Management Advisory Committees (MACs). These committees would be patterned on the Soil Conservation Service watershed committee format. MACs will be established in each of the following drainage basins: Poplar Creek, Salt Creek, Des Plaines River, North Branch, Combined Sewer Area, Cal_Sag Channel and Little Calumet River. The MACs will not have the authority to direct or veto policies or actions of the District.

Each MAC will be established by resolution of the District and the other management agencies within the basin. The membership of each MAC will include all designated 208 management agencies in the drainage basin within the District's jurisdiction and will also include members reflecting a reasonable balance among interests as represented by private industry, citizen groups, and other government agencies. Criteria for the appointment of these members will be determined by the management agency members. In its role as the water quality coordinating agency, the District will consult with the MACs prior to taking any major action called for by the 208 plan.

Designation of Interim Coordinating Bodies

The above recommendation provides a nine-month period after certification of the plan during which the coordinating structure in each county will be established. It is important that implementation of the areawide plan begin as soon as possible after it has been certified by the Governor and accepted by USEPA. This will require the designation of interim bodies that meet the guidelines in this plan and are able to assume the functions to be assigned to the county committees. These interim bodies could be formed in several ways.

The simplest approach in those counties in which a new committee is to be established may be the designation of the local steering committee. These bodies were formed in 1975 and 1976 to coordinate areawide and basin planning. They could continue in place as coordinating agencies, provided they met the guidelines in the plan as to composition and had the acceptance of the designating management agencies. Currently the composition of the LSCs varies from county to county and in some cases the requirements with respect to composition of countywide committees are not met. Membership of each LSC could be adjusted as necessary to assure adequate representation of the several types of local management agencies and of private interests and the general public. Representatives of any management advisory committees would also be added. The determination of compliance with the plan would be made by the Commission. The LSC would play the major role in developing the intergovernmental agreement for the establishment of the permanent countywide committee.

Where the countywide committees' functions are to be assumed by an existing agency or body, this should be done immediately upon certification of the plan. This may require revisions in the body's composition, the establishment of advisory structures, or the assumption of new responsibilities. Depending on the significance of these changes, the Commission might recommend that conditicnal designation be made while such changes are in progress or that designation be withheld until their completion. As in the case of the LSCs, such existing bodies (e.g., a regional planning commission) will be principally responsible for the development of the intergovernmental agreement applicable to the county area.

Where subcounty management advisory committees are to be established, formation of the countywide umbrella group will be necessary. The LSC may form the basis of this body, or it may be newly established. In either event, the development of the intergovernmental agreement for the establishment of the countywide body should be done jointly by the interim coordinating body, the MACs, and designated management agencies.

An organization able and qualified to assume the responsibilities of the countywide committee on an interim basis should be identified within three months after the initial areawide plan has been certified by the Governor. If this has not been accomplished within three months, the Commission will carry out the major responsibilities of the countywide committee until an acceptable interim entity meeting the plan guidelines is in place. This transitional process is discussed further in Chapter 10.

Summary of Recommendations

(13) Countywide water quality committees will be established or authorized under intergovernmental agreements which will establish their composition, selection of membership, responsibilities and relationships with local management agencies and regional and state agencies.

(14) A draft intergovernmental agreement will be prepared by the Commission in consultation with the LSCs and potential countywide coordinating agencies within three months after the certification of the management portions of the plan.

(15) An intergovernmental agreement for the establishment of a countywide committee will take effect upon its adoption by a majority of the designated management agencies in the county. Each intergovernmental agreement should take effect within six months after the transmittal of the draft agreement by the Commission to the designated management agencies. In any county in which an agreement is not in effect within six months, the Commission will assume the functions of the countywide committee until an agreement takes effect.

(16) Any Management Advisory Committee outside the jurisdiction of the Metropolitan Sanitary District will be established by intergovernmental agreement. The prospective members of a MAC should make their proposed agreement available for review and comment by the countywide coordinating body and the Commission. The MAC and the countywide body should agree on the divisions of responsibilities between them.

(17) Management Advisory Committees within the jurisdiction of the Metropolitan Sanitary District will be established by resolution of the District and management agencies within each drainage basin area.

(18) During the development of intergovernmental agreements the functions of the countywide committees will be performed by interim bodies based on LSCs or existing agencies.

(19) Interim coordinating bodies will be identified within three months after certification of the areawide plan and should perform the functions of the countywide committees during the development of the intergovernmental agreement. In the event that an interim body meeting the requirements of the plan has not been organized within three months after certification of the plan, the Commission will perform the essential functions of the countywide committee until an interim body or a permanent countywide committee is in place, whichever comes first. Compliance with the requirements of the plan will be determined by the Commission.

Relationships to Drainage Basins

Each countywide water quality committee will be dealing with issues in at least two, and as many as six drainage basins simultaneously. Because the characteristics and problems of each basin are unique, implementation programs and associated management activities will vary from basin to basin. Each countywide committee, therefore, will be overseeing the implementation of at least two programs, which could be directed at different objectives, based on different priorities and proceedings at different rates. This is why it is recommended that each countywide committee include representation from each basin to which it is related.

The possibility of organizing the management system along basin or sub-basin lines, instead of on a county-by-county basis, was considereed during the areawide planning process but rejected for a number of reasons.

First of all, more elaborate changes to the existing institutional structure would have been required. Second, if the basin committees were formed, the geographic areas from which representatives would have to be assembled would be large, in some cases stretching from the Wisconsin border to the southern-most boundaries of Kane and Will counties.

The operations of such a committee would be handicapped not only by distance, but by the need to reflect interests that may have nothing in common but their relationship to a given waterway system. Also, it would be difficult for a basin committee to deal with related issues, like growth and development, which tend to emerge arcund county and municipal plans and policies.

If sub-basin committees were to be established as an alternative to countywide water quality committees, additional disadvantages are apparent. Assuming that sub-basins were defined as areas within a county that do not

interact hydrologically, more than 20 such bodies would be required. In Dupage County, for example, the separate areas drained by the east and west branches of the DuPage River, and by Salt Creek, all would be defined as sub-basin areas. Such a system would be much more complex than one with six countywide committees. Even the process of defining sub-basin boundaries may generate problems, particularly if water quality improvements are to be evaluated on a sub-basin level. The issue here would probably revolve arcund the inclusion or exclusion of a particular tributary or stream reach which would impact favorably or adversely on the water quality rating. Furthermore, personnel and other supporting resources would have to be divided among from two to six sub-basin groups in each county, each with the responsibility for different programs and products. And in general, the areawide perspective called for by Public Law 92-500 would be more elusive as the number of coordinating bodies increased, and the scope of each of these bodies was narrowed.

However, nothing in this plan prevents countywide committees from supporting informal sub-basin groupings to consider joint problems and develop consistent implementation programs. Such coordination ought to be particularly valuable at the technical level where a great deal of consultation among staff already exists. The operations of each countywide committee should be sufficiently flexible to permit consideration of projects or proposals of sub-basin scope. The development of demonstration projects, for example, might be done within sub-basin areas in order to isolate and evaluate water quality benefits.

Although the countywide committees are to be principal coordinating bodies within the 208 management framework, it is essential that a forum be maintained through which basinwide issues can be focused and solutions considered. Drainage basin advisory committees have performed this role during preparation of the initial plan, particularly by sponsoring meetings through which representatives of local government, business and conservationist interests, and the general public were able to review the results of the technical planning program.

Drainage Basin Forums, based on the DBACs, should be continued as the major opportunity for broad public participation in the plan review and revision process and in the identification and resolution of basinwide issues. In fulfilling this role, the forums should be advisory to the countywide committees and the Commission. They should not be formally organized as structured committees with defined membership, but should be open to the broadest possible participation. Every opportunity should be taken to educate the general public through the forums as to water quality problems and solutions in the region. The steering groups referred to below have the responsibility for identifying means of doing this.

Each forum should be convened at least semi-annually to review progress in implementing the plan and to consider and make such recommendations as they see fit on basinwide issues and on proposed revisions to the plan. A forum could be convened at any time at the request of the Commission, a countywide committee or MAC, or the participants in the forum themselves to consider matters of basinwide importance. The forums would be convened by the steering groups described below, with necessary staff support provided by the Commission and the countywide committees or MACs.

In addition to providing technical support to the forums, the Commission will act as a guarantor of the public interest in their activities. Through its public information and participation programs, the Commission will seek to assure the broadest possible public knowledge of and participation in the forums, and will provide notice of the issues and information to be considered by them.

In addition to the forums, smaller working groups may be necessary to consider basinwide matters arising in the preparation of implementation programs and the performance of the countywide committees' coordinating functions. For this purpose, it is suggested that each countywide committee designate two of its members or other persons as its liaison representatives in each basin to which it relates. If a drainage basin area within a county is contained wholly within the area of a single MAC, the liaisons should be designated by the MAC.

The liaison representatives in each basin should function as a steering group for the basin forum, convening the forum and preparing its agenda and reporting its results with the assistance of staff. The liaisons should also meet as necessary to consider issues arising among the countywide committees. In this role, the liaisons will not be organized as separate committees. Their task will be to identify possible resolutions to basinwide issues for recommendation to the countywide committees, MACs, or management agencies.

The local governments in a county may also wish to reflect drainage basin areas in the establishment of the countywide committees. This reflection could take the form of selection of committee members from basin areas or the recognition of informal subcommittees on a basin pattern as sources of recommendations to the countywide committees. Management advisory committees could, of course, also be created on the basis of drainage basin boundaries.

Summary of Recommendations

(20) Drainage Basin Forums in each basin will provide the principal opportunity for broad public participation in the continuing review and revision of the 208 plan.

(21) The Forums will not be formally organized. Participation should be open to all interested persons.

(22) The Forums will be convened at least semi-annually at the initiative of the Commission to review progress in implementing the plan, to consider and make recommendations on basinwide issues, and to consider and make recommendations on revisions to the plan. The Forums may be convened at other times at the initiative of the Commission, by one or more of the countywide committees, or by the participants in the Forum themselves to consider matters of basin-wide importance. The Forums will be convened by the steering group provided for below.

(23) Each of the countywide committees should designate two persons in each basin as responsible for liaison at the basinwide scale. Where a drainage basin within a county is solely contained within the area of a single MAC, the liaisons should be designated by the MAC.

(24) The basin liaisons will provide a working group for the consideration of issues arising in the preparation of implementation programs or the performance of other countywide functions, and will constitute the steering groups of the respective basin forums.

(25) The basin liaisons will not be formally organized as committees. They will function solely to make recommendations to the countywide committees, the management advisory committees, and management agencies.

Staffing and Technical Support

Each countywide committee will require considerable technical and administrative support. In facilitating the preparation of implementation programs, evaluating proposed plan amendments, and resolving inter-basin issues, the committee's effectiveness will depend on the technical quality of the recommendations it receives. In assisting in the preparation of model ordinances, reviewing proposed land develcpments, conducting hearings and handling other matters, the committee will require technical expertise and administrative support. Countywide committees should not duplicate the expertise of local management agencies in such areas as sanitary engineering, land use planning, and law. Instead, the countywide committees should draw upon the resources of their member agencies and the Commission.

Technical Advisory Committees (TACs) comprising representatives of water quality agencies and private consultants, have proved useful at the areawide level, and in several counties, during the initial areawide planning period. The establishment of similar TACs to advise

countywide committees is recommended as one way of increasing the range of expertise and information available to the committees. A countywide TAC could contain representatives of a larger number of agencies than could be included on the countywide committee itself. Thus, the base of participation in countywide water quality management activities could be expanded. A TAC also would provide a vehicle for involving agencies (such as those responsible for water supply) that are not designated management agencies, but which operate in areas related to or affected by water quality considerations.

At the same time, however, each countywide committee should have its own staff or staff resources assigned to it by a member agency or agencies. A professional staff of two, with expertise in water quality management and public administration, is probably the minimum that each committee will require. A larger staff, or the assurance of assistance from other agencies, may become necessary in some counties as the roles of the committees develop.

It will be necessary to provide the countywide committee staffs with administrative services and customary fringe benefits and personnel services. If the staff is to be hired by the committee, these support services might be provided by agreement with a member agency, as is done by the DuPage Mayors and Managers Conference, or by the county planning agency. Office space could be provided in the same manner.

Where a Management Advisory Committee is established on a subcounty basis, some staff support will be required for its activities. The particular staff needs of each MAC will be determined by the division of responsibility agreed to between the county and subcounty levels. Staff for each MAC should be provided by one or more of the member agencies, on terms established in the intergovernmental agreement, or by contract with the county. The countywide body will provide necessary staff assistance to those areas which elect not to enter into MAC agreements.

Financial support for each countywide committee should come from two sources: federal funds for continuing areawide planning, allocated to the Commission through IEPA, and funds contributed by designated management agencies in the county. The Commission will pass through to each committee a portion of the federal continuing planning funds received by it. This will be done on a contractual basis, similar to the approach used to support the LSCs. Each countywide committee should provide, through management agency contributions, the local funds required to match its portion of the federal funds. It should also provide funds necessary to support those continuing coordinating activities which are not eligible for federal funding. The funding necessary to support the management framework and probable sources are discussed in Chapter 10.

(26) Each countywide committee will consider the establishment of a Technical Advisory Committee comprising staff of designated management agencies, private interests represented on the countywide committee, and organizations with expertise or interest in water quality management.

(27) The countywide TAC will contain as nearly as possible representatives of all designated management agencies wishing to be represented. At a minimum, the composition of a countywide TAC should parallel that of the countywide committee.

(28) Each countywide committee will hire the necessary professional staff or should enter into an agreement with one or more of its member agencies for the provision of necessary staff.

(29) Each committee that has its own staff will enter into an agreement with one of its member agencies to provide office space and administrative support to the committee staff.

(30) The Metropolitan Sanitary District will provide necessary technical and staff support to the Management Advisory Committees within its jurisdiction and will provide its fair share of the non-federal resources necessary to support the continuing planning program.

(31) Funding for the countywide committees shall be provided from the federal funds made available to the Commission for the continuing planning process, and from contributions by the designated management agencies in the county. Local funds should be sufficient to satisfy the matching requirement for federal funds provided to the committee by the Commission, and to support necessary activities which are not eligible for federal support.

d. The Northeastern Illinois Planning Commission 1396

The Commission's role as the areawide water quality planning agency should be maintained in the continuing planning and implementation process. It is not recommended that the Commission's existing scope of authority be expanded. The Commission will provide the regional policy and technical leadership which Public Law 92-500 requires and will assist in the resolution of basin and areawide issues arising in implementation of the plan. The Commission's continuing responsibilities will include:

- Playing the lead role in maintaining the areawide water quality plan through a continuing research and planning program, and through annual review of the region's progress in implementing the plan and the preparation of proposed amendments to it.

- Continuing to exercise its responsibilities as the area "clearinghouse" for federal funding applications, reviewing local facilities planning and construction grant applications under the process outlined in federal Circular A-95, and reviewing NPDES permits and other proposed state and local actions of importance to the implementation of the plan.

- Maintaining areawide forecasts of population, employment and land use, updating these as needed in consultation with local governments, and relating water quality management planning to comprehensive planning for the region.

- Providing advisory review of the basinwide and intercounty aspects of proposed implementation strategies and programs, and assisting in the resolution of issues affecting more than one county or basin.

- Providing coordination to assure consistency of local water quality planning with the adopted 208 plan.

The Commission can fulfill these responsibilities within its existing statutory mandate as the areawide comprehensive planning agency and clearinghouse. No amendment of the Commission's enabling legislation is required. As specified in its enabling legislation, the Commission's role will continue to be an advisory one. The Commission will not have the authority to direct the actions of local agencies or countywide committees, or to veto actions which they propose to take under the areawide plan. The powers and resources available to the Commission under the areawide plan will be the same as those it currently exercises: to bring public and private interests together to resolve common problems; to conduct research on matters of regional concern; to review and comment upon proposed local actions and projects in terms of their consistency with adopted regional plans and policies; and to develop plans and forecasts for major aspects of regional development and conservation.

The Commission's role must be both proactive and reactive, however. State legislation gives the Commission a clear directive to prepare its plans and recommendations from a six-county perspective. This means that the Commission cannot simply respond to recommendations made by constituent local governments through countywide committees, or compile them without change for transmittal to state and

federal governments. It must also be able to offer recommendations for improving basin plans and countywide implementation programs in order to achieve areawide water quality objectives.

The attainment of high water quality standards in the region must be the Commission's principal concern in reviewing implementation programs, preparing plan revisions, and in researching and assessing water quality management techniques. The Commission is, however, designated by Illinois statutes as a comprehensive planning agency and as the areawide clearinghouse pursuant to circular A-95. These mandates require that proposed actions to implement the areawide plan be reviewed not only in terms of their water quality impacts, but also with respect to their interaction with transportation, recreation, residential development, land use, and other aspects of the region. However, in taking actions required of it as the areawide 208 planning agency, the Commission will not veto any action related solely to water quality proposed by the Metropolitan Sanitary District which is consistent with the adopted 208 Plan on the ground that it is inconsistent with another adopted plan (e.g., land use, housing, transportation, etc.) of the Commission. The Commission will not adopt amendments to the 208 Plan which relate to the District's jurisdiction to which the District objects.

Any continuing dispute between the Commission and the District concerning the consistency of District or Commission actions or proposals with the adopted 208 plan will be referred to the State of Illinois for resolution under the State's responsibilities to annually recertify the areawide 208 Plan and to evaluate management agency performance.

Recommendations

(1) The Northeastern Illinois Planning Commission shall be designated by the governor as the agency responsible for continuing water quality management planning and for certain areawide oversight and coordinating functions specified in this plan.

(2) The 208 Steering Committee will be reconstituted by resolution of the Commission as the Areawide Water Quality Steering Committee. Since the Areawide Water Quality Steering Committee will serve simply as an advisory committee to the full Northeastern Illinois Planning Commission as legally constituted, and will not take final action in and by itself, the resolution will provide for voting participation by the countywide coordinating body in each county, the Areawide Planning Advisory Committee, and the Water Resources Technical Advisory Committee. Responsibility for project review, including the review of facility plans and NPDES

permits, will be retained by the Governmental Services Committee.

The Steering Committee will be maintained as the principal body advising the Commission in the performance of its functions under the 208 plan. Each countywide committee or other countywide coordinating body, the APAC, and the TAC will be asked to appoint its chairperson or other representative as a voting participant member of the Steering Committee.

(3) Prior to reconstituting the Steering Committee, the Commission will make available for public review and comment a draft resolution identifying the Committee's responsibilities and providing for the appointment of participant members.

(4) In reviewing proposed areawide plan amendments and implementation programs, including those submitted through the A-95 process, the Commission will assess compatibility with the certified areawide water quality plan and with other adopted regional plans and programs.

(5) The Commission will maintain adequate staff to permit it to fulfill the responsibilities identified in this plan, including the continuing technical assessment of water quality management strategies.

(6) Federal, state and local financial support will be made available to support the continuing planning process.

Areawide Advisory Groups to the Commission

In the preparation of the initial areawide plan, major contributions have been made by areawide advisory groups to the Commission. The Water Resources Technical Advisory Committee (representatives of operating and regulatory agencies, consulting firms and universities) has helped identify major water resource problems, advised on the scope and methods of technical analyses, and evaluated recommended control measures. Smaller, and more specialized, TACs were equally valuable in areas related to agriculture and overall management. The Areawide Planning Advisory Committee (APAC) was established to assure that the areawide plan dealt with all major water quality issues, and that it considered a broad spectrum of public concerns. It included representatives of state and federal agencies, professional associations, business and industry, and environmental and other public interest groups. The purpose of the APAC, which was established by federal mandate, was to provide a mechanism for the presentation of views on water quality management planning that represent a regional, rather than a local or special technical viewpoint.

A broad advisory structure should be maintained in the continuing planning process. Such a structure can extend the Commission's own technical resources, assist in the assessment of innovative techniques, support the Commission in its efforts to bridge county and basin boundaries, and assure that adequate attention is given in the continuing planning process to long-range water quality management issues and opportunities. These may include potential modifications of the institutional structure. The areawide advisory structure should also provide the opportunity for interaction between local and areawide concerns, particularly in the annual review and update of the areawide plan. The roles of areawide advisory committees in the annual plan review and revision process are described more fully in Chapter 10.

Summary of Recommendations

(7) The Commission will utilize a series of areawide advisory bodies representing technical specialists; federal, state and local management agencies; economic interests; and environmental and public interest groups concerned for water quality.

(8) The Commission will continue to rely on its water resources Technical Advisory Committee for expert advice in developing research projects, relating the Commission's water resources plan to those of other agencies, and revising the areawide plan. The composition of the regionwide water resources TAC should be expanded by amendment of the Commission's establishing resolution to provide for a technical representative or appointee of each countywide committee and then annually assessed and revised, if necessary, by the 208 Steering Committee in view of the needs of the continuing planning program.

During the organizational stage of the continuing planning process, the Commission will review the resolution by which the Water Technical Advisory Committee was established to assure that its composition and responsibilities are adequately defined. A statement of the Commission's expectations of its technical advisers will be prepared, in which each prospective TAC member will be asked to concur prior to appointment.

(9) The Commission will convene representatives of the Drainage Basin Forums described above as necessary, but at least semi-annually, to advise the Commission in the resolution of issues affecting more than one drainage basin, in the preparation of the annual implementation progress report, and in the conduct of continuing technical studies. Representatives of particular

economic interests or management specialties will be included in these discussions as appropriate.

(10) The APAC will be maintained as a forum for groups concerned with water quality management on an areawide scale. The APAC will be convened at least quarterly to review progress in implementing the plan and to advise the Commission on areawide water quality issues and changes in federal and state water quality policy. The APAC will also review and comment on proposed areawide research programs, management proposals, and public information and participation programs, and may recommend special studies to the Commission.

The composition of the APAC, in terms of the organizations and interests represented, has been well-suited to its duties. The composition of the committee should, however, be reviewed by the Commission and the APAC and modified if necessary to assure that it meets requirements of USEPA with respect to public participation and that it is reasonably balanced among interests as represented by private industry, citizen groups, governmental agencies, and citizens. During the organizational stage of the continuing planning process, the Commission and the APAC should jointly prepare a statement defining the committee's responsibilities and the performance expected of its members.

The APAC should determine its own meeting schedule on the basis of the interests of its members and the need of the Commission for its advice. Consistent with its practice regarding other advisory committees, the Commission will designate a member of its senior professional staff to provide liaison and secretarial support to the APAC.

(11) In conjunction with the review and update of the areawide plan, the Commission will sponsor areawide public conferences for the purpose of assessing progress in implementing the plan and examining major water quality issues confronting the region. Such conferences will be held at least once every three years.

Illinois-Indiana Bi-State Commission

The Illinois-Indiana Bi-State Commission was established in 1974 to provide planning policy guidance and coordination in the eight-county northeastern Illinois-northwestern Indiana urbanized area. Its policy body includes representatives of the regional commissions in the two metropolitan areas, and it has a small technical and administrative staff.

During preparation of the initial areawide plan, the Bi-State Commission has taken the lead in bringing together representatives of regional, state and federal water quality agencies to examine issues of interstate significance. The most important of these has involved water quality in the Little Calumet River as it enters Illinois. The ability of agencies in Indiana to meet required water quality standards in the Little Calumet as it enters Illinois will seriously affect the region's achievement of the objectives of the areawide plan.

The Bi-State Commission should continue to perform this coordinating role during the continuing planning and implementation process. It should principally provide a forum through which agencies in the two states can seek ways of assuring that the State of Indiana can meet its obligations under Public Law 92-500 as they affect northeastern Illinois. The Bi-State Commission should play a similar role in assuring that water quality factors are considered by the bodies studying flood control issues in the Kankakee River Basin.

Recommendations

(12) The Illinois-Indiana Bi-State Commission will continue to provide a forum for the coordination of water quality management planning efforts in the northeastern Illinois-northwestern Indiana area.

The State of Illinois

The third level of the management framework consists of agencies of the State of Illinois, which has overall responsibility for water quality throughout the state. This responsibility derives from Article XI of the Illinois Constitution and from several federal and state laws. Under public Law 92-500, the state is directed to establish and enforce water quality standards acceptable to the federal government. The state also must certify annually, and submit to the USEPA, water quality management plans from regions designated for areawide planning under Section 208. For portions of the state not designated, the state itself must prepare an initial areawide plan and maintain a continuing water quality planning process. The areawide plan for northeastern Illinois, therefore, is in the strictest sense the state's plan. Although it was developed by the Commission, local governments and citizens of the region, it will be reviewed, and may be subjected to change, by the state. It is the state which certifies the plan and submits it to the USEPA.

State responsibilities with respect to implementation of the plan rest primarily with the IEPA and IPCB, the state agencies principally concerned with water quality. Acting through the IEPA and the IPCB, the state will be responsible for the establishment and the enforcement of water quality

standards, for the approval of construction grants and the issuance of permits, and for the continuing water quality monitoring and periodic recertification of the areawide plan. The IEPA will also continue to coordinate areawide planning and implementation in northeastern Illinois with similar efforts throughout the state. New responsibilities to be assumed by the IEPA under the areawide plan include the certification of county implementation programs, the establishment of performance standards for nonpoint source control, and the provision of financial assistance for the implementation of nonpoint source controls.

The Illinois Environmental Protection Act assigns the authority to set and enforce water quality and performance standards to the IPCB. The IPCB also is authorized to adopt any standards and regulations needed by the state in order for it to issue NPDES permits, which it does through the IEPA. The IEPA is designated by the Environmental Protection Act as the state water pollution agency for the purpose of carrying out state responsibilities under the federal water pollution control law. A number of IEPA's specific responsibilities under the Environmental Protection Act were identified above.

Other state agencies also are assigned responsibility for management of particular aspects of the areawide plan implementation. Regulations and programs of the Departments of Agriculture, Public Health and Transportation, for example, are important to some of the recommendations of the areawide plan. These responsibilities have been identified in the preceding chapters. The IEPA's responsibility for involving other state agencies in the attainment of water quality objectives should be reaffirmed by the governor in the course of certifying the areawide plan.

Under the continuing planning requirements in Section 303 of Public Law 92-500 (See Chapter One), the state is required to assure that all elements of the statewide water pollution control strategy, including plans from the designated areas, are updated periodically. Under this provision, the state could assume responsibility for updating the northeastern Illinois plan. It is recommended, however, as noted above, that this responsibility be delegated to the management system within the region.

Specific state responsibilities for implementation of the areawide plan have been discussed and included as recommendations at various points in preceding chapters. In general, state responsibilities under this areawide plan involve the following functions:

- set and enforce water quality and effluent standards, and revise these standards as necessary;

- administer NPDES and state permit programs for constructing and connecting to wastewater treatment plants;

- administer construction grant programs under Public Law 92-500 and the state anti-pollution bond program;

- set and enforce standards for sanitary landfills, on-site disposal systems, agricultural chemical applicators, and flood plain development;

- develop authority to regulate certain diffuse point sources, particularly those related to urban stormwater, under the proposed general area permit system;

- cooperate in the cost-sharing program for soil erosion control administered by the ASCS;

- develop statewide guidelines for erosion and sedimentation control programs to be prepared by soil and water conservation districts;

- coordinate with adjoining states and with federal authorities to assure that Illinois standards are met in boundary waters;

In addition to these functions related to specific technical elements of the plan, certain state responsibilities are recommended as parts of the general management framework. The state should:

- continue to monitor water quality in the region in conjunction with local governments;

- review and certify the annual water quality management programs prepared by the countywide committees;

- coordinate the activities of all state agencies with responsibilities that impact on water quality;

- review and recertify this plan annually on the basis of recommendations developed in the region and submitted by the Commission. The responsibility for recertification of the plan is assigned to the governor under PL 92-500.

These functions are discussed in detail later in this chapter. Principal responsibility for their performance should be assigned to the IEPA. All fall within the IEPA's scope of authority as defined by the Environmental Protection Act. Most represent continuations or extensions of the IEPA's current activities. No reorganization of the agency should be required, although some additional personnel may be necessary to review and certify management programs and plan revisions.

The establishment of water quality and performance standards is central to the state's role. It is recommended at several points in the areawide plan that the state should review its existing standards to insure that they reflect the provisions of this initial areawide plan. Standards should be evaluated periodically in the future on the basis of experience in plan implementation. It also has been recommended that the state develop statewide standards and standby regulatory programs with respect to the management of urban stormwater (See Section 6.02). As recommended in Chapter Six, this authority is to be exercised only if implementation efforts by local designated management agencies are inadequate.

Because state standards will be relied upon in the implementation of the areawide plan, the state must remain a part of the continuing planning program. The IEPA should utilize the results of future quality modeling, demonstration projects, and other planning and development activities in the region. Much of this information will be available to the state through its review of implementation progress reports and management programs, and through its continuing representation on the Commission's advisory bodies. In addition, the IEPA should maintain its own consultative bodies, similar to those maintained by the Commission. Through such bodies, the Commission, countywide committees, and continuing planning agencies from other designated areas should be given an opportunity to review and comment on draft standards and regulations. Such consultation, through periodic meetings between IEPA officials and representatives of the three designated areas and through the Statewide Policy Advisory Committee, has been helpful in the initial planning program.

Recommendations

(13) A permanent statewide advisory committee for water quality planning and management should be maintained by the IEPA as a forum for coordinating plan implementation and continuing planning in the designated areas and the rest of the state.

(14) The IEPA should consult regularly with the advisory committee in the development of statewide plans, programs and standards.

(15) The advisory committee should meet periodically to review progress in implementing areawide plans throughout the state; to advise IEPA on its water quality monitoring programs and on standards, regulations and programs in preparation; to review proposed legislation and levels of state funding for the plan implementation activities; and to develop recommendations for changes in federal policies bearing on implementation of areawide plans.

8.05 FUNCTIONS OF THE AREAWIDE MANAGEMENT FRAMEWORK

This section describes the functions of the management framework, and the designated agencies that constitute the framework, in greater detail than the preceding sections provided. The management functions fall within five general categories: (a) management programming and certification, (b) monitoring, (c) coordination, (d) enforcement, and (e) financial management. This section is organized accordingly. The continuing planning process, a critical element of the areawide management program, is discussed in Chapter 10.

a. Management Programming and Certification

Regulations issued under Public Law 92-500 require areawide plans to identify the specific steps necessary for plan implementation. For both point and nonpoint sources of pollution, the plan must specify the actions to be taken and the agencies responsible, levels of funding, and the sources from which funding should be obtained. These specifications are to cover the 20-year period following the certification of the initial areawide plan, and to be described in five-year increments. This requirement applies not just to the technical elements of the plan, but also to organizational and administrative elements.

The ability of a planning agency to achieve such precision depends on a number of factors, including time, resources, and technical knowledge. Adequate technical knowledge is essential. There are sometimes ways to compensate for inadequate time or inadequate funding, but there is no alternative to an adequate technical understanding of water quality problems, the factors that cause them, and the results to be expected from recommended solutions. An areawide plan that reached for more specificity than its technical base could support would have little credibility, and, over the long run, would be of questionable value. A plan that deferred all substantial recommendations, however, would be equally defective.

In this plan, wherever there is adequate technical understanding of problems and solutions, recommendations are as precise as possible. This is particularly true with respect to point sources, because the results obtainable from a particular system usually can be quantified and assessed with confidence. With respect to nonpoint sources, however, the specificity of the plan is generally lower.

As the General Accounting Office has pointed out on a nationwide basis, there is a lack of sound information on the efficacy of various nonpoint source control strategies. In light of this, the Commission sees no basis for recommending step-by-step nonpoint control programs that spell out specific actions to be taken by management agencies. Local governments, which are also generally

familiar with the uncertainties of nonpoint source control, would rightfully question the technical support for such a recommendation.

The approach generally taken in this plan with respect to nonpoint sources is this: a range of potentially effective strategies is identified, management agencies are expected to select strategies, or combinations of them, and develop the program that is the most feasible with respect to problems and resources, including their cost impact on the private sector. Where it is clear that specific strategies should be implemented on an areawide basis, necessary recommendations are included in the areawide plan. In the particular area of urban stormwater control, this plan specifies the degree of pollution reduction to be achieved by designated management agencies but leaves open the choice of measures to be implemented. In addition, the Commission recommends that demonstration projects and other research be included in the continuing planning process so that the technical base can be steadily strengthened.

The reliance on this "performance" approach to implementation requires a mechanism through which the most feasible control measures can be selected, and through which the individual and combined impacts of these measures can be determined. The mechanism recommended is the implementation program.

The implementation program can be described generally as the strategy and actions agreed to by designated management agencies within each county to achieve the objectives of the areawide plan. The implementation program will be compiled by the countywide water quality committees on the basis of proposals by designated management agencies. With respect to facilities construction, public service programs, regulatory and enforcement programs and other strategies, the countywide committee's responsibility will be to facilitate development of a consistent set of actions intended to yield significant progress toward clean water. The program will also identify priority water quality needs in the county and will identify those strategies and problems for which state and federal funding are required. In the development of the implementation program each countywide committee will assist in resolving conflicts and inconsistencies between the programs of its consistent management agencies.

It is not intended that the implementation program be newly prepared each year. Rather, it is recommended that the program be developed on a three-year basis, with review and revision as necessary in the intervening years. This schedule takes account of the fact that some water pollution control strategies will require several years to be fully implemented. It also reflects the likelihood that several years' action will be necessary before definitive improvements in water quality can be realized. At the same time, annual review of the program will help assure that long-term efforts are on schedule and that reasonable

efforts are being made by designated management agencies. The process outlined below refers to the preparation of the three-year program.

Each implementation program should be recertified annually by IEPA. Certification of the three-year program will involve a full review of the adequacy of proposed local actions to meet the objectives of the plan. In the intervening years, IEPA will consider whether implementation of the program is proceeding on schedule and assess any proposed revisions or additions.

In some counties, management advisory committees may be formed and may perform certain of the responsibilities assigned in this plan to the countywide committees. This may include primary responsibility for facilitating preparation of the implementation program. Where this is the preferred approach, provision must be made for review of draft implementation programs by the countywide coordinating body prior to their completion by the MACs. The precise division of responsibilities between the countywide and subcounty levels, including responsibility for submitting the program to the state, should be established in the agreements for the creation of the countywide body and the MACs.

It is essential to the success of the plan that there be compatibility among countywide management programs affecting different portions of the same drainage basin. Priorities and programs within each basin must be reconciled in order to avoid an undue burden being imposed on some communities because problems are ignored by others upstream. Technical analysis, including computer simulation of innovative or complex strategies, should also be done on a drainage basin or reach basis. The management system organized on the basis of counties does not lend itself easily to the solution of these problems.

The Commission will play a supportive role in the resolution of the basinwide issues. It will review county implementation programs during their preparation, focusing on those proposed strategies which may have an impact on other counties. Where inconsistencies or potential conflicts between annual programs are identified, the Commission will convene representatives of the countywide committees and management agencies involved and assist them in resolving these issues. The drainage basin advisory committees will also be convened to consider major basinwide issues identified in this process and will be encouraged to make recommendations to countywide committees as to their resolution. The Commission may also submit recommendations to the countywide committees on the resolution of issues and the attainment of consistency with the 208 plan. Where a recommendation by the Commission is not accepted, the countywide committee should provide a statement of its reasons for not doing so. It is not recommended that the Commission be given the authority to approve or disapprove the implementation programs.

In performing its role, the Commission should assure that a minimum number of steps is interposed between local management agencies and the state. As much as possible of its review should be conducted through an A-95-type process with simplified notification and response. This system will be developed during the first year of the continuing planning program.

After considering any recommendations by the Commission and the drainage basin advisory committees, each countywide committee will finalize its own program. The components of the program will be those actions agreed to by the designated management agencies. The countywide committees may include such statements of reservation or identification of unresolved issues and inconsistencies as they may see fit. These statements may be considered by IEPA in its review of the program. Each countywide program will be the basis for any state financial support for implementation of the non-point source provisions of the plan except where there are rules or regulations to the contrary. The IEPA may grant only conditional or partial certification if it determines that acceptable progress has not been made in implementing required elements of the areawide plan or the prior year's implementation program. It is expected that the state will forebear from enforcement actions (particularly with respect to nonpoint source problems) only as long as the contents and implementation of the countywide programs represent good faith efforts to satisfy water quality objectives. Thus, although the implementation program itself is basically an advisory document, failure to implement it may jeopardize financial support and invite authoritative state action to implement the plan.

Participants in the management planning process have expressed the concern that the "performance" concept--in which the selection of particular control techniques is to be made by local management agencies--places an excessive burden upon them. Local government officials have expressed the opinion that the plan requires local governments to risk their resources, particularly in urban stormwater control, where the results of control strategies cannot be predicted. In this plan, the Commission has attempted to address this concern in two ways.

First, the urban stormwater controls that have been stipulated in the plan--adoption of on-site detention and erosion control ordinances--are ones in which the risks are relatively low. Many counties and municipalities already have such ordinances. There is considerable knowledge of the costs and problems associated with such ordinances and it is known that the costs of administration and enforcement are relatively small compared to other, more capital-intensive measures for stormwater management. Where new personnel with specialized training (particularly in erosion control techniques) are required, these personnel can be shared by several governments. This will reduce costs and also reduce inconsistencies in enforcement.

Second, the Commission strongly recommends that the IEPA exercise restraint in enforcing the nonpoint provisions of this plan. A "grace period" of several years should be provided during which local agencies and countywide committees can implement and assess different methods, drawing upon ongoing research and the results of demonstration efforts. During this period, compliance with the plan should be judged on the basis of good faith effort rather than on immediate results. State enforcement is intended as a standby capacity in the event that this effort is not made.

Concern has also been expressed that revisions in implementation programs may impose excessive burdens on private development and other activities by changing the requirements or standards under which they were initiated. For example, revisions in on-site stormwater detention requirements may entail substantial costs to residential development if they are imposed retroactively. In preparing recommended revisions to their implementation programs, the management agencies and countywide committees should consider this problem and provide reasonable assurance that projects in progress can proceed under existing requirements.

Recommendations

The first three of the recommendations that follow summarize the preceding discussion on the development of implementation programs, review of these programs by the Commission, and certification by the IEPA. The fourth recommendation includes a number of guidelines which local management agencies and countywide committees should follow in developing, reviewing, certifying and implementing implementation programs.

(1) Each countywide committee will facilitate the preparation of a three-year implementation program identifying consistent actions to be taken in the county to achieve the goals and objectives of the areawide plan. The first such program will be prepared within twelve months after certification of this plan.

(2) In the years intervening between three-year programs, each countywide committee will facilitate preparation of an annual report on implementation of the program, including any necessary revisions or additions to the program.

(3) Each implementation program will be submitted to the Commission for review prior to its adoption by the countywide committee.

(4) Each program will be submitted to the IEPA for certification. Certified programs should be a primary basis for state allocation of any funding for nonpoint scurce management and for state enforcement decisions.

(5) In the preparation of the implementation program, each countywide water quality committee and its constituent management agencies should observe the following general procedures. Any changes in these procedures should be included in the intergovernmental agreement establishing the countywide committee and should be submitted to the Commission for its review and endorsement.

(a) The Commission and the respective countywide committees will prepare jointly, an annual report on progress in implementing the areawide plan and the implementation programs. The report should cover any changes in regional conditions which may require revisions in the plan implementation strategy, and discuss probable levels of funding and other support available from federal and state agencies. In the intervening years, this report will form the basis of a request for IEPA recertification of the three-year program.

(b) Each local designated management agency will prepare annually a brief report on actions it has taken in the preceding year to achieve the goals and objectives of the plan.

(c) Each local desiganted management agency, in its three-year report, will identify actions or programs which it proposes to include in the next implementation program. Depending on the agency and its area of responsibility proposals should include:

- actions to implement local facilities plans (treatment plant construction or modification; sewer extensions; anticipated changes in performance levels; enactment of pretreatment or other regulations; etc.)

- regulatory policies, ordinances or enforcement programs to be undertaken with respect to stormwater detention, erosion and sedimentation control, septic systems, water conservation, performance zoning, etc.

- public service programs to be undertaken (street sweeping, tree planting, septic tank replacement, drainage improvement) and the level of activity proposed.

- priorities for providing technical and cost-sharing assistance to farm owners and operators in implementing agricultural best management practices.

- programs to monitor and evaluate water quality and performance by management agencies.

- planning and research studies and demonstration projects.

(d) Each local designated management agency, in its annual report, will identify the approximate level of funding, and sources of funding, required for its water quality management activities in the forthcoming year.

(e) Each countywide committee will compile and assess the proposals contained in the annual reports of designated management agencies within the county. This assessment should identify:

- areawide plan recommendations that are addressed inadequately by the proposed programs,

- conflicts, duplications, and areas in which consistency among local activities is important,

- areas in which joint programs or activities might be undertaken,

- potential issues of cost-effectiveness or of equity among designated management agencies,

- potential basin and inter-basin issues.

(f) The compiled progress reports and program proposals (or a summary of them) shall be distributed by the countywide water quality committee to all designated management agencies in the county, to other countywide committees in the drainage basins affected, the Commission, IEPA, and others requesting them.

(g) The Commission will review the proposed implementation programs and assess their adequacy with respect to:

- the reductions in pollutant levels likely to be achieved by implementation of the program elements,

- issues involving more than one county or drainage basin,

- strategies for which technical analysis, including computer simulation, may be necessary to determine probable effectiveness,

- proposals which may require amendment of the areawide plan if they are to be implemented.

(h) Representatives of countywide committees and designated management agencies will confer to identify resolutions of intra-county issues and of deficiencies in individual implementation program proposals.

(i) The Commission will assist countywide committees and management agencies in each basin area in identifying resolutions of inter-county or basinwide issues and areas in which further computer simulation or other technical assessments are required. Major basinwide issues will be referred to the drainage basin advisory committees for consideration and recommendation. The Commission may make recommendations to the countywide committees and IEPA on issues which cannot be resolved through these discussions.

(j) Each countywide committee will adopt a three-year implementation program comprising the program elements agreed to by its constituent agencies. The countywide committee program may also include recommended priorities, statements of unresolved issues or inconsistencies, and the identification of problems and strategies requiring state and federal funding. The program shall be transmitted to IEPA for certification, accompanied by the technical assessment of its components and by any recommendations submitted by the Commission or the drainage basin advisory committees.

(k) The IEPA should review each three-year program and each request for annual recertification to determine its consistency with the objectives of the areawide plan. With respect to each countywide committee's program, the IEPA may:

- certify the entire program, or,

- certify the program conditionally with an identification of deficiencies to be corrected and recommended measures to be taken, or

- refuse to certify the program and return it with a statement of deficiencies and recommended corrections, or

- certify parts of the program, relating to one or more basin areas in a county and return parts relating to other basin areas in which issues remain unresolved.

(1) The IEPA should allocate any state funds for the implementation of non-point source programs or activities included in the areawide plan in a manner consistent with the implementation programs certified by it.

(6) In reviewing implementation programs the IEPA should determine whether reasonable progress and effort are being made and should take such reasonable effort into account when considering whether to take enforcement action with regard to any non-point source-related violation of water quality standards.

b. Water Quality Monitoring

Reliable information on water quality conditions is essential to any effort to improve those conditions. During the preparation of the initial areawide plan, data collected by the state, local wastewater treatment authorities, and the Commission provided the basis on which existing problems were identified and assessed and future water quality conditions were simulated (see Chapter Four). Monitoring and analysis must also be part of the continuing planning process so that the region maintains a current, accurate basis for assessing the effectiveness of water quality management programs. Data collected and analyzed through continuing monitoring programs will be useful in consideration of plan amendments, adjustments in plan priorities, extraordinary control measures, or enforcement actions. Monitoring of effluent discharges will provide a means for assessing the impact of point source discharges on water quality and determining whether discharges are meeting their obligations under federal and state permits and the areawide plan.

The most extensive water quality monitoring program in the region is administered by the IEPA and MSDGC. In-stream water quality data are collected from 58 sampling stations, in all but a few cases on a monthly basis. Each sample is regularly analyzed for 11 parameters. Quarterly samples are analyzed for 30 parameters.

The IEPA also receives monthly operating reports from NPDES permit holders in the region. These reports show the quantity and quality of treatment plant flows. The contents of these reports, combined with the results of direct

sampling by IEPA and MSDGC, are the base on which the agency assesses compliance with rules and orders of the IPCB and with the terms of permits. In-stream sampling and analysis programs also are conducted by many wastewater treatment authorities, as an aid in assessing the performance of their facilities, and by local regulatory agencies such as the McHenry County Health Department.

Data submitted to demonstrate compliance with federal requirements must be prepared according to standards set forth in federal regulations. The IEPA certifies sampling programs and laboratory procedures that meet federal standards. Only a few of the treatment authorities in the region are so certified, which means that local monitoring, while it is useful, cannot supplant the state's own analyses for purposes of enforcement. Local data are useful primarily in identifying problems and assessing plant performance.

It is recommended that the IEPA expand its water quality monitoring efforts to provide data necessary for assessing the effectiveness of this plan. The IEPA should provide water quality reports annually or more often to the Commission and to countywide committees. Monitoring data should be made available to the Commission, the countywide committees, management agencies, or any interested citizen or group on request at a reasonable cost. The IEPA's statewide advisory committee should be consulted with respect to the variety, amount, and frequency of the data produced. The number and location of sampling stations, and samples, should be reviewed periodically and assessed against the needs of areawide plan implementation.

As a minimum, future water quality data should be adequate to support the computer model used in developing the initial areawide plan (see Chapter Four). The sampling and analysis program conducted by the Commission included coordinated water quality and stream flow sampling so that interactions of quantitative and qualitative factors could be assessed. The IEPA sampling program is now similarly coordinated with a stream flow monitoring effort, so the data on this relationship can be maintained as a base for continuing simulation of water quality strategies. It is of concern that the number of sampling stations (including those not related to gauging stations) be sufficiently large to provide an adequate data base for continuing analysis. The IEPA also should provide for intensive sampling efforts related to particular suspected problems or demonstration projects.

Recommendations

(1) The IEPA should retain primary responsibility for monitoring water quality and preparing data on which assessments of areawide plan implementation can be

based, and for the certification of sampling programs and laboratory procedures.

(2) The IEPA should provide an annual report to the Commission and to countywide committees on the results of its in-stream and point source sampling programs, and should make sampling data available on request. Information to be provided and the form in which it is presented should be reviewed through the statewide advisory committee.

(3) The Commission and the countywide committee will make recommendations to IEPA on the location and the frequency of in-stream and point source sampling to assure that results are adequate for assessing implementation progress.

(4) The IEPA should maintain sufficient sampling sites in the region, including those coordinated with stream flow gauging, to permit continuing calibration and refinement of the computer simulation model.

(5) Agencies conducting sampling programs in the region, including treatment and regulatory authorities, will consult with their respective countywide committees to make the sampling programs useful for assessing plan implementation. Information gathered through these programs should be made available to the countywide committees, the Commission, and the IEPA.

c. Coordination

Although each implementation program should reflect the best assessment of conditions that are likely to affect water quality and implementation of the implementation program itself, it is to be expected that events will occur which will call for actions not anticipated in the implementation program. Expected levels of state or federal funding may not materialize, for example, or forecasts of growth and development may prove unrealistic. Recognizing that such situations are likely, the management framework must provide a way for their effects on water quality management programs to be assessed and necessary corrective actions to be taken.

Land use decisions by local governments are expected to create situations which will require adjustments in water quality management programs. A major development could alter surface water flows into adjoining communities in ways that were not anticipated, or impose an unanticipated demand on available treatment capacity. This plan does not propose to alter municipal or county authority to regulate the use of the land. It is important to the success of the plan, however, that such decisions be accompanied by efforts to

anticipate and provide for their water quality impacts. If this is done, the need to take costly remedial actions later can be avoided.

It is recommended, therefore, that communities potentially affected by development actions be given the opportunity to review and comment on those actions in advance. Through such advisory review they can recommend steps which might mitigate any negative impacts of the development on them and can prepare their own measures to reduce the effects of unavoidable impacts. While the community proposing to take action should not be bound by the recommendations of its neighbors, it can benefit from comments which may avoid later irritation and expense.

Such a referral process should be instituted in each county, through the countywide water quality committees and at the regional scale through the Commission. When an action with a probable water quality impact outside a community is proposed, notice should be provided to other designated management agencies within the area that would be affected. Notice also should be provided to the Commission. The notice should include a description of the proposed project or action and the steps to be taken to minimize any negative water quality impacts. The agencies to which notice was provided and the agency, organization, or party which originated the proposed action would be given an opportunity to comment on the proposal and recommend actions which could be taken to prevent adverse impacts. The countywide committee or the Commission also could comment or make recommendations with respect to the areawide plan. Comments and recommendations would go directly to the originating community. Agencies to whom notice was given would not be required to submit comments, nor would the initating community be required to alter its proposed action in response to comments received.

The principal responsibility of each countywide committee or other coordinating body should be to facilitate the review of projects by management agencies potentially impacted by them. It should do this through the maintenance of a clearinghouse process and through the recommendation to management agencies of review criteria and procedures. Each countywide committee will undertake independent review of the water quality impacts of proposed land use changes only to the extent desired by its member agencies. The responsibility, if it is to be assumed by the committee, will be identified in the agreement or resolutions constituting the committee.

This referral process must be structured so it does not raise extraneous issues or unduly delay local processes. A maximum of 21 days should be provided for each agency to submit its comments to the originating agency. This same time limit should apply to the Commission and the countywide committees. It may be necessary to permit staff comment if the meeting schedules of policy bodies will not allow them to meet a 21-day timetable. Each countywide committee

should develop whatever additional safeguards it considers necessary and should include these in its first implementation program.

In several counties, referral processes on major land use planning decisions have already been established through the county planning agency. Where these processes are effective, the countywide committee should consider whether they can be used to meet the coordination objectives of this plan. The creation of a separate review process limited to water quality concerns could thus be avoided.

An initial responsibility of each countywide committee, in conjunction with the Commission, will be to recommend to local governments the types of projects to be circulated for comment. These should include proposed developments exceeding some minimum acreage or number of units, sewer extensions exceeding a determined length or capacity, and impoundments or other channel modifications. Criteria set by countywide committees and the Commission should be included in the five-year continuing planning program.

Activities for which federal financial assistance is requested will continue to be referred to the Commission under the A-95 process. These include applications for wastewater facility construction grants and for Section 201 planning studies. Funding applications and draft environmental impact statements on other types of projects with potential water quality effects also are reviewed under A-95. The Commission will continue to assess these proposals in light of its water quality policies included in this plan and of its other adopted plans and policies, and in accordance with procedures included in the NIPC A-95 Review Manual. Projects with probable water quality impact will be transmitted to the countywide water quality committees, as well as to potentially affected local governments, for review and comment as part of the A-95 clearinghouse process.

The Commission will also receive and review all applications for NPDES permits for discharge points in the six-county area, including both new permits and renewals. Proposed permitted discharges will be assessed as to their probable impact on the receiving water and their consistency with the areawide plan. In the case of major discharges, the computer simulation model may be used in this assessment. The Commission may recommend that a countywide committee review and comment upon an application of major significance to the county. Such recommendations will be made on a case-by-case basis. Review and comment will be completed by the Commission within 30 days of the receipt of the application from IEPA. During the first year of the continuing planning process, criteria will be established under which permits for minor discharges can be reviewed on a more rapid basis or can bypass the review process altogether. The process by which the areawide plan will be amended to allow issuance of a new NPDES permit which is consistent with it is described in Chapter 10.

Federal and state actions of significance to water quality management which are received through the A-95 process also will be referred by NIPC to countywide committees and local governments. Similar review processes should be provided for state actions that do not fall within the scope of A-95 or other existing referral procedures. The Commission should receive advance notice of such actions along with an indication of steps to be taken to limit any negative water quality impacts. The Commission, in turn, will transmit notice to all management agencies that might be affected. A 30-day review period would be provided for comments to be returned to the Commission and forwarded to the originating agency. As in the case of the local referral process outlined above, comments would be of an advisory nature and would not bind the state agency.

Selection of the types of state proposals to be submitted for review, and procedures to be used in these reviews, should be an initial item on the agenda of the continuing planning process. Proposed grants from the anti-pollution bond funds, proposed flood control and drainage improvements, permit applications for sanitary landfills, and proposed changes in permit regulations are the types of proposals that might be subject to the advisory review. The IEPA should take a lead role, on behalf of the state, in developing agreements on program coverage and procedures with the Commission and the countywide committees.

Recommendations

(1) Designated management agencies will have the opportunity to review and comment on proposed actions which may affect water quality within their areas of interest, or affect water quality management programs in which they are involved.

(2) Each countywide committee will establish procedures and criteria, consistent with this plan, for notification of agencies potentially affected by proposed actions. An existing project referral process may be used for this purpose. These procedures and criteria should be included in each committee's implementation program.

(3) Notice of proposed actions will be provided by the originating agency to each designated management agency potentially affected, as well as to the countywide water quality committee and the Commission, and shall include a summary of the proposed action prepared by the originating agency, organization, and/or party.

(4) Agencies receiving notice may (but would not be required to) comment on the proposal, or recommend measures to reduce its negative water quality impact.

Such comments are to be returned to the originating agency within 21 days after the receipt of notice.

(5) The originating agency will give full consideration to comments and recommendations received through the referral process before taking final action, but is not bound to accept or act upon such comments and recommendations.

(6) Federal and state actions with potential impacts on water quality, or on the implementation of this plan, should be made available for advance review and comment by affected management agencies.

(7) The IEPA and the Commission should take lead roles in identifying the types of state projects to be submitted for regional review, the process through which this is to be done, and the time limits and other reasonable safeguards to be included.

(8) Notices of proposed state actions should be provided to the Commission for review and transmittal to countywide committees concerned. Within 30 days, the Commission will compile comments received and return these to the state agency. The Commission also will prepare a statement as to consistency of the proposed action with the areawide plan and the probable water quality impacts of the proposed action, and recommend steps to be taken to remedy inconsistencies or prevent negative effects.

(9) The Commission will transmit notices of all projects received through the A-95 process that could affect water quality to any countywide committee affected, as well as to local governments affected. Comments and recommendations received will be transmitted to the federal funding agency with the Commission's comments.

d. Enforcement

Throughout this plan, responsibility for taking any necessary enforcement action to assure that designated management agencies fulfill their obligations under the plan has been assigned to the state. Alternatives to this approach, including the placement of enforcement authority in the countywide committee or in a new regional agency were considered but rejected as inconsistent with the dominant pattern of governance in Illinois. The state's enforcement responsibilities are well understood and the continuation of this prime state role is considered preferable to the creation of a new enforcement process. The various enforcement mechanisms available to the state have been described in previous chapters.

However, dependence on the state for enforcement has one significant shortcoming. If all conflicts potentially requiring enforcement action are taken directly to the state for resolution, the administrative and judicial burden could be unmanageable, and the opportunity for mutual resolution of the conflict at the local level would be lost. There is a need for a process through which problems of noncompliance with the plan can be identified and resolved within the region. Only those which absolutely require state intervention should be sent to the state, with the issues involved clearly identified. This approach would mean that a larger share of responsibility for plan implementation would be retained in the region. It also would reduce the enforcement burden on the state.

It is recommended that the countywide water quality committees have a role in the mutual resolution of issues concerning management agency compliance with the plan. This role should be an advisory one. Countywide committees should not have the authority to require the designated management agencies to take particular actions. However, the countywide committee will possess a collective understanding of water quality problems in their counties and they are an ideal forum for attempts to resolve issues before the need for state enforcement arises. Issues that cannot be resolved at the countywide level will be referred to the state for resolution.

To facilitate this role, each countywide committee should develop a hearing process for considering complaints alleging failure by a designated management agency to meet its responsibilities under the plan. Such hearings should be informal and conciliatory, rather than adversary. They should be directed at identifying solutions to the problem at hand. Complaints of failure to carry out the plan could come from another designated management agency or private citizen. When a complaint has merit, the countywide committee should assist in identifying steps through which the management agency could more fully comply with its responsibilities under the areawide plan and the implementation program. Such recommendations would be advisory. The countywide committee would not have the authority to compel attendance at a hearing. However, the management agency should be encouraged to participate in the hearing process and to respond to countywide committee requests for information on its implementation efforts. Failure to do so would mean that the issue would have to be referred to the state. Whenever such referrals were made, all findings and recommendations of the countywide committee should be made available to the appropriate state agency. Obviously, any complainant could seek redress through the courts, or take the complaint directly to the state. However, state and local agencies should encourage the use of the countywide committee process.

A similar process should be instituted at the regional level to facilitate resolution of issues of plan compliance involving more than one county or basin. It is important to minimize the number of such cases brought to the regional level and to assure that local resolution is attempted first. To this end, complaints should be brought to the regional level only by a countywide committee, a designated management agency, or one of the areawide advisory committees. The Commission would appoint an ad hoc committee to meet with the parties to the complaint and seek a resolution of the issues involved.

Each ad hoc committee might include members of the Commission, representatives of the countywide committees, and/or members of the areawide advisory bodies. Any recommendations by an ad hoc committee would be addressed to the parties to the issue. If the issue remained unresolved, the pursuit of enforcement action would be at the discretion of the local parties. The ad hoc committees would not be empowered to seek enforcement action directly.

Recommendations

(1) Each countywide committee will provide a process through which issues concerning plan implementation can be heard and conciliated prior to formal enforcement proceedings.

(2) A similar process shall be provided, through the Commission, for issues which because of their scope cannot be resolved at the county level.

(3) Complaints alleging the failure of a designated management agency to carry out its responsibilities under the plan may be submitted to a countywide committee.

(4) The committee will provide an opportunity for the management agency and other agencies and individuals affected by the issue to be heard and to seek resolution of the issue. The committee may prepare a statement of the facts and issues involved, may make recommendations as to the resolution of the issues, or may provide other assistance to the affected parties.

(5) If the issue cannot be resolved with the assistance of the countywide committee, the committee may prepare a statement of the remaining unresolved problems and make this available to the participants.

(6) A countywide committee may, if it chooses, recommend that the Pollution Control Board or other appropriate body pursue appropriate action.

(7) Complaints that involve inter-county or basin issues, will be brought by a designated management agency, a countywide committee, or any areawide advisory committee to the Commission.

(8) Upon the receipt of such complaint the Commission will appoint an ad hoc committee comprising members of the Commission and representatives of the advisory bodies (other than representatives of parties to the complaint) to hear the issues and make recommendations as to its resolution.

(9) Recommendations of the ad hoc committee shall be referred to the designated management agency in question and the entity filing the complaint for their consideration. Any such findings and recommendation shall be strictly advisory.

(10) In the event that a countywide committee or ad hoc areawide committee finds that an issue can best be resolved by amendment to the areawide plan, it shall submit a finding to that effect to the Commission.

8.06 FINANCIAL MANAGEMENT

The costs of implementing the 208 plan and the probable sources of funds have been identified in general terms of the preceding chapters. More precise costs are included in Chapter 9 and the drainage basin chapters which follow. The purpose of this section is to suggest ways of coordinating the sources and allocation of funds for plan implementation in order to assure that optimum use is made of the limited resources available for water quality management. The funding of the areawide management framework and the continuing planning process will be considered separately.

a. Sources of Funds

It is evident that funds for implementation of the plan will be provided by a large number of agencies and programs. The construction of wastewater treatment facilities will depend primarily on 75 percent construction grants from USEPA under the terms of PL 92-500 and PL 95-217. The required 25 percent local share will be raised primarily through the issuance of revenue bonds by local treatment authorities. Operation and maintenance will be funded with local tax revenues or service charges. The TARP system of the MSDGC is expected to be funded from these sources plus flood control funds appropriated to the U.S. Army Corps of Engineers. Implementation of agricultural best management practices will depend on the continuing availability of funds under the cost-sharing program of the ASCS and on new

funds for water quality-related agricultural practices authorized by the water quality amendments of 1977. Implementation of other non-point source controls will be largely dependent on local management agency funding for code administration and enforcement, public service programs, and some capital improvements, unless the region is successful in securing federal or state grant assistance for those activities. Other control strategies, some of which are specific to a basin, will be funded from a mixture of local general revenues and federal and state categorical funds.

b. Management and Allocation

The management of these dispersed resources involves two interrelated aspects. The first is the allocation of resources among possible projects by each management agency. For example, the Illinois share of USEPA construction grants must be allocated among construction programs on the basis of criteria of need, readiness to proceed, and statewide equity. Similarly, ASCS cost-sharing funds for Illinois must be allocated among counties, and then among farm operators within counties. Local revenues must be budgeted among local activities related to water quality management and all the other programs which local governments maintain and which compete for scarce resources. Processes for making these allocations are in operation and have been discussed in preceding sections of this plan and in NIPC staff management papers.

The second level of allocation would be that of resources between programs or recipient agencies. Ideally, from an areawide management standpoint all funds available for the implementation of the water quality plan would be allocated from a single point so that resources could be placed where they would have the most beneficial effect in terms of water quality, equity, and cost-effectiveness. This would require that funds be transferrable not only among agencies or recipients, but also among types of projects or activities. A parallel situation occurs in the transportation area, in which a portion of the mass transportation funds granted by the UMTA can be applied to either capital or operating and maintenance purposes.

There are major obstacles to the establishment of a process for such an areawide across-the-board allocation of funds. First, the largest portion of funding for wastewater operations and maintenance and for implementation of non-point source controls will continue to be raised by local management agencies through general taxation and user charge systems or service fees. Any system which proposed that the use of these funds be determined by a county or area-wide process would raise the most severe constitutional questions. Second, federal and state funds are made available as categorical aid under statutes which stipulate

the purposes to which they can be applied and the processes through which they must be allocated. Such categorical grants involve problems of both equity and flexibility, and they may make it difficult to apply funds to areas or problems of the greatest urgency. Any change in this pattern, however, would involve direct changes in federal policy. While increased flexibility in the use of federal funds may be a desirable objective, it is not something which can be achieved immediately in the implementation program.

The processes through which federal and state funds will be allocated among subareas and recipient agencies within the region for the implementation of the 208 plan have been discussed in the preceding chapters related to particular problem areas. Some aspects of this process, particularly with regard to USEPA construction grant funds will be considered further in Chapter Nine. Final decisions on the allocation of federal and state funds will continue to be made by the agencies which now make them: the IEPA for 201 construction grants, the ASCS (through its countywide committees) for cost-sharing funds for agricultural best management practices; and a structure not yet fully defined but centered around the U.S. Soil Conservation Service for the so-called Culver amendment funds (for water quality-related agricultural practices). The respective roles of the Commission and the countywide water quality committees in reviewing the proposed allocation of these funds and commenting on the consistency of spending priorities with the areawide plan has been described in Chapters Five and Six.

It is equally important that there be a mechanism through which local expenditures for 208 implementation can be reviewed and assessed as to their adequacy, their responsiveness to plan priorities, and their effectiveness. The implementation programming process provides the means of this review. Each local management agency's annual report to the countywide committee (described above) will include a summary of expenditures for activities related to the plan and a projection of expenditures during the program year in each major water quality problem area (e.g., urban stormwater control). A compilation of the programs, with the inclusion of federal and state funds projected to be received, would thus represent an annual water quality budget for the region.

In its annual progress report on implementation of the plan, the Commission will summarize patterns of water quality expenditure and will recommend general priorities for continuing expenditure based on the identification of additional sources of federal and state funding which may reduce the burden on limited local resources.

c. Recommendations 2628

(1) The countywide committees, in developing implementation programs, will agree on priority water quality needs to be met through local programs and regulatory activities. Local governments should give full consideration to these priorities in determining the expenditure of local funds on water quality-related activities. 2630 2631 2632 2633

(2) Each implementation program will include a summary and projection of local management agency expenditures for water quality-related programs and activities. 2635 2636

(3) The Commission will annually assemble a summary of water quality expenditures and project a budget for such expenditures based on the county programs for the program year. 2638 2639

8.07 APPENDIX TO CHAPTER 8 2641

Recommended 208 Water Quality Management Agencies for Northeastern Illinois 2643

The governments and agencies recommended for designation as water quality management agencies under this 208 plan are listed below. The drainage basin(s) in which each agency is located is identified. Consistent with federal regulations (discussed in Chapter 8), this listing includes agencies which will be responsible for direct plan implementation activities, for regulating or overseeing the performance of any person or entity as required by the plan, and for review and coordination of management activities. 2645 2646 2647 2648 2649 2650 2651

The recommended management agencies are grouped by type according to their responsibilities under the plan. These responsibilities, the legal basis and time schedule for their performance, and generalized sources of funding are identified in Implementation Statements drafted by the Commission and transmitted to each proposed local management agency. Management agencies have been asked to endorse these statements as an indication of their willingness to assume implementing responsibilities under the plan. 2653 2655 2656 2657 2658 2659

In some cases, more than one administrative unit of a local government may have management responsibilities under the plan. In Lake and Dupage counties, for instance, elements of the plan will be implemented by the public works, highways, health, and planning departments. These units are not identified separately in the following list, since designation as a management agency will be granted to the county through the County Board. The particular responsibilities of the administrative units are suggested in the substantive chapters of this plan. 2661 2662 2663 2664 2665 2666 2667 2668

The drainage basin designations are as follows:

LC - Little Calumet
LD - Lower Des Plaines
UD - Upper Des Plaines
D - DuPage
F - Fox
H - Hickory Creek
KA - Kankakee
KI - Kishwaukee
MN - Lake Michigan North
MS - Lake Michigan South
N - North Branch, Chicago River
S - Salt Creek
SS - Sanitary and Ship Canal

Municipalities Presently Providing or Potentially Providing Wastewater Treatment Service

Addison (S,D)
Antioch (F)
Bartlett (F,D)
Beecher (KA)
Bloomingdale (S,D)
Carol Stream (D)
Cary (F)
Crest Hill (D,LD)
Deerfield (N)
Elburn (F)
Elwood (LD)
Fox River Grove (F)
Geneva (F)
Glen Ellyn (D)
Hampshire (KI)
Harvard (KI)
Homewood (LC)
Itasca (S)
Lake Villa (F)
Libertyville (UD)
Lindenhurst (UD)
Lombard (S,D)
Maple Park (KI)
McHenry (F)
Mokena (H)
Naperville (D,F)
Peotone (KA)
Richmond (F)
Roselle (S,D)
St. Charles (F,D)
Sugar Grove (F)
Wauconda (F)
West Dundee (F)
Winfield (D)
Woodstock (F,KI)
Algonquin (F)
Barrington (F)
Batavia (F,D)
Bensenville (S,UD)
Bolingbrook (D,LD)
Carpentersville (F)
Channahon (LD)
Crystal Lake (F)
East Dundee (F)
Elmhurst (S)
Fox Lake (F)
Frankfort (H,LD)
Glendale Heights (D)
Grayslake (UD,F)
Hanover Park (D,F)
Hebron (F)
Huntley (KI)
Joliet (H,D,LD)
Lake Zurich (UD,F)
Lincolnshire (N,UD)
Lockport (D,LD)
Manhattan (KA,LD)
Marengo (KI)
McHenry Shores (F)
Mundelein (UD)
New Lenox (H,LD)
Plainfield (D)
Romeoville (D,LD)
Shorewood (D)
Streamwood (F,D)
Union (KI)
West Chicago (D)
Wilmington (KA)
Wood Dale (S)

Alsip (SS)	Arlington Heights (S,UD)	2730
Aurora (F)	Bannockburn (N)	2731
Barrington Hills (F)	Bedford Park (SS)	2732
Bellwood (S)	Berkeley (S)	2734
Berwyn (SS,UD)	Blue Island (SS)	2735
Braidwood (KA)	Bridgeview (SS)	2736
Broadview (S)	Brookfield (S,LD)	2737
Buffalo Grove (UD)	Bull Valley (F)	2738
Burbank (SS)	Burlington (KI)	2739
Burnham (SS)	Burr Ridge (LD)	2740
Calumet City (LC,SS)	Calumet Park (SS)	2741
Chicago (SS,UD)	Chicago Heights (LC)	2742
Chicago Ridge (SS)	Cicero (SS,UD)	2743
Clarendon Hills (S,LD)	Country Club Hills (LC,H,SS)	2744
Countryside (LD)	Crestwood (SS)	2745
Crete (LC)	Darien (LD)	2746
Deer Park (F,UD)		2747
Des Plaines (UD)	Dixmoor (LC)	2748
Dolton (LC,SS)	Downers Grove (S,D)	2749
East Chicago Heights (LC)	East Hazelcrest (LC)	2750
Elk Grove Village (S,UD)	Elgin (F)	2751
Evergreen Park (SS)	Elmwood Park (UD)	2752
Forest Park (UD)	Evanston (SS)	2753
Fox River Valley Gardens (F)	Flossmoor (LC)	2754
Glencoe (N,MS)	Forest View (SS,LD,UD)	2755
Glenwood (LC)	Franklin Park (S,UD)	2756
Golf (N)	Gilberts (F)	2757
Gurnee (N,UD)	Glenview (N)	2758
Harvey (LC)	Godley (KA)	2759
Hawthorne Woods (F,UD)	Green Oaks (N,UD)	2760
Hickory Hills (SS)	Hainesville (F)	2761
Highwood (MN,N)	Harwood Heights (SS,UD)	2762
Hinsdale (S,LD)	Hazelcrest (LC)	2763
Hoffman Estates (F,S)	Highland Park (MN,N)	2764
Hometown (SS)	Hillside (S)	2765
Indian Head Park (LD)	Hodgkins (SS,LD)	2766
Island Lake (F)	Holiday Hills (F)	2767
Kenilworth (N,MS,SS)	Indian Creek (UD)	2768
La Grange (LD,S)	Inverness (S,F)	2769
Lake Barrington (F)	Justice (SS)	2770
Lake Forest (MN,N)	Kildeer (UD)	2771
Lakemoor (F)	La Grange Park (S)	2772
Lansing (LC)	Lake Bluff (MN,N)	2773
Lincolnwood (SS)	Lake in the Hills (F)	2774
Long Grove (UD)	Lakewood (F,KI)	2775
Lyons (S, LD)	Lemont (SS,LD)	2776
Markham (LC)	Lisle (D)	2777
Maywood (S,UD)	Lynwood (LC)	2778
	McCullom Lake (F)	2779
	Matteson (LC,H)	2780
	McCook (LD)	2781

Melrose Park (S,UD)	Merrionette Park (SS)	2782
Mettawa (N,UD)	Midlothian (LC,SS)	2783
Monee (LC,KA)	Montgomery (F)	2784
Morton Grove (N,SS)	Mount Prospect (UD)	2785
Niles (N,SS)	Norridge (SS,UD)	2786
North Aurora (F)	North Barrington (F)	2787
Northbrook (N,UD)	North Chicago (MN,N)	2788
Northfield (N)	Northlake (S,UD)	2789
North Riverside (S,UD)	Oak Brook (S,D)	2790
Oakbrook Terrace (S,D)	Oak Forest (SS)	2791
Oak Lawn (SS)	Oak Park (SS,UD)	2792
Oakwood Hills (F)	Old Mill Creek (UD)	2793
Olympia Fields (LC)	Orland Park (SS,H,LD)	2794
Palatine (S,UD)	Palos Heights (SS)	2795
Palos Hills (SS)	Palos Park (SS)	2796
Park City (N,UD)	Park Forest (LC)	2797
Park Forest South (LC,H,KA)	Park Ridge (SS,UD)	2798
	Phoenix (LC)	2799
Pingree Grove (F)	Posen (LC)	2800
Prairie Grove (F)	Prospect Heights (UD)	2801
Richton Park (LC,H)	Riverdale (LC,SS)	2802
River Forest (UD)	River Grove (UD)	2803
Riverside (S,UD)	Riverwoods (N,UD)	2804
Robbins (SS)	Rockdale (LD)	2805
Rolling Meadows (S,UD)	Rosemont (UD)	2806
Round Lake (F)	Round Lake Beach (F,UD)	2807
Round Lake Heights (F)	Round Lake Park (F)	2808
	Sauk Village (LC)	2809
Schaumburg (S,D,F)	Schiller Park (UD)	2810
Skokie (SS)	Sleepy Hollow (F)	2811
South Barrington (F)	South Chicago Heights (LC)	2812
South Elgin (F)	South Holland (LC)	2813
Spring Grove (F)	Steger (LC)	2814
Stickney (SS,LD)	Stone Park (S,UD)	2815
Summit (SS,LD)	Sunnyside (F)	2816
Sunrise Ridge (F)	Symerton (KA)	2817
Third Lake (UD)	Thornton (LC)	2818
Tinley Park (H,SS)	Tower Lakes (F)	2819
Valley View (F)	Vernon Hills (UD)	2820
Villa Park (S,D)	Wadsworth (UD)	2821
Warrenville (D)	Waukegan (MN,N,UD)	2822
Wayne (F)	Westchester (S)	2823
Westhaven (SS)	Western Springs (S,LD)	2824
Westmont (S,D,LD)	Wheaton (D)	2825
Wheeling (UD)	Willowbrook (LD)	2826
Willow Springs (SS,LD)	Wilmette (SS,N,MS)	2827
	Winnetka (N,MS)	2828
Winthrop Harbor (MN)	Woodridge (D,LD)	2829
Worth (SS)	Zion (MN)	2830

Sanitary Districts 2834

Aurora (F) 2837
Barrington Woods (S,UD) 2838
Beach Park (MN) 2839
Bloom Township (LC) 2840
Bonnie-Brae Manor (H) 2842
Central Stickney (SS) 2843
Country Gardens (UD) 2844
Downers Grove (S,D) 2845
Elgin (F) 2846
Forest River (UD) 2847
Fox Lake Hills (F) 2848
Gages Lake (UD) 2849
Garden Homes (SS) 2850
Glenbrook (N) 2851
Glen Ellyn Heights (D) 2852
Glen Oak Acres (N) 2853
Highland Hills (D) 2854
Hinsdale (S) 2855
Island Lake (F) 2856
Kimberly Heights (H, LC) 2857
Lake in the Hills (F) 2858
Lakes Region (UD,F) 2859
Lindenhurst (UD) 2860
Lockport Heights (SS) 2861
Marion Brook (S) 2862
Mission Brook (N,UD) 2863
MSDGC (N,S,H,D, UD,SS,LC) 2864
Northfield Woods (N,UD)
North Shore (N,MN,UD)
Oak Highland-Ingalls (H)
Oak Meadows (UD)
Orchard Place (UD)
Pine Gate (UD)
Plum Grove Woodland (S,UD)
Prospect Heights (UD)
Prospect Heights-Old Town (UD)
Prospect Meadows (UD)
Round Lake (UD,F)
Salt Creek (S)
South Palos Township (SS)
South Stickney (SS)
Timber Trails (S)
Waukegan Road (N)
Wasco (F)
Wheaton (D)
Wolf Mandel (UD)

Counties Presently Providing Wastewater Treatment Services 2868

DuPage (S,D,UD,F,LD) 2871
Lake (N,UD,F)

Counties Not Providing Wastewater Treatment Services 2875

Cook (N,S,H,D,UD,SS,F,LD,LD) 2878
Kane (KI,D,F) 2879
McHenry (KI,F) 2881
Will (KA,H,D,SS,F,LC,LD) 2882

Soil and Water Conservation Districts 2886

Kane-DuPage Counties (S,KI,D,F,LD) 2889
Lake County (N,UD,F) 2890
McHenry County (KI,F) 2892
North Cook County (N,S,D,UD,SS,F) 2893
Will-South Cook Counties (S,KA,KI,D,SS,F,LC,LD) 2894

Cook County Townships 2898

Barrington (F,SC)	Berwyn (UD)	2901
Bloom (LC)	Bremen (LC,SS,H)	2902
Calumet (LC,SS)	Cicero (SS,UD)	2903
Elk Grove (UD,SC)	Evanston (SS,N)	2904
Hanover (F,SC,D)	Lemont (SS,LD)	2906
Leyden (UD,SC)	Lyons (UD,SC,LD)	2907
Maine (UD,N)	New Trier (SS,N)	2908
Niles (UD,SS,N)	Norwood (SS,N)	2909
Northfield (UD,N)	Oak Park (UD,SS)	2910
Orland (SS,H,LD)	Palatine (UD,F,SC)	2911
Palos (SS,LD)	Proviso (UD,SC,SS)	2912
Rich (LC,H)	River Forest (UD)	2913
Riverside (SC)	Schaumburg (F,SC,D)	2914
Stickney (SS)	Thornton (LC,SS)	2915
Wheeling (UD)	Worth (SS)	2916

DuPage County Townships 2920

Addison (UD,SC,D)	Bloomingdale (SC,D)	2923
Downers Grove (SC,D,LD)	Lisle (D)	2924
	Milton (D)	2925
Naperville (F,D)	Wayne (F,D)	2927
Winfield (F,D)	York (SC,D)	2928

Kane County Townships 2932

Aurora (F)	Batavia (F)	2935
Big Rock (F)	Blackberry (F)	2936
Burlington (KI)	Campton (F,KI)	2938
Dundee (F,KI)	Elgin (F)	2939
Geneva (F,D)	Hampshire (F,KI)	2940
Kaneville (F,KI)	Plato (F,KI)	2941
Rutland (F,KI)	St. Charles (F,D)	2942
Sugar Grove (F)	Virgil (F,KI)	2943

Lake County Townships 2947

Antioch (UD,F)	Avon (UD,F)	2950
Benton (MN)	Cuba (F)	2951
Deerfield (MN,N)	Ela (UD,F)	2953
Fremont (UD,F)	Grant (F)	2954
Lake Villa (UD,F)	Libertyville (UD,N)	2955
Newport (UD)	Shields (MN,N)	2956
Vernon (UD,N)	Warren (UD,N)	2957
Wauconda (F)	Waukegan (UD,MN,N)	2958

West Deerfield (N) Zion (UD,MN) 2959

McHenry County Townships 2963

Alden (F,KI)	Algonquin (F)	2966
Burton (F)	Chemung (KI)	2967
Coral (KI)	Dorr (KI)	2969
Dunham (KI)	Grafton (F,KI)	2970
Greenwood (F)	Hartland (KI)	2971
Hebron (F)	Marengo (KI)	2972
McHenry (F)	Nunda (F)	2973
Richmond (F)	Riley (KI)	2974
Seneca (F,KI)		2975

Will County Townships 2979

Channahon (D,LD)	Crete (LC,KA)	2982
Custer (KA)	DuPage (SS,D,LD)	2983
Florence (KA)	Frankfort (KA,H,LD)	2984
Green Garden (KA,H,LD)	Homer (H,LD)	2986
	Jackson (KA,LD)	2987
Joliet (H,LD)	Lockport (SS,H,D,LD)	2988
Manhattan (KA,LD)	Monee (LC,KA,H)	2989
New Lenox (H,LD)	Peotone (KA)	2990
Plainfield (D)	Reed (KA)	2991
Troy (D,LD)	Washington (KA,LC)	2992
Wesley (KA)	Wheatland (F,D)	2993
Will (LC,KA)	Wilmington (LC,KA)	2994
Wilton (KA)		2995

Sub-Regional and Regional Agencies* Northeastern Illinois Planning Commission 3000

State Agencies 3002

Illinois Environmental Protection Agency	3005
Illinois Institute for Environmental Quality	3006
Illinois Pollution Control Board	3007
Illinois Commerce Commission	3009
Illinois Department of Transportation	3010
Illinois Department of Public Health	3011
Illinois Department of Agriculture	3012
Illinois State Water Survey	3013
Illinois State Geological Survey	3014
Illinois Toll Highway Authority	3015

*One or more sub-regional coordinating entities will be designated in each county. As of the date of this list the precise identity of these entities has not been established. They will be added to the designation list as soon as a final decision has been made. 3017 3018 3019 3020

CHAPTER 9

Costs and Financing of Water Quality Management

CHAPTER NINE
THE COSTS AND FINANCING OF WATER QUALITY MANAGEMENT

9.01 INTRODUCTION

The preceding chapters have outlined an ambitious program to achieve clean water in northeastern Illinois. While many of the detailed actions to be taken will be identified during the implementation process, this areawide plan has described the central strategies to be followed in dealing with major sources of pollution, as well as specific programs and projects in a number of areas.

It is evident that the implementation of this plan will not be inexpensive. A number of water quality problems have gone unaddressed for a long time and will require considerable effort to be remedied. It is also necessary to begin taking steps now to deal with the impacts on water quality of future growth and development. Current operation of and future investment in water quality management programs and facilities will require a major financial commitment by both the public and private sectors.

The purpose of this chapter is to identify the magnitude of that commitment and the means by which it can be met. For each of the four major areas of concern, the chapter identifies (1) the projected costs of implementing major elements of the plan, (2) projected sources of funds for that implementation, and (3) alternative approaches to raising funds whose source is not now apparent. Issues of the adequacy of funds and of the incidence of the costs of water quality management are also considered.

The region recognizes its primary responsibility for dealing with its own water quality problems. But practically, the region's financial resources are limited, and the plan cannot be successfully implemented without substantial assistance from state and federal sources. To the extent that wastewater construction grants are not provided at the authorized 75 percent level, plan implementation will be delayed. Agricultural pollution control is also dependent upon adequate cost-sharing funds. Urban stormwater pollution control is not currently eligible for similar financial aid. Accordingly, local agencies must attempt to achieve this control through modifications to existing regulations and public service programs in order to minimize additional costs. Where this is not possible, federal and state assistance for urban stormwater control may also be crucial to plan implementation.

The estimated implementation costs and sources of funding included in this chapter are shown in Figure 9-1. The overall cost of the plan elements included in this chapter is $7.7 billion of which 95 percent is for the construction and operation of facilities for the transmission and treatment of municipal wastes and

stormwater. The largest sources of funding will be local governments and the federal construction grant program.

It is important to recognize that the cost estimates in this chapter do not represent the total public and private costs to be incurred in implementing the plan. Certain costs which the Commission considers impractical to estimate have been excluded from this analysis. These include:

1. The total private (e.g., non-tax supported) costs of complying with urban stormwater management requirements. The factors involved in estimating these costs are discussed below.

2. Other administrative costs to management agencies, including the state, principally for extension of existing monitoring and regulatory programs. These activities are discussed in other chapters of this plan. Some costs will be identified more precisely in the continuing planning process.

3. Collector sewers to serve future new growth, except where these are included in local facilities plans.

4. Compliance by private industry with effluent requirements imposed through their NPDES permits. These permits have been taken as givens in the preparation of the areawide plan.

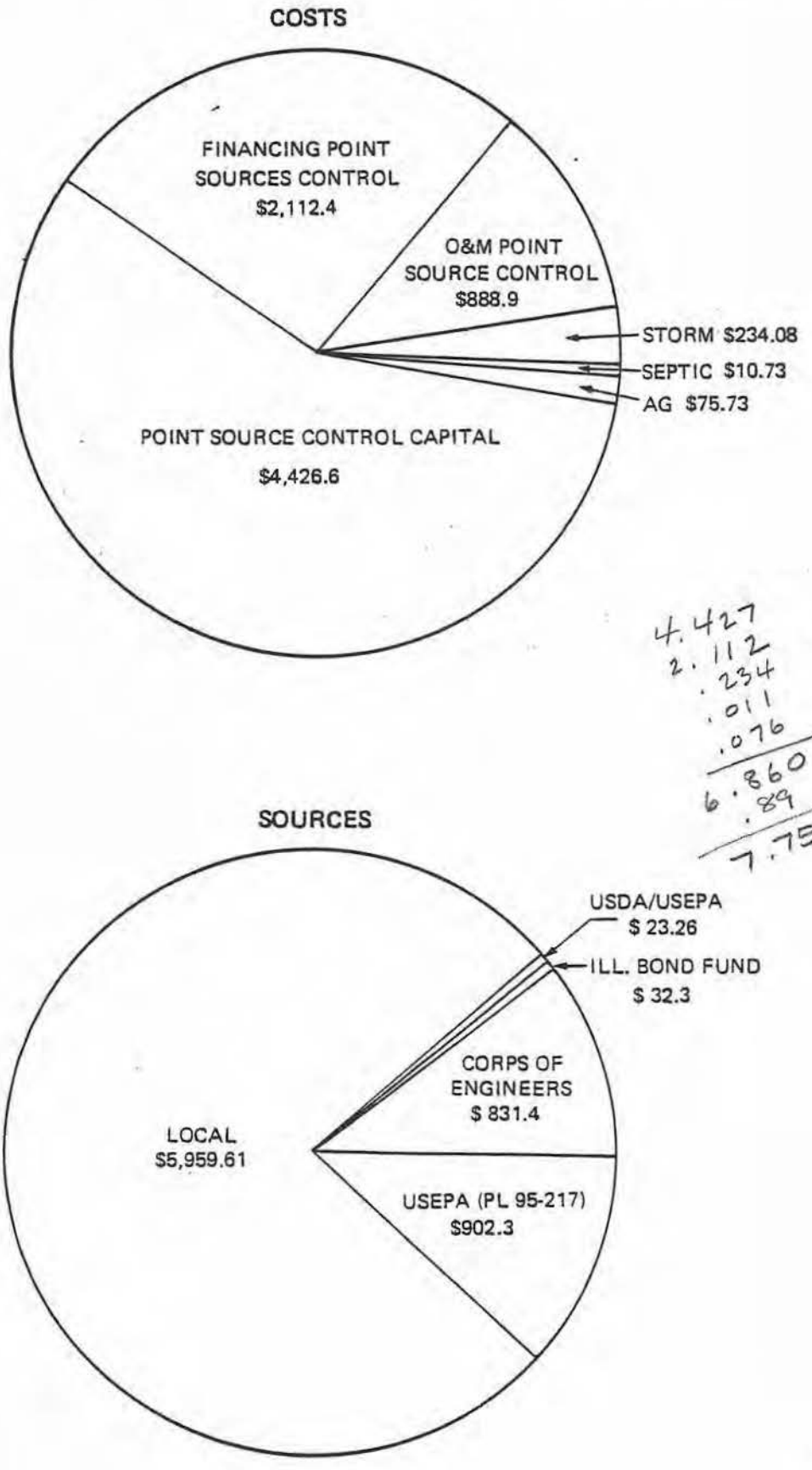
5. Administrative costs to state agencies for expanding or reorienting existing administrative and regulatory programs to reflect water quality concerns.

6. Various particular strategies peculiar to one or a few drainage basins. These costs will also be identified in the continuing planning process.

It is also important to note that the costs in this chapter represent the current best estimates of the resources required to implement the plan. As conditions changes, implementation progresses, and new problems and opportunities are identified, the costs will necessarily require continuing revision.

All costs are stated in constant 1977 dollars. This approach was chosen because of the difficulty of projecting either future impacts of inflation on costs or the extent to which these would be offset by inflation-related increases in revenues. The effect of this constant dollar base is to understate the true cost of implementing the plan, particularly in the later years of the program when the cumulative effects of inflation will be greatest. During this same later period, of course, the base costs themselves may also be subject to substantial reassessment as the plan is revised.

FIGURE 9–1. COSTS AND SOURCES OF FUNDING FOR MAJOR PLAN ELEMENTS (IN $ MILLIONS)



4.427
2.112
.234
.011
.076
6.860
.89
7.75

The costs presented are for future projects and activities only. That is, they represent additional increments over and above the costs presently being incurred for water quality management activities. For the most part, these current costs relate to current water quality. Some, however, reflect the sunk costs of facilities not yet in operation.

These facilities will contribute to future improvements in water quality and thus represent costs of implementing the plan. They are, however, already committed. In this chapter, we have attempted to identify the magnitude of future commitments. Wherever possible, we have expressed this as a percentage of current expenditures in order to identify the magnitude of increase required. It is recognized that, because of the factor of sunk costs, this increased expenditure cannot be correlated precisely with improvements in water quality above current levels.

Finally, the costs presented here have been aggregated at the areawide, drainage basin, or county level. It is recognized that expenditures will in fact be incurred at the level of individual management agencies. Projected local costs for the implementation of point source controls are included in the basin plan chapters. The identification of local costs for non-point source controls, however, requires more particularized analysis than is possible or appropriate in a regional planning process. Wherever possible, an effort has been made to express costs in unit or per household terms in order to give a sense of local scale. A major task in the development of annual implementation programs will be the identification of these detailed local costs for non-point source management.

9.02 COST AND FINANCING OF POINT SOURCE CONTROLS

a. Overview

The largest portion of the cost of implementing this areawide plan will be related to the point source control strategies described in Chapter Five. These involve principally the continuing construction and operation of wastewater treatment systems. Of the total cost to the region of implementing the plan between now and the year 2000, around 95 percent is accounted for by point source control. Even with the expectation of continuing 75 percent federal construction grants for treatment facilities, this represents a massive investment of local resources in clean water.

One of the basic federal objectives in the 208 program has been to control the cost of point source management. The federal government, under a series of laws beginning in 1967, has borne a major portion of the cost of wastewater treatment facilities through the construction grant program. Additional obligations of $24.5 billion through FY 1982 are

included in the water quality amendments of 1977 (PL 95-217). Federal policy reflected in construction grant regulations and in the 1977 amendments is intended to minimize this federal expenditure (and related local costs) by emphasizing the use of land treatment, on-site disposal systems, regionalization, and other solutions which promote cost-effectiveness in facilities development. Reductions in treatment plant flows and thus in costs are also sought through improved land use management and water conservation. The 208 planning program in particular is also directed at more effective control of non-point sources of pollution, in order to reduce dependence on point source management in meeting water quality standards.

Despite this concentration in federal policy on the reduction of capital costs, the construction and operation of traditional treatment facilities will remain a central element in the region's water quality management strategy. The Commission's computer simulations of existing and future water quality conditions show that treatment plant flows are a major source of existing pollutant loadings, and that this contribution will increase as the population of the region increases. This will occur despite improvements in the quality of treatment plant effluent. The attainment of water quality standards thus depends on the expansion and upgrading of treatment facilities, both to improve the quality of effluent where it is now deficient and to accommodate expected new needs for additional service.

b. The Costs of Point Source Controls

The capital costs of improvements required to implement the point source control strategies are summarized in Table 9-1. These costs are presented in greater detail in the individual basin chapters of this areawide plan. Data are derived principally from the 201 facilities plans prepared by local treatment authorities or from needs assessments prepared by the Commission for areas in which 201 planning has not yet been undertaken.

The principal construction cost items in the table are as follows:

MSDGC TARP Phase I. As described in Chapter Five, Phase I of the Tunnel and Reservoir Plan (TARP) of the Metropolitan Sanitary District includes these elements which are directly related to water quality management through the reduction of combined sewer overflows. A portion of the Phase I tunnels and other structures are now under construction. The District's facilities plan calls for completion of Phase I by 1983. The costs indicated are derived from the District's 1978 Appropriation Ordinance, adjusted to constant 1977 dollars.

1.41 billion 1972-78
1.25 billion 1978-82
2.66 billion 24.5

5 billion/yr
1977-82
250 million

$T = 2.66 + .25T$
$.75T = 2.66/.75$
$.25X + 2.66 = T$
3.5 billion

TABLE 9-1: TOTAL CAPITAL REQUIREMENTS, POINT SOURCE CONTROLS, 1978-2000 ($ million, 1977)

	1978	1979	1980	1981	1982	1983	1984	1985	1985–2000	TOTAL
MSDGC TARP Phase I	365.6	729.1				22.7				1,117.4
TARP Phase II		65.6	831.4							897.0
Other Facilities	75.7	39.6	415.7	344.3	51.5					926.8
Local Improvements in MSDGC Service Area	54.0	186.1	198.7	164.2	126.0	116.4				845.4
Facilities Plans other than MSDGC	228.4	103.4	162.6	17.3	21.9	19.0	13.6	19.6	54.2	640.0
TOTAL	723.7	1,123.8	1,608.4	525.8	199.4	158.1	13.6	19.6	54.2	4,426.6

R

MSDGC TARP Phase II. Phase II of the TARP includes storage reservoirs and other elements which are intended to achieve flood control benefits. The estimates for the flood control portion of the plan have been included in this overall cost summary because Phase II was included in the Commission's simulation of future water quality conditions. However, the District expects to incur only the cost of land for the reservoirs ($65.6 million). It has been assumed by the District that funding for construction of Phase II will be provided through the U.S. Army Corps of Engineers. Because this expenditure has not been authorized by Congress, it is not known in what year funds will be available or what the timing of construction may be. The entire amount of the Corps' portion has been shown in 1980 for simplicity.

MSDGC Facilities. This element includes the cost of implementing the District's facilities plan except for the TARP. The elements included for the period 1978-83 (in 1977 dollars) are:

Interceptor sewers	$ 74.2 million
Water reclamation plant expansions and improvements	765.8
Solids utilization	58.3
Instream aeration	28.5
TOTAL	$926.8 million

These projected costs are included in the District's 1978 appropriation ordinance. Like the other data shown in Table 9-1, they do not include the costs of facilities already under construction or the value of contracts let on which construction has not begun.

Local Improvements in the MSDGC Area. This element comprises sewer improvements which will be undertaken by local governments within the District service area. These include upgrading of local sewers in the combined sewer area, sewer rehabilitation in the separate sewer area, and separation of sewers in Lemont and Palatine. Local programs related to flood control and the extension of new sewer service are not included. The estimated costs of these local improvements have been derived from District figures. They are not, however, included in the District's program or financial projections, since they are to be financed by the individual local governments. Issues related to this financing are discussed below.

Other Facilities. This element includes the capital costs of point source control facilities in all parts of the region outside the MSDGC area. As in the case of the District, the estimates are of costs not yet incurred.

As has been noted above, all data have been expressed in constant 1977 dollars. The figures shown here thus

differ in some instances from those publicized by individual management agencies, to the extent that they have used escalated costs including some associated with financing and operation. As has also been noted, the estimates presented represent future construction costs only. Sunk costs of facilities under construction but not yet on line have been excluded. Costs of debt service for short-term financing and of planning, engineering, and administration have not been estimated. The cost of debt service for long-term financing of the local share of capital costs is included in Table 9-7 and in estimates of financial impact in each of the basin chapters.

It must be recognized that the figures presented in Table 9-1, and the plan elements in Chapter Five on which they are based, represent only the best current estimates of the requirements of point source control in the region. Facilities which are recommended in the plan but which are still under study as part of 201 facilities planning programs have been included in the cost estimates. These include projects for wastewater treatment and urban stormwater management. The cost of nitrification has been estimated for those facilities identified by IEPA as requiring it. It is certain that some additional facilities will be found necessary and that the size or scheduling of others will be changed in future years. These factors, combined with the impact of inflation, will necessitate continuing reassessment of the estimates in this chapter.

Table 9-2 includes estimated annual expenditures for operations, maintenance and replacement (OM&R) for the plan elements outlined above. These represent incremental amounts attributable to new facilities under construction or to be constructed. They are thus over and above current OM&R costs for facilities already in operation and contributing to existing water quality. The percentage increase of future over current capital and OM&R expenses is summarized in each of the basin plan chapters.

c. Sources of Funding

The ability of the region to pay for the treatment facilities and other point source control measures called for in the plan is subject to a number of uncertainties. These include the continuing availability of federal and state construction grants, the ability of designated management agencies to market their obligations and to levy adequate taxes or user charges to finance required local costs, and the rate of inflation in costs of construction, operations and maintenance. Recognizing that these factors make it impossible to project the precise amounts or sources of funds needed to implement the plan with absolute certainty, it is possible to identify general sources on which the region will place continuing reliance.

Federal Construction Grants. Grants for planning, engineering and construction of wastewater collection and treatment facilities under PL 92-500 and its predecessor legislation have been a major source of capital funding for the recent development of the region's wastewater treatment capacity. In the period 1973-77, construction grant offers totalling $1.06 billion were made to agencies in the six-county area. These required the generation of $353 million in local matching funds.

In 1977, the national administration proposed a ten-year, $45 billion extension of the construction grant program under PL 92-500. A five-year extension of the program is authorized in PL 95-217, at a slightly higher level than that proposed by the administration. The act authorizes appropriation of $4.5 billion for FY 1978 and $5.0 billion for each of FY 1979-82, for a total authorization of $24.5 billion. PL 95-217 further provides for the allotment of this amount among the states on the basis of a formula adopted by Congress. Under the formula, published in the Federal Register on January 10, 1978, the allotment to Illinois will be $233.7 million in FY 1978 and $259.6 million in each of the three succeeding years. Funds authorized for FY 1982 have not been allocated. Programming by IEPA of future construction grants is currently based on the assumption that the amounts actually appropriated by Congress will provide Illinois with $233 million in FY '78 and between $200 and $225 million in each of the succeeding three years.

The areawide plan recommends that the administration of the construction grant program, including the establishment of priorities for funding of particular projects, continue to be the responsibility of the IEPA. It is recommended as part of the continuing planning program that IEPA, in cooperation with NIPC and the county committees, review the criteria used to determine priorities in order to assure their consistency with the 208 plans for northeastern Illinois and the rest of the state. Until such review is completed, it is expected that the priority system and the allocation of funds within the state will continue as they have been.

Under an established understanding, up to 50 percent of all construction grant funds (federal and state Anti-Pollution Bond Act funds) may be allocated to the MSDGC and its tributary communities. The balance is allocated to the remainder of the state (including the remainder of northeastern Illinois) on the basis of the existing IEPA priority system. In the past, approximately 40 percent of the non-MSDGC portion (or 20 percent of the state total) has been allocated to the remainder of the region. As high-priority projects are completed and new monies received, this proportion may be expected to change.

U. S. Army Corps of Engineers. Phase II of the MSDGC Tunnel and Reservoir Plan, as has been noted, is justified

TABLE 9-2: TOTAL OPERATIONS, MAINTENANCE and REPLACEMENT REQUIREMENTS, POINT SOURCE CONTROLS 1978-200 ($ million, 1977)

	1978	1979	1980	1981	1982	1983	1984	1985	1985–2000	TOTAL
MSDGC TARP Phase I						6.0	6.0	6.0	90.0	108.0
TARP Phase II							6.0	6.0	90.0	102.0
Other Facilities			3.7	14.7	14.7	14.7	14.7	14.7	220.5	297.7
Local Improvements in MSDGC Service Area				(not estimated)						
Facilities Plans other than MSDGC	6.34	8.67	8.84	13.95	13.99	16.16	16.34	16.34	280.57	381.2
TOTAL	6.34	8.67	12.54	28.65	28.69	36.86	43.04	43.04	681.07	888.9

R

primarily in terms of its flood control benefits. The District in its planning has assumed that the cost of this phase would be borne by the Corps of Engineers under its responsibility for flood control works. The costs and flood control benefits of the system were established in a study prepared by the Corps in 1975. An advanced engineering and design study, authorized by Congress in 1976, has not yet been initiated, nor has funding for construction of Phase II (estimated at $831 million) been authorized. It is thus not certain in what year construction might begin.

State Anti-pollution Bond Fund. In 1970, the Illinois General Assembly enacted legislation authorizing the establishment by referendum of a fund to provide financial support for environmental protection activities. The issuance of $750 million in general obligation bonds was authorized, with the proceeds to be appropriated to the IEPA to assist the planning, financing, and construction of municipal sewage treatment works and solid waste disposal activities. The bond funds were originally to be used to provide a portion of the matching requirement to receive federal grants. Since 1972, IEPA has used the funds to provide 75 percent grants for projects which met the priority criteria for federal construction grants or which qualified as special health hazard area projects, were tributary to a regional facility, or were eligible for federal matching support under a program other than the construction grants program. As of April, 1978, $535 million of the authorized amount had been expended, obligated, or appropriated. Of this amount, $82.1 million had been awarded to the MSDGC and $115.4 million to the balance of the region. IEPA has programmed approximately $45 million for expenditure or obligation in FY '78 and has tentatively programmed approximately $40 million in each of the three succeeding years. The amounts tentatively programmed after 1978 are subject to appropriation by the General Assembly.

Local Sources. Two basic methods are in use by local governments for financing point source control activities: ad valorem taxation and user charges. Table 9-3 summarizes information about the use of these two methods by the thirteen largest treatment agencies in the region.

All of the agencies currently providing wastewater service (municipalities, sanitary districts, and Lake and DuPage counties) have statutory authority to levy property taxes for support of their activities. Various statutory limitations apply with respect to maximum tax rates and the requirement of referenda either to levy the initial tax (in the case of counties) or to exceed the basic statutory rate (in the case of sanitary districts other than MSDGC). In addition to a levy for corporate purposes, sanitary districts are authorized to levy in order to pay principal

TABLE 9-3: WASTEWATER REVENUE SYSTEMS, THIRTEEN LARGEST MUNICIPAL SYSTEMS IN NORTHEASTERN ILLINOIS

Jurisdiction	1975 Population Served	Average Annual Residential Wastewater Charges Per Household, 1977-78				Estimated Percentage Revenues Other than Grants by Major Source, 1978	
		Property Tax	User Charge	Service & Other Charges	Total Charge	Residential	Non-Residential
Aurora S.D.	112,200	31.09	47.27	0	78.36	70	30
Downers Grove S.D.	50,000	23.88	59.38	0	83.26	85	15
Elgin S.D.	80,000	15.00	60.22	0	75.22	70	30
Elmhurst	51,000	0	56.61	17.00	73.61	95	5
Glen Ellyn	26,000	0	76.65	0	76.65	80	20
Hinsdale S.D.	45,000	16.50	65.70	38.56	120.76	95	5
Joliet	82,000	0	106.22	0	106.22	74	26
MSDGC S.D.	5,500,000	72.60	0	0	72.60	40	60
Naperville	30,900	0	42.49	41.31	83.80	72	28
North Shore S.D.	220,000	147.90	0	0	147.99	92	8
St. Charles	17,300	0	72.27	18.00	90.27	54	46
S.D. of Bloom Township	80,000	20.22	44.74	2.40	67.36	95	5
Wheaton S.D.	49,800	13.18	80.89	0	94.07	90	10

and interest on bonded debt. Statutory limits are placed on the amount of debt which may be outstanding at any time.

As indicated in Table 9-3, the vast majority of the region's population is subject to ad valorem taxation for wastewater service. This is the principal method of financing both capital and operating expenses of the MSDGC and the North Shore Sanitary District. Six other units fund a portion of their program from property tax revenues. Within each district, the tax is applied to all property within the jurisdiction whether or not wastewater service is actually provided. A major advantage of the ad valorem approach is ease of administration, since no metering of sewage flows is required and revenues can be collected as part of the property owner's overall tax bill.

Outside of MSDGC and NSSD all of the treatment agencies listed utilize a user charge system, either solely or in combination with ad valorem taxation. In most cases, user charges are based on water pumpage and are collected as part of each user's water bill rather than by direct metering of sewage flows. In some instances user charge revenues are applied to all expenses of the treatment authority. In other cases, the user charge is applied to OM&R expenses while the service charge is imposed for the purpose of repaying principal and interest on revenue bonds. The city of Elmhurst and the Elgin Sanitary District impose differing user charge rates on residential and non-residential customers. Uniform rates are imposed by other agencies which levy a user charge.

The considerable use of the user charge approach is responsive both to statutory limits on ad valorem tax rates and to a federal requirement that the user charge system be instituted as a condition of full 75 percent construction grants. PL 92-500 provided that applicants for construction grants establish a user charge to assure that each user pays its proportionate share of OM&R costs. This requirement was intended to assure that adequate funds would be available for the continuing operation of facilities originally funded with federal grants. Continuing use of ad valorem taxes or service charges for the payment of capital costs was permissable under PL 92-500. Federal regulations provided that where an applicant had failed to institute an acceptable user charge system (and a system for recovering the share of capital costs attributable to industrial users), between 20 and 50 percent of the federal share of construction grants could be withheld. This provision has been applied to grants payable to MSDGC since 1973, as well as to the individual projects of several other treatment authorities.

The user charge requirement was amended in 1977 by PL 95-217. The law now provides that an agency using an ad valorem system may continue to do so provided that (1) the system has the effect of imposing proportionate shares of OM&R costs on residential and small non-residential users, (2) that user charge and industrial cost recovery systems

are applied to large non-residential and industrial users, and (3) that users are informed of the portion of their tax levy which is dedicated to OM&R. Final regulations for the administration of this provision have not been issued. It will be necessary for USEPA to assess the adequacy of existing ad valorem charge systems to meet these requirements as it reviews applications for construction grants or for the release of grant funds withheld under the earlier requirement.

Two principal methods have been available to local treatment authorities for financing the required local costs of capital improvements. These are general obligation (G.O.) bonds and revenue bonds. A third approach, financing from current revenues, has been very uncommon. All classes of agencies recommended for designation as treatment authorities under this plan have statutory authority to issue general obligation bonds. With the exception of home rule municipalities, these agencies are limited in their G.O. indebtedness to a statutorily fixed percentage of their assessed valuation. General obligation bonds for wastewater service may be issued by counties only by referendum, while the bonds of non-home rule municipalities are subject to "back-door" referendum by petition after passage of the bond ordinance. Sanitary districts are not subject to referendum requirements. The principal advantage of G.O. bonds is that they can be marketed at slightly lower rates of interest than revenue bonds. The need to secure referendum approval and the existence of statutory debt limits related to valuation, however, have meant that G.O. bonds could not be used in many cases to satisfy the entire capital requirement of a wastewater system.

The second approach to capital funding is the issuance of revenue bonds. All of the recommended treatment agencies have the authority to sell bonds and to pledge revenues from their operations for the repayment of principal and interest. In each case the enabling legislation places limits on the term of revenue bonds and the rate of interest which may be paid. In the case of MSDGC, revenue bonds may be issued only to pay for the construction of a sewer system to serve a particular locality.

As has been suggested, the principal disadvantage of the revenue bond is the need to pay a slightly higher rate of interest. This reflects the fact that the agency's ability to repay the obligation is dependent on the connection of a sufficient number or volume of users. This higher cost to the treatment authority is offset by the lack of a legal limit on the amount of bonds which may be outstanding at any time. There are, of course, effective limits on outstanding debt imposed by the willingness of the financial community to purchase the bonds.

d. Availability of Non-Local Funds to Finance Point Controls

The continuing availability of federal and state grant assistance is essential to the ability of the region to meet the water quality goals set forth in PL 92-500 and adopted in this plan. The amounts of these grants which are currently authorized have been summarized above. As was noted, federal construction grant funds allotted to Illinois are divided among major portions of the state on the basis of an established formula and the IEPA priority list. It is assumed that this method of allocation will be continued. It is thus necessary to review the adequacy of projected grant funds for the MSDGC area and the balance of the region separately.

MSDGC. Table 9-4 summarizes the projected costs of major elements of the MSDGC facilities plan, projected revenues from state and federal sources, and the residual amount which will be paid from local funds. The amount of contracts already let and grant offers received by the District have not been included. The table thus reflects future costs and revenues required to complete the facilities plan.

The total estimated cost of the MSDGC facilities is $2,941.2 million (line 5). This includes completion of Phase I TARP, the portion of Phase II TARP proposed for funding by the Corps of Engineers, land for Phase II TARP which will be purchased by the District, and other elements of the facilities plan summarized above. The cost estimates in Table 9-4 are those prepared by the District, adjusted to constant 1977 dollars. The relationship of this estimate to that prepared by the General Accounting Office is discussed in Chapter 5.

Total federal and state funds to be made available are $1,464.0 million (line 10). The following assumptions were used in making this projection:

1. It is assumed that federal construction grants will be allocated to Illinois as indicated above.

2. It is assumed that grants will be awarded to MSDGC as currently programmed by IEPA. By 1982 MSDGC will have received 50 percent of the combined total of federal construction grant and state anti-pollution bond funds available for obligation in Illinois during the period 1973-82. Since MSDGC received more than 50 percent of federal grants available prior to 1977, its allocation will be less than 50 percent in 1981 and 1982.

3. It is assumed that MSDGC's system of ad valorem taxation will be found consistent with the provisions of PL 95-217 with respect to substitutes for user charge systems. The District will thus not be

TABLE 9-4: PROJECTED CAPITAL FUNDING REQUIREMENTS, MSDGC FACILITIES PLAN ($ million, 1977)

		1978	1979	1980	1981	1982	1983	1984	1985	1986-2000	TOTAL
1	MSDGC FACILITIES PLAN COSTS										
2	TARP I	365.6	729.1				22.7				1117.4
3	TARP II		65.6	831.4							897.0
4	OTHER FACILITIES	75.7	39.6	415.7	344.3	51.5					926.8
5	TOTAL	441.3	834.3	1247.1	344.3	51.5	22.7				2941.2
6	PROJECTED FEDERAL AND STATE FUNDS										
7	PL95-217	190.0	81.0	168.0			181.3				620.3
8	CORPS OF ENGINEERS			831.4							831.4
9	STATE OF ILLINOIS	1.3	11.0								12.3
10	TOTAL	191.3	92.0	999.4			181.3				1464.0
11	LOCAL CAPITAL FUNDS										
12	GRANT MATCH	63.8	30.7	56.0			60.4				210.9
13	FEDERAL SHORTFALL	139.7	533.7	143.8	258.2	38.6	(164.3)				949.7
14	REMAINDER	46.5	177.9	47.9	86.1	12.9	(54.7)				316.6
15	TOTAL	250.0	742.3	247.7	344.3	51.5	(158.6)				1477.2

subjected to any further hold-back of federal grants. In addition, the 20 percent retainage imposed on previous grant awards will be released. We have indicated these funds to be received in 1983. It must be emphasized that this assumption is made for the purpose of estimating costs and does not represent a judgment by the Commission that the District is in compliance with PL 95-217.

4. It is assumed that funding for construction of Phase II of the TARP will be appropriated by Congress to the Corps of Engineers.

A change in any of these assumptions would, of course, alter the total projection of non-local funds available.

The amount of projected District capital expenditures not accounted for by state and federal funds is $1,477.2 million (line 15). This amount includes the following particulars:

--Local share (25 percent) required to match projected grants: 210.9 million

--Federal shortfall: $949.7 million
This represents the amount of additional federal construction grants which would be received by the District if adequate federal funds were available to pay the full 75 percent share of Phase I of the TARP and the balance of the facilities plan.

--Remaining local cost: $316.6 million
This represents the cost of land for Phase II of the TARP and the 25 percent local share which would be attributable to the federal shortfall amount.

The cost of financing this local capital expenditure is included in Table 9-7. The amount of $1,187.4 million is based on the assumption that 20-year bonds will be sold at a 7 percent interest rate. It should be noted that the amount to be financed in Table 9-7 ($16.92.2 million) differs from the amount of local funds shown in Table 9-4 ($1477.2). The latter figure is a net amount, reflecting the assumption that excess grant funds (and their required local matching share) in 1983 will be used to reduce grant shortfalls in prior years. To the extent that interim financing is used to cover this shortfall, the total financing cost in Table 9-7 will be reduced slightly. This same discrepancy will be noted in the estimates of local costs for local improvements in the MSDGC service area and for the balance of the region.

Local Improvements Related to MSDGC. Table 9-5 summarizes the projected costs and sources of funding for local improvements within the MSDGC service area. These projects,

described above, are required to support the water quality and flood control objectives of the District's facilities plan. The District has not, however, included them in its financial plans. Individual local governments will be responsible for securing necessary funding.

The total cost of the projects, as estimated by the District, is $845.4 million. IEPA has programmed $89.5 million in federal construction grants in the period 1979-82. These grants are for improvements in the separate sewer area of the MSDGC jurisdiction. The balance of local capital costs is $755.9 million. As indicated in Table 9-7, the estimated cost of financing this local capital is $529.1 million.

It is not known to what extent additional projects in this category will be eligible for construction grant assistance. This determination will be made by USEPA, based on infiltration/inflow studies and sewer system evaluation surveys to be prepared by the local governments under Section 201. Construction grant eligibility will reflect the pro rata degree to which each local project is found to have water quality (as opposed to local stormwater control) benefits. It is assumed that the priority of these projects for grants would reflect the priority ranking of the MSDGC facilities to which they are related. Grant funds would be drawn from the allocation to the MSDGC area under the existing statewide formula.

Balance of Region. Table 9-6 summarizes the projected cost of point source controls outside the MSDGC service area, projected revenues from federal and state sources, and the residual amount which must be paid from local sources. The total cost of improvements called for in the plan is $640.0 million (line 1). This includes both the implementation of local 201 facilities plans and the addition of certain projects called for in the areawide plan.

Total federal and state grant funds projected for the balance of the region outside MSDGC through 1982 are $212.8 million. This reflects the amounts currently programmed by IEPA, based on the authorizations in PL95-217 and on the assumption that the General Assembly will appropriate the balance of the Bond Fund Act funds.

The residual amount to be provided from local sources is $427.2 million. This includes, for the entire five-year funding period, $70.8 million in required matching funds, $267.3 million in eligible expenses for which adequate federal funds are not available, and $89.1 million in unfunded costs, including the matching share attributable to the federal shortfall.

Summarizing information for the entire six-county area, the following costs are currently attributable to local sources:

Required local matching share	$ 311.5 million
Federal shortfall	1338.6 million

TABLE 9-5: PROJECTED CAPITAL FUNDING REQUIREMENTS AND SOURCES, LOCAL IMPROVEMENTS RELATED TO MSDGC FACILITIES PLAN ($ MILLION, 1977)

	1978	1979	1980	1981	1982	1983	1984	1985	1986-2000	TOTAL
COST OF LOCAL IMPROVEMENTS	54.0	186.1	198.7	164.2	126.0	116.4				845.4
PROJECTED FEDERAL FUNDS										
PL95-217		2.5	3.5	31.5	52.0					89.5
LOCAL CAPITAL FUNDS										
GRANT MATCH		0.8	1.2	10.5	17.3					29.8
FEDERAL SHORTFALL	13.5	44.0	46.2	9.6	(20.5)	28.8				121.6
REMAINDER	40.5	138.8	147.8	112.6	77.2	87.6				604.5
TOTAL	54.0	183.6	195.2	132.7	74.0	116.4				755.9

TABLE 9-6: PROJECTED CAPITAL FUNDING REQUIREMENTS AND SOURCES, FACILITIES PLANS OTHER THAN MSDGC ($ MILLION, 1977)

		1978	1979	1980	1981	1982	1983	1984	1985	1986-2000	TOTAL
1	FACILITIES PLAN COSTS	228.4	103.4	162.6	17.3	21.9	19.0	13.6	19.6	54.2	640.0
2	PROJECTED FEDERAL AND STATE GRANTS										
3	PL95-217	5.0	54.0	6.0	15.0	115.0					195.0
4	STATE OF ILLINOIS	10.3	2.5	2.5	2.5						17.8
5	TOTAL	15.3	56.5	8.5	17.5	115.0					212.8
6	REQUIRED LOCAL FUNDS										
7	GRANT MATCHING	5.1	18.8	2.8	5.8	38.3					70.8
8	GRANT SHORTFALL	156.0	21.1	113.5	(4.5)	(98.6)	14.2	10.2	14.7	40.7	267.3
9	REMAINDER	52.0	7.0	37.8	(1.5)	(32.9)	4.8	3.4	4.9	13.6	89.1
10	TOTAL	213.1	46.9	154.1	(0.2)	(93.0)	19.0	13.6	19.6	54.3	427.2

TABLE 9-7: LOCAL CAPITAL FUNDS AND FINANCING COSTS (20 YRS AT 7%, $ MILLION 1977)

		1978	1979	1980	1981	1982	1983	1984	1985	1986-2000	TOTAL
1	MSDGC										
2	LOCAL FUNDS REQUIRED	250.0	742.3	247.7	344.3	51.5	60.4				1696.2
3	FINANCING COST	175.0	519.6	173.4	241.0	36.1	42.3				1187.4
4											
5	LOCAL IMPROVEMENTS IN MSDGC SERVICE AREA										
6	LOCAL FUNDS REQUIRED	54.0	183.6	195.2	132.7	74.0	116.4				755.9
7	FINANCING COST	37.8	128.5	136.6	92.9	51.8	81.5				529.1
8											
9	BALANCE OF REGION										
10	LOCAL FUNDS REQUIRED	213.1	46.9	154.1	5.8	38.3	19.0	13.6	19.6	54.3	564.7
11	FINANCING COST	149.2	32.8	107.9	4.1	26.8	13.3	9.5	13.7	38.0	395.3
12											
13	TOTAL LOCAL CAPITAL FUNDS	517.1	972.8	597.0	482.8	163.8	195.8	13.6	19.6	54.3	3016.8
14	TOTAL FINANCING COST	362.0	680.9	417.9	338.0	114.7	137.1	9.5	13.7	38.0	2111.8

Unfunded local costs	1010.2 million	589
Local Capital Financing	2111.8 million	590

It is evident from these figures that the ability of the region to finance required point source control improvements is heavily dependent on future federal and state policy with respect to construction grants and project eligibility. The following recommendations address these factors. The availability of local funds for capital and OM&R expenses is addressed in the following section.

1. It is essential that the program of federal grants-in-aid for the construction of wastewater facilities be extended beyond 1982. At a minimum, Congress should authorize an additional five-year program at no less than the current rate of funding and with grants at the 75 percent level.

As has been noted at several points in this plan document, it is a major concern of federal policy that the cost-effectiveness of alternatives to traditional wastewater treatment facilities be carefully evaluated and that facilities be developed in harmony with reasonable projections of future need. This plan and the 201 facilities plans reflected in it have been developed on this basis. Further, the continuing management and planning processes outlined in Chapters Eight and Ten establish mechanisms for assuring continuing assessment and evaluation of future needs. The point source control facilities in this plan thus meet federal criteria for eligibility for grant support, and have been shown by the Commission's computer analysis to be necessary to move the region toward the 1983 water quality standards established by Congress. In the absence of some change in those standards, a federal commitment to continuing 75 percent grant assistance in the construction of these facilities beyond 1982 is essential. Full implementation of the facilities plans reflected in this areawide plan will not occur unless this federal commitment is made.

Table 9-8 indicates the effect which a five-year extension of the construction grant program (from 1983 to 1987) would have on the projected shortfall in federal funds. It is assumed that the current $5 billion per year authorization level and the existing formula for allocation of funds among the states and within Illinois would be continued. With respect, to the MSDGC facilities plan, the shortfall in grant funds would be reduced from $949.7 million to $349.0 million by 1987. The shortfall related to local improvements in the MSDGC service area would be reduced from $121.6 to $24.4 million. These two projections are based on the assumption that of the amount allocated to the MSD area (50 percent of the state total), 85 percent would be obligated to the District's projects and 15 percent to local improvements. If 20 percent of the state's total

TABLE 9-8: FEDERAL AND STATE CONSTRUCTION GRANTS AND SHORTFALL PROJECTED TO 1987 ($ MILLION, 1977)

	1978	1979	1980	1981	1982	1983	1984	1985	1986-7	TOTAL
1 MSDGC										
2 FEDERAL AND STATE SHARE OF COSTS	331.0	576.5	1143.2	258.2	38.6	17.0				2364.5
3 FEDERAL AND STATE GRANTS PROJECTED	191.3	92.0	999.4			291.6	110.3	110.3	220.6	2015.5
4 GRANT SHORTFALL	139.7	484.5	143.8	258.2	38.6	(274.6)	(110.3)	(110.3)	(220.6)	349.0
5 CUMULATIVE SHORTFALL	139.7	624.2	763.0	1026.7	1064.8	790.2	679.9	569.6	349.0	
6										
7 LOCAL IMPROVEMENTS, MSD AREA										
8 FEDERAL AND STATE SHARE OF COSTS	13.5	46.5	49.7	41.1	31.5	29.1				211.4
9 FEDERAL AND STATE FUNDS PROJECTED		2.5	3.5	31.5	52.0	19.5	19.5	19.5	39.0	187.0
10 GRANT SHORTFALL	13.5	44.0	46.2	9.6	(20.5)	9.6	(19.5)	(19.5)	(39.0)	24.4
11 CUMULATIVE SHORTFALL	13.5	57.5	103.7	113.3	92.8	102.4	82.9	63.4	24.4	
12										
13 BALANCE OF REGION										
14 FEDERAL AND STATE SHARE OF COSTS	171.3	77.6	122.0	13.0	16.4	14.3	10.2	14.7	40.7	480.2
15 FEDERAL AND STATE FUNDS PROJECTED	15.3	56.5	8.5	17.5	115.0	51.9	51.9	51.9	103.8	472.3
16 GRANT SHORTFALL	156.0	21.1	113.5	(4.5)	(98.6)	(37.6)	(41.7)	(37.2)	(63.1)	7.9
17 CUMULATIVE SHORTFALL	156.0	177.1	290.6	286.1	187.5	149.9	108.2	71.0	7.9	

federal grant funds were allocated to the balance of the region, the grant shortfall in that area would be reduced from $264.8 to $7.9 million.

Even a five-year extension of the construction grant program will thus not provide the full federal share of facilities called for by this plan, although it moves substantially in that direction. It is evident, however, that the benefit from the program extension requires that one of two other conditions be met. In the case of MSDGC facilities and local improvements, either (1) the construction schedule must be extended to correspond to the longer authorization period for grants or (2) retroactive grant awards must be possible for projects completed prior to the time when federal funds become available. With respect to the balance of the region, it will be noted that more federal funds will be available than are projected for expenditure in each year beginning in 1981. It will thus be necessary to bring federal sources and local requirements into conformity with each other. This can be done either by altering construction schedules in the plan to defer some projects until federal funds become available, or by proceeding with construction on the basis of local financing with the expectation of recapturing federal assistance at a later time.

Either one of these strategies involves direct costs, either in the inflationary impact of deferred construction or in the costs of interim financing. In its continuing administration of the construction grant program, the state will continue its practice of allocating construction grants to projects which are ready to start. This will have the effect of matching resources to immediate needs, but will undoubtedly require amendment of the schedules in this plan. Any stretch-out of construction programs beyond the schedules indicated in this plan will necessarily impact the region's ability to attain its water quality objectives on schedule.

2. The General Assembly should make the remainder of the funds authorized by the Anti-Pollution Bond Act available for obligation.

The Anti-Pollution Bond Fund has been a significant factor in the progress made thus far in dealing with water quality problems in Illinois. The fund has been used by IEPA primarily to support projects related to major state objectives (e.g., reduction of health hazards, wastewater regionalization) which could not be funded immediately under the priority system related to USEPA grants. Some projects with high federal priorities have also been funded. Approximately eighty percent of the bond funds have been appropriated.

The portion of the remaining bond funds tentatively programmed for northeastern Illinois through 1982 is relatively small ($32.6 million). The amount programmed for

that portion of the region outside MSDGC, however, represents ten percent of the grant funds projected to be availalbe to this area. The loss of these grant funds could necessitate an extension of construction schedules with a consequent overall increase in the cost of implementing the plan due to inflation. Given the impact which water quality conditions in northeastern Illinois have on areas downstream in the Illinois River system, an early commitment by the legislature to make the remaining funds available is extremely important.

3. A federal commitment on extension of the grant program should be made as soon as possible in order to permit advanced planning of construction by designated treatment authorities.

If local governments are to make a commitment to continuing planning of their facilities needs, it is important that they have an early indication of the level of federal funding to be available to them. The draft National Water Quality Management Program for 1978-83, prepared by USEPA in January, 1978, states:

> Planning for urban storm runoff must be completed by FY 1983 so that EPA can prepare legislative initiatives related to new construction grant authorizations by 1985. The vast projected costs of traditional capital intensive solutions and the potential for lower cost implementation through alternative methods after successful water quality management planning make urban storm runoff a high priority.

The Commission's studies underlying this plan indicate that even with a high degree of pollutant removal from projected storm flows, water quality standards will not be met without continuing development of the region's wastewater system. Further, the principal strategy for the management of urban stormwater in the most densely populated portion of the region is the TARP, a major structural approach. This suggests that to defer any decision on continued funding for point source controls until 1985 or after is to impose needless uncertainties and planning and funding delays on facilities, the need for which is recognizable now. The process of 208 planning and implementation should be sufficiently advanced by 1980 to permit USEPA to assess progress being made and to recommend an initial extension of the construction grant program for at least two years beyond 1983. This would be well within the ten-year program recommended by the administration in 1977, and would permit designated management agencies to continue the revision of their facilities plans in response to changing conditions including those arising out of successful implementation of the areawide plan. Ideally, the federal government should extend the grant authorization annually or biennially,

maintaing a continuing five-year authorization of funds to facilitate rational continuing planning. This would still permit adjustment of the grant program in response to forecasted future needs and to changes in technology.

4. Future authorizations for construction grants should be adjusted upward to reflect a portion of the inflationary impact on the cost of facilities.

The costs summarized in this chapter have been presented in constant 1977 dollars in order to maintain a uniform base for analysis. It is to be assumed, however, that these costs will continue to escalate as the prices of land, labor and materials increase under general inflationary pressure. One consequence of this inflationary movement is that a constant federal dollar contribution will represent an increasingly smaller percentage of the total cost of wastewater improvements. If we assume a six percent annual inflation, for instance, a federal grant of $30 million which represents 75 percent of the cost of the project in 1977 will represent only 60 percent in 1981. The shortfall in federal construction grants, identified above, will thus become increasingly greater over the period of the current grant authorization.

Federal construction grants are funded from general revenues raised through the federal income tax, the receipts of which increase at a higher rate than general inflation due to the progressivity of the tax structure. Some portion of this natural increase in federal revenues should be reflected in the construction grant program through an escalation factor. This would maintain the effective federal grant near 75 percent of project costs. Alternatively, Congress should indicate its intent not to keep up with the inflation in construction costs and amend the grant program legislation to provide a lower percentage grant. While this change is not desirable from the standpoint of achieving the mandated water quality standards, it would allow local governments to arrange necessary local financing on the basis of clear federal policy.

5. The eligibility of sewer rehabilitation and upgrading in established urban areas for federal construction grants should be determined as soon as possible.

This plan has identified the considerable investment required to upgrade and rehabilitate existing local sewers within the MSDGC service area. Similar improvements will be required in established urban areas outside the District but have not been quantified in this plan except where they have been included in 201 facilities plans. The costs of these improvements are still highly tentative since studies of infiltration/inflow and required corrective measures have

not been completed in most areas. The federal determination of the degree of eligibility of these projects for grant assistance has been deferred, pending a determination of the relative benefits of the projects for water quality and local stormwater management.

It is important that these determinations be made expeditiously once the required study findings are available from local agencies. The draft land use, residential, and water supply plans prepared by the Commission all emphasize the need to conserve the region's investment in developed communities while accommodating new urban expansion in a manner supportive of regional goals. These same policies are reflected in this plan. Such a strategy of urban conservation requires the maintenance of the infrastructure of public facilities which provide a major incentive for private activities to remain or locate in established areas. In the review of the state construction grant priority criteria called for in this plan, the importance of local sewer improvements to the achievement of water quality standards as well as to the overall maintenance of established urban communities should be adequately reflected.

e. Adequacy of Local Point Source Control Funding

Even with the assumption that sufficient construction grants will be available to provide 75 percent of the cost of required point source control projects, considerable local funding will be required between now and the year 2000. Based on the cost estimates and other assumptions in this chapter, it will be necessary for local management agencies to provide $3,017.7 million in capital funds and, $2,112.4 million in long-term financing, and $888.9 million in additional OM&R funds. These amounts exclude the costs of new collector sewer systems (where these have not been estimated as part of local 201 plans) and the OM&R expense on local sewer improvements within the MSDGC jurisdiction.

The principal local sources which are currently relied upon to meet capital and OM&R requirements have been identified above. It is expected that primary reliance will continue to be placed on property taxes and on user and service charges, with a smaller portion of local requirements met through the imposition of connection and other fees, industrial cost recovery, and miscellaneous revenues. It is expected that the relative portion of local funding raised through the user charges will increase, but that the ad valorem tax will remain the dominant source of local funds. It is also anticipated that revenue bonds will be the principal source of long-term capital funding as statutory limitations on general obligation bonding are reached.

It is much more difficult to assess the adequacy of these sources to meet the financial requirements of the plan

than it is to determine the availability of federal funds. Federal construction grants are allocated from a single source, with the dollar amount available and the criteria for their allocation known in advance. The adequacy of financial resources within the region, on the other hand, can be assessed only as the sum of the fiscal capacities of individual units of government responsible for implementing portions of the areawide plan.

Two factors make it impractical to perform this assessment from a regional scale. First, the analysis of the fiscal capacity of an individual unit of government is highly particularized and complex, requiring an examination of past financial experience, existing indebtedness, projected budgetary conditions and the financial condition of overlapping units of government. It also requires a judgement as to the likelihood of securing necessary referendum and other approvals. This analysis is customarily done by each unit of government or its consultants at the time it seeks to finance a particular project. Second, an attempt to assess the overall fiscal capacity of the region which did not reach this local level of detail would inevitably conceal differences between those communities with more than adequate capacity to carry out their responsibilities under the plan and other communities with inadequate financial resources.

The necessary analysis of the fiscal capacity of the region can thus be done only by each individual management agency in conjunction with its facilities planning. The areawide plan can speak only in broad terms about the impact of local funding requirements on the region and about ways of improving the adequacy of detailed fiscal analysis as the plan is implemented.

Table 9-9 summarizes one measure of the financial impact of the areawide point source control plan within each drainage basin. The table compares the projected local cost (i.e., exclusive of federal and state grants) of implementing point source controls in the plan to the current tax or charge for wastewater service paid by an average household in the basin. The projected household charge is stated in dollars and as a percentage of the current average charges. Both capital and OM&R costs are included. The cost of facilities has been capitalized to reflect the cost of debt service, on the assumption that local capital funds would be raised through the issuance of revenue bonds. The table further assumes that federal funds are available to provide full 75 percent support for eligible projects. It should be noted that although the table applies to average residential rates, the same percentage increase will apply to industrial and commercial users as long as existing rate structures and proportional contributions to treatment plant loads remain the same.

It is evident that the local cost of implementing the point source control plan varies considerably from basin to basin. This variation reflects both the different

magnitudes of the point source contribution to water quality problems and the adequacy of existing facilities to deal with these problems. With respect to the latter point, there is an equally broad variation within drainage basins. It should be noted that when the costs of managing urban stormwater and agricultural sources of pollution are added to these point source costs, the differences among the basins tend to even out. It should also be clear that these cost impacts of the areawide plan are not necessarily proportional to the aggregate fiscal capacity of each basin.

To a considerable extent, the local costs necessary to implement the point source elements of the plan are no longer discretionary. Most of the improvements and expansions in wastewater treatment facilities are derived directly from the 201 facilities plans prepared by local treatment authorities. These improvements have been determined to be necessary to meet current water quality and effluent standards or to serve future population in the most cost-effective manner. A decision not to implement these plans is thus practically foreclosed in most facilities areas, unless water quality or effluent standards are changed or a community takes steps to limit future population increase. This nondiscretionary quality of the point source control plan was recognized in the Commission's commitment to accept the 201 facilities plans as given elements in the development of the 208 plan. This commitment also reflects a federal guidance which requires that completed 201 plans be incorporated into the areawide 208 plan.

At the same time, it is a federal requirement that the elements of the areawide 208 plan be not only cost-effective but also economically feasible. This dictates that each facilities plan which has not advanced to the construction and financing stage be assessed in terms of the fiscal capacity of the jurisdiction to pay for the facility. Any future new facilites should be subjected to similar assessment. This assessment should be made before major federal or local funds are committed. The following recommendations are intended to assure that decisions on the implementation of particular point source control elements of the plan are preceded by thorough analysis of local fiscal capacity.

> 6. Prior to awarding any new Step II grant for detailed engineering, the USEPA should require a detailed analysis of the capacity of the treatment authority to finance the projected local share of the cost of facilities included in its Step I plan.

An acceptable facilities plan prepared under Step I of Section 201 must include a statement demonstrating that the treatment authority has the necessary financial resources available to insure the construction, operation and maintenance of the proposed facility. In some instances,

TABLE 9-9: PROJECTED AVERAGE ANNUAL COST OF POINT SOURCE CONTROLS, PER HOUSEHOLD, IN DOLLARS, AND PERCENTAGE INCREASE OVER CURRENT AVERAGE ANNUAL WASTEWATER CHARGE

Basin	Current Charge $/Yr.	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000
DuPage	($) 83.84	118.34	129.59	127.94	128.84	115.34
	(%)	41.1	54.6	52.6	53.7	37.6
Fox	($) 84.75	135.55	146.35	156.85	155.35	132.35
	(%)	59.1	73.3	75.8	72.9	53.3
Hickory	($) 81.43	130.18	131.83	127.48	124.78	100.93
	(%)	59.9	61.9	56.6	53.2	23.9
Kishwaukee	($) 85.01	121.31	137.81	140.66	145.61	136.16
	(%)	42.7	62.1	65.5	71.3	60.2
Little Calumet	($) 72.60	113.70	120.00	118.80	116.25	91.80
	(%)	56.6	65.3	63.6	60.1	26.4
Lake Michigan North	($) 111.60	165.30	162.60	160.35	158.25	148.80
	(%)	48.1	45.7	43.7	41.8	33.3
Lower Des Plaines	($) 90.49	135.79	139.39	138.94	137.29	111.19
	(%)	50.1	54.0	53.5	51.7	22.9
North Branch	($) 97.60	169.30	176.05	172.76	169.45	124.60
	(%)	73.5	80.4	77.0	73.6	27.7
Salt Creek	($) 71.39	146.39	153.74	150.89	147.14	103.04
	(%)	105.1	115.4	111.4	106.1	44.3
Sanitary & Ship	($) 72.60	132.45	147.60	148.65	149.95	93.30
	(%)	82.4	103.3	104.8	105.2	28.5
Upper Des Plaines	($) 88.18	130.63	137.68	136.48	135.13	106.33
	(%)	48.1	56.1	54.8	53.2	20.6
Kankakee	($) 42.20	70.25	87.35	96.50	106.40	103.40
	(%)	66.5	107.0	128.7	152.1	145.0

this statement is proforma and does not include a thorough evaluation of the community's financial status. The IEPA should require that this analysis take the form of a preliminary assessment of the treatment authority's ability to market the required capital obligations and to charge sufficient revenues to meet debt service and OM&R expenses. Since facility costs based on a Step I plan will be only preliminary approximations, it is recognized that a final financial analysis preparatory to issuing bonds will not be possible. The cost of this preliminary financial analysis should be included as an eligible cost in the Step I planning grant.

This assessment of financial capacity is particularly important in the case of those relatively small facilities areas in which it is proposed to construct entirely new central treatment systems or to add major increments to existing small systems. Nationwide studies by USEPA have determined that such major facility expansions often impose unacceptable fiscal strains on small communities, in which the per capita cost of centralized wastewater service may be significantly higher than in larger communities with existing systems. The USEPA study suggests that as a guideline annual wastewater service charges (including both debt service and OM&R) ought not exceed 2 percent of median gross family income. This figure cannot be taken as more than a rough indicator and must be supplemented by a more detailed financial analysis in order to determine fiscal capacity of any particular community in the region.

7. IEPA should prepare, in conjunction with the Commission, guidelines for the preparation of preliminary financial assessments and for the determination of inadequate fiscal capacity.

In preparing guidelines for use in assessing preliminary fiscal capacity, IEPA and the Commission should work with representatives of treatment authorities and of the legal and financial community concerned with municipal finance. Guidelines should not establish firm limits on the basis of which funding decisions would be made, but should indicate general threshold conditions which would suggest the need for more detailed financial and technical analysis prior to making such grant commitments.

8. IEPA should retain a portion of the remainder of the anti-pollution bond fund for use in areas with high priority for the installation of facilities but with limited local fiscal capacity.

Where it is determined that local financing of required capital facilities will place extreme burdens on a community, IEPA should apply state bond funds to provide part or all of the required local matching share. IEPA, in conjunction with the Commission, should prepare guidelines

for identifying those communities for which such extraordinary fiscal support is required. Eligibility criteria should give priority to those problem septic areas for which the provision of municipal-type wastewater service is found (under procedures described in Chapter Six) the only effective way of assuring compliance with water quality and public health requirements.

9.03 COSTS OF URBAN STORMWATER POLLUTION CONTROL

Overview

An important part of the strategy outlined in Chapter Six is that the measures selected to control pollution from urban stormwater will vary from one part of the region to another. Practices such as increased or improved street cleaning may be useful in most communities. However, stormwater detention and erosion and sedimentation ordinances will be applicable primarily in those communities in which significant levels of new development are expected. An even smaller number of communities, at least initially, may use innovative techniques such as performance zoning. Each community's package of control measures (and their associated costs) will, thus, depend upon the nature of the community, future advances in knowledge of urban stormwater control, and local preferences. These measures are to be specified in the periodic implementation programs prepared in each county.

Because of this variability, the costs of potential control measures are discussed below in separate sections, recognizing that the total costs in any particular area will be made up of some combination of these. The discussion is also separated into public and private costs, since a significant portion of the expense of urban stormwater control is likely to be borne by the private sector.

The recommendations concentrate upon those existing governmental programs and regulations which, though now carried out for other purposes, can be expanded or redirected to simultaneously reduce urban stormwater pollution. If this pollution was not a problem, most communities would still be incurring costs for street cleaning and various types of development regulation. Therefore, only the incremental costs resulting directly from the recommended expansions or redirections of these programs can legitimately be attributed to water pollution control.

Street Cleaning

In the basin-level testing of urban stormwater pollution controls, it was assumed that a 25 percent reduction of BOD could be achieved in existing urban areas and a 50 percent reduction in newly urbanized areas. Having tested the effects of this reduction on the streams, estimates were then made of the type and frequency of street cleaning programs which would be needed to accomplish this reduction if no other methods (e.g., detention, catch basin cleaning, performance zoning, etc.) were used. Costs were then calculated for each basin; these are shown in Table 9-10. The total cost of a program based on vacuum sweeping for the period 1978-2000 is $234.1 million.

These costs are based upon an estimation that, in order to achieve the specified reduction levels, it will be necessary to make approximately one pass a week with a vacuum sweeper in all newly urbanized areas and one pass every two weeks in existing areas, throughout a nine-month period each year. These vary somewhat from basin to basin. Cleaning would not take place on rainy days.

It is important to note that vacuum sweeping is a more economical means of achieving the tested pollutant reductions than traditional brush-type equipment. The difference is largely attributable to the greater efficiency

TABLE 9-10: ESTIMATED ANNUAL STREET CLEANING COSTS

BASIN	1976		2000	
	VACUUM	BRUSH	VACUUM	BRUSH
Chgo.Rvr./San.& Ship	$ 45,100	$ 78,200	$ 52,800	$ 95,100
Fox	1,338,000	2,320,000	3,560,000	4,980,000
DuPage	704,100	1,220,000	2,620,000	4,020,000
Salt	849,700	1,473,000	1,670,000	2,820,000
Little Calumet	425,300	737,200	1,110,000	1,780,000
Kishwaukee	105,300	182,600	190,000	273,000
North Branch	464,300	804,800	959,400	1,380,600
Hickory Creek	173,200	300,300	338,000	608,000
Upper Des Plaines	888,900	1,541,000	1,800,000	2,880,000
Lower Des Plaines	343,000	594,833	748,000	1,088,576
Kankakee	54,300	94,134	95,300	165,212
Lake Michigan North	852,000	1,477,030	968,000	1,678,125
TOTAL	$6,243,000	$10,823,097	$14,111,500	$21,768,613

of vacuum equipment, particularly in removing fine particles which have a high pollution potential.

The expenditures in Table 9-10 are based on estimated unit costs of $10/curb-mile for one pass with a vacuum sweeper and $8/curb-mile with a brush sweeper. (See NIPC Staff Paper No.28) Combined sewer areas are not included. Sweeping would take place during nine months of the year. The number of sweeping passes required varies among basins.

The costs in Table 9-10 also include the initial cost of equipment (amortized over a 10-year period) as well as the costs of operation and maintenance. The initial cost of vacuum equipment ($40-50 thousand in April, 1978) is half again that of traditional brush sweepers. However, several studies have indicated that despite this higher initial cost, the overall cost (including depreciation) of vacuum sweeping is as much as 18 percent less than that for brush sweeping to obtain the same removal of the fine particles which contain the pollutants of concern.*

It should be noted that these costs do not take into consideration the nature and costs of existing street cleaning programs in the region. These vary considerably in terms of type of equipment and frequency of operation. The incremental cost of moving from these existing programs to the levels assumed in the testing of basin alternatives will be less than those shown in Table 9-10. Exactly how much less will depend upon such factors as the age and condition of each community's present equipment, equipment replacement plans, and the feasibility of modifying existing schedules and staff assignments.

In sum, these estimates can be viewed as the upper limits of the costs of achieving urban stormwater pollution reductions through street cleaning. These would be the costs only if no other control measures were used and none of the existing street cleaning programs could be used as a base for future expansions.

Local Regulation of New Development

In those portions of the region in which urbanization has already occurred, remedial measures, including such things as street and catch basin cleaning, may be the most feasible solution to urban stormwater runoff pollution. However, in areas in which new development is expected, local governments have an opportunity to take actions which will prevent the development of a stormwater pollution problem.

Virtually all municipalities and counties in northeastern Illinois currently have ordinances in effect which control the form of new urban development. This plan

*Greeley and Hansen Engineers, Preventive and Corrective Measures, Urban Stormwater Pollution, NIPC 208 Staff Paper No. 28, December, 1977, pp. 2-8.

recommends that these ordinances--including subdivision, zoning and building codes--be modified where necessary and consciously used to insure that stormwater runoff from future residential, commercial, and industrial developments contributes as little pollution to the region's waterways as possible. Generally, this will involve the adoption of additional controls over private development to require erosion and sedimentation control, stormwater detention, and a reduction of impervious surfaces through performance zoning or other concepts.

The present costs to the public of enforcing these development controls are likely to change as a result of these suggested modifications. In turn, the costs to the private developer will also change as he is required to comply with new regulations. These costs of compliance will be passed on to the home buyer or renter as part of his shelter cost, as will the cost of enforcement through local taxation. It is important to note that these changes may not always be in the form of a cost increase. Depending upon the particular ordinances involved and the specific characteristics of a proposed development, there may well be opportunities to reduce both public and private costs while simultaneously achieving desired reductions in urban stormwater pollution. It is also important to note that, even where costs may be increased, many of these proposed development control modifications have multiple benefits beyond water quality (e.g., flood control, recreation, reduced maintenance requirements) which should be taken into consideration when comparing costs and benefits.

The focus in this discussion is on the development of new residential areas. However, the basic concepts apply equally well to commercial and industrial development.

The Public Costs of Development Regulation

In order to implement their current subdivision, zoning, and building codes, municipalities and counties may need to have access to staff with expertise in the areas of comprehensive planning, site design, law, engineering, public health, and construction techniques. Many communities maintain some or all of these specialists on permanent staff. Others utilize part-time employees, seek assistance from other agencies, or hire private consultants on an "as-needed" basis to carry out the necessary project reviews and inspections. The course taken in a particular community is dependent upon such factors as its size, the intensity and nature of development currently in progress, and local custom. Such variations affect the cost of carrying out the municipality's development review process.

The relative sophistication or complexity of the community's development regulations also can affect costs. The fewer documents a community must review, and the fewer

the number of on-site inspections required, the lower the costs of enforcement are likely to be.

The varying nature of proposed developments is an additional factor in determining the public costs of enforcement. In some cases, a single individual or corporation may propose to subdivide a large tract of land, install the necessary public facilities, and construct and sell the buildings. In other cases, a similarly sized tract of land will be subdivided by several different individuals, thus increasing the number of reviews, permits, and inspections required for the development of the same number of dwellings. The process can be still further complicated (and the costs of enforcement changed) if one individual subdivides a parcel and sells lots to others who then carry out the actual construction.

Finally, a large number of intangibles can affect the community's costs. Requests for re-zonings, pre-annexation agreements, problems with the extension of public utilities, and various possible technical or legal disputes all have the potential to increase costs by complicating and extending the review process. Even changes in the local housing market can affect the process if they necessitate changes in the design or timing of a development.

Because the process is so variable, it is impossible to project what it will cost for all municipalities and counties between now and the year 2000 to enforce either their existing development ordinances, or the additional regulations recommended in this plan. What can be said is that the total costs could be significant, particularly in areas undergoing rapid development. However, the added costs solely due to water qualty related modification need not be large in those communities which already have sophisticated development review programs.

Of the various modifications to local ordinances recommended in this plan, stormwater detention regulations may have the least cost impact. One reason is that 162 of the 262 municipalities in the region already have detention requirements. In addition, the costs of staff engineering reviews of proposed detention schemes may often be no greater than would have been required to review a more traditional drainage scheme in which a larger storm sewer system is used.

Erosion and sedimentation regulations may add more to the public costs of development review. Depending upon the complexity of the local ordinance, the erosion control plan for an area may include a variety of measures (sediment basins, plantings, phased land clearing, etc.), the effectiveness of which can be best judged by staff which has some specialized expertise. Also, these regulations are concerned with the control of activities during the development process, not merely with the end result of that process. More frequent on-site inspections may, therefore, be necessary, adding to enforcement costs.

There is insufficient experience in the region with the use of the flexible performance zoning approach to determine the effect on the public costs of development review. Rather than merely comparing a development proposal to established standards for lot size, street width, and overall density, the enforcement staff will have to evaluate the impacts and quality of each proposal more on its own individual merits. The flexibility of this approach will also provide more opportunity for negotiation between the developer and the community, thereby lengthening the process and increasing the costs to the public agency.

Funding for the Enforcement of Water Quality Related Development Controls - Recommendations

Most communities currently reduce or even eliminate the costs of development reviews by assessing fees for the issuance of the necessary approvals and permits. Such fees can be set at a flat rate or at a specified percentage of the estimated value of the development. Thus, the private developer assumes much of the financial burden to the public agency of reviewing, approving, and inspecting his project. Some communities pass these costs on even more directly by charging the developer on an hourly basis for all staff time devoted to his project.

The means of funding the development regulation process is a matter for local determination. However, the Commission recognizes that effective enforcement is crucial to the accomplishment of urban stormwater pollution control objectives; and that adequate funding is, in turn, crucial to effective enforcement.

1. Where local budget limitations would prevent the maintenance of an adequate development review and enforcement process, the county or municipality should adopt procedures which require the prospective developer to pay some or all of the costs.

This practice is already in effect in many parts of the region. Aside from these precedents, passing the public costs of development review on to the private sector is justified by the likelihood that the more sophisticated and flexible public review process which results has the potential to reduce some of the developer's other costs, thus more than offsetting the increased fees he must pay. These potential reductions are discussed in the following section.

The procedures of three municipalities in which substantial development is currently occurring demonstrate the variability of funding methods, which in turn reflect the variability of review costs. In Naperville, developers are generally charged on an hourly basis for staff time devoted to reviews of their projects. However, in a small

number of instances agreements have been reached with developers to charge a fee equal to one and one-half percent of the value of site improvements. Downers Grove uses a sliding fee scale which ranges from 6 percent of construction value for projects under $2,500, to 3.25 percent for those over $200,000. In Schaumburg, the Village bears most of the costs of project reviews; the fees it requires developers to pay cover only a small portion of these costs.

The Private Costs of Development Regulation

Recently considerable concern has been expressed by representatives of the building industry and some public officials over the added costs which various government regulations have imposed upon developers, and ultimately upon consumers, of new housing. It has been argued that local, state, and federal regulations, in combination with a variety of other factors, are helping to push the cost of new housing beyond the reach of all but a small portion of the population.

The National Association of Home Builders (NAHB) recently released the results of a nationwide survey which suggests that the private costs of local regulations may be particularly high in the Chicago Metropolitan area; higher in fact, than in any other of the areas surveyed.* Their estimate is that the land development costs per lot for a hypothetical ten-acre subdivision in the Chicago area would be $6,841, compared to only $2,748 in Sacramento, California, the least expensive area. The NAHB attributes this difference to higher standards for such things as pavement, storm sewers, street lights, and signs. They estimate that if more economical development standards were used, the developer of this hypothetical subdivision could reduce his costs from $6,841 to $2,319 per lot.

The inventory of local regulations conducted during the course of the 208 program suggests that development regulations and standards vary considerably throughout northeastern Illinois. Thus, it may not be valid to consider the NAHB's $6,841 per lot estimate to be a typical or average figure for the region. NAHB's survey does, however, address a very real problem. The 208 plan must take into consideration the potential impacts of additional local water quality regulations on the availability of affordable new housing.

This plan suggests that many communities enact and enforce additional regulatory measures to their existing development control programs. Taken by themselves, these water quality-related regulations do add to the cost of

*"NAHB Multi-State Survey of Development Costs: Regulation Price Table varies from $2,961 to $6,841 per lot", Professional Builder, March, 1978 pages 30-31.

residential construction. Experience of one major builder in the region indicates that the installation of stormwater retention facilities adds approximately $200 to the cost of each house in a 160-acre subdivision with one-third acre lots. Such costs are subject to substantial variation, of course, depending on the density and type of construction, characteristics of the site, and particular local requirements. An estimate of the total future cost of stormwater retention requirements throughout the region is thus impractical to develop.

Nor is it clear that such an estimate would have substantial meaning. Stormwater retention and erosion and sedimentation control have benefits (such as flood control) to which some portion of their total cost should be assigned. Further, these costs may be offset through savings, in other aspects of development related to efficient and economical subdivision design. The recommendations in this plan are often consistent with NAHB's own suggestions in this respect. Changes in overall costs of new development could occur in any of the following areas

The Costs of Land Acquisition

Local public policies, such as zoning and utility extensions, can affect the cost of undeveloped land by either increasing or decreasing its development potential. These policies can also limit the overall supply of land which can feasibly be developed, thereby generally increasing raw land costs to developers in an area.

The urban stormwater related regulations recommended in this plan may not directly affect either the supply or development potential of raw land. However, some indirect cost effects may occur. Typically, erosion control or detention regulations apply only to larger developments, generally of five acres or greater. This may create some incentive for developers to purchase smaller tracts of land for which costs per acre may be higher. On the other hand, performance zoning and planned unit development is more feasible on larger tracts of land and may, therefore, encourage larger scale land purchases. It would appear that these stormwater-related regulations would have a mixed, but minor, impact on the costs of raw land.

The Costs of Land Preparation

The most significant cost impacts of the recommended regulations would be in the area of land preparation. Local subdivision regulations currently require the developer to install basic facilities such as streets, sidewalks, curbs and gutters, storm sewers, sanitary sewers, water mains, lights, and street trees. Lots must also be laid out

according to the community's zoning requirements. Most communities have precise, long-established standards for these facilities which the developer must follow. At times, these standards have been too stringent or too rigidly applied without adequate consideration of the particular site. The result has been added costs for the construction of larger than necessary streets and sewers, or expensive curbs and gutters where roadside drainage swales would be satisfactory.

The performance zoning regulations and associated planned unit development concepts recommended in Chapter 6 allow more flexibility for the application of standards to new subdivisions. Flexibility in zoning provisions will allow for clustered lots at higher net densities which will reduce the amount of impervious surface, while simultaneously reducing the developer's cost for roads and utility lines. Flexibility in subdivision-type standards for street-width and curbing will also permit a reduction in both the quality of runoff and development costs.

The precise levels of both pollution and cost reductions will vary by community and site. The NAHB has compared the costs of conventional and clustered development for a hypothetical 166-acre site. Its analysis indicates that site development costs at a given average overall density level could be reduced from $6,367 to $4,222 per dwelling unit, a 33 percent reduction, if a clustered approach is used. Performance zoning would clearly allow some cost savings, even if a community did not choose to accept all of the NAHB's modifications of conventional standards.

Stormwater detention regulations would require the developer to design and install backyard swales, constrictors and basins not normally necessary under conventional subdivision regulations. However, it is likely that part or all of the resulting costs would be offset by the reduced size or elimination of some stormwater facilities needed downstream of the detention structure.

The most significant cost increases for the developer might result from erosion and sedimentation control requirements. Phased land clearing, sedimentation basins, temporary seeding, or other erosion prevention measures will be necessary during the development process. The developer and the potential buyer will gain some benefit from the reduced loss of topsoil, but much of the benefit from his efforts will be in the form of lessened sedimentation problems downstream. The developer may be able to reduce costs somewhat by effectively coordinating temporary construction site erosion control with his other plans for permanent detention basins and landscaping plans.

The Costs of Financing

Initially, the new and more flexible development regulations recommended in this plan may tend to extend the time it takes for a developer to design, submit and receive approval for proposed projects. This may increase his cost of financing the project. However, as these relatively new concepts are more widely and consistently adopted, and as both developers and public officials become more familiar with them, the time required for project approval should decrease.

2. In the development of model ordinances called for in Chapter Six, the Commission should consult with representatives of the development industry and of local government to assure that opportunities to reduce the costs of private compliance with the requirements of this plan are taken advantage of.

In developing these ordinances, the possibility of including reasonable time limitations on governmental action, in order to reduce the cost of delay to the developer, will be explored.

Post-Development Costs--Public and Private Maintenance Programs

Questions of ownership and responsibility for maintenance associated with flood retention basins and erosion control measures during construction are legally, financially, and politically complex. This plan can only point out the major issues and, in some cases, suggest some general directions toward their resolution. The costs and funding of retention basin maintenance will, however, be an important item on the agenda of the continuing planning program.

Erosion and Sedimentation Control

Municipalities and counties should provide regular inspections throughout the development period to insure that control measures are being kept in operating condition. The costs of such inspections to the public agency can be minimized by combining them with other required inspections. The costs of the actual maintenance should be borne by the developer as an integral part of his site development costs. The developer should post a performance bond sufficient to cover the cost of carrying out his proposed erosion control plan.

The continuing maintenance of permanent detention basins can involve substantial expenditures for both public agencies and landowners, particularly where it is necessary to drain and dredge basins. Those basins already in existence present the most difficult maintenance funding problems. In residential areas, homeowners' associations or individual owners may have been assigned maintenance responsibilities through deed restrictions. But, these groups are likely to be unaware of the long-range implications at the time of purchase, and may be neither able nor willing to take on the substantial cost burdens.

Where municipalities, or other public agencies, have accepted the retention basin through public dedication, they may have been as unaware of the long-range maintenance burdens as the private landowners. And, the municipality or county may find that, regardless of who owns the basin or what deed restrictions exist, unless it assumes the responsibility, no one else will.

In some cases it might be necessary for the municipality or county to assume the entire cost of basin maintenance. In others, particularly where the potential water quality benefits are significant, sanitary districts might also become involved as part of their responsibilities to control sources of water pollution. The use of water quality-related funding to maintain retention basins may be justifiable for only a portion of the cost, since flooding and recreation benefits will also result.

Where additional wet-bottomed basins are the only solution for detention, maintenance responsibilities should be vested in a private association through deed restrictions. However, during the continuing planning program, some procedures will need to be developed for estimating likely maintenance costs and making these available to purchasers of property at the outset so that they fully understand the extent of their responsibilities. Where other detention solutions would work, but a retention basin is desired by a municipality, county, or park district because of its recreational or aesthetic value, that public agency should accept dedication and assume all costs of necessary maintenance.

3. In the development of model ordinances for stormwater retention and erosion sedimentation control, the Commission will work with local governments, developers, and homeowners' associations to consider ways of assessing the maintenance costs of stormwater management facilities and of assuring that responsibilities for maintenance are taken and fulfilled.

9.04 COSTS AND FINANCING OF AGRICULTURAL POLLUTION CONTROL

Overview

Chapter Six of this plan recommends an agricultural pollution control program based upon the installation of soil conservation-type Best Management Practices (BMPs) on lands which have been identified as subject to erosion and pollutant runoff problems. This plan assumes that these BMPs will be implemented on a gradual schedule, with targets of 30 percent of the acreage under BMPs by 1985, 70 percent by 1995, and 100 percent by 2000.

The majority of BMPs will be carried out through the voluntary efforts of individual farmers. Traditionally, the U.S. Department of Agriculture (USDA) has provided incentives for such practices through technical assistance and grants which cover a share of the total cost. It is assumed that public cost-sharing, at considerably higher levels than in the past, will be necessary to achieve substantial progress through a voluntary program. For this reason, it is important to compare the cost-sharing resources likely to be available in coming years with the need for funds associated with the recommended BMPs.

Costs. During the course of initial 208 planning, an inventory of agricultural lands requiring some form of management was compiled for the entire northeastern Illinois region. The annual costs of the appropriate BMPs were then estimated, using the typical costs per acre for each practice. These are reported in NIPC 208 Staff Paper No. 26, "Preventive and Corrective Measures for Controlling Agricultural Pollution". For those practices requiring capital expenditures, it was assumed that these would be amortized at an interest rate of 7 percent over a 20-year period. This process resulted in an estimated cost of $6,449,000 per year for the complete implementation of all needed practices in the region. The total for the entire period 1978-2000 was estimated to be $156,216,000. These estimated costs would be reduced by more than half (to $75,733,900), under the phased implementation program recommended in this plan. Table 9-11 shows the estimated annual phased costs for each basin and for the entire region between 1978 and 2000.

It should be pointed out that 42.5 percent of the total estimated cost in Table 9-11 is for capital investments such as terraces and other structures. As these capital costs become completely amortized, the total annual costs will begin to fall. This reduction would begin in the late 1990's and gradually increase at roughly the same phased rate at which the expenditures were originally made.

Funding Sources. Three sources of public funds should be available to assist in the implementation of agricultural BMPs. These are: (1) continuing Agricultural Conservation

TABLE 9-11: AVERAGE ANNUAL COSTS OF PHASED AGRICULTURAL BEST MANAGEMENT PRACTICES

Basin	Average Annual Cost 1978 - 1984	1985 - 1995	1995 - 2000	Total 1978 - 2000
Chicago Sanitary & Ship	$ 6,430	$ 21,435	$ 36,439	$ 478,000
DuPage	54,142	180,400	306,833	4,024,000
Fox	322,000	1,073,500	1,825,000	23,939,000
Hickory Creek	12,184	40,614	69,045	905,700
Illinois	12,414	41,390	70,367	923,000
Kankakee	240,000	800,000	1,360,000	17,840,000
Kishwaukee	201,857	672,900	1,143,833	15,005,000
Lake Michigan North	217	722	1,227	16,100
Little Calumet	36,000	120,000	204,000	2,676,000
Lower Des Plaines	74,286	247,800	421,166	5,525,000
North Branch Chicago River	3,281	10,937	18,593	243,900
Salt Creek	917	3,058	5,200	68,200
Upper Des Plaines	55,000	183,400	311,833	4,090,000
TOTAL AVERAGE ANNUAL COST	$ 1,018,728	$ 3,396,156	$ 5,773,536	
TOTAL FOR ENTIRE PERIOD	$ 7,131,113	$33,961,560	$34,641,227	$75,733,900

Program funds; (2) newly authorized funds under the Federal Water Pollution Control Act Amendments; and (3) possible state funds in support of activities called for under the recently amended state conservation legislation. These programs have been described in Chapter Six. Of them, the ACP and FWPCA funds will provide the majority of direct assistance to individual landowners and operators.

ASCS. During each of the last two years annual appropriations for the Agricultural Stabilization and Conservation Service's ACP program have been $190,000,000 nationwide. Of this, Illinois was allocated $5,971,800 in cost-sharing money for distribution to counties throughout the state.

The distribution to counties is based in large part on the acreage of land needing conservation in each county compared to total needs in the state. These needs were determined in a 1967 Conservation Needs Inventory (CNI). This "need" based distribution formula is modified each year to reflect each county's past experience and current ability to utilize the funds. As a result, the final distribution of 1978 ACP funds to the six counties in northeastern Illinois totaled $135,000, only 39.5 percent of the $342,500 which could have been allocated under the CNI. The actual allocation of funds among the six counties, and the amounts reflective of the CNI formula, are as follows:

	Actual	CNI Formula
Cook	$ 5,000	$ 38,596
DuPage	5,000	26,276
Kane	20,000	48,288
Lake	33,000	40,948
McHenry	37,000	80,703
Will	35,000	107,689
	$ 135,000	$ 342,500

For the duration of the planning period it is assumed that national ACP funding will remain at a minimum level of $190,000,000 per year. It is also assumed that participation in the program will increase considerably in northeastern Illinois, in part as a result of the 208 program, resulting in an annual allocation of the full amount due in the region under the CNI formula. This latter assumption will depend on the ability and willingness of farm operators in the region to submit sufficient project proposals to require full funding under the CNI formula.

FWPCA (PL 95-217). The 1977 amendments to the Federal Water Pollution Control Act authorized $200,000,000 in 1979 and $400,000,000 in 1980 for a water quality-related agricultural cost-sharing program. State and sub-state

allocation methods for those funds have not yet been formalized. However, assuming the allocations would be proportional to those of the existing ACP program, Illinois could expect an additional $6,280,000 in 1979 and $12,560,000 in 1980. Using the CNI need factors, northeastern Illinois could, in turn, receive $360,176 and $720,354 respectively.

In terms of funding, the major differences between the new program and the traditional ACP are in the areas of cost-share percentage and project eligibility for funding. Under PL 95-217, cost-sharing for a project may be no greater than 50 percent unless the additional share above this figure is clearly attributable only to off-site water quality improvement. Unlike ACP, these new funds may be used for maintaining as well as installing BMPs over the life of a five to ten year contractual agreement.

State of Illinois. Currently, the Illinois Department of Agriculture (IDA) provides some financial assistance to local soil and water conservation districts to support their programs. It does not provide conservation aid directly to landowners and operators. After statewide and county standards and programs (discussed in Chapter Six) are finalized by IDA and the local districts, it would be appropriate for IDA to evaluate the need for (and recommend to the legislature, if appropriate) state financial aid to make up for any shortfalls in USDA funding.

Adequacy of Funding Sources. Table 9-12 is a regionwide comparison of the costs of needed agricultural BMPs to federal financial aid likely to be available during the period 1978 through 2000. In general, it appears that these resources will be adequate during the early years of the phased BMP implementation process. Indeed, a surplus in the first eleven years suggests the implementation schedule can be accelerated somewhat. However, beginning in 1989, a shortfall will exist, which will steadily increase until 2000, when only 49.2 percent of needed BMPs will be funded.

Even this assessment must be made with reservations, due to some basic assumptions which have been used in the analysis. The first is that a 33 percent average cost-sharing rate (75 percent of capital cost) will provide sufficient incentive to landowners and operators to implement necessary BMPs. The many reasons why this may not be sufficient, including agricultural market conditions, land ownership patterns, and the low prospects of short-term economic returns on BMP investments, have been discussed earlier in Chapter Six.

The second crucial assumption is that both ACP and FWPCA funding will continue throughout the planning period at the peak levels expected in 1980; and that these funds will increase as needed to account for any inflation in the cost of BMP implementation. The history of variability in federal appropriations for the ACP program and the present

lack of any authorization of FWPCA agricultural funds beyond 1980 cast doubts on this assumption.

The third crucial assumption is that the six northeastern Illinois counties will receive allocations of both ACP and FWPCA funds according to CNI need factors, rather than at the much lower levels experienced in recent years. The 1978 ACP figure shown on line (d) of Table 9-12 already overestimates actual allocations by more than 60 percent. The ACP (and possibly the FWPCA) allocations to the region can be expected to be considerably lower than those shown in the table unless the landowners and operators in the six counties begin to demonstrate an ability to fully utilize all potential funds.

Utilization of Resources. The limits of existing financial resources, when compared to need, suggest that extreme care must be taken in the utilization of these resources. Some of the expected gap can be filled by other programs, such as the loans available to farmers and public agencies through the USDA's Farmers Home Administration. There is also the possibility that either ACP and FWPCA appropriations will increase, or that state assistance will be provided. However, the success or failure of the agricultural implementation process need not be totally dependent upon these uncertain developments.

During the last several years, USEPA has sponsored an intensive agricultural research and demonstration project in the Black Creek watershed in Indiana. Among the more significant results of this project has been the finding that fully 40 percent of the sediment in the stream is due to erosion on 80 acres of land. An expenditure of $6,000 on this critical acreage would accomplish the same 40 percent reduction of sediment in the stream as $135,000 expended more uniformly across the basin.

During the early years of the continuing planning process, the various agricultural management agencies should attempt to determine whether this pattern exists in northeastern Illinois. If a limited amount of critical acreage can be identified in each basin, it will then be possible to concentrate financial resources on those areas. In some cases, cost-sharing approaching 100 percent might be used. In this way, a significant portion of pollution could be controlled, even if a relatively small percentage of the total acreage requiring BMPs were funded.

It might be argued that this would amount to an over-concentration on water quality, to the detriment of other objectives (e.g., soil productivity) of agricultural conservation programs. The solution would be to continue to provide ACP funds on a broad basis for any land experiencing erosion problems while concentrating the new water quality related FWPCA funds on critical areas. In this way the landowner or operator who had an erosion problem which did not have significant instream water quality impacts would still have access to financial assistance for its control.

TABLE 9-12: AREAWIDE AGRICULTURAL BMP COSTS COMPARED TO AVAILABLE RESOURCES

(All data in 1977 dollars in millions)

NEED		1978	1979	1980	1981	1982	1983	1984	1985	1986-1999	2000	TOTAL
(a) Costs of Phased Installation of BMPs		.279	.559	.838	1.118	1.397	1.677	1.956	2.210	59.201	6.499	75.734
RESOURCES												
(b) ACP Distribution to Northeastern Illinois		.342	.342	.342	.342	.342	.342	.342	.342	4.788	.342	7.866
(c) FWPCA - Expected Distrib.		0	.358	.716	.716	.716	.716	.716	.716	10.024	.716	15.394
(d) Total -- (b) + (c)		.342	.700	1.058	1.058	1.058	1.058	1.058	1.058	14.812	1.058	23.260
(e) Total Effective Value		1.026	2.100	3.174	3.174	3.174	3.174	3.174	3.174	44.436	3.174	69.780
RESOURCES v. NEED												
(f) Percent (e) of (a)		367.7	375.7	378.8	283.9	227.2	189.3	162.3	143.6	75.1	48.8	92.1

NOTES:

(a) Estimated by NIPC; includes operation and maintenance plus capital costs amortized at 7% over 20 years; also assumes gradual implementation towards goals of 30% by 1985, 70% by 1995, and 100% by 2000.

(b) Based upon 1967 Conservation Needs Inventory factors and assumes continued USDA funding at $190,000,000 per year nationwide. Actual distribution to northeastern Illinois in 1978 was only $135,000.

(c) Based upon a national distribution of funds proportional to current ACP distribution and statewide distribution according to CNI factors. Also assumes continued USEPA funding at $400,000,000 per year between 1980 and 2000.

(e) Assumes average public cost-sharing rate of 75% of initial capital costs. Since costs represent only 42.5% of estimated total costs, cost-sharing is assumed to average 33% of total need. Total effective value is therefore shown as three times the actual amount of federal cost-sharing funds allocated to the region.

9.05 COST AND FINANCING OF THE ON-SITE DISPOSAL REGULATORY PROGRAM

The areawide water quality plan proposed that county health authorities assume a larger role in the regulation of on-site disposal systems. Chapter Six recommends that all new on-site disposal systems be inspected and issued a permit by the county health authority. Further, it is recommended that facilities with on-site disposal systems be inspected wherever they are sold. As complaints are received concerning existing on-site disposal systems, a series of inspections should continually be conducted.

Cost of the Regulatory System

In estimating the cost of this regulatory program, the Commission examined two different approaches encompassing a total of four alternative levels of activity. e/Table 9-13 illustrated these alternatives as applied to McHenry County.

The first approach involved the study of three alternatives. The first of these alternatives based incremental annual costs of a regulatory program on the assumption that renewal of permits for all septic systems would be required at three year intervals. The second alternative was based upon a five-year renewal period for permits. The third alternative also assumed a five year permit renewal period, but based it on the assumption that the annual number of new on-site disposal systems would be reduced by 50 percent below present levels.

The second approach contemplated renewals at times when property is sold. Once again, it was assumed that the annual number of new on-site disposal systems would be reduced by 50 percent below present levels. This thinking reflects the likelihood that extension of sewer service to presently unsewered areas and a more comprehensive regulation of on-site disposal system installation will discourage new on-site systems in much of the region. There may be offsetting factors, however. For example, restricted water allocations to northern Cook County and Lake County may increase the likelihood that new development will rely on well and septic service. However, the net effect of implementation of the recommended on-site disposal regulatory program as well as other elements of the 208 plan will probably be to significantly reduce the number of new septic systems installed.

It will be noted that the incremental cost of the third alternative of the first approach, as calculated for McHenry County (see Table 9-13) is significantly lower than the cost of the first two alternatives. The second approach is somewhat more expensive than the cost-preferred alternative for the first approach (on a regionwide basis, $10,729,100 as compared to $11,378,050 through the year 2000). Public hearing comments on this plan (including statements by

county health department officers from some of the counties,) indicate, however, that the second approach is more easily implemented than is the cost-preferred third alternative to the first approach. This is in large part due to an existing pattern of commercial and governmental lenders stipulating that septic inspections be conducted as a prerequisite to financing. Further, it is the opinion of the Commission that both approaches are likely to be of equal effectiveness from a water quality management standpoint.

In all calculations, the annual number of new on-site systems was assumed to remain constant to the year 2000. Although it is likely that the annual number will be higher or lower, there are so many variables that it was believed best to base the cost analysis on current activity levels. However, the septic assessments undertaken for each county as part of the 208 program have estimated that in some counties the total cumulative number of on-site disposal systems in existence will decrease markedly by the year 2000 because extension of sewer service will eliminate more on-site systems than will be installed. Therefore, an annual percentage decrease in the number of renewal permits has been assumed in some counties as indicated.

Certain general assumptions were made in assessing each of the alternative levels of activity. It was assumed that necessary additional field inspectors would be in entry level positions. Salary levels were assumed to be $950/month, or approximately $11,500 per year. It was also assumed that for every four field inspectors hired, two additional support and supervisory staff positions would have to be filled. One of these positions would be a supervisor (estimated annual salary: $20,000) and the other an entry-level clerk/typist (estimated annual salary: $8,000). To reflect the difference in salaries between the two types of positions, it has been assumed that each additional support position would average $14,000 in salary. Total costs including all overhead expenses and additional administrative costs have been determined by doubling the staff salary costs.

County health authority estimates of the number of inspections which a field person can make annually vary from 700 to more than 2,000. The number varies from county to county depending on such factors as the distance between on-site disposal sites and the pattern of development (e.g., widely scattered new single family homes installing septics or concentrated areas of large subdivisions in whcih each home has a septic system). To reflect the variations, an average figure of 1,150 inspections per field person per year has been assumed.

To determine how many additional inspection visits would result from the recommended regulatory program, it has been assumed that each new system installed would require six visits by a health authority field inspector as follows: 1 to inspect soil conditions, 1 or 2 to witness percolation

tests, 2 or 3 inspections during construction, and 1 six months after installation.

To estimate the number of inspections of residential units sold in each county per year (for the purpose of calculating costs associated with the preferred approach), the following data and assumptions were used. The number of single family residences existing in each county through 1976 was estimated by using 1970 federal census information plus 1970-76 data compiled for the Commission's 1978 Regional Residential Policy Plan. Figures as to the recent annual numbers of single family dwellings sold in each county was derived from data provided by lending institutions and associations of realtors. The number of septic units in each county was derived from each county's septic assessment (see Table 6-11). It was assumed that the percentage of family homes annually changing hands as a function of the total single family housing stock closely approximates the ratio of units on septics sold annually to the total number of septic units in each county. It was in this fashion that the "Annual Sales of Residences on Septics" figures for tables 9-14 through 9-19 were derived.

The estimated number of inspections of on-site disposal systems associated with transfer of property, as proposed here, differs from county to county. Figures on the frequency of inspections were provided by the staffs of each county's health and/or planning departments.

Financing the Regulatory System

Existing county programs for the regulation of on-site disposal systems are financed principally from general revenues. This method of funding could be continued for the expanded regulatory programs recommended in this plan. Another method is the imposition of a system of fees for the issuance of installation and maintenance permits. This would be similar in concept to the common practice of imposing fees for the issuance of building permits, and relates the costs of regulation directly to the users of on-site systems.

Current experience of county health departments indicates that the cost of one field inspection (including related administrative and overhead costs) is approximately $30-35. An installation permit fee of approximately $200 would thus cover the cost of the recommended six inspections. The revenue expected to be generated by permit fees at these levels is indicated in the detailed county tables.

County by County Costs

The particular assumptions applied in each county are set out below. They are summarized in Tables 9-14 through 9-19.

COOK COUNTY (Table 9-14): The septic assessment performed by NIPC as part of the 108 planning process indicates that the number of on-site disposal systems in the year 2000 will be 12,000, approximately the same as the number now in existence. Although the Cook County Health Department undertakes some inspection activity on new on-site disposal systems in unincorporated areas of the County, the level of inspection activity would be significantly increased. The Health Department would also assume responsibility for inspection in incorporated as well as unincorporated areas. Using a 3.3 percent annual figure for the transfer of single family homes on septics, the total cost of the regulatory program beyond current levels of expenditure would be $2.1 millin. If fees were to be charged for inspections, a like amount could be derived from revenues during this period.

DUPAGE COUNTY (Table 9-15): It is estimated that there are 20,000 on-site systems in DuPage County. Current estimates put the year 2000 figure at slightly over 6,500, an annual reduction of five percent. The additional first year burden on the County Health Department would be about 2,500 inspections, assuming present new installation activity levels and current turnover rate of single family households at about 14%. Total additional costs beyond current levels of expenditure to the year 2000 would be $0.6 million. Offsetting permit inspection revenues could recoup almost all of this outlay.

KANE COUNTY (Table 9-16): The septic assessment for Kane County estimates that the total number of on-site systems in the county in the year 2000 will be about 8,500, or about 700 more than existed in 1978. Additional inspection costs are estimated at $2.17 million through 2000; inspection fees would offset this cost and leave a small surplus. The transfer of single family homes is currently at an annual rate of about 6 percent.

LAKE COUNTY (Table 9-17): There are about 30,000 existing on-site disposal systems in Lake County. The estimated year 2000 total is slightly over 12,000, an annual reduction of 4 percent. All new on-site systems in the County are inspected by County Health Department officials. The number of inspection visits corresponds to the recommended six visits for each new system installation and three visits for each complaint received. Since estimated transfers of title run at about a 13 percent annual rate (3,700 in the first year), and because inspections of new units are estimated to average about 3,600 per year, it is expected that a

reduction from the amount currently spent will be derived in that the County now undertakes about 8,700 inspections a year. This reduction will increase in future years as the absolute number of existing septics continues to decline, as is expected. Estimated cost reductions through the year 2000 will be about $7.4 million. Approximately 13 percent of single family residences are sold each year.

MC HENRY COUNTY (Table 9-18): It has been estimated that there are about 20,000 on-site disposal systems in McHenry County today. By the year 2000, this number will be reduced to approximately 6,300 units. That represents an annual reduction in total septics and renewal permits of 6 percent. The larger number of new on-site disposal systems installed annually in McHenry County means that the initial start-up costs of the regulatory program will be quite high. The additional inspection activities of the County Health Department under this proposal would necessitate 7,650 additional inspections at the outset of the program, based upon present levels of new on-site disposal system installation activity and on a rate of about 6 percent in the annual transfer of single family homes. Total additional costs of the new recommended program to the year 2000 would be $4.9 million. If inspection fees were charged, slightly over $5 million in inspections fees could be made available to meet this outlay.

WILL COUNTY (Table 9-19): The total number of existing residential systems in Will County is about 18,000. It is estimated that there will be about 11,000 systems in operation in the year 2000, which represents an annual decrease of approximately 3 percent. Although all new systems are inspected by the County Health Department, the number of field inspections made for each unit is less than the recommended six. With residences presently changing hands at approximately 3 percent per year, about 2,700 additional inspections would be necessitated at the outset of the regulatory program. Total additional inspection costs through the year 2000 would be approximately $1.68 million. A like amount could be derived from inspection fees, thereby defraying these expenses.

TABLE 9-13: COSTS OF ALTERNATIVE ON-SITE DISPOSAL REGULATORY PROGRAMS IN McHENRY COUNTY

PROGRAM		1979	1982-1984	1985-1987	1988-1990	1991-1993	1994-1996	1997-1999	2000
ALTERNATIVE 1	A. Three-year Renewals Incremental Add'l. Costs	$314,400	$74,000	$67,100	$32,200	$53,300	$23,000	$46,000	$16,100
		1979	1984-1988		1989-1993		1984-1998		1999-2000
	B. Five-year Renewals Incremental Add'l. Costs	314,400	69,400		29,900		51,000		16,100
	C. Five year Renewals with Decreasing Number of New Systems	159,500	23,000		44,100		11,500		9,200
		1979-1983		1984-1988		1989-1993	1994-1998		1999-2000
ALTERNATIVE II	Inspections upon transfer of property with Decreasing Number of New Systems	249,300		234,500		219,700	207,200		194,700

TABLE 9 - 14
COSTS OF RECOMMENDED SEPTIC REGULATORY PROGRAM, COOK COUNTY

	1979-1983	1984-1988	1989-1993	1994-1998	1999-2000
Annual New Permits *	350	350	350	350	350
Annual Sales of Residences on Septics	389	391	393	394	396
Annual Additional Inspections (150 complaints times 3 inspections)	450	450	450	450	450
Total Additional Inspections Required	2,934	2,937	2,940	2,942	2,944
Additional Inspectors Required	2.6	2.6	2.6	2.6	2.6
Additional Support and Supervisory Staff Required	1.3	1.3	1.3	1.3	1.3
Total Additional Inspection Costs	$96,200	$96,200	$96,200	$96,200	$96,200
Permit Fee Revenues	$96,822	$96,921	$97,020	$97,086	$97,152

* Includes incorporated as well as unincorporated areas.

TABLE 9-15
COSTS OF RECOMMENDED SEPTIC REGULATORY PROGRAM, DU PAGE COUNTY

	1979-1983	1984-1988	1989-1993	1994-1998	1999-2000
Annual New Permits	200	200	200	200	200
Annual Sales of Residences on Septics (5% Annual Decrease)	555	413	291	227	185
Annual Additional Inspections (200 complaints times 3 inspections = 600)	600	600	600	600	600
Total Additional Inspections Required	1,022	837	678	595	541
Additional Inspectors Required	0.9	0,7	0.6	0.5	0.5
Additional Support and Supervisory Staff Required	0.5	0.4	0.3	0.3	0.2
Total Additional Inspection Costs	$34,470	$27,990	$21,970	$20,360	$17,560
Permit Fee Revenues	$33,726	$27,621	$22,374	$19,635	$17,853

TABLE 9-16
COSTS OF RECOMMENDED SEPTIC REGULATORY PROGRAM, KANE COUNTY

	1979-1983	1984-1988	1989-1993	1994-1998	1999-2000
Annual New Permits	450	450	450	450	450
Annual Sales of Residences on Septics (4% Annual Decrease)	475	486	497	508	516
Annual Additional Inspections (100 complaints times 3 inspections = 300)	300	300	300	300	300
Total Additional Inspections Required	3,018	3,032	3,046	3,060	3,071
Additional Inspectors Required	2.6	2.6	2.7	2.7	2.7
Additional Support and Supervisory Staff Required	1.3	1.3	1.4	1.4	1.4
Total Additional Inspection Costs	$96,660	$ 96,660	$100,150	$100,150	$100,150
Permit Fee Revenues	$99,594	$100,056	$100,518	$100,980	$101,343

TABLE 9-17
COSTS OF RECOMMENDED SEPTIC REGULATORY PROGRAM, LAKE COUNTY

	1979-1983	1984-1988	1989-1993	1994-1998	1999-2000
Annual New Permits	600	600	600	600	600
Annual Sales of Residences on Septics (4% Annual Decrease)	2,769	2,591	2,356	1,897	1,576
Annual Additional Inspections (500 complaints times 3 inspections=1500)	1,500	1,500	1,500	1,500	1,500
Total Additional Inspections Required	(554)	(750)	(1,008)	(1,513)	(1,867)
Additional Inspectors Required	(0.5)	(0.6)	(0.9)	(1.3)	(1.6)
Additional Support and Supervisory Staff Required	(0.2)	(0.3)	(0.5)	(0.7)	(0.8)
Total Additional Inspection Costs	($16,640)	($23,350)	($34,240)	($49,960)	($59,660)
Permit Fee Revenues	($18,282)	($24,750)	($33,264)	($49,929)	($61,611)

TABLE 9-18
COSTS OF RECOMMENDED SEPTIC REGULATORY PROGRAM, MCHENRY COUNTY

	1979-1983	1984-1988	1989-1993	1994-1998	1999-2000
Annual New Permits	825	825	825	825	825
Annual Sales of Residences on Septics (6% annual decrease)	1,087	898	710	521	389
Annual Additional Inspections (200 complaints times 3 inspections =600)	600	600	600	600	600
Total Additional Inspections	7,560	7,215	6,783	6,348	6,045
Additional Inspectors Required	6.7	6.3	5.9	5.6	5.3
Additional Support and Supervisory Staff Required	3.4	3.2	3.0	2.8	2.6
Total Additional Inspections Costs	$249,300	$234,500	$219,700	$207,200	$194,700
Permit Fee Revenues	$252,450	$238,096	$223,839	$209,484	$199,485

TABLE 9-19
COSTS OF RECOMMENDED SEPTIC REGULATORY PROGRAM, WILL COUNTY

	1979-1983	1984-1988	1989-1993	1994-1998	1999-2000
Annual New Permits	350	350	350	350	350
Annual Sales of Residences on Septics (3% annual decrease)	614	533	454	385	337
Annual Additional Inspections	600	600	600	600	600
Total Additional Inspections Required	2,742	2,499	2,266	2,055	1,911
Additional Inspectors Required	2.4	2.2	2.0	1.8	1.7
Additional Support and Supervisory Staff Required	1.2	1.1	1.0	0.9	0.9
Total Additional Inspection Costs	$88,800	$81,400	$74,000	$66,600	$64,300
Permit Fee Revenues	$90,486	$82,467	$74,778	$67,815	$63,063

CHAPTER 10

Continuing Planning Program

CHAPTER TEN
CONTINUING PLANNING PROGRAM

10.0 INTRODUCTION

The recommendations contained in this plan are intended to guide water quality programs in this region through the year 2000. Such long-term guidelines are important. However, it must be recognized that no single plan can anticipate all of the changes and problems which will arise during the next twenty-three years. Thus, a crucial element of the program will be the establishment of an effective continuing planning process.

Annual review, revision, and recertification of the 208 plan is an explicit requirement of PL 92-500. Federal regulations provide that the initial areawide plan must identify the process through which implementation progress will be monitored and the plan revised. This process is to be part of the required state continuing planning program.

The continuing planning program is thus a basic component of this areawide plan. As outlined in this chapter, it contains two major components:

1. Continuing activities for plan implementation.

2. Completion of work to fill the gaps in the technical and management components of the plan.

In this chapter the continuing planning program is presented in outline form through a general description of the work components, when the work will be done, who will do it, and what the cost will be. Potential sources of funding are also identified.

A basic recommendation of this plan is that NIPC will continue to have primary responsibility for areawide water quality planning. The same factors which made the Commission the logical agency for initial plan preparation (e.g., its areawide perspective, its comprehensive planning capabilities) apply with respect to the continuing program. However, as was true with the initial plan, continuing planning will rely to a significant extent upon the cooperation and direct participation of various other planning agencies at the local, state, and federal levels.

Some degree of overlap between the continuing planning program and the management process described in Chapter Eight should be recognized. The institutional structure described in that chapter for management and coordination of plan implementation will also be used in the plan revision process. Several of the major functions of the management framework, particularly the preparation of annual implementation programs and the ongoing monitoring of water quality in the region, will be major inputs to the annual plan review cycle. Thus, during the initial period of

implementing the plan, management and continuing planning will be inseparable processes.

The estimated costs of the first year continuing planning program are summarized in Table 10.1. Costs are identified for Commission and county water quality committee staffs, consultants, and other expenses (primarily computer time).

10.1 CONTINUING ACTIVITIES FOR PLAN IMPLEMENTATION

The Commission, in cooperation with the other agencies included in the management framework, will maintain continuing programs of technical analysis and assistance. These are intended to maintain a current base of information for continuing planning and to contribute to the state of the art in water quality management in the region.

a. Plan Implementation Monitoring

The countywide water quality committees, NIPC, and IEPA will share responsibility for monitoring implementation of the 208 plan. The countywide committees will take the lead role in preparing the triennial implementation program for each county on the basis of proposals submitted by the designated management agencies. With respect to facilities construction, public service programs and regulatory and enforcement programs, the county committee's responsibility will be to facilitate the development of a consistent set of strategies intended to yield significant progress toward clean water. The implementation program also will identify the priority non-point source water quality needs in the county and recommend those problems and strategies for which state and federal funding is appropriate.

The implementation program will be prepared on a three-year basis, since some long-range programs will remain a part of the implementation program over several years. Each countywide committee should, however, review the entire program annually to assure that long-term projects are on schedule and to consider whether reasonable efforts are being made by the designated management agencies. Where benefits are not expected to be apparent in the first year's programs, the committee should set target dates for results and should make reference in the triennial program to the longer-term program within which the coming year's actions will take place.

It will also be the responsibility of each countywide committee to prepare an annual report which assesses the progress in implementing the areawide plan and each year's proposed management program.

One basis for preparation of the annual county report will be individual progress reports prepared by all designated management agencies in the region. The

TABLE 10-1: FIRST YEAR COST SUMMARY - CONTINUING PLANNING PROGRAM

WORK ITEMS	Work Force Months		Labor Costs		Other Costs		TOTAL
	NIPC ($4155)	CWQC ($3000)	NIPC	CWCC	Cont.	Other	
1. CONTINUING ACTIVITIES FOR PLAN IMPLEMENTATION							
a. Plan. Impl. Monitor	4	8	16,620	24,000	-	-	40,620
b. Annual Impl. Report.	3	6	12,465	18,000	-	-	30,465
c. Annual Plan Update	7	3	29,085	9,000	-	-	38,085
d. Project & Permit Reviews	8	4	33,240	12,000	-	-	45,240
e. Technical Assistance	12	-	49,860	-	-	-	49,860
* g. Update Pop. L U Forecasts	6	2	24,930	6,000	-	-	30,930
h. Continuing WQ Modeling	30	-	124,650	-	10,000	60,800	195,450
2. FILLING GAPS IN THE PLAN							
b. Devel. 5-Year Work Program	6	3	24,930	9,000	-	-	33,930
c. Organize CWQC	4	18	16,620	54,000	-	-	70,620
d. Prep. Yr. WQ Impl. Program	8	30	33,240	90,000	-	-	123,240
e. Org. Adv. Comm. & PP Program	6	3	24,930	9,000	-	-	33,930
h. CWQC Enabling Act	1	2	4,155	6,000	-	-	10,155
i. WWTA Enabling Act	1	0.5	4,155	1,500	-	-	5,655
j. Model Ordinances	2	4	8,310	12,000	-	-	20,310
k. Toxics, Pest. & Heavy Metals	4	-	16,620	-	57,500	-	74,120
l. Septage Disposal Plan	8	3	33,240	9,000	-	-	42,240
m. Comp. & Reex. 201 Fac. Plans	6	3	24,930	9,000	5,000	24,800	63,730
n. Exten. Sewer Serv.-New Areas	4	2	16,620	6,000	-	-	22,620
o. Exten. Sewer Serv.- Septic Problem Area	2	1	8,310	3,000	-	-	11,310
TOTALS	122	92.5	506,910	277,500	72,500	85,600	942,510

*Gaps in alphabetic sequence represent work items which are described in text but for which costs are not included in this program.

countywide committees will review and assess the reports prepared by the designated management agencies. The assessment should identify those areawide plan recommendations that are addressed inadequately and programs in which joint activities might be advisable, and should also be based on the informal hearing process instituted by the countywide committees.

On some items in the triennial work program, monitoring will necessitate nothing more than determining whether a recommended ordinance has in fact been adopted. Other aspects of plan implementation monitoring may be more difficult. For example, a countywide committee may have to assess the effectiveness with which a municipality is enforcing a recommended ordinance after adoption. The hearing process for addressing complaints of noncompliance, described in Chapter 8, will also provide a source of information on the pace of plan implementation.

Cost: $40,620

b. Preparation of Annual Implementation Progress Report

The Commission will prepare, on the basis of inputs from the countywide water quality committees and the state, an annual progress report on implementation of the 208 water quality plan in each basin.

The Commission will also be monitoring plan implementation progress but from an areawide perspective. The effectiveness with which the Commission can gauge progress will depend on countywide committee monitoring of designated management agency progress in implementation. Draft annual reports from each countywide committee will be reviewed by the Commission to form a composite picture of areawide implementation progress. The Commission's report will cover any changes in areawide conditions which require changes in plan implementation strategy, and will discuss probable levels of funding and other support available from federal and state agencies.

Cost: $30,465

c. Annual Plan Review and Revision

Annual review, revision, and recertification of the areawide plan is a focal aspect of the continuing planning process. Annual resubmittal of the plan is the only aspect of the continuing planning process which is specifically required by PL 92-500. It provides the process through which the region can take an overall view of its progress in implementing its water quality objectives and assess its on-going needs. It is also the process through which the

feasibility of the plan and the effectiveness of the management system can be continually reassessed.

The major inputs to the annual review process have been described in Chapter 8 and in this chapter. These include:

--water quality and effluent monitoring reports prepared by IEPA and designated management agencies;

--annual implementation progress reports prepared by the Commission and the Countywide Water Quality Committees;

--triennial implementation programs prepared by the countywide committees;

--completed elements of the initial 208 plan.

The first three of these elements have been described in the preceding chapter as part of the management framework because they are central to the implementation of the plan by local designated management agencies. They are equally integral parts of the continuing planning program. The first two provide essential information with which to identify the need for plan revisions. The triennial implementation programs will undoubtedly identify some actions which will require plan amendments in order to be implemented. In some instances, portions of the triennial programs may be incorporated in an annual revision where they represent the detailed development of elements of the areawide plan.

Potential amendments to the areawide plan will emerge from a number of different sources and processes, including:

1. failures to meet implementation requirements or schedules, identified through the monitoring process;

2. inability to meet implementation requirements or schedules, identified by designated management agencies in the development of the triennial implementation program;

3. projects, activities, or decisions not anticipated in the initial areawide plan, identified in the review of federal grant and NPDES permit applications and land use decisions of major significance;

4. changes in forecasts of regional population, employment, land use, and waste loads and flows, identified in the Commission's continuing forecasting program;

5. changes in state or federal policies, standards, program requirements, or funding programs;

6. completion under this continuing planning program of elements required to be included in this areawide plan for full certification;

7. completion or amendment of 201 facilities plans or of management arrangements required for their implementation.

It should be clear that a plan amendment will not be recommended in every case on the basis of one of these events. For example, the Commission may choose not to amend the plan when an NPDES permit is requested for a discharge which is inconsistent with the plan. The effect of NIPC's action, if accepted by the state, would be to require that the permit be denied. The list is of events which may suggest the need for a plan amendment and which must be assessed in that light.

In its annual implementation progress report, the Commission will identify those events or changed conditions during the year which indicate possible amendments of the areawide or basin plans. The report will include an assessment of the reasons for deficiencies in implementation and of the effect of successes, failures, and changed conditions on attainment of the plan objectives. It will also include a summary of any amendments to the plan adopted through the project review process outlined below. The draft report will be prepared by the Commission in consultation with the countywide water quality committees, the areawide advisory committees, and IEPA. It will include any plan amendments proposed by these groups.

On the basis of its review of the progress report and its consultation with the participant groups, the Commission will prepare a tentative list of revisions to the areawide and basin plans. A statement of reasons will be provided with respect to any proposed amendment which is not included in the tentative list. Amendments included in the tentative list will be evaluated by staff as to their probable impact on water quality if implemented. Amendments involving elements of the initial plan or with probable major or far-reaching impacts on water quality will be tested with the computer simulation model where appropriate. Staff review will also assess the consistency of proposed amendments with the NIPC Comprehensive General Plan and with its adopted functional plans and policies. Where inconsistencies are identified, the staff will recommend ways of resolving them.

The Commission staff will prepare a report on the results of water quality evaluations, which will be reviewed with the countywide committees, the areawide advisory committees, and IEPA. The countywide committees will be encouraged to review proposed amendments in light of adopted county and municipal land use and other plans, and to comment on their contributions to development and conservation objectives. A recommended package of plan

amendments, with any comments or suggested revisions by the participant groups, will be submitted to the Commission. On approval of proposed amendments, the Commission will authorize a public hearing. Notice of the hearing will be provided as required by the Commission's enabling act and USEPA regulations.

On completion of the public hearing, the Commission will review the testimony, make whatever revisions to the proposed amendments are appropriate, and adopt the revised plan for submittal to the Governor.

In summary the annual review and revision cycle will include the following major steps:

1. Commission reviews IEPA monitoring reports, countywide committee progress reports and implementation program proposals and other materials on progress toward attainment of areawide plan objectives;

2. Commission prepares annual implementation progress report including identification of potential amendments to plan and of amendments adopted in conjunction with project reviews;

3. Countywide Water Quality Committees, areawide advisory committees and IEPA review progress report and potential amendments;

4. Commission selects package of tentative plan amendments for water quality evaluation;

5. NIPC staff evaluates water quality effects of proposed amendments and consistency of amendments with adopted plans and policies of the Commission;

6. Staff report on evaluation results is reviewed with participant groups;

7. Commission reviews staff report and participant comments and approves tentative plan revision for public heaing;

8. Public hearings held on plan revision;

9. Commission reviews hearing results, amends and adopts plan revision for submittal to Governor for certification.

It is estimated that the elapsed time required for the annual review and revision cycle as described will be between six and eight months.

Cost: $38,085

d. Project and Permit Reviews

Land use decisions by local governments are expected to create situations which will require adjustments in water quality management programs. A major development could alter surface water flows into adjoining communities in ways that were not anticipated, or impose an unanticipated demand on available treatment capacity. This plan does not propose to alter municipal or county authority to regulate the use of land. It is important to the success of the plan, however, that such decisions be accompanied by efforts to anticipate and provide for their water quality impacts. If this is done, the need to take costly remedial actions later can be avoided.

It is recommended in Chapter Eight, therefore, that communities potentially affected by development actions be given the opportunity to review and comment on those actions in advance. A referral process to be instituted in each county, through the countywide water quality committees and at the regional scale through the Commission is described in detail in that chapter. Through such advisory review local agencies can recommend steps which might mitigate any negative impacts of the development on them and can prepare their own measures to reduce the effects of unavoidable impacts. While the community proposing to take action should not be bound by the recommendations of its neighbors, it can benefit from comments which may avoid later irritation and expense.

An initial responsibility of each countywide committee, in conjunction with the Commission, will be to determine the types of projects to be circulated for comment. These should include proposed developments exceeding some minimum acreage or number of units, sewer extensions exceeding a determined length or capacity, and impoundments or other channel modifications. Guidelines for such projects are identified in the Commission's Regional Land Use Policy Plan. Criteria set by county committees and the Commission should be included in the five-year continuing planning program.

Activities for which federal financial assistance is requested will continue to be referred to the Commission under the A-95 process. These include applications for wastewater facility construction grants and for Section 201 planning studies. Funding applications and draft environmental impact statements on other types of projects with potential water quality effects also are reviewed under A-95. Projects with probable water quality impact will be transmitted to the countywide water quality committees for review and comment as part of the A-95 clearinghouse process.

Federal and state actions of significance to water quality management which are received through the A-95 process also will be referred by NIPC to countywide committees and local governments. Similar review processes

should be provided for state actions that do not fall within the scope of A-95 or other existing referral procedures. The Commission should receive advance notice of such actions along with an indication of steps to be taken to limit any negative water quality impacts. The Commission, in turn, will transmit notice to all management agencies that might be affected. A 30-day review period would be provided for comments to be returned to the Commission and forwarded to the originating agency. As is the case of the local referral process outlined above, comments would be of an advisory nature and would not bind the state agency. Proposed grants from the anti-pollution bond fund, proposed flood control and drainage improvements, permit applications for sanitary landfills, and proposed changes in permit regulations are the types of proposals that might be subject to advisory review.

The Commission will also receive and review all applications for NPDES permits for discharge points in the six-county area, including both new permits and renewals. Proposed permitted discharges will be assessed as to their probable impact on the receiving stream and their consistency with the areawide plan. The process to be followed in reviewing permit applications is described below.

In its review of federal grant proposals, permit applications, and other projects, the Commission will use as its main benchmark this areawide plan. The primary questions to be addressed in these reviews will be whether the proposed actions contribute to or detract from the attainment of mandated water quality standards. As an agency established by state law to perform comprehensive planning, however, the Commission must also consider the impacts of water quality projects in other functional areas. The Commission will thus continue to evaluate projects submitted to it for review in terms of their consistency with the adopted Comprehensive General Plan and with functional plans for water supply, residential development, land use, and other areas. These review comments will be transmitted on an advisory basis to the local entity proposing the project or action for its consideration and for transmittal to the cognizant state or federal agency.

One of the fundamental objectives of the 208 planning process is to achieve general agreement among the governments and planning bodies of the region on a common set of water quality management policies. The Commission's concern for an accepted body or regional and local plans and policies goes beyond the area of water quality, however. In the draft regional land use policy plan, a system of "cross-acceptance" of municipal, county, and regional plans is proposed. Cross-acceptance would permit units of government and planning bodies to accept each others plans and policies for use in their own conservation and development decisions and project reviews. The effect would be to attain compatibility of public actions through a

cooperative intergovernmental mechanism. The reciprocal development of areawide 208 plan amendments, countywide implementation programs, and local facilities plans is a model of cross-acceptance which is already built into the areawide water quality planning process. In its programs of technical and coordinative assistance to the countywide committees and local management agencies, the Commission will encourage further cross-acceptance of water quality and other policies as an important ingredient of the review processes outlined in this chapter.

It is inevitable that events or proposed actions will occur at various times during the year which will suggest the need for amendment of the areawide plan or a basin plan. Wherever possible, these potential amendments should be deferred for consideration as part of the annual revision cycle. This will permit the analysis of their water quality impact as part of an overall revision, and will reduce the number of separate amendments requiring the Governor's certification and USEPA approval. Where the Commission finds, however, that legal, financial, or other exigencies require it, a separate revision of the plan may be processed. This might occur, for instance, where a 201 facilities plan had been completed and it is necessary to complete a plan amendment in order to permit the obligation of construction grant funds. In such cases, the above procedures should be observed as closely as possible.

With respect to certain proposed actions for which consistency with the 208 plan is required, it may be neither necessary nor expeditious to process a full amendment to the plan. This will be the case, for instance, with respect to NPDES permits issued to public and private point source discharges. Each such permit is required by PL 92-500 to be consistent with the plan. It has not been possible, however, to anticipate all such permits and include them in the plan. A finding of consistency must thus be made with respect to each new or reissued permit. Where a permit is judged inconsistent with the plan, it will be necessary to consider whether the plan should be amended in order to allow its issuance.

Official findings of consistency with the plan will be made by IEPA as the agency responsible for issuing NPDES permits. IEPA will act on recommendation of the Commission. In order to avoid imposing undue delays on permit applicants, Commission recommendations will be returned to IEPA within 45 days of receipt of applications for review, except where a permitted discharge of major magnitude or complexity is involved.

The procedure to be used in acting upon permit applications and necessary plan amendments related to them will be similar to that used in conjunction with the A-95 process for adopting certain minor plan amendments. The following major steps will be followed:

1. Each applicant for a new, amended, or renewed NPDES permit will transmit a copy of the application to the Commission at the time it is submitted to IEPA;

2. The Commission staff will review the application and prepare a recommended finding. Staff review will be on the basis of criteria to be prepared and adopted by the Commission during the first year of the continuing planning program, which will include considerations of (1) nondegradation of receiving waters, (2) alternatives to direct discharge into receiving waters (e.g., discharge into a municipal system), and (3) compliance with water quality standards in the receiving waters;

3. Within 10 days, the Commission staff will give notice of each application to the applicant and to the unit of general government and the treatment authority within whose jurisdiction the discharge point is located. The Commission may also give notice of particularly significant applications to the countywide committee(s) and request their review and comment. The notice shall include a summary of the proposed permit and the recommended NIPC review finding on it. Where the recommended finding is negative or conditioned, the notice will also include the time and place of a meeting of the Commission's Governmental Services Committee at which the application will be reviewed as provided below.

4. If the recommended review finding is one of consistency with the 208 plan, and if no negative comment on the permit application is received within 20 days after notice is given as provided above, the finding will be transmitted to IEPA. The finding will be accompanied by any comments received on the application, and will also be transmitted to the parties to whom notice was given and to the Governmental Services Committee. The Committee will be asked to endorse such findings at its next meeting.

5. If the recommended review finding on an application is negative or conditioned or if negative public comment is received or if any Commissioner requests a presentation, the application will be placed on the agenda of the first meeting of the Governmental Services Committee after the completion of the 20-day public review period. Notice of that meeting will be provided to the parties to whom notice of the application was provided, to the Countywide Committee affected, and to IEPA.

6. At its meeting, the Committee will review the staff recommendation and receive comments from the applicant and other interested parties. The Committee will then make a finding that the permit is or is not consistent with the plan. The finding will be transmitted to the IEPA;

7. In the event of a finding of inconsistency, the subcommittee may (1) recommend to IEPA that the permit be denied, (2) recommend conditions to be attached to the permit to bring it into consistency with the plan, or (3) recommend that the plan be amended to allow the permit to be issued;

8. If the Committee finds an application inconsistent with the 208 plan and recommends that it be denied or that conditions be attached to it, the applicant may appeal the finding to the full Commission. The appeal shall be addressed to the Executive Committee, chaired by the President of the Commission. A copy of the appeal shall be sent to IEPA.

9. If the Committee recommends that the plan be amended, notice of that recommendation shall be given in the same manner as notice is given of meetings of the Commission. The notice shall include a description of the permit and the required amendment and the time and place of the next regular or special meeting of the Commission. Written notice will also be provided directly to the parties receiving notice of the original application and to IEPA;

10. The Commission staff shall prepare the proposed amendment and transmit it for review by the parties receiving direct notice;

11. At its meeting, the Commission will review the staff recommended amendment and receive comments from interested parties. It will then either adopt, amend and adopt, or reject the proposed amendment, and transmit notice of its action to IEPA and the parties receiving the initial notice.

If IEPA acts on a permit application in a manner other than that recommended by the Commission, it will provide written notice of that fact, with a statement of its reasons for rejecting the Commission's recommendation, to the Commission.

After the review criteria referenced in Paragraph 2 above have been adopted, the Commission may consider amendments to these procedures (in accordance with the plan amendment process described) to permit expedited review of permit renewals or minor amendments.

Cost: $45,240

e. Technical Assistance to Management Agencies

The technical complexity of an effective areawide water quality management program has been clearly demonstrated during the initial planning period. During the continuing planning and implementation phase of the program it will continue to be necessary to draw upon the expertise of specialists in a variety of disciplines, including engineering, hydrology, agriculture, law, computer simulation, land use planning, and public finance. It would not be feasible for every management agency and each of the countywide water quality committees to maintain its own staff with expertise in each of these areas. Rather, these agencies must have ready access to pools of technical assistance at the federal, state, regional and subregional levels. Assuring that these pools are adequate and insuring local access to them are essential functions of the continuing planning program.

Commission and countywide water quality committee staff will be available on a continuing basis to provide management agencies with assistance in their own areas of expertise. Where this expertise is not sufficient, they will provide information on existing federal and state sources, or suggest other local agencies which have had experience with the particular problem. An essential function of both Commission and countywide water quality committee staff will be to identify areas of common need, where several management agencies can share technical information or share the costs of acquiring and maintaining specialized technical capabilities.

Cost: $49,860

f. Water Quality Monitoring

Water quality monitoring and analysis must be part of the continuing planning process so that the region maintains a current, accurate basis for assessing the effectiveness of water quality management programs. Data collected and analyzed through continuing monitoring programs will be useful in consideration of plan amendments, adjustments in plan priorities, extraordinary control measures, or enforcement actions. Monitoring of effluent discharges will provide a means for assessing the impact of point source discharges on water quality and determining whether discharges are meeting their obligations under federal and state permits and the areawide plan.

The current water quality monitoring program of the IEPA and MSDGC is described briefly in Chapter 8. It is recommended that the IEPA continue to conduct instream water

quality monitoring and provide data necessary for assessing the effectiveness of this areawide plan. The IEPA should provide water quality reports annually or more often to the Commission and to countywide committees. Monitoring data should be made available to the Commission, the countywide committees and management agencies on request. The IEPA's statewide advisory committee (recommended in Chapter Eight) should be consulted with respect to the variety, amount, and frequency of the data produced. The number and location of sampling stations, and samples should be reviewed periodically and assessed against the needs of areawide plan implementation.

As a minimum, future water quality data should be adequate to support the computer model used in developing the initial areawide plan (see Chapter Four). The IEPA also should provide for intensive sampling efforts related to particular suspected problems or demonstration projects.

Estimated total costs to state and local agencies of the expanded water quality monitoring program is $300,000 per year.

g. Update of Forecasts of Population, Employment and Land Use

Such forecasts are routinely prepared by the Commission, in cooperation with the Illinois Bureau of the Budget and local units of government. They are crucial as input to many elements of the areawide plan. These data, together with waste loads and flows, are particularly important in the local planning, design, funding, and programming of wastewater treatment facilities under the 201 program. Substantial revision in the Commission forecasts will be needed during the course of the planning period to respond to revised state and federal projections.

Commission staff will prepare revised forecasts for the use of all participants in the areawide process at regular intervals. This will be done (as it has been previously) through a cooperative process involving the countywide water quality committees, and county and municipal governments. Implementing agencies will be advised to adjust their programs where significant forecast changes occur. This most directly affects the implementation of 201 facilities plans in the areas of waste load and flow projections, multi-community capacity allocations, and funding priorities.

Where 201 plans have not yet been completed, the lead agency will be expected to utilize the most current available forecasts. Where the 201 process has moved beyond the "Step 1" phase into detailed design or construction, the lead agency in consultation with the countywide water quality committee, the Commission, and the IEPA, will review the interceptors and plant expansions not yet under final design or construction in light of the revised forecasts.

Detailed re-evaluations will be expected only where forecasts are revised upwards or downwards by a minimum of 20 percent over the original design forecasts, and where the revision is not shown to present an undue hardship to the treatment agencies or property owners within the service area in terms of commitments made on the assumptions of future service.

Cost: $30,930

h. Continued Water Quality Modeling

In the development of the 208 plan, water quality modeling was used to relate water quality to sources of materials entering the streams and to evaluate the water quality effects of existing sources, both nonpoint and point, as well as future controls and sources. In the continuing planning program, water quality modeling will be important in evaluating the effectiveness of the 208 plan elements as they are implemented. A number of areas of uncertainty were identified by the previous work and the continuing modeling will be directed to eliminating these uncertainties or assessing their importance relative to the water quality assessment. Further work needs to be done to more precisely define the extent of water quality problems. For example the frequency and duration of dissolved oxygen excursions need to be investigated in a number of stream reaches; the causes, whether real or mathematical, need to be determined. The modeling analysis needs to be checked, and it undoubtedly will be improved by the use of data not available during the initial 208 program. The continuing planning program has as one of its objectives the improvement in the reliability of the model.

To accomplish this, recalibration of the model will be undertaken. Not all of the instream water quality measures taken during the 208 program were used in the initial model calibration because of the collection schedule and time constraints. The unused data will serve recalibration. Also, as the State of Illinois, the Metropolitan Sanitary District of Greater Chicago and other agencies continue to collect water quality data this information will be used to verify the model and insure a better representation of the water quality behavior of the streams in northeastern Illinois.

For example, further analysis will be made of the relationship between wet and dry weather low dissolved oxygen events. While consideration was given to these conditions in the evaluation of alternative plans, further consideration in the continuing program will be given to the rates of oxidation under these different flow conditions. The recalibration will assist with this.

Undoubtedly between the submittal of the 208 plan and the time when elements of the plan are implemented, there

will be many changes in treatment plant designs and in scheduling of the implementation of the plan elements. Also, land use and land cover will change from what was anticipated by the 208 plan. Consequently, a periodic review of water quality conditions will be necessary. This assessment will be accomplished, in part, through the use of the water quality model.

Another potential use for the model is in the evaluation of local plans and localized changes in land use, land cover and treatment facilities. The initial water quality modeling was done on a regional scale. However, it also has applicability to local situations. The Commission will maintain the ability to serve these local needs.

The purposes, then, of water quality modeling in the continuing 208 program are to refine and improve the capability to assess water quality conditions in northeastern Illinois, monitor the changes in water quality due to the implementation of plan components allowing for variations, and finally meet the needs for more localized, subregional analyses.

In order to maintain the ability to meet these objectives, a data base will need to be maintained. Current data will need to be collected and analyzed on a routine, systematic basis. The required data can be divided into ten categories: (1) meteorologic, (2) hydrologic, (3) instream water quality, (4) washoff, (5) detention and retention facilities, (6) land cover and land use, (7) atmospheric deposition, (8) drainage network, (9) treatment plants, and (10) combined sewers.

The computer facilities necessary to run and maintain the water quality model can be divided into two sets: in-house and time sharing. The in-house equipment should consist of a low-speed terminal, one capable of transmitting 30 to 120 characters per second. This terminal will be used primarily for executing the water quality model. For retrieving the output, a medium speed line printer will be required. This printer should have the capability of printing 400 lines per minute. The remote computer will need to be an IBM with a PL 1 compiler and minimum core storage of 400K.
This computer will serve to store the data and execute the programs.

Cost: $195,450

10.2 FILLING GAPS IN THE PLAN

a. Completion of Initial Plan

Review and comment by the IEPA and USEPA which will follow submission of the plan to the Governor may necessitate modifications and revisions to the plan. The IEPA and USEPA have 120 days and 150 days respectively for

review, and the Commission must have time to analyze the comments and develop the necessary changes. The amendments to the plan must be presented to the public for review and discussion. After the public participation has been completed, the Commission will print the final revised 208 water quality plan and submit it to the IEPA and USEPA.

Completion of the plan means more than approval and acceptance of the plan by the IEPA and USEPA. It also entails acceptance by designated management agencies of their assigned responsibilities, and acceptance by the public of the substance of the 208 water quality plan for northeastern Illinois. To complete the 208 plan, each management agency must be informed of its management assignment and must sign an implementation statement or otherwise indicate its acceptance of that assignment. Designated management agencies must be given an opportunity to comment on their designation and to determine implementing departments and estimate their budgeting and manpower requirements. In some situations intergovernmental agreements will be necessary before a designated management agency can begin to implement its assigned responsibilities. It will be necessary for the Commission to work closely with each designated management agency so that it has a clear understanding of its duties before it signs an implementation statement.

Designated management agencies will be willing to implement their assigned responsibilities only to the extent that public support for implementation has been developed. Seminars, workshops and other presentations with local officials and citizen groups will be necessary to explain and interpret the final adopted plan.

Cost: Not estimated. This work element will be funded with the carry-over portion of the initial planning grant.

b. Development of a Five-Year Work Program

USEPA has recognized that it will take several years before definitive results of areawide 208 planning are available. In recognition of this fact, they have prepared a national work program for the period 1978 to 1983. During this period additional technical and planning studies will be carried out on areas of priority concern and the results of the initial implementation will be assessed. Further development of a national water quality control strategy will be based on a determination of how well the nation moves toward achievement of the 1983 standards. During the first year the Commission will prepare a five-year work program in line with these objectives. The program will include the identification of particular technical studies necessary to address water quality problems not dealt with in the initial plan. Necessary amendments to existing state laws and regulations and to local ordinances in order to

fully implement the 208 water quality plan will be proposed. It will also establish in greater detail the work descriptions and anticipated staffings and financial needs of continuing technical activities and of activities related to the annual review cycle. The work items described in this section will be included as early elements of the five-year program, but do not represent an exhaustive list of its contents. The work program will also include technical work and demonstration projects to be carried on by the countywide water quality committees.

Among other subject areas to be included in the work program are the following:

--Inland Lakes Eutrophication Studies and Strategies Development. (An expanded lake sampling program should be undertaken by IEPA by July 1, 1979 to support this work.)

--The Impact of Cattle Grazing on Water Quality

--The Impact of Air Quality on Water Quality

--Evaluation of Future Water Quality Conditions Against Emerging New Stream Classifications and Water Quality Standards

--Pilot Demonstration Projects on Urban Stormwater Management

--Pilot Demonstration Projects on Agicultural Pollution Control

--The Nutrient Cycle

Cost: $33,930

c. Organization of Countywide Water Quality Committees

Interim countywide committees should be established soon after final plan certification to begin the process of coordinating the implementation of the 208 plan in each county. There are two alternative methods for establishment of interim countywide committees outlined in Chapter Eight. The Local Steering Committees may decide to assume the responsibilities, or the Local Steering Committee may decide another existing countywide agency, such as a county planning commission, should be the interim agency. Each Local Steering Committee should decide within three months after final plan certification the appropriate interim countywide committee format to pursue. The decision should be made in consultation with the Commission.

The guidelines in Chapter Eight on membership composition of countywide water quality committees will be

applicable as well to interim committees. In some counties the guidelines may mean changes in the composition of the Local Steering Committee or other agency designated as the interim county committee. If an acceptable interim countywide committee has not been established in any county within three months after final certification of the plan, the Commission will serve as the interim committee in that county until establishment is complete.

Cost: $70,620

d. Preparation of First-Year Countywide Implementation Programs

Each interim countywide water quality committee will prepare an implementation program for the first three years following final plan certification. It is essential in the preparation of the first triennial program that the interim committee consult with all local implementing agencies and determine a mutually agreeable program of specific implementation measures. Each element of the proposed program should be evaluated as to cost-effectiveness. The countywide committee should also recommend the best allocation of available state and federal funding for implementation of nonpoint control measures.

In its first program, the countywide committee should begin to assume its role in the long-term coordination of water quality management activities within the county. The committee should institute the process through which designated management agencies can comment on actions affecting them, including major land use changes. An agreement should be prepared by the countywide committee to define the types and magnitudes of land use changes to be reviewed and the time schedule for notification and review. The countywide committee should also begin to develop criteria for the review of facilities planning and construction grant applications under the A-95 process and for the evaluation of complaints alleging noncompliance with the plan
designated management agencies.

Cost: $123,240

e. Organization of Advisory Committees, Public Information and Public Participation Programs

Because the countywide committees will have only small staff resources available to them, much of the essential water quality management work will need to be done through advisory committees in each county. A Technical Advisory Committee comprising representatives of water quality agencies and private consultants should be formed to assist

each county committee in preparing detailed plan implementation programs, preparing model ordinances, reviewing proposed land developments, evaluating proposed plan amendments, and resolving inter-basin disputes.

At the regional level, two areawide standing advisory committees will be maintained as outlines in Chapter Eight. These are the Water Resources Technical Advisory Committee and the Areawide Planning Advisory Committee. Representatives of these committees and of the countywide water quality committees will serve as non-voting participant members of the Areawide Water Quality Steering Committee. In addition, an ad hoc advisory committee of designated agency technical staff will be convened periodically to assist the Commission in addressing basinwide issues. As indicated in Chapter Eight, the memberships of the standing advisory committees will be reviewed during the initial phase of the continuing planning process to assure that they meet the needs of the program.

The principal functions of the areawide advisory committees will be related to the annual plan revision cycle described above, as follows:

1. Review the Commission's draft annual implementation progress report and comment on the staff's assessment of major implementation problems and on staff proposals for plan amendments to address those problems.

2. Recommend, on the basis of review of the progress report, plan amendments for evaluation by the Commission. These may include possible changes in substantive plan recommendations, implementation schedules, or management or financial arrangements.

3. Review the staff report on water quality and plan consistency evaluations of proposed plan amendments, and offer additional assessments of the amendments for consideration by the Commission.

4. Review and comment upon the annual work program and budget of the Commission and the countywide committees for water quality coordination and continuing planning prior to their adoption by the Commission.

At least one joint meeting of the areawide advisory committees will be held each year for the review of proposed plan amendments after staff evaluation of them has been completed. Other joint meetings may be held as desired by the advisory committees.

In addition to these functions related to plan revision, the areawide advisory committees will assist the Commission in the following ways:

5. The committees will advise the Commission in the resolution of basinwide issues identified in reviewing

draft county implementation programs, and will participate in ad hoc committees appointed by the Commission to conciliate basinwide or intercounty complaints under the hearing process described in Chapter Eight.

6. The Water Resources Technical Advisory Committee will continue to advise the Commission in the design and conduct of technical studies, and in the coordination of water quality studies with other water resources studies of the Commission and units of state and local government.

7. The APAC will review and comment on the Commission's proposed public information and participation programs related to water quality prior to their adoption by the Commission.

Necessary technical and secretarial assistance will be provided to the areawide advisory committees by designated members of the Commission staff.

Advisory committees will not be a substitute for direct involvement of the public in the plan implementation and revision process. As discussed above, completion of the plan entails building public understanding and support for its essential recommendations. Seminars, workshops and public meetings must continue to be used to explain the plan and provide an opportunity for the public to comment on its implementation. Although the Commission will take the lead role in providing information to the public, countywide water quality committees as well as individual designated water quality management agencies should each initiate programs to involve the public in plan implementation and revision.

Cost: $33,930

f. Draft Amendments to Illinois Commerce Commission Act

In Chapter Five of the plan it is recommended that there be better coordination between state water quality programs administered by the IEPA and state regulation of privately-owned utilities through the Illinois Commerce Commission. Amendments to the Illinois Commerce Commission Act are necessary so that the ICC is required to give notice to the IEPA whenever it receives an application for a certificate of convenience and necessity for construction of a new privately-owned wastewater treatment system or expansion of an existing system. The amendments to the Commerce Commission Act should make it clear that no certification will be issued without IEPA approval, expressed in the form of IEPA intent to issue necessary permits.

Cost: Work to be completed by IEPA.

g. Draft Amendments to IPCB, IEPA and Illinois Department of Public Health Regulations

As a result of the recommendations of the plan, a member of amendments to regulations issued under the Illinois Environmental Protection Act will be necessary. For example, it has been recommended that the NPDES permit process be modified to require wastewater treatment authority applicants to estimate five-year service areas, to identify problem septic areas which should be provided with sewer service, and to authorize municipal wastewater treatment authorities to review and comment on other NPDES applications in the projected five-year service areas. It is likely that the IEPA, as a result of its certification of the final 208 plan for northeastern Illinois, will actively work with the IPCB to implement the necessary amendments. However, close cooperation between the Commission, the IEPA and the IPCB is essential to assure that any proposed amendments are acceptable to each agency. In the course of the continuing planning program, proposals for additional amendments to IPCB regulations may be made.

The private sewage disposal code issued by the Illinois Department of Public Health should also be amended to incorporate the recommendations of the 208 plan concerning installation, inspection and maintenance of on-site disposal systems. Again, it should be the responsibility of the IEPA to work with the Illinois Department of Public Health in the preparation of the necessary amendments. However, the close cooperation of the Commission is also essential if the code is to be revised to adequately reflect the water quality planning considerations for northeastern Illinois.

Cost: Work to be completed by IEPA. Related Commission and county committee costs included in Item "o" below.

h. Draft Model County Water Quality Committee Agreement

The countywide water quality committees, discussed in detail in Chapter Eight, are to be established by intergovernmental agreement of the designated management agencies in each county. Within three months after certification of the management sections of this plan, the Commission will prepare a model agreement for consideration by the management agencies. The model agreement will be developed in consultation with the interim county committees described in Chapter 8. At a minimum, the model agreement will address the following subjects:

Organization. Establishment of a countywide committee upon the adoption of agreements by a majority of the

designated management agencies in the county. Alternative designation of an existing agency to perform the functions of the countywide committee by agreement of the management agencies will be provided.

Composition. Among the details to be spelled out are the number of members, method of appointment of representatives of designated management agencies, number and method of appointment of private citizen members, distribution of membership between drainage basins, term of office, and filling of vacancies.

Powers. The responsibilities of a countywide committee should be clearly stated. The committee must be authorized to facilitate the preparation of a triennial implementation program by designated management agencies, to prepare an annual report on progress in implementing the water quality plan, to review and comment on applications for wastewater planning and construction grants and for NPDES permits, to review major land use changes in the county and comment on their effect on water quality, and to hear complaints concerning non-compliance with the plan implementation programs. A complete discussion of countywide water quality committee responsibilities is contained in Chapter Eight.

Meetings. A minimum schedule for committee meetings, a quorum requirement, and a stipulation that meetings be open to the public should be included in the intergovernmental agreement.

Staff. The intergovernmental agreement should authorize the countywide water quality committees to enter into agreements for staff support. A countywide committee should also be authorized to form a technical advisory committee.

Funding. County water quality committees should be authorized to accept funding from local, state, or federal government sources.

Cost: $10,555

i. Draft Amendments to Wastewater Treatment Authority Enabling Acts to Include On-Site Disposal Systems

Illinois wastewater treatment authorities may have existing implied authority to directly own or operate on-site disposal systems in areas where they are the the most cost-effective solution to wastewater disposal needs. However, the meaning of the term "sewerage system" in the various Illinois enabling acts is so vague that the acts

should be amended to specifically authorize wastewater treatment authorities to own, operate, construct, or maintain on-site disposal systems.

Section 6.04 of Chapter Six of the areawide plan recommends that all individual or cluster on-site disposal systems in northeastern Illinois should continue to be privately owned and operated wherever possible. In some situations, private ownership of a cluster system may be impossible. Construction and maintenance of a cluster system by a public wastewater treatment authority may be the best available alternative. An amendment to the enabling acts would make it clear that existing wastewater treatment authorities could own and operate such systems.

The Illinois General Assembly has enacted legislation (Public Act 80-1371) to authorize creation of wastewater disposal zones by municipalities. The legislation was developed jointly by IEPA and the Illinois Municipal League. Thee Commission should review this legislation and cooperate with the IEPA to consider what additional approaches to public ownership on on-site disposal systems may be necessary.

Cost: $5,655

j. Draft Model Local Ordinances for Stormwater Detention and Soil Erosion and Sedimentation Control and Surface Runoff

The Commission should review existing stormwater detention ordinances in effect in the six-county area and determine their effectiveness from a water quality viewpoint. On the basis of existing ordinances and ordinances from other jurisdictions which have been effective in controlling pollution from urban stormwater runoff, the Commission should prepare a model ordinance which would establish minimum standards for stormwater runoff detention. The ordinance should specify the minimum size and type of developments which must comply, the alternative types and design of detention facilities which may be constructed, including wet or dry bottom reservoirs, storage on flat roofs, parking lots, recreational areas or streets, and the proper size of detention facilities in relation to area to be developed. The ordinance should also specify the relationship between stormwater detention requirements and other subdivision requirements, and the content of any maps, site plans, and comprehensive drainage plans which a developer must submit for approval. In drafting the model stormwater detention ordinance, the Commission should also recommend strategies for disposal of the sediment deposits which will accumulate in the detention facilities.

Similarly, for control of construction site runoff the Commission should prepare a model erosion and sedimentation control ordinance after reviewing existing ordinances in the

six-county area. The ordinance should define the type and size of construction activity which must comply, the types of ground cover or sedimentation basins which must be utilized, and the contents of any site development permits and plans which are required. Inspection procedures by which local governments monitor compliance with the ordinance and the standards and criteria against which that compliance is measured should also be specified. Procedures to control surface runoff from materials storage yards should be included in this ordinance. The Commission will work jointly with the countywide water quality committees and designated agencies in completing this work item.

Cost: $20,310

k. Toxics, Pesticides and Heavy Metals

In the initial 208 plan, the Commission was able to collect only minimal information on toxic substances, pesticides and heavy metals found in the waters and sediments of waterbodies in northeastern Illinois. The Illinois Natural History Survey performed a one-time screening survey at four agricultural and two single family residential sites on sediments and overlying waters for possible pesticide and PCB contaminants. The MSDGC took special samples and made supplementary analyses for seven different metals at the land use runoff sampling sites. The impact of toxic substances on fish is being analyzed by the Illinois Natural History Survey, using historical data collected by the IEPA. All of the results indicate that more attention must be given these contaminants to determine their presence (or absence) and concentrations throughout the region. Origins of these pollutants need to be identified and preventive/corrective measures proposed and evaluated. This will initially require specialized field sampling and laboratory equipment and skills for which contractors will be used.

Cost: Work to be completed by IEPA.

1. Develop a Detailed Plan for Disposal of Septage The 208 plan recommends that the IEPA designate specific wastewater treatment facilities to receive and treat domestic septage, and that it designate specific sanitary landfill sites to receive septage which includes toxic or hazardous wastes. In the first year of the continuing planning program, the Commission should recommend to the IEPA specific facilities and sites to be designated. The recommendations should take into consideration the volumes of septage which must be treated, the capacity and technical capability of wastewater treatment facilities and landfill sites to receive septage, and the proper geographic distribution of designated

facilities and sites so that septage haulers will not be unduly inconvenienced by the disposal requirement. Before making its recommendations of designated facilities and sites the Commission should evaluate the additional technical and administrative procedures necessary to assure that toxic or hazardous substances will not be introduced into designated facilities. An estimate will be made of the additional costs to designated facilities and sites which will result, and recommendations on financing the additional costs will be incorporated into the 208 plan.

Cost: $42,240

m. Completion and Re-examination of 201 Facilities Plans

In some facilities planning areas within the region, a completed facilities plan has been certified by the IEPA and USEPA and the wastewater treatment authorities are proceeding with Step II, detailed design and specifications of the new or improved facilities and sewers which will be constructed. The Commission, as the principal coordinating agency for purposes of on-going 208 water quality management, should monitor progress in Step II facilities planning.

In other facilities planning areas, 201 planning is not yet complete and the Commission will assume a more active role in the facilities planning process. In those FPAs in which a formal 201 facilities planning application has been made, the Commission will continue to review plans of study and facilities plans as they are completed. In some FPAs, Commission review of infiltration and inflow analyses in the first year of the continuing planning program may necessitate a more complete analysis or a sewer system evaluation study. Commission review may result in suggested modifications to the facilities plan.

In those FPAs in which a preliminary plan of study is the only 201 activity presently under way, the Commission will review formal facilities plans as they are drafted. In approximately seventeen facilities planning areas a needs analysis has been prepared by or for the Commission as an interim facilities plan. The results of these needs analyses are being reviewed by the IEPA to assess the need for additional work to satisfy facilities planning requirements.

In some basins implementation of the elements of the recommended program necessitate amendments to the 201 plans. The Commission must identify those FPAs affected, and in the first year's program recommend the necessary changes.

Undoubtedly, when the initial 208 plan is published, many units of government will see opportunities for questioning their NPDES or 208 assigned effluent standards. Additional computer analyses will be requested to evaluate the most cost-effective solutions. Finally, it is expected

that the State will publish new stream use classifications and related in-stream water quality standards. This will cause additional reviews of 201 facilities plans which are still in the Step I or Step II phase. Concurrent with or supplementary to all of these actions there will be requests of the staff to interpret modeling results and for guidance in preparing or evaluating alternative solutions.

Cost: $63,730

n. Develop Detailed Recommendations for Extension of Sewer Service to New Development Within Projected Service Areas

The 208 plan recommends that each applicant for an NPDES permit make a determination in its permit application concerning those portions of its projected year 2000 service area to which it will be providing service during the term of the NPDES permit. In the case of municipalities which will be providing wastewater service to areas presently outside the corporate limits of the municipality, there should be a corresponding right on the part of the municipality to review and comment on any other NPDES permits to be issued in the projected year 2000 service areas. In the first year's work program the Commission should evaluate alternative methods for defining the service extension areas and recommend specific language for the NPDES permits. The Commission should also recommend a process by which municipalities which provide wastewater treatment service will have review and comment authority over new NPDES permits in unincorporated areas in the projected year 2000 service areas. This recommendation should detail the time period within which the IEPA must send permit applications to the appropriate municipalities and within which the municipality must comment. There should also be a recommendation as to how much weight the comments of the municipal wastewater treatment authority should be given by the IEPA when it makes its final determination on an NPDES permit application.

Cost: $22,620

o. Develop Detailed Recommendations for Extension of Sewer Service to Problem Septic Areas

The 208 plan includes recommendations which generally address the problem of unsatisfactory on-site disposal systems and the desirability and feasibility of extending municipal-type sewerage service to replace them. The first year's work program will develop recommendations as to the precise manner in which problem on-site disposal areas will be provided with service.

The recommendations must address the following critical issues:

--identification of problem on-site disposal areas;

--identification of the problem systems within the first five-year service extension area;

--necessary proximity of a problem on-site disposal area to a proposed sewer extension before sewer service is feasible

--financing extension of sewer service to those problem septic areas outside a treatment authority's jurisdiction; and

--evaluation of the need for approval or merely review and comment by the municipal wastewater treatment authority before new on-site disposal systems may be installed in unincorproated portions of the municipality's projected year 2000 service area. The purpose of the approval/review and comment process would be to assure coordination between municipal sewage extension and new development in unincorporated areas.

Cost: $11,310

10.3 FINANCING MANAGEMENT AND CONTINUING PLANNING

This chapter and Chapter Eight have described an extensive set of processes and activities for initiating implementation of the areawide plan, for developing elements of the plan not completed in the initial phase, and for assuring that the plan and the management process remain optimal responses to problems and opportunities in the region. It is evident that considerable staff and financial resources will be necessary to carry out the coordination and planning required to meet the objectives of PL 92-500 and to assure the region's continuing eligibility for federal permits and financial assistance.

The funds required to support the continuing management and planning processes outlined in this chapter during the first year are identified in Table 10-1. Principal costs identified are those for staff of the Commission and the Countywide Water Quality Committees. Projected consultant expenses have also been identified in several cases. With respect to the countywide committees, it is anticipated that the first year's activities will consist primarily of initial organization, preparation of the first annual implementation program, and participation in plan completion programs. Costs of interagency coordination and conflict resolution accordingly, have not been included.

In considering staffing and financial requirements, it is appropriate to discuss the management framework and the continuing planning program together. As was pointed out in the introduction to this chapter, the two programs are closely related and will be carried on through the same set of institutions. Professional staff members at the county and regional levels will be engaged in both technical and coordinative activities. Further, there is considerable overlap in work products in management and planning. The initial development of annual countywide programs, the development and implementation of demonstration projects, and the preparation of ordinances and other regulatory measures are all related both to completion of the initial areawide plan and to its implementation. Other activities, such as project and permit review and annual review and revision of the areawide plan are more strictly managerial in nature, but are required to protect the region's eligibility for federal support.

PL 92-500 provides explicitly for federal funding of the continuing planning process. Section 208(f)(1) states that

> the Administrator shall make grants to any agency designated under subsection (a) of this section for payment of the reasonable costs of developing and operating a continuing areawide waste treatment management planning process...

The Commission is the agency designated under subsection (a) for northeastern Illinois.

USEPA has placed a restrictive interpretation on this provision for continuing planning support, the effect of which is to distinguish between continuing planning and areawide management and coordination. The Agency has prepared (January, 1978) a draft national water quality management program for the period FY 1978-83. This draft program identifies priority areas and funding levels for continuing federal support of the 208 program. It provides that funds will be granted for 75 percent of the cost of activities required to complete development of an unconditionally approvable areawide plan. This may include technical studies, institutional development, regulatory program development, and public information activities. Specific outputs are expected from these planning efforts. The principal priority areas under the six-year program are:

- facility planning in selected problem areas
- urban storm runoff
- nonpoint sources, including agriculture
- other problems in urban-industrial areas

Other problem areas are assigned lower priority in the six-year program.

One of the stated objectives of the USEPA draft program is that it establish "self-sustaining state/local continuing planning processes and management/institutional structures." This suggests that federal support will not be provided for continuing management activities or for technical studies after the initial certifiable plan has been completed. Strong emphasis is thus placed on the importance of local and state government support for the areawide management process.

The costs of areawide management and continuing planning have not been estimated for the second and later years of the programs. These will be identified in the second-year work program and grant application to be prepared by the Commission and the Countywide Committees at the end of the first year. It is anticipated that a significant proportion of work activities in the second and third years will be eligible for federal funding under the six-year program. In the absence of a reinterpretation of federal policy to permit support of continuing management, the burden of sustaining the management process will shift more to non-federal sources in subsequent years.

Federal Sources

(1) It is anticipated that approximately $200 thousand from the initial 208 planning grant to the Commission will remain unexpended at the end of the project period. These are 100 percent federal funds which do not require any local matching share. The Commission has made application to USEPA to carry these funds over past the end of the planning period to support finalization of the initial plan and initiation of the management process.

(2) The draft 1978-83 federal water quality management program proposes a six-year federal expenditure for 208 planning of approximately $542 million. PL 95-217 authorizes $150 million for 208 in each of FY 1979 and 1980. The six-year program recommends expenditure of $85 million and $90 million in those years respectively.

The proposed six-year allocation to Illinois is $16.665 million, or $2.77 million per year. On the basis of both population and the complexity and severity of water quality problems, it is reasonable to suggest that northeastern Illinois should receive between one-quarter and one-third of this amount. This would amount to between $695 and $914 thousand per year, and would require non-federal matching funds of between $232 and $305 thousand per year. The principal issues to be resolved in determining how much of this amount could be secured by the region are (1) the eligibility of proposed activities for federal assistance, and (2) the availability of non-federal matchning funds.

(3) The six-year program includes an allocation of approximately $1.6 million to Illinois for facilities planning under Section 201 of PL 92-500. The largest portion of this, $1 million, is designated for planning related to on-site disposal systems. Funds are also identified for planning for municipal treatment, industrial pretreatment, and sludge management. It is not known at this time what portion of these funds might be made available to northeastern Illinois. The Commission should determine whether it is eligible to receive Section 201 funds directly to provide planning and technical assistance (including computer analyses) to designated management agencies.

State Sources

It has been noted at several points that the State of Illinois is ultimately responsible for the annual resubmittal of the areawide plan to USEPA and for other federally-mandated aspects of the continuing planning program. It has been recommended that the state continue the designation of the region, through the Commission, as a 208 planning area. If it elects to de-designate the region, the state will be responsible for carrying on continuing planning in the six counties and for providing the required matching share to receive federal 208 funds.

Given the state's interest in an effective areawide management process and the fact that it has delegated certain responsibilities to the region, it is recommended that the state provide one-half of the required matching share for federal grants. Based on the assumptions stated above, this would require an appropriation of between $116 and $152 thousand per year. This could be provided in one of several ways:

(1) A direct appropriation by the General Assembly to the Commission for the purpose of matching federal funds. This might be combined with similar appropriations to the 208 agencies in the southwestern Illinois and Greater Egypt regions, assuming that they retain their designations as continuing planning agencies.

(2) An appropriation of general revenue funds to IEPA for the purpose of entering into a contract with the region, through the Commission, for the performance of continuing planning responsibilities. This would be similar to the manner in which the Commission's transportation planning activities are supported by IDOT, which provides the required match for 80 percent planning grants from USDOT. Such a contract can include both project-type and continuing activities as long as the end-products are identifiable.

(3) An appropriation from the Anti-Pollution Bond Fund. Funds from the Bond Fund were used to support the Commission during the initial preparation of its application for the 208 planning agency. Because of restrictions in the bond act, these funds might be applicable to only certain parts of the management and continuing planning requirements related to facilities planning.

(4) Fees. It is common practice at the local level to charge a fee for the issuance of various permits as a way of defraying the expense of the regulatory process. It is reasonable to suggest that the state institute a similar permit fee system related to both the NPDES permits and to the state-required connection permits. A sliding scale of fees would be established related to the size of the facility being permitted, with lower fees for permit renewals or minor amendments. A portion of the fee would be passed through to regional agencies which will be required to review NPDES applications and to process plan amendments in some cases to allow their issuance.

The method of state funding chosen should be one which will permit continuing state support of the planning program in the event that federal grants for 208 planning are discontinued at some future time. It is recommended below that either the first (direct appropriation to NIPC) or second (appropriation to IEPA) approach be adopted.

Local Sources

The Commission's intent in developing the management framework and continuing planning program has been to retain as close and accountable a relationship to local government as possible. The preference in the plan for a coordinating framework of countywide committees and the Commission, rather than for a more centralized management process through a new regional body, is intended to achieve this end. Neither the Commission nor the countywide committees should have independent authority to raise funds by taxation. They will be eligible to receive federal and state grants. It is reasonable that the local designated management agencies provide a share of the financial resources for the continuing planning and management programs necessary to coordinate their independent programs and to maintain the eligibility of the region for federal financial support.

During the initial continuing planning period, when the region will be eligible for its full share of federal funds, it is recommended that local governments provide one-half of the requiring matching funds. In later years, it is expected that the proportionate local share of the areawide

management and continuing planning budget would increase as federal sources decrease.

Several alternative approaches are available for raising the required local share of program costs:

(1) Designated management agencies could appropriate to the Commission and the respective countywide committees from their general revenues. This would be similar to the manner in which local governments presently contribute to the support of the Commission and intergovernmental organizations at the county and subregional levels. No new legislation would be necessary, but a general intergovernmental agreement would be required to determine the share to be contributed by each agency. A more general issue of shares is discussed below. Shares might be determined on a per capita basis or as a percentage of each agency's operating budget (as is now the case for contributions to the Commission). An equity issue is raised by the fact that some parts of the region are served by more than one designated management agency and would thus be subject to a form of double taxation.

(2) Each county could levy an addition to the property tax, the proceeds of which would be appropriated to the countywide committee and the Commission to support continuing planning. An additional property tax levy of $0.003/$1000 would produce $100 thousand, based on the 1975 equalized assessed valuation of the region of $30 billion. This represents an increase of approximately .05 percent of the existing levies for the corporate funds of the counties. A property levy collected by the counties would assure that all parts of the region contributed uniform proportional shares to continuing water quality management and planning without any double taxation. New state legislation would be required if the levy were to be entered as a new item on the tax bill rather than included in each county's general corporate fund.

(3) A surcharge could be added to sewage treatment charges. The surcharge would be collected by each treatment authority and the proceeds appropriated to the county committee and the Commission. A surcharge of $0.20/million gallons of sewage treated would produce $100 thousand per year. This figure is based on the region's annual municipal water pumpage of 1.3 billion gallons, which differs from sewage pumpage by the amount of water use from private wells plus infiltration and inflows. In the absence of regionwide metering of sewage flows, a surcharge based on water use would be a reasonable approximation. In those jurisdictions in which sewer service is provided on an advalorem tax basis, the surcharge would be added to

the tax rate. This approach has the advantage (compared to a property levy) of relating the cost of water quality management and planning to a major source of pollutant flows. It would also assign collection of the required funds to those agencies which are eligible for the major source of federal subsidies for water quality management activities. It would exclude that portion of the region's population which is served by on-site disposal systems and by private utilities whose rates are established by the Illinois Commerce Commission.

It is recommended below that the first of these approaches--appropriation by all designated management agencies from their general revenues--be adopted.

No matter which of these approaches were chosen, several major issues would require resolution. The most serious of these involves the allocation of the costs of management and planning among parts of the region. Table 10-2 identifies the proportional share each county would pay of each $100 thousand required, based on their respective assessed valuations and water use. Although the relative proportions differ under the two approaches, it is clear that both are roughly proportional to population. Each of the countywide committees will require a minimum level of funding to fulfill its basic responsibilities. The larger and more complex counties may require some additional increment above this base amount. The Commission's costs, because they are related to areawide aspects of the planning process, cannot be readily allocated among the counties. The consequence is an apparent need for some transfer of resources within the management and planning framework from the more to the less populous parts of the region.

This transfer could be approached in two ways:

(1) A single regional fund could be established into which each of the counties or management agencies would contribute its proportional share under one of the funding methods outlined above. The funds would then be used to provide the necessary non-federal funds for the Commission and each of the countywide committees as determined in a jointly-prepared annual planning and management work program. The fund might best be administered by the Commission, since the management agencies are authorized under existing law to contribute to it. An intergovernmental agreement with the countywide committees would be necessary for the transfer of funds (as well as their share of federal and state planning grants) to them.

(2) Under the alternative approach, each county area would generate sufficient funds to meet the non-federal portion (matching share plus non-eligible costs) of the countywide water quality committee's budget. In

addition, each county area would contribute a proportional share of the non-federal portion of the Commission's expenses. These shares could be based on population, assessed valuation, or water use, and would reflect the fact that the Commission's activities are regionwide and not divisible. The effect of this approach would be to eliminate any transfer of resources between counties for county-wide activities.

Either of these approaches requires a mechanism for determining the allocation of costs and financing requirements. An annual areawide management and planning work program and budget would best meet this need. The work program would establish the staffing requirements of the Commission and the countywide committees, while the budget would form the basis for a federal planning grant applications and for determination of required local funds. Preparation of the work program would be done jointly by the Commission and the countywide committees and would require the concurrence of all prior to its adoption. The technical advisory committees would be consulted in the development of the annual program. IEPA would arbitrate any difference over the content of the program or the allocation of costs which threatened to jeopardize the region's eligibility for planning or construction funds. It is recommended that the continuing planning program be financed as follows:

1. The Areawide Water Quality Steering Committee will annually prepare and recommend to the Commission and the countywide committees a work program and budget for continuing water quality planning and coordination.

The work program and budget will be developed jointly with the countywide water quality committees and other interested management agencies and coordinating bodies. It will include funding for continuing refinement and extension of the 208 plan and for monitoring, and other functions of the Commission and the countywide committees. The latter items will be based on annual budget for their activities prepared by the county wide committees. The work program and budget should include priorities for the use of federal planning funds. During the first year of the continuing planning process, the Areawide Steering Committee should work with Commission staff to identify ways of adapting the work program and budget to the several fiscal years required by law and regulations.

The work program and budget will include a recommended allocation among the county areas of one-half of the non-federal funds required to support the program. These funds will include the amounts necessary to match expected federal grants and to support grant-ineligible activities. This portion of the non-federal funds may be a combination of cash and in-kind staff services applicable to elements of the work program. Cash and in-kind contributions will be

identified in the budget in order to make them eligible as a portion of the federal matching requirement.

The work program and budget will be made available for public review through the drainage basin forums prior to its final adoption by the Commission.

2. The Commission will annually prepare, on the basis of the approved work program and budget, an application for federal financial support for the continuing planning program.

The Commission will seek maximum federal support for the activities contained in the work program, including those of the countywide committees. Funds received by the Commission for the support of the county wide committees will be provided to them by contract between the Commission and each committee or the management agency providing its staff services. Each contract will specify the cash or in-kind service contribution to be provided by the committee or management agency.

3. The State of Illinois should provide one-half of the non-federal portion of the approved budget.

The Commission will annually seek funding from the State of Illinois for one-half of the non-federal portion of the approved budget. This funding (the "state share") will be applied as a portion of the required matching share for federal grants and to support grant-ineligible coordinating activities of the Commission and the subregional coordinating bodies. The coordinating bodies will assist the Commission in seeking these funds. Funds will be sought through an appropriation either directly to the Commission or through the IEPA. The appropriation should be specifically designated for activities included in the areawide water quality work program, and should be over and above the state's current funding of the Commission's on-going activities.

4. One-half of the non-federal portion of the approved budget will be provided by local designated management agencies.

Any agency or body (including the Commission and the subregional coordinating bodies) which proposes to carry on a work activity will be responsible for providing the necessary local portion of the costs. It may do this from its regular funding sources or by requesting contributions from management agencies or other sources.

The annual work program and budget will include an identification of the local funds required for its accomplishment and the agencies responsible for providing those funds. Where contributions are to be sought, a recommended level or allocation of contributions may be

included. Each coordinating body may establish a formula for requesting local contributions to support its activities.

A portion of the local share may be provided in the form of in-kind services as provided in the annual work program and budget. The portion to be provided in cash for the support of countywide committee activities will be paid to the committee or the agency furnishing its staff services, as provided in the agreement establishing the committee. The portion to be provided in cash for the support of Commission activities will be paid to the Commission.

A remaining issue is how it can be assured that each local agency will accept its fair share of the costs of coordination and planning. The plan does not include sanctions to be applied to management agencies which fail to contribute a share of continuing planning costs. Financial support is voluntary, and thus subject to some uncertainty. This will relate, in the first instance, to each government's acceptance of the management framework. A major purpose of the proposed intergovernmental framework is to assure that coordination and planning are done by entities directly accountable to local governments in the region. If these entities--the countywide committees and the Commission--are unable to function due to inadequate funds, the continuing planning function must be performed by the state. This should provide some incentive to local governments to support the coordination and continuing planning program. Chapter 8 provides for a triennial reassesment of all agency designations under this plan, including those of coordinating and planning agencies, to evaluate whether assigned responsibilities are reasonable and are being adequately met. As part of this assessment, the countywide committees and the Areawide Steering Committee should consider whether voluntary local funding of continuing planning has been effective or whether some alternative funding mechanism should be considered.

TABLE 10-2: COUNTY SHARES OF $100,000 MATCHING SHARE
Based on Assessed Valuation and Water Consumption

County	A.V. Basis	Water Basis
COOK	$ 73,500	$ 87,410
DuPAGE	9,500	3,820
KANE	4,000	2,540
LAKE	6,400	3,720
McHENRY	2,000	720
WILL	4,600	1,790
Total	$100,000	$100,000

CHAPTER 11

North Branch Chicago River

TABLE OF CONTENTS

	Page
11.01 DESCRIPTION OF BASIN	11-1
a. Physical Characteristics	-1
(1) Geography	-1
(2) Waterways	-1
(3) Geology and Soils	-1
(4) Fish and Wildlife	-2
b. Socio-Economic Characteristics	-5
(1) Population	-5
(2) Land Use	-5
(3) Economy	-5
(4) Water Supply	-5
(5) Government	-5
(6) Recreation	-5
11.02 IMPACTS OF OTHER PROJECTS	-6
a. Introduction	-6
b. Corps of Engineers	-7
(1) Navigation	-7
(2) Wastewater Studies	-8
(3) TARP Study	-9
(4) Flood Control	-9
c. Department of Agriculture	-9
(1) Conservation Program	-10
(2) PL-566 Projects	-10
d. Illinois Department of Transportation	-10
(1) IDOWR	-11
(2) DOH	-11
(3) Lake Michigan Water Allocation	-11
e. Local Units of Governments	-11
11.03 WATER QUALITY IN THE BASIN	-12
a. Stream Classifications and Applicable State Standards	-12
b. Sources of Water Quality Information	-12
(1) Commission Sampling and Analyses Programs	-12
(2) IEPA Data	-14
(3) Computer Simulation of Existing Conditions	-14
c. Results of Sampling and Analyses	-14
d. Results of Water Quality Modeling	-20
(1) Pollutant Concentrations	-21
(2) Pollutant Loadings and Sources	-22
(a) Point Sources	-22
(b) Pervious Sources	-24
(c) Impervious Sources	-28
(3) Summary	-28
e. Overview	-28

TABLE OF CONTENTS (CONT.)

	Page
11.04 POINT SOURCES: EXISTING CONDITIONS	11-29
a. Municipal Type Wastewater Treatment Plants	-29
b. Industrial Wastewater Treatment Plants	-29
c. Miscellaneous Wastewater Treatment Plants	-30
d. Combined Sewer Overflows	-30
e. Local Facilities Planning	-30
11.05 NON POINT SOURCES: EXISTING CONDITIONS	-35
a. Urban Stormwater Systems	-35
b. Construction Activities	-36
c. Septic Systems	-36
d. Hydrologic Modifications	-36
11.06 DISPOSAL OF RESIDUALS	-36
11.07 EXISTING MANAGEMENT PROGRAMS	-38
11.08 MODELING PROCESSES: FUTURE CONDITIONS	-40
a. First Text Plan Assumptions	-40
(1) Population and Land Use	-40
(2) Local Facilities Plans	-41
(3) Phosphate Reductions	-41
(4) Combined Sewer Overflows	-42
(5) Urban Stormwater Runoff	-42
(6) Septic Systems	-42
(7) Soil Conservation	-42
(8) Stream Flow Changes	-42
b. First Test Plan Simulated Results	-43
c. Second Test Plan Assumptions	-50
(1) First Simulation	-50
(a) West Fork	-50
(b) Middle Fork	-53
(c) Skokie River	-53
(2) Second Simulation	-53
(3) Third Simulation	-53
d. Second Test Plan Simulated Results	-53
(1) First Simulation	-53
(2) Second Simulation	-53
(3) Third Simulation	-54
e. Summary	-54
11.09 PROBLEM ASSESSMENT	-54
a. Excessive Infiltration/Inflow (I/I)	-55
b. NSSD Facility Plans	-55
c. Skokie Lagoons	-56
d. Water Quality Modeling Results	-57
(1) Reach No. 5	-57
(2) Reach No. 36	-57
(3) Reach No. 42	-58

TABLE OF CONTENTS (CONT.)

	Page
11.10 BASIN RECOMMENDATIONS	11-58
a. Overview	-58
b. Point Sources	-59
(1) Publicly Owned Wastewater Systems	-59
(2) Private Utilities	-60
(3) Industrial Wastewater Treatment Plants	-61
(4) Miscellaneous Wastewater Treatment Plants	-61
c. Non-Point Sources	-61
(1) Urban Stormwater Runoff	-61
(2) Agricultural Runoff	-62
(3) On-Site Disposal Systems	-64
(4) Air Pollution	-64
(5) Sanitary Landfills	-65
(6) Waterways	-65
d. Residuals	-66
e. Groundwater	-66
11.11 COSTS OF RECOMMENDED PLAN	-66
a. Facility Plans	-66
(1) General	-66
(2) MSDGC Areas	-67
(3) Phasing and O&M Costs	-67
(4) Local Costs	-68
(5) Increased Costs	-68
b. Urban Stormwater	-68
c. Agricultural Runoff	-68
11.12 WATER QUALITY CONDITIONS IN 1983	-75
a. Introduction	-75
b. Assumptions of Changes in the Basin	-75
(1) Land Cover	-75
(2) Urban Runoff Control	-76
(3) Point Sources	-76
c. Expected Water Quality in 1983	-76

FIGURES

		Page
11-1	Basin Location	11-2a
11-2	Water Sampling Stations	-14a
11-3	Basin Modeling Segments	-16a
11-4	Point Source Discharges	-34a
11-5	Wastewater Service Areas	-36a
11-6	Location of Septic Areas	-38a

TABLES

		Page
11-1	Stream Inventory	11-3
11-2	Lake and Pond Inventory	-3
11-3	Predominant Soil Unit Characteristics For Northeastern Illinois	-4
11-4	Population Changes 1975-2000	-6
11-5	1970 Land Use	-7
11-6	Land Use Forecasts (Acres)	-8
11-7	Employment Forecast	-8
11-8	Important Reaches	-15
11-9	In-Stream Water Quality Analyses - Summary Data	-16
11-10	In-Stream Water Quality Analyses - Summary Data	-17
11-11	Violations in 1976 of Illinois In-Stream Water Quality Standards	-18
11-12	Biological Stream Site Classifications	-20
11-13	Generalized Benthic Sediment Conditions	-21
11-14	Statistical Summary of Current Water Quality	-23
11-15	Statistical Summary of Current Dissolved Oxygen Levels	-24
11-16	Pollutant Contributions by Source Category, Existing Conditions, Reach 109	-25
11-17	Sources of Pollutants, Existing Conditions	-26
11-18	Municipal Type Wastewater Treatment Plants	-31
11-19	Other Point Source Discharges	-33
11-20	Miscellaneous Wastewater Treatment Plants	-34
11-21	Summary of Septic Tank Installations	-37
11-22	Septic System Areas Having Limitations	-37
11-23	Existing Local Water Quality Management Agencies and Programs	-39
11-24	Changes in Land Cover, 1976-2000	-41
11-25	Comparison of Sources and Volumes of Pollutants, Reach 109	-44
11-26	Comparison of Pollutant Concentrations, Existing Conditions - First Test Plan - Second Test Plan	-46
11-27	Changes in Dissolved Oxygen Levels Under Alternative Test Conditions	-49
11-28	Water Quality Events in Violation of Desired Levels Under Alternative Test Plan Conditions	-51
11-29	Recommended Plans, Publicly Owned Treatment Systems	-69
11-30	Summary of Future Costs	-70
11-31	Projected Annualized Local Costs	-71
11-32	Projected Average Annual Increase in Household Wastewater Charge - Lake County	-72
11-33	Projected Average Annual Increase in Household Wastewater Charge - Cook County	-73
11-34	Projected Average Annual Increase in Household Wastewater Charge - Total Basin	-74
11-35	Land Cover Changes	-76
11-36	Point Sources in the North Branch Basin	-77
11-37	Water Quality Ratings in 1983	-78
11-38	Ammonia and Dissolved Oxygen Ratings in 1983	-79

CHAPTER ELEVEN
NORTH BRANCH, CHICAGO RIVER BASIN

11.01 DESCRIPTION OF THE BASIN

a. Physical Characteristics

(1) Geography: The North Branch of the Chicago River, known to the Indians as the "River of the Onions," drains the area just inland from Lake Michigan. The North Branch extends roughly from Waukegan, in Lake County, to its confluence with the Chicago River, in downtown Chicago. However, for purposes of this study, the southernmost limits of the basin are in the Village of Niles, at Touhy Avenue. The 58,811 acre drainage area, divided almost equally between Lake and Cook counties, is approximately 29 miles long and six miles wide at its widest point. (See Figure 11-1).

(2) Waterways: The basin is drained by three major streams: The Skokie River, and the West Fork and main stem (or Middle Fork) of the North Branch of the Chicago River. The Skokie River begins in Lake County, northwest of North Chicago, and flows southward to where it joins the main stem south of Northfield. The West Fork begins northeast of Lincolnshire and flows south to join the main stem near Golf. The main stem originates near Libertyville in Lake County and flows into northeast Cook County where it picks up the Skokie and the West Fork before it continues to the north side of Chicago.

One of the unique features of the waterway system is the Skokie Lagoons, a series of impoundments in the Skokie River, just above the point where the Skokie River joins the main stem.

Although the basin lies just west of the Lake Michigan shoreline, there is no interaction between the North Branch system and the Lake. The basin is separated from the Lake's basin by the low continental divide which separates the Great Lakes and Mississippi River basins.

Tables 11-1 and 11-2 describe the significant waterways and impoundments in the basin.

(3) Geology and Soils: Till, the dominant surficial deposit in the basin, is relatively impermeable. Water recharge capability is limited and there is risk of pollutant runoff to surface waters from the applications of wastes, fertilizers or agri-chemicals.

Along the streams that traverse the till plain there are deposits of clays, which also tend to be impermeable. Sanitary landfills and septic tanks can create surface water pollution problems in these areas by the lack of vertical drainage.

Sand and gravel deposits are found in clustered beach ridge complexes in eastern portions of the basin. These deposits are coarse, loosely sorted, and highly permeable.

Throughout the basin, geological conditions represent impediments to effective use of septic systems. In the clustered beach ridge complexes, usage would be hampered by the high infiltration rate of surficial deposits and the proximity of the sand and gravel aquifers. In most other areas, the inability of septic wastes to infiltrate the impermeable soils could create surface runoff problems, particularly where there are steep slopes.

Predominant soils in northeastern Illinois are described in Chapter Three. Soils occuring in this basin are identified in Table 11-3.

(4) Fish and Wildlife: The wildlife population in the basin is not as large or as diverse as it once was, but numerous types of small mammals and even whitetail deer, a species reintroduced in recent years, inhabit the area. Most wildlife is concentrated in Cook County within the forest preserves. Ducks and geese are numerous on the Skokie Lagoons during migratory seasons.

The MSDGC collected fishes at three sites within the North Branch Basin in 1976 as part of the 208 fish sampling program. Ten species and one hybrid were found. All but two of the species collected are considered tolerant to habitat abuse. Green sunfish, fathead minnows, and bluegills were taken at all of the sites and represented 67 percent of the total number of fishes collected.

Follow-on work by the Illinois Natural History Survey (INHS) involved computation of a "toxicity index" relating water quality to fish habitat suitability. Included in the parameters for computing the toxicity index (using bluegills as the target species) are cadmium, nickel, arsenic, chromium, boron, mercury, silver, cyanide, ammonia, and copper, among others. On the basis of its analysis, the INHS determined that the calculated "Bluegill Toxicity Index" was in excess of the theoretical maximum level above which a diverse fishery cannot be maintained at five of the ten IEPA water quality sampling sites in the watershed, based on 1976 water quality data. The parameters found to have the greatest effect on the high index calculations were silver, cyanide, and ammonia nitrogen. Significantly, while cyanide was often found to be a major contributor to the toxicity index, the State in-stream standard for that parameter was never violated in 1976. Conversely, some parameters (copper, lead and total iron) often exceeded instream standards, yet did not contribute significantly to the toxicity index.

Overall, the INHS concluded that fish habitat in the North Branch Basin (as measured by water quality) was extremely degraded.

Figure 11-1: BASIN LOCATION

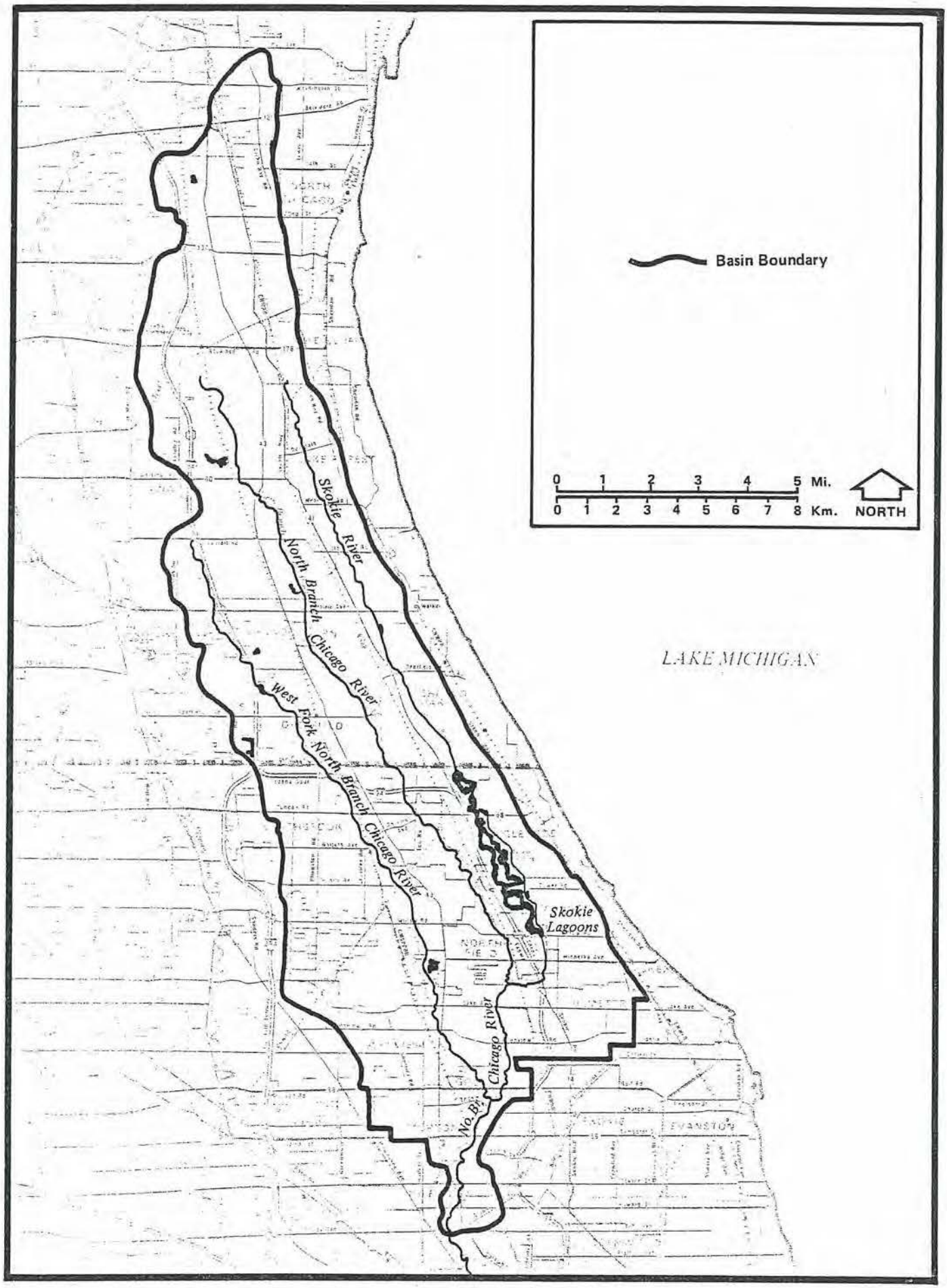


TABLE 11-1 : STREAM INVENTORY, NORTH BRANCH BASIN

STREAM NAME	LENGTH (MILES)	AVG. WIDTH (FT.)	WATER SURFACE (ACRES)	GRADIENT (FT/MILE)	DRAINAGE AREA (SQ. MILES)	COMMENTS
NO. BRANCH CHIC. RV.	50.6	69	423.2	2.5	200.0	
NORTH SHORE CHANNEL	7.6	35	32.2	0.7	NA	
SKOKIE RIVER	22.0	20	NA	4.0	32.9	
WEST FORK NO. BRANCH OF CHICAGO RIVER	8.3	8.3	18.4	2.0	30.0	

TABLE 11-2 : LAKE AND POND INVENTORY, NORTH BRANCH BASIN

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
AL-RICH GARDENS PIT	44	11	23	12.8	0.5	18	Ground-water	1959	Private	Owner & Employees
CHICAGO BOTANIC GARDENS LAKE	42	12	1,2	62.0	5.7	17	NA	1967-68	Org.	NA
LAKE ELEANOR	43	12	30	15.0	1.5	8	2000	1964	Org.	Association Members
LAKE FOREST ACADEMY LAKE	44	11	30	23.0	0.9	12	200	1910	Org.	Persons attending the Academy
LAMB'S PET FARM LAKE	44	11	23	18.0	0.8	15	25	1957	Org.	Fee
NORTHBROOK SPORTSMENS CLUB LAKE	42	12	5	11.0	0.5	26	NA	1957	Org.	Members
SKOKIE LAGOONS	42	13	19	283.3	14.3	9	NA	1933-42	Public	Public
STONE BRIDGE PRIORY LAKES	44	12	20	12.0	NA	9	150	1915	Org.	Students & Personnel
TWENTIETH CENTURY LAKE	44	11	23	10.5	0.2	23	25 and grdwtr.	1957	Org.	Employees
VALLEY LO. LAKE	42	12	26	28.5	1.3	28	NA	1955-60	Org.	Homeowners

TABLE 11-3: PREDOMINANT SOIL UNIT CHARACTERISTICS FOR NORTHEASTERN ILLINOIS

Unit In Basin	Soil Unit	Soil Color	Soil Texture	Permeability	Drainage	Subsoil Texture	Underlying Materials	Agricultural Usage Limitations	Approximate Percentage of Prime Agri. Land	Development Usage Limitations
	Fox-Dresden-Casco	brown	loam	mod-rapid	well	loam	sand and gravel	E, D, LF	12	S, E, ST
	Warsaw-Rodman-Lorenzo	brown	loam	moderate	well	loam	sand and gravel	E, D	50	S, E, ST
YES	Volinia-Selma-Lomax	brown	loam	moderate	excessive	loam	sand	WE, D, W	80	W, S, P
YES	Maumee-Watseka Plainfield	black	loamy sand	rapid	excessive	sand	sand	W, WE, D	30	S, W
YES	Zurich-Grays-Wauconda	gray	silt loam	moderate	moderate	clay loam	silt loam	W, E, LF	90	S, W, ST
YES	Drummer-Brenton-Proctor	brown	silt loam	moderate	moderate	clay loam	loam	W, E	100	W, S, P
	Miami-Kidder-McHenry	gray-brown	loam	moderate	well	clay loam	loam	E, ST, LF	40	ST, S, SS
	Drummer-Saybrook-Lisbon	dark gray	silt loam	moderate	moderate	clay loam	loam	W, E	80	W, S, SP, SS
	Ringwood-Griswold	brown	loam	moderate	well	clay loam	sandy loam	E, W	85	S, W, ST
YES	Morley-Markham-Ashkum	gray	loam	slow	moderate	silty clay	clay loam	E, W, LF	60	ST, SP, SS, W, HC
YES	Elliot-Ashkum-Beecher	dark gray	silt loam	slow	moderate	silt loam	clay loam	W, E	85	W, SP, CS, SS
YES	Milford-Martinton	black	silt loam	mod. slow	poor	silty clay	calcareous sediment	W	95	W, HC, P, SP, SS
	Symerton-Andres-Ashkum	black	silt loam	moderate	moderate	clay loam	clay loam	E, W	95	W, SP, SS
YES	Nappanee-Peotone-Del Rey	dark gray	silt loam	slow	well	silt loam	calcareous sediment	W, T, LF, E	50	W, SP, HC, P
YES	Frankfort-Bryce-Montgomery	dark brown	silt loam	slow	poor	silty clay	calcareous sediment	W, T, LF, E	5	W, SP, HC, P
	Romeo-Joliet	black	loam	moderate	poor	loam	limestone	W,STN, FL	60	W, SH, FL, SS
	Otter-Huntsville-Millington	black	loam	moderate	moderate	loam	loam	FL, W	95	W, FL
YES	Fox-Wauconda-Sawmill	dark gray	silt loam	moderate	poor	loam	sand	W, FL, E	75	W, FL
	Houghton-Lena	black	muck/peat	rapid	poor	muck/peat	sand/silt	HWT, W	0	W, P, S, HWT, LS

USAGE LIMITATION CODES

CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION
CS	Clayey Subsoil	D	Drouthiness	E	Erosion	FL	Flooding
HC	Heavy Clayey Subsoil	HWT	High Water Table	LF	Low Fertility	LS	Low Strength
P	Ponding	S	Seepage	SH	Shallowness to Bedrock	SP	Slow Percolation
SS	Shrink-Swell	ST	Steepness	STN	Stoniness	T	Soil Tilth
W	Wetness	WE	Wind Erosion				

b. Socio-Economic Characteristics

(1) Population: All or part of 24 communities are located within this basin with their population densities higher than the average in the region. The estimated 1976 population was 189,153. The largest community is Waukegan, although only a small part of it is in the basin.

As shown in Table 11-4, the population of the basin is forecasted to increase by the year 2000 to 257,303, an increase of 31.7 percent over 1975. As will be seen later in this chapter, projected growth is a factor in the future water quality of the North Branch and its tributaries.

(2) Land Use: The basin contains a wide variety of land uses, as indicated in Table 11-5. Vacant, agricultural and forested land is the largest current land use category followed by single-family residential.

Nearly 7,500 acres are categorized as public or semi-public open space. Of the remaining 25 percent of land, 10 percent is streets and parking. Commercial, industrial, and remaining uses account for only a small percentage of land.

The Commission's land use forecasts (Table 11-6) anticipate increasing urbanization of the basin and accompanying changes in land use. Largest increases, proportionately, are forecasted in nonresidential land use categories, particularly commercial. The amount of undeveloped (open, vacant, agricultural) land is expected to decrease by more than 21 percent by the year 2000.

(3) Economy: Economic activity in the basin in recent years reflects regional trends. Manufacturing employment has leveled off, while employment in wholesale trade, finance, insurance, real estate, and government has increased and will continue to do so. (See Table 11-7).

(4) Water Supply: Lake Michigan is now, and will continue to be the major source of water supply for northeastern Illinois, serving about 5 million people in Chicago and 89 other communities, including all but two in this basin. Only the Villages of Green Oaks and Mettawa use well water.

(5) Government: The North Branch Basin lies within both Cook and Lake counties. The basin includes all or parts of 24 municipalities. Portions of ten townships lie within the basin. Two sanitary districts serve the basin: the North Shore Sanitary District (NSSD) and the Metropolitan Sanitary District of Greater Chicago (MSDGC).

(6) Recreation: A major recreational area centers on the Skokie Lagoons. Row boats, canoes, and dinghy sailboats may use the lagoons, but power boats are prohibited. Swimming also is prohibited. Fishing, horseback riding, cross country skiing, and hiking are popular activities. The

TABLE 11-4. POPULATION CHANGE 1975-2000

FACILITY PLANNING AREAS	1975	1980	1985	1990	1995	2000	% Change 1975-2000
BANNOCKBURN	1800	1960	2090	2230	2380	2420	34.4
DEERFIELD	20560	21330	22360	23380	23560	23740	15.5
NORTH SHORE SANIT. DISTRICT 1/	222260	230950	250400	269880	288580	307310	38.2
CHICAGO MSD NORTH-SIDE 1/(000)'s	(2) 1383	1374	1381	1387	1387	1388	.04
BASIN AREA	195302	210173	225044	237431	247367	257303	31.7
1/ These Facility Planning Areas are located in more than one basin.							
2/ Includes population served from areas outside of future defined service areas.							

Source: Northeastern Illinois Planning Commission

North Branch itself is a popular canoe stream, and a major canoe race is held annually on the river.

11.02 IMPACTS OF CTHER PROJECTS

a. Introduction

In many basins there are studies or projects underway which may impact directly or indirectly on surface and/or groundwater quality. Most will have indirect effects since they usually involve water quantity or hydrologic modifications. These include the flood control activities of the U.S. Soil Conservation Service (SCS), the U.S. Army Corps of Engineers, and the Illinois Division of Water Resources. Also of direct impact are SCS soil conservation programs.

Many local, county, state, and federal public works projects unrelated to water quality, nevertheless, have water quality impacts. Perhaps the most significant of there involves the construction or improvement of roads and highways. As a result of these projects, drainage patterns are altered, local farm tiles may be interrupted, silt is introduced during construction, and vehicular pollutants are conveyed to rivers and streams. Waterway crossings by

TABLE 11-5: 1970 LAND USE

Land Use Category	Total Acres	% of Total
Single Family Residential	16762	28.5
Multi Family Residential	251	.4
Mobile Home Parks	119	.2
Manufacturing and Processing	1438	2.4
Transportation, Communications, & Utilities	225	.4
Railroad Rights-of-way	861	1.5
Airports	140	.2
Streets & Parking	5444	9.3
Trade	538	.9
Services-Private	232	.4
Services-Institutional	1435	2.4
Military Services	1716	2.9
Cemetaries	62	.1
Entertainment Assembly	23	.1
Public Buildings	22	.1
Public and Quasi-Public Open Space	7471	12.7
Mining and Quarries	17	0
Vacant, Agricultural & Forest Areas	21,266	36.1
Vacant-Under Development	449	.8
Water	157	.3
Warehousing	125	.2
Shopping Centers	50	.1
Hotels-Motels		
Parking Lots	8	0
Total	58,811	100.0

highway projects and various public and private utilities all affect water quality to varying degrees and for various lengths of time. Not to be overlooked are public and private storm sewer outlets.

Discussion in this section will serve as a check list to assure consideration of significant projects in the evaluation of initial plan alternatives, and in future plan revisions.

b. Corps of Engineers

Corps responsibilities are related primarily to navigation and flood control.

(1) Navigation: The Corps has general jurisdiction over navigation in United States waters. Responsibilities

TABLE 11-6: LAND USE FORECASTS (ACRES)

Land Use Category	1980	1985	1990	1995	2000
Residential	18039	18508	18977	19264	19552
Manufacturing	2412	2900	3388	3698	4009
Commercial	1790	2309	2827	3154	3481
Transportation/Communication, etc.	5796	6335	6875	7197	7519
Open Space, Vacant Agriculture, etc.	30774	28759	26744	25498	24250
Total	58811	58811	58811	58811	58811

SOURCE: Northeastern Illinois Planning Commission, 1976

include channel and harbor construction and maintenance, clearing and snagging of navigable waters, and control over the location and placement of structures which might impact upon navigability.

Under special legislation enacted in 1972, the Corps is conducting a snagging and clearing project on the North Branch. The work involves the removal of accumulated debris in the main stem from its junction with the North Shore Channel, upstream to the confluence of the West Fork. Depending upon the availability of funds, the project may be extended further upstream.

(2) Wastewater Studies: Pursuant to Section 206 of the Flood Control Act of 1958 and resolutions adopted by Congress in 1971, the Corps was involved in a planning study on alternative wastewater management systems for the Chicago-South End of Lake Michigan (C-SELM) area, which covered portions of northeastern Illinois and northwestern Indiana.

TABLE 11-7: EMPLOYMENT FORECAST

CATEGORY	1970	1980	1985	1990	1995	2000	1970-2000 % Increase
Manufacturing	33013	35067	35945	36823	38034	39244	18.9
Local Retail	10060	10468	10894	11320	11632	11945	18.7
Other	28223	52184	55516	58847	63869	68891	144.1
Total	71296	97719	102355	106990	113535	120080	68.4

Specifically, the study was directed at the evaluation of various regional wastewater management systems, including plans which would result in the elimination of pollutional discharges into the region's waterways. The report was completed in 1974. However, since this was only a planning study, it contained no recommendations for federal action. Congress intended that the study be presented to local units of government for their consideration and adoption, as desired. Some information developed in the study served as a point of reference in the current studies under PL 92-500.

(3) TARP Study: As part of the overall C-SELM study, the Corps is also involved in an investigation as to the appropriate "Federal interest" in the Tunnel and Reservoir Plan (TARP) proposed by the MSDGC. In its Interim Report No. 1, the Corps confirmed that supplemental sewers, tunnels and reservoirs (such as proposed in the TARP) were the optimal means for controlling runoff on both a community and an areawide basis.

The report noted that flood damage reduction aspects of the plan appeared to fall within the purview of the federal flood control program, thus establishing national interest in that component. Follow-on studies concluded that the tunnel, reservoir, and channel-widening components of the plan (related to flood control) were appropriate for implementation under the regular flood control program administered by the Corps. Subsequently, the Water Resources Development Act of 1976 authorized the preparation of Phase I General Design Memoranda which will evaluate Federal interest in the flood control aspects of certain tunnels and reservoirs called for by the so-called "TARP II" phase of the MSDGC plan. Details of the TARP plan and its impact on the North Branch basin are discussed elsewhere in this report.

(4) Flood Control: The Corps is currently engaged in a flood control study of the basin, which involves the re-evaluation of projects proposed by the SCS-MSDGC Floodwater Management Plan (discussed subsequently). In the study, previously developed data on hydrology, hydraulics, costs and benefits are being re-evaluated. The overall objective is to seek congressional authorization and funding for the construction of flood control reservoirs and other projects on the North Branch, all of which would be executed by the Corps. However, Corps' involvement in project construction is uncertain due to recent policy directives which restrict Corps participation to streams whose 10-year flood flows are in excess of 800 cubic feet per second.

c. U.S. Department of Agriculture

The Agricultural Stabilization and Conservation Service (ASCS) and the Soil Conservation Service (SCS) are the two

principal units of the U.S. Department of Agriculture with programs related to water quality management.

(1) Conservation Program: The SCS and ASCS provide a variety of functions and services directed at the reduction of soil erosion. The SCS offers extensive technical assistance to farm operators, local soil and water conservation districts, and other interested parties in developing erosion control plans. The ASCS gives assistance through cost-sharing to farmers to control erosion. The Clean Water Act of 1977, authorized additional funds to be expended in projects designed to abate agriculturally related water pollution. Various site specific control techniques are available for implementation under these programs, depending upon the nature of local problems.

(2) PL-566 Projects: The small watershed program of the SCS, authorized by the Watershed Protection and Flood Prevention Act of 1954 (PL 83-566), provides a framework through which federal, state, and local units of government can deal with local water resources problems on a cooperative basis. The program is principally oriented toward the prevention of soil erosion and the control of flooding and sedimentation damages. Works typically include the construction of small reservoirs, stream channelization, grade stabilization, and bank protection. Projects are sponsored by and coordinated through local soil and water conservation districts and other interested agencies.

The Chicago Area River Basin Study was initiated by the SCS in 1971 under PL-566 authority. Work was undertaken in six watersheds in Cook and Lake counties, under the local sponsorship of the MSDGC. The principal objective of the study is to develop comprehensive plans to reduce floodwater damage.

The North Branch, Chicago River was in that Study and in 1974, a floodwater management plan was completed. The plan called for the construction of seven flood control reservoirs, stream channel maintenance, expanded floodplain and land use regulations, structural floodproofing, and improved erosion control measures. Within Cook County, the project has already advanced to the reservoir construction stage.

d. Illinois Department of Transportation

Two divisions of this Department have duties and responsibilities related to water quality management: the Illinois Division of Water Resources (IDOWR) and the Division of Highways (DOH).

(1) IDOWR: The IDOWR has statutory responsibility for navigation and flood control projects on water bodies throughout the State, as well as permit authority for private and public projects which enter or cross over or under such waters. The IDOWR also has underway a number of flood control projects in the region. None, however, is active or proposed for the North Branch basin.

(2) DOH: The Division of Highways is responsible for the construction and maintenance of State highways. Highways have associated water quality impacts both during their construction (e.g. erosion and sedimentation, disruption of drainage, etc.) as well as when placed in use (e.g. road salt usage, roadway drainage). Long-range plans call for the construction of U.S. Route 41 as a multi-lane freeway connecting the Edens Expressway with the proposed Richmond-Waukegan Freeway (generally paralleling the North Branch system northward from the Lake-Cook county line to Waukegan), and construction of a new Lakefront Freeway (crossing headwaters reaches of the basin) near Waukegan.

(3) Lake Michigan Water Allocation: IDOWR has responsibility for the diversion of Lake Michigan waters by and for all parties in Illinois. A long series of hearings have been held, which culminated in the initial allocation and reallocation of waters. This will be a continuing responsibility with the actual quantities of water available within the 3200 cfs Supreme Court limitations being influenced by such on-going activities as: the determination of a revised method for computing natural diversions of storm and ground waters a proposal currently being negotiated with other Lake states and reduction in dilution waters required by the MSDGC which will result from completion of the TARP. With the declining water supplies available to a number of communities now using well water, the availability of Lake Michigan water will strongly influence the potential for growth of those communities. If relief is not forthcoming, the question will not be growth, but rather maintenance of established standards. Impacts on wastewater quality and quantity are self-evident.

e. Local Units of Government

Municipalities, Cook and Lake counties, and special purpose districts are involved in a number of local projects which have direct or indirect water quality impacts. The general purpose governments are empowered to adopt regulations such as floodplain ordinances, on-site stormwater detention ordinances, and soil erosion and sedimentation control ordinances. All of these have potential local water quality impacts. Still other effects result from more routine activities such as street sweeping, sewer and catch basin cleaning, and solid waste management.

Other water quality impacts result from building permits which involve stormwater drainage systems discharging into streams.

Programs of special purpose governments also impact on water quality. The Cook County Forest Preserve District has been especially active in acquiring land in the basin and preserving it in a natural state. The Lake County and the North Cook County Soil and Water Conservation Districts have been active in promoting soil erosion control measures.

Also of interest are the Cook County and the Lake County Clean Streams Committees which serve as focal points for citizen reporting of pollution incidents. Through these committees of volunteers, actions are taken to identify pollutant sources and to stimulate corrective measures.

11.03 WATER QUALITY IN THE BASIN

a. Stream Classifications and Applicable State Standards

All waterways in the basin are designated as "General Use, Protected for Public and Food Processing Water Supply," and are subject to state standards for waterways with that designation. A full discussion on General Use standards and other standards applicable to water quality is included in Chapter Four.

The State has been divided by the IEPA into hydrologic units that coincide with major river basins. These units have been further divided into segments on the basis of common characteristics. The North Branch Chicago River Basin, as defined by the Commission for areawide planning, is nearly identical to segment A-3, which is one of 20 segments in the Des Plaines/Lake Michigan hydrologic unit as defined by the IEPA. This segment, like all others in the state, has been designated "water quality limited." This means that water quality does not currently meet applicable water quality standards and/or is not expected to meet those standards even after minimal statutory limitations have been applied to effluents discharged to the basin.

b. Sources of Water Quality Information

Assessment of current water quality conditions in the North Branch and its tributaries is based partly on information developed in the Commission's water quality sampling program and by other public agencies, principally the IEPA. The results of these sampling programs are described below. The simulation of existing conditions with the water quality model also provides a comprehensive picture of water quality in the basin.

(1) Commission Sampling and Analyses Programs: The instream sampling program conducted by the Commission involved 48

stations (See Chapter Four), four of which were in the North Branch Basin as follows (see Figure 11-2):

--Station 27: Middle Fork, North Branch Chicago River, at Deerfield Road in Deerfield

--Station 28: West Fork, North Branch Chicago River, at Dundee Road in Northbrook

--Station 29: Skokie River, at West Frontage Road in Northfield

--Station 31: North Branch Chicago River at Touhy Avenue in Niles.

Data were collected at seasonal intervals over a 13-month period (April 1976-April 1977) at each of these stations. Sampling results were used in calibrating the water quality model but they also represent important information on water quality in the basin. Samples were analyzed for 19 constituents.

In addition to the instream sampling program, the Commission conducted several other monitoring programs as part of the overall study. These were:

--Stormwater runoff sampling and analysis at 16 sites representing various land uses in the region, and two ravines tributary to Lake Michigan

--Sediment oxygen demand (SOD) measurements from bottom deposits at 110 stations

--Benthic community (macroinvertebrate) sampling from bottom deposits at 116 stations

--Dam aeration/deaeration measurements at 48 structures, and

--Fish population surveys at 60 sites.

One of the stormwater runoff sampling sites (highway) is located within the North Branch Basin. However, the data from the stormwater sampling sites are not intended to be basin-specific; rather, they indicate characteristics of runoff from particular kinds of land uses, wherever they are found in the region. Results of the sampling effort are discussed in Chapter Six.

Four of the sites at which SOD was measured are in this basin. (see Table 11-8). In addition to measuring the oxygen demands of various organisms, bottom sediment samples were collected, analyzed and described as being representative of one of the following generalized conditions: clean, moderately clean, slightly degraded, moderately polluted, polluted, heavily polluted, or sewage

sludge-like. For the four sites, benthic communities were analyzed, and mathematical indices reflecting the nature and diversity of these communities were developed according to standard formulas. Indexes above 3.0 are indicative of generally clean water; values between 1.0 and 3.0 are indicative of moderately polluted water; and values below 1.0 are indicative of seriously polluted water.

(2) IEPA Data: The IEPA water quality sampling network in northeastern Illinois consists of 176 sampling stations, 12 of which are in the North Branch Basin. Sampling results discussed below are from the IEPA's sampling of chemical parameters at these 12 sites in 1976. Sites where IEPA samples were collected are shown in Figure 11-2.

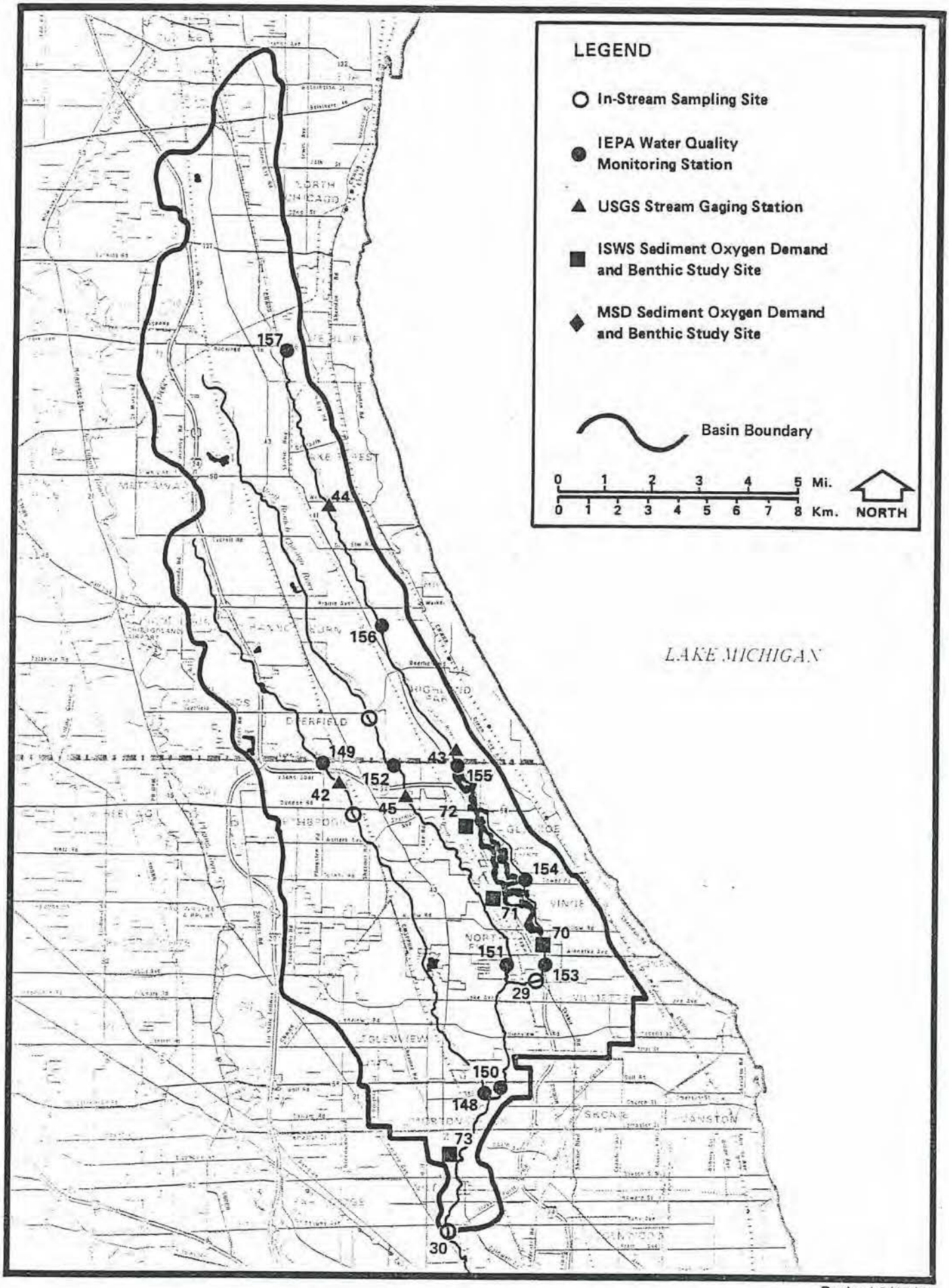
(3) Computer Simulation of Existing Conditions: As shown in Figure 11-3, for modeling purposes the basin was divided into seven areas called "reaches." Each reach is composed of a segment of a major stream, the waterways that are tributary to that segment, and the land area drained within the segment. Each is a direct tributary to the reach immediately downstream from it along the same major stream, and an indirect tributary to other downstream reaches. Reach 109 is the farthest downstream point for which water quality data on the basin have been simulated. Since water from all other North Branch reaches eventually flows into Reach 109, it represents a "summary" of pollutant loadings in the basin. The discussion here focuses on water quality conditions in Reach 109. Conditions in Reaches 5, 42, 68 and 76 are discussed as necessary. (See Table 11-8 for descriptions of the most downstream points in these five reaches).

c. Results of Sampling and Analyses

Results of the Commission's in-stream sampling program are shown in Tables 11-9 and 11-10. Of the 19 parameters evaluated, the State of Illinois has established standards for pH, temperature, dissolved oxygen (DO), and ammonia. Violations of State standards are used here as a measure of the relative water quality. The ammonia nitrogen standard is the one violated most frequently in the basin. Samples from stations 28 and 31, located on the West Fork and main stem respectively, produced the greatest number of violations. Standards for ammonia and temperature were violated at station 29, but only during one sampling period. The standard for DO was violated during one sampling period at station 28. No violations were noted at station 27, which is located on the Middle Fork.

Ammonia violations also were common in the samples collected by the IEPA at 12 sites in the basin (see Table 11-11). The standard for ammonia was violated in 32 percent

Figure 11-2: WATER SAMPLING STATIONS



Revised 2/15/79

TABLE 11-8: IMPORTANT REACHES, NORTH BRANCH CHICAGO RIVER BASIN

Reach 5 Area drained by West Fork of North Branch above Dundee Road including the Deerfield Treatment Plant	Reach 68 Area drained by the Skokie River above but not including the Clavey Road Treatment Plant
Reach 36 Area drained by headwaters of Middle Fork of North Branch above Half-Day Road	Reach 76 Area drained by the Skokie River above Willow Road including the Skokie Lagoons and the Clavey Road Treatment Plant
Reach 42 Area drained by Middle Fork of North Branch above Lake-Cook Rd.	Reach 109 Area drained by the North Branch and its tributaries above Touhy Avenue in Niles

of the samples, and in some cases, concentrations were far in excess of the standard.

Violations of standards for DO, copper and fecal coliform also were noted frequently in the IEPA samples. Out of 76 analyses for fecal coliform, 55 apparent (the IEPA varies from preferred methodology for sampling fecal coliform) violations were recorded. Of 23 analyses for copper, 17 violations were noted. Violations of the DO standard were noted in 20 percent of the samples, and in several instances the violations were far in excess of standards.

Results of sampling and analyses of benthic macroinvertebrate communities and sediment oxygen demand by the Illinois State Water Survey in 1976 are presented in Tables 11-12 and 11-13, respectively. Based on biological analyses, (Shannon-Weaver), two sites were considered seriously polluted and two were considered moderately polluted (Table 11-12). Based on SOD measurements, two sites were described as heavily polluted, one as polluted and one as moderately polluted (Table 11-13). These apparently conflicting classifications of the same stream sites result from the use of different parameters and/or criteria.

TABLE 11-9 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

NORTH BRANCH OF THE CHICAGO RIVER BASIN

STATION NO. 27

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		pH (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5[2]	BOD_{20}[2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
JUNE 1 – 10 1976	No. of Analyses	30	10	30	30	30	30	30	29	10	10			30	30	30	30	10	2	10	
	Maximum	8.5	240	150	456	1058	50	25	13	4	7			1.6	1.2	3.3	0.48	10	359	29	
	Minimum	7.2	90	13	9	562	2	13	3	2	4			0.4	0	0.2	0.10	2	346	3	
	Mean	7.9	208	29	53	675	8	19	7	3	5			1.0	0.2	0.8	0.24	4	353	7	
SEPTEMBER 7 – 16 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.1	202	40	91	504	22	23	12	5	9			2.6	0.6	0.7	0.48	6	267	31	
	Minimum	7.2	118	5	7	210	1	16	2	1	3			0.7	0.1	0	0.19	1	236	2	
	Mean	7.6	160	14	31	356	8	19	6	2	5			1.2	0.3	0.1	0.33	3	252	11	
DECEMBER 5 – 15 1976	No. of Analyses	2	0	2	2	2	2	2	0	0	0			2	2	2	2	0	0	0	
	Maximum	7.3		25	77	802	15	0						4	3.4	1.3	0.57				
	Minimum	7.2		17	34	770	8	0						3	2.7	1.2	0.51				
	Mean	7.2		21	56	786	12	0						4	3.1	1.3	0.54				
FEBRUARY 21 – 28 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
MARCH 14 – 19 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	10
	Maximum	7.6	166	23	29	1338	8	10	9	3	9			2.6	1.8	1.5	0.17	8	452	8	11
	Minimum	6.8	147	10	10	1040	3	1	7	2	2			1.9	1.2	0.7	0.04	5	442	4	6
	Mean	7.2	156	13	19	1152	6	2	8	2	6			2.3	1.6	1.1	0.10	6	447	6	8

STATION NO. 28

JUNE 1 – 10 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	29	10	2	10	
	Maximum	8.1	230	57	128	878	29	24	13	23	38			13.2	12.0	6.0	2.10	9	362	53	
	Minimum	6.8	83	12	5	180	1	13	2	3	11			0.2	0	0.1	0.10	7	300	5	
	Mean	7.6	199	20	26	697	8	19	6	12	23			8.3	7.0	2.8	1.00	8	331	22	
SEPTEMBER 7 – 16 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	9			30	30	30	30	10	2	10	
	Maximum	8.6	253	52	77	932	14	24	10	19	54			25.6	25.0	4.1	5.60	12	212	50	
	Minimum	7.3	86	7	6	372	1	17	0	5	11			3.5	1.9	0.1	1.20	9	207	14	
	Mean	7.6	197	15	19	689	6	21	4	8	22			11.2	10.0	1.4	3.90	10	210	26	
DECEMBER 5 – 15 1976	No. of Analyses	14	10	14	14	14	14	14	13	10	10			14	14	14	14	10	2	10	
	Maximum	7.6	217	74	171	1436	46	7	12	25	48			18.3	19.2	3.7	6.70	11	250	185	
	Minimum	7.1	188	14	14	554	8	0	4	10	24			11.4	9.7	1.4	3.40	7	218	4	
	Mean	7.4	199	28	60	877	20	3	7	18	34			15.0	13.5	2.6	4.90	9	234	31	
FEBRUARY 21 – 28 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
MARCH 14 – 19 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	10
	Maximum	7.7	212	34	59	1546	13	16	11	7	19			12.2	10.8	3.9	2.88	9	438	20	7
	Minimum	7.1	146	8	8	1172	5	3	7	2	12			5.7	4.1	1.9	1.28	6	417	4	3
	Mean	7.4	186	18	30	1269	9	9	9	5	17			8.7	7.2	2.7	2.23	8	428	8	5

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited.

(3) Analysis by Nalco

TABLE 11-10 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

NORTH BRANCH OF THE CHICAGO RIVER BASIN

STATION NO. 29

SAMPLING PERIOD	STATISTICS	PARAMETERS(1)																			
		pH (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5 (2)	BOD_{20} (2)	Chemical Oxygen Demand (3)	Total Organic Carbon (3)	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
JUNE 1 – 10 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	9.3	203	35	67	714	21	26	21	11	19			3.2	0.8	7.8	0.98	4	338	186	
	Minimum	7.4	147	14	11	188	1	15	7	6	12			1.3	0	2.0	0.16	2	252	103	
	Mean	8.7	184	22	39	591	11	20	12	9	16			2.0	0.3	3.7	0.63	3	295	153	
SEPTEMBER 7 – 16 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	9.5	174	30	79	620	25	24	16	13	36			4.2	0.6	3.9	0.89	3	239	328	
	Minimum	9.1	112	18	41	456	15	19	5	7	16			1.8	0.1	2.3	0.32	0	225	134	
	Mean	9.3	154	23	55	523	21	21	11	9	21			2.4	0.2	2.9	0.60	1	232	249	
DECEMBER 5 – 15 1976	No. of Analyses	9	6	9	9	9	9	9	9	6	6			9	9	9	9	6	2	6	
	Maximum	7.7	162	13	26	628	10	3	13	12	55			4.7	2.7	12.4	5.90	7	274	33	
	Minimum	7.2	153	5	8	360	3	0	4	2	9			3.7	2.1	9.5	3.90	6	264	17	
	Mean	7.5	157	9	15	546	7	1	10	5	25			4.2	2.4	11.2	4.70	6	269	22	
FEBRUARY 21 – 28 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
MARCH 14 – 19 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	10
	Maximum	7.5	147	30	64	674	12	17	10	5	17			6.0	5.1	1.9	2.12	8	251	47	45
	Minimum	7.0	126	15	19	586	5	5	7	3	8			5.0	3.8	1.4	1.28	4	210	31	37
	Mean	7.3	136	20	37	619	10	8	9	4	11			5.4	4.3	1.6	1.69	7	230	39	42

STATION NO. 31

JUNE 1 – 10 1976	No. of Analyses	30	10	30	30	30	30	30	29	10	10			30	30	30	30	10	2	10	
	Maximum	9.0	215	20	41	710	10	24	8	7	14			2.3	1.0	6.1	0.86	5	334	41	
	Minimum	7.5	186	8	3	416	1	13	2	3	6			0.8	0.1	0.8	0	2	326	18	
	Mean	8.1	204	12	17	628	5	19	6	5	9			1.5	0.6	3.0	0.68	3	330	28	
SEPTEMBER 7 – 16 1976	No. of Analyses	30	10	30	29	30	29	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.8	172	51	126	662	31	25	9	11	28			3.7	1.9	2.4	1.09	7	301	149	
	Minimum	7.4	121	8	8	356	2	19	2	3	7			1.6	0.2	1.4	0.52	1	247	30	
	Mean	8.1	154	16	29	513	11	21	5	5	12			2.2	0.7	2.0	0.80	3	274	81	
DECEMBER 5 – 15 1976	No. of Analyses	14	10	14	14	14	14	14	14	10	10			14	14	14	14	10	2	10	
	Maximum	7.6	177	22	24	888	14	1	10	12	32			6.1	4.5	8.7	5.10	7	275	17	
	Minimum	7.3	168	6	7	496	3	0	6	2	8			4.8	3.1	6.4	3.80	6	270	7	
	Mean	7.4	173	10	15	702	7	0.3	9	5	14			5.5	3.9	7.4	4.20	6	273	10	
FEBRUARY 21 – 28 1977	No. of Analyses	12	8	12	12	12	12	12	12	8	0			12	12	12	12	8	2	8	
	Maximum	7.6	178	58	134	1122	30	5	13	15	0			8.2	6.8	4.1	3.48	16	257	24	
	Minimum	7.0	119	8	8	742	4	0	7	5	0			4.5	3.1	1.9	0.64	6	243	6	
	Mean	7.2	152	19	36	843	11	2	9	8	0			6.3	5.0	3.0	1.96	8	250	14	
MARCH 14 – 19 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	10
	Maximum	7.6	157	38	135	896	19	17	11	5	14			5.2	4.2	2.0	1.52	8	282	47	52
	Minimum	7.2	140	12	14	652	5	4	5	3	5			3.8	2.7	1.4	1.18	5	278	23	38
	Mean	7.4	150	18	40	805	9	8	8	4	11			4.4	3.4	1.6	1.35	6	280	30	44

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited.

(3) Analysis by Nalco.

TABLE 11-11 : VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																			
			Ammonia Nitrogen 1.50	Fecal[2] Coliform (per 100 ml.) 200	Iron 1.0	Copper 0.02	Dissolved Oxygen 5.0	Lead 0.10	Silver 0.005	Chloride (4)	Fluoride (4)	PH (Units) 6.5-9	Boron (4)	Sulfate (4)	Cyanide (4)	Hexavalent Chromium (4)	Total Phosphorus (4)	Manganese (4)	Phenol (4)	Total Dissolved Solids (4)	Temp. (°F) (4)
147	No. Branch Chicago River	No of Analyses	4	4	3	3	4	3	3			4										
		No of Violations	1	3	0	2	1	1	0			0										
HCC 07		Maximum	4.00	7900		0.08	9.3	1.72														
		Minimum	0.00	200		0.02	3.1	0.00														
		Mean[3]	1.41	1598		0.04	6.8	0.58														
148	West Fork No. Branch	No of Analyses	6	6	2	2	6	2	2			6										
		No of Violations	3	5	0	1	1	0	0			0										
HCCB 04		Maximum	14.0	30,000		0.06	10.5															
		Minimum	0.18	100		0.01	4.2															
		Mean[3]	3.74	1677		0.03	7.5															
149	West Fork No. Branch	No of Analyses	7	7	2	2	7	2	2			7										
		No of Violations	6	4	0	1	3	0	0			0										
HCCB 03		Maximum	19.00	500,000		0.06	10.7															
		Minimum	1.06	100		0.02	3.0															
		Mean[3]	8.55	1626		0.04	6.5															
150	Middle Fork No. Branch	No of Analyses	6	6	1	1	6	1	1			6										
		No of Violations	0	6	0	1	1	0	0			0										
HCCC 04		Maximum		65000		0.04	11.7															
		Minimum		600		0.04	2.4															
		Mean[3]		2760		0.04	9.1															
151	Middle Fork No. Branch	No of Analyses	6	6	1	1	6	1	1			6										
		No of Violations	1	5	0	1	1	0	0			0										
HCCC 03		Maximum	4.00	5700		0.07	14.0															
		Minimum	0.00	100		0.07	3.7															
		Mean[3]	0.78	1165		0.07	9.2															
152	Middle Fork No. Branch	No of Analyses	7	6	2	2	7	2	2			7										
		No of Violations	3	6	1	1	4	1	1			0										
HCCC 02		Maximum	11.00	800,000	1.3	0.14	10.5	1.00	0.050													
		Minimum	0.07	28000	1.0	0.01	0.0	0.02	0.000													
		Mean[3]	3.56	103,880	1.1	0.07	4.6	0.51	0.025													
		No of Analyses																				
		No of Violations																				
		Maximum																				
		Minimum																				
		Mean[3]																				
		No of Analyses																				
		No of Violations																				
		Maximum																				
		Minimum																				
		Mean[3]																				
		No of Analyses																				
		No of Violations																				
		Maximum																				
		Minimum																				
		Mean[3]																				

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) Fecal coliform violations are apparent violations. (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric

(4) No water quality violations for this parameter were reported.

TABLE 11-11 : VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																			
			Ammonia Nitrogen	Fecal[2] Coliform (per 100 ml)	Iron	Copper	Dissolved Oxygen	Lead	Silver	Chloride	Fluoride	PH (Units)	Boron	Sulfate	Cyanide	Hexavalent Chromium	Total Phosphorus	Manganese	Phenol	Total Dissolved Solids	Temp. (°F)
			1.50	200	1.0	0.02	5.0	0.10	0.005	(4)	(4)	6.5-9	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
153	Skokie River	No of Analyses	6	6	1	1	6	1	1			6									
		No of Violations	2	4	0	1	0	0	0			1									
HCCD 03		Maximum	2.30	4700		0.07						9.4									
		Minimum	0.07	100		0.07						7.9									
		Mean[3]	0.79	681		0.07						8.4									
154	Skokie River	No of Analyses	7	6	2	2	7	2	2			7									
		No of Violations	2	4	0	2	0	0	0			0									
HCCD 04		Maximum	2.60	1200		0.04															
		Minimum	0.03	100		0.03															
		Mean[3]	0.79	288		0.03															
155	Skokie River	No of Analyses	7	7	2	2	7	2	2			7									
		No of Violations	3	2	1	2	0	1	1			0									
HCCD 01		Maximum	3.40	1100	1.3	0.12		0.2	0.040												
		Minimum	0.14	100	0.1	0.04		0.04	0.000												
		Mean[3]	1.60	164	0.7	0.08		0.12	0.020												
156	Skokie River	No of Analyses	7	7	2	2	7	2	2			7									
		No of Violations	0	6	0	2	1	1	1			0									
HCCD 06		Maximum		3200		0.08	15.2	0.20	0.030												
		Minimum		100		0.08	4.5	0.05	0.000												
		Mean[3]		854		0.08	10.0	0.12	0.015												
157	Skokie River	No of Analyses	7	7	2	2	7	2	2			7									
		No of Violations	3	3	1	1	3	1	0			0									
HCCD 07		Maximum	4.00	4100	2.0	0.07	10.8	0.29													
		Minimum	0.12	100	0.6	0.00	2.2	0.02													
		Mean[3]	1.79	340	1.3	0.03	6.7	0.15													
		No of Analyses																			
		No of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			
		No of Analyses																			
		No of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			
		No of Analyses																			
		No of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			
		No of Analyses																			
		No of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) Fecal coliform violations are apparent violations (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric

(4) No water quality violations for this parameter were reported

d. Results of Water Quality Modeling

As described in Chapter Four, the model is a computerized system that uses mathematical formulas to simulate the drainage system and water quality interactions. To ensure that the model is an accurate representation of the North Branch Basin, the behavior of the model was balanced against hundreds of measurements and observations of actual conditions in the basin and actual water samples collected and analyzed in the basin during 1976 and 1977.

Sources of pollution are categorized in the modeling process as follows:

--Point Sources: treatment plants and other discrete discharges

--Nonpoint Sources: surface runoff and groundwater seepage from developed and undeveloped areas

--Combined Sewer Overflows

--Boundary Conditions: the amount of pollution flowing into a basin from another basin or another state. Boundary conditions are not a factor in the North Branch Basin.

The simulation of existing conditions provides a more comprehensive picture of water quality in the basin than do the results of periodic sampling programs. Water quality conditions are estimated by the model on an hourly basis. In addition, not only are pollutant concentrations determined and related to state standards, but also the relative amounts of pollutants contributed by various sources can be described.

TABLE 11-12: BIOLOGICAL STREAM SITE CLASSIFICATIONS

North Branch of the Chicago River BASIN

Station Number	Stream Name	IEPA Classification[1]	Shannon-Weaver	
			Index	Classification[2]
70	Skokie Lagoons	P	0.59	SeP
71	Skokie Lagoons	P	1.22	MP
72	Skokie Lagoons	P	0.53	SeP
73	No. Branch Chg. R.	SP	1.75	MP

(1) Polluted (P); Semi-polluted (SP); Unbalanced (U); Balanced (B).

(2) Severe pollution (Se P); Moderately polluted (MP); Clean (C).

TABLE 11-13: GENERALIZED BENTHIC SEDIMENT CONDITIONS

North Branch of the Chicago River BASIN

STATION NUMBER	STREAM NAME	BENTHIC CONDITION*
70	Skokie lagoons	Heavily Polluted
71	Skokie Lagoons	Heavily Polluted
72	Skokie Lagoons	Polluted
73	No. Branch Chicago River.	Moderately Polluted

*Based on SOD value

(1) Pollutant Concentrations: Although the Commission analyzed 19 water quality indicators, simulation reports on existing conditions were prepared for only eight: stream flow, temperature, chlorophyll a, dissolved oxygen (DO), biochemical oxygen demand (BOD), ammonia (NH_3), nitrate (NO_3), and phosphate (PO_4). The last four of these represent pollutants that can be quantified and tied to specific categories of sources by using the model.

Assessments of conditions with respect to each parameter are based on state instream standards, where there are standards that can be applied. Statistical values express the minimum, maximum and average concentrations of pollutants. Values also describe the number of times that simulated concentrations violated State standards, and the average duration of the violations.

The simulation was continuous, with hourly outputs over a three-year period. Therefore, if a standard for a particular pollutant was constantly violated over the entire simulation period, that would be reflected in the statistics for number and frequency of violations, as follows:

--Number of violations: one (because there was only one violation, even though it was of three years' duration)

--Average duration: 26,304 hours (the total number of hours in the three-year period)

Table 11-14 summarizes pollutant levels as simulated for the North Branch under existing conditions. As indicated by the results of the instream sampling programs discussed above, problems are apparent with respect to ammonia. Maximum levels were far above the standard of 1.5 mg/l in all five reaches.

In Reach 5 on the West Fork, the mean concentration of ammonia also exceeded the standard. The maximum level

encountered in Reach 5 was 16.5 mg/l, more than 10 times the concentration allowable under the standard.

The phosphate standard of .05 mg/l, although it does not apply to the North Branch, was violated continually in all five reaches.

Levels of BOD are variable, but maximum levels in all five reaches are considered excessive, as are the mean levels in Reaches 5 and 58. Mean BOD concentrations in Reaches 42, 76 and 109 would be considered marginal where the maximum concentrations are not as high.

Dissolved oxygen (DO) has been used by the Commission as a reliable indication of water quality. Conditions with respect to DO in the North Branch are described in Table 11-15. The minimum DO level of zero in Reach 109, reflects the worst DO problems in the basin. Elsewhere, the 5.0 mg/l proposed standard is violated fairly frequently in each of the five reaches.

(2) Pollutant Loadings and Sources: In general, pollutant loadings in the North Branch Basin are quite high. The basin is highly developed and experiences many of the severe water quality stresses associated with an urbanized watershed. The major land cover type is grassland, followed by impervious cover, cropland, and lowland. An analysis of pollutant loads is presented below for reaches in the four major elements of the system. These are: Reach 5 on the West Fork; Reach 42 on the Middle Fork; Reach 76 on the Skokie River; Reach 109 on the main stem North Branch below the confluences of the upstream branches. Reach 109 encompasses all of the pollutant loads entering the basin as modeled. Table 11-16 summarizes pollutant loads, by source, as simulated in Reach 109. While the data is more meaningful when combined with information on area and flow, Table 11-16 does give an accurate, general picture of the significance of various pollutant sources in the basin.

In Table 11-17, statistics on flow and area are combined with data showing the percentages of each pollutant coming from various sources in Reaches 5, 42, 76 and 109.

(a) Point Sources: A modest portion of the total flow in Reaches 5, 76, and 109 comes from point sources, as indicated by the stream flow data in Table 11-17. Point sources account for an even greater share of the total pollution load, even though there are only two treatment plants of any significance in the basin: the NSSD plant at Clavey Road and the Deerfield treatment plant, which discharge into Reaches 76 and 5, respectively. The quality of the Deerfield effluent is quite poor relative to the NSSD Clavey Road effluent, and this is reflected in the simulated water quality in Reaches 5 and 76. The 5 mg/l dissolved oxygen standard is violated about 89 percent of the time in Reach 5 as compared to 22 violations covering 23 percent of the time in Reach 76. In Reach 109, DO levels are severely low, sometimes dropping to zero, as noted above, although

TABLE 11-14: STATISTICAL SUMMARY OF CURRENT WATER QUALITY

Parameter (Standard) (All data in mg/l)	REACHES				
	5	42	68	76	109
BOD (No Standard) Maximum	54.9	55.4	66.2	18.6	43.3
Minimum	2.62	1.88	2.76	3.94	3.54
Mean	20.6	6.97	16.9	10.5	11.1
AMMONIA (1.5 mg/l) Maximum	16.5	2.6	2.84	3.45	2.84
Minimum	.48	0	.14	.11	.31
Mean	6.05	.38	1.03	.69	.95
No. Violations	43	26	39	14	87
Avg. Duration Viol.	602	11	122	120	22
NITRATE (No Standard) Maximum	6.42	4.94	7.77	9.49	8.93
Minimum	.32	.75	.22	1.5	.50
Mean	3.63	2.46	3.27	4.88	3.94
PHOSPHATE (.05 mg/l) Maximum	2.31	.841	1.55	1.46	1.35
Minimum	.10	0	.07	.06	.13
Mean	.90	.18	.52	.66	.52
No. Violations	1	1	1	1	1
Avg. Duration Viol.	263,300	263,300	263,300	263,300	263,300

TABLE 11-15: STATISTICAL SUMMARY OF CURRENT DISSOLVED OXYGEN LEVELS

SIMULATED DO CHARACTERISTICS (Expressed in mg/l)	REACH				
	5	42	68	76	109
Maximum	12.5	13.0	12.9	13.6	12.9
Minimum	.26	1.81	1.84	.28	0
Mean	3.07	7.12	7.78	7.99	4.45
*No. of Violations	191	84	66	118	120
Avg. Duration	123	47	15	52	253
**Overall Assessment	Bad	Fair	Good	Poor	Bad

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time DO levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

the mean concentration of 4.45 mg/l is higher than the mean of 3.07 mg/l in Reach 5.

There are several factors affecting the impact of point sources on the North Branch. The first is the limited assimilative capacity of the stream. Typically, flow is very sluggish because of the flat stream gradient, and this is not conducive to natural reaeration. Thus, oxygen consumed by the degradation of BOD and by the oxidation of ammonia is not readily replaced, which in turn, leads to severe DO depletions. This situation is compounded in Reach 76 which contains the Skokie Lagoons, where flow is even more sluggish. However, the lagoons also provide a suitable environment for algae populations. Through photosysthesis, these algae generally are able to maintain safe DO levels at least during daylight periods of warm weather. The same situation exists in several other downstream reaches in the North Branch system.

Water quality, particularly DO levels during low flow periods, also is affected by the combined impact of sediment oxygen demand and ammonia.

In addition to their dissolved oxygen impact, point sources are responsible for numerous violations of the ammonia standard (1.5 mg/l). They also contribute large amounts of phosphorous which promote algal blooms.

(b) Pervious Sources: Runoff from pervious land cover accounts for nearly one-half of the total stream flow. Of this portion, about 27 percent is surface runoff and 73 percent is from groundwater. However, the larger pollutant loads of BOD, ammonia, and phosphate are associated with

TABLE11-16:POLLUTANT CONTRIBUTIONS BY SOURCE CATEGORY, EXISTING CONDITIONS
REACH: 109

PARAMETER	POINT SOURCES			NON-POINT SOURCES			Total Loads
	Comb Sewers	Treatment Plants	Boundary Conditions	Pervious Surfaces		Impervious	
				Surface	Ground	Surface	
BOD Load (tons/year)	177	480	N/A	113	42.3	346	1158
% Total Load	16	41	N/A	10	4	30	100
AMMONIA Load (tons/year)	12.6	278	N/A	46.6	2.13	11.5	351
% Total Load	4	79	N/A	13.3	1	3	100
NITRATE Load (tons/year).	2.79	26.8	N/A	48.8	93.3	5.8	177
% Total Load	2	15	N/A	28	53	3	100
PHOSPHATE Load (tons/year)	3.90	35.2	N/A	4.96	2.53	5.79	52.4
% Total Load	8	67	N/A	9	5	11	100

surface runoff, reflecting the highly concentrated nature of pollutants found in surface runoff. The majority of the nitrate (NO_3) from pervious land cover enters through groundwater, reflecting the conversion of ammonia to nitrate. There are large amounts of nitrate in the groundwater flow, but nitrate does not pose a problem from the standpoint of maximum concentration, and it is not an algal nutrient. The groundwater component of runoff from pervious areas has very little negative impact on water quality in the basin.

The impact of surface runoff from pervious surfaces is significant, as illustrated by the situation in Reach 42 on the Middle Fork. Modeling results have shown that there are numerous violations of the DO standards in this reach, even though there are no point sources contributing to this reach. Furthermore, nearly all of the simulated DO violations occur during wet weather periods. This implies that the stream is not able to assimilate the loads of oxygen-demanding pollutants associated with surface runoff from pervious land cover which represents 96 percent of the land cover in the reach.

TABLE 11-17: SOURCES OF POLLUTANTS, EXISTING CONDITIONS

REACH/SOURCE	PERCENTAGES					
	AREA	STREAM FLOW	POLLUTANTS			
			BOD	NH_3	NO_3	PO_4
1. West Fork						
(REACH NO. 5)						
BOUNDARY CONDITIONS						
POINT SOURCES	<1	27	71	88	44	80
COMBINED SEWERS						
PERVIOUS COVER	81					
Surface Runoff		12	6	10	20	7
Groundwater		33	3	0	34	4
IMPERVIOUS COVER	19	28	20	2	2	9
2. Middle Fork						
(REACH NO. 42)						
BOUNDARY CONDITIONS						
POINT SOURCES	<1	<1	1	0	0	0
COMBINED SEWERS						
PERVIOUS COVER	96					
Surface Runoff		26	52	91	35	59
Groundwater		65	20	5	64	30
IMPERVIOUS COVER	4	9	27	4	1	11
3. Skokie River						
(REACH NO. 76)						
BOUNDARY CONDITIONS						
POINT SOURCES	<1	45	71	94	25	90
COMBINED SEWERS						
PERVIOUS COVER	80					
Surface Runoff		9	5	5	25	3
Groundwater		24	2	0	47	2
IMPERVIOUS COVER	20	22	22	1	3	5

TABLE 11-17: SOURCES OF POLLUTANTS, EXISTING CONDITIONS

REACH/SOURCE	PERCENTAGES					
	AREA	STREAM FLOW	POLLUTANTS			
			BOD	NH_3	NO_3	PO_4
1. North Branch						
(REACH NO. 109)						
BOUNDARY CONDITIONS						
POINT SOURCES		21	40	72	15	56
COMBINED SEWERS	6	5	29	13	2	24
PERVIOUS COVER	77					
Surface Runoff		13	7	12	28	7
Groundwater		35	3	0	52	4
IMPERVIOUS COVER	17	26	21	3	3	9

Impervious Sources: Impervious surface runoff generates about 26 percent of the total stream flow in the basin and approximately 21 percent of the total BOD load. This BOD load contributes to wet weather DO violations.

Combined sewer overflows are a factor in Reach 109, which includes the northern part of the combined sewer system of the MSDGC. As shown in the tables, the overflows from this system are a major factor in the total pollutant load on the basin. Approximately 29 percent of the BOD and 13 percent of the ammonia entering the basin come from combined sewer overflows. Combined sewer overflows, along with stormwater runoff, are responsible for the numerous wet weather dissolved oxygen and ammonia violations observed in Reach 109.

(3) Summary

The statistics produced from modeling results showed the waters in the basin to be of poor quality. State standards, which call for 6 mg/l of dissolved oxygen, and not less than 5 mg/l for not in excess of 16 hours during a 24 hour day, are being violated in all reaches.

The amount of BOD in the streams in this basin also is far in excess of acceptable levels. About 1,158 tons of BOD are entering the streams in the basin each year. This amount would have to be reduced significantly before levels would be low enough to indicate good water quality.

Overflows from combined sewers account for 29 percent of the BOD in the basin; discharges from wastewater treatment plants, 40 percent; and stormwater runoff, 31 percent.

The basin is equally stressed by another serious pollutant, ammonia; more than 351 tons enter the North Branch every year.

e. Overview

The poor water quality observed in the North Branch Basin may be attributed to several factors: the sluggish stream flows and the heavy pollutant loads from point source discharges, combined sewer overflows, and stormwater runoffs. Dissolved oxygen problems are severe throughout the basin due to oxygen-demanding constituents entering the system during both wet and dry weather. There are frequent violations of the ammonia standard, which can be attributed to point sources during low flow conditions and to stormwater runoff and combined sewer overflows during wet weather conditions. Nitrate and phosphate levels are generally high enough to support algal blooms throughout the basin. Blooms are particularly severe in the Skokie Lagoons due to the sluggish flow and the abundant supply of nutrients contributed by point sources. Algae though, may

actually have a positive impact on water quality by maintaining relatively high DO levels during daylight hours.

Overall, the most significant violations of water quality standards occur in relation to the treatment plants on the West Fork and to natural conditions in the Middle Fork. It appears from the computer simulation data reported for Reach 109 that the stream does not recover from these impacts within the basin.

11.04 POINT SOURCES: EXISTING CONDITIONS

a. Municipal-Type Wastewater Treatment Plants

Within the North Branch Basin there are two municipal-type wastewater treatment facilities: the Village of Deerfield plant and the North Shore Sanitary District Clavey Road Plant in Highland Park (See Figure 11-16). The NSSD is the largest wastewater collection and treatment agency in Lake County. In recent years, the District has had underway an extensive program designed to eliminate the discharges from small inefficient plants by redirecting wastewater to larger facilities. The Clavey Road Plant recently was expanded to an average design capacity of 17.8 MGD. The plant now serves Lake Bluff, Lake Forest, Highwood and Highland Park and receives all wastewater flows from five NSSD facilities which were phased out in 1974 and 1975.

The NSSD recently put new tertiary treatment facilities into operation at Clavey Road. Construction of a force main was begun early in 1978 to convey wastewater flows in excess of the Clavey Road plant capacity to the Des Plaines Plant operated by the Lake County Department of Public Works (LCDPW). This will eliminate the need to expand the Clavey Road plant. Construction of the new force main is expected to be completed in early 1979. The Clavey Road plant also operates a retention basin to hold wet weather flows in excess of two times plant capacity for subsequent treatment. Flows in excess of retention basin capacity are given primary treatment and disinfection before being discharged. Upon completion of the excess load force main to the Des Plaines plant, excess flows will be diverted to that facility for treatment.

The Deerfield plant is being expanded and upgraded from 2.25 to 3.0 MGD. The plant serves only the community of Deerfield which had a 1975 estimated population of 19,000. The Deerfield and Clavey Road plants are described in Table 11-18 (Parts A, B, C, D and E).

b. Industrial Wastewater Plants

There are no industrial plants in the basin treating their own process wastes; all industries discharge to the NSSD or MSDGC systems. However, a number of industries have

NPDES permits for discharging cooling water and stormwater. These are listed in Table 11-19 (Parts A and B).

c. Miscellaneous Wastewater Treatment Plants

There are six miscellaneous wastewater treatment facilities currently discharging in the North Branch Basin. Information available for these facilities, including treatment units, flows and effluent limitations is presented in Table 11-20 (Parts A and B).

d. Combined Sewer Overflows

Combined sewers are found in the Villages of Golf, Morton Grove, Wilmette, Kenilworth and Niles in Cook County, within the MSDGC. It is estimated that about 6.1 square miles of the North Branch Basin are tributary to combined sewer overflows.

e. Local Facilities Planning

Water quality in the basin is influenced by decisions in four facilities planning areas (FPAs): the NSSD, MSDGC, Deerfield and Bannockburn (see Figure 11-5). In addition, portions of the Southeast Central and Southeast Lake County FPAs also lie in the basin, although these areas do not contribute any point source discharges to the basin.

The NSSD Clavey Road service area and treatment plant (L-27) account for NSSD involvement in the North Branch Basin. The NSSD has not yet completed a formal facility plan, although it has submitted a plan of study, and is now developing a facility plan to cover proposed system improvements.

The Village of Deerfield (L-4) owns the only municipal-type treatment plant in the Deerfield FPA. The plant is being expanded to 3.0 MGD to serve a year 2000 design load. The plant is also being upgraded to include nitrification and filtration. Deerfield has received a facilities planning exemption for a facility plan under 40 CFR 35.917(c).

There are no publicly-owned wastewater collection and treatment systems in the Bannockburn FPA. The Bannockburn Needs Analysis recommended that the FPA be divided into three potential sewer service areas--Deerfield; NSSD; LCDPW--each of which is designated as a "sub-FPA."

Bannockburn is presently planning to install sewers throughout portions of the village designated as the Deerfield sub-FPA.

In the NSSD sub-FPA, which includes the Del-Mar Woods area, Bannockburn is completing a connection to NSSD facilities. The commercial and light industrial properties

TABLE 11-18 A: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP CODE	FACILITY NAME	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	RECEIVING STREAM NAME	7 DAY 10 YR. LOW FLOW (MGD) 1970	2000	PUBLICLY OWNED TREATMENT WORKS NO	YES	IEPA FY 78 PRIORITY NO.
L4	Deerfield	Deerfield/Deerfield	Deerfield	W. Fork of North Branch	0.07			X	28
L27	NSSD Clavey Road	NSSD/NSSD	Highland Park	Skokie River	0.87			X	127

TABLE 11-18 B: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP CODE	NPDES PERMIT NUMBER	DATE ISSUED	DATE EXPIRES	EFFLUENT REQUIREMENTS (mg/l) INTERIM (A) BOD_5	TSS	P	NH_3N	FINAL (A) EFFECTIVE DATE	BOD_5	TSS	P	NH_3N	YEAR 2000 (B) BOD_5	TSS	P	NH_3N	COMMENTS
L4	0028347	6-29-77	12-31-81						10	12			10	12		(a) 1.5	(a) In-stream after mixing.
L27	0030171	2-28-77	12-1-81	15	20			7-1-77	10	12		(a) (b) 1.5	10	12		(a) 1.5	(b) 24 hour mean not to exceed 3.0 mg/l.

(A) From NPDES Permits (B) From Facility Plans

TABLE 11-18 C: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS — NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP CODE	STATUS OF TREATMENT PLANT					WASTEWATER TREATMENT PLANT (MGD)										COMMENTS
	INTERIM		PERMANENT			AVERAGE FLOWS (a)						DESIGN CAPACITIES				
	YES	PHASE OUT DATE	EXIST-ING	PROPOSED NEW		1975	1980	1985	1990	1995	2000	1975	1985	OTHER YEAR	2000	
				YES	EST. DATE IN SERVICE											
L4			X			2.66	2.73	2.80	2.87	2.94	3.00	2.3	3.0		3.0	(a) Average daily flows are from facility planning or needs analysis documents unless otherwise noted. (b) Flows in excess of 17.8 MGD to be treated at LCDPW Des Plaines plant.
L27			X			9.85	16.39	22.92	29.46 (b)	31.11	32.75	17.8	17.8		17.8	

TABLE 11-18 D: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANT — NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP CODE	POPULATION SERVED (1000's)						PROPOSED PROJECTS (C)								CAPITAL COSTS (million $)		
							PLANT				SEWERS						
	1975	1980	1985	1990	1995	2000	Exp.	UpG	New	Out	I/I	SSE	New	Reh	Initial	Future	Total
L4	20.5	21.4	22.0	22.5	22.8	23.1	X	X					X	X	4.99	-	4.99
L27	62.5	67.4	72.3	76.8	80.9	85.0							X		10.9	12.6	23.5

(C) PROPOSED PROJECTS

SEWER(S): I/I - Infiltration/Inflow Study; SSE - Sewer System Evaluation; New - New Sewer Construction; Reh - Rehabilitation of Existing Sewers

PLANT: Exp - Expansion; UpG - Upgrading; New - New plant; Out - Phase out

TABLE 11-18 E. MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS — NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP CODE	FACILITY PLANS												COMMENTS
	TYPE		STATUS			REVIEWS / APPROVALS							
						NIPC			IEPA				
	NEEDS ANAL-YSIS	STEP ONE STUDY	COM-PLETED	UNDER WAY	LOCAL ISSUES	NUMBER	ENDORSED	UNDER REVIEW	NUMBER	APPROVED	UNDER REVIEW	UN-RESOLVED ISSUES	
L4		X	X						C17-1714	X			*Exempted under 40 CFR 35.917(c). New plan proposed.
L27			* X						C17-1895	X			

TABLE 11-19 A: OTHER POINT SOURCE DISCHARGES — NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	LOCATION AND NEAREST MUNICIPALITY	FLOW (MGD) 1976	NPDES PERMIT DATES	
						ISSUED	EXPIRES
L9	Goodyear Tire and Rubber Co.	0001449	NSSD/NSSD	North Chicago	1.250	12-18-74	12-1-77
L10	Great Lakes NTC Fire School	0002712	NSSD/NSSD	North Chicago	0.350	4-19-74	4-13-79
L15	Ill. State Toll Hwy. Auth.	0049433	NSSD/NSSD	Lake Forest		3-11-76	9-30-80
C75	ITT Harper, Inc.	0034851	MSDGC/MSDGC	Morton Grove	0.016	6-6-75	4-30-80
L23	SCM Corporation	0033758	Deerfield/Deerfield	Deerfield	0.0015	4-28-75	12-31-78
C142	Underwriters Laboratory	0002739	MSDGC/MSDGC	Northbrook	3.5	6-27-75	6-30-79

TABLE 11-19 B: OTHER POINT SOURCE DISCHARGES — NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP CODE	RECEIVING STREAM NAME	7 DAY-10 YR. LOW FLOW (MGD) 1970	2000	EFFLUENT REQUIREMENTS(1) (mg/l)	COMMENTS
L9	Skokie River	0		Daily Max: DM); 15 TSS, 2 Fe, 0.1 Pb, 15 oil/grease (o/g)	Cooling water
L10	Skokie River	0		10 o/g	Operates April to October
L15	ditch to North Branch	0		Daily Max: 15 o/g	
C75	North Branch	5.06		Temp, 15 o/g	Cooling and storm water
L23	ditch to West Fork of No.Br.	0		Daily Max: 15 TSS, 15 o/g, 0.025 Cn, 0.3 $Cr^{+}6$, 1 $Cr^{+}3$, 0.1 tot Pb.	Cooling water
C142	West Fork of North Branch	0.26		Temp.	Cooling water

(1) From NPDES Permits

TABLE 11-20A: MISCELLANEOUS WASTEWATER TREATMENT PLANTS — NORTH BRANCH OF THE CHICAGO RIVER BASIN

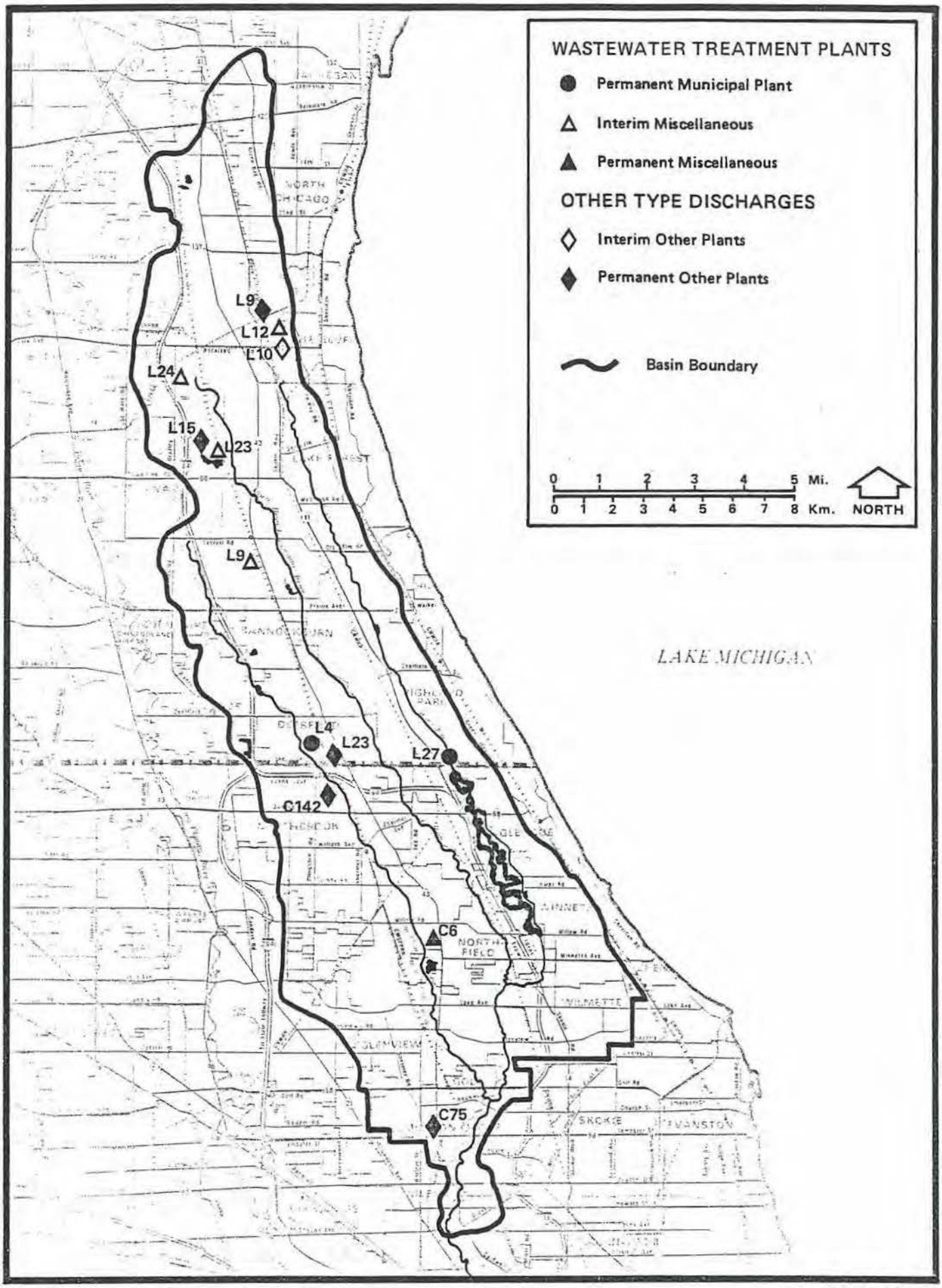
MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS(1)	WASTEWATER LOADS MGD			
						CURRENT		1985	2000
						DESIGN CAPACITY	1976 LOAD		
C6	Convent of the Holy Spirit	0026689	MSDGC/MSDGC	Techny	IM, F, E		0.060	-	0.060
L9	Everett School	0025852	NSSD/NSSD	Lake Forest	IM, F, E		0.005	*	-
L12	Great Lakes NTC Green Bay Plt.	0027057	NSSD/NSSD	North Chicago	A, E	1.400	0.776	*	-
L23	Lake Forest Academy	0024775	NSSD/NSSD	Lake Forest	IM, F, E	0.026	0.011	*	-
L24	Lamb's Pet Farm, Inc.	0044989	NSSD/NSSD	Green Oaks	A, F, E	0.050	0.010	*	-
	(1) Activated Sludge (A); Chlorination (E); Tertiary Filter (F); Imhoff Tank (IM).								
				*Projected to be phased out					

TABLE 11-20 B: MISCELLANEOUS WASTEWATER TREATMENT PLANTS — NORTH BRANCH OF THE CHICAGO RIVER BASIN

MAP CODE	RECEIVING STREAM			NPDES PERMIT DATES		EFFLUENT REQUIREMENTS (mg/l)								COMMENTS
	NAME	7 DAY-10 YR. LOW FLOW (MGD)				1976(1)				2000				
		1970	2000	ISSUED	EXPIRES	BOD	TSS	P	NH_3-N	BOD	TSS	P	NH_3-N	
C6	West Fork of North Branch	0.9		6-9-75	12-31-75	30	30							Operated by MSDGC
L9	Middle Fork of North Branch	0		6-9-75	8-1-78	30	30							
L12	Skokie River	0		7-29-77	12-31-77	30	10							Flows diverted to NSSD-Gurnee 11-16-77
L23	Middle Fork of North Branch	0		6-9-75	12-31-79	4	5							
L24	ditch to Middle Fork of No.Br.	0		6-18-75	6-18-80	4	5							

(1) From NPDES Permits

Figure 11-4: POINT SOURCE DISCHARGES



Revised 2/15/79

east of Waukegan Road are also scheduled to be sewered and connected to the NSSD. Both of these flows will be tributary to the NSSD's existing 66-inch interceptor outside the eastern edge of the FPA.

In the LCDPW sub-FPA, Bannockburn originally intended to connect to an extension of the existing LCDPW sewer to the north of Route 22. However, the LCDPW has indicated that it does not have sufficient sewer capacity to serve this area. The area north of Route 22 will be served by the NSSD, with wastewater routed to the Clavey Road plant. Portions of the NSSD and the LCDPW sub-FPAs, with low population densities, are expected to continue using septic systems.

Unresolved issues with respect to facilities planning in Bannockburn are under negotiation. At this time the Commission recommends that local management agencies attempt to work out acceptable and effective solutions, particularly with respect to the area of Bannnockburn north of Route 22.

The southern part of the basin is covered by the MSDGC facility plan, which is discussed in more detail in Chapter Twenty, which deals with the Chicago River/Sanitary and Ship Canal Basin.

The sewered portions of the MSDGC within the North Branch Basin are tributary to the MSDGC North Side Treatment Plant, which discharges to the North Shore Channel, an element of the Chicago River/Sanitary and Ship Canal Basin. However, there are combined sewers in the villages of Golf, Morton Grove, Wilmette, Kenilworth, and Niles, which do discharge in the North Branch Basin. It is anticipated that these overflows will be eliminated once the MSDGC Tunnel and Reservoir Plan (TARP) is completed.

11.05 NONPOINT SOURCES: EXISTING CONDITIONS

a. Urban Stormwater systems

Separate sewer systems serve all or portions of approximately 13 municipalities and numerous unincorporated areas in the basin. It is estimated that 38 square miles, 37 percent of the basin area, are served by separate storm sewers. These systems follow natural drainage courses and discharge either directly into the North Branch or indirectly via ditches or small water cources that are tributary to the North Branch.

Combined sewer systems serve all or portions of five Cook County municipalities in the basin. It is estimated that 6.1 square miles, 6 percent of the basin, are connected to combined sewers. There are no combined sewers in the Lake County part of the basin.

In the remaining areas of the basin, about 58 square miles or 57 percent of the total area, stormwater enters the North Branch by overland flow, or through ditches or other small water courses.

b. Construction Activities

As discussed in Chapter Six, construction activities, coupled with stormwater runoff and resultant erosion, can contribute sediments, chemicals and organic pollutants to rivers and streams. Construction activities are not known to be causing water pollution problems at present in the basins but the potential for damage to water quality will exist in the future. Changes in population and land use, as forecasted, will generate substantial residential and commercial construction, accompanied by surface disturbances by new roads and utilities.

c. Septic Systems

Septic systems are used widely in the basin. Presently there are about 1,800 residential septic systems serving about 6,731 persons (see Table 11-21). In addition, the basin has an estimated 30 non-residential septic systems serving an approximate population equivalent of 222 persons.

Figure 11-6 shows the locations of septic system areas and Table 11-22 provides a general description of the areas known to have actual problems or potential limitations for septic usage.

d. Hydrologic Modifications

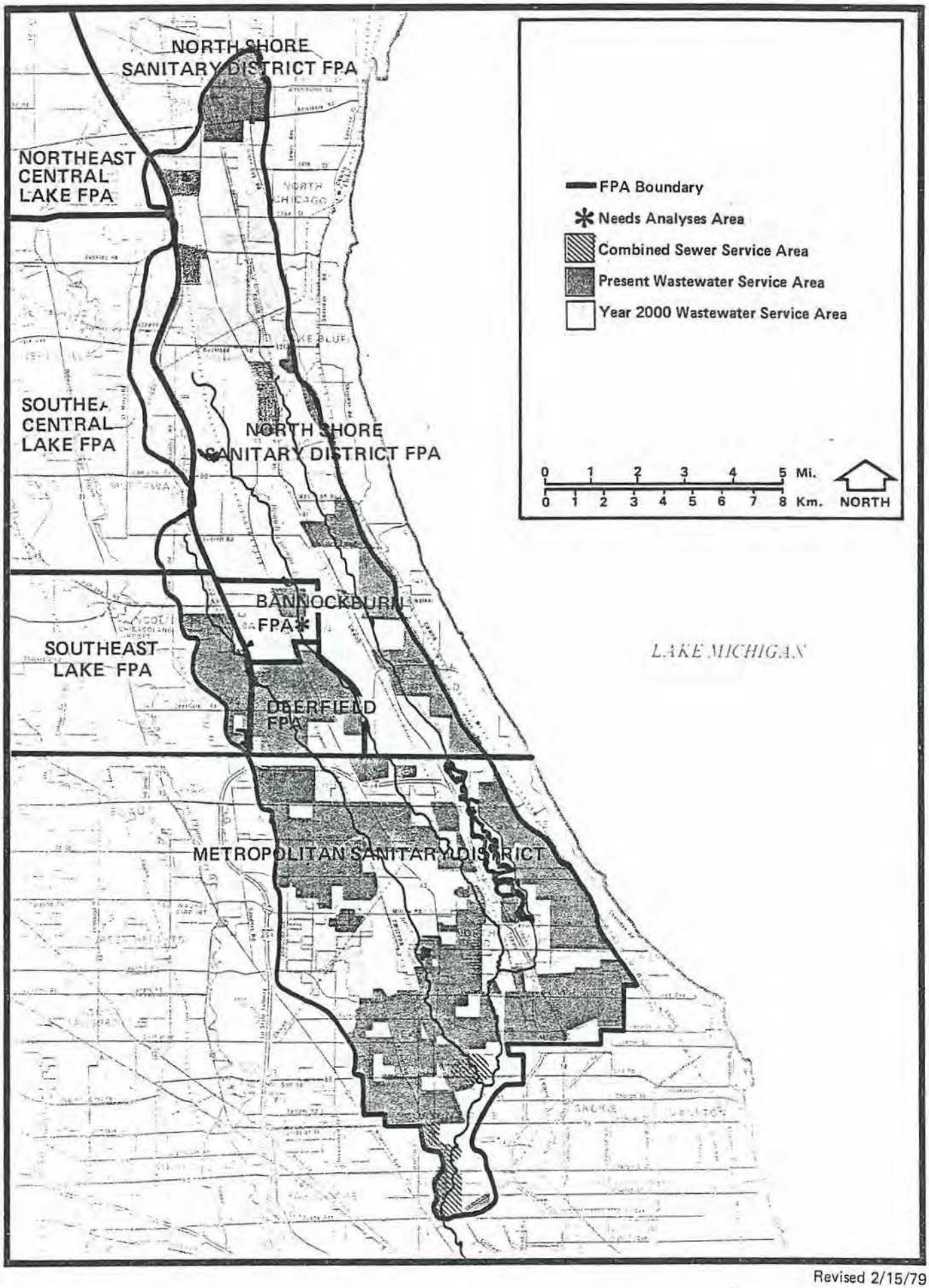
Many rivers in northeastern Illinois contain channels, dams, weirs and other structures which significantly influence and control the dissolved oxygen (DO) concentrations in these water bodies. Consideration was given to these structures in the water quality model. The influence of a channel dam on water quality can often be dramatic. Weirs and dams create pools which have DO levels below or above those normally expected if the stream were free flowing. Forty-eight dams were analyzed in the region, of which six are located in the North Branch Basin. Two of the six dams overflow only during medium or high flows.

11.06 DISPOSAL OF RESIDUALS

The areawide aspects of residuals waste management were discussed in Chapter Seven, which included a summary of current practices in the region, residual waste characteristics, and alternative methods for their utilization and/or disposal. The information that follows pertains specifically to the North Branch Basin.

Anaerobically digested sludge is trucked from the NSSD Clavey Road Wastewater Treatment Plant to the District's Waukegan plant where it is further processed, vacuum filtered, and then hauled to a landfill site operated by the

Figure 11-5: WASTEWATER SERVICE AREAS



Revised 2/15/79

TABLE 11-21 : SUMMARY OF SEPTIC TANK INSTALLATIONS

North Branch of the Chicago River BASIN

COUNTY	NUMBER OF SEPTIC SYSTEMS			POPULATION SERVED		
	RESIDENTIAL	NON RESIDENTIAL	TOTAL	RESIDENTIAL	NON RESIDENTIAL (PE)	TOTAL
Lake	1,527	29	1,556	5,563	216	5,779
Cook	305	1	306	1,168	6	1,174
TOTAL	1,832	30	1,862	6,731	222	6,953

TABLE 11-22 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

North Branch of the Chicago River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Lake	Warren	US 41 & Washington St.	50	181	7-2*
Lake	Waukegan	Waukegan	54	154	8-3*
Lake	Waukegan	North Chicago	72	215	8-4*
Lake	Libertyville	Green Oaks - Area 2	73	313	11-3
Lake	Libertyville	St. Mary's Road	900	3,204	11-4*
Lake	Libertyville	Rondout	63	272	11-5
Lake	Libertyville	Forest Haven	88	313	11-6*
Lake	Vernon	Duffy Lane	70	264	15-5*
Lake	West Deerfield	West Lake Forest	662	2,508	16-1
Lake	West Deerfield	Bannockburn	152	637	16-2
Lake	West Deerfield	Woodview	18	79	16-3
Lake	West Deerfield	Deerfield	16	60	16-4
Cook	Northfield		1	6	4-18

* Septic system areas located partially in this basin.

District outside the basin. Sludge generated by the Deerfield plant is made available to local citizens. Septage generated within the NSSD corporate limits may be taken by scavengers to the NSSD Waukegan plant if agricultural sites are not available. Septage generated in portions of Lake County not within the corporate limits of the NSSD may be taken to the Lake County Department of Public Works New Century Town Treatment Plant. However, the amount that can be accepted (from all unincorporated Lake County) is limited because of the inherent nature of the septage and the rated capacity of the treatment plant digesters.

There are no sanitary landfills, land application sites, or other types of disposal sites within the basin which receive sludges for their ultimate disposal.

Further details on sludge generation and disposal are contained in 208 Staff Paper No. 30, "Regional Sludge Management Report".

At the present time, except for septage, there are no known problems associated with residuals management in the basin. As sludge volumes increase in the future, because of increased waste loads and higher levels of treatment, costs of processing, removing and disposing, or utilizing the sludge materials will increase. Continued urbanization of the six-county region also will impact on the availability of potential lands suitable for the disposal or application of sludges.

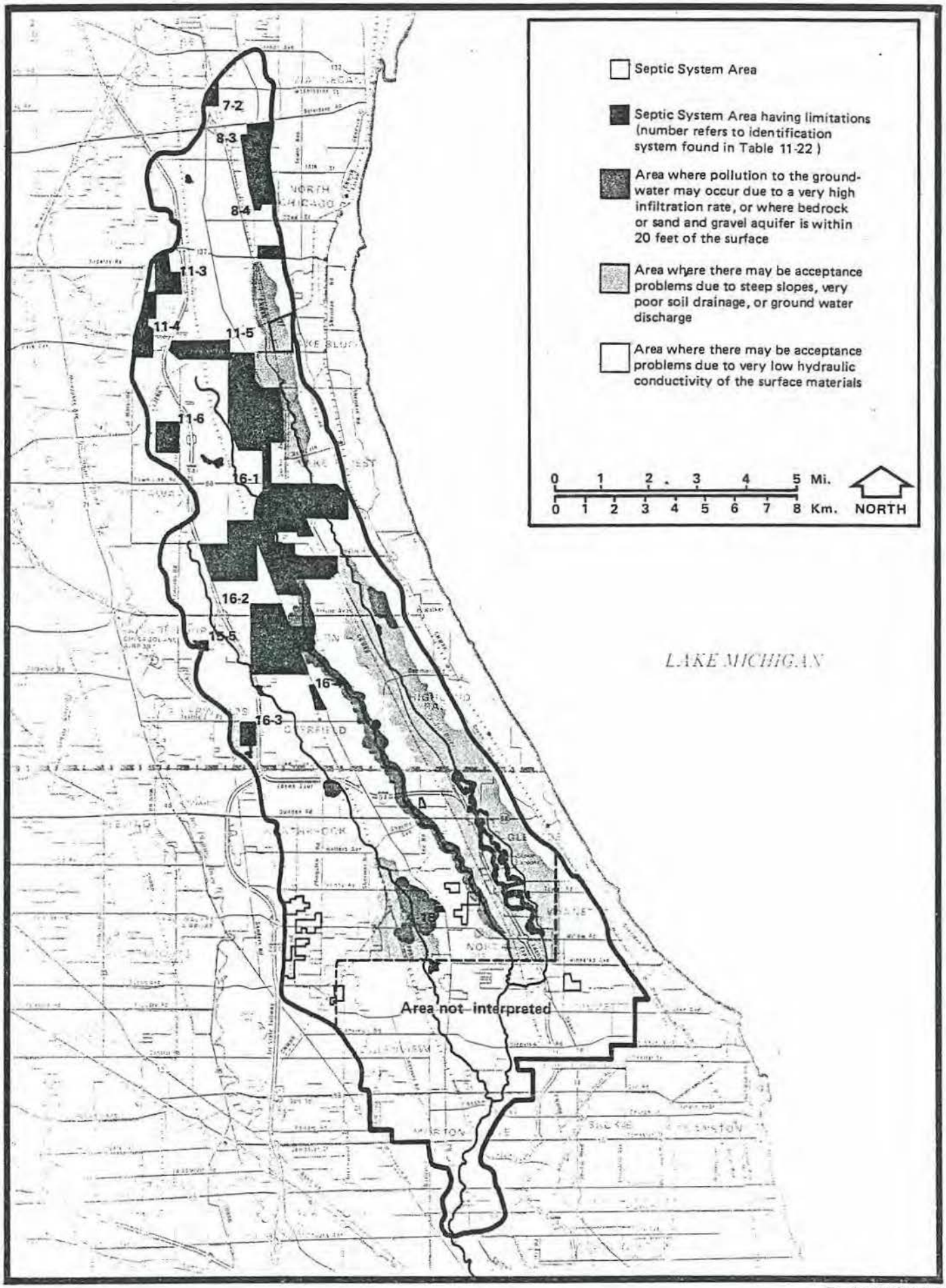
With respect to the NSSD landfill site, it was originally estimated that it would be adequate to meet the Sanitary District's requirements until the mid 1990's. Because of reduced population forecasts which were generated in 1976, this plan assumes that the site will be adequate until the year 2000 if the District's sludge disposal program is continued and land application sites are not used for all or a portion of the sludge.

11.07 EXISTING MANAGEMENT PROGRAMS

The major features of the existing water quality management system in northeastern Illinois have already been discussed in Part I of this report. In this chapter, management programs within the North Branch basin are presented, but only to the extent that it is necessary to clarify the previous discussion.

Table 11-23 is a list of the public agencies and private utilities in the North Branch basin which are currently involved in water quality related activities. Variations in programs and responsibilities between these agencies are indicated by a numerical code.

Figure 11-6: LOCATION OF SEPTIC AREAS



Revised 2/15/79

TABLE 11-23: EXISTING LOCAL WATER QUALITY MANAGEMENT AGENCIES AND PROGRAMS; NORTH BRANCH CHICAGO RIVER BASIN

MUNICIPALITIES			
Bannockburn	1 +	Lincolnshire	1,5
Deerfield	1,2,5	Mettawa	1,5
Glencoe	1,5	Morton Grove	1,3,5
Glenview	1,4,5	Niles	1,3,5
Golf	1,3,5	Northbrook	1,5
Green Oaks	1	Northfield	1,5
Gurnee	1,5	North Chicago	1,4,5
Highland Park	1,4,5	Park City	1,5
Highwood	1	Riverwoods	1,4
Kenilworth	1,3,5	Waukegan	1,5
Lake Bluff	1	Wilmette	1,3,4,5
Lake Forest	1	Winnetka	1,5

COUNTIES			
Cook	4	Lake	1,2,4,5

SANITARY DISTRICTS			
Glenbrook	1,5	Mission Brook	1,5
Glen Oaks Acres	1,5	Northfield Woods	1,5
Metropolitan Sanitary District of Greater Chicago	2,5	North Shore Sanitary District	2
		Waukegan Road	1,5

SOIL AND WATER CONSERVATION DISTRICTS
Lake County
North Cook County

PRIVATE UTILITY COMPANIES
Bel Air Utility Company

+Numbers indicate existing water quality related activities as follows:

1. Wastewater collection agency
2. Wastewater treatment agency
3. To be included in MSDGC TARP system
4. Has enacted erosion and sediment control regulations
5. Stormwater detention regulations in effect

11.08 MODELING PROCESSES: FUTURE CONDITIONS

As described in paragraph 11.03d above, the first major use of the computer model in the process of simulation was to develop an overview of existing water quality in the basin. From these results, three sources: combined sewers, treatment plants and stormwater runoff, became the focus of efforts to develop first and second test plans for future conditions, and finally, a recommended plan for the basin. The results of those efforts, and test plans that grew out of staff work and public discussion, are described below.

a. First Test Plan Assumptions

Beginning in July 1977, the Commission held a series of meetings in the North Branch Basin. The purpose was to review water quality conditions with residents and local officials, and to provide an opportunity for public participation in the development of the basin plan.

At the initial meetings, the Commission staff reported on existing water quality conditions, identified sources of pollution, and assisted participants in developing appropriate strategies. The suggestions that were presented were reviewed by Local Steering Committees from Lake and Cook counties. (Members of Local Steering Committees were selected by local public officials in the Counties or by public interest organizations, and the memberships reflected the major technical and public interests in each County.) The Local Steering Committees, in turn, made recommendations to the Commission on strategies to be evaluated using the water quality model and other techniques. The Commission's 208 Steering Committee reviewed the recommendations and formulated a "first test plan" to be evaluated.

In addition to the recommendations developed through this process, the first test plan was shaped by assumptions made to reflect forecasted population increases; land cover changes; improvements in wastewater treatment and in stormwater controls; flood control and channel improvements; and changes in agricultural acreage and practices. These assumptions are described below:

(1) Population and Land Use: The Commission's 1976 forecasts for the year 2000 were used to determine future changes in land cover and wastewater loads. These forecasts were applied in each reach. Overall, a 31.7 percent increase in population was forecast.

Present land cover in the basin was determined by satellite photography and field observation, with initial estimates being revised in the model calibration process in certain instances. This information was divided into four categories: lowlands--marshes, swamps and forested areas lying close to rivers and streams; grasslands--open to the infiltration of rainwater and snowmelt, but not tilled

regularly, including pastures, parks, golf courses and upland forest; croplands--regularly tilled for agricultural purposes (there is some exchange between cropland and grasslands due to crop rotation); and impervious surfaces--covered with buildings, roads and parking lots. For the first test plan, estimates of land cover changes by the year 2000 were made using population forecasts and their attendant housing and employment assumptions. Land required for new urbanization in the basin was taken from the grassland and cropland categories first. When this land was largely depleted, land from the lowland category was taken for urban purposes. Table 11-24 shows the results of this process.

(2) Local Facilities Plans: Extensive planning has been conducted in this basin in recent years for the improvement of existing wastewater treatment facilities, both public and private, and the creation of new facilities to serve developing areas. These plans were included in the forecast of water quality conditions for the year 2000. Table 11-18 shows the assumptions which were made about point sources in year 2000 conditions.

In general, it was assumed that all planned improvements in municipal wastewater treatment plants (per local facilities plans) would be in operation; also, that industrial treatment plants would meet required water quality standards in their effluent permits. No changes in the capacities of miscellaneous treatment plants were estimated, given the many imponderables associated with such forecasts for small areas and individual enterprises.

(3) Phosphate Reduction: The City of Chicago and several suburbs have ordinances limiting the phosphate content of home laundry detergents. Because a substantial portion of the metropolitan area market has limitations on phosphate in detergents, most distributors have withdrawn high phosphate

TABLE 11-24: CHANGES IN LAND COVER, 1976-2000

Category	1976 Land Cover Estimates	Year 2000 Land Cover Forecast	% Change
Lowlands	14.27 sq.mi.	14.03 sq.mi.	- 1.7
Grasslands	46.58 sq.mi.	48.56 sq.mi.	+ 4.4
Croplands	15.83 sq.mi.	13.08 sq.mi.	-17.4
Impervious	16.53 sq.mi.	17.54 sq.mi.	+ 6.4
TOTAL	93.21 sq.mi.	93.21 sq.mi.	

Source: Northeastern Illinois Planning Commission

degergents from the entire area. In considering changes in wastewater treatment practices for the year 2000, it was assumed that regulations limiting the amount of phosphate in domestic laundry detergents would be expanded to cover all communities and to include, in part, commercial and industrial uses as well. Based upon studies of the effect of detergent phosphate reductions on wastewater treatment plant operations, it was assumed that phosphate concentrations in plant effluent for the year 2000 would be two-thirds of existing levels.

(4) Combined Sewer Overflows: It was assumed that combined sewer overflow in the Cook County portion of the basin would be eliminated by the year 2000, by the diversion of these flows to the completed Tunnel and Reservoir Plan (TARP) of the MSDGC.

(5) Urban Stormwater Runoff: The conditions set for the year 2000 in simulating future water quality assumed that 25 percent of the present materials constituting BOD in urban stormwater runoff would be removed from the existing impervious areas (largely through street sweeping and vacuuming) and prevented from entering the waters of the North Branch. In newly developing urban areas, it was assumed that 50 percent of the BOD materials would be captured by a variety of techniques, including street vacuuming, stormwater detention basins, greater use of performance zoning techniques, and other measures.

(6) Septic Systems: The impact of septic systems on water quality was also considered in the first simulation of conditions in the year 2000. In the first test plan it was assumed that adverse effects of septic systems on water quality would be eliminated, either by the conversion of these systems to sewage collection and treatment systems, or by eliminating problems in the remaining systems by on-site improvements. However, in the North Branch Basin, problem septic systems were assessed as having only minor significance, and therefore were not represented in the model.

(7) Soil Conservation: Agricultural Best Management Practices, recommended by local U.S. Department of Agricultural officials, were included in the calculations of future water quality. In the North Branch Basin, 4,070 acres of land were forecast to be under conservation practices by the year 2000, employing conservation tillage, contouring, terracing, combinations of these, or conversions to grassland.

(8) Stream Flow Changes: The seven reservoirs proposed for the North Branch in the Floodwater Management Plan of the MSDGC and the U.S. SCS were assumed to have been constructed by the year 2000.

b. First Test Plan Simulated Results

If a water quality program that contained all the features of the "first test plan" actually were implemented, the overall water quality would be substantially improved, especially downstream of the basin, below the point where the North Shore Channel joins the North Branch. However, several individual areas in the upstream portion of the basin would actually experience water quality deterioration. Despite overall improvement, the North Branch still would not be a "clean" river, able to support a great diversity of fish and aquatic life. These were the conclusions reached after a review of the data for each of the reaches for year 2000 conditions.

The simulation showed the interaction of two competing trends. Efforts to upgrade water quality, including improved wastewater treatment, the elimination of combined sewers, and implementation of BMPs for reducing pollutants in urban stormwater runoffs, would compete against the expected increase in the volume of pollutants caused by increased population and urban runoff.

The results of the year 2000 simulation for Reach 109 show that the first test plan would produce significant reductions in the amount of BOD and ammonia. Today, the BOD load to Reach 109 is about 1,116 tons per year from surface sources (see Table 11-25). In the year 2000, under the simulated first test plan conditions, the surface load would be only 738 tons per year, a reduction of more than 53 percent. The ammonia load from surface sources to reach 109 would be 91 tons per year in the year 2000, down from 349 tons per year under existing conditions. However, even such substantial reductions in BOD and ammonia as those just described would not produce clean water in Reach 109. Tables 11-25 and 11-26 summarize the water quality impacts of the first test plan and compare them to existing conditions. The former table expresses the units in tons per year; the latter in mg/l. Table 11-26 also includes information on the concentration of pollutants in reaches 5, 42, 68 and 76 as well as 109, under present and possible future conditions.

With respect to DO, the first test plan also would produce significant improvements, if implemented. (See Table 11-27). For example, whereas conditions in Reach 109 now violate the minimum state DO standard about 64 percent of the time, that standard (5.0 mg/l) would be violated only 2 percent of the time in the year 2000.

The DO levels in most other areas of the basin would also be reduced significantly. However, the Skokie Lagoons, in reach 76, which act as natural pollutant-removal ponds, would still experience low DO levels and substantial algae growth.

Some of the upper reaches (including 42 in the Middle Fork, and 68 in the Skokie River) would experience a slight deterioration in water quality. Virtually all of the

TABLE 11-25: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS

REACH 109

Pollutant Indicator and Source	Existing Conditions				First Test Plan				*Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
BOD (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	480	41			359	46			321	43		
Comb. Sewer Over.	177	16			0	0			0	0		
Lowland	6.62	1	4.41	0	6.45	1	4.34	1	6.45	1	4.34	1
Cropland	24.1	2	10.4	1	16.6	2	8.97	1	16.1	2	8.96	1
Grassland	82.3	7	27.5	2	85.6	11	28.6	4	85.6	12	28.6	4
Impervious	346	30			270	35			270	36		
TOTAL	1116	96	42.3	4	738	94	41.9	6	699	94	41.9	6
Ammonia (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	278	79			35.7	38			34.0	37		
Comb. Sewer Over.	12.6	4			0	0			0	0		
Lowland	.66	0	0.22	0	0.64	1	0.22	0	.64	1	.22	0
Cropland	4.83	1	0.52	0	3.33	4	0.45	0	3.33	4	.45	0
Grassland	41.1	12	1.39	0	42.7	46	1.45	1	42.7	46	1.45	2
Impervious	11.5	3			8.96	10			8.96	10		
TOTAL	349	99	2.13	1	91.3	99	2.12	1	89.6	98	2.11	2

*Data are from the first simulation of the 2nd Test Plan

revised 1/25/79

TABLE 11-25: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS (Continued)

REACH 109

Pollutant Indicator and Source	Existing Conditions				First Test Plan				*Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Nitrate (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	26.8	15			255	64			255	64		
Comb. Sewer Over.	2.79	2			0	0			0	0		
Lowland	1.32	1	9.98	5	1.29	0	9.52	2	1.29	0	9.52	2
Cropland	14.6	8	22.9	13	10.2	3	19.8	5	10.2	3	19.8	5
Grassland	32.9	19	60.7	34	34.2	9	63.1	16	34.2	9	63.1	16
Impervious	5.8	3			4.54	1			4.54	1		
TOTAL	84.2	47	93.3	53	305	77	92.4	23	305	77	92.5	23
Phosphorous (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	35.2	67			21.8	65			21.8	65		
Comb. Sewer Over.	3.90	8			0	0			0	0		
Lowland	.26	1	0.26	1	0.26	1	0.26	1	.26	1	.26	1
Cropland	1.42	3	0.62	1	0.97	3	0.54	2	.97	3	.54	2
Grassland	3.28	6	1.65	3	3.41	10	1.71	5	3.41	10	1.71	5
Impervious	5.79	11			4.54	14			4.54	13		
TOTAL	49.8	95	2.53	5	31.0	92	2.51	8	30.98	92	2.51	8

*Data are from the first simulation of the 2nd Test Plan

revised 1/25/79

TABLE 11-26: COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 5			REACH 42		
		Existing	1st	*2nd	Existing	1st	*2nd
BOD (mg/l) Maximum	None	54.9	36.6	34.6	55.4	54.0	55.4
Minimum		2.62	1.25	0.96	1.88	1.86	1.54
Mean		8.57	9.93	6.00	6.97	8.86	8.65
Ammonia (mg/l) Maximum		16.5	3.17	3.08	2.60	2.58	2.58
Minimum		0.48	0.07	0.07	0.00	0	0.09
Mean		6.05	0.81	0.79	0.38	0.36	0.40
Frequency of Violation	(1) 1.5	43	32	31	26	22	21
Average Duration of Violations (hours)	(1) 1.5	602	42	43	11	9	9
Nitrate (mg/l) Maximum	None	6.42	19.1	19.1	4.94	4.89	4.75
Minimum		0.32	0.22	0.25	0.75	.69	0.83
Mean		3.63	9.01	8.99	2.46	2.41	2.54
Frequency of Violation	10.0	0	106	107	0	0	0
Average Duration of Violations (hours)	10.0	0	101	99	0	0	0
Phosphate (mg/l) Maximum		2.31	1.53	1.52	0.84	0.77	0.75
Minimum		0.10	0.04	0.04	0.00	0.00	0.08
Mean		0.90	0.62	0.61	0.18	0.17	0.19
Frequency of Violation	(1) .05	1	2	2	1	88	1
	.20	22	61	60	76	51	48
Average Duration of Violations (hours)	(1) .05	26300	13100	13100	26300	278	26300
	.20	1184	418	425	84	116	177

(1) Illinois Pollution Control Board Standard

*Data are from the first simulation of the 2nd Test Plan

TABLE 11-26: COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 68			REACH 76		
		Existing	1st	*2nd	Existing	1st	*2nd
BOD (mg/l) Maximum	None	66.2	87.7	84.7	18.6	17.3	121
Minimum		2.76	1.67	2.44	3.94	2.93	2.68
Mean		8.57	9.93	6.00	6.97	8.86	8.65
Ammonia (mg/l) Maximum		2.84	2.53	2.39	3.45	.66	2.29
Minimum		0.14	0	0.09	0.11	0.00	0
Mean		1.03	0.74	0.67	0.69	.14	0.82
Frequency of Violation	1.5 (1)	39	29	21	14	0	91
Average Duration of Violations (hours)	1.5 (1)	122	99	47	120	0	3
Nitrate (mg/l) Maximum	None	7.77	5.43	5.61	9.49	11.1	18.2
Minimum		0.22	0.10	0.15	1.50	0.00	0.30
Mean		3.27	2.52	2.61	4.88	5.64	7.26
Frequency of Violation	10.0	0	0	0	0	2	63
Average Duration of Violations (hours)	10.0	0	0	0	0	264	72
Phosphate (mg/l) Maximum		1.55	1.01	1.16	1.46	0.98	1.13
Minimum		0.07	0.03	0.04	0.06	0.00	0.02
Mean		0.52	0.29	0.36	0.66	0.37	0.58
Frequency of Violation	.05 (1)	1	2	2	1	93	6
	.20	48	101	65	96	5	41
Average Duration of Violations (hours)	.05 (1)	26300	13100	13100	26300	188	4380
	.20	509	162	310	230	2980	633

(1) Illinois Pollution Control Board Standard

*Data are from the first simulation of the 2nd Test Plan

TABLE 11-26. COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 109			REACH		
		Existing	1st	*2nd	Existing	1st	*2nd
BOD (mg/l) Maximum	None	43.3	25.8	45.7			
Minimum		3.54	2.30	2.30			
Mean		11.1	10.4	12.0			
Ammonia (mg/l) Maximum		2.84	1.65	1.70			
Minimum		0.31	0.00	0			
Mean		0.95	0.25	0.53			
Frequency of Violation	(1) 1.5	87	1	3			
Average Duration of Violations (hours)	(1) 1.5	22	7	4			
Nitrate (mg/l) Maximum	None	8.93	10.4	13.6			
Minimum		0.50	0.19	0.60			
Mean		3.94	4.63	5.59			
Frequency of Violation	10.0	0	1	12			
Average Duration of Violations (hours)	10.0	0	2	121			
Phosphate (mg/l) Maximum		1.35	0.90	1.04			
Minimum		0.13	0.00	0			
Mean		0.52	0.32	0.43			
Frequency of Violation	(1) (2) .05	1	255	14			
	.20	44	63	102			
Average Duration of Violations (hours)	(1) (2) .05	26300	89	1870			
	.20	562	254	240			

(1) Illinois Pollution Control Board Standard

*Data are from the first simulation of the 2nd Test Plan

TABLE 11-27: CHANGES IN DISSOLVED OXYGEN LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

(All data in mg/l)	REACH 5			REACH 42		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	12.5	12.8	13.0	13.0	11.8	11.9
Minimum	0.26	1.62	2.12	1.81	1.87	1.86
Mean	3.07	5.29	6.46	7.12	6.81	6.38
* Violations	191	243	89	84	82	93
Average Duration	123	40.5	33	47	48	50
** Overall Assessment	Bad	Bad	Poor	Good	Poor	Poor

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

(All data in mg/l)	REACH 68			REACH 76		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	12.9	13.5	13.2	13.6	13.3	12.8
Minimum	1.84	1.95	2.95	0.28	1.17	0.28
Mean	7.78	7.58	8.25	7.99	8.35	7.67
* Violations	66	57	43	188	168	250
Average Duration	15	16	12	52	19	9
** Overall Assessment	Good	Good	Good	Poor	Fair	Fair

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

(All data in mg/l)	REACH 109			REACH		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	12.9	12.9	13.2			
Minimum	0	2.90	2.20			
Mean	4.45	8.69	7.59			
* Violations	120	34	157			
Average Duration	253	14	9			
** Overall Assessment	Bad	Good	Fair			

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

pollution to these reaches is from nonpoint sources, particularly urban runoff in Reach 68. However, the First Test Plan alternative would result in significant decreases in nonpoint pollutant loads. Therefore, it appears likely that the effects of flood control reservoirs as simulated by the model are responsible for the slight deterioration in water quality. Water quality in these reaches would be even worse in the year 2000 if the assumptions in the first test plan were not implemented.

The assessment of the plans tested in each basin is based on the extent to which a given plan reduces the total time that instream dissolved oxygen standards would be violated. The Commission, in the formulation of strategies in the initial areawide plan, attempted to develop plans that would allow all streams to comply with state standards at least 95 percent of the time. Table 11-28 illustrates the effect the first test plan would have on compliance with standards in Reaches, 5, 42,68, 76 and 109. The final three columns in each table shows the percent of time that standards for each pollutant indicator would be violated in each reach. The objective was to have all figures in this column below 5 percent.

c. Second Test Plan Assumptions

The second test plan was developed through much the same process described earlier for the first test plan. Simulation results from the first test plan were publicized and discussed at a series of public meetings in the basin and a second test plan evolved out of suggestions for improvements.

Because of the form of the suggestions approved by the 208 Steering Committee, three separate alternative simulation processes were programmed. The first of the three simulations assumed these changes to the first test plan:

(1) First Simulation: The following changes to the first test plan were involved in the first alternative of the second test plan:

(a) West Fork

-Represent the Deerfield Wastewater Treatment Plant discharge at 4 mg/l BOD_5 .

-Implement post-treatment aeration at the Deerfield plant.

-Eliminate cooling water discharges at the SCM and Underwriters plants.

TABLE 11-28: WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

REACH 5

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan
Temperature °C	32.2	0	1	1	0	2	2	0	0	0
Dissolved Oxygen as O, mg/l	5.0	191	243	89	123	40.5	33	72	37	11
BOD_{20} Carbonaceous as O, mg/l	10	47	151	133	509	77.4	15.	91	44	8
Ammonia as N, mg/l	1.5	43	32	31	602	41.8	43	98	5	5
Nitrate as N, mg/l	10	0	106	107	0	101	99	0	41	40
Phosphorus Soluble as P, mg/l	.05	1	2	2	26300	13150	13100	100	100	100

REACH 42

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan
Temperature °C	32.2	2	2	0	2	3	0	0	0	0
Dissolved Oxygen as O, mg/l	5.0	84	82	93	47	48	50	15	15	18
BOD_{20} Carbonaceous as O, mg/l	10	107	103	50	80	75	131	33	29	25
Ammonia as N, mg/l	1.5	26	22	21	11	9	9	1	1	1
Nitrate as N, mg/l	10	0	0	0	0	0	0	0	0	0
Phosphorus Soluble as P, mg/l	.05	1	88	1	26300	278	26300	100	93	100

*Data are from the first simulation of the 2nd Test Plan

TABLE 11-28. WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS (Continued)

REACH 68

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan
Temperature °C	32.2	9	12	12	3	3	4	0	0	0
Dissolved Oxygen as O, mg/l	5.0	66	57	43	15	16	12	4	3	2
BOD_{20} Carbonaceous as O, mg/l	10	56	81	65	383	247	320	82	76	79
Ammonia as N, mg/l	1.5	39	29	21	122	99	47	18	11	4
Nitrate as N, mg/l	10	0	0	0	0	0	0	0	0	0
Phosphorus Soluble as P, mg/l	.05	1	2	2	26300	13100	13100	100	100	100

REACH 76

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan
Temperature °C	32.2	0	0	1	0	0	8	0	0	0
Dissolved Oxygen as O, mg/l	5.0	118	168	250	52	19	9	23	12	9
BOD_{20} Carbonaceous as O, mg/l	10	66	123	56	201	95	383	50	44	82
Ammonia as N, mg/l	1.5	14	0	91	120	0	3	6	0	1
Nitrate as N, mg/l	10	0	2	63	0	264	72	0	2	17
Phosphorus Soluble as P, mg/l	.05	1	93	6	26300	188	4380	100	66	100

REACH 109

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan
Temperature °C	32.2	0	0	0	0	0	0	0	0	0
Dissolved Oxygen as O, mg/l	5.0	120	34	157	141	14	9	64	2	5
BOD_{20} Carbonaceous as O, mg/l	10	149	219	83	102	62	191	58	52	60
Ammonia as N, mg/l	1.5	87	1	3	22	7	4	7	0	0
Nitrate as N, mg/l	10	0	1	12	0	2	121	0	0	0
Phosphorus Soluble as P, mg/l	.05	1	255	14	26300	89	1870	100	86	00

*Data are f he first simulation of the 2nd Test Plan

(b) Middle Fork

-Eliminate proposed reservoirs at Soil Conservation Service sites 15 and 18.

-Increase stream shading factors to 90 percent by assuming aggressive tree-planting programs along stream banks.

(c) Skokie River

-Eliminate proposed reservoirs at Soil Conservation Service sites 4 and 7.

-Remove ammonia from the Goodyear plant effluent.

-Eliminate the permanent pool at Skokie Lagoons.

(2) Second Simulation: A second alternative of the second test plan was based on the assumption that population growth in the basin over the rest of the century would be 45 percent less than forecast by the Commission in 1976. It was anticipated that such an assumption and the associated reductions in projected urban development would reduce wastewater treatment plant and surface runoff loads.

(3) Third Simulation: The third simulation of the second test plan included:

-Bypass of 20 cfs of the Skokie River around the Skokie Lagoons.

-Reduction in sediment oxygen demand and bottom nutrient releases by 50 percent.

-Addition of a constant 10 cfs of Lake Michigan water above the lagoons for the months of May through October. (This 10 cfs was recommended in the Soil Conservation Service-Metropolitan Sanitary District North Branch flood control plan.)

d. Second Test Plan Simulated Results

(1) First Simulation: The results of this first simulation of the second test plan are shown in Table 11-26 through 11-28. The tables indicate the extent to which the second test plan achieved its primary objective, which was to further improve the depressed DO levels in the basin.

(2) Second Simulation: In almost all cases, positive impacts on instream water quality were apparent as a result of the theoretical reduction in population. However, in no case were the reductions as great as the assumed 45 percent

reduction in population growth. Most improvements were slightly better than those achieved with the first test plan. Results of this second simulation are not reflected in Tables 11-26 through 11-28, but they are available from the Commission.

(3) Third Simulation: The effects of this simuation were felt primarily in Reach 76 and areas downstream. When compared to the results of the first test plan, the third simulation/second test plan showed a slight reduction in the number of violations of that DO standard. BOD was significantly reduced, however, as were nitrate concentrations.

If the third simulation were implemented, water quality in the Skokie Lagoon Area (Reach 76) would improve, but still fall short of desired levels.

Diverting low flows of the Skokie River around the lagoons would reduce the amount of oxygen-using nutrients from sewage treatment plants entering the lagoons. In addition, the oxygen demand of the lagoon bottom would be reduced, either by natural stabilization or by dredging. In order to maintain water levels in the lagoons during dry weather, water would be pumped into the lagoons either from Lake Michigan or from wells. Water from the former source is generally rich in oxygen. This oxygen-rich water would mix with water already in the lagoons and would raise the dissolved oxygen level. However, in terms of dissolved oxygen, the lagoons still would be only at the "fair" level.

e. Summary

All of the results achieved in simulation of second test plan proposals were reviewed at additional public meetings in the basin. Comments and suggestions from the public were solicited and recorded. The Commission staff, considered all available simulation results and other information, then prepared a list of elements for a recommended basin plan. These were discussed with local participating groups and staff then prepared the recommended basin plan described below.

11.09 PROBLEM ASSESSMENT

In Part I of this report, a number of problems were identified and solutions recommended. Those findings are applicable to all basins. Noted below are certain problems specifically associated with the North Branch, Chicago River Basin.

(a) Excessive Infiltration/Inflow (I/I)

In order to quality for construction grants related to wastewater system improvements, federal regulations require applicants to follow certain procedures. Code of Federal Regulations 40 CFR 35.917(c) requires evidence that the treatment works for which grant assistance is sought will not be the subject to excessive infiltration or inflow (I/I). An I/I analysis is performed to determine whether excessive infiltration and/or inflow is present in a sewer system. If excessive flows are found, the next step is to conduct a Sewer System Evaluation Survey (SSES). If corrective measures are justified to remedy the identified problems, a sewer rehabilitation project may be authorized as part of the facilities planning project.

Within the MSDGC area, the initial I/I study was performed by the District and excessive flows were found to exist. Because of the large number of individual SSES studies that must be made in each municipal and separate sanitary district sewer system, the work is being done by the local governments. Federal grants covering 75 percent of allowable costs are available for these studies.

In the combined sewer areas, the grant procedures are more complicated because the sewers are considered to serve multi-purposes. In addition to pollution abatement, the sewers provide local stormwater drainage and may have flood control implications. According to the USEPA Program Guidance Memo PG-61, dated December 16, 1976, rehabilitation and/or construction grants will be made available only for the costs allocable to pollution abatement. However, the SSES studies themselves are fundable as are any concurrent special studies necessary to determine the causes of and alternative corrective measures related to combined sewer overflows and sewer backups.

As of December, 1978 only 71 applications for SSES grants had been received from the 130 municipal governments and separate sanitary districts located within the MSDGC area. Local units of government which have not already done so should submit applications for grants to undertake Sewer System Evaluation Surveys.

(b) NSSD Facility Plans

As noted previously, the NSSD's wastewater treatment plans were completed in 1971, prior to the enactment of PL 92-500 and subsequent regulations. Those plans were designed for the year 2010, and all elements have been implemented except certain items scheduled for construction at a later date. Because of the elapsed time since the plans were prepared, giving due consideration to new population forecasts and other changed conditions, it is appropriate that the NSSD review its earlier plans. This is

currently being done by the District by a facility plan study for its entire service area.

(c) Skokie Lagoons

The Skokie constitute the largest water body in the basin. Immediate upgrading is necessary to correct oxygen, algal and sediment related problems. Alternate plans were considered for correcting these conditions which included: the complete elimination of the lagoons as standing water bodies, converting them into marshes; the cleaning out of the lagoon bottom deposits and bypassing future low flows; augumenting lagoon waters by either Lake Michigan or well waters; and aeration.

Elimination of the lagoons as water bodies was not deemed advisable because this would run contrary to regional open space plans which call for more sites for water based recreation. Bypassing low flows was considered attractive, particularly since an alternate channel exists together with certain hydraulic works already in place. In order to prevent the lagoons from becoming anaerobic during dry weather periods, it was recognized that supplementary fresh waters should be added. The use of 10 cfs of Lake Michigan water was considered unacceptable because of the critical need for potable water in many communities. Furnishing water from wells was also evaluated. To furnish the required amount, an initial expenditure of about $1 million would be required for the well system. O&M costs would vary with the percentage of time the wells were used. On a sustained basis, the cost would amount to about $225,000 per year.

Removal of the bottom deposits is considered essential in order to eliminate the accumulated organic and inorganic materials which have built up over the years. In addition to reducing the sediment oxygen demand on the overlying waters, removal of these materials will provide a more favorable habitat for fish and other aquatic life.

Consideration was also given to higher effluent standards at the NSSD Clavey Road Plant with respect to ammonia nitrogen and phosphorus removal. The intention here was to reduce the adverse impact on the Skokie Lagoons from these nutrients. Given the high costs involved, it was determined that preventive or restorative measures could be developed after experience had been gained with the restored lagoons.

In the above evaluations, consideration was given to the fact that implementation of the Clean Lakes Program called for by Section 314 of PL 92-500 is actually a State responsibility. Also, it was noted that special funds are available to local units of government for implementing restorative and preventive programs.

Given the lack of time and funds to make such detailed studies under Section 208, this plan recommends that the

necessary studies be made at a later date in the continuing planning program under the purview of Section 314.

(d) Water Quality Modeling Results

The results of water quality modeling revealed certain reaches where desired in-stream standards could not be met. These findings apply to reaches 5, 36 and 42.

(1) Reach No. 5: This is on the West Branch, and extends upstream from Dundee Road. Under the most favorable alternatives studied, 89 events (with an average duration of 33 hours) would occur during the three-year period when DO would fall below 5 mg/l. This would result in dissolved oxygen being below the proposed standard for approximately 11 percent of the time, a significant variation from the 5 percent tolerance established as a 208 plan objective.

One alternative considered was to have the Deerfield Wastewater Treatment Plant, which is located just a short distance upstream from the terminus of Reach 5, meet an effluent standard of 4 mg/l BOD and 5 mg/l SS, instead of the present NPDES requirement of 10/12. Post-treatment aeration at Deerfield was also included as well as performance zoning developments for future growth in the Lake County portion of the basin. However, neither the 4/5 standard nor post-treatment aeration was recommended in the final recommendation as no feasible plan was identified which would enable Reach 5 to attain the desired DO standard.

It was finally decided that configuration of the basin, with the stream's flat gradient, the small tributary area from which base flow could be developed, and the lack of aeration in the natural stream bed, all contributed to poor water quality. No viable solution was identified except for the diversion of the Deerfield effluent outside the basin, or the introduction of large amounts of Lake Michigan or well waters for dilution and oxygen. All of these were considered infeasible. It should be noted that similar poor water quality conditions were identified in Reaches 36 and 42, where no point source discharges influenced the results.

(2) Reach 36: This is on the Middle Fork, extending upstream from Half Day Road. DO violations would occur an estimated 20 percent of the time, no matter what alternative, preventative or corrective measures were applied. It should be noted that there are no point source discharges in this reach. About 20 percent of the BOD is generated from impervious areas, with about an equal amount from subsurface waters and the balance coming from surface runoff. Swampy areas in the headwaters, plus a low gradient, all contribute to the lack of restorative capabilities of the stream and to the depressed DO levels.

(3) Reach 42: This is also located on the Middle Fork, farther downstream from Reach 36, with its terminus at Lake-Cook Road. There are no point source discharges in this reach, either. DO violations are expected to exist for 15 percent of the time, even if two proposed flood control reservoirs are eliminated and shade from trees increased in attempts to lower water temperatures. The basic reasons for the poor water quality are the same as noted for Reach 36.

Based on the results of computer modeling and a review of background conditions, the conclusion was reached that it would be unlikely that established water quality conditions could be met now or in the future in this reach. However, these areas will be monitored closely in the continuing planning program to note any changes in water quality which might confirm or deny modeling results.

11.10 BASIN RECOMMENDATIONS

a. Overview

Measures for protecting and improving water quality in the North Branch Basin are derived from the recommendations in Part I of this plan, and from problems identified in the preceding sections of this chapter. Of particular importance are the serious impacts of treatment plant discharges, the water quality problems aggravated by sluggish stream flows, and the wet weather pollution from pervious and impervious surfaces. The adverse effects of combined sewer overflows in the lower portions of the basin (Reach 109) also must be eliminated.

The preparation of a facility plan by the NSSD is an important need in the basin to quantify future requirements of that large sanitary district. The implementation of current plans by the Village of Deerfield and the NSSD should reduce problems from treatment plant effluents and the MSDGC TARP should eliminate combined sewer overflows. It is imperative, however, that actual performance be consistent with plan provisions.

Additional measures, such as reduction of wastewater flows and post-treatment aeration, are recommended in this basin. Aeration should help correct the extremely low DO levels experienced in some reaches.

Recommendations with respect to nonpoint sources are basically the same as the overall program outlined in Chapter Six. Control of runoff pollution from the present and future urban areas is of critical importance in this basin, because of the extensive new growth forecast.

It is recommended that special consideration be given to the Skokie Lagoons, but that no modifications to the flow of stream in this basin be undertaken until the alternative courses of action and their acceptance by the public have been studied more thoroughly.

b. Point Sources

(1) Publicly Owned Wastewater Systems

(a) Municipal-type wastewater treatment authorities in the basin should implement their respective portions of their 201 plans as they have been or may be approved by the Illinois and/or U.S. Environmental Protection Agencies. A summary of the current status of these plans appears in Section 11.04e and suggested changes thereto or features to be included are noted below. In the absence of completed and/or approved facility plans, certain assumptions had to be made as to the expected locations and of sizes of treatment plants, their estimated costs and designated management agencies. This information must not be construed as binding in the Areawide Plan until the 201 facility plans have been finalized.

(b) All municipalities and counties of Cook and Lake should seek to achieve continued reductions in water use in order to conserve water resources and to reduce wastewater flows at all publicly owned treatment plants. This should be accomplished through the modification of building codes to require water conserving plumbing fixtures, metering of all new developments, pricing policies and public education to reduce consumption in already developed areas.

(c) By July 1, 1983 all treatment plants whose seven-day ten-year low flow dilution ratio is 10 to 1 or less should provide or continue to provide not less than 80 percent oxygen saturation in their effluents. Monitoring of wastewater quality after aeration should be conducted. However, during the continuing planning program, studies should be undertaken to determine where this requirement may be waived without detriment to instream water quality.

(d) Municipal-type wastewater service required to serve future growth within the service areas identified for the year 2000 should be provided only by treatment authorities designated in this plan except where this is not practical or cost-effective.

(e) In any application for issuance or amendment of an NPDES permit, each designated treatment authority should delineate its projected five-year service area for which treatment capacity is in place or under construction consistent with agreed regional population forecasts.

(f) No NPDES permit should be issued for municipal-type wastewater service within the five-year service area

delineated in the permit, other than to the treatment authority, except on a finding by IEPA that the proposed facility (1) is the most cost-effective means of providing service or (2) is an interim facility pending extension of service by the treatment authority.

(g) Treatment plant operators should assure the very high standard of performance for wastewater treatment plants which the 201 plans assume. The IEPA should monitor treatment plant operation and performance and its effect on instream water quality. IEPA should establish a technical assistance program to aid operators and laboratory technicians of public and private treatment plants in dealing with technical problems and assuring a consistent high level of performance in treatment operations.

(h) Bannockburn should install local collector and trunk sewers connecting with the NSSD and Deerfield systems.

(i) The following listed Cook County communities having separate sewers should seek Federal Grants, initiate and/or complete by July 1, 1981 sewer systems evaluation studies as required by 40 CFR 35.927: Glencoe, Glenview, Northbrook, Northfield, and Winnetka. The following listed communities having combined sewers in all or portions of their corporate limits should complete the same studies plus supplementary studies to optimize local systems in order to take advantage of TARP capacity: Golf, Kenilworth, Morton Grove, Niles and Wilmette.

(j) The MSDGC should control combined sewer overflows in the 6.1 square mile combined sewer area as provided by its Tunnel and Reservoir Plan (TARP). The implementation of TARP is critical to water quality throughout the combined sewer area and in downstream rivers and canals.

(2) Private Utilities

(a) NPDES permits issued by IEPA to private utility companies should identify projected five year service areas. No other NPDES permits should be issued for municipal type wastewater service within those five year service areas to other treatment authorities except upon a finding by the IEPA that the proposed facility is the most cost effective means of providing service; is an interim facility pending extension of service by another established treatment authority; or is intended to serve an isolated location.

(3) Industrial Wastewater Treatment Plants

(a) The IEPA should continue to enforce all requirements of NPDES permits for all industries in the basin and assure that treatment plants achieve and maintain required standards of plant performance. This can be achieved through IEPA standards for treatment plant personnel and through frequent sampling and analysis of treatment plant effluent by the IEPA for the purpose of monitoring compliance with NPDES permits.

(4) Miscellaneous Wastewater Treatment Plants

(a) Miscellaneous publicly and privately owned wastewater treatment plants should continue in operation until such time as wastewater service can be provided by publicly owned municipal type wastewater systems on a cost effective basis. Service areas of privately owned treatment systems should not be expanded or their treatment capacities increased when service can be provided on a cost effective basis by publically owned municipal type wastewater systems.

(b) The IEPA should continue to enforce all requirements of NPDES permits and assure that treatment plant operators achieve required standards of plant performance.

c. Non-Point Sources

(1) Urban Stormwater Runoff

(a) In separately sewered areas, by July 1, 1983 Cook and Lake counties and all municipalities should implement measures to work towards a reduction in BOD in stormwater runoff in already urbanized areas of 25 percent and in newly urbanized areas of 50 percent 1976 surface loadings on impervious areas. The implementing agencies should work through the countywide water quality committee to develop plans and standards for the implementation of appropriate measures such as catch basin cleaning programs, street cleaning, performance zoning, use of porous pavement surfaces, increased vegetation cover, grass waterways, wetland storage of stormwater, stormwater detention, sedimentation and erosion control, and other measures to achieve the desired pollutant reductions.

(b) Township and state highway organizations, the Illinois State Toll Highway Authority, and facility engineering departments at state and federal

installation should participate in the programs described aboved by implementing accelerated and/or improved street sweeping programs for streets, roads and highways that are hydraulically connected to perennial streams or permanent lakes via stormwater conveyance systems.

(c) During the period up to July 1, 1983 agencies should utilize voluntary exploratory programs, implementing techniques to control pollutants from urban nonpoint sources.

(d) Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should adopt and enforce adequate stormwater detention ordinances. These ordinances should include provisions which clearly establish long-term responsibilities for maintenance of detention facilities. All such local ordinances also should be consistent with minimal areawide standards set forth in the model ordinance.

(e) Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should develop and enforce adequate erosion and sedimentation control ordinances. All such local ordinances should be consistent with minimal areawide standards set forth in the model ordinance.

(f) Within one year following the preparation by NIPC Of a model ordinance, Cook and Lake counties and all municipalities in the basin should adopt measures to control surface runoff from open storage yards containing industrial stockpiles and other materials which may go into solution or which may be carried away by stormwater runoffs and pollute streams and other water bodies.

(g) By July 1, 1979 municipalities, townships, counties, and State and county highway departments responsible for de-icing streets and highways should develop programs to control the application of de-icing materials, to train personnel in proper application methods, and to use proper equipment in order to minimize any negative water quality impacts. The impact of de-icing agents on water quality should be given further study by NIPC in the continuing planning program.

(2) Agricultural Runoff

(a) By July 1, 1980 the Lake County and North Cook County Soil and Water Conservation Districts, agencies

of the United States and Illinois Departments of Agriculture and the countywide water quality committees, should identify the best management practices necessary to implement the agricultural aspects of the 208 plan, including conservation tillage, contour plowing, terracing, and conversion of cropland to grassland.

(b) By July 1, 1981, agricultural lands on which BMP's should be applied should be identified by appropriate soil and water conservation districts. Agencies of the U.S. Department of Agriculture and countywide water quality committees should be consulted.

(c) By July 1, 1985, a comprehensive conservation plan should be prepared for each farm in the basin which has soil erosion losses in excess of standards set by the Illinois Department of Agriculture and soil and water conservation districts under House Bill 818.

(d) Using available cost sharing and technical assistance programs, the soil and water conservation districts should ensure implementation of the BMP program according to the following schedule on approximately 4,070 acres of agricultural lands:

By 1985 - 30% of the identified land.
By 1995 - 70% of the identified land.
By 2000 - 100% of the identified land.

(e) The IEPA, NIPC and local governments should provide the results of their instream water quality monitoring to the soil and water conservation districts and to the Departments of Agriculture so that priority can be given to the areas most sensitive from a water quality standpoint in order to maximize the impact of the best management practices.

(f) The IEPA should enforce the IPCB regulations which require permits for feedlots, and should use the IEPA draft technical policy WPC-2 "Design Criteria for Field application of Livestock Wastes" as a guide.

(g) Illinois Department of Agriculture, Illinois Department of Public Health, and USEPA regulations on the use of pesticides and disposal of containers, and Illinois Department of Agriculture regulations on the training and licensing of pesticide applicators and operators should be continued.

(h) Farmers should implement good pasture management practices, utilize grass waterways, vegetative filter strips and field borders, and make wise use of fertilizers wherever possible in accordance with the

Illinois Agronomy Handbook to reduce the dangers of pollution. The U.S. Department of Agriculture agencies should assist farmers to recognize the water quality problems posed by improper practices, and educate them in the use of proper practices.

(3) On-site Disposal Systems

(a) Individual malfunctioning on-site disposal systems outside the five-year service areas should be repaired wherever possible upon complaint to the appropriate county authorities or replaced with a new system if necessary. By July 1, 1983, special service areas should be established under the initial sponsorship of municipal governments (for sites located within corporate limits) and by the counties (in unincorporated areas), where necessary to facilitate the financing of any innovative-type systems or other on-site improvements necessary to correct or replace malfunctioning systems in areas outside the five-year projected service areas.

(b) The minimum requirements of the Illinois Private Sewage Disposal Code should be upgraded to require more innovative site analysis techniques, and Cook and Lake County Health Departments should require a construction permit to regulate the design, location, and installation of every new on-site system in incorporated as well as unincorporated areas.

(c) Local officials should inspect all septic systems known to be failing, threatening public health or causing nuisance conditions. The inspection should result in the issuance of a repair permit for corrective measures which are to be undertaken and paid for by the septic system owner. Septic systems also should be inspected by local officials prior to the transfer of ownership of properties where such systems are installed. The results of the inspections should be made known to the lending institutions which are furnishing the mortgages.

(4) Air Pollution

(a) As part of the continuing planning program the IEPA in cooperation with the Illinois Institute for Natural Resources, the Illinois State Water Survey, and local air quality management agencies should analyze the relationship between air pollution and water quality in all of its aspects. The IEPA should cooperate with NIPC in devising strategies for correcting present

negative effects and preventing future problems through the 208 continuing planning program.

(5) Sanitary Landfills

(a) The IEPA should ensure that every sanitary landfill complies with all regulations of the IPCB for its siting, design, construction and operation. As a substitute for existing State regulations, the IEPA and IPCB should consider certification of local solid waste disposal programs which comply with areawide plans to be prepared under the Federal Resource Conservation and Recovery Act. Alternatives to land disposal of solid wastes, including recycling, should be considered and utilized wherever feasible.

(6) Waterways

(a) NIPC, in conjunction with the countywide water quality committees, in the continuing planning program, should develop recommendations to simplify the fragmented system for channel maintenance and improvement in the North Branch Basin. Present responsibilities for such maintenance functions as debris removal, streambank stabilization, public access, dredging, disposal of dredge spoil, protection and augmentation of habitat, tree shading and vegetation are shared between a host of Federal, State and local authorities.

(b) Due to the unique recreational benefits of the Skokie Lagoons, the Cook County Forest Preserve District, in cooperation with the MSDGC, should implement a program to monitor water quality in the Lagoons. Under the leadership of the Cook County Forest Preserve District, further study should be devoted to assessing the various alternatives to improve water quality. Among the alternatives are: bypassing of Skokie River low flows; augmentation of flows into the Lagoons; instream aeration; and bottom cleaning. Any flow augmentation program should include a determination whether wells or allocation from Lake Michigan is the proper source of the augmentation flows. Plans for Lagoon restoration should be completed by December 31, 1980, and actual work by July 1, 1983. In executing the restoration work itself, the Forest Preserve District should seek a grant under Section 314 of PL 92-500.

(c) In-stream water quality data collected by local treatment plant operators should be periodically published by the IEPA.

(d) Water quality conditions in Reaches 5, 36, and 42 should be monitored closely in the continuing planning program to confirm or deny modeling results which show adverse DO conditions in those Reaches.

d. Residuals

(1) As regulated by the IEPA, present methods for the disposal of sludge from treatment plants are adequate to handle present and anticipated future volumes, and should continue to be administered by the IEPA.

(2) Highest priority should be given to the use of sludge as a soil conditioner and efforts should be expanded to utilize sludge for that purpose. The IEPA should assure proper practices in the utilization of sludge on agricultural lands through implementation of the draft standards in IEPA Technical Policy WPC-3 "Design Criteria for Municipal Sludge Utilization on Agricultural Land."

(3) The preferred method for the disposal of domestic septage is through land application, and this method should be encouraged and used whenever possible. Recognizing a continuing need for the disposal of large volumes of septage at wastewater treatment plants, specific facilities should be designated by the IEPA to receive domestic septage on recommendation by NIPC through the continuing planning process.

(4) The USEPA standards and the IPCB regulations for permits for the disposal of hazardous or toxic substances should continue to be enforced by the IEPA.

e. Groundwater

(1) By July 1, 1980 the Illinois State Water Survey and the Illinois State Geological Survey should undertake a coordinated well sampling program to monitor groundwater quality in areas where a potential for infiltration by pollutants now exists or might exist in the future.

11.11 COSTS OF RECOMMENDED PLAN

a. Facility Plans

(1) General Table 11-29 shows pertinent capacities in the year 2000 for surviving wastewater treatment plants, their effluent standards and construction costs. Local collector sewer projects are shown, if they have been processed for

federal or state grants. Also shown are total MSDGC costs allocated to this basin.

Cost data were assembled from various sources as noted below in the tables that follow. The processing of this information and its allocation to the North Branch basin are described, where applicable.

Except for the MSDGC area, "Initial" costs of facility plans listed in Table 11-29 apply to the first phase of any project which is to be followed at some future date by programmed expansions or extensions. Under this definition, the total cost of works currently under construction fall under the classification "Initial" even though the project has not yet been completed and future payments to contractors will be made. Except for the MSDGC area, "future" costs cover phased work scheduled at later dates.

(2) MSDGC Area Because of their magnitude and complexity, special procedures were followed in depicting MSDGC costs.

Total costs of MSDGC improvements and locally funded improvements were taken from Table U7-IX-1 and from page 229 in MSDGC's 1977 Facilities Plan Update Supplement. They were revised and brought up to date in a conference with MSDGC staff representatives. The cost of all MSDGC improvements was assumed to be spread throughout the MSDGC service area on an ad valorem basis. Thus, each basin's share of the cost was assumed to be proportional to the share of total District assessed valuation in that basin.

For locally funded improvements, the estimates for Local Sewer Upgrading are 1977 values from page 229 of the MSDGC 1977 Plan Update Supplement, updated as noted above. For other local improvements, the estimates in pages XI-18 and XI-19 of the MSDGC Overview Report are as of January 1, 1975, also updated as noted above. Where applicable, costs were also updated at six percent compounded for the intervening period to January, 1977 levels.

The costs of local improvements were allocated differently, depending upon the particular type of project. Local Sewer Upgradings required as supplements to the TARP apply only to the 49 communities in the TARP area. A basin's share of the total cost of these upgradings was assumed to be equal to the percentage share of the total TARP area assessed valuation in TARP communities in that basin.

For local sewer improvements outside the TARP area, the costs were allocated to non-TARP communities in each basin in accordance with their share of the total assessed valuation for all non-TARP areas.

(3) Phasing and O&M Costs Table 11-30 distributes capital costs within five year time frames. Annual O&M costs are also shown, which are based on data included in current reports, where available, or from data furnished by operating agencies. In their absence, they were estimated based on information in Staff Paper No. 20, "Wastewater

Treatment Processes and Cost Estimating Data." The cost for bonded indebtedness of previous system improvements are not included in the O&M costs listed in Table 11-30. The costs for constructing TARP II are included in the table. Construction costs do not differentiate between grant eligible and local shares.

(4) Local Costs Table 11-31 shows annualized local capital costs.

(5) Increased Costs Tables 11-32, -33, -34 show the estimated annual increases in wastewater charges per household: for Lake County residents in the Basin; for residents in Cook County; and for the Basin as a whole, respectively for the previously described improvements and/or expansions.

b. Urban Stormwater

Methods for controlling pollution in urban stormwater runoff include: street sweeping, catch basin cleaning, performance zoning, use of porous pavements, increased vegetation, grass waterways, wetland storage of stormwater, stormwater detention, and erosion and sediment controls. The goals of a 25 percent decrease in BOD loads on existing (1976) impervious and a 50 percent decrease in pollutant loads on impervious areas built between 1976 and 2000 are to be achieved by combinations of the above practices. The cost of the mix of specific practices which would meet these goals is dependent upon the practices selected and the intensity of their individual use.

An estimate of the total cost based solely on street cleaning utilizing vacuum sweepers is $14,769,000 through the year 2000, increasing from $464,300/year in 1978 to $820,000/year in the final year. The frequency of cleaning streets with vacuum sweepers averaged about once every 12 days in 1976 and increased to once every 7.5 days during the year 2000, excluding the three winter months of December through February.

The above costs did not include street cleaning in combined sewer areas where stormwater runoffs would be treated. Naturally, some street cleaning activities would be required in those areas for sanitary, public relations or other reasons. Costs for that cleaning are not included in the above figures.

c. Agricultural Runoff

Agricultural croplands presently amount to 10,200 acres in the basin, and are projected to decrease to 8,380 acres by the year 2000. In order to reduce agricultural pollution from croplands, Best Management Practices (BMP's) are

TABLE 11-29: RECOMMENDED PLANS, PUBLICLY OWNED TREATMENT SYSTEMS — NORTH BRANCH BASIN

MAP CODE	FACILITY NAME	DESIGN CAPACITIES (MGD)		EFFLUENT STANDARDS (Year 2000) (mg/l)				CAPITAL COSTS (million $)			COMMENTS
		1975	2000	BOD_5	TSS	P	NH_3N	INITIAL	FUTURE	TOTAL	
L4	Deerfield WWTP	2.3	3.0	10	12		(1) 1.5	(2) 4.99		4.99	
L27	NSSD Clavey Rd. WWTP	17.8	17.8	10	12		(1) (3) 1.5	(4) 10.9	(5) 12.6	23.5	
N/A	Bannockburn	-	-	-	-		-	(6) 0.50		0.50	
N/A	MSDGC TARP							(7) 79.4		79.4	
N/A	MSDGC Non-TARP Projects							(7) 37.9		37.9	
N/A	Local Projects, TARP Related							(7) 5.3		5.3	
N/A	Local Projects, Non-TARP Related							(7) 62.9		62.9	

(1) In-streams, after mixing.

(2) Plant improvements being finalized.

(3) Effluent must not exceed 3.0 mg/l at any time.

(4) Work currently under contract.

(5) Balance of sewer to LCDPW Des Plaines WWTP.

(6) Local sewers to Deerfield Interceptor.

(7) Total cost shown, whether or not under construction because of the method used in distributing costs to each basin.

N/A:Not applicable.

TABLE 11-30: SUMMARY OF FUTURE COSTS (All data in 1977 dollars in millions) North Branch

Jurisdiction	Capital Costs						Annual Operations & Maintenance Expense				
	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	Total	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)
NSSD	26.67					26.67	0.85	1.06	1.06	1.06	1.06
DEERFIELD	4.99					4.99	0.15	0.19	0.19	0.19	0.19
BANNOCKBURN	0.49					0.49	0.002	0.002	0.002	0.002	0.002
MSDGC	116.40	0.90				117.30	0.26	1.02	1.06	1.06	1.06
LOCAL IMPROVEMENTS RELATED TO MSDGC	64.40	0.80				65.20					
AGRICULTURAL BMPs							0.005	0.01	0.02	0.02	0.03
URBAN STORMWATER MANAGEMENT EXPENSE							0.54	0.61	0.68	0.75	0.81
TOTAL	212.95	1.70				214.65	1.81	2.89	3.01	3.08	3.15

TABLE 11-31: PROJECTED ANNUALIZED LOCAL COSTS (All data 1977 dollars in millions)

Jurisdiction	CAPITAL COSTS			LOCAL CAPITAL PLUS O & M ANNUALIZED Costs (Mil./yr.)*					Total Cost** 1978-2000	Comments
	Cost Total Through Yr. 2000	Est. Fed'l. Share	Est. Local Share	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000		
NSSD	26.67	20.00	6.67	1.48	1.69	1.69	1.69	1.06	35.93	
DEERFIELD	4.99	3.74	1.25	0.27	0.31	0.31	0.31	0.19	6.57	
BANNOCKBURN	0.49	0.37	0.12	0.01	0.01	0.01	0.01	0.002	.206	
MSDGC	117.30	87.98	29.32	3.01	3.79	3.83	3.83	1.08	75.54	
LOCAL IMPROVEMENTS RELATED TO MSDGC	65.20	48.90	16.30	1.52	1.54	1.54	1.54	0.02	30.76	
AGRICULTURAL BMPs				0.005	0.01	0.02	0.02	0.03	.365	
URBAN STORMWATER MANAGEMENT EXPENSE				0.54	0.61	0.68	0.75	0.81	15.33	
TOTAL	214.65	160.99	53.66	6.84	7.96	8.08	8.15	3.19	164.70	

*Local Capital Amortized @ 7% for 20 yrs.

**Sum of Local Capital Plus O & M Annualized Costs, in million $

TABLE 11-32: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER CHARGE Lake County

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	509.8	541.7	573.9	605.9	631.4	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.148	.140	.132	.125		
O & M Related	.238	.272	.262	.252	.246	
Total Rate:	.386	.412	.394	.377	.246	
Additional Cost per Home of $45,000 FMV ($/yr.)	57.90	61.80	59.10	56.55	36.90	
Existing Av. Annual WW Cost ($/Household yr.)	97.60					
Total Av. Annual WW Cost ($ / Household yr.)	155.50	159.40	156.70	154.15	134.50	
Percent Av. Increase* in WW Costs per Household (%)	59.3	63.3	60.5	57.9	37.8	

*Total Rate Used

TABLE 11-33: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER CHARGE Cook County

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	922.8	980.7	1039.0	1096.9	1143.2	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.449	.497	.469	.444	.005	
O & M Related	.043	.071	.067	.064	.061	
Total Rate:	.492	.568	.536	.508	.066	
Additional Cost per Home of $45,000 FMV ($/yr.)	73.80	85.20	80.40	76.20	9.90	
Existing Av. Annual WW Charge ($/Household yr.)	97.60					
Average Increase* in WW Charge per Household (%)	75.6	87.3	82.4	78.1	10.1	

*Total Rate Used

TABLE 11-34: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER CHARGE Total Basin

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	1432.6	1522.4	1612.9	1702.8	1774.6	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.352	.333	.314	.298	.002	
O & M Related	.126	.190	.187	.181	.178	
Total Rate:	.478	.523	.501	.479	.180	
Additional Cost per Home of $45,000 FMV ($/yr.)	71.70	78.45	75.15	71.85	27.00	
Existing Av. Annual WW Cost ($/Household yr.)	97.60					
Total Av. Annual WW Cost ($ / Household yr.)	169.30	176.05	172.76	169.45	124.60	
Percent Av. Increase* in WW Costs per Household (%)	73.5	80.4	77.0	73.6	27.7	

*Total Rate Used

targeted for implementation by the year 2000 on 4,070 acres at a total cost over the years of $243,900.

Although a comprehensive farm plan would include a wide range of BMP's, the following four practices and several combinations have been recommended for implementation: conservation tillage, contouring, terracing, and cropland conversion to pastureland. These BMP's were selected because of their direct effects on water quality as well as their ability to reduce soil erosion. Many other practices which would be contained in a farm plan, but not considered by the Commission, are either too localized or difficult to evaluate for their effects on water quality.

Of the above total costs, there were none that represented initial installation (or capital) expenditures for which grants on the order of 50 percent may be available from the Federal government. The expenditure of $243,900 represents total operating and maintenance costs. The farmers share is estimated at 50 percent of the total based on Federal funding for the remaining 50 percent. However, the USEPA Black Creek Study has indicated that even a 50-50 cost-sharing program may not be sufficient to encourage farmer participation.

For estimating purposes, it was assumed that 30 percent of the BMP's will be installed by 1985, 70 percent by 1995, and 100 percent by the year 2000.

11.12 WATER QUALITY CONDITIONS IN 1983

a. Introduction

Public Law 92-500 includes the statement: "Whereever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water be achieved by July 1, 1983." The water quality standards of the Illinois Pollution Control Board for General Use streams, such as the North Branch of the Chicago River, were adopted to "protect the State's waters for aquatic life, ... primary and secondary contact use, ..." This Commission is using the Illinois standards, as modified by this plan, to judge compliance with the 1983 national goal. This section assesses the feasibility of compliance with the dissolved oxygen and ammonia standards in 1983 in the North Branch Basin.

b. Assumptions of Changes in the Basin

(1) Land Cover: Land cover estimates for the years 1976, 1983, and 2000 are summarized in Table 11-35. It should be noted that impervious area is forecast to increase by only 6 percent from 1976 to 2000. Also forecast is some shifting from lowland and cropland to urban grassland. The cropland

areas listed under "conservation" indicate those lands where additional soil conservation practices are expected to be implemented.

(2) Urban Runoff Control: Management measures are to be implemented with the objective of reducing runoff-related pollutants from existing urbanized areas by 25 percent of BOD loadings found to be present in 1976. The BOD loadings from areas urbanized after that year are to be reduced by 50 percent of 1976 loads. This will result in an overall 25 percent reduction in urban runoff related BOD loads by 1983 from separately sewered areas.

Combined sewer discharges in the basin are assumed to be partially controlled by the first phase of TARP in 1983. It is assumed that a 90 percent reduction of pollutant loads from existing levels will be achieved.

(3) Point Sources: Effluent characteristics of point sources are given for 1976 and 1983 in Table 11-36.

c. Expected Water Quality in 1983

The water quality model was used indirectly to estimate 1983 water quality conditions. Results of 1976 and year 2000 served as the basis for estimating 1983 values. In the process, pollution loads to the river were calculated for each of those three years. These loads are reported in Table 11-37 for sever reaches, along with the water quality ratings for dissolved oxygen and ammonia associated with the loads. The ratings for 1976 and 2000 are from previous water quality modeling results. The 1983 ratings are informed judgments.

TABLE 11-35: LAND COVER CHANGES

Cover Type	Area in Square Miles		
	1976	1983	2000
Lowland	14.3	14.2	14.0
Cropland	15.8	15.0	13.1
Conservation	(0)	(1.15)	(6.39)
Grassland	46.6	47.2	48.6
Impervious	16.5	16.8	17.5

Revised 2/15/79

TABLE 11-36: POINT SOURCES IN THE NORTH BRANCH BASIN

Plant Name	Reach	Effluent Characteristics					
		Flow, cfs		BOD_5 (mg/l)		Ammonia (mg/l)	
		1976	1983	1976	1983	1976	1983
SCM Corporation	5	0.002	0.002	0	0.0	0	0.0
Underwriters Lab	5	0.005	0.005	0	0.0	0	0.0
Deerfield WWTP	5	4.4	4.21	24	10.0	13.8	1.5
Holy Spirit Convent	109	0.095	0.095	9	30.0	1.4	1.4
LCDPW Lambs	36	0.008	*	9		1.7	
Lake Forest Academy WWTP	42	0.017	*	9		1.7	
Everett Grade School	42	0.005	*	9		1.7	
Goodyear Tire & Rubber Company	59	1.3	1.3	4		1.4	1.4
Great Lakes NTC Skokie River	59	1.21	*	18		9.0	
Solo Cup Corporation	68	0.031	*	0		0	
NSSD Clavey Road WWTP	76	18.3	18.5	10	10.0	11.5	3.0
IIT Harper	109	0.025	0.025	0	0.0	0	0.0

*Flows diverted to other plants

Revised 2/15/79

The goal (expressed in terms of achievement of water quality standards) is considered to be met satisfactorily when a rating of "good" or "excellent" is achieved. Assignment of these adjective ratings was based on the following criteria:

Excellent = no dissolved oxygen concentrations below 5 mg/l; no violations of 1.5 mg/l ammonia standard.

Good = dissolved oxygen remains above 5 mg/l 95 percent of the time; the ammonia standard is met 95 percent or more of the time.

Fair = dissolved oxygen remains above 5 mg/l 85 percent of the time; the ammonia standard is met 85 percent or more of the time.

TABLE 11-37: WATER QUALITY RATINGS IN 1983

Reach 5, West Fork at Dundee Road			
Loads & Ratings	1976	1983	2000
BOD, tons/year	221	118	74
Ammonia, tons/year	68	14	13
Dissolved oxygen	Bad	Bad	Bad
Ammonia	Bad	Fair	Good

Reach 68, Skokie River above Clavey Road			
Loadings & Ratings	1976	1983	2000
BOD, tons/year	166	112	102
Ammonia, tons/year	27	15	13
Dissolved oxygen	Good	Good	Good
Ammonia	Poor	Fair	Good

Reach 36, Middle Fork at Half-Day Road			
Loads & Ratings	1976	1983	2000
BOD, tons/year	36	35	35
Ammonia, tons/year	9	9	9
Dissolved oxygen	Poor	Poor	Poor
Ammonia	Good	Good	Good

Reach 76, Skokie River at Willow Road			
Loads & Ratings	1976	1983	2000
BOD, tons/year	460	401	396
Ammonia, tons/year	234	70	41
Dissolved oxygen	Poor	Fair	Fair
Ammonia	Fair	Good	Good+

Reach 42, Middle Fork at Lake-Cook County Line			
Loads & Ratings	1976	1983	2000
BOD, tons/year	63	58	57
Ammonia, tons/year	14	14	13
Dissolved oxygen	Poor	Poor	Poor+
Ammonia	Good+	Good+	Good+

Reach 109, North Branch at Touhy Avenue			
Loads & Ratings	1976	1983	2000
BOD, tons/year	1158	790	705
Ammonia, tons/year	351	121	91
Dissolved oxygen	Bad	Good	Good
Ammonia	Fair	Good	Good+

Revised 2/15/79

Reach 59, Skokie River at Westleigh Road			
Loads & Ratings	1976	1983	2000
BOD, tons/year	93	54	51
Ammonia, tons/year	21	10	8
Dissolved oxygen	Good	Good	Good
Ammonia	Bad	Fair	Good

Poor = dissolved oxygen remains above 5 mg/l 70 percent of the time; the ammonia standard is met 70 percent or more of the time.

Bad = dissolved oxygen remains above 5 mg/l less than 70 percent of the time; the ammonia standard is not less than 70 percent of the time.

In any reach where the dissolved oxygen drops to zero, the qualitative state of the reach is lowered by one category.

Adjective ratings for dissolved oxygen and ammonia in 1983 are noted in Table 11-38:

The "poor" dissolved oxygen ratings in the Middle Fork (reaches 36 and 42) are attributed to the sluggish character of this small stream which will have no treatment plant discharges in 1983. During dry weather as flows drop near zero, the dissolved oxygen used by algae is not renewed adequately. It is unlikely that significant improvement can be expected without augmenting low flows in this stream.

Dissolved oxygen conditions in Reach 5 are now rated "Bad", and will continue that way through 1983 to the year 2000. Improvement of dissolved oxygen in Reach 76 to "fair" in 1983 can be expected as the point sources in those reaches are upgraded and urban runoff loads are partially controlled. More study would be required to determine whether additional point source control, non-point source control, flow augmentation, or in-stream aeration would be justified. In reach 76 (the Skokie Lagoons), the control of algae and of bottom sediment oxygen demands are additional possibilities for improvement.

TABLE 11-38: AMMONIA AND DISSOLVED OXYGEN RATINGS IN 1983

Stream	Reach	Dissolved Oxygen	Ammonia
West Fork	5	Bad	Fair
Middle Fork	36	Poor	Good
Middle Fork	42	Poor	Good+
Skokie River	59	Good	Fair
Skokie River	68	Good	Fair
Skokie River	76	Fair	Good
North Branch	109	Good	Good

Revised 2/15/79

The "fair" ammonia ratings in reaches 5, 59, and 68 are probably caused by assuming in the water quality model that the mean concentration in point source discharges will be at the in-stream standard. The objective of point source ammonia control should be to keep ammonia from exceeding 1.5 mg/l in-stream. Therefore, it is likely that the operation of the planned ammonia control facilities will actually achieve a performance adequate to reach a "good" rating. This situation should also be studied carefully before any additional recommendations are made.

It should be noted that in Reach 5 slightly over 40 percent of the ammonia will be contributed by treatment plans and an equivalent amount by grasslands. The flat gradient of the stream does little to assist in the assimilation.

In Reach 59, 17 percent of the ammonia is expected to come from a single, small treatment plant and 65 percent from grasslands. Again, low marshy areas and flat gradients do little to assist in the assimilations.

Reach 68, downstream of Reach 59, reflects a continuation of conditions noted for Reach 59.

As noted in Section 11.01a(4), existing fish habitat conditions are described as "extremely degraded" in the reports submitted by the Illinois Natural Survey. Virtually, all of the species collected in the 1976 fish survey were tolerant of habitat abuse. Not surprisingly, ammonia nitrogen was one of three parameters determined to be significant in the toxicity index calculations made by the Natural History Survey. Improvements in point source controls which have been made or are forecast may require a considerable period of time to correct the degraded conditions. Even after DO and ammonia conditions have been improved, other adverse habitat factors such as low or zero flows, high temperatures and adverse natural bottom conditions may still persist.

The judgment is made that the prescribed goal will be met in portions of the basin by 1983. More reaches will meet the goal by the year 2000. However, it is probable that certain reaches will never attain the goal.

CHAPTER 12

Lake Michigan North

TABLE OF CONTENTS

	Page
(1) PREFACE	12-1
12.01 DESCRIPTION OF BASIN	12-1
a. Physical Characteristics	12-1
(1) Geography	12-1
(2) Waterways	12-2
(3) Geology and Soils	12-2
(4) Fish Species and Habitat	12-5
b. Socio-Economic Characteristics	12-5
(1) Population	12-5
(2) Land Use	12-7
(3) Economy	12-7
(4) Water Supply	12-11
(5) Government	12-11
(6) Recreation	12-11
12.02 IMPACTS OF OTHER PROJECTS	12-13
a. Introduction	12-13
b. Corps of Engineers	12-14
(1) Navigation	12-14
(2) Small Boat Harbors	12-15
(3) Shore Erosion	12-15
(4) Wastewater Studies	12-15
(5) Lake Diversion Study	12-16
(6) Dredge and Fill Permits	12-16
c. Soil Conservation Service	12-16
d. Illinois Division of Water Resources	12-17
(1) Coastal Zone Management	12-17
(2) Lake Water Allocation	12-18
(3) Lake Water Diversion Accounting Procedures	12-18
(4) Permits	12-18
e. Illinois Department of Conservation	12-19
f. Illinois Division of Highways	12-19
g. Local Units of Governments	12-19
12.03 WATER QUALITY IN THE BASIN	12-20
a. Stream Classifications and Applicable State Standards	12-20
b. Sources of Water Quality Information	12-20
(1) Commission Sampling and Analyses Programs	12-21
(2) IEPA Data	12-22
(3) Other Studies	12-22
c. Results of Sampling and Analyses	12-23
(1) IEPA Programs	12-23
(a) Tributary Streams	12-23
(b) Beaches	12-23
(c) Water Supply Intakes	12-23
(2) NIPC Programs	12-24
(a) Tributary Streams	12-24
(b) Land Use Runoff Program	12-24
d. Overview of Lake Michigan Water Quality	12-31
12.04 POINT SOURCES: EXISTING CONDITIONS	12-34
a. Municipal Type Wastewater Treatment Plants	12-34
b. Industrial Wastewater Treatment Plants	12-34
c. Miscellaneous Wastewater Treatment Plants	12-34
d. Other Point Sources	12-37
e. Local Facilities Planning	12-37

12.05 NON POINT SOURCES: EXISTING CONDITIONS 12-37
a. Urban Stormwater Systems 12-37
b. Construction Activities 12-43
c. Air Pollution 12-43
d. Erosion and Sedimentation 12-43
e. Septic Systems 12-44
f. Surface Waste Disposal Sites 12-46
g. Hydrologic Modifications 12-46
h. Marine Activities 12-47

12.06 DISPOSAL OF RESIDUALS 12-48

12.07 EXISTING MANAGEMENT PROGRAMS 12-48
a. Water Quality Management Programs 12-49
b. Regulatory Programs 12-50
(1) Municipal Regulations 12-50
(2) County Regulations 12-51
(3) Soil and Water Conservation District Regulations 12-52
(4) State and Federal Regulations 12-52

12.08 PROBLEM ASSESSMENT 12-54
a. Water Quality 12-55
b. Point Sources 12-55
c. NSSD Facility Plans 12-56
d. Non Point Sources 12-57
e. Residuals 12-58

12.09 BASIN RECOMMENDATIONS 12-58
a. Overview 12-58
b. Point Sources 12-58
(1) Publicly Owned Wastewater Systems 12-58
(2) Miscellaneous Wastewater Treatment Plants 12-60
(3) Other Point Source Discharges 12-60
c. Non-Point Sources 12-60
(1) Urban Stormwater Runoff 12-60
(2) Agricultural Runoff 12-62
(3) On-Site Disposal Systems 12-63
(4) Air Pollution 12-63
(5) Sanitary Landfills 12-64
(6) Waterways 12-64
(7) Boundary Conditions 12-64
d. Residuals 12-65
e. Groundwater 12-65

12.10 COSTS OF RECOMMENDED PLAN 12-66
a. Facility Plans 12-66
(1) General 12-66
(2) Summary of Future Costs 12-66
(3) Annualized Local Capital Costs 12-66
(4) Increased Costs 12-66
b. Urban Stormwater 12-66
c. Agricultural Runoff 12-70

12.11 WATER QUALITY CONDITIONS IN 1983 12-70

FIGURES

No.		Page
12-1	Basin Location	12-4
12-2	Water Sampling Stations	12-22a
12-3	Point Source Discharges	12-32
12-4	Wastewater Service Areas	12-33
12-5	Location of Septic Areas	12-45

TABLES

No.		
12-1	Stream Inventory	12-3
12-2	Lake and Pond Inventory	12-3
12-3	Predominant Soil Unit Characteristics For Northeastern Illinois	12-6
12-4	Population Changes 1950-1978	12-8
12-5	Population Changes 1970-2000	12-8
12-6	1970 Land Use	12-9
12-7	Land Use Forecasts (Acres)	12-9
12-8	1970 Employment Characteristics	12-10
12-9	Employment Forecast	12-10
12-10	Estimated Lake Michigan Water Pumpage	12-12
12-11	Lake Michigan Standards Compared With General Use Standards For Selected Parameters	12-21
12-12	Maximum Water Temperatures, Lake Michigan	12-21
12-13	Violations in 1976 of Illinois In-Stream Water Quality Standards	12-25
12-14	Illinois Environmental Protection Agency Water Quality Stations	12-27
12-15	In-Stream Water Quality Analyses - Summary Data	12-28
12-16	Land Use Water Quality Sampling - Summary Data - Ravines	12-30
12-17	Municipal Type Wastewater Treatment Plants	12-35
12-18	Miscellaneous Wastewater Treatment Plants	12-38
12-19	Other Point Source Discharges	12-39
12-20	Septic System Areas Having Limitations	12-46
12-21	Local Water Quality Management Agencies	12-49
12-22	Municiapl Stormwater Detention Ordinances	12-51
12-23	Municipal Septic Regulations	12-53
12-24	Municipal Flood Plain Regulations	12-54
12-25	Recommended Plans, Publicly Owned Treatment Systems	12-67
12-26	Summary of Future Costs	12-67
12-27	Projected Annualized Local Costs	12-68
12-28	Projected Average Annual Increase in Household Wastewater Costs	12-69

CHAPTER TWELVE: LAKE MICHIGAN NORTH BASIN

(1) PREFACE

Because this Commission's areawide waste treatment study was limited in both time and financial resources, it was not possible to conduct a full scale research program sophisticated enough to adequately account for all the complexities of pollution in Lake Michigan. With the knowledge that water quality problems in the Lake were being addressed by a variety of other agencies, this Commission's efforts during the initial 208 planning program were limited in scope. The Commission's principal efforts regarding Lake water quality involved the sampling and analysis of water flowing into the Lake via streams and ravines. In December 1976, the Commission published Staff Paper No. 11, "Lake Michigan Water Quality Trends and Monitoring Programs in Illinois Waters."

This plan contains an overview of water quality problems, trends and opportunities for improvement. Both point and nonpoint sources are covered. However, primary emphasis is on the drainage basin tributary to the Lake and on the immediate near shore water areas.

12.01 DESCRIPTION OF THE BASIN

a. Physical Characteristics

(1) Geography: The 34,100-acre drainage area identified as Lake Michigan Basin-North is a narrow strip along the Lake Michigan coastline in Lake County. It includes 31 miles of shoreline stretching from the Cook County border on the south to the Wisconsin state line on the north. The basin extends inland about one mile at its southern boundary and about three miles at its northern boundary. All the rivers and streams in this basin flow directly into Lake Michigan (See Figure 12-1).

Certain areas in the basin are environmentally sensitive and deserve special attention in clean water planning. Wetlands extend from 3rd Street in Waukegan north to the Wisconsin line in a band that generally lies between the Chicago and Northwestern Railroad right-of-way on the west and the shoreline dunes on the east. They are important wildlife habitats. Those along Dead River, for example, are the only spawning areas for northern pike in the Illinois portion of the Lake Michigan Basin.

Ravines and bluffs are major natural features of the landscape. The ravines, some of which extend inland for more than a mile, are also important wildlife habitats.

Bluffs, some of which rise 90 feet above the beach, are characteristic of the shoreline from the Great lakes Naval Training Center south to Winnetka. Bluffs and ravines are sensitive to stormwater runoff, wave action and loss of vegetation, all of which contribute to soil erosion.

(2) Waterways: Lake Michigan, the second largest of the Great Lakes and the dominant waterway in northeastern Illincis, is a unique system with several complex features that must be considered in water quality planning.

The lake's bed is divided into two parts by an underwater ridge running from northern Wisconsin to central Michigan. The southern part of the lake is shallower and warmer than the northern part. Its shoreline configuration, underwater topography and geology affect littoral drift, turbulence and the disposition of suspended solids and benthic deposits. The areas of the lake bed most susceptible to harm, as a result of man's activities, generally are near harbors and marinas.

There are two "zones" in the Lake, a nearshore zone and an offshore zone that begins about five or ten miles from shore. The two zones are the result of differences in water temperature and density. There is little mixing of nearshore and offshore waters, so that pollutants discharged into near shore waters tend to remain close to shore. Winds and bottom topography also restrict the offshore movement of surface waters and inhibit the spread of nearshore pollution.

Annual and seasonal variations in water levels depend primarily on changes in precipitation and evaporation. Seasonal water levels generally are highest in mid-summer and lowest in mid and late winter. Rapid, short-term variations in lake levels are caused by changes in wind velocities and atmospheric pressure. Long-term variations are affected by the cumulative departures from normal annual precipitation.

Aside from the lake itself, the waterway network of this basin is relatively simple. The drainage system includes only six small streams that flow into the lake and one small lagoon. Each of these is described in Tables 12-1 and 12-2.

(3) Geology and Soils: The dominant deposit in the basin is till, which generally is found inland in the northern half of the basin and across the entire width of the southern half of the basin (below North Chicago). Till is relatively impermeable; water recharge capability is limited and there is risk of pollutant runoff to surface waters through applications of wastes, fertilizers or agri-chemicals.

In shoreline areas, highly permeable, coarse-grained beach and bar deposits are found. Infiltration is rapid and pollutants may enter groundwaters as a result of leachate from landfills, discharges from septic tanks and surface application of wastes, fertilizers or agri-chemicals.

TABLE 12-1. STREAM INVENTORY — LAKE MICHIGAN BASIN-NORTH BASIN

	LENGTH (MILES)	AVG. WIDTH (FT.)	WATER SURFACE (ACRES)	GRADIENT (FT/MILE)	DRAINAGE AREA (SQ. MILES)	COMMENTS
Bull Creek	.9	4.0	.4	NA	NA	
Dead River	1.5	150.0	27.2	9.3	6.0	
Kellogg Ravine	9.5	6.0	6.9	3.1	6.2	
Pettibone Creek	3.7	3.0	1.3	40.0	5.4	
Lake Michigan Tributary	4.0	6.0	2.9	30.0	1.5	
Waukegan River	8.5	4.0	4.1	21.8	9.0	

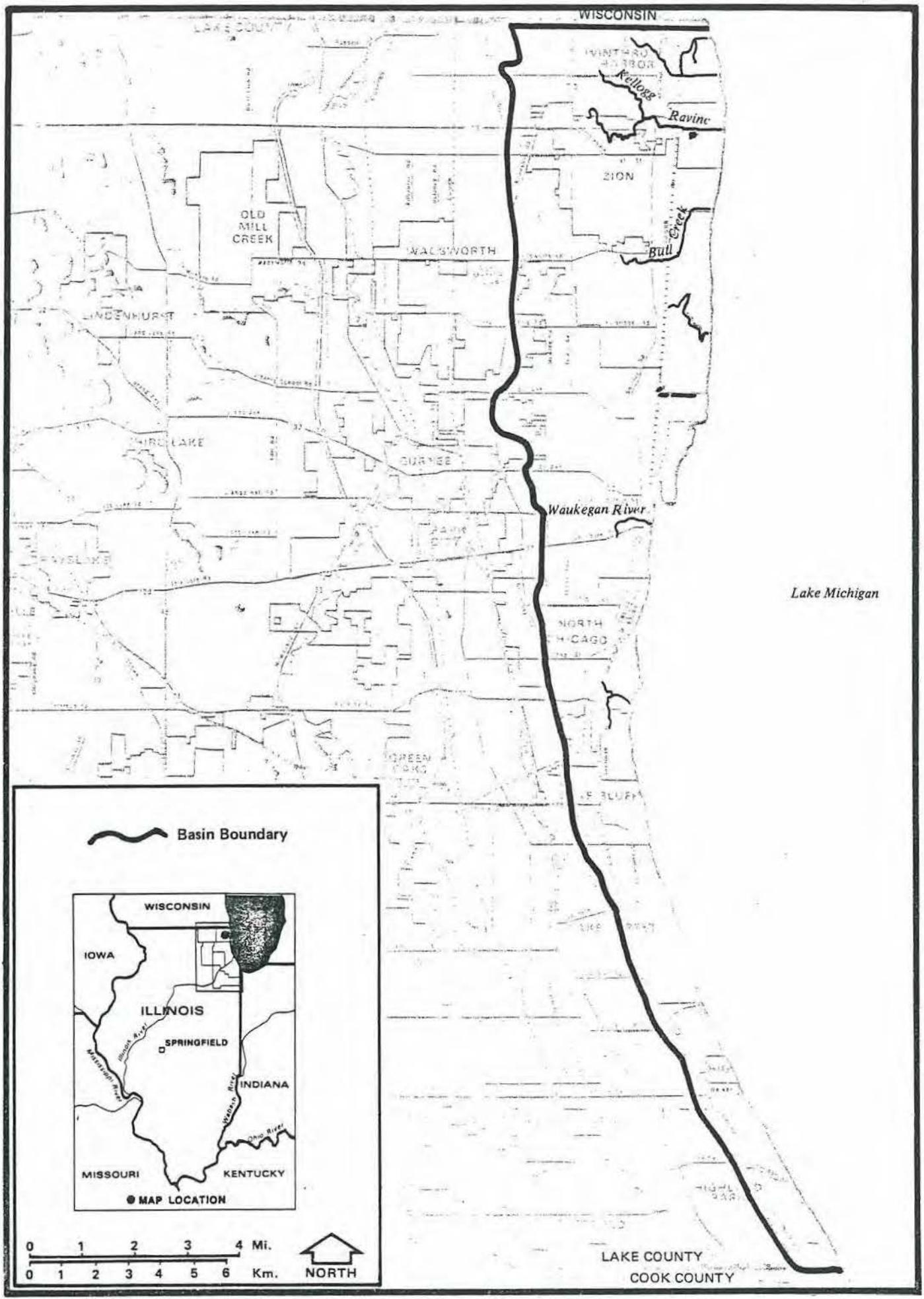
TABLE 12–2: LAKE AND POND INVENTORY — LAKE MICHIGAN BASIN-NORTH BASIN

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
JOHNS-MANVILLE LAGOON	45	12	10	2.5	1.4	12.0	NA	1926	Org.	

Some of the areas along the shoreline also are regarded as restricted for land disposal of effluents or residuals (even in sanitary landfills) because surficial sand and gravel aquifers lie within 20 feet of the surface. The high permeability of the surficial deposits could allow pollutants to infiltrate the aquifers.

Throughout the basin, geologic conditions indicate potential limitations for septic tank usage. Near the shoreline, usage is hampered by the high infiltration rate of surficial deposits and the proximity of surficial aquifers. Inland, in the till deposits, problems could result from the inability of septic wastes to infiltrate the impermeable soils. Surface runoff problems also could occur from the till, particularly where there are steep slopes.

Figure 12-1: BASIN LOCATION



Soils vary as to type and properties, and indicate the potential for impacts on water quality under certain conditions. Predominant soils in northeastern Illinois are described in Chapter Three. Soils occuring in this basin are identified in Table 12-3.

(4) Fish Species and Habitat: There was no fish sampling conducted in the Lake as part of the 208 program. However, extensive sampling has been conducted over the years by the Illinois Department of Conservation, the Natural History Survey, and other agencies, so a good data base is available.

Records indicate that 58 species are present in the Illinois portion of the Lake and its tributaries. These include non-native salmon species which have been introduced in recent years, and now provide excellent sportfishing opportunities, enhancing the recreational potential of the Lake.

As part of the 208 project, the Natural History Survey performed a number of "toxicity index" calculations relating existing water quality conditions to fish habitat suitability. Included in the parameters for computing the toxicity index are cadmium, nickel, arsenic, silver, chromium, boron, mercury, cyanide, ammonia, and copper, among others. On the basis of its analysis, the Natural History Survey determined that the toxicity index was well below the maximum level above which a diverse fishery cannot be maintained. The conclusion drawn is that existing water quality conditions in the Lake and tributary streams do not adversely impact upon fish and aquatic life, and indeed the Lake is favorable for the support of a diverse fishery.

Many fish native to the Lake have been either extirpated or their numbers vastly depleted due primarily to poor fishery management and the presence of alewives and (formerly) the sea lamprey. Excessive PCB levels are a lingering problem affecting several fish species. This problem is addressed in greater detail subsequently in this chapter.

b. Socio-Economic Characteristics

(1) Population: With all or portions of eight municipalities and two large military installations located in a narrow band along the Lake, the basin's population density (3,276 persons per square mile) is among the highest in northeastern Illinois outside of Chicago.

The estimated 1975 population in the basin was 157,700, representing 34 percent of Lake County's estimated 1975 population of 407,400. Population changes in basins municipalities are presented in Table 12-4 together with population changes in all of Lake County and the region as a whole.

TABLE 12-3: PREDOMINANT SOIL UNIT CHARACTERISTICS FOR NORTHEASTERN ILLINOIS

Unit In Basin	Soil Unit	Soil Color	Soil Texture	Permeability	Drainage	Subsoil Texture	Underlying Materials	Agricultural Usage Limitations	Approximate Percentage of Prime Agri. Land	Development Usage Limitations
YES	Fox-Dresden-Casco	brown	loam	mod-rapid	well	loam	sand and gravel	E, D, LF	12	S, E, ST
	Warsaw-Rodman-Lorenzo	brown	loam	moderate	well	loam	sand and gravel	E, D	50	S, E, ST
	Volinia-Selma-Lomax	brown	loam	moderate	excessive	loam	sand	WE, D, W	80	W, S, P
	Maumee-Watseka Plainfield	black	loamy sand	rapid	excessive	sand	sand	W, WE, D	30	S, W
YES	Zurich-Grays-Wauconda	gray	silt loam	moderate	moderate	clay loam	silt loam	W, E, LF	90	S, W, ST
YES	Drummer-Brenton-Proctor	brown	silt loam	moderate	moderate	clay loam	loam	W, E	100	W, S, P
YES	Miami-Kidder-McHenry	gray-brown	loam	moderate	well	clay loam	loam	E, ST, LF	40	ST, S, SS
	Drummer-Saybrook-Lisbon	dark gray	silt loam	moderate	moderate	clay loam	loam	W, E	80	W, S, SP, SS
	Ringwood-Griswold	brown	loam	moderate	well	clay loam	sandy loam	E, W	85	S, W, ST
YES	Morley-Markham-Ashkum	gray	loam	slow	moderate	silty clay	clay loam	E, W, LF	60	ST, SP, SS, W, HC
	Elliot-Ashkum-Beecher	dark gray	silt loam	slow	moderate	silt loam	clay loam	W, E	85	W, SP, CS, SS
	Milford-Martinton	black	silt loam	mod. slow	poor	silty clay	calcareous sediment	W	95	W, HC, P, SP, SS
	Symerton-Andres-Ashkum	black	silt loam	moderate	moderate	clay loam	clay loam	E, W	95	W, SP, SS
	Nappanee-Peotone-Del Rey	dark gray	silt loam	slow	well	silt loam	calcareous sediment	W, T, LF, E	50	W, SP, HC, P
	Frankfort-Bryce-Montgomery	dark brown	silt loam	slow	poor	silty clay	calcareous sediment	W, T, LF, E	5	W, SP, HC, P
	Romeo-Joliet	black	loam	moderate	poor	loam	limestone	W,STN, FL	60	W, SH, FL, SS
	Otter-Huntsville-Millington	black	loam	moderate	moderate	loam	loam	FL, W	95	W, FL
	Fox-Wauconda-Sawmill	dark gray	silt loam	moderate	poor	loam	sand	W, FL, E	75	W, FL
	Houghton-Lena	black	muck/peat	rapid	poor	muck/peat	sand/silt	HWT, W	0	W, P, S, HWT, LS

USAGE LIMITATION CODES

CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION
CS	Clayey Subsoil	D	Drouthiness	E	Erosion	FL	Flooding
HC	Heavy Clayey Subsoil	HWT	High Water Table	LF	Low Fertility	LS	Low Strength
P	Ponding	S	Seepage	SH	Shallowness to Bedrock	SP	Slow Percolation
SS	Shrink-Swell	ST	Steepness	STN	Stoniness	T	Soil Tilth
W	Wetness	WE	Wind Erosion				

One can see from the table that, according to U.S. Census estimates, total population in the communities that lie entirely or partly in the basin generally declined from 1970 to 1975. This is not a trend that will continue, according to population forecasts prepared in 1976 by this Commission in consultation with state, county and local agencies.

Table 12-5 presents forecasted population changes between 1970 and 2000 for the basin and for the North Shore Sanitary District Facility Planning Area. The population of the basin is forecasted to increase by the year 2000 to 214,000, an increase of 35.7 percent over the estimated 1975 population of 157,700.

(2) Land Use: In this basin there is a wide variety of land use, as indicated by the figures in Table 12-6. One-third of the basin total is vacant, agricultural or forested land. As would be expected in a suburban area of high population density, the next largest land use category is single-family residential.

More than 10 percent of the basin is categorized as public or quasi-public open space, including the Illinois Beach State park at Zion. Two large military installations, Fort Sheridan and the Great Lakes Naval Training Center, together utilize nearly 2,000 acres.

Industry in the basin, while not a major land use in terms of acreage, tends to be concentrated along the Lake. In addition, there are two Commonwealth Edison power plants on the lakeshore--the Waukegan fossil fuel plant and the Zion nuclear plant, the letter being located between the north and south sections of Illinois Beach State Park. Also located along the shoreline in this basin are two wastewater treatment plants and eight water filtration plants.

NIPC land use forecasts anticipate increasing urbanization of the basin and accompanying changes in land use, as indicated in Table 12-7. Largest increases, proportionately, are forecasted in non-residential land use categories, particularly in land for manufacturing and commercial purposes. The amount of undeveloped (open, vacant, agricultural) land is forecast to decrease by more than 25 percent by the year 2000.

(3) Economy: Economic activities in the basin in recent years reflect regional trends. Manufacturing employment has leveled off, while employment in wholesale trade, finance, insurance, real estate and government has increased. Total employment in the basin was 63,249 in 1970 (Table 12-8).

As indicated by employment figures, manufacturing plays a substantial role in the economy of the basin. Major employers include Outboard Marine Corporation, U.S. Steel Corporation, the Midland Division of Dexter Corporation, Johns-Manville Corporation, and Abbott Laboratories. All affect, to some degree, local water resources, particularly

TABLE 12-4. POPULATION CHANGE 1950-1975

Area	Population				% Change 1950-75
	1950	1960	1970	1975 (est.)	
HIGHLAND PARK	16,808	25,532	32,263	31,848	89
HIGHWOOD	3,818	4,499	4,973	4,832	27
LAKE BLUFF	2,000	3,494	5,008	4,895	145
LAKE FOREST	7,819	10,687	15,642	16,106	106
NORTH CHICAGO	8,628	22,938	47,275	42,639	394
WAUKEGAN	38,946	55,197	65,269	65,133	67
WINTHROP HARBOR	1,765	3,848	4,794	4,487	154
ZION	8,950	11,441	17,504	17,504	95
LAKE COUNTY	179,097	293,656	382,638	407,373	127
N.E. ILLINOIS	5,177,368	6,220,913	6,977,611	7,015,251	35

TABLE 12-5: POPULATION CHANGES 1970-2000

Year	Population		Percent Change**	
	Basin	NSSD FPA*	Basin	NSSD FPA
1970	146,071	-	-	-
1975	157,710	222,260	8.0	-
1980	169,349	230,950	15.4	1.9
1985	180,546	250,400	23.6	12.7
1990	191,743	269,850	31.3	21.4
1995	202,939	288,580	38.9	29.8
2000	214,136	307,310	46.6	38.3

* NSSD Facility Planning Area extends outside Lake Michigan Basin

** From 1970 for Basin population: From 1975 for FPA population.

Source: NIPC

TABLE 12-6: 1970 LAND USE

Land Use Category	Total Acres	% of Total
Single Family Residential	8,750.0	25.6
Multi Family Residential	238.5	0.7
Mobile Home Parks	89.2	0.3
Manufacturing and Processing	593.9	1.7
Transportation, Communications, & Utilities	568.2	1.7
Railroad Rights-of-way	650.7	1.9
Airports	215.9	0.6
Streets & Parking	3,389.2	9.9
Trade	531.5	1.6
Services-Private	159.9	0.5
Services-Institutional	699.3	2.1
Military Services	1,951.0	5.7
Cemetaries	204.1	0.6
Entertainment Assembly	7.2	0.0
Public Buildings	53.7	0.2
Public and Quasi-Public Open Space	3,793.6	11.1
Mining and Quarries	34.5	0.1
Vacant, Agricultural & Forest Areas	11,879.7	34.8
Vacant-Under Development	22.5	0.1
Water	91.6	0.3
Warehousing	31.2	0.1
Shopping Centers	65.5	0.2
Hotels-Motels	33.5	0.1
Parking Lots	52.4	0.2
Total	34,103.9	100.0

TABLE 12-7: LAND USE FORECASTS (ACRES)

Land Use Category	1980	1985	1990	1995	2000
Residential	9,078	9,246	9,414	9,839	10,304
Manufacturing	594	860	1,126	1,479	1,831
Commercial	632	925	1,218	1,602	1,989
Transportation/Communication, etc.	4,379	4,676	4,973	5,384	5,795
Open Space, Vacant Agriculture, etc.	19,421	18,397	17,373	15,780	14,185
Total	34,104	34,104	34,104	34,104	34,104

SOURCE: Northeastern Illinois Planning Commission, 1976

TABLE 12-8: 1970 EMPLOYMENT CHARACTERISTICS

Employment Category	Number of Employees 1970	% of Total
Construction	2,766	4.4
Manufacturing-Durable	11,039	17.5
Non-Durable	10,422	16.5
Transportation/Warehousing	645	1.0
Communication/Public Utility	869	1.4
Wholesale Trade	1,160	1.8
Retail Trade	7,613	12.0
Finance, Insurance, Real Estate	1,217	1.9
Services	8,186	12.9
Institutions	775	1.2
Federal Government	7,772	12.3
State Government	85	0.1
Local Government	5,677	9.0
Self Employment	5,023	7.9
Total	63,249	100.0

Source: 1970 estimates by Northeastern Illinois Planning Commission

TABLE 12-9: EMPLOYMENT FORECAST

CATEGORY	1970	1980	1985	1990	1995	2000	1970-2000 % Increase
Manufacturing	21,481	23,225	23,407	23,589	24,133	24,677	14.9
Local Retail	7,613	8,090	8,286	8,482	8,839	9,196	20.8
Other	34,155	46,833	49,847	52,860	57,011	61,162	79.1
Total	63,249	78,148	81,540	84,931	89,983	95,035	50.3

around Waukegan and North Chicago where industrial activity is concentrated.

Commercial navigation and commercial fishing, once important to Waukegan's economy, have nearly disappeared. Only three full-time commercial fishing licenses are currently issued for operation in the Illinois waters of Lake Michigan, and catches are strictly limited. Commercial

fishing in all of Lake Michigan is now a $400,000 a year industry, and does not compare with the resurgence of sport fishing, a $5 million a year industry.

Total employment in the basin is forecast to increase by 22 percent, to 95,035 employees, by the year 2000. Table 12-9 indicates continuing increases in all categories, although increases in manufacturing will be minimal.

(4) Water Supply: Lake Michigan is now, and will continue to be, the major source of water supply for northeastern Illinois. About five million people in Chicago and 89 other communities use lake water. In this basin, only the Village of Winthrop Harbor uses well water (for a portion of its needs). The Village also uses lake water supplied by the Lake County Public Water District. All other communities and the two military installations withdraw water from the Lake. In addition, the power plants at Waukegan and Zion use large volumes of lake water for cooling, as do some industries, including the large U.S. Steel plant in Waukegan. Table 12-10 presents the current and projected water pumpage for the basin communities.

(5) Government: The Lake Michigan Basin-North lies entirely within Lake County. The basin includes all or parts of eight municipalities, the largest of which, Waukegan, is the county seat and the primary center of governmental activity. Parts of five townships lie within the basin. The single sanitary district serving the basin is the North Shore Sanitary District (NSSD).

(6) Recreation: Lake Michigan and its shoreline offer recreational opportunities of local, regional and statewide importance.

Free public beaches are available at Illinois Beach State Park near Zion, Moraine Park Beach in Highland Park, and at the municipal beach in Waukegan. All other shoreline municipalities also have public beaches but charge admission.

Recreational boating is a major activity with local marinas unable to handle the demand. The Lake Michigan Regional Boating Survey, completed by the Corps of Engineers in 1974, indicated an existing excess demand for about 300 permanent storage facilities and 13 launching ramps at that time. In addition, the report stated there would be a shortage of fifty launching ramps and 2700 berths and moorings in Illinois waters by 1980. Part of that deficiency is allocated to the Lake Michigan-North Basin.

Launchings at Waukegan harbor have reached 800 per day, and the facility is to be expanded. There also is a proposal to build a large marina at Zion, although such plans currently are the subject of debate centered around economic, environmental, and other community and area interests.

TABLE 12-10: ESTIMATED LAKE MICHIGAN WATER PUMPAGE

Community	Population served 1974	Estimated Average Daily Pumpage (MGD)				
		1974	1980	1985	1990	2000
WINTHROP HARBOR (1)	4,083	0.27	0.46	0.65	0.85	1.22
ZION (1)	19,200	1.62	1.60	1.97	2.34	2.71
ILL. BEACH STATE PARK	-	0.03	-	-	-	-
WAUKEGAN	65,300	9.99	12.70	14.12	15.46	18.04
NORTH CHICAGO	18,000	16.00	16.16	16.32	16.32	16.95
LAKE BLUFF	5,200	0.52	0.73	0.90	1.07	1.22
LAKE FOREST	16,831	2.39	2.90	3.17	3.43	4.05
HIGHWOOD	5,000	0.50	0.52	0.58	0.62	0.88
HIGHLAND PARK	33,000	4.97	5.30	5.52	5.69	5.88
FORT SHERIDAN (2)	2,616	.50	NA	NA	NA	NA
GREAT LAKES NAVAL (2)	27,801	5.31	NA	NA	NA	NA
TOTAL	197,031	42.10	40.37	43.23	45.78	50.95

Revised 2/15/79

(1) Water Supplied by the Lake County Public Water District

(2) Data obtained by private communication, September 30, 1976

Source: NIPC Estimated Future Water Supply Demands for Northeastern Illinois, Rev. 1976.

Camping at Illinois Beach State Park reflects national trends and has increased rapidly in recent years. In the 10 years from 1961 to 1971, the number of campers using the park increased from 16,733 to 31,558. These lakeshore facilities frequently are used to capacity.

Although commercial fishing in Lake Michigan has been nearly ruled out due to USEPA and U.S. Food and Drug Administration concern over the presence of dangerous pollutants in fish flesh, sport fishing is increasing along with the growing populations of lake trout and salmon.

12.02 IMPACTS OF OTHER PROJECTS

a. Introduction

In many basins there are studies or projects underway which may impact directly or indirectly on surface and/or groundwater quality. Most will have indirect effects since they usually pertain to water quantity or hydrologic modifications. Included in these classifications are activities by the U.S. Department of Agriculture, Soil Conservation Service, related to flood control plans under Public Law 83-566. The U.S. Army Corps of Engineers has similar responsibilities for flood control works under a series of acts, the first of which was passed in 1936. In the recent past, the Corps was authorized to perform urban water resources studies which may cover the entire scope of water-related problems, ranging from flood control through water supply, recreation and, with local approval, areawide waste treatment management under Public Law 92-500.

The Corps of Engineers still retains its customary jurisdiction for navigation projects which include the construction and maintenance of navigable channels, harbors and rivers. Section 404 of Public Law 92-500 itself has delegated far-reaching authority to the Corps on the issuance of permits for the placement of dredged or fill materials into waters of the United States and adjacent lands.

The Coastal Zone Management Act of 1972 will have an impact on the use and protection of the Lake Michigan shoreline, the results of which will affect water quality through erosion control and other programs.

The Division of Water Resources, Illinois Department of Transportation, has statutory responsibility for navigation and flood control projects on water bodies throughout the state, as well as permit authority for private or public projects which enter, cross over or under lakes and streams. Where the federal government has primary responsibility on certain of these water bodies, responsibility is shared with the Corps of Engineers.

The City of Chicago has a long-range study evaluating the feasibility of constructing a series of island and promontories in Lake Michigan for recreational purposes. Recently, a community in Lake County expressed a similar interest, with the intention of reducing the impact of waves during storms.

The question of additional water to be diverted from Lake Michigan is currently being studied by several federal and state agencies. In addition, wastewater improvement projects in the Milwaukee, Wisconsin area and in the Indiana Harbor Canal will have direct beneficial effects on Lake Michigan water adjacent to Illinois.

There are many local, county, state, and federal public works projects other than those directly related to wastewater which impact on local water bodies. Perhaps the most significant type involves the construction or improvement of roads and highways. In those instances, drainage patterns are altered, local farm tiles may be interrupted, silt is introduced during construction, and vehicular pollutants are conveyed to local water bodies thereafter, all affecting water quality. Stream crossings by these highway projects and similar crossings by various public and private utilities all affect, to varying degrees and for various lengths of time, water quality in those lakes and streams. Not to be overlooked are public and private storm sewer outlets that may be authorized in the future.

As can be seen, there is a wide variety of projects that impact on water quality. However, in this section, attention will be given only to those of significant size, breadth or impact.

b. Corps of Engineers

(1) Navigation: The Corps has general jurisdiction over navigation in the waters of the United States. Responsibilities include channel and harbor construction and maintenance, clearing and snagging of obstructions, and control over the location and placement of structures which might impact upon navigation.

The Corps conducts routine maintenance dredging of the Federally-authorized navigation project which includes the outer entrance and navigation channel of Waukegan Harbor. While unpolluted materials suitable for beach nourishment are placed in inshore waters to replenish littoral drift downstream of the Harbor, other unpolluted materials not suitable for beach nourishment are deposited in offshore waters.

Maintenance dredging is scheduled for Waukegan harbor in 1979. In accordance with a request from the State of Illinois, an open lake disposal area will be used, located south of the harbor and as close to shore as possible.

(2) Small Boat Harbors: Under Resolutions adopted by the Public Works Committee of the U.S. House of Representatives, the Corps has a continuing study underway to determine the feasibility and need for additional small boat harbors along the Lake County shoreline, from Waukegan to the Illinois-Wisconsin State line. Preliminary indications are that two potential sites will be evaluated: one at Waukegan, south of the existing harbor, and the other at Zion. The principal purpose of the facilities, if constructed, would be to ease the greatly increased pressures on recreational boat launching and harbor facilities in northeastern Illinois. Another similar study has been intermittently underway since 1964 with the objective of determining the advisability of a recreational boat harbor further south, in the vicinity of Highland Park.

(3) Shore Erosion: Under other House Committee resolutions (dated December 2, 1971 and April 11, 1974), the Corps is involved in a continuing survey of shore erosion problems and control measures. The study area includes the entire Illinois shore, extending from the Wisconsin line south to the Indiana line. Particular attention has been given to areas of serious erosion damage, including the sites north of Waukegan, and in Lake Bluff, Fort Sheridan, Lake Forest, and Highland Park.

The original project was authorized in 1953 and included a series of groins and other shoreline protective measures, some of which have been installed at periodic intervals on a cost-sharing basis with municipal governments where public property was to be protected. Current House resolutions call for review and updating of earlier findings. In this regard, efforts have been coordinated with the Illinois Coastal Zone Management Program. When that program is fully implemented, the Corps may undertake site-specific projects such as construction of protective works in critical areas and beach nourishment.

(4) Wastewater Studies: Pursuant to Section 206 of the Flood Control Act of 1958 and resolutions adopted by Congress in 1971, the Corps developed plans for alternative wastewater management systems for the Chicago-South End of Lake Michigan (C-SELM) area, which covered portions of northeastern Illinois and northwestern Indiana. (This basin was included in the study.) Specifically, the study was directed at the evaluation of various regional wastewater management systems, including plans which would result in the elimination of pollutant discharges. An initial pilot study was completed in 1974. However, since this was only a planning study, the report contained no recommendations for federal action with respect to any of the specific wastewater management systems evaluated. The intent of Congress was for these studies to be presented to local units of government for their consideration and adoption, as

desired. Wastewater planning is now covered by Public Law 92-500.

(5) Lake Diversion Study: Section 166 of the Water Resources Development Act of 1976 authorized the Corps to evaluate the practicability of increasing the Illinois diversion of Lake Michigan waters in order to alleviate shoreline damage on the Great lakes during periods of high water levels, and to improve water quality in the Illinois Waterway. The project consists of a 5-year demonstration program which would increase average annual diversion from 3,200 cfs to as much as 10,000 cfs. Resultant adverse and/or beneficial impacts are to be evaluated.

The diversion rate may only be increased when: 1) the level of Lake Michigan is above its average levels; 2) when the Illinois Waterway is at less than bankfull capacity; and 3) when no adverse navigation effects would impact upon the St. Lawrence Seaway.

Current efforts are directed at the collection of data to serve for comparison purposes, and the initiation of an environmental impact assessment. Under the authorizing legislation, a report is to be submitted to Congress in October 1981 with the results of the demonstration study, including recommendations as to whether to continue the authority or to change the criteria. As now envisioned, actual increased diversion would not begin until the latter part of 1979, and then only if the conditions set forth in the Act exist at the time.

(6) Dredge and Fill Permits: Under Section 404 of Public Law 92-500, the Corps is authorized to issue permits for the placement of dredged or fill material into navigable waters or on adjacent land sites. Permits may be withheld if it is determined that the discharge of materials will have adverse effects on water supplies, fish and wildlife, or recreation. Under current guidelines, Corps authority extends to all navigable waters and tributaries thereto, up to points where the average annual flow is 5 cfs or more.

c. Soil Conservation Service

The Soil Conservation Service (SCS) in the U.S. Department of Agriculture is charged with developing and implementing a national soil and water conservation program. The Watershed Protection and Flood Prevention Act of 1954 (PL 83-566) provides a framework through which federal, state, and local units of government can deal with local water resources problems on a cooperative basis. This so-called "small watershed program" of the SCS is principally oriented toward the prevention of soil erosion and the control of flooding and sedimentation damages. Works typically include the construction of small reservoirs,

stream channelization, grade stabilization, and bank protection.

The Soil Conservation Service has no active programs in Lake Michigan Basin-North other than case-by-case technical assistance which is offered to landowners and local units of government in the interest of reducing erosion and sedimentation. The SCS is active in other basins, however, as part of a cooperative program with the MSDGC to develop flood control plans for six watersheds in the region. The County of Lake is a cooperating agency for two of these basin studies: North Branch, Chicago River and the Des Plaines River.

d. Illinois Division of Water Resources

The Division of Water Resources, a unit of the Illinois Department of Transportation, is involved in programs directly pertaining to water and related land resources management in the basin.

(1) Coastal Zone Management: In 1972, Congress passed the Coastal Zone Management Act (PL 92-583) which established a national policy to preserve, protect, develop, restore, and enhance coastal zone resources (including the coastal zone of the Great Lakes). In Illinois, responsibility for implementation of the provision of the Act has been vested in the Division of Water Resources. Program requirements include: identification of the boundaries of the coastal zone; definition of what constitutes permissible land and water uses within the coastal zone that have direct and significant impacts on the coastal waters; an inventory and designation of areas of particular concern; an identification of the means by which the state proposes to exert control over these lands and waters; broad guidelines on the priority of uses in particular areas; and a description of the organizational structure proposed to implement the program.

In Illinois, a recommended CZM program was developed by the Division of Water Resources. Major water quality related features of the program included greater control of land use activities on the shoreline area and attention to shore and bluff erosion. However, in November, 1978, the General Assembly failed to pass the necessary enabling legislation which would have allowed these and other elements of the program to be implemented. Also, as a result of the General Assembly's failure to act, federal support for the program was withdrawn, effective December 31, 1978. The future of the program is uncertain at this time, and would be dependent upon passage of the necessary legislation in future years.

(2) Lake Water Allocation: The Division has also been assigned responsibility for allocating Lake Michigan water to Illinois users for water supply and other purposes within the 3,200 cfs diversion limitation established by the U.S. Supreme Court. Following extensive hearings, an initial allocation was made to various units of government through the year 1980. The allocation order sets forth the amount of water which may be used by each unit and the purposes for which it may be used. The order also establishes rules and regulations relative to the management of water use. All communities in the basin are affected by the initial allocation order, and will continue to be affected by subsequent orders.

(3) Lake Water Diversion Accounting Procedures: The Division and other state agencies currently are attempting to secure a revision in the method by which the amount of water diverted from Lake Michigan is measured and accounted for. Under this proposed revision, direct diversion would be measured at the lakefront intake structures instead of at Lockport, where measurements are now made. In addition, the stormwater runoff component of diversion would be assumed a constant, 550 cfs long-term average. (Currently, this amount is computed at approximately 730 cfs.) The rationale for assigning the lower 550 cfs figure is predicated on the fact that the stormwater runoff component of the diversion varies from year to year, with the long-term average being 550 cfs. In certain wet years the natural diversion has been 730 cfs as a maximum five year moving average. Since the Supreme Court decree specified a five year moving average of 3200 cfs total water use, it is necessary that 730 cfs be reserved each year for natural diversion in order to meet the limitations. The use of the 550 cfs long-term average as a fixed value will also facilitate accounting procedures.

In an effort to gain acceptance of this accounting method, a meeting of Great Lakes States' Attorney-Generals was held in 1977, and the Illinois proposal was presented. If agreement can be reached among the states and if the revised accounting method is approved by the U.S. Supreme Court, an additional 180 cfs of lake water could be made available for distribution to existing and new water supply users in the region. This would be possible even though the overall 3,200 cfs limitation would remain in effect.

(4) Permits: The Division issues permits for all public and private projects located below the highwater elevation of Lake Michigan, including beach protection devices, water intakes, cooling water discharge structures and storm sewer outlets.

e. Illinois Department of Conservation

The Illinois Department of Conservation is responsible for fish and wildlife management and it also administers the park system. In connection with the former, the Department has been involved in a program to establish and maintain a viable sport fishery in the Illinois portion of Lake Michigan, including the stocking of salmon. If tributary streams are to be used more extensively for this purpose in the future, water quality and other improvement measures may need be taken to upgrade their suitability. The Department of Conservation, with assistance from the ICZM program is also attempting to establish a naturally reproducing population of Lake Trout in Illinois waters of Lake Michigan through offshore reef stocking.

With respect to park management, the Department operates the existing Illinois Beach State Park near Zion. In addition to future land acquisition, the Department studied the feasibility of constructing a large (3,000 boat) recreational harbor on park property. The plan was rejected early in the study as being environmentally unacceptable.

f. Illinois Division of Highways

The Division of Highways, another unit of the Illinois Department of Transportation, is responsible for state highway construction. Highways have associated water quality impacts both during their construction (e.g. erosion and sedimentation, disruption of drainage, etc.) as well as when placed in use (e.g. road salt usage, roadway drainage). Long-range plans call for a multi-lane lakefront freeway from Waukegan north to Zion.

g. Local Units of Government

Municipalities, the County of Lake, and special purpose districts are involved in a number of local projects which have direct or indirect water quality effects. The general purpose units are empowered to adopt regulations such as flood plain ordinances, on-site stormwater detention ordinances, and soil erosion and sedimentation control ordinances. All of these have the potential for improving water quality in tributary streams and ravines, and consequently, in the Lake itself. Zoning ordinances, building codes, and health regulations all have the potential for at least peripheral impact on local water quality. Still other effects result from more routine activities such as street sweeping, sewer and catch basin cleaning, and solid waste management.

Special purpose districts also are involved. The extensive wastewater management program of the NSSD will be covered in a subsequent section. Lake County Forest Preserve District acquisitions also may have a bearing on future development in the basin. The Lake County Soil and Water Conservation District long has been active in promoting soil erosion control measures.

12.03 WATER QUALITY IN THE BASIN

a. Stream Classifications and Applicable State Standards

All waterways in the basin are designated as "General Use, Protected for Public and Food Processing Water Supply," and are subject to state standards for waterways with such designation (see Table 4-2 in Chapter Four). However, the state has set more stringent standards for certain parameters in the Lake and they are listed in Table 12-11. In addition to the different standards for various parameters, specific standards for Lake Michigan water temperature also have been established. These are shown in Table 12-12.

As disussed in Chapter Four, the IEPA has divided the state into hydrologic units that coincide with major river basins. These units have been further divided into segments on the basis of common characteristics. The Lake Michigan Basin-North is identical to segment A-11, which is one of the 20 segments in the Des Plaines/Lake Michigan hydrologic unit as defined by the IEPA. This segment, like all others in the state, has been designated "water quality limited." This means that water quality now does not currently meet established standards and/or is not expected to meet these standards even after the minimum statutory limitations have been applied to effluents discharged to the water body.

b. Sources of Water Quality Information

Assessment of current water quality conditions in lake Michigan and its tributaries is based on information from public agencies at several levels. No computer simulation results for water quality are available because the basin is one of three in the region for which water quality modeling was not conducted as part of areawide planning. Lake Michigan is so vast and its hydrology so complicated that no meaningful results could be anticipated from modeling within the time and financial resources available.

In general, assessment of water quality in the basin has been based on information from these sources:

TABLE 12-11: LAKE MICHIGAN STANDARDS COMPARED WITH GENERAL USE STANDARDS FOR SELECTED PARAMETERS

Parameter	Standard (in mg/l unless otherwise indicated)	
	Lake Michigan	General Use
BIOLOGICAL		
Fecal Coliform (per 100 ml.)	20	200
CHEMICAL		
Ammonia Nitrogen (as N)	0.02	1.5
Arsenic	1.0	1.0
Chloride	12.0	500.0
Dissolved Oxygen	*	6/5
Iron (total)	1.0	1.0
Lead	0.1	0.1
Phenols	0.1	0.1
Phosphorous (as P)	0.007	0.05**
Sulfates	24.0	500.0
PHYSICAL		
Total Dissolved Solids	180.0	1000.0

Revised 2/15/79

*Not less than 90% saturation except for natural causes

**Applicable in reservoirs or lakes and in streams at points of entry to reservoirs or lakes

TABLE 12-12: MAXIMUM WATER TEMPERATURE STANDARDS - LAKE MICHIGAN

	Jan.	Feb.	Mar	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Maximum Temperature (F°)	45°	45°	45°	55°	60°	70°	80°	80°	80°	65°	60°	50°

(1) Commission Sampling and Analyses Programs: Sampling and analyses programs conducted by the Commission as part of Areawide Planning included the following activities

(a) In-Stream Sampling: Three of the 48 in-stream sampling stations established for areawide planning (see Chapter Four) were within Lake Michigan Basin-North. Their locations (as shown on Figure 12-2) were:

- Station 46: Kellogg Ravine at 16th Street in Winthrop Harbor,
- Station 47: Waukegan River at Genesee Street in Waukegan,

- Station 48: Pettibone Creek at the Great Lakes Naval Training Center boat harbor.

(b) Land Use Runoff Sampling: Also located in the basin were two stations for sampling tributary stormwater runoffs:

- Station 17: Ravine at the Ft. Sheridan water treatment plant,

- Station 18: Ravine at Ravine Drive in Highland Park.

(2) IEPA Data: Data cited below are from the IEPA's sampling of chemical and physical parameters in 1976. Samples were collected at 17 stations in the basin. Three stations were in tributary streams, 12 were off beaches, and two were at public water supply intakes. Station locations are depicted in Figure 12-2.

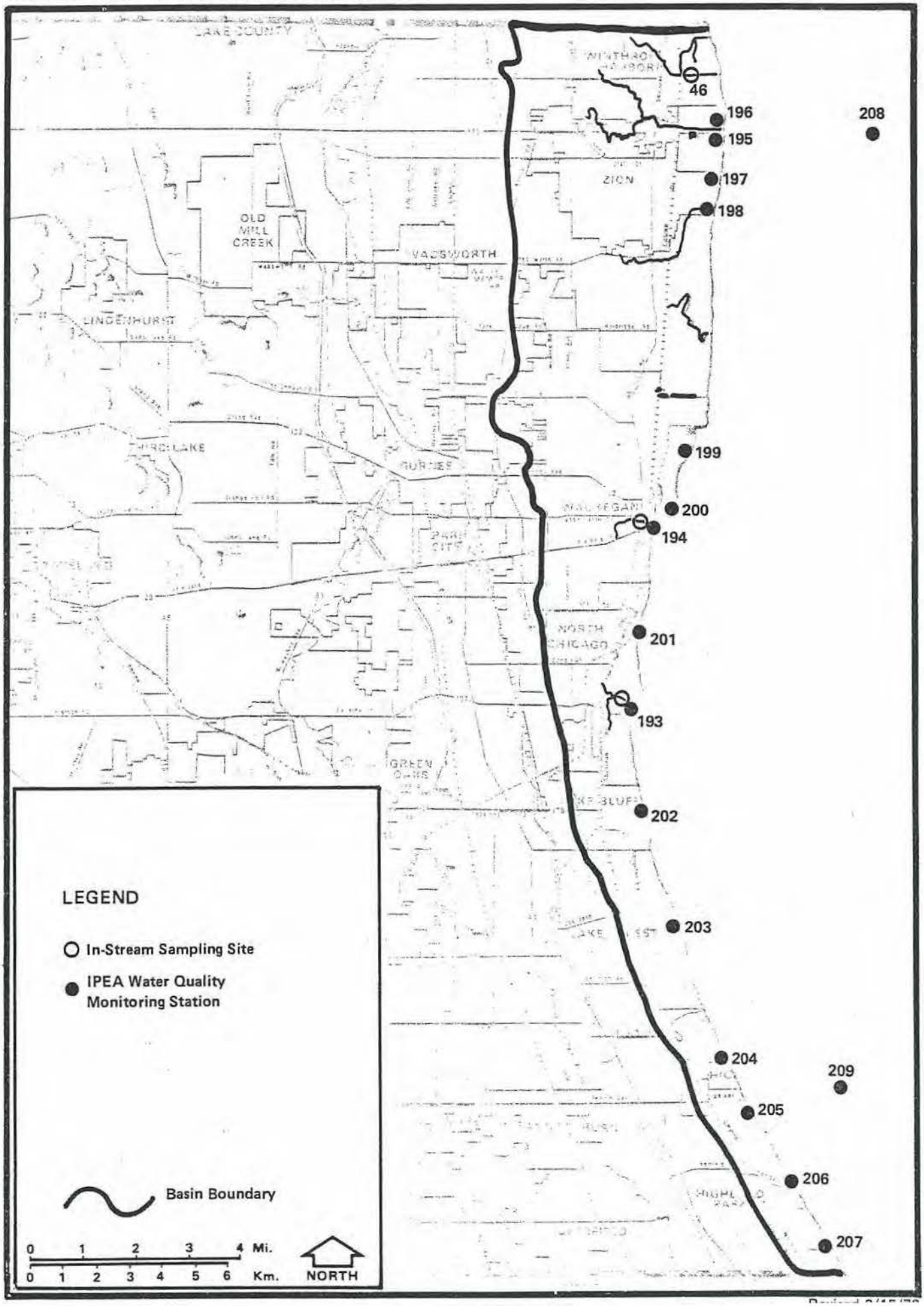
Also cited below are IEPA results from fish sampling and analyses conducted in 1974; benthic surveys of the Lake, near shore, in 1973; and ongoing studies of pesticides and polychlorinated biphenyls (PCB's) in streams that are tributary to the Lake.

(3) Other Studies: Two organizations, the Illinois Coastal Zone Management Program (ICZM) and the Great Lakes Basin Commission, have issued recent reports on various aspects of Lake Michigan and its shoreline. Both have emphasized the water quality impacts of shoreline erosion. Their findings have been used as a basis for assessing erosion problems in the basin and have been considered in the analyses of other subjects of concern, including toxic substances.

Additional aspects of Lake Michigan water quality are being examined in federally sponsored programs, including a recently concluded two-year study of the Lake's water quality by USEPA. The study is part of a U.S.-Canadian effort sponsored by the International Joint Commission. Underway are studies in a series of reports entitled "Environmental Status of the Lake Michigan Region." Responsibility for these studies rests with the U.S. Energy Research and Development Administration, but the reports themselves are being prepared by the Argonne National Laboratory. As results of this research become available during subsequent years, they will need to be studied and the results applied as necessary to this initial plan for the basin. The same holds true for ongoing work by IEPA and other agencies that monitor the water quality of the Lake and its tributaries.

A full discussion of all major monitoring and analysis programs that include Lake Michigan can be found in the Commission's 208 Staff Paper No. 11, "Lake Michigan Waters Quality Trends and Monitoring Programs in Illinois Waters."

FIGURE 12-2: WATER SAMPLING STATIONS



c. Results of Sampling and Analyses

(1) IEPA Programs: As the data in Table 12-13 (A, B, C) indicate, violations of some state water quality standards were recorded at each of the 17 IEPA sampling stations during 1976. Standards for fecal coliform and total phosphorous were violated at all the stations; most stations experienced violations of standards for ammonia nitrogen, chloride, sulfate and total dissolved solids. Table 12-14 presents a locational description of each IEPA station.

A summary of the analytical results reveals the following:

(a) Tributary Streams

- 52 violations of the phosphorus standard were recorded out of a total of 55 analyses. With no treatment plants discharging in these streams, it is self-evident that stormwater runoffs were responsible. It should also be noted that the 0.007 mg/l standard applicable to Lake Michigan waters probably cannot be met in these tributary streams.

- 39 apparent violations of the fecal coliform standard were noted out of 54 analyses.

- Pettibone Creek (No. 193) recorded the highest numbers of parameters violated (6) and the largest number of violations (41).

(b) Beaches

- Total phosphorus and ammonia nitrogen standards were violated consistently at all sampling stations. There was a 100 percent violation of the phosphorus standard, and 87 percent of the samples showed ammonia nitrogen violations.

- Fecal coliform standards were violated in 45 percent of the samples.

- The Highland Park-Ravine Drive sampling station (No. 206) had nine parameters which were violated, the largest number among all beach sampling stations.

(c) Water Supply Intakes

- Total phosphorus and ammonia nitrogen standards were violated consistently at both stations. There was a 91 percent violation of the phosphorus standard, and 72 percent of the samples showed ammonia nitrogen violations.

o Fecal coliform standards were violated in 23 percent of the samples.

(2) NIPC Programs:

(a) Tributary Streams: Results of the Commission's limited sampling program on tributary streams during 1976-77 generally were consistent with IEPA findings. (See Table 12-15). Violations of the ammonia nitrogen standard were infrequent or nonexistent in all cases. Commission results for DC, however, indicate slightly worse conditions than those indicated by IEPA results, although in neither case were DC levels cause for concern.

With respect to pesticides, none of the samples taken from tributary streams revealed concentrations in violation of state standards for DDT, diedrin or heptachor expoxide, the three pesticides included in the IEPA program. Traces of each pesticide were found in all samples, however.

Illinois does not have stream standards for PCBs. However, the USEPA recommends 1.0 parts per billion (ppb) as a criterion for open water samples. None of the samples from Lake Michigan tributaries produced concentrations in excess of the USEPA's suggested standard. The highest concentration found was 0.79 ppb in Pettibone Creek in July, 1976; the next highest was 0.47 ppb in the same stream in February, 1976. Most samples contained PCB concentrations of less than 0.1 ppb.

Results cited here are consistent with the "Water Quality Index" classification system used by IEPA. According to that index, Pettibone Creek improved from a "semipolluted" condition in 1972 to a "good" condition in 1975. The Waukegan River was upgraded from "polluted" in 1971 to "good" in 1975. No index has been computed for Kellogg Ravine, but statistics cited here indicate it to be in about the same condition as the other two tributaries. There is room for improvement in levels of fecal coliform and phosphorus in all three tributaries but overall, in-stream water quality is good and the potential for tributary streams to contribute harmful pollution in the lake is minimal.

(b) Land Use Runoff Program: Table 12-16 presents the summary statistics of laboratory analyses of stormwater runoff samples collected for the Commission's two ravine sites. Fifteen chemical and seven heavy metal constituents were analyzed. Mean and maximum values for both copper and lead violated state standards. Both mean and maximum values for all other heavy metals met the standards.

Illinois has established water quality standards for pH, DC, and ammonia nitrogen and for total phosphorus. The pH and ammonia nitrogen values (maximum and mean) complied with the standard. The soluble phosphorus concentrations alone, which should be equal to or less than the total phosphorus in the sample, exceeded the established standard

TABLE 12-13A: VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

Lake Michigan BASIN North Beaches

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																		
			Ammonia Nitrogen 0.02	Fecal[2] Coliform (per 100 ml.) 20	Iron 1.0	Copper 0.02	Dissolved Oxygen (4)	Lead (4)	Silver (4)	Chloride 12	Fluoride (4)	PH (Units) (4)	Boron (4)	Sulfate 24	Cyanide (4)	Hexavalent Chromium (4)	Total Phosphorus 0.007	Manganese (4)	Phenol (4)	Total Dissolved Solids 180	Temp. (°F) (45-80)
196	Lake Michigan (Beach)	No. of Analyses	14	14	7	7				14				15			14			14	16
		No. of Violations	12	6	1	0				1				1			14			3	0
QH 01		Maximum	0.15	3300	1.2					14				28			0.140			195	
		Minimum	0.00	2	0.1					8				19			0.026			162	
		Mean[3]	0.07	27	0.4					9				21			0.079			170	
197	Lake Michigan (Beach)	No. of Analyses	14	15	7	7				14				15			14			14	16
		No. of Violations	12	9	0	1				1				1			14			3	0
QH 02		Maximum	0.15	2000		0.03				13				26			0.205			189	
		Minimum	0.02	2		0.00				8				18			0.019			162	
		Mean[3]	0.07	31		0.00				9				21			0.073			170	
198	Lake Michigan (Beach)	No. of Analyses	13	14	7	7				13				14			13			12	15
		No. of Violations	12	6	1	1				0				1			13			2	1
QH 03		Maximum	0.12	1000	1.8	0.03								25			0.210			189	75
		Minimum	0.02	2	0.0	0.00								18			0.011			162	50
		Mean[3]	0.06	23	0.4	0.00								20			0.079			170	61
199	Lake Michigan (Beach)	No. of Analyses	13	13	7	7				13				14			12			13	15
		No. of Violations	13	6	0	1				2				3			12			4	1
QH 04		Maximum	1.60	210		0.03				25				55			0.142			259	79
		Minimum	0.04	2		0.00				8				18			0.011			161	49
		Mean[3]	0.33	16		0.00				10				24			0.075			178	63
200	Lake Michigan (Beach)	No. of Analyses	14	14	7	7				14				15			14			14	16
		No. of Violations	13	3	0	1				1				2			14			0	1
QH 05		Maximum	1.10	140		0.03				13				25			0.170				75
		Minimum	0.00	2		0.00				8				19			0.008				48
		Mean[3]	0.24	7		0.00				9				22			0.071				63
201	Lake Michigan (Beach)	No. of Analyses	14	14	7	7				14				15			14			13	15
		No. of Violations	13	6	0	0				2				1			14			3	0
QI 01		Maximum	0.55	190						15				38			0.260			198	
		Minimum	0.01	2						8				18			0.024			163	
		Mean[3]	0.10	13						9				22			0.084			172	
202	Lake Michigan (Beach)	No. of Analyses	13	14	7	7				13				14			13			13	15
		No. of Violations	12	3	1	0				0				0			13			0	0
QI 06		Maximum	0.16	200	1.1												0.280				
		Minimum	0.02	2	0.0												0.034				
		Mean[3]	0.06	9	0.3												0.097				
203	Lake Michigan (Beach)	No. of Analyses	14	14	7	7				14				15			14			14	16
		No. of Violations	13	4	1	0				0				1			14			0	0
QI 10		Maximum	0.21	200	1.2									25			0.240				
		Minimum	0.02	2	0.0									18			0.018				
		Mean[3]	0.06	9	0.3									20			0.070				
204	Lake Michigan (Beach)	No. of Analyses	14	15	7	7				14				15			15			15	16
		No. of Violations	9	7	2	0				0				1			15			1	0
QJ 04		Maximum	0.23	3800	3.1									25			0.160			184	
		Minimum	0.00	2	0.0									18			0.024			161	
		Mean[3]	0.05	23	0.8									21			0.073			168	
205	Lake Michigan (Beach)	No. of Analyses	13	14	7	7				13				14			14			14	15
		No. of Violations	9	9	0	0				1				1			14			1	0
QJ 05		Maximum	0.18	1600						13				25			0.095			185	
		Minimum	0.00	2						8				18			0.024			161	
		Mean[3]	0.08	61						9				21			0.059			168	
206	Lake Michigan (Beach)	No. of Analyses	14	14	7	7				14				15			15			15	16
		No. of Violations	13	9	2	1				1				1			15			1	1
QJ 08		Maximum	0.11	1200	1.7	0.03				13				25			0.420			190	76
		Minimum	0.02	2	0.1	0.00				8				19			0.030			161	50
		Mean[3]	0.05	39	0.7	0.00				9				20			0.095			168	63
207	Lake Michigan (Beach)	No. of Analyses	12	13	6	6				12				12			13			12	14
		No. of Violations	10	7	1	1				1				0			13			1	0
QJ 09		Maximum	0.17	39,000	6.0	0.03				34							0.560			251	
		Minimum	0.0	2	0.0	0.00				8							0.029			161	
		Mean[3]	0.05	39	1.3	0.00				10							0.092			172	

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) Fecal coliform violations are apparent violations. (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric.

(4) No water quality violations for this parameter were reported.

TABLE 12 13B: VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

Lake Michigan BASIN North
Tributary Streams

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																			
			Ammonia Nitrogen	Fecal[2] Coliform (per 100 ml.)	Iron	Copper	Dissolved Oxygen	Lead	Silver	Chloride	Fluoride	PH (Units)	Boron	Sulfate	Cyanide	Hexavalent Chromium	Total Phosphorus	Manganese	Phenol	Total Dissolved Solids	Temp. (°F)
			1.50	200	1.0	0.02	(4)	0.10	(4)	(4)	(4)	(4)	1.0	(4)	(4)	(4)	0.050	(4)	(4)	(4)	(4)
193	Pettibone Creek	No. of Analyses	19	19	10	10		10					10				19				
		No. of Violations	0	16	2	3		1					1				18				
		Maximum		15,000	2.3	0.11		0.23					1.1				0.480				
QA 01		Minimum		60	0.1	0.00		0.00					1.3				0.040				
		Mean[3]		1929	0.5	0.02		0.02					0.5				0.139				
194	Waukegan River	No. of Analyses	19	18	10	10		10					10				19				
		No. of Violations	0	16	0	2		0					0				19				
		Maximum		21,000		0.10											0.870				
		Minimum		98		0.00											0.080				
QC 01		Mean[3]		2691		0.02											0.210				
195	Kellogg Ravine	No. of Analyses	17	17	13	10		10					10				17				
		No. of Violations	1	7	3	0		0					0				15				
		Maximum	4.10	4500	1.3												0.210				
		Minimum	0.00	10	0.5												0.020				
QF 01		Mean[3]	0.32	170	0.8												0.109				
		No. of Analyses																			
		No. of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.
(2) Fecal coliform violations are apparent violations. (See narrative)
(3) All mean values are arithmetic except for fecal coliforms, which are geometric.
(4) No water quality violations for this parameter were reported.

TABLE 12-13C: VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

LAKE MICHIGAN BASIN NORTH
WATER SUPPLY INTAKES

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																			
			Ammonia Nitrogen	Fecal[2] Coliform (per 100 ml.)	Iron	Copper	Dissolved Oxygen	Lead	Silver	Chloride	Fluoride	PH (Units)	Boron	Sulfate	Cyanide	Hexavalent Chromium	Total Phosphorus	Manganese	Phenol	Total Dissolved Solids	Temp. (°F)
			0.02	20	0.3	(4)	(4)	(4)	(4)	12	(4)	(4)	(4)	24	(4)	(4)	0.007	(4)	(4)	180	(45-80)
208	Lake Michigan Water Intake	No. of Analyses	20	21	10					20				21			18			20	22
		No. of Violations	14	4	0					1				2			16			1	1
		Maximum	0.13	100						13				27			0.132			181	71
QH 08		Minimum	0.00	2						8				18			0.000			159	37
		Mean[3]	0.05	4						9				21			0.037			169	53
209	Lake Michigan Water Intake	No. of Analyses	19	19	10					19				19			16			19	20
		No. of Violations	14	5	1					0				3			15			0	2
		Maximum	0.16	2000	1.2									26			0.076				71
QJ 06		Minimum	0.00	2	0.0									18			0.000				37
		Mean[3]	0.05	8	0.2									21			0.030				54

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.
(2) Fecal coliform violations are apparent violations. (See narrative)
(3) All mean values are arithmetic except for fecal coliforms, which are geometric.
(4) No water quality violations for this parameter were reported

TABLE 12-14: ILLINOIS ENVIRONMENTAL PROTECTION AGENCY WATER QUALITY STATIONS

Lake Michigan **BASIN** - North

MAP STATION NUMBER	IEPA CODE NUMBER	STATION DESCRIPTION	STREAM NAME
193	QA 01	Great Lakes NTC-Off Bank at Spillway	Pettibone Ck.
194	QC 01	EJ & E RR Bridge, 200 yards from Mouth	Waukegan River
195	QF 01	20 yds upstream from Lake Michigan	Kellogg Ravine
196	QH 01	Winthrop Harbor - Main St. Beach	Winthrop Har.
197	QH 02	Zion Ft. of Rt 173 Extension - 21st St.	Lk. Michigan
198	QH 03	Ill. Beach St. Park - Concession Build.	Lk. Michigan
199	QH 04	Waukegan-North Beach at Bath House	Lk. Michigan
200	QH 05	Waukegan-Central Beach at Bath House	Lk. Michigan
201	QI 01	North Chicago- Foss Pk. Beach at S. End	Lk. Michigan
202	QI 06	Lake Bluff-Ctr.Ave. Beach at Bath House	Lk. Michigan
203	QI 10	Lake Forest-Westminister Ave. Beach	Lk. Michigan
204	QJ 04	Highwood-Walker Ave. Beach	Lk. Michigan
205	QJ 05	Highland Pk. Park Ave. Beach at Bath H.	Lk. Michigan
206	QJ 08	Highland Pk-Ravine Dr Beach-So of STW	Lk. Michigan
207	QJ 09	Highland Pk-Cary Av. Beach,S.of Prk Lot	Lk. Michigan
208	QH 08	Zion-Benton Wtr Intake at Camp Logan	Lk. Michigan
209	QJ 06	Highland Park Water Intake	Lk. Michigan

TABLE 12-15 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

LAKE MICHIGAN NORTH BASIN

STATION NO. 46

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		ph (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5[2]	BOD_{20}[2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
JUNE 1 – 10 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.4	276	33	88	906	18	28	11	6	8			1.6	0.5	2.9	0.42	9	410	13	
	Minimum	7.5	230	9	6	502	1	12	1	2	3			0.1	0.1	0.7	0.06	4	351	4	
	Mean	8.0	252	16	22	631	4	19	8	3	5			0.7	0.2	1.5	0.16	6	380	6	
SEPTEMBER 7 – 16 1976	No. of Analyses	2	1	2	2	2	2	2	2	1	1			2	2	2	2	1	0	1	2
	Maximum	7.4	58	74	117	280	20	22	8	12	35			1.4	0.5	0.8	0.16	9		22	1
	Minimum	7.3	58	60	83	272	16	26	6	12	35			1.3	0.2	0.7	0.16	9		22	0.7
	Mean	7.3	58	67	100	276	18	21	7	12	35			1.3	0.3	0.7	0.16	9		22	0.9
DECEMBER 5 – 15 1976	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
FEBRUARY 21 – 28 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
MARCH 14 – 19 1977	No. of Analyses	10	6	10	10	10	10	19	10	6	6			10	10	10	10	6	2	6	10
	Maximum	7.7	216	26	26	1152	12	13	11	5	18			1.6	0.7	1.1	0.11	9	420	5	0.8
	Minimum	7.2	168	6	6	844	3	1	4	2	7			1.0	0.4	0.8	0.02	7	375	2	0.3
	Mean	7.5	194	12	18	934	6	6	9	4	11			1.3	0.6	1.0	0.04	8	398	3	0.6

STATION NO. 47

JUNE 1 – 10 1976	No. of Analyses	30	10	30	30	30	30	30	29	10	10			30	30	30	30	10	2	10	
	Maximum	8.3	274	32	90	1176	16	23	11	4	7			1.7	0.5	1.2	0.36	6	488	12	
	Minimum	7.5	212	7	4	474	1	12	5	2	3			0.1	0.0	0.2	0.06	3	391	4	
	Mean	7.9	257	11	18	829	4	17	8	3	6			0.7	0.2	0.7	0.14	4	439	7	
SEPTEMBER 7 – 16 1976	No. of Analyses	29	10	29	29	29	29	29	29	10	10			29	29	29	29	10	2	10	29
	Maximum	8.4	308	53	74	866	16	24	12	6	24			1.6	0.4	0.8	0.23	12	481	25	3.5
	Minimum	7.4	59	4	3	292	0	15	3	1	2			0.1	0.0	0.0	0.0	5	457	3	0.1
	Mean	8.0	229	10	17	652	4	19	8	2	6			0.6	0.1	0.3	0.10	9	469	10	0.6
DECEMBER 5 – 15 1976	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
FEBRUARY 21 – 28 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
MARCH 14 – 19 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	10
	Maximum	8.0	196	58	105	2928	27	17	12	7	21			1.2	0.8	1.8	0.14	9	392	10	3.9
	Minimum	7.4	115	6	11	608	4	2	8	2	1			0.2	0.1	0.4	0.02	5	346	1	1.4
	Mean	7.7	176	18	40	987	9	7	10	3	8			0.6	0.3	0.7	0.05	6	369	3	2.0

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited.

(3) Analysis by Nalco

TABLE 12-15 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

LAKE MICHIGAN – NORTH BASIN

STATION NO. 48

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		ph (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5[2]	BOD_{20}[2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
JUNE 1 – 10 1976	No. of Analyses	30	10	30	30	30	30	30	29	10	10			30	30	30	30	10	2	10	
	Maximum	8.3	240	29	130	750	13	20	11	6	8			1.4	0.6	0.8	0.28	7	304	5	
	Minimum	7.4	173	7	4	448	1	13	7	2	3			0.1	0.0	0.5	0.06	4	294	1	
	Mean	8.0	194	10	15	560	4	17	9	3	5			0.7	0.2	0.6	0.15	5	299	3	
SEPTEMBER 7 – 16 1976	No. of Analyses	30	10	30	29	30	29	30	30	10	10			30	30	30	30	10	2	10	30
	Maximum	8.3	179	68	57	734	21	24	11	7	16			1.3	0.6	4.7	0.33	11	211	12	23.0
	Minimum	7.6	46	5	4	288	1	16	4	1	2			0.1	0.0	0.4	0.06	4	203	1	0.7
	Mean	8.0	134	10	12	417	4	20	8	2	5			0.5	0.1	0.7	0.18	5	207	2	1.8
DECEMBER 5 – 15 1976	No. of Analyses	6	6	6	6	6	6	6	6	6	5			6	6	6	6	6	0	6	6
	Maximum	7.6	128	4	19	1382	8	6	12	7	12			0.6	0.2	4.1	0.2	4		1	3.2
	Minimum	7.0	114	2	4	294	1	0	9	1	5			0.1	0.1	0.4	0.2	3		0	1.2
	Mean	7.5	122	3	10	583	4	2	11	4	8			0.3	0.1	1.1	0.2	3		1	1.7
FEBRUARY 21 – 28 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
MARCH 14 – 19 1977	No. of Analyses	10	6	10	10	10	10	10	9	6	6			10	10	10	10	6	2	6	10
	Maximum	8.0	160	80	140	1060	17	16	13	7	10			0.5	0.5	2.4	0.08	8	346	6	4.0
	Minimum	7.5	110	10	15	506	3	5	8	2	1			0.1	0.1	0.4	0.02	5	323	2	2.0
	Mean	7.7	148	24	39	736	7	9	10	4	5			0.3	0.2	0.8	0.04	6	334	4	2.6

STATION NO. _____

	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited.

(3) Analysis by Nalco.

TABLE 12-16. LAND USE WATER QUALITY SAMPLING – SUMMARY DATA – RAVINES

STATISTICS	CHEMICALS							
	PARAMETERS(1)							
	ph (units)	Alkalinity	Hardness	Total Suspended Solids	Volatile Suspended Solids	Total Solids	Dissolved Oxygen	BOD_5 (2)
No. of Events	7	7	7	7	7	7	7	7
No. of Analyses	84	14	7	84	84	84	0	46
Maximum	8.1	238	398	4240	346	4738		43
Minimum	6.7	75	147	56	12	406		3
Mean	7.6	121	250	1076	97	1364		14

STATISTICS	CHEMICALS							
	PARAMETERS(1)							
	BOD_{20} (2)	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Flow (cfs)	Chemical Oxygen Demand(3)
No. of Events	7	7	7	7	7	7	7	7
No. of Analyses	7	84	84	84	84	84	51	4
Maximum	70	9.0	1.2	2.0	0.46	172	7.5	337
Minimum	12	0.6	0.1	0.2	0.04	7	0.3	74
Mean	33	2.9	0.3	0.8	0.12	31	2.2	174

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited.

(3) Analysis by IEPA.

STATISTICS	HEAVY METALS						
	PARAMETERS(1)						
	Zinc (mg/l)	Cadmium	Copper	Total Chromium	Nickel	Lead	Mercury
No. of Events	7	7	7	7	7	7	7
No. of Analyses	19	19	19	19	19	19	19
Maximum	0.41	2.1	150	45	62	570	0.4
Minimum	0.02	0.3	1	0	5	13	0
Mean	0.20	1.0	45	21	39	242	0.2

(1) All units are expressed in micograms per liter (µg/l) unless otherwise noted.

(0.05 mg/l) for total phosphorus. In addition, the total suspended solids and COD concentration (maximum and mean) were high.

d. Overview of Lake Michigan Water Quality

The quality of the Lake's near shore waters is good, primarily as a result of continuing improvement in recent years. Lake County bathing beaches that were closed in 1969 were able to reopen in 1975 and have remained in operation without interruption.

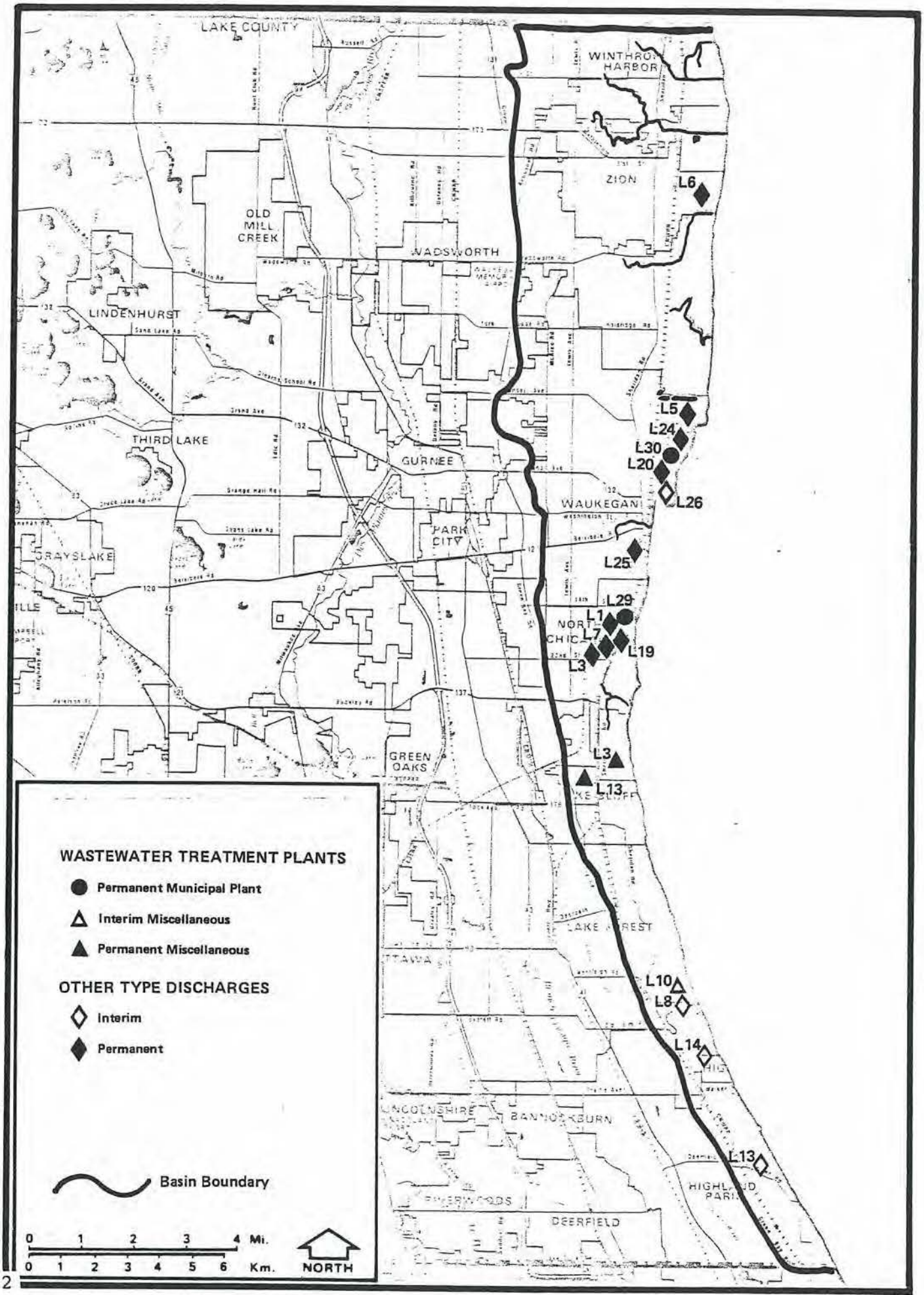
As indicated by the IEPA's 1976 data from 12 beach sampling stations, however, conditions near shore could be improved with respect to certain parameters (see Table 12-13B). For example, the standard for total phosphorus was violated in each of 165 analyses. The ammonia nitrogen standard was violated in 141 of the 164 analyses. Apparent violations of the fecal coliform standard were recorded at every beach, with counts in excess of the 20 per 100 ml found in nearly half of the analyses conducted. Six other parameters also were violated on occasion. The significance of these violations has to be assessed in light of the stringent standards Illinois has established for the Lake. The fecal coliform standard for inland waterways is 200 per 100 ml, for example, while the Lake Michigan standard is 20 per 100 ml. On the whole, near shore water quality, as indicated by the parameters measured by IEPA, is good.

Samples taken at two water intake points 3,000 to 3,500 feet offshore were similar to those taken off the beaches, although violations of most standards were less frequent. Analyses of the samples, which were taken in 35 feet of water at the Zion-Benton intake and in 28 feet of water at Highland Park, showed frequent violations of standards for total phosphorus and ammonia nitrogen. Apparent violations of the fecal coliform standard were markedly fewer, relatively speaking, than nearer the shore.

An unfortunate exception to the steadily improving outlook for Lake Michigan is the continuing evidence of high concentrations of pesticides and PCBs. Analyses of the flesh from several fish collected in the IEPA survey of 1974 produced mixed results but showed clearly that dangerous substances were highly concentrated in some specimens, particularly lake trout. In every lake trout studied, standards set by the U.S. Food and Drug Administration were violated for DDT, PCBs, or both. No violations were recorded for two other pesticides, heptachlor epoxide and dieldrin.

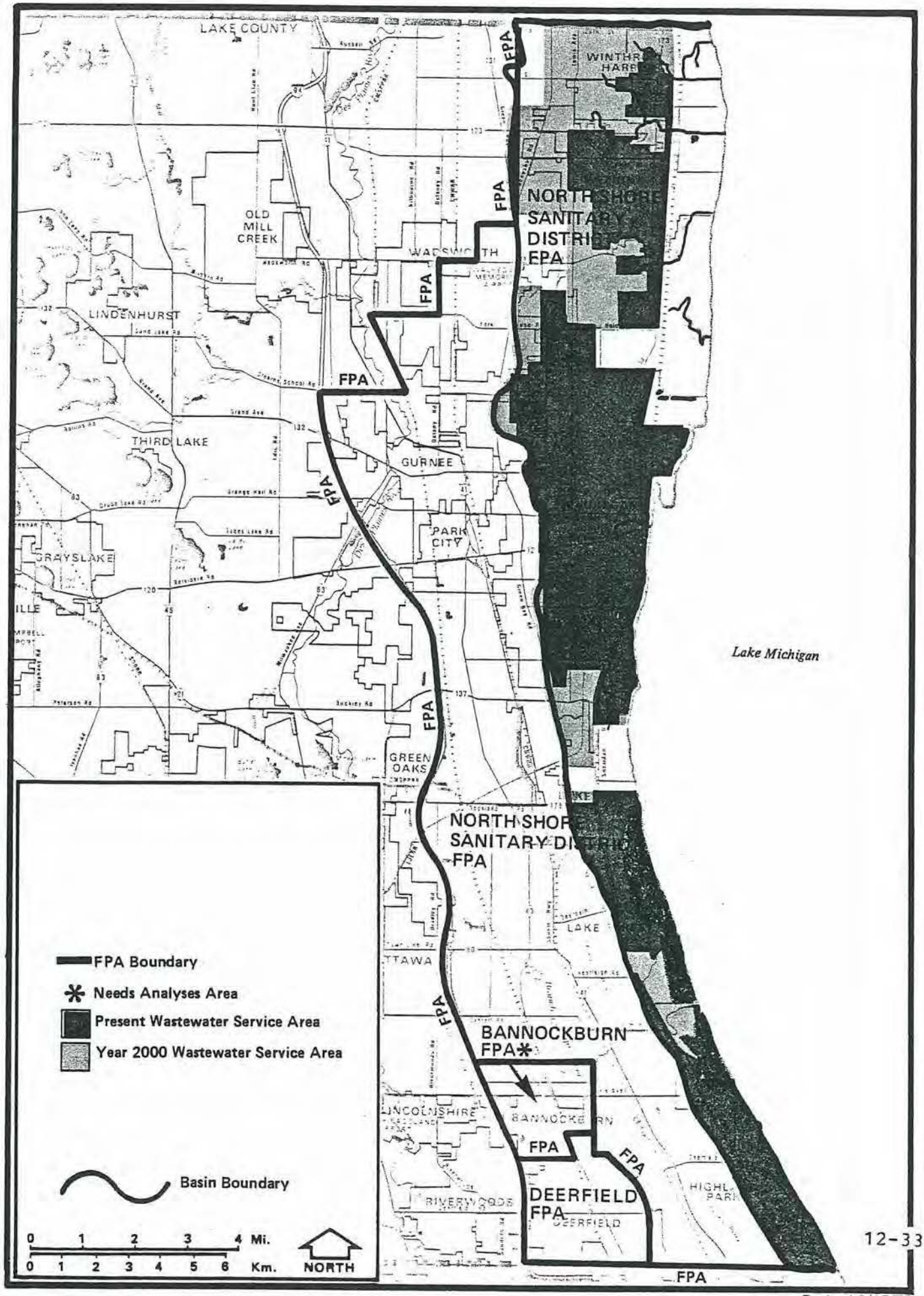
Serious PCB pollution exists in Waukegan Harbor and will continue to exist until the harbor has been dredged and the spoil has been properly disposed.

Figure 12-3: POINT SOURCE DISCHARGES



Revised 2/15/79

Figure 12-4: WASTEWATER SERVICE AREAS



12.04 POINT SOURCES: EXISTING CONDITIONS

a. Municipal-Type Wastewater Treatment Plants

The publicly owned wastewater treatment system in the basin has changed and improved greatly in recent years, primarily as a result of efforts by the NSSD to eliminate discharges of effluent to Lake Michigan. A number of small plants operated by the NSSD have been phased out and serve as pumping stations. The wastewaters they once treated are now directed to newer plants located inland on the Des Plaines and Skokie Rivers. It should be noted that the Lake Forest and Lake Bluff plants are being retained for emergency use in periods of excess wet weather flow. They will provide primary treatment and disinfection before discharging effluents to Lake Michigan. The North Chicago plant is assigned a similar role and also will discharge partially treated effluent to the Lake under periods of excess flow. Settling tanks and trickling filters at the North Chicago plant also remain in use for preliminary treatment of effluent that is routed to the District's Des Plaines River facility at Gurnee. The NSSD Waukegan wastewater treatment plant was the last major facility in the basin to discharge effluent to the Lake. But, discharges from Waukegan were diverted to the Des Plaines River via a new force main in 1978. The Waukegan plant now will only discharge to the Lake during periods of excess flows. Figure 12-3 shows the NSSD wastewater treatment plants and all other point source discharges in the basin.

With all phase-outs completed, the NSSD system will consist of three principal facilities: Waukegan, Gurnee and Clavey Road. It should be noted that overflows from the Waukegan and North Chicago retention basins, which may occur once or twice per year, are required (in accord with current NPDES permits) to produce an effluent quality which, when combined with the plant effluent quality, will not exceed a concentration of 30 mg/l BOD and 30 mg/l suspended solids. Municipal-type wastewater treatment facilities in the basin are described in Table 12-17 (A, B, C, D, E).

b. Industrial Wastewater Treatment Plants

There are no industrial plants in the basin which treat and discharge their process waters to the Lake; all industries discharge to the NSSD system.

c. Miscellaneous Wastewater Treatment Plants

Two small plants, the Arden Shores Home for Boys and the A.S. Hansen Actuaries, are the only "miscellaneous" plants in the basin. Arden Shores discharges to Lake Michigan. Hansen has a septic tank and sand filter, the

TABLE 12-17 A: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS — LAKE MICHIGAN-NORTH BASIN

MAP CODE	FACILITY NAME	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	RECEIVING STREAM NAME	7 DAY 10 YR. LOW FLOW (MGD) 1970	2000	PUBLICLY OWNED TREATMENT WORKS NO	YES	IEPA FY 78 PRIORITY NO.
L29	NSSD No. Chicago Retention Basin	NSSD/NSSD	North Chicago	Lake Michigan	0			X	None
L30	NSSD Waukegan	NSSD/NSSD	Waukegan	Lake Michigan *	0			X	305
L30	NSSD Waukegan Retention Basin	NSSD/NSSD	Waukegan	Lake Michigan	0			X	305
		*Flows will be diverted to the Des Plaines River 5-1-78							

TABLE 12-17 B: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS — LAKE MICHIGAN-NORTH BASIN

MAP CODE	NPDES PERMIT NUMBER	DATE ISSUED	DATE EXPIRES	EFFLUENT REQUIREMENTS (mg/l) INTERIM (A) BOD_5	TSS	P	NH_3N	FINAL (A) EFFECTIVE DATE	BOD_5	TSS	P	NH_3N	YEAR 2000 (B) BOD_5	TSS	P	NH_3N	COMMENTS
L29	0035092	12-24-74	10-1-79						(1)	(1)							(a) 1.5 mg/l in-stream after mixing.
L30	0030244	11-10-75	12-1-81	20	25	1.0		7-1-77*	10	12		(a) (b)	10	12		(a)	(b) 24 hr. mean is 3 mg/l.
L30	0030244	12-24-74	10-1-79						(2)	(2)							
			*Expected discharge to the Des Plaines River														
			(1) Annual average of Gurnee plant effluent plus N. Chicago retention basin														
			overflow must meet 30 mg/l BOD and 30 mg/l TSS.														
			(2) Annual average of Waukegan plant effluent plus Waukegan retention basin														
			overflow must meet 30 mg/l BOD and 30 mg/l TSS.														

(A) From NPDES Permits (B) From Facility Plans

TABLE 12-17 C: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS — LAKE MICHIGAN-NORTH BASIN

MAP CODE	STATUS OF TREATMENT PLANT INTERIM YES	INTERIM PHASE OUT DATE	PERMANENT EXISTING	PROPOSED NEW YES	PROPOSED NEW EST. DATE IN SERVICE	WASTEWATER TREATMENT PLANT (MGD) AVERAGE FLOWS (a) 1975	1980	1985	1990	1995	2000	DESIGN CAPACITIES 1975	1985	OTHER YEAR	2000	COMMENTS
L29			X			INTERMITTENT										(a) From facility plans or needs analysis documents unless otherwise noted. (b) Effluent flows to be diverted to the Upper Des Plaines River 5/1/78.
L30			X			15.62	(b)									
L30			X			INTERMITTENT										

TABLE 12-17 D: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANT LAKE MICHIGAN-NORTH BASIN

MAP CODE	POPULATION SERVED (1000's)						PROPOSED PROJECTS (C)								CAPITAL COSTS (million $)		
							PLANT				SEWERS						
	1975	1980	1985	1990	1995	2000	Exp.	UpG	New	Out	I/I	SSE	New	Reh	Initial	Future	Total
L29		NOT APPLICABLE															
L30	96.9							X					X		23.53	-	23.53
L30		NOT APPLICABLE															

(C) PROPOSED PROJECTS

SEWER(S): I/I - Infiltration/Inflow Study; SSE - Sewer System Evaluation; New - New Sewer Construction; Reh - Rehabilitation of Existing Sewers

PLANT: Exp - Expansion; UpG - Upgrading; New - New plant; Out - Phase out

TABLE 12-17 E. MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS LAKE MICHIGAN-NORTH BASIN

MAP CODE	FACILITY PLANS												COMMENTS
	TYPE		STATUS			REVIEWS / APPROVALS							
						NIPC			IEPA				
	NEEDS ANALYSIS	STEP ONE STUDY	COMPLETED	UNDER WAY	LOCAL ISSUES	NUMBER	ENDORSED	UNDER REVIEW	NUMBER	APPROVED	UNDER REVIEW	UNRESOLVED ISSUES	
L29		X	X			71-105	X		C17-1890	X			
L30		X	X			71-105	X		C17-1890	X			
L30		X	X			71-105	X		C17-1890	X			

effluent from which reaches small ditch that is tributary to the Lake. Operators of both facilities are considering a connection to the NSSD system. Basic features of both plants are described in Table 12-18 (A, B). Two former wastewater treatment plants located at military installations in the basin which discharged to Lake Michigan now have their wastes treated by the NSSD system.

d. Other Point Sources

A number of industrial firms have NPDES permits for discharging cooling water and stormwater into Lake Michigan. Those located in this basin are described in Table 12-19 (A, B). Combined sewers are found only in small areas of Waukegan and Lake Bluff, and all the flow is treated by the NSSD. Water treatment plants in the basin generate residual products, the treatment and disposal of which is discussed subsequently in this chapter. Backwash waters from four of these plants are discharged into Lake Michigan.

e. Local Facilities Planning

As the largest wastewater agency in the basin (see Figure 12-4), the NSSD is responsible for virtually all planning of significance to the future of the basin with respect to systems, facilities, service areas, wastewater flows and effluent quality.

A 201 facilities planning study is currently underway in the basin. However, existing facilities of the NSSD are part of a long-range program started by the District prior to the passage of Public Law 92-500 in 1972. One objective of the NSSD program was the elimination of the several small treatment plants that once discharged into Lake Michigan. As discussed above, all such plants have been phased out and wastewaters have been redirected to larger, inland plants. The second major phase of the District's long-range planning program has involved upgrading the larger plants and redirecting the effluent of the Waukegan and North Chicago plants away from the lake.

12.05 NONPOINT SOURCES: EXISTING CONDITIONS

a. Urban Stormwater Systems

About 17 square miles, or 32 percent of the basin, is served by storm sewers. Waukegan and North Chicago have extensive storm sewer systems that discharge into Lake Michigan, the Waukegan River and Pettibone Creek. Zion's storm sewer system discharges directly into Kellogg Ravine and Bull Creek, and also into a slough which flows into Bull

TABLE 12-18 A: MISCELLANEOUS WASTEWATER TREATMENT PLANTS

LAKE MICHIGAN NORTH BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS(1)	WASTEWATER LOADS MGD			
						CURRENT		1985	2000
						DESIGN CAPACITY	1975 LOAD		
L3	Arden Shore Home for Boys	0049808	NSSD/NSSD	Lake Bluff	IM,E	0.003	0.005	-	0.005
L10	Fort Sheridan	0033014	NSSD/NSSD	Highwood	FT,E	1.500	0.750	-	-
L13	Hansen, A.S., Actuaries	0022632	NSSD/NSSD	Lake Bluff	S,FB,E	0.004	0.001	-	0.001
	(1):Chlorination (E), buried sand filter (FB), Trickling filter (FT), Imhoff Tank (IM), Septic (S)								

TABLE 12-18 B: MISCELLANEOUS WASTEWATER TREATMENT PLANTS

LAKE MICHIGAN-NORTH BASIN

MAP CODE	RECEIVING STREAM			NPDES PERMIT DATES		EFFLUENT REQUIREMENTS (mg/l)								COMMENTS
	NAME	7 DAY-10 YR. LOW FLOW (MGD)				1976(1)				2000				
		1970	2000	ISSUED	EXPIRES	BOD	TSS	P	NH_3-N	BOD	TSS	P	NH_3-N	
L3	Lake Michigan	0		3-31-77	7-1-77	As Discharged								
L10	Lake Michigan	0		11-6-74	12-31-76	30	30	1.0						Flow to be diverted TO NSSD by late 1977
L13	ditch to Lake Michigan	0		6-9-75	12-31-79	4	5							

(1) From NPDES Permits

TABLE 12-19 A: OTHER POINT SOURCE DISCHARGES

LAKE MICHIGAN NORTH BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	LOCATION AND NEAREST MUNICIPALITY	FLOW (MGD) 1976	NPDES PERMIT DATES	
						ISSUED	EXPIRES
L1	Abbott Laboratories	0001881	NSSD/NSSD	North Chicago	15.9	11-8-76	8-31-81
L3	Ammco Tools Inc	0054968	NSSD/NSSD	North Chicago	0.013	3-17-77	1-31-81
L5	Commonwealth Edison 001a	0002259	NSSD/NSSD	Waukegan	900	12-30-76	10-1-79
L5	Commonwealth Ed 001 (b-e),002	0002259	NSSD/NSSD	Waukegan	6.9	12-30-76	10-1-79
L6	Commonwealth Edison - MDFB	0002763	NSSD/NSSD	Zion	10 gpm	12-30-76	10-1-79
L6	Commonwealth Edison - CWD	0002763	NSSD/NSSD	Zion	1000	12-30-76	10-1-79
L6	Commonwealth Edison - RWSE	0002763	NSSD/NSSD	Zion	25 gpm	12-30-76	10-1-79
L6	Commonwealth Edison - NTE	0002763	NSSD/NSSD	Zion	14 gpm	12-30-76	10-1-79
L7	Fansteel Inc. North Plant	0002411	NSSD/NSSD	North Chicago	0.012	2-22-74	9-1-78
L7	Fansteel Inc. South Plant	0002411	NSSD/NSSD	North Chicago	0.008	2-22-74	9-1-78
L19	North Chicago Refiners & Smelters, Inc	0002755	NSSD/NSSD	North Chicago		6-30-75	3-31-80
L20	Outboard Marine Corp. 001	0002267	NSSD/NSSD	Waukegan	0.68	6-12-75	3-31-80
L20	Outboard Marine Corp. 006	0002267	NSSD/NSSD	Waukegan	0.93	6-12-75	3-31-80
L20	Outboard Marine Corp. 007-008	0002267	NSSD/NSSD	Waukegan	0.10	6-12-75	3-31-80

TABLE 12-19 A. OTHER POINT SOURCE DISCHARGES LAKE MICHIGAN NORTH **BASIN**

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	LOCATION AND NEAREST MUNICIPALITY	FLOW (MGD) 1976	NPDES PERMIT DATES	
						ISSUED	EXPIRES
L20	Outboard Marine Corp. 009	0002267	NSSD/NSSD	Waukegan	0.10	6-12-75	3-31-80
L20	Outboard Marine 002-005,010,011	0002267	NSSD/NSSD	Waukegan	Periodic	6-12-75	3-31-80
L20	Outboard Marine Corp. 014	0002267	NSSD/NSSD	Waukegan	0.10	6-12-75	3-31-80
L24	Union Metal Mfg. Co.	0037702	NSSD/NSSD	Waukegan	0.018	6-23-75	5-31-80
L25	U.S. Steel Cyclone Fence Plant-001	0047775	NSSD/NSSD	Waukegan	0.199	6-30-75	4-1-80
L25	U.S. Steel Cyclone Fence Plant-002	0047775	NSSD/NSSD	Waukegan	0.024	6-30-75	4-1-80
L25	U.S. Steel 001-009 009A,009B	0002682	NSSD/NSSD	Waukegan	5.565	8-29-75	8-1-80
L8	Fort Sheridan Water Plant	0037630	NSSD/NSSD	Fort Sheridan	0.022	10-29-74	12-31-77
L13	Highland Park Water Plant	0005185	NSSD/NSSD	Highland Park	0.117	11-14-77	12-31-78
L14	Highwood Water Plant	0049883	NSSD/NSSD	Highwood		4-14-76	7-1-78
L26	Waukegan Water Plant	0001856	NSSD/NSSD	Waukegan	0.300	6-13-75	12-31-77

TABLE 12-19 B: OTHER POINT SOURCE DISCHARGES

LAKE MICHIGAN-NORTH **BASIN**

MAP CODE	RECEIVING STREAM NAME	7 DAY-10 YR. LOW FLOW (MGD) 1970	7 DAY-10 YR. LOW FLOW (MGD) 2000	EFFLUENT REQUIREMENTS(1) (mg/l)	COMMENTS
L1	Storm Sewer	0		Temp.,Daily Max: 10 BOD, 1.0P, 0.23 As, 0.02 Phenol,0.0005 Hg, 0.025 Cn. Daily Avg:4 BOD	Cooling and storm water, blowdown
L3	Pettibone Ck	0		Daily Max: Temp., 15 oil and grease (o/g)	Cooling water
L5	Lake Michigan	0		Temp.	Cooling water
L5	ditch to Lake Michigan	0		Daily Maximum (DM): 15 TSS, 15 o/g, 3500 TDS, 2 (tot) Fe, 0.5 (dis) Fe, 1.0 (tot) Cu	Storm water, regenerant waste. Ash pond overflow
L6	Lake Michigan	0		(DM): 15 TSS	Filter backwash
L6	Lake Michigan	0		Temp.	Cooling water
L6	Lake Michigan	0		(DM): 15 TSS, 15 o/g	Rad-waste system effluent
L6	Lake Michigan	0		(DM): 3500 TDS	Neutralizing tank effluent
L7	Pettibone Ck	0		None	Cooling water
L7	Pettibone Ck	0		None	Cooling water and storm water
L19	Pettibone Ck	0		15 TSS, 2 (tot) Fe, 1 Cu, 0.1 Pb, 0.0005 Hg, 1 Ni, 1 Zn	Process water overflow from Cooling pond
L20	Waukegan Hbr	0		Temp., Daily Max: 15 TSS, 15 o/g, 0.025 Cn	Combined process flow
L20	Waukegan Hbr	0		Temp.,Daily Max: 15 TSS, 15 o/g, 0.025 Cn	Combined process flow
L20	Lake Michigan	0		Temp.,Daily Max: 15 TSS, 15 o/g, 0.025 Cn, 0.3 Phenol	Combined process flow

(1) From NPDES Permits

TABLE 12-19 B: OTHER POINT SOURCE DISCHARGES

LAKE MICHIGAN-NORTH **BASIN**

MAP CODE	RECEIVING STREAM NAME	7 DAY-10 YR. LOW FLOW (MGD) 1970	7 DAY-10 YR. LOW FLOW (MGD) 2000	EFFLUENT REQUIREMENTS(1) (mg/l)	COMMENTS
L20	Waukegan Hbr.	0		Temp., Daily Max: 15 TSS, 15 o/g	
L20	ditch to Lake Michigan	0		Limited to uncontaminated stormwater	Stormwater and yard drainage
L20	ditch to Lake Michigan	0		Temp., Daily Max.: 15 TSS, 15 o/g	Cooling water
L24	Lake Michigan	0		15 TSS, 15 o/g, 750 TDS above background	Process water
L25	Storm sewer	0		Limited solely to non-contact cooling water, uncontaminated stormwater, steam condensate	
L25	Storm sewer	0		Limited solely to non-contact cooling water, uncontaminated stormwater, steam condensate	
L25	Lake Michigan	0		Limited solely to non-contact cooling water, uncontaminated stormwater, steam condensate	
L8	Lake Michigan	0		Daily Maximum (DM): 100 TSS	Flow to be diverted to NSSD Clavey Rd by Dec. 1977
L13	Lake Michigan	0		(DM): 15 TSS	Flow to be diverted to NSSD Clavey Rd.
L14	Lake Michigan	0			Flow to be diverted to NSSD Clavey Rd.
L26	Lake Michigan	0		(DM): 15 TSS, 2(tot)Fe, 0.5 (dis)Fe	Flow to be diverted to NSSD Clavey Rd.

(1) From NPDES Permits

Creek and Lake Michigan. Parts of other communities, such as the eastern half of Winthrop Harbor, also have storm sewers which discharge into Kellogg Ravine and the Lake. Partial storm sewer networks in Lake Bluff, Lake Forest, Highwood and Highland Park contribute minor flows to ravines that are tributary to the lake.

About 35.6 square miles, 67 percent of the basin, have no storm sewer service. Stormwater falling in these areas enters Lake Michigan by overland flow, or joins the groundwater table by percolation through the soil.

b. Construction Activities

As discussed in Part I, construction operations, coupled with stormwater runoff and resultant erosion, can contribute sediments, chemicals and biological organisms to surface waterways. When evaluations were conducted in 1976-77, several areas of the basin were experiencing major construction or other surface disturbances. However, none of these activities was found to be causing known water pollution problems.

The potential for damage to water quality as a result of construction activities will not diminish in future years. Changes in population and land use, as forecasted, will generate substantial residential and commercial construction accompanied by other surface disturbances for roads and utilities.

c. Air Pollution

As was discussed in Part I, the impacts of air pollution fallout on water quality vary in response to several factors. Critical among these is the surface area-volume ratio of the water body. In general, fallout is a source of great concern with respect to large water bodies like Lake Michigan. Indeed, recent research indicates that as much as 80 to 90 percent of the current PCB input to Lake Michigan may be atmospherically-derived. In addition, an estimated 11 percent of the total annual phosphorus loading on the Lake is from the atmosphere.

d. Erosion and Sedimentation

A major problem in the basin is erosion and resulting sedimentation of the shoreline bluffs along Lake Michigan. The primary cause of bluff erosion is the undercutting of the toe of the bluff by high waves.

The Illinois State Geological Survey has identified a number of areas between Waukegan and Highland Park where significant bluff erosion has occurred. The most severe problem area is a 1.5-mile stretch in Lake Bluff, where

erosion damage has been occurring for over 100 years. Since 1872, an average of 267 feet of recession has occurred along 1.5 miles of receding shore, amounting to a loss of more than 6 million cubic yards of material. Portions of the shoreline at Lake Bluff have receded an average of 32 feet in the eleven year period 1964-1975.

Two moderately serious erosion areas are located at the north and south ends of Fort Sheridan, with the former including a portion of the Village of Lake Forest. In these areas, erosion is related to recent high water levels. Most damage has occured since 1973, with approximately 45,000 and 50,000 cubic yards of material lost from these two areas, respectively. Minor problem areas include several sites in Highland Park and two in North Chicago.

Phosphorus contained in the parent bluff materials entering the Great Lakes from shore erosion is virtually unavailable as a nutrient for the growth of aquatic plants. While studies have not been completed, and contradictory evidence may yet be found, shoreline erosion appears to be more of an economic and aesthetic problem, as distinct from a water quality-related problem.

Stormwater-induced erosion of the many ravines in the basin also is a potential source of sediment and associated contaminants.

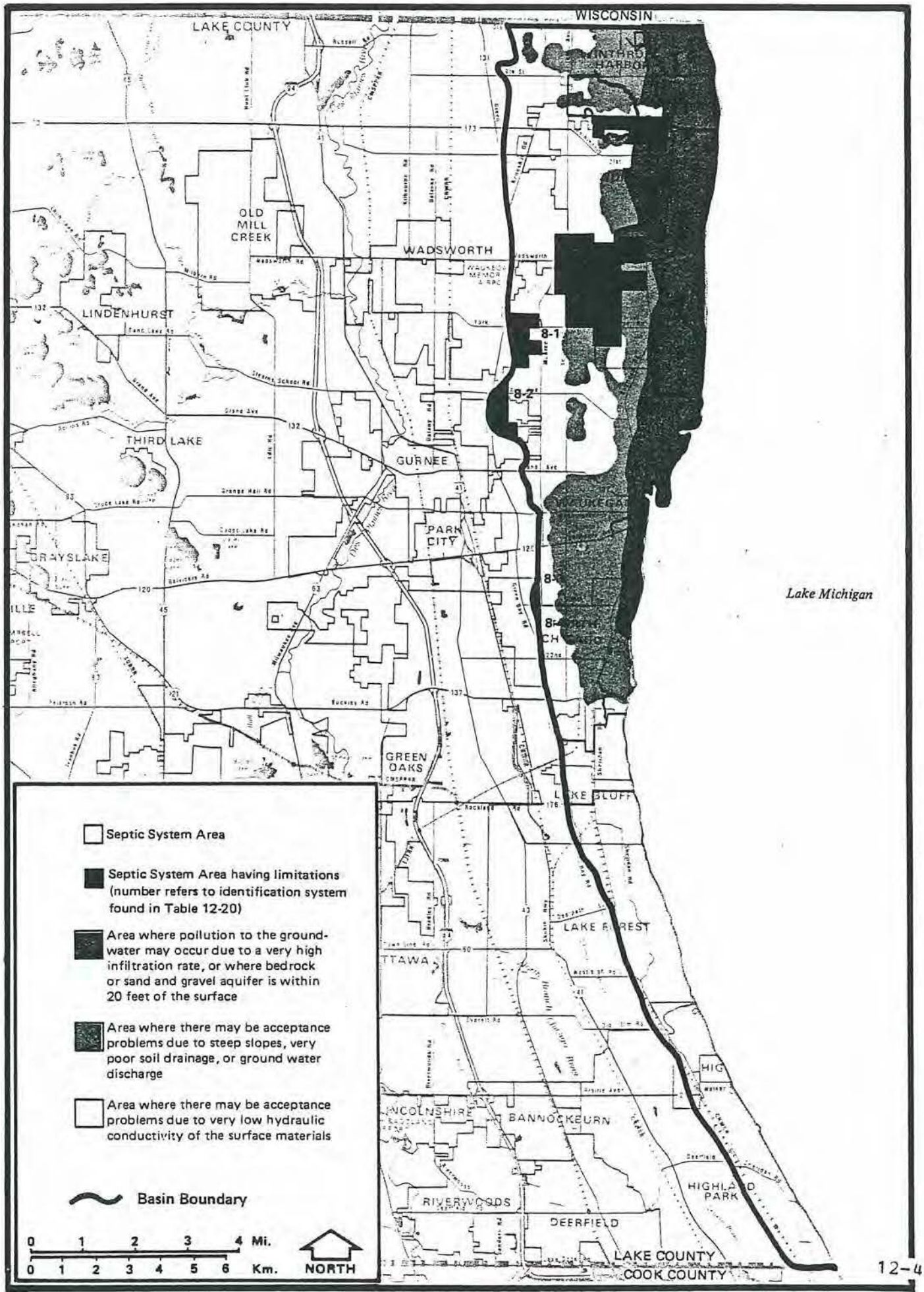
e. Septic Systems

Septic systems are used widely in the basin. Presently there are 2,306 residential septic systems serving about 7,900 persons. In addition, the basin has 25 nonresidential septic systems serving a population equivalent of 132 persons. There are four concentrations of septic tank areas located entirely within the basin that have been identified as having site limitations. These areas contain 1,363 residential and nonresidential septic systems serving approximately 4,650 people. Thus, about 60 percent of the systems are considered to be located in "problem areas" where there are unsatisfactory soil conditions, small lots, high water tables, or a combination of these factors.

However, the Lake County Health Department does not consider existing septic systems to be significant sources of pollution in the basin. Only a small number of systems fail at any one time, and only a few of these failing systems would have access to the Lake. The fact that such a high percentage of the systems are located in areas with actual or potential limitations, however, cannot be overlocked. Table 12-20 lists each such area and includes map identification numbers keyed to Figure 12-5.

It is difficult to accurately estimate the present annual volume of septic sludge produced due to the many variables involved. However, using an average annual volume of 70 gallons of septage per person, it is possible to make a rough approximation. There are 7,921 persons in the basin

Figure 12-5: LOCATION OF SEPTIC AREAS



served by residential septic systems. Thus, 7,921 x 70 gallons = 138,618 or about 140,000 of residential septage produced each year.

f. Surface Waste Disposal Sites

There are two active and four abandoned landfill sites in the basin. In addition, part of a 45-acre site at the Commonwealth Edison plant in Waukegan is used for the disposal of fly ash. None of these sites is known to be causing water pollution.

g. Hydrologic Modifications

The Waukegan Harbor is dredged periodically by the U.S. Army Corps of Engineers, and this program is the major hydrologic modification in the basin. Contaminated spoil from these dredging operations is to be disposed of in enclosed areas at Kenosha, Wisconsin; uncontaminated spoil is disposed of at authorized locations in Lake Michigan. During dredging, sediments are placed in suspension and their effects on water quality can be pronounced. At present, however, there is no information available with respect to the impact of Waukegan Harbor dredging on Lake Michigan water quality. The presence of excessive PCBs in

TABLE 12-20: SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Lake Michigan North BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Lake	Zion Benton	North Zion	162	562	3-1
Lake	Zion Benton	Beach Park	1075	3720	3-2
Lake	Warren	US 41 & Washington St.	50	181	7-2*
Lake	Waukegan	Bonnie Brook	104	360	8-1*
Lake	Waukegan	Green Bay Road (Waukegan, N. Chicago)	915	3320	8-2*
Lake	Waukegan	North Chicago	54	154	8-3
Lake	Waukegan	Waukegan	72	215	8-4

*Located partially in basin

Waukegan Harbor is a particularly vexatrous problem, for which no corrective measures have yet been developed.

Modifications of much less significance result from the efforts of local governments or private landowners to control shoreline erosion. Facilities most commonly built are groins and sea walls. During construction, sediments and other pollutants are introduced to the Lake, but these generally are of little significance. The most serious impact is the temporary increase in turbidity that results when surface and subsurface materials are disturbed and placed into suspension.

There is some channelization in the basin, but these programs also have little impact on water quality at the present time. Streams that have been channelized include Bull Creek (in Zion), Kellogg Ravine, Pettibone Creek and one other unnamed tributary to the Lake. In each case, only about one-half mile of the stream is channelized.

h. Marine Activities

Between about April 15 and November 1, recreational boating is heavy in Lake Michigan off Lake County. About 400 boats use Waukegan Harbor on an average day, and the number reaches 800 on the busiest days.

Two pump-out facilities are available at the harbor for the disposal of wastes from recreational boats; a third pump-out station is located at Trident Harbor, just north of the Wisconsin state line.

Commercial shipping activity at Waukegan Harbor has declined in recent years and National Gypsum currently is the only shipper using the port. In 1976, 20 ships, carrying a total of 350,000 net tons, called on the port. No pollution problems are attributed to current commercial shipping activity in the Waukegan area.

In response to local desires, the Corps of Engineers has made intermittent attempts to study the feasibility of additional small boat harbors on the Lake. The Waukegan Port District has requested construction of breakwaters and marina development adjacent to and south of the Waukegan Harbor south pier. In 1972, a reconnaissance type study was completed covering a small boat harbor at Illinois Beach State Park. Subsequent studies by others found this to be environmentally unacceptable. In 1976, the City of Zion sought technical and financial assistance in constructing a harbor to accommodate 3,000 permanently based boats. A Congressionally authorized study for a small boat harbor at Highland Park has been intermittently under way since 1964. However the study is now being made by professional consulting firm and is being funded by the ICZM and the Park District of Highland Park.

12.06 DISPCSAL OF RESIDUALS

The NSSD's Waukegan plant is the only municipal-type wastewater treatment facility processing sludge in the basin. In addition to treating the dewatered sludge generated in its own treatment practices, the Waukegan plant:

- provides dewatering for sludge that is generated and treated at other NSSD plants (Clavey Road, North Chicago and Gurnee), then conveyed to Waukegan by truck or pipeline.

- provides dewatering for sludge that is generated and treated at wastewater facilities operated by A.S. Hansen Actuaries and the Arden Shores Home for Boys.

- treats and dewaters sludge that is generated in septic systems in the area and trucked to the Waukegan plant by scavenger services.

- provides dewatering for sludges generated at water supply treatment plants at Lake Forest, North Chicago, and the Great Lakes Naval Training Center.

All sludge treated and/or dewatered at the Waukegan wastewater plant is disposed at the NSSD's 289-acre landfill site located in the Upper Des Plaines River Basin near Wadsworth. This landfill, now operating at an annual cost of $2 million, was estimated to have a lifespan of 25 years when it opened in July of 1974.

The eight water supply treatment plants in the basin use a variety of residual disposal techniques. As mentioned above, residuals from the plants at Lake Forest, North Chicago and the Great Lakes Naval Training Center are dewatered at the NSSD's Waukegan plant and then disposed of at the NSSD landfill.

The water treatment plant operated by the Lake County Department of Public Works in Zion disposes of its sludge in lagoons and relies on evaporation and seepage to remove excess water.

Presently, sludge from water supply treatment plants at Waukegan, Highland Park, Fort Sheridan and Highwood is discharged into Lake Michigan, in violation of Illinois water quality standards. All of the plants (except Highwood) are expected to stop discharging sludge into the Lake by mid-1979, and to begin routing their sludge to NSSD facilities for proper disposal.

12.07 EXISTING MANAGEMENT PROGRAMS

a. Water Quality Management Programs

Compared to other basins, the Lake Michigan Basin-North contains few local agencies that have programs related to water quality management (See Table 12-21). Lake Michigan itself is of concern beyond this region, of course, and agencies at the state, interstate, national and international levels are involved in research, planning, implementing or monitoring programs affecting the basin. These include the Illinois Division of Water Resources, the IEPA, the Great Lakes Basin Commission, the USEPA, and the International Joint Commission of Canada and the United States.

The operation of wastewater treatment plants is the most familiar type of waste management program. The primary responsibility for plants in the basin belongs to the NSSD, which was created by the Illinois General Assembly in 1911 (Ill. Rev. Stat. 1975, ch. 42 Sec. 276.99). The NSSD provides wastewater treatment services to approximately 300,000 people in the lakeshore communities of Lake County and at the Great Lakes Naval Training Center and Fort Sheridan.

The district's facilities include treatment plants, pumping stations, and large interceptor sewers. In most cases, the NSSD does not collect wastewater from homes and businesses; the construction and operation of local collection systems is a municipal or private responsibility. However, the NSSD, as the eventual treatment agency, has authority to inspect and approve or disapprove all connections to its own system or to municipally owned sewers tributary to its system. It also has the authority to set

TABLE 12-21: LOCAL WATER QUALITY MANAGEMENT AGENCIES, LAKE MICHIGAN BASIN-NORTH

Municipalities	Townships	Sanitary Districts	Drainage Districts	Other
Highland Park	Benton	North Shore	East Skokie	Lake County
Highwood	Deerfield		North Skokie	Lake County Forest Preserve District
Lake Bluff	Shields			
North Chicago	Waukegan			Lake County Soil & Water Conservation District
Waukegan	Zion			
Winthrop Harbor				
Zion				

design standards for all collection systems tributary to its facilities. All industrial process wastewater discharges in the basin are connected to the NSSD system. Industries can be required to meet pretreatment standards established to protect treatment facilities. Surcharges may also be levied against industrial wastewater sources.

The NSSD charges a fee for all connections to its system, but the district's principal source of revenue is taxation on real property within its boundaries. It can, by statute, issue bonds against its property tax income up to a maximum of 5 percent of the total assessed valuation of property in the district. The NSSD's outstanding bonded indebtedness as of January 1, 1976 was $30.6 million, according to reports filed with the Illinois Comptroller's Office. The NSSD had a total income of $25,085,756 in 1976, and total expenditures of $30,926,710.

While wastewater management is centralized in the NSSD, the responsibility for urban stormwater management in the basin is fragmented. Many government agencies, including municipalities, the county drainage districts, and state and local highway departments, either construct their own drainage systems or regulate the construction of such systems by private individuals.

b. Regulatory Programs

(1) Municipal Regulations: Because so much of this basin lies within municipal corporate boundaries, regulatory programs administered by municipalities are highly significant. As discussed in Chapter Eight, municipal ordinances influence the quantity of urban runoff, the washoff of sediment and other pollutants from construction sites, and the siting, installation, and operation of septic disposal systems. Other municipal regulations indirectly affect water quality. For example, subdivision regulations and zoning ordinances, by influencing the location and form of new developments, can affect the quantity and quality of surface runoff. They also are a factor in determining the capacity required in treatment facilities. The frequency with which streets are cleaned and the type of equipment used have a paramount influence on the quality of stormwater runoffs and their impacts on receiving water bodies.

All communities in the basin have some form of sewerage regulation in effect as part of their subdivision ordinances. In some cases, these ordinances refer to additional standards and requirements of the NSSD.

As of the completion of research for areawide planning, only Waukegan, North Chicago, and Winthrop Harbor had stormwater detention regulations in effect. See Table 12-22 for a description of the legal authority and scope of the Waukegan and Winthrop Harbor ordinances.

Municipal regulations with respect to septic systems vary among communities in the basin (See Table 12-23), with the communities expressing a strong preference, if not a mandate, for connection to the municipal/NSSD wastewater system.

None of the municipalities in the basin have an erosion and sedimentation control ordinance. Some have addressed erosion problems in their subdivision regulations, however, either in reference to the recommendations of the Lake County Soil and Water Conservation District or in general statements on the suitability or unsuitability of certain tracts for a development because of erodibility, among other factors.

Highland Park has enacted regulations dealing with stormwater runoff, site grading, deposition of materials on bluffs and ravines, and tree replacement. The City also is considering setback regulations based on projected bluff recession rates. Lake Bluff is presently drafting regulations for coastal flood plains, erosion and sedimentation control, and bluff setbacks. Lake Forest is reviewing the work of Highland Park and Lake Bluff for local application.

All municipalities in the basin have adopted flood plain regulations, which are described in Table 12-24. In addition, the communities of Lake Bluff and Lake Forest are studying the possibility of special regulations to control development in the Lake Michigan flood hazard area.

(2) County Regulations: While most of the area in this basin is within the corporate limits of municipalities, certain regulatory programs of Lake County affect unincorporated areas. For example, the county zoning ordinance contains specific sections dealing with stormwater detention, erosion and sedimentation control, and flood plain regulations.

TABLE 12-22: MUNICIPAL STORMWATER DETENTION ORDINANCES

Waukegan	Munic. Code Chapter 28 Section 28-67	Has stormwater detention ordnance applicable to industrial and muli-family developments of 2 acres or more, single family developments of 5 acres or more.
Winthrop Harbor	Subdivision Ordinance Section 6.2-1	Stormwater detention regulations contained in subdivision ordinances.

In addition, the Lake County Health Department has an extensive and sophisticated program to regulate septic systems. Under the county's current subdivision ordinance, the Health Department, along with the Lake County Public Works Department and the Soil Conservation Service, reviews any subdivision plans that include septic systems. The Health Department also enforces the Board of Health Ordinance which requires permits for the installation of septic disposal systems and licensing of contractors involved in the construction of such systems in the county. This ordinance also applies within municipal boundaries unless the municipality itself has enacted higher standards.

There are some inconsistencies between county and municipal development regulations, which create the potential for conflicts where development is proposed in unincorporated areas close to municipal boundaries. The problem of coordinating county and municipal programs is particularly acute in the Lake Michigan Basin-North because the small amount of unincorporated area which remains is generally close to municipal boundaries.

(3) Soil and Water Conservation District Regulations: The Lake County Soil and Water Conservation District, the only such district affecting the basin, has jurisdiction only in unincorporated areas between Winthrop Harbor and Zion and between Zion and Waukegan. Like other districts in the state, it does not exercise its authority to enact regulatory programs (See Chapter Eight for further discussions).

(4) State and Federal Regulations: Typically, state and federal regulations, including the National Pollution Discharge Elimination System program, apply uniformly to all portions of the region. Some regulatory programs affect only the Lake Michigan basin, however because of the unusual problems involved in the protection of Lake Michigan as a state, national and international resource. A series of court decisions dating back to the late nineteenth century have established that Illinois has a special responsibility to protect Lake Michigan as a "public trust." Ownership of the lake bed itself has also been clearly vested in the state. Relying largely on the "public trust" doctrine as well as environmental laws, the Illinois Attorney General has used litigation actively to restrict the discharge of pollutants into Lake Michigan. Successful lawsuits related to the Lake in recent months include actions taken against the U.S. Steel Corporation and against the City of Milwaukee. Finally, the U.S. Army Corps of Engineers maintains a direct role in a variety of programs affecting Lake Michigan water quality, including dredging, filling of wetlands, dredge spoil disposal, harbor improvements and issuance of permits for structures in the Lake (including erosion protection devices). Another federal agency, the U.S. Coast Guard, is responsible for enforcing dumping and

TABLE 12-23: MUNICIPAL SEPTIC REGULATIONS, LAKE MICHIGAN BASIN-NORTH

Community	Subdivision Regulations	Conditions for Septic System Use
Highland Park	Chapter 151.155(B)	Permissable if NSSD system is not "reasonably accessible"; lot must be greater than 40,000 sq. ft.
Highwood		None specified
Lake Bluff	Section 43.12	None specified; however, new developments must connect to an existing public sanitary sewer system if within 1000 feet.
Lake Forest	Chapter 38, Section 8-3-12	None specified; however, new developments must connect to a central system where there are public sanitary sewers "in the vicinity."
North Chicago	Section VIII,A,1	If development cannot reasonably be served by city sewer and water systems, lots must be at least 100 feet wide and at least 20,000 sq. ft. in area. If development can be reasonably served by either city sewers or city water, but not both, lots must be at least 75 feet wide and at least 10,000 sq. ft. in area. Increased lot area may be required where bad soils exist.
Waukegan	Section IX,1,a	None specified; connection of new development to city or NSSD sanitary systems required.
Winthrop Harbor	Section* 6.5-1	None specified; "every effort" must be made to connect to an existing system.
Zion	Code 12-8	Septics must be disconnected six months after a sanitary sewer comes within 100 feet of lot line.

*Subdivision Ordinance

TABLE 12-24: MUNICIPAL FLOOD PLAIN REGULATIONS, LAKE MICHIGAN BASIN-NORTH

Community	Regulations	
Highland Park	Municipal Code Chapter 152	Has flood plain regulations
Highwood		
Lake Bluff	Building Ordinance § 2-B-1	Flood plain regulations in building code.
Lake Forest	Zoning Code § 46-1B	Has flood plain regulations
North Chicago		
Waukegan	Municipal Code Chapter 28	Flood Damage Prevention Ordinance supplements subdivision, zoning, and building regulations.
Winthrop Harbor	Zoning Ordinance, § 5.13 Subdivision Ordinance § 5.2-8 6.2-6	Has flood regulations for "Lake Plain District." Additional restrictions on flood plains contained in subdivision regulations.
Zion	Municipal Code § 23-55	No specific ordinance. Subdivision regulations state, generally, that land subject to flooding must meet city and NSSD requirements to insure that land will be safe for occupancy.

spilling regulations for commercial navigation, and for spill cleanups. 1400

12.08 PROBLEM ASSESSMENT 1402

In Part I, a number of problems were identified and solutions recommended. Those findings are applicable to all basins. Noted below are certain problems specifically associated with Lake Michigan Basin-North.

a. Water Quality

While water quality problems in the Lake and tributaries may not be readily apparent, there are some situations that represent existing or potential problems.

(1) Tributary Streams: The total phosphorus and fecal coliform standards are consistently violated. Minimum DO values periodically fall below the standard. Suspended inorganic solids concentrations are at times elevated. Standards for iron and copper are violated in about 25 percent of the samples.

(2) Beaches: The total phosphorus standard is violated at all times. Mean values for total dissolved solids nearly equal the standard, while maximum values exceed the standard. The fecal coliform standard is violated in about 45 percent of the samples. The ammonia nitrogen standard is consistently violated.

(3) Water Intakes: The total phosphorus and ammonia nitrogen standards are consistently violated. The fecal coliform standard is violated in about 25 percent of the samples.

(4) Ravines: The copper and lead mean concentrations exceed the standard. Mean concentrations of soluble phosphorus exceed the total phosphorus standard. Total suspended solids and COD concentrations are high.

b. Point Sources

Problems associated with point source pollution have been nearly eliminated in the basin. However, there are some situations that represent existing, or potential problems:

(1) Excess Wastewater Flows: In times of excess wastewater flows to treatment plants, effluents could be discharged into Lake Michigan after receiving only primary treatment and disinfection. Potential sources are the Waukegan and North Chicago wastewater treatment plants of the NSSD. Under emergency conditions, such discharges also can come from the phased-out plants at the Great Lakes Naval Training Center, Fort Sheridan, Lake Forest and Lake Bluff. Such discharges are inconsistent with the areawide goal of eliminating all pollutant discharges to the Lake.

(2) NPDES Permits: The acceptable quality of excess wastewater flows that are discharged into Lake Michigan should be specified in the appropriate NPDES permits. The current NPDES permits regulating the excess wastewater discharges call for the annual average of the treatment plant effluent combined with the quality of excess wastewater discharges to the Lake not to exceed 30 mg/l of BOD or suspended solids. This type of requirement allows unspecified concentrations of pollutants to be discharged into the Lake from the excess wastewater facilities.

(3) Infiltration/Inflow: Analysis of the Waukegan sewer system indicates that excessive infiltration and inflow exist in the system. In view of the situation with respect to excess wastewater flows, described above, inflow and infiltration are contributing factors in periodic discharges into Lake Michigan of partially treated effluent.

(4) Hansen Plant: The "miscellaneous" wastewater treatment plant (actually a septic tank and sand filter) at A.S. Hansen Actuaries continually fails to meet fecal coliform standards for the effluent it discharges into a small ditch leading into Lake Michigan.

(5) Extension of Sewers: Additional interceptor sewer service will be required to accommodate areas within the Waukegan sewer service area that are forecasted to grow substantially by the year 2000.

(6) Water Treatment Plant Residuals: Water treatment plants continue to discharge backwash waters and related wastes into the Lake. These discharges can periodically impact upon water quality.

(7) Thermal Discharges: The impact of heated discharges upon the Lake are not entirely known. However, due to the very large volume of water normally discharged from Commonwealth Edison's Waukegan and Zion plants, the total thermal load can be significant.

c. NSSD Facility Plans

As noted above, the NSSD completed system expansion and improvement plans in 1971, prior to the enactment of PL 92-500 and subsequent regulations. Those plans were farsighted, designed for the year 2010, and took into consideration a number of factors which eventually ended up as requirements of PL 92-500. Features of those plans have essentially been implemented except for certain items scheduled for phased construction at a later date. Because of the elapsed time since the plans were prepared, giving due consideration to new population forecasts and other changed conditions, it is appropriate that the NSSD review

those earlier plans, which it is now in the process of doing.

d. Nonpoint Sources

With respect to nonpoint sources of water pollution, the situations described below represent existing or potential water quality problems in the basin.

(1) Septics: Many of the septic systems now in use in the basin are located where soils or surficial geologic conditions are either marginal or unsuited for such systems. In other cases, septic systems are too heavily concentrated, or located in areas where groundwater tables are known to be high. Overall, 60 percent of the septic systems in the basin are in marginal areas. It is anticipated that current local regulations in the basin will prevent new problems from septic systems installed in the future.

(2) Stormwater: Problems associated with urban stormwater runoff discharging directly to the Lake or indirectly via tributaries and ravines, continue to exist, but are difficult to quantify. In proportion to total pollutant discharges from all sources, which are decreasing in the basin, the relative impact of stormwater may increase.

(3) Construction: The threat of construction-related pollution is present any time vegetative cover is removed and land disturbances take place. In this basin, however, new building construction and roadway improvements are expected to be minimal with periods of exposure relatively short. The only exception concerns the proposed construction of the Lakefront Freeway between Waukegan and Zion. There is a continuing risk of damage to water quality from new construction on lake bluffs and along ravines, and these activities should be carefully monitored by local governments.

(4) Dredging: Waukegan Harbor and the Great Lakes Naval Training Center Harbor require periodic dredging to maintain navigable depths, and such work will accelerate if lake water levels continue to fall as they did in 1977. Potential pollution from dredging includes localized and short-term suspension of bottom sediments, turbidity, and nutrient activation. Adverse effects are possible if dredge spoils are not disposed of properly, but current disposal practices do not appear deficient.

Plans for the possible construction of harbors for small craft at Zion and/or Highland Park, together with offshore facilities, may present water quality problems, including possible shore erosion.

(5) Shore Erosion: Sediment loadings and suspended materials generated by soil erosion are and will continue to be a significant problem in this basin, particularly in areas where adequate measures to control wave energy and stabilize the shoreline are lacking. This is true in the vicinity of Illinois Beach State Park.

(6) Air Pollution: Adverse effects from air pollution fallout and washout will continue to influence Lake Michigan water quality, but the extent of the effects, as discussed in paragraph 12.05c of this chapter and in paragraph 6.08 of Chapter Six, is difficult to quantify.

(7) PCB's: The existence of PCBs in the bed of Waukegan Harbor is a cause of concern because no viable plan has been proposed for their removal. The discharge of wastewaters that contained the PCB's was ended in 1971. Prior to discontinuing the discharge, it is estimated that one industry discharged approximately 2 million pounds of PCBs into the harbor over an 18-year period of time.

e. Residuals

Suitable plans for the ultimate disposal of residuals from the Highwood water treatment plant have yet to be developed.

12.09 BASIN RECOMMENDATIONS

a. Overview

Recommended measures for improving and protecting water quality in Lake Michigan Basin-North are derived from the recommendations in Chapters Four through Eight and from specific basin problems discussed in earler sections of this chapter. Very stringent water quality standards have been established for Lake Michigan. Every economical effort must be made toward compliance. Only at that time should the standards be re-evaluated. In addition, the activities of adjacent states relative to the lake water quality should be closely scrutinized.

b. Point Sources

(1) Publicly Owned Wastewater Systems

(a) The NSSD should complete its present construction program as described in paragraph 12.04 above, and a 201 facility plan. The items noted below as pertaining to the NSSD should be considered by the District in its 201 study and/or operating program.

(b) During wet weather periods fully or partially treated effluents in excess of the Waukegan plant's Des Plaines River outfall sewer capacity may have to be diverted to Lake Michigan. If this takes place, it is recommended that all such diversions be quantified and sampled in order to form the basis of possible future alternative plans to be studied in the NSSD's 201 facility plan now being prepared.

(c) Specific standards should be established by the IEPA for all effluent streams discharged by the Waukegan plant, including those from any ancillary facilities.

(d) Recognition should be given to the City of Waukegan's sewer rehabilitation work so as to reduce excessive wastewater loads to the NSSD Waukegan treatment plant.

(e) All basin municipalities and Lake County should seek to achieve continued reductions in water use in order to help reduce wastewater flows at publicly owned treatment plants. This should be accomplished through pricing policies, modification of building codes to require water conserving plumbing fixtures, metering of all new development, and public education to reduce consumption in already developed areas.

(f) Municipal-type sewer service required to serve future growth within service areas identified for the year 2000 will be provided only by public agencies except where this is impractical or not cost-effective.

(g) Projected five-year service areas should be identified in the NPDES permits issued by IEPA.

(h) No NPDES permit should be issued for municipal-type wastewater service within the five-year service area, other than to the treatment authority, except on a finding by IEPA that the proposed facility is the most cost-effective means of providing service, is an interim facility pending extension of service by the treatment authority, or is intended to serve an isolated location.

(i) The treatment plant operators of the NSSD should assure the very high standards of performance for wastewater treatment plants which the local plans assume.

(j) The IEPA should monitor treatment plant operation and performance and its effect on in-stream water quality.

(k) The IEPA should establish a technical assistance program to aid operators of treatment plants where necessary in dealing with technical problems and

assuring a consistent high level of performance in treatment operations.

(2) Miscellaneous Wastewater Treatment Plants

(a) The A.S. Hansen Actuaries should make plans to correct reported deficiencies in its on-site treatment plant. At the same time, serious consideration should be given to eliminating this plant and connecting the flows to the local public sewer system.

(b) Miscellaneous publicly and privately owned wastewater treatment plants should continue in operation until such time as wastewater service can be provided by publicly owned municipal-type wastewater systems on a cost-effective basis. Service areas of privately owned treatment systems should not be expanded or their treatment capacities increased when service can be provided on a cost-effective basis by publicly owned municipal-type wastewater systems.

(3) Other Point Source Discharges

(a) Necessary steps should be taken by Highwood, Highland Park, Waukegan and Fort Sheridan to eliminate water treatment plant backwash and residual wastes now being discharged into the lake.

(b) The IEPA and USEPA should continue to monitor power plant discharges and develop information relating to water quality impact on the lake.

(c) Other point source discharges should continue in operation and the IEPA should enforce all NPDES requirements.

c. Non-Point Sources

(1) Urban Stormwater Runoff

(a) By July 1, 1983, Lake County and all affected municipalities should seek to achieve a reduction of BOD in urban stormwater runoff from separately sewered impervious surfaces by 50 percent of 1976 surface loadings in already urbanized areas and in newly urbanizing areas tributary to the Lake. The implementing agencies should work through the countywide water quality committee to develop plans and standards for the implementation of appropriate measures, such as catch basin cleaning, performance zoning, street cleaning, use of porous pavement surfaces, increased vegetative cover, grass waterways, wetland storage of stormwater, stormwater detention,

sedimentation and erosion controls, and other measures to achieve the desired pollutant reductions.

(b) Township and state highway organizations, the Illinois State Toll Highway Authority, and facility engineering departments at state and federal installation should participate in the programs described above by implementing accelerated and/or improved street sweeping programs for streets, roads and highways that are hydraulically connected to perennial streams or permanent lakes via stormwater conveyance systems.

(c) During the period up to July 1, 1983 agencies should utilize voluntary exploratory programs, implementing techniques to control pollutants from urban nonpoint scurces.

(d) Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should adopt and enforce adequate stormwater detention ordinances. These ordinances should include provisions which clearly establish long-term responsibilities for maintenance of detention facilities. All such local ordinances also should be consistent with minimal areawide standards set forth in the model ordinance.

(e) Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should develop and enforce adequate erosion and sedimentation control ordinances. All such local ordinances should be consistent with minimal areawide standards set forth in the model ordinance.

(f) Within one year following the preparation by NIPC of a recommended model ordinance, Lake County and all municipalities in the basin should adopt measures to control surface runoff from open storage yards containing industrial stockpiles and other materials which may go into solution or which may be carried away by stormwater runoffs and pollute streams and other water bodies.

(g) By July 1, 1979, municipalities, townships, Lake County and state highway departments responsible for de-icing streets and highways should develop programs to control the application of de-icing materials, to train personnel in proper application methods, and to use proper equipment in order to minimize any negative water quality impacts. The impact of de-icing agents on water quality will be given further study by the Commission in the continuing planning program.

(2) Agricultural Runoff

(a) By July 1, 1980, the Lake County Soil and Water Conservation District, in conjunction with agencies of the United States and Illinois Departments of Agriculture and the countywide water quality committee, should identify the specific best management practices necessary to implement the agricultural aspects of the 208 plan, including conservation tillage, contour plowing, terracing, and conversion of cropland to grassland.

(b) By July 1, 1981, agricultural lands on which BMP's should be applied should be identified by the Soil and Water Conservation District. Agencies of the U.S. Department of Agriculture and the countywide water quality committee should be consulted.

(c) By July 1, 1985, a comprehensive conservation plan should be prepared for each farm in the basin which has soil erosion losses in excess of standards set by the Illinois Department of Agriculture and soil and water conservation districts under House Bill 818.

(d) Using available cost sharing and technical assistance programs, the Soil and Water Conservation District should ensure implementation of the BMP program according to the following schedule on approximately 268 acres of agricultural lands:

By 1985 - 30% of the identified land.
By 1995 - 70% of the identified land.
By 2000 - 100% of the identified land.

(e) The IEPA and NIPC should provide the results of their instream water quality monitoring to the Soil and Water Conservation District and to the Departments of Agriculture so that priority can be given to the areas most sensitive from a water quality standpoint in order to maximize the impact of the best management practices.

(f) The IEPA should enforce the IPCB regulations which require permits for feedlots and should use the IEPA draft technical policy WPC-2 "Design Criteria for Field Application of Livestock Wastes" as a guide.

(g) Illinois Department of Agriculture, Illinois Department of Public Health, and USEPA regulations on the use of pesticides and disposal of containers, and Illinois Department of Agriculture regulations on the training and licensing of pesticide applicators and operators should be continued.

(h) Farmers should implement good pasture management practices, utilize grass waterways, vegetative filter strips, and field borders, and make wise use of fertilizers wherever possible in accordance with the Illinois Agronomy Handbook to reduce the dangers of pollution. The U.S. Department of Agriculture agencies should assist farmers in recognizing the water quality problems posed by improper practices, and assist them in the use of proper practices.

(3) On-site Disposal Systems

(a) Individual malfunctioning on-site disposal systems outside of the five-year service areas should be repaired wherever possible upon complaint to the Lake County Health Department, or replaced with a new system if necessary.

(b) By July 1, 1983, special service areas should be established under the initial sponsorship of municipal governments (for sites located within corporate limits) and by Lake County (in unincorporated areas) where necessary to aid in the financing of any cluster septic systems or other on-site improvements necessary to correct or replace malfunctioning systems in areas outside the five-year projected service areas.

(c) The minimum requirements of the Illinois Private Sewage Disposal Code should be upgraded to require a construction permit to regulate the design, location, and installation of every new on-site system in incorporated as well as unincorporated areas.

(d) Local officials should inspect all septic systems known to be failing, threatening public health or causing nuisance conditions. The inspection should result in the issuance of a repair permit for corrective measures which are to be undertaken and paid for by the septic system owner. Septic systems also should be inspected by local officials prior to the transfer of ownership of properties where such systems are installed. The results of the inspections should be made known to the lending institutions which are furnishing the mortgages.

(4) Air Pollution

(a) As part of the continuing planning program, the IEPA, in cooperation with the Illinois Institute for Natural Resources, the Illinois State Water Survey, and local air quality management agencies, should analyze the relationship between air pollution and water quality in all of its aspects. The IEPA should cooperate with the Commission in devising strategies for correcting

present negative effects and preventing future problems through the 208 continuing planning program.

(5) Sanitary Landfills

(a) The IEPA should ensure that every sanitary landfill complies with all regulations of the IPCB for its siting, design, construction and operation. As a substitute for existing state regulation, the IEPA and IPCB should consider certification of local solid waste disposal programs which comply with areawide plans to be prepared under the federal Resource Conservation and Recovery Act. Alternatives to land disposal of solid waste, including recycling, should be considered and utilized wherever feasible.

(6) Waterways

(a) A plan for the removal of PCB concentrations in Waukegan Harbor should be developed by the Outboard Marine Corporation by July 1, 1980 and implemented by that firm.

(b) Given the existence of a federal navigation project to maintain minimum channel depths in the Waukegan Harbor, local authorities should cooperate with the U.S. Army Corps of Engineers in identifying and making available suitable dredge spoil disposal areas.

(c) The Commission, in conjunction with the Lake County Water Quality Committee in the continuing planning program, should develop recommendations to simplify the highly fragmented system for channel maintenance and improvement. Present responsibilities for such maintenance functions as debris removal, streambank stabilization, public access, dredging, disposal of dredge spoil, protection and augmentation of habitat, tree shading and vegetation is shared between a host of federal, state and local authorities.

(d) The Lake County Health Department should insure that adequate pump-out facilities are maintained at all boat marinas and docks for the proper disposal of waste generated on board watercraft.

(e) In-stream water quality data collected by local treatment plant operators shall be periodically published by the IEPA.

(7) Boundary Conditions

(a) Out-of-state influences on Lake Michigan water quality should continue to be monitored by the IEPA and USEPA to determine impacts on the Illinois portion of the Lake.

d. Residuals

(1) As regulated by the IEPA, present methods for the disposal of sludge from treatment plants are adequate to handle present and anticipated future volumes and should continue to be administered by the IEPA.

(2) Highest priority should be given to the use of sludge as a soil conditioner, and efforts to utilize sludge for that purpose should be expanded. The IEPA should assure proper practices in the utilization of sludge on agricultural lands through implementation of the draft standards in IEPA Technical Policy WPC-3 "Design Criteria for Municipal Sludge Utilization on Agricultural Land."

(3) The preferred method for the disposal of domestic septage is through land application, and this method should be encouraged and used whenever possible. Recognizing a continuing need for the disposal of large volumes of septage at wastewater treatment plants, specific facilities should be designated by the IEPA to receive domestic septage on recommendation by the Commission through the continuing planning process.

(4) The USEPA standards and the IPCB regulations for permits for the disposal of hazardous or toxic substances should continue to be enforced by the IEPA.

(5) By July 1, 1980, the City of Highwood should complete plans designed to handle the sludges from its water treatment plant in a satisfactory manner, thus eliminating the present practice of backwashing these residual wastes into Lake Michigan. Work on the project should be completed by December 31, 1981.

e. Groundwater

(6) By July 1, 1980, the Illinois State Water Survey and the Illinois State Geological Survey should undertake a coordinated well sampling program to monitor groundwater quality in areas where a potential for infiltration by pollutants now exists or might exist in the future.

12.10 COSTS OF RECOMMENDED PLAN

a. Facility Plans

(1) General: Table 12-25 shows the capacity in the year 2000 of the NSSD Waukegan wastewater treatment plant, its effluent standards and current construction costs.

The "Initial" costs of facility plans listed in Table 12-25 apply to the first phase of any project which may be followed at some future date by programmed expansions or extensions. Under this definition, the total cost of works currently under construction fall under the classification "Initial" even though the project has not yet been completed and future payments to contractors will be made. The "Future" costs in Table 12-25 cover phased work scheduled at later dates.

All authorized improvements at or related to the Waukegan plant are essentially completed. When the NSSD completes its facility plans, information may be developed which will call for "Future" costs.

(2) Summary of Future Costs: Table 12-26 has assigned capital costs within five year time frames. Annual operation and maintenance costs are also shown, which are based on data included in current reports, where available, or from data furnished by operating agencies. In their absence, they were estimated based on information in 208 Staff Paper No. 20, "Wastewater Treatment Processes and Cost Estimating Data."

(3) Annualized Local Capital Costs: Table 12-27 shows annualized local capital costs.

(4) Increased Costs: Table 12-28 shows the estimated annual increases in wastewater charges per household for residents in the basin for the previously described improvements and/or expansions.

b. Urban Stormwater

Methods for controlling pollution in urban stormwater runoff include: street sweeping, catch basin cleaning, performance zoning, use of porous pavements, increased vegetation, grass waterways, wetland storage of stormwater, stormwater detention, and erosion and sedimentation controls. The target of a 50 percent decrease in BOD pollutants (of 1976 loads) on all present and future separately sewered impervious areas, present and future to the year 2000, is to be achieved by combinations of the above practices. The cost of the mix of specific practices which would meet these goals is dependent upon the practices selected and the intensity of their individual use.

TABLE 12-25: RECOMMENDED PLANS, PUBLICLY OWNED TREATMENT SYSTEMS

LAKE MICHIGAN NORTH BASIN

MAP CODE	FACILITY NAME	DESIGN CAPACITIES (MGD)		EFFLUENT STANDARDS (Year 2000) (mg/l)				CAPITAL COSTS (million $)			COMMENTS
		1975	2000	BOD_5	TSS	P	NH_3N	INITIAL	FUTURE	TOTAL	
L30	(1) NSSD Waukegan	12.75	25.41	10	12		1.5	23.53	-	23.53	(1) Effluents diverted to Des Plaines
L29	(2) NSSD North Chicago	-	-	SEE GURNEE				INCLUDED WITH GURNEE COSTS			River 5-1-78.
											(2) Flows diverted to NSSD-GURNEE
											WWTP, May 1976. (Des Plaines
											River)

Revised 2/15/79

TABLE 12-26: SUMMARY OF FUTURE COSTS (All data in 1977 dollars in millions)

Jurisdiction	Capital Costs						Annual Operations & Maintenance Expense				
	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	Total	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)
NSSD	29.73					29.73	0.94	1.18	1.18	1.18	1.18
Agricultural BMP's									0.001	0.001	0.001
Urban Stormwater Management Expense							0.88	0.90	0.92	0.94	0.96
Total	29.73					29.73	1.82	2.08	2.10	2.12	2.14

Revised 2/15/79

TABLE 12-27: PROJECTED ANNUALIZED LOCAL COSTS (All data in 1977 dollars in millions)

Jurisdiction	CAPITAL COSTS			LOCAL CAPITAL PLUS O & M ANNUALIZED Costs (Mil./yr.)*					Total Cost** 1978-2000	Comments
	Cost Total Through Yr. 2000	Est. Fed'l. Share	Est. Local Share	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000		
NSSD	29.73	22.30	7.43	1.64	1.64	1.64	1.64	1.18	36.34	Note:
Agricultural BMP's						0.001	0.001	0.001	.013	The analysis in this table
Urban Stormwater Management Expense				0.88	0.90	0.92	0.94	0.96	21.08	is based on future costs
										as estimated in the plan.
Total				2.52	2.54	2.56	2.58	2.14	57.43	Some additio-nal costs may
										be incurred based on
										facility plan currently
										being prepared.

*Local Capital Amortized @ 7% for 20 yrs.
**Sum of Local Capital Plus O & M Annualized Costs, in million $

Revised 2/15/79

TABLE 12-28: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	704.5	746.5	788.5	830.5	864.1	Note: The analysis in this table is based on future costs as estimated in the plan. Some additional costs may be incurred based on facility plan currently being prepared.
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.100	.061	.059	.056		
O & M Related	.258	.279	.266	.255	.248	
Total Rate:	.358	.340	.325	.311	.248	
Additional Cost per Home of $45,000 FMV ($/yr.)	53.70	51.00	48.75	46.65	37.20	
Existing Av. Annual WW Cost ($/Household yr.)	111.60					
Total Av. Annual WW Cost ($ / Household yr.)	165.30	162.60	160.35	158.25	148.80	
Percent Av. Increase* in WW Costs per Household (%)	48.1	45.7	43.7	41.8	33.3	

*Total Rate Used

Revised 2/15/79

An estimate of the total cost, based solely on street cleaning utilizing vacuum sweepers, is $20,930,000 through the year 2000, increasing from $852,000/year in 1978 to $968,000/year in the final year. The frequency of cleaning streets with vacuum sweepers averaged about once every 4.2 days. No sweeping was estimated for the three winter months of December through February. Costs are shown in Tables 12-26 and 12-27.

c. Agricultural Runoff

Agricultural croplands presently amount to 1,180 acres in the basin, and are projected to decrease to 595 acres by the year 2000. In order to reduce agricultural pollution from croplands, BMP's are targeted for implementation by the year 2000 on 268 acres at a total cost over the years of $16,000.

Although a comprehensive farm plan would include a wide range of BMP's, the following four practices and several combinations have been recommended for implementation: conservation tillage, contcuring, terracing, and cropland conversion to pastureland. These BMP's were selected because of their direct effects on water quality as well as their ability to reduce soil erosion. Many other practices which would be applied in a farm plan, but not considered by the Commission, are either too localized or difficult to evaluate for their effects on water quality.

Of the above total costs, there were none that represented initial installation (or capital) expenditures for which grants may be available from the federal government. The proposed expenditure of $16,100 represents total operating and maintenance costs to the farmers over and above straight up and down plowing.

For estimating purposes, it was assumed that 30 percent of the BMP's will be installed by 1985, 70 percent of 1995, and 100 percent by the year 2000.

12.11 WATER QUALITY CONDITIONS IN 1983

According to Section 101(a) of PL 92-500, it is the national goal that "wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water shall be achieved by July 1, 1983."

As noted in previous sections, existing water quality in Lake Michigan Basin-North rates very high. This condition was brought about principally by the closing of five small North Shore Sanitary District treatment plants which formerly discharged their effluents into Lake Michigan, the diversion to inland treatment facilities of

CHAPTER 13

Little Calumet River

TABLE OF CONTENTS

	Page
13.01 DESCRIPTION OF BASIN	13-1
a. Physical Characteristics	13-1
(1) Geography	13-1
(2) Waterways	13-1
(3) Geology and Soils	13-1
(4) Fish Inventory	13-3
b. Socio-Economic Characteristics	13-3
(1) Population	13-3
(2) Land Use	13-3
(3) Economy	13-3
(4) Water Supply	13-5
(5) Government	13-5
(6) Recreation	13-5
13.02 IMPACTS OF OTHER PROJECTS	13-5
a. Introduction	13-5
b. Corps of Engineers	13-8
(1) Navigation	13-8
(2) Wastewater Studies	13-8
(3) TARP Study	13-9
(4) Dredge and Fill Permits	13-9
(5) Flood Control	13-9
c. U.S. Department of Agriculture	13-10
(1) Conservation Program	13-10
(2) PL-566 Projects	13-10
(a) Chicago Area River Basin Study	13-10
d. Illinois Department of Transportation	13-11
(1) IDWR	13-11
(2) DOH	13-11
e. NIRPC	13-11
f. Local Units of Governments	13-12
13.03 WATER QUALITY IN THE BASIN	13-12
a. Stream Classifications and Applicable Standards	13-12
b. IEPA Stream Segment Classifications	13-12
c. Existing Water Quality Conditions	13-13
(1) Commission In-Stream Sampling	13-14
(2) SOD Sampling	13-19
(3) Biological Classifications	13-19
(4) Fish Species and Habitat	13-20
(5) Land Use Runoff	13-20
(6) IEPA In-Stream Sampling	13-20
(7) Computer Simulations of Existing Conditions	13-21
d. Results of Water Quality Modeling	13-22
(1) Pollutant Concentrations	13-22
(2) Pollutant Loadings and Sources	13-24
(3) Point Sources	13-24

TABLE OF CONTENTS (Continued)

	Page
(4) Pervious Sources	13-28
(5) Impervious Sources	13-28
(6) Combined Sewer Overflows	13-28
(7) Boundary Conditions	13-29
e. Watershed Not Modeled - Plum Creek	13-29
(1) Introduction	13-29
(2) Existing Water Quality Conditions	13-29
(a) IEPA Water Quality Sampling Data	13-29
(b) IEPA Water Quality Index	13-30
(c) IEPA Biological Survey	13-30
13.04 POINT SOURCES: EXISTING CONDITIONS	13-31
a. Municipal Type Wastewater Treatment Plants	13-31
b. Industrial Wastewater Treatment Plants	13-42
c. Miscellaneous Wastewater Treatment Plants	13-42
d. Other Point Sources	13-42
e. Combined Sewer Overflows	13-42
f. Local Facilities Planning	13-42
13.05 NON POINT SOURCES: EXISTING CONDITIONS	13-44
a. Urban Stormwater Systems	13-44
b. Construction Activities	13-44
c. Air Deposition	13-44
d. Septic Systems	13-45
e. Surface Waste Disposal Sites	13-45
f. Hydrologic Modifications	13-47
13.06 DISPOSAL OF RESIDUALS	13-47
a. Point Sources	13-47
b. Non Point Sources	13-49
c. Residual Disposal Facilities	
13.07 EXISTING MANAGEMENT PROGRAMS	13-49
13.08 MODELING PROCESSES: FUTURE CONDITIONS	13-49
a. First Text Plan Assumptions	13-50
(1) Population and Land Use	13-51
(2) Local Facilities Plans	13-51
(3) Phosphate Reductions	13-52
(4) Combined Sewer Overflows	13-52
(5) Boundary Conditions	13-52
(6) Urban Stormwater Runoff	13-53
(7) Air Desposition of Pollutants	13-53
(8) Septic Systems	13-53
(9) Soil Conservation	13-53
(10) Livestock Populations	13-53
(11) Fertilizer Applications	13-53
(12) Stream Flow Changes	13-54
(13) Channel Improvements	13-54
(14) Shading of Streams	13-54

TABLE OF CONTENTS (Continued)

	Page
b. First Test Plan, Simulated Results	13-54
(1) BOD	13-54
(2) Ammonia	13-54
(3) Nitrate and Phosphorus	13-55
(4) Dissolved Oxygen	13-55
(5) Percent of Time That Standards are Violated	13-55
(6) Summary	13-55
c. Second Test Plan: Assumptions and Results	13-60
(1) Test A	13-60
(2) Test B	13-60
(3) Test C	13-60
(4) Test D	13-63
(5) Test E	13-63
(6) Test C & E	13-63
(7) Summary	13-63
13.09 PROBLEM ASSESSMENT	13-64
a. Excessive Infiltration/Inflow (I/I)	13-64
b. Sampling	13-65
c. Computer Simulation - Existing Conditions	13-65
d. Point Sources	13-65
e. Non Point Sources	13-66
f. Problems Remaining after Implementation of Test Plans	13-67
13.10 BASIN RECOMMENDATIONS	13-67
a. Overview	13-67
b. Point Sources	13-68
(1) Publicly Owned Wastewater Systems	13-68
(2) Industrial Wastewater Treatment Plants	13-70
(3) Miscellaneous Wastewater Treatment Plants	13-70
(4) Combined Sewer Overflows	13-70
(5) Other Wastewater Dischargers	13-71
c. Non-Point Sources	13-71
(1) Urban Stormwater Runoff	13-71
(2) Agricultural Runoff	13-73
(3) On-Site Disposal Systems	13-74
(4) Air Pollution	13-75
(5) Sanitary Landfills	13-75
(6) Waterways	13-75
(7) Boundary Conditions	13-76
d. Residuals	13-76
e. Groundwater	13-77
f. Inland Lakes	13-77
g. Mining	13-77

TABLE OF CONTENTS (Continued)

	Page
13.11 COSTS OF RECOMMENDED PLAN	13-77
a. Facility Plans	13-77
(1) General	13-77
(2) MSDGC Area	13-79
(3) Future Costs	13-79
(4) Local Costs	13-79
(5) Increased Costs	13-80
(6) Basin Specifics	13-80
b. Urban Stormwater	13-80
c. Agricultural Runoff	13-86
d. Boundary Conditions	13-86
e. Other Costs	13-86
13.12 WATER QUALITY CONDITIONS IN 1983	13-87
a. Introduction	13-87
b. Assumptions of Changes in the Basin	13-87
(1) Land Cover	13-87
(2) Urban Runoff Controls	13-87
(3) Point Sources	13-87
c. Expected Water Quality in 1983	13-87
d. Evaluations	13-90

FIGURES

No.		Page
13-1	Basin Location	13-2a
13-2	Water Sampling Stations	13-6a
13-3	Basin Modeling Segments	13-6b
13-4	Point Source Discharges	13-30a
13-5	Wastewater Service Areas	13-41
13-6	Location of Septic Areas	13-46

TABLES

No.		Page
13-1	Stream Inventory	13-2
13-2	Lake and Pond Inventory	13-2
13-3	Predominant Soil Unit Characteristics for Northeastern Illinois	13-4
13-4	Population Changes 1975-2000	13-6
13-5	1970 Land Use	13-6
13-6	Land Use Forecasts (Acres)	13-7
13-7	Employment Forecast	13-7
13-8	In-Stream Water Quality Analyses - Summary Data	13-14
13-9	Generalized Benthic Sediment Conditions	13-16

TABLE OF CONTENTS (Continued)

		Page
13-10	Biological Stream Site Classifications	13-16
13-11	Violations in 1976 of Illinois In-Stream Water Quality Standards	13-17
13-12	Data Output Points - Important Reaches	13-19
13-13	Statistical Summary of Current Water Quality	13-23
13-14	Statistical Summary of Current Dissolved Oxygen Levels	13-26
13-15	Pollutant Contributions by Source Category, Existing Conditions, Reach 31	13-26
13-16	Sources of Pollutants, Existing Conditions	13-27
13-17	IEPA - Recorded Violations of Water Quality Standards, Plum Creek, 1972-1975	13-30
13-18	Municipal Type Wastewater Treatment Plants	13-32
13-19	Miscellaneous Wastewater Treatment Plants	13-37
13-20	Other Point Source Discharges	13-39
13-21	Summary of Septic Tank Installations	13-45
13-22	Septic System Areas Having Limitations	13-48
13-23	Existing Local Water Quality Management Agencies and Programs	13-50
13-24	Changes in Land Cover, 1976-2000	13-51
13-25	Comparison of Sources and Volumes of Pollutants, Reach 31	13-56
13-26	Comparison of Pollutant Concentrations, Existing Conditions - First Test Plan - Second Test Plan	13-58
13-27	Changes in Dissolved Oxygen Levels Under Alternative Test Plan Conditions	13-61
13-28	Water Quality Events in Violation of Desired Levels Under Alternative Test Plan Conditions	13-62
13-29	Recommended Plans, Publicly Owned Treatment Systems	13-78
13-30	Summary of Future Costs	13-81
13-31	Projected Annualized Local Costs	13-82
13-32	Projected Average Annual Increase in Household Wastewater Costs - Cook County	13-83
13-33	Projected Average Annual Increase in Household Wastewater Costs - Will County	13-84
13-34	Projected Average Annual Increase in Household Wastewater Costs - Basin Total	13-85
13-35	Land Cover Changes	13-88
13-36	Point Sources	13-88
13-37	Water Quality Ratings in 1983	13-89
13-38	Ammonia and Dissolved Oxygen Ratings in 1983	13-90

CHAPTER THIRTEEN
LITTLE CALUMET RIVER BASIN

13.01 DESCRIPTION OF BASIN

a. Physical Characteristics

(1) Geography: The Little Calumet River Basin is located in northeastern Illinois and northwestern Indiana where the stream originates. The watershed contains 857 square miles of which 181 are in Illinois. In Illinois the river is 19.5 miles long, and flows in a westerly direction from the Indiana border to its junction with the Cal-Sag Channel. The basin is 18 miles wide at its widest point. Most of the Illinois portion of the basin is in Cook County, with the remainder in Will County. (See Figure 13-1) This plan concerns the Illinois portion of the basin.

(2) Waterways: The drainage system of the basin includes nine lakes of more than 10 acres each and eight important tributaries. Five of these tributaries flow directly into the Little Calumet River, two are tributary to Thorn Creek and one is tributary to Deer Creek. Significant water bodies in the basin are listed in Tables 13-1 and 13-2. Midlothian Creek, tributary to the Little Calumet River, was considered part of the Chicago River/Sanitary and Ship Canal Basin for modeling purposes, and is discussed in that basin chapter.

(3) Geology and Soils: The dominant deposit in the basin is till, covering a large portion of the surface and underlying most other surficial materials at shallow depths. Till is relatively impermeable; water recharge capability is limited and applications of wastes, fertilizers or agri-chemicals can be carried by runoff to surface waters.

Glacial sand and gravel deposits generally consist of linear or curvilinear clusters, found mainly in the Cook County portion of the basin. Sand and gravel does not attenuate pollutants well. As a result, rapid pollutant infiltration may allow leachate from landfills, discharges from septic tanks and surface applications of wastes, fertilizers or, agri-chemicals to pollute the groundwater.

Fine-grained glacial lake deposits and windblown deposits are also common, especially in low-lying areas. The low permeability of these materials leads to runoff and surface ponding. At the same time, when such deposits are thin, wastes may travel downward and pollute underlying aquifers.

Most of the basin is suitable for the land burial of wastes, with the exception of scattered areas having high infiltration rates or areas where bedrock lies close to the surface. Surficial deposits of dolomite limestone are extensive in the vicinity of Thornton where the largest commercial quarry is located. Septic tank usage and surface

TABLE 13-1: STREAM INVENTORY

LITTLE CALUMET RIVER BASIN

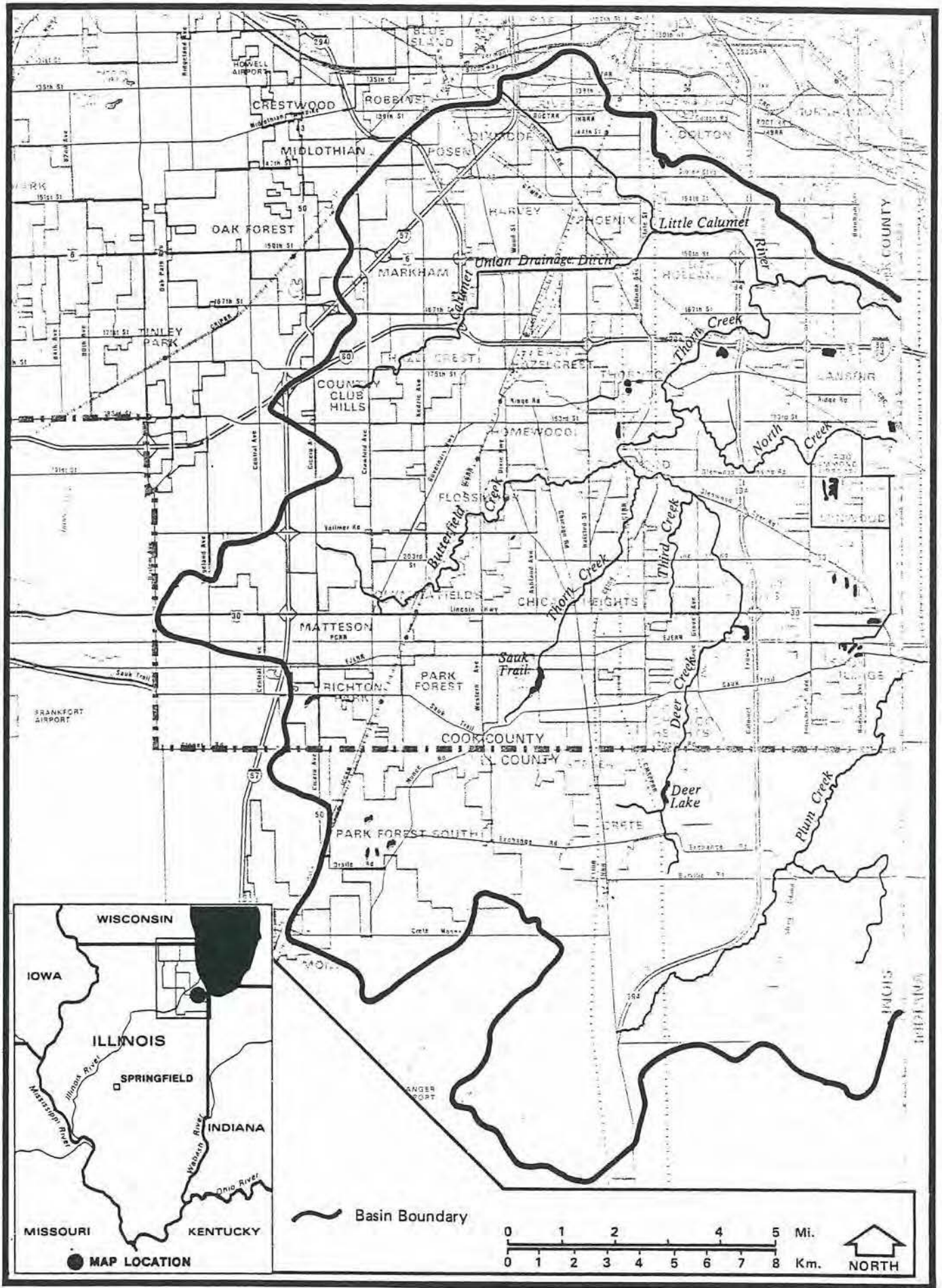
STREAM NAME	LENGTH (MILES)	AVG. WIDTH (FT.)	WATER SURFACE (ACRES)	GRADIENT (FT/MILE)	DRAINAGE AREA (SQ. MILES)	COMMENTS
LITTLE CALUMET RIVER	5.8	321.0	225.8	Variable	857	
CALUMET UNION DRAINAGE DITCH	5.1	8.0	4.9	5.8	19	
DEER CREEK	6.7	18.0	14.6	11.1	23	
BUTTERFIELD CREEK	10.1	16.0	19.5	6.9	26	
NORTH CREEK	5.7	22.0	15.2	1.7	23	
PLUM CREEK	1.7	30.0	6.1	0.1	37	
THIRD CREEK	5.4	10.0	6.5	2.7	4	
THORN CREEK	12.8	30.7	47.6	8.5	107	

TABLE 13-2: LAKE AND POND INVENTORY

LITTLE CALUMET RIVER BASIN

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
ALIDA LAKE	35	15		12.8	0.6	50	NA	Early 1960's	Private	
CALUMET LAKE	37	14		1600	7.2	10	NA	Natural	Public	
FLATFOOT LAKE	37	14		15.0	1.1	20	NA	1958	Public	
HOMEWOOD IZAAK WALTON MEMORIAL PARK LAKE	36	14		10.7	2.1	9	NA	1923	Org.	
LANSING SPORTSMENS CLUB LAKE	35	15		21.5	1.5	25	NA	1915	Org.	
POWDERHORN LAKE	36	15		34.5	1.1	13	NA	1958	Public	
SAUK LAKE	35	14		26.3	1.7	6.4	NA	1923	Public	
WAMPUM LAKE	36	17		34.5	0.8	13	NA	1953-54	Public	
WOLF LAKE	37	15		419.0	13.5	21	NA	Natural	State	

Figure 13-1: BASIN LOCATION



Revised 2/15/79

spreading of wastes or agri-chemicals are limited in most areas by the impermeability of the soil and the accompanying problem of runoff.

Soils vary in this basin in type and in properties that indicate the potential for impacts on water quality under certain conditions. Predominant soils in northeastern Illinois are described in Chapter Three. Soils occurring in this basin are identified in Table 13-3.

(4) Fish Inventory

Fish population surveys were conducted at 19 sites along the Little Calumet River and its tributaries in 1976 as part of the 208 sampling program. Only 15 species of fish and two hybrid crosses were collected in the survey. Significantly, no fish were secured at three of the collection sites, despite repeated attempts. Almost all of the species collected are considered tolerant of habitat abuse, with creek chubs being the most abundant species collected.

b. Socic-Economic Characteristics

(1) Population: The estimated 1975 population of the basin was 368,203, representing 14 per cent of the combined populations of suburban Cook and Will Counties (2,566,161). Population density is highest in the northern portion of the basin. Overall population density (2,035 persons per square mile) is average for areas in suburban northeastern Illinois.

Table 13-4 provides population forecasts for the basin as a whole and for the facilities planning areas. Projected wasteloads, which are discussed later in this chapter, are based in part on these population projections.

(2) Land Use: The Little Calumet Basin exhibits a wide variety of land use, ranging from industrial and suburban residential in the north to agricultural in the south. As indicated in Table 13-5, more than half of the basin is undeveloped (open, space, vacant, agricultural), while residential is the second largest land use category. Open space accessible to the public includes portions of several forest preserves, and accounts for about 9 percent of the total acreage.

Land use forecasts anticipate increasing urbanization of the basin and accompanying changes in land use, as shown in Table 13-6. The largest proportionate increases are in the categories of manufacturing and commercial. Undeveloped land is forecast to decrease by 33 percent by the year 2000.

(3) Economy: Employment in the basin totaled 75,683 in 1970. Economic activity in recent years has reflected regional patterns. While still dominated by manufacturing, other categories of employment, such as wholesale trade, finance, insurance, real estate and government have shown higher rates of growth.

TABLE 13-3: PREDOMINANT SOIL UNIT CHARACTERISTICS FOR NORTHEASTERN ILLINOIS

Unit In Basin	Soil Unit	Soil Color	Soil Texture	Permeability	Drainage	Subsoil Texture	Underlying Materials	Agricultural Usage Limitations	Approximate Percentage of Prime Agri. Land	Development Usage Limitations
	Fox-Dresden-Casco	brown	loam	mod-rapid	well	loam	sand and gravel	E, D, LF	12	S, E, ST
	Warsaw-Rodman-Lorenzo	brown	loam	moderate	well	loam	sand and gravel	E, D	50	S, E, ST
Yes	Volinia-Selma-Lomax	brown	loam	moderate	excessive	loam	sand	WE, D, W	80	W, S, P
Yes	Maumee-Watseka-Plainfield	black	loamy sand	rapid	excessive	sand	sand	W, WE, D	30	S, W
	Zurich-Grays-Wauconda	gray	silt loam	moderate	moderate	clay loam	silt loam	W, E, LF	90	S, W, ST
Yes	Drummer-Brenton-Proctor	brown	silt loam	moderate	moderate	clay loam	loam	W, E	100	W, S, P
	Miami-Kidder-McHenry	gray-brown	loam	moderate	well	clay loam	loam	E, ST, LF	40	ST, S, SS
	Drummer-Saybrook-Lisbon	dark gray	silt loam	moderate	moderate	clay loam	loam	W, E	80	W, S, SP, SS
	Ringwood-Griswold	brown	loam	moderate	well	clay loam	sandy loam	E, W	85	S, W, ST
Yes	Morley-Markham-Ashkum	gray	loam	slow	moderate	silty clay	clay loam	E, W, LF	60	ST, SP, SS, W, HC
Yes	Elliot-Ashkum-Beecher	dark gray	silt loam	slow	moderate	silt loam	clay loam	W, E	85	W, SP, CS, SS
Yes	Milford-Martinton	black	silt loam	mod. slow	poor	silty clay	calcareous sediment	W	95	W, HC, P, SP, SS
	Symerton-Andres-Ashkum	black	silt loam	moderate	moderate	clay loam	clay loam	E, W	95	W, SP, SS
	Nappanee-Peotone-Del Rey	dark gray	silt loam	slow	well	silt loam	calcareous sediment	W, T, LF, E	50	W, SP, HC, P
Yes	Frankfort-Bryce-Montgomery	dark brown	silt loam	slow	poor	silty clay	calcareous sediment	W, T, LF, E	5	W, SP, HC, P
Yes	Romeo-Joliet	black	loam	moderate	poor	loam	limestone	W,STN, FL	60	W, SH, FL, SS
	Otter-Huntsville-Millington	black	loam	moderate	moderate	loam	loam	FL, W	95	W, FL
Yes	Fox-Wauconda-Sawmill	dark gray	silt loam	moderate	poor	loam	sand	W, FL, E	75	W, FL
Yes	Houghton-Lena	black	muck/peat	rapid	poor	muck/peat	sand/silt	HWT, W	0	W, P, S, HWT, LS

USAGE LIMITATION CODES

CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION
CS	Clayey Subsoil	D	Drouthiness	E	Erosion	FL	Flooding
HC	Heavy Clayey Subsoil	HWT	High Water Table	LF	Low Fertility	LS	Low Strength
P	Ponding	S	Seepage	SH	Shallowness to Bedrock	SP	Slow Percolation
SS	Shrink-Swell	ST	Steepness	STN	Stoniness	T	Soil Tilth
W	Wetness	WE	Wind Erosion				

Continuing urbanization of the basin will contribute to a forecasted increase in total employment of 75 percent by the year 2000, as shown in Table 13-7. Manufacturing employment will increase substantially, but the rate of growth will continue to be lower than service-related occupations.

(4) Water Supply: Lake Michigan is now, and will continue to be, the major water supply source for northeastern Illinois. About 5 million people in Chicago and 89 other communities use lake water. Fifteen of these communities are in the Little Calumet Basin, representing about half the basin's total population. Groundwater pumpage is the sole water supply source for the other communities and rural areas. Shallow dolomite wells account for 86.6 percent of groundwater pumpage and deep sandstone aquifers account for 13.4 percent.

(5) Government: The Illinois portion of the Little Calument Basin lies within two counties and includes all or part of 31 incorporated communities, the largest of which are Chicago Heights, Calumet City, Park Forest and Harvey. Also in the basin are all or parts of nine townships, three sanitary districts, nine drainage districts and three other special districts.

(6) Recreation: The basin contains many recreational recources , though extensive urban and agricultural development limit their size and the variety of outdoor activities. Though no quality stream fishing is found in the basin, forest preserve lakes and former quarry and aggregate pit lakes are fished extensively. Forest preserve areas also provide opportunities for hiking and picnicking. Extensive boating facilities on the Little Calumet River are used both for inland power boating and for access to Lake Michigan. Hunting in the basin is limited to small game hunting in agricultural areas.

13.02 IMPACTS OF OTHER PROJECTS

a. Introduction

In many basins there are studies or projects underway which may impact directly or indirectly on surface and/or ground water quality. Most will have indirect effects since they usually pertain to water quantity or hydrologic modifications. Included in these classifications are the flood control activities of the U.S. Soil Conservation Service (SCS), the U.S. Army Corps of Engineers, and the Illinois Division of Water Resources. Also of direct impact are the soil conservation programs of the SCS.

There are also many local, county, state and federal public works projects other than those related to water

TABLE 13-4: POPULATION CHANGE 1975-2000

FACILITY PLANNING AREAS	1975	1980	1985	1990	1995	2000	% Change 1975-2000
Bloom Township FPA[1]	103,500	105,200	113,000	120,800	129,800	138,900	34.2
Homewood FPA	20,500	25,000	26,800	28,500	30,700	32,800	60.0
MSD South Plant	1,035,000	1,082,000	1,082,000	1,135,000	1,245,000	1,302,000	25.8
Thornton FPA	3,800	5,000	5,400				
FPA Total	1,159,000	1,212,200	1,274,800	1,336,300	1,405,000	1,473,700	27.2
Basin Total	368,203	415,183	449,286	483,388	521,013	558,638	51.7

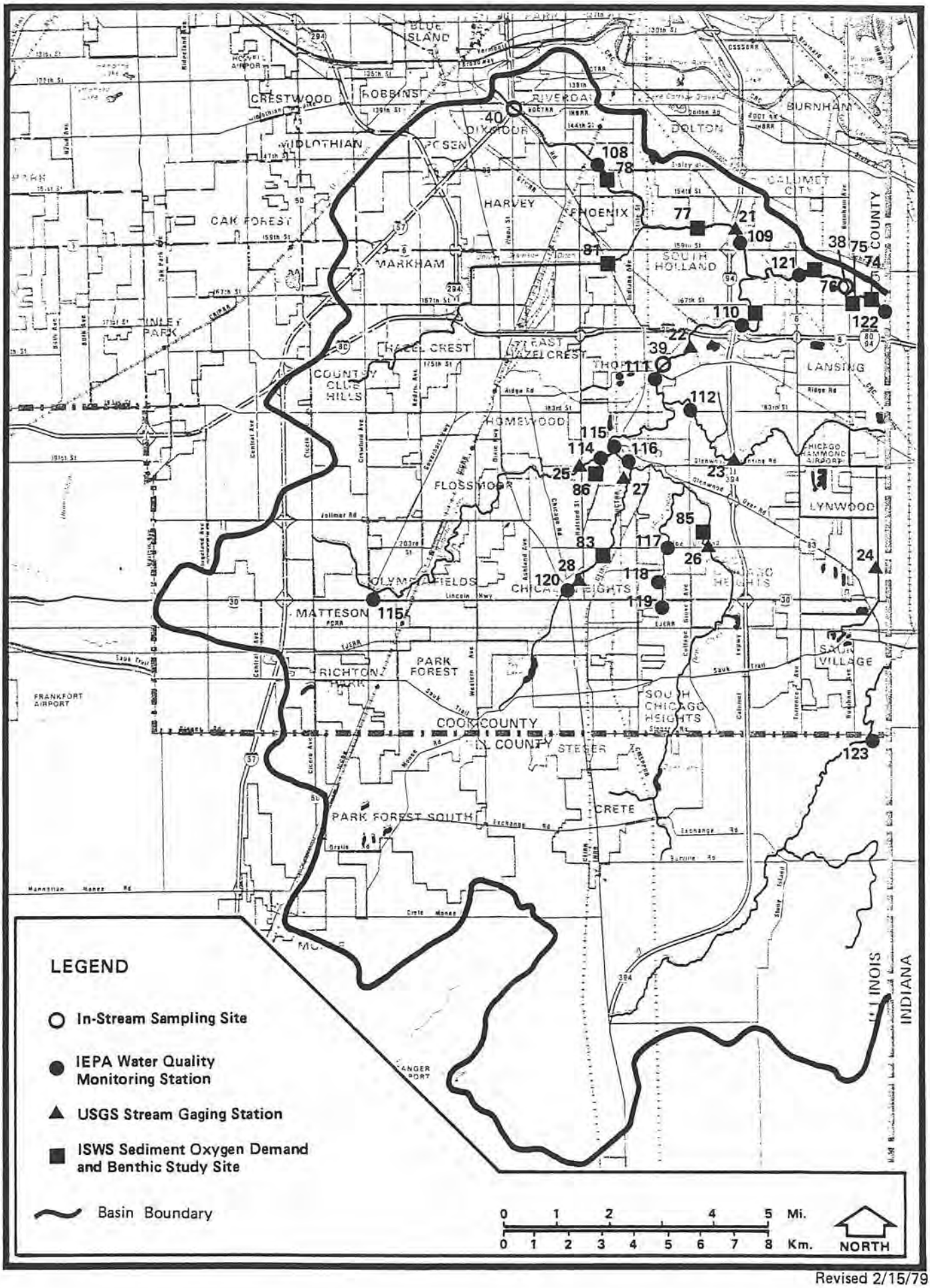
1/ Facility Planning area is located in more than one basin
Source: Northeastern Illinois Planning Commission

TABLE 13-5: 1970 LAND USE

Land Use Category	Total Acres	% of Total
Single Family Residential	19,131	16.5
Multi Family Residential	718	.6
Mobile Home Parks	158	.1
Manufacturing and Processing	1,676	1.4
Transportation, Communications, & Utilities	1,244	1.1
Railroad Rights-of-way	2,050	1.7
Airports	410	.4
Streets & Parking	8,201	7.1
Trade	1,099	.9
Services-Private	298	.3
Services-Institutional	2,278	2.0
Military Services	50	1/
Cemetaries	252	.2
Entertainment Assembly	474	.4
Public Buildings	9	1/
Public and Quasi-Public Open Space	10,177	8.8
Mining and Quarries	883	.8
Vacant, Agricultural & Forest Areas	64,029	55.3
Vacant-Under Development	1,650	1.4
Water	449	.4
Warehousing	188	.2
Shopping Centers	253	.2
Hotels-Motels	66	1/
Parking Lots	47	1/
Total	115,789	100

(1/) Less than .1 percent

Figure 13-2: WATER SAMPLING STATIONS



Revised 2/15/79

Figure 13-3: BASIN MODELING SEGMENTS



TABLE 13-6: LAND USE FORECASTS (ACRES)

Land Use Category	1980	1985	1990	1995	2000
Residential	23,391	24,751	26,111	27,480	28,850
Manufacturing	4,926	6,176	7,425	8,738	10,051
Commercial	5,355	6,668	7.982	9,380	10,777
Transportation/Communication, etc.	10,327	11,934	13,541	15,017	16,493
Open Space, Vacant Agriculture, etc.	71,790	66,260	60,730	55,174	49,618
Total	115,789	115,789	115,789	115,789	115,789

SOURCE: Northeastern Illinois Planning Commission, 1976

TABLE 13-7: EMPLOYMENT FORECAST

CATEGORY	1970	1980	1985	1990	1995	2000	1970-2000 % Increase
Manufacturing	27,011	28,793	29,557	30,321	31,812	33,302	23.3
Local Retail	11,201	14,696	15,866	16,762	18,315	19,868	77.4
Other	37,471	55,249	59,901	64,553	72,032	79,510	112.2
Total	75,683	99,011	105,324	111,636	122,159	132,680	75.3

Source: NIPC

quality which impact on local water bodies. Perhaps the most significant type involves the construction or improvement of roads and highways. These projects may alter drainage patterns, interrupt local farm tiles, introduce silt during construction, and convey vehicular pollutants to rivers and streams thereafter, all affecting water quality. Waterway crossings by highway projects and similar crossings by various public and private utilities all affect water quality to varying degrees and for various lengths of time. Not to be overlooked are public and private storm sewer outlets which may be authorized in the future.

b. Corps of Engineers

The U.S. Army Corps of Engineers has a variety of responsibilities relating primarily to navigation and flood control.

(1) Navigation: The Corps has general jurisdiction over navigable waters of the United States. Responsibilities include channel and harbor construction and maintenance, clearing and snagging, and control over the placement of structures which might impact upon navigability.

The Corps has no active navigation projects in the portion of the Little Calumet Basin included in this plan. The Corps does retain navigation jurisdiction, however, over that portion of the Little Calumet River from its junction with Cal-Sag Channel to its junction with the Calumet and Grand Calumet Rivers. Information on that reach is contained in the Chicago River/Sanitary and Ship Canal Basin chapter.

By a Congressional resolution, the Corps was directed to clean up debris in the portion of the Little Calumet River in this study and to remove silt. The first part of the project was completed. The second part has been deferred until appropriate measures have been taken to prevent their reoccurrence. Sediment samples taken in the Little Calumet River by the Illinois State Water Survey for the Commission have been found to be heavily organic, indicating sewage origins.

(2) Wastewater Studies: Pursuant to Section 206 of the Flood Control Act of 1958 and to Resolutions adopted by Congress in 1971, the Corps was involved in a planning study on alternative wastewater management systems for the Chicago-South End of Lake Michigan (C-SELM) area, which covered portions of northeastern Illinois and northwestern Indiana. Specifically, the study was directed at the evaluation of various regional wastewater management systems, including plans to eliminate pollutant discharges into water bodies. An initial pilot study was completed in 1974. However, since this was only a planning study, the report contained no recommendations for federal action with

respect to any of the specific wastewater management systems evaluated. The intent of Congress was for these studies to be presented to local units of government for their consideration and adoption, as desired. Some information developed in that study served as a point of reference in the current studies under PL 92-500.

(3) TARP Study: As part of the overall C-SELM study, the Corps is also involved in an investigation of the appropriate "federal interest" in the Tunnel and Reservoir Plan (TARP) proposed by the MSDGC. In its Interim Report No. 1, the Corps confirmed that supplemental sewers, tunnels and reservoirs (such as proposed in the TARP) were the optimal means for controlling runoff on both a community and an areawide basis.

The report noted that the flood damage reduction aspects of the plan appeared to fall within the purview of the federal flood control program, thus establishing the federal interest in that component. Follow-on studies concluded that the tunnel, reservoir, and channel-widening components of the plan (related to flood control) were appropriate for implementation under the regular flood control program administered by the Corps. Subsequently, the Water Resources Development Act of 1976 authorized the preparation of Phase I General Design Memoranda studies. These will evaluate federal interest in the flood control aspects of certain tunnels and reservoirs called for by the so-called Phase II of the TARP plan. Details of the TARP plan and its impact on the Little Calumet basin are discussed elsewhere in this plan.

(4) Dredge and Fill Permits: Under Section 404 of PL 92-500, the Corps is authorized to issue permits for the placement of dredged or fill materials into navigable waters or on adjacent land sites. Permits may be withheld if it is determined that the discharge of materials will have adverse effects on water supplies, fish and wildlife, or recreation. Under current guidelines, Corps authority extends to all navigable waters and tributaries thereto, up to points where the average annual flow is 5 cfs or more. Thus, much of the Little Calumet Basin is included under this permit program.

(5) Flood Control: The Corps has been involved in several studies and projects relating to flood control in the basin. A project for the Calumet Union Drainage Ditch which was authorized in 1954 has been placed on inactive status due to lack of local sponsorship. A report on the Indiana portion of the Little Calumet River Basin was completed in 1973. It recommended the construction of a multi-purpose project for flood control, recreational navigation, and general recreation. The project is now in the Phase I General Design Memorandum stage, which will develop project plans in greater detail. Potential flood damage reduction measures include flood storage along tributaries, levees, floodwalls,

and channel modifications. Since the Environmental Impact Statement on the project is not expected before 1980, it is difficult to estimate the impact of these actions on water quality in Illinois. One significant feature was proposed in the preliminary report which would impact on flows into Illinois. This was a small dam to be located near the Illinois-Indiana border which would divert low flows in an westerly direction to Illinois and high flows in an easterly direction to Lake Michigan via Burns Ditch. Corps action in the Illinois portion of the basin has been deferred pending completion of Soil Conservation Service investigations discussed below.

c. U.S. Department of Agriculture

The Agricultural Stabilization and Conservation Service (ASCS) and the Soil Conservation Service (SCS) are the two principal units of the U.S. Department of Agriculture having programs related to water quality management.

(1) Conservation Program: The SCS and ASCS provide a variety of services directed at the reduction of soil erosion. The SCS offers extensive technical assistance to individuals, local soil and water conservation districts, and other interested parties in developing erosion-control plans. The ASCS gives assistance through cost-sharing to farmers in order to control erosion and agriculturally related water pollution. Various site-specific control techniques are available for implementation under this program, depending upon the nature of local problems.

(2) PL-566 Projects: The small watershed program of the SCS, authorized by the Watershed Protection and Flood Prevention Act of 1954 (PL 83-566), provides a framework through which federal, state, and local governments can deal with local water resource problems on a cooperative basis. The program is principally oriented toward the prevention of soil erosion and the control of flooding and sedimentation damage. Projects typically include the construction of small reservoirs, stream channelization, grade stabilization, and bank protection. These projects are sponsored by and coordinated through local soil and water conservation districts and other interested agencies.

(a) Chicago Area River Basin Study: The Chicago Area River Basin Study was initiated by the SCS in 1971 under PL-566 authority. Work was undertaken in six watersheds in Cook and Lake counties under the local sponsorship of the MSDGC. The principal objective of the study was to develop comprehensive plans to reduce floodwater damage.

That portion of the Little Calumet basin lying in Illinois was included in the study, and in 1975, a floodwater management plan was completed. The plan calls for the

construction of three single-purpose reservoirs and one multiple-purpose flood control reservoir, approximately four miles of stream channel modifications, expanded floodplain regulation, stream channel maintenance, and structural floodproofing.

The management plan also calls for measures to control erosion on 45,800 acres of land. Implementation of these measures will have obvious (though unquantified) water quality benefits. Current SCS estimates are that average annual erosion will be reduced from 8.4 to 3.8 tons per acre on agricultural land, and from 11 to 2 tons per acre in urban areas.

d. Illinois Department of Transportation

Two divisions of this department have responsibilities related to water quality management: the Division of Water Resources (IDWR) and the Division of Highways (DOH).

(1) IDWR The IDWR has statutory responsibility for navigation and flood control projects on water bodies throughout the state, as well as permit authority for private and public projects which enter or cross over or under such waters. The IDWR also has underway a number of flood control projects in the region. None, however, are active or proposed for the Little Calumet Basin. The IDWR also has statutory authority to issue regulations controlling the use of flood plains.

(2) DOH: The Division of Highways is responsible for the construction and maintenance of state highways. Highways have associated water quality impacts both during their construction (e.g. erosion and sedimentation, disruption of drainage, etc.) as well as in use (e.g. road salt usage, roadway drainage). Current long-range plans call for the construction of multi-lane freeways connecting I-57 and I-65 (in headwater reaches of the Little Calumet River in Will County and in Indiana). ing the Little Calumet River itself).

e. NIRPC

The Northwestern Indiana Regional Planning Commission (NIRPC) is the regional planning agency for Lake and Porter counties, Indiana. NIRPC has prepared a 208 water quality management plan for its jurisdictional area. Due to a common interest in certain water bodies of an interstate nature (Lake Michigan, Grand Calumet River, Kankakee River, and Little Calumet River), water planning activities of NIPC and NIRPC have been coordinated. The mechanism for this interstate coordination is the Illinois-Indiana Bi-State Commission, which coordinates interstate planning programs

and public construction projects. Major emphasis throughout the 208 process has been placed on the development of plans for the Indiana portion of the Little Calumet River and other waters to meet the more stringent Illinois water quality standards.

f. Local Units of Government

Municipalities, Cook and Will counties, and special purpose districts are involved in a number of local projects which have water quality impacts. The general purpose units are empowered to adopt regulations such as floodplain ordinances, on-site stormwater detention ordinances, and soil erosion and sedimentation control ordinances. All of these relate directly or indirectly to improvements in water quality. Zoning ordinances, building codes, and health regulations all have the potential for at least peripheral impact on local water quality, particularly with respect to the installation and maintenance of septic tanks. Other effects result from activities such as street sweeping, sewer and catch basin cleaning, and solid waste management.

Special purpose districts also are involved. The Cook County Forest Preserve District has been particularly active in acquiring land in the basin and preserving it in a natural state. Local soil and water conservation districts long have been active in promoting soil erosion control measures.

Another organization is the Cook County Clean Streams Committee which serves as a focal point for citizen reporting of pollution incidents. Through a committee of volunteers and correspondence, follow-up actions are taken to identify sources of pollutants and institute corrective measures.

13.03 WATER QUALITY IN THE BASIN

a. Stream Classifications and Applicable State Standards

All waterways in the basin are designated as "General Use, Protected for Public and Food Processing Water Supply" except for the Little Calumet River itself, which is classified for General Use, but is not protected for public and food processing water supply. A full discussion on applicable water quality standards for each of these designations is given in Chapter Four.

b. IEPA Stream Segment Classifications

The State has been divided by the Illinois EPA into hydrologic units that coincide with major river basins. These units have been further divided into segments on the

basis of common characteristics. The Little Calumet basin, as defined by the Commission for areawide planning, is nearly identical to segment A-14, which is one of 20 segments in the Des Plaines/Lake Michigan hydrologic unit as defined by the IEPA. The exception concerns Midlothian Creek which was excluded from the Commission's delineation of the Little Calumet River Basin in order to take advantage of U.S. Geological Survey information at a point upstream of its confluence. This segment, like all others in the State, has been designated "water quality limited." This designation means that water quality does not currently meet applicable water quality standards and/or is not expected to meet those standards even after the minimum statutory limitations have been applied to effluents discharged to the water body.

c. Existing Water Quality Conditions

Assessment of current water quality in the Little Calumet River and its tributaries is based partly on information developed in the Commission's water quality sampling program and partly on programs conducted by other public agencies, principally, the IEPA. These sampling programs and their results are described below. The computer simulation of existing conditions by the water quality model also provides a comprehensive picture of water quality in the basin.

(1) Commission Instream Sampling: Three of the 48 instream sampling stations were located in the Little Calumet basin at the following locations as shown on Figure 13-2:

Station 38: Little Calumet River at Wentworth Avenue in Calumet City,

Station 39: Thorn Creek at Margaret Street in Thornton,

Station 40: Little Calumet River at Ashland Avenue in Dixmoor.

Data were collected seasonally over a 13 month period (April, 1976 through April, 1977) at each of these stations primarily for use in calibrating the water quality simulation model. Summary results are shown in Table 13-8. Samples were analyzed for 19 constituents or characteristics, and stream flow was measured at the time of sample collections. Of the 19 parameters evaluated, the State of Illinois has established standards for these four: pH, temperature, dissolved oxygen (DO), and ammonia. Violations of the DO standard were frequent during all sampling periods at all stations. Mean DO levels dropped below state standards during the summer months and minimum readings of 0 mg/l were reported during the summer months at

TABLE 13-8: IN-STREAM WATER QUALITY ANALYSES -- SUMMARY DATA

LITTLE CALUMET RIVER BASIN

STATION NO. 38

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		ph (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5[2]	BOD_{20}[2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
JUNE 1 - 10 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.3	266	46	82	1500	24	26	11	15	22			5.4	3.3	3.2	0.66	11	445	185	
	Minimum	7.0	193	18	11	208	1	15	0	4	12			2.0	0.4	0.8	0.06	7	348	57	
	Mean	7.6	227	26	44	769	13	20	5	10	18			3.2	1.5	1.7	0.33	8	396	106	
SEPTEMBER 7 - 16 1976	No. of Analyses	30	10	30	30	30	30	30	29	10	10			30	30	30	30	10	2	10	
	Maximum	8.0	335	26	80	1188	25	24	9	33	60			13.0	12.8	1.1	2.68	13	577	24	
	Minimum	7.4	152	12	17	462	4	17	0	3	7			3.7	2.1	0.0	0.50	6	446	9	
	Mean	7.7	273	18	29	866	12	20	3	15	26			8.0	6.7	0.2	1.46	11	512	15	
DECEMBER 5 - 15 1976	No. of Analyses	5	3	5	5	5	5	5	5	3	3			5	5	5	5	3	0	3	
	Maximum	7.7	317	28	147	974	123	1	8	37	57			13.2	10.0	0.3	1.86	11		43	
	Minimum	7.4	279	12	26	854	11	0	5	11	38			9.4	7.5	0.2	1.06	10		27	
	Mean	7.5	300	21	54	923	36	1	6	26	46			11.2	9.2	0.2	1.38	10		32	
FEBRUARY 21 - 28 1977	No. of Analyses	11	8	11	11	11	11	11	11	8	0			11	11	11	11	8	2	8	
	Maximum	7.4	218	86	334	794	47	13	11	29				6.5	5.2	1.9	1.32	32	359	19	
	Minimum	7.1	80	14	19	408	8	0	4	10				2.4	0.9	0.6	0.20	10	308	3	
	Mean	7.3	153	31	80	623	18	3	7	17				4.5	3.1	1.2	0.57	16	334	8	
MARCH 14 - 19 1977	No. of Analyses	10	6	10	10	10	10	10	9	6	6			10	10	10	10	6	2	6	10
	Maximum	7.6	228	56	295	912	42	12	8	10	16			5.5	4.1	2.8	0.38	11	378	38	152
	Minimum	7.2	160	8	17	550	8	5	5	6	10			2.8	1.5	0.9	0.21	5	365	17	56
	Mean	7.4	200	26	75	722	15	9	6	7	12			3.5	2.2	1.4	0.28	9	371	30	110

STATION NO. 39

JUNE 1 - 10 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	7.9	356	37	91	1844	15	24	6	16	32			12.0	10.4	4.5	2.22	15	730	12	
	Minimum	7.2	221	9	5	668	1	16	2	4	8			3.0	2.6	0.7	0.52	11	426	6	
	Mean	7.7	290	19	29	1311	7	20	4	8	15			7.1	6.4	2.6	1.39	12	578	9	
SEPTEMBER 7 - 16 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.0	371	30	73	2016	27	23	7	8	17			14.0	14.0	1.0	7.12	15	774	19	
	Minimum	7.5	272	6	6	660	1	17	2	3	9			5.3	2.1	0.2	1.31	9	733	6	
	Mean	7.8	346	10	14	1667	6	20	4	5	12			10.4	9.3	0.5	4.31	13	754	14	
DECEMBER 5 - 15 1976	No. of Analyses	14	10	14	14	14	14	14	14	10	10			14	14	14	14	10	2	10	
	Maximum	7.9	401	40	40	2052	22	5	9	11	40			12.4	12.4	3.5	20.20	16	807	15	
	Minimum	7.5	362	12	18	1636	8	1	7	6	3			9.8	9.6	1.3	0.65	13	714	7	
	Mean	7.7	373	17	28	1811	13	3	8	8	19			10.9	10.5	1.8	8.50	14	761	9	
FEBRUARY 21 - 28 1977	No. of Analyses	12	8	12	12	12	12	12	12	8	0			12	12	12	12	8	2	8	
	Maximum	7.8	332	68	231	1666	65	7	10	15				10.7	10.0	1.8	6.20	23	613	21	
	Minimum	7.2	112	10	17	772	7	2	5	7				2.8	1.8	0.4	1.20	12	538	3	
	Mean	7.5	221	25	64	1288	17	5	8	10				7.8	6.8	0.9	3.34	16	576	6	
MARCH 14 - 19 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	10
	Maximum	7.8	305	48	122	1280	25	15	10	15	18			8.7	7.5	4.4	2.50	13	445	9	160
	Minimum	7.3	190	11	21	942	8	6	3	5	13			3.6	2.4	1.3	1.30	6	432	5	67
	Mean	7.5	238	25	48	1094	12	10	7	8	15			5.2	4.0	2.2	1.82	10	438	7	100

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited.

(3) Analyses by Natco.

TABLE 13-8: IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

LITTLE CALUMET RIVER BASIN

STATION NO. 40

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		ph (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5[2]	BOD_{20}[2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
JUNE 1 – 10 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.2	296	56	254	1524	21	28	14	8	16			10.4	9.2	3.9	1.52	12	636	276	
	Minimum	7.3	174	11	12	450	3	16	3	5	8			1.8	0.8	0.4	0.54	8	368	31	
	Mean	7.8	242	22	42	1019	10	21	7	6	13			3.9	2.4	2.6	0.96	9	502	98	
SEPTEMBER 7 – 16 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.4	333	24	112	2046	59	25	21	30	66			9.8	8.0	4.1	4.28	10	737	230	
	Minimum	7.4	202	5	7	1056	3	18	2	3	7			3.2	2.0	0.1	1.02	3	613	28	
	Mean	7.9	276	9	25	1516	12	21	7	8	20			5.8	4.2	1.7	3.23	7	675	126	
DECEMBER 5 – 15 1976	No. of Analyses	3	3	3	3	3	3	3	3	3	3			3	3	3	3	3	0	3	
	Maximum	7.7	343	16	18	1694	9	1	8	12	23			11.1	9.7	1.2	7.50	13		10	
	Minimum	7.6	340	7	15	1524	7	0	6	7	9			9.9	9.1	1.1	4.84	11		4	
	Mean	7.7	342	10	16	1610	8	0	6	10	16			10.4	9.3	1.2	6.14	12		7	
FEBRUARY 21 – 28 1977	No. of Analyses	12	8	12	12	12	12	12	12	8	0			12	12	12	12	8	2	8	
	Maximum	7.8	291	72	309	1236	69	8	9	27				7.8	6.8	2.0	4.20	31	450	70	
	Minimum	7.2	107	11	8	664	6	1	4	7				2.9	1.6	0.4	0.60	10	426	4	
	Mean	7.5	161	26	83	1017	16	3	7	13				5.8	4.6	0.9	2.27	15	438	17	
MARCH 14 – 19 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	10
	Maximum	7.7	251	60	482	1538	61	15	11	12	600			5.4	3.7	6.7	1.78	11	388	26	250
	Minimum	7.2	178	10	15	790	7	5	4	3	8			2.7	1.8	1.6	0.68	8	378	13	130
	Mean	7.5	212	26	83	974	15	10	6	6	109			3.7	2.5	2.2	1.12	10	383	18	180

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited

(3) Analysis by Nalco

revised 2/15/79

TABLE 13-9: GENERALIZED BENTHIC SEDIMENT CONDITIONS

Little Calumet River BASIN

STATION NUMBER	STREAM NAME	BENTHIC CONDITION*
74	Little Calumet River	Sewage Sludge Like
75	LIttle Calumet River	Heavily Polluted
76	Little Calumet River	Sewage Sludge Like
77	Little Calumet River	Polluted
78	Little Calumet River	Polluted
81	Calumet Union Canal	Heavily Polluted
83	Thorn Creek	Moderately Polluted
84	Thorn Creek	Polluted
85	Deer Creek	Moderately Polluted
86	Butterfield Creek	Moderately Polluted

revised 2/15/79

*Based on SOD value

TABLE 13-10: BIOLOGICAL STREAM SITE CLASSIFICATIONS

Little Calumet River BASIN

Station Number	Stream Name	IEPA Classification(1)	Shannon-Weaver	
			Index	Classification(2)
74	Little Calumet River	P	0.00	SeP
75	Little Calumet River	P	0.88	SeP
76	Little Calumet River	P	0.87	SeP
77	Little Calumet River	P	0.14	SeP
78	Little Calumet River	SP	1.07	MP
81	Calumet Union Canal	SP	0.99	SeP
83	Thorn Creek	P	0.00	SeP
84	Thorn Creek	P	0.99	SeP
85	Deer Creek	SP	1.58	MP
86	Butterfield	SP	0.32	SeP

revised 2/15/79

(1) Polluted (P); Semi-polluted (SP); Unbalanced (U); Balanced (B).

(2) Severe pollution (Se P); Moderately polluted (MP); Clean (C).

TABLE 13-11A: VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

LITTLE CALUMET RIVER BASIN

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																		
			Ammonia Nitrogen 1.5	Fecal[2] Coliform (per 100 ml.) 200	Iron 1.0	Copper 0.02	Dissolved Oxygen 5.0	Lead 0.1	Silver 0.005	Chloride 500	Fluoride 1.4	PH (Units) (4)	Boron 1.0	Sulfate (4)	Cyanide (4)	Hexavalent Chromium 0.05	Total Phosphorus (4)	Manganese (4)	Phenol (4)	Total Dissolved Solids (4)	Temp. (°F) (4)
108	Little Calumet River	No. of Analyses	6	6	3	3	6	3	3	3	3		3			3					
		No. of Violations	4	6	1	2	3	1	2	0	2		0			0					
HB 05		Maximum	14.00	36,000	3.6	0.10	9.0	0.29	0.010		1.7										
		Minimum	0.40	2,000	0.3	0.00	3.6	0.00	0.000		0.7										
		Mean[3]	6.03	10,352	1.4	0.05	5.5	0.11	0.007		1.3										
109	Little Calumet River	No. of Analyses	8	8	2	2	6	2	2	2	2		2			2					
		No. of Violations	6	8	1	2	3	0	0	0	1		0			1					
HB 04		Maximum	13.00	180,000	1.2	0.07	10.6				8.8					0.06					
		Minimum	0.43	1400	0.9	0.03	0.0				1.2					0.00					
		Mean[3]	6.71	13752	1.0	0.05	5.2				5.0					0.03					
121	Little Calumet River	No. of Analyses	8	8	3	3	7	3	3	3	3		3			3					
		No. of Violations	6	8	1	2	4	0	2	0	1		0			0					
HB 03		Maximum	11.00	180,000	2.7	0.73	11.0		0.080		5.5										
		Minimum	0.33	1,500	0.7	0.02	0.0		0.000		1.3										
		Mean[3]	3.90	28,709	1.4	0.26	4.0		0.030		2.7										
122	Little Calumet River	No. of Analyses	8	8	3	3	7	3	3	3	3		3			3					
		No. of Violations	6	8	1	2	3	1	0	0	1		0			0					
HB 02		Maximum	11.00	400,000	4.6	0.21	11.6	0.96			14.5										
		Minimum	0.33	1,500	0.7	0.01	0.0	0.01			0.6										
		Mean[3]	4.92	15,078	2.0	0.10	5.0	0.33			5.3										
110	Thorn Creek	No. of Analyses	8	8	2	2	7	2	2	2	2		2			2					
		No. of Violations	6	6	0	2	2	0	0	0	0		0			1					
HBD 01		Maximum	14.00	8,400		0.05	10.6									0.06					
		Minimum	0.84	100		0.05	1.3									0.00					
		Mean[3]	7.65	1072		0.05	6.1									0.03					
111	Thorn Creek	No. of Analyses	8	8	2	2	7	2	2	2	2		2			2					
		No. of Violations	6	6	0	2	2	0	0	0	0		0			0					
HBD 04		Maximum	13.0	180,000		0.10	10.9														
		Minimum	0.62	100		0.04	1.0														
		Mean[3]	5.97	1,370		0.07	6.2														
113	Thorn Creek	No. of Analyses	8	7	2	2	7	2	2	2	2		2			2					
		No. of Violations	7	5	0	1	2	0	0	1	1		1			0					
HBD 02		Maximum	20.0	700,000		0.05	10.1			520	1.7		1.3								
		Minimum	1.0	100		0.02	2.3			275	1.3		1.0								
		Mean[3]	10.86	1401		0.03	5.8			397	1.5		1.1								
120	Thorn Creek	No. of Analyses	6	5	2	2	6	2	2	2	2		2			2					
		No. of Violations	2	3	0	2	0	0	0	2	0		0			0					
HBD 03		Maximum	4.40	74,000		0.17				2600											
		Minimum	0.05	60		0.07				1600											
		Mean[3]	1.63	2,570		0.12				2100											
		No. of Analyses																			
		No. of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) Fecal coliform violations are apparent violations (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric

(4) No water quality violations for this parameter were reported

revised 2/15/79

TABLE 13-11B: VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

LITTLE CALUMET RIVER BASIN

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																		
			Ammonia Nitrogen	Fecal[2] Coliform (per 100 ml.)	Iron	Copper	Dissolved Oxygen	Lead	Silver	Chloride	Fluoride	PH (Units)	Boron	Sulfate	Cyanide	Hexavalent Chromium	Total Phosphorus	Manganese	Phenol	Total Dissolved Solids	Temp. (°F)
			1.5	200	1.0	0.02	5.0	0.1	0.005	500	1.4	(4)	1.0	(4)	(4)	0.05	(4)	(4)	(4)	(4)	(4)
117	Third Creek B	No. of Analyses	0	0	0	0	0	0	0	0	0		0			0					
		No. of Violations																			
HBDD 01		Maximum																			
		Minimum																			
		Mean[3]																			
118	Third Creek B	No. of Analyses	8	7	2	2	7	2	2	2	2		2			2					
		No. of Violations	8	7	0	1	1	0	0	0	0		2			0					
HBDD 08		Maximum	14.00	530,000		0.03	22.7						1.2								
		Minimum	2.80	500		0.02	3.8						1.2								
		Mean[3]	8.26	11,825		0.02	8.8						1.2								
119	Third Creek B	No. of Analyses	7	6	3	3	7	3	3	3	3		3			3					
		No. of Violations	7	5	1	3	1	0	0	0	0		1			0					
HBDD 03		Maximum	25.0	600,000	1.4	0.12	17.5						1.1								
		Minimum	4.2	100	0.7	0.03	1.6						0.9								
		Mean[3]	16.97	10488	1.0	0.07	8.5						0.9								
114	Butterfield Creek	No. of Analyses	8	7	3	3	7	3	3	3	3		3			3					
		No. of Violations	7	6	0	2	2	0	0	2	1		2			0					
HBDB 01		Maximum	18.00	21,000		0.05	14.2			1000	1.9		1.5								
		Minimum	0.36	100		0.01	3.5			250	0.5		0.6								
		Mean[3]	8.10	1788		0.03	7.4			733	1.2		1.1								
115	Butterfield Creek	No. of Analyses	7	6	3	3	7	3	3	3	3		3			3					
		No. of Violations	0	4	1	1	0	0	0	0	0		0			0					
HBDB 02		Maximum		8,200	7.0	0.10															
		Minimum		100	0.8	0.01															
		Mean[3]		556	2.8	0.04															
112	North Creek	No. of Analyses	8	8	3	3	6	3	3	3	3		3			3					
		No. of Violations	1	7	2	2	1	1	0	0	0		0			0					
HBDA 01		Maximum	5.80	7300	5.2	0.06	14.6	0.12													
		Minimum	0.00	100	0.3	0.00	3.5	0.01													
		Mean[3]	0.86	867	2.3	0.03	10.00	0.05													
116	Deer Creek	No. of Analyses	7	7	2	2	7	2	2	2	2		2			2					
		No. of Violations	2	5	0	0	0	0	0	0	0		0			0					
HBDC 01		Maximum	7.60	12000																	
		Minimum	0.04	100																	
		Mean[3]	1.44	544																	
123	Plum Creek	No. of Analyses	7	7	2	2	6	2	2	2	2		2			2					
		No. of Violations	0	2	1	2	0	0	0	0	0		0			0					
HBE 01		Maximum		11,000	7.00	0.05															
		Minimum		100	1.00	0.03															
		Mean[3]		263	4.00	0.04															
		No. of Analyses																			
		No. of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) Fecal coliform violations are apparent violations. (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric.

(4) No water quality violations for this parameter were reported.

revised 2/15/79

Station 38, 2 mg/l at Station 39, and 3 mg/l at Station 40. Violations of the ammonia nitrogen standard of 1.5 mg/l were very frequent with mean concentrations in fourteen of the fifteen sample groups in excess of the standard.

(2) SCD Sampling: Ten of the 110 sites at which sediment oxygen demand ((2) SOD) was measured are in the Little Calumet Basin as shown on Figure 13-2. The overall purpose of this program was to estimate the oxygen demand exerted upon the overlying water by bottom-dwelling (benthic) organisms. Conditions were then classified under one of the following categories: clean, moderately clean, slightly degraded, moderately polluted, polluted, heavily polluted, or sewage sludge-like. On the basis of this evaluation, conditions as noted in Table 13-9 ranged from "moderately polluted" (three sites) to "sewage sludge-like" (two sites).

(3) Biological Classification: As part of the SOD study, benthic macroinvertebrate communities were analyzed at 110 stations in the region,, and mathematical Shannon-Weaver Indices reflecting the nature and diversity of these communities were developed according to standard formulae. Indices above 3.0 are indicative of generally clean water, values between 1.0 and 3.0 are indicative of moderately polluted water, and values below 1.0 are indicative of severe pollution.

Shannon-Weaver Indices and their relevant classifications for the ten sampling stations in the Little Calumet Basin are shown in Table 13-10. Two stations were classified as moderately polluted and eight stations were classified as severely polluted under this system. Under the IEPA's biological classification system (also shown in

TABLE 13-12: IMPORTANT REACHES IN THE LITTLE CALUMET BASIN

Reach 7 Area drained by the headwaters of Thorn Creek	Reach 19 Area drained by the lower portions of Thorn Creek
Reach 11 Area drained by Butterfield Creek above Thorn Creek	Reach 31 Northernmost area of the basin, and the farthest downstream portions of the Little Calumet River

revised 2/15/79

Table 13-14), four stations were classified as semi-polluted and six stations were classified as polluted.

(4) Fish Species and Habitat: Follow-on analysis by the Illinois Natural History Survey (INHS) involved computation of a toxicity index relating water quality to fish habitat suitability. Included in the parameters for computing the toxicity index (using bluegills as the target species) are cadmium, nickel, arsenic, chromium, boron, silver, mercury, cyanide, ammonia and copper, among others. On the basis of its analysis, the INHS determined that at 15 of the 21 IEPA water quality sampling sites in the basin, the calculated bluegill toxicity index was in excess of the theoretical maximum level above which a diverse fishery cannot be maintained. Those parameters contributing to the high index values were ammonia nitrogen, flouride, silver, cyanide, MBAS, and total iron. Ammonia nitrogen contribute significantly to the index calculations at all of the sites. Overall, fish habitat suitability in the Little Calumet basin is regarded as poor, particularly in the river itself.

The Thorn Creek tributaries have acceptable water quality and diverse fish populations at their head waters. Downstream conditions deteriorate rapidly with several toxicant primarily ammonia nitrogen, entering the streams. Thorn Creek then flows into the Little Calumet, further degrading the river's water quality. Plum Creek, a high-quality stream in its Illinois portion, is channelized and flows through a suburban area before it enters the Little Calumet in Indiana. Midlothian Creek, also channelized, seems to maintain moderate quality throughout its length.

(5) Land Use Runoff: As part of the areawide planning effort, the Commission conducted landuse runoff sampling and analyses at 16 sites and 2 ravines tributary to Lake Michigan. One of the two high-density residential land use runoff sampling sites was located in the Little Calumet Basin, in Park Forest South. The results of sampling at these two sites are summarized in Table 6-1 in Chapter 6.

(6) IEPA In-Stream Sampling: Eighteen IEPA instream sampling stations are located in the Little Calumet Basin. The results of that sampling program in 1976 are shown in Table 13-11.(A and B) Ammmonia nitrogen, fecal coliform, copper, and DO were the parameters for which violations were most frequent. The standard for ammonia nitrogen was violated in 58 percent of the samples. Out of 119 analyses for fecal coliform, 99 apparent violations (the IEPA method varies from conventional methodology for sampling fecal coliform) were recorded. Out of 42 analyses for copper, 29 violations were noted. Violations of the DO standard were noted in 25 percent of the samples analyzed. In several instances the violations were far in excess of state standards, particularly for ammonia nitrogen.

The major problem in Thorn Creek was ammonia violations but DC violations were also noted. Third Creek, a tributary of Deer Creek, showed 100 percent violation of the ammonia standard and 14 percent DO violations. Deer Creek itself showed few ammonia violations and no DO violations.

Butterfield Creek, upstream of the Homewood wastewater treatment plant, showed no DO violations. Downstream of the plant, 14 percent of the samples showed DO violations. Numerous ammonia violations were noted throughout Butterfield Creek. The Little Calumet River as it enters Illinois showed numerous violations of both the ammonia and DO standards. The Little Calumet after it is joined by Thorn Creek continued to show numerous violations of the ammonia and DO standards.

(7) Computer Simulation of Existing Conditions: For modeling purposes the basin was divided into 15 areas called reaches. However, in order to reduce the mass of information to manageable size, information was reported at only 4 points which are located at critical stream junctions or at locations where it was desirable to determine the impacts of pollutant sources. Figure 13-3 shows the critical reaches in the Little Calumet basin and Table 13-12 describes each reach.

The concept of "reaches" is an important one in this areawide planning program. Water quality research done by the Commission was conducted in each basin on a reach-by-reach basis. The data shown represent simulated conditions at the "data output points" shown in Figure 13-3.

As described in Chapter Four, the model is a computerized system that, uses mathematical formulas to replicate the drainage basin of the Little Calumet River. This process of using a computerized system to replicate conditions in a physical system is called "simulation."

To ensure that the model is an accurate representation of the real Little Calumet basin, the behavior of the model has been balanced against measurements and observations of actual conditions in the basin. For example, the model's description of existing water quality in the basin has been calibrated by using actual water samples collected and analyzed in the basin during 1976 and 1977.

Sources of pollutants are catergorized in the modeling process as follows:

--Point Sources: treatment plants and other discrete discharges

--Nonpoint Sources: surface runoff and groundwater seepage from developed and undeveloped areas

--Combined Sewer Overflows

--Boundary Conditions: the amount of pollution flowing into a basin from another basin or another state. Boundary conditions are a factor since the Little Calumet River enters Illinois from Indiana.

- Results are discussed below.

d. Results of Water Quality Modeling

The model simulation of existing conditions provides a more comprehensive picture of water quality in the basin than the results of sampling programs. Not only are pollutant concentrations determined and related to state standards, but the relative amounts of pollutants contributed by various sources are also described.

(1) Pollutant Concentrations: Although the Commission sampled for 19 pollutant parameters, simulation reports on existing conditions were prepared only for eight parameters: stream flow, temperature, chlorophyll a, dissolved oxygen (DO), biochemical oxygen demand (BOD), ammonia (NH_3), nitrate (NO_3), and phosphate (PO_4). The last four of these represent pollutants that can be quantified and tied to specific categories of sources using the model.

Assessments of conditions with respect to each parameter or pollutant are based on state in-stream standards, if established. Statistical values express the minimum, maximum, and average concentrations of pollutants. The number of times that simulated concentrations violated state standards is shown, as are the average durations of the periods of violation.

The simulation was continuous over a three-year period. Readings were hourly. Therefore, if a standard for a particular pollutant was constantly violated over the entire simulation period, that would be reflected in the statistics for number and frequency of violations like this:

--Number of violations: one (because there was only one violation, even though it was of three years' duration)

TABLE 13-13: STATISTICAL SUMMARY OF CURRENT WATER QUALITY

Parameter (Standard) (All data in mg/l)	REACHES				
	7	11	19	31	
BOD (No Standard) Maximum	*	60.2	*	*	
Minimum	4.23	1.65	4.50	2.63	
Mean	31.3	6.91	13.2	15.2	
AMMONIA (1.5 mg/l) Maximum	16.8	10.0	11.6	10.3	
Minimum	.57	.25	.88	1.38	
Mean	9.71	4.25	5.39	4.61	
No. Violations	45	77	40	4	
Avg. Duration Viol.	582	323	643	6,560	
NITRATE (No Standard) Maximum	5.44	5.73	4.07	3.98	
Minimum	.44	.90	.76	0	
Mean	1.45	1.95	1.49	1.33	
PHOSPHATE (.05 mg/l) Maximum	3.03	4.13	3.49	3.28	
Minimum	.10	.13	.15	.37	
Mean	1.90	1.54	1.75	1.44	
No. Violations	1	1	1	1	
Avg. Duration Viol.	26,300	26,300	26,300	26,300	

* Exceeded expected range

--Average duration: 26,304 hours (the total number of hours in the three-year period)

Table 13-13 summarizes pollutant levels simulated for the Little Calumet under existing conditions. As was indicated by the results of the instream sampling programs discussed above, problems are apparent with respect to ammonia. Maximum levels were far above the standard in all four of the reaches covered in the table. The mean ammonia levels were also three to six times the standard of 1.5 mg/l in all four reaches. The phosphorus standard of 0.05 mg/l, although it is not applicable in this basin, was continuously violated in all four reaches. The maximum BOD levels in three of the four reaches were exceedingly high.

Dissolved oxygen has been used by the Commission as a general indicator of water quality. Conditions with respect to DO are described by statistics in Table 13-14. Of particular importance is the fact that minimum DO levels in all reaches are zero, indicating the severity of DO problems in the basin. The state minimum DO standard of 5.0 mg/l was violated frequently in Reach 31 as well as its tributaries, Reach 7, Thorn Creek, and Reach 19, Deer Creek and North Creek. The frequency and duration of violations in Reach 11, Butterfield Creek, were relatively low.

(2) Pollutant Loadings and Sources: Pollutant loads in the basin are very high. The basin contains significant urbanization. However, the predominant land cover type is lowland, comprising about 45 percent of the total land cover, excluding boundary conditions. (Boundary conditions for the Little Calumet simulation include all the tributary areas contributing flow which enter Illinois from Indiana at the state line. These include flows from the Plum Creek drainage area which originates in Illinois before flowing into Indiana and back to Illinois.) Lowland is followed by grassland and cropland in order of predominance.

Table 13-15 is a summary of pollutant loads by source as simulated for Reach 31. Since Reach 31 receives flow from all other reaches, as well as Indiana, it provides a summary of pollutant contributions to the basin. Instream reactions prevent it from being a true summary, but it does give a general indication of the relative contributions of various sources.

Table 13-16 relates statistics on flow and area combined with statistics showing the percentage of pollutants coming from various sources in Reaches 11, 19, and 31. Flow and area must be taken into consideration to obtain a meaningful assessment of the various pollutant sources.

(3) Point Sources: Point sources contribute a significant portion of the total flow in the Little Calumet system. They contribute pollutant loads disproportionately larger than their flows due to their relatively high pollutant

concentrations. Under existing conditions, point source loads are severest in Thorn Creek. Here, the major impact is caused by the Sanitary District of Bloom Township (SDBT) treatment plant which discharges into the upper reaches of Thorn Creek. The impact of this effluent is exerted over a considerable distance downstream. Severe low DO problems occur in Thorn Creek and in the Little Calumet downstream of Thorn Creek (Reaches 19 and 31). Low-flow DO conditions are significantly better in Butterfield Creek (Reach 11). In that Reach, the major point source (Homewood sewage treatment plant), discharges an effluent of much higher quality than the SDBT plant's effluent. (The typical effluent biochemical oxygen demand (BOD_5) rom Homewood is 16.9 mg/l compared to 48.7 mg/l from the SDBT plant). Typically, there are few violations of the 5.0 mg/l DO standard in Reach 11. Under all conditions, the DO standard is viclated 0.3 percent of the time in Reach 11, 13 percent of the time in Reach 19, and 76 percent of the time in Reach 31.

In addition to point source loads, there are several other factors which have important impacts on low-flow dissolved oxygen levels. The first of these involves the assimilative capacity of the stream. Channel gradients and stream velocities are significantly greater in upstream and tributary reaches than they are in the mainstem of the Little Calumet. In the low-gradient, low-velocity reaches, natural reaeration rates are low, while flow-through times are long. Significant break-down of pollutants results, and suspended solids tend to settle out and accumulate as bottom sediments. All of these factors contribute to poorer dissolved oxygen conditions in these reaches.

Another important factor affecting warm weather, low-flow dissolved oxygen levels is algal populations. In general, algal populations are quite high in the lower reaches of Thorn Creek and in the main stem Little Calumet during the warmer months of the year. Both the sluggish stream flow and the high levels of nutrient supplied by point sources contribute to this situation. Algal photosynthesis supplies large quantities of DO to the stream and helps tc maintain safe DO levels during daylight hours when algal concentrations are high. However, there is a diurnal cycle involved, with algae consuming oxygen at night.

In addition to their oxygen-demanding loads, point sources contribute large quantities of nitrate (NO_3), phosphate (PS_4), and ammonia (NH_3). Nitrate and phosphate are important algal nutrients. Ammonia exerts an impact from both toxicity and oxygen demand aspects. The state standard for ammonia, based on toxicity, is violated frequently at each of the reporting reaches. Mean concentrations of 4 to 5 mg/l are typical in the Little Calumet, whereas the applicable standard for ammonia is 1.5 mg/l. At these concentrations, ammonia exerts a significant oxygen demand, also. Point source ammonia loads

TABLE 13-14: STATISTICAL SUMMARY OF CURRENT DISSOLVED OXYGEN LEVELS

SIMULATED DO CHARACTERISTICS (Expressed in mg/l)	REACH				
	7	11	19	31	
Maximum	13.7	13.5	12.6	10.7	
Minimum	0	0	0	0	
Mean	6.04	8.58	6.53	3.10	
*No. of Violations	217	7	166	216	
Avg. Duration	24	12	20	92	
**Overall Assessment	Bad	Fair	Poor	Bad	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time DO levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

TABLE 13-15: POLLUTANT CONTRIBUTIONS BY SOURCE CATEGORY, EXISTING CONDITIONS

REACH: 31

PARAMETER	POINT SOURCES			NON-POINT SOURCES			Total Loads
	Comb Sewers	Treatment Plants	Boundary Conditions	Pervious Surfaces		Impervious	
				Surface	Ground	Surface	
BOD Load (tons/year)	2,080	1,520	2,490	271	408	172	6,941
% Total Load	30	22	36	4	6	2	100
AMMONIA Load (tons/year)	170	477	364	28.5	2.71	4.58	1,047
% Total Load	16	46	35	3	0	0	100
NITRATE Load (tons/year).	16.1	68.2	70	39.2	82.7	49.6	326
% Total Load	5	21	21	12	25	15	100
PHOSPHATE Load (tons/year)	48.3	71.4	67.0	2.63	5.16	1.33	195.0
% Total Load	34	36	25	1	3	1	100

TABLE 13-16: SOURCES OF POLLUTANTS, EXISTING CONDITIONS

REACH/SOURCE	PERCENTAGES					
	AREA	STREAM FLOW	POLLUTANTS			
			BOD	NH_3	NO_3	PO_4
1. Butterfield Creek						
(REACH NO. 11)						
BOUNDARY CONDITIONS						
POINT SOURCES		21	37	89	42	82
COMBINED SEWERS						
PERVIOUS COVER	92					
Surface Runoff		9	18	8	12	5
Groundwater		52	30	1	28	10
IMPERVIOUS COVER	8	18	15	2	18	13
2. Thorn Creek						
(REACH NO. 19)						
BOUNDARY CONDITIONS						
POINT SOURCES		28	68	94	32	92
COMBINED SEWERS						
PERVIOUS COVER	92					
Surface Runoff		10	10	4	15	2
Groundwater		47	16	1	33	5
IMPERVIOUS COVER	8	15	6	1	20	1
3. Little Calumet River						
(REACH NO. 31)						
BOUNDARY CONDITIONS	41	31	36	35	21	34
POINT SOURCES		15	21	45	21	35
COMBINED SEWERS	1	7	30	16	5	25
PERVIOUS COVER	53					
Surface Runoff		7	4		12	2
Groundwater		30	6	3	26	3
IMPERVIOUS COVER	5	9	3	1	15	1

thus contribute to the dissolved oxygen problems simulated for the watershed under existing conditions.

(4) Pervious Sources: Runoff from pervious land cover comprises the largest portion of stream flow. Of this source, over 80 percent is groundwater runoff, with the remainder being surface runoff. However, the concentrations of pollutants are generally much greater in surface runoff than in groundwater.

Surface loadings of pollutants are typically associated with accumulated organic matter and air pollutant fallout. There are non-point source loads associated with fertilizer applications on croplands and on urban grasslands, such as private lawns, golf courses, and parks. Septic systems are also contributors where malfunctioning systems are located. Modeling results have shown that there are numerous violations of the DO standard during wet-weather periods throughout the basin. These are associated with the surface washoff of oxygen-demanding pollutants (BOD and ammonia). The durations of the violations are quite variable.

Subsurface inputs from pervious areas generally have a beneficial impact on water quality. Being of better quality than the other components of stream flow, they provide a diluting effect. However, associated with this grcundwater are significant loads of nitrate and phosphate which, again, serve as nutrients for algal growth.

(5) Impervious Sources: Runoff from impervious surfaces accounts for relatively small portions of the stream flow and pollutant loads in the Little Calumet River. The pollutant load of impervious runoff is particularly significant in its impact on water quality, due to "shock load" effect. Runoff from impervious areas reaches the stream rather rapidly resulting in sudden increases in stream flow and in concentrations of certain pollutants, particularly BOD. As a result, assimilative capacity is often exceeded and DO levels may be severly depressed.

(6) Combined Sewer Overflows: Overflows from combined sewers exert a major pollutant load on the Little Calumet. The overflows are located on the mainstem Little Calumet, in both Indiana and Illinois. (There are no combined sewers identified in the upstream Reaches 11 and 19.) At Reach 31, combined sewer overflows account for approximately 47 percent of the BOD load, excluding boundary condition inputs. However, they account for only about 11 percent of the flow. This reflects their highly concentrated nature. Combined sewer overflows are the major source of pollutants during wet-weather conditions and, thus, are the major cause of wet-weather water quality problems. The residuals of these combined sewer overflow were identified as shoals and mudflats in the Commission's sediment oxygen demand (SOD) studies by the Illinois State Water Survey. (208 Staff Paper No. 29)

(7) Boundary Conditions: The water quality model has shown that much of the pollution in the basin originates in Indiana, the source of the Little Calumet. Of the nearly 7,000 tons of BOD entering the stream system each year, for example, nearly 2,500 tons originate in Indiana. The model also has shown that about one-third of the ammonia in the system comes from Indiana.

e. Watershed Not Modeled - Plum Creek

(1) Introduction: Plum Creek in the Little Calumet Basin is unique among streams in the region because it is the only one which originates in Illinois, and then flows into another state. Because Plum Creek is not a direct tributary to the Little Calumet Basin in Illinois, it was not modeled. The headwaters of the creek are in easternmost Will County near Beecher (see Figure 13-1). The creek then flows northeasterly into Cook County before crossing the Illinois border into Indiana. In Indiana, the stream has been extensively channelized, and is known as Hart Ditch. Hart Ditch empties into the Little Calumet River near Munster, Indiana. Thus, Plum Creek flows eventually return to Illinois via Hart Ditch and the Little Calumet River.

(2) Existing Water Quality Conditions: Plum Creek is a small, shallow, low-gradient stream having a seven day, ten-year low flow of 0 cfs. Due to its small size and relatively minor drainage area in the region, no special 208-sponsored sampling programs were conducted in the watershed. The IEPA, however, does maintain a sampling station on Plum Creek at the Steger Road bridge (near the Indiana State line).

(a) IEPA Water Quality Sampling Data: A review of IEPA sampling data over the period 1972-1975 for certain parameters (as reported in 208 Staff Paper No. 15) indicated that water quality conditions in the creek are reasonably good. Violations of certain General Use stream standards are given in Table 13-17.

TABLE 13-17: IEPA-RECORDED VIOLATIONS OF WATER QUALITY STANDARDS: PLUM CREEK, 1972-1975

PARAMETER	NUMBER OF	
	SAMPLES	VIOLATIONS
Temperature	30	1
Dissolved Oxygen	31	2
Ammonia Nitrogen	26	1
Total Dissolved Solids	28	0
pH	30	0
Fecal Coliform	*	*

* Violations occurred but data not summarized here. revised 2/15/79

In 1976, the IEPA reported standards violations for the following parameters: fecal coliform (2 violations in 7 samples); iron (1 in 2); and copper (2 of 2).

Values for all other parameters sampled in 1976 were found to be within established standards.

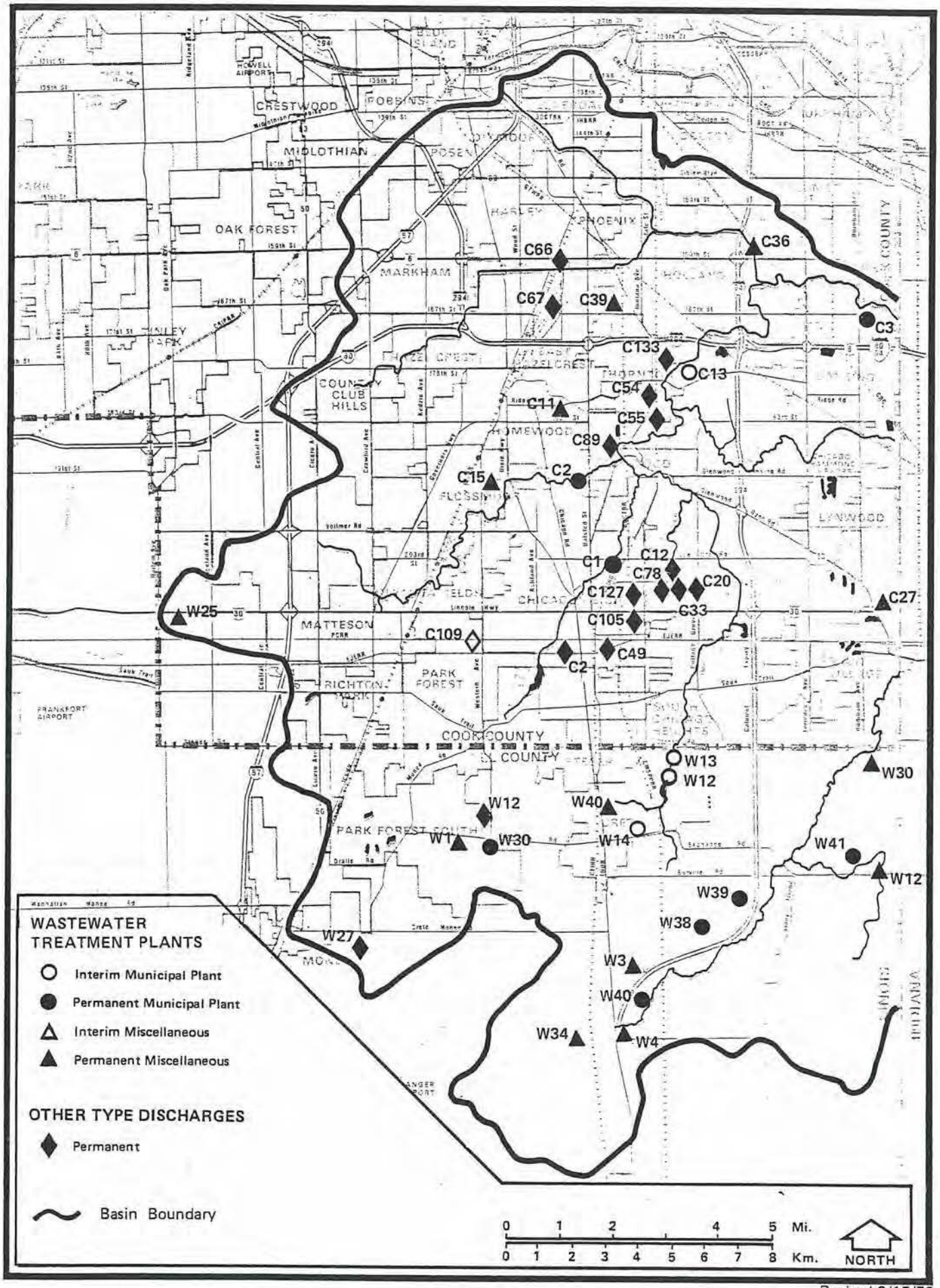
(b) IEPA Water Quality Index: The IEPA has developed "water quality indices" for all its sampling stations based on sampling results for dissolved oxygen, fecal coliform, total dissolved solids, and ammonia nitrogen. Using these indices, the IEPA classifies conditions at each station to overall quality.

For 1975 (the most recent year of index record for the Steger Road station), Plum Creek was rated "good or balanced", which is the highest of four ratings which can be assigned. Significantly, the Plum Creek station was one of only three stations (of the total 17 sampling stations in the Little Calumet Basin) to receive the "good or balanced" classification, indicating relatively good water quality in relation to most other streams in the basin.

(c) IEPA Biological Survey: Biological surveys have also been conducted on Plum Creek by the IEPA with the most recent one having been done in 1975. These surveys determine the types and amounts of stream bottom-dwelling organisms present. The results of these surveys, when correlated with the informations on the organisms known to be sensitivite to pollution, can be used to provide an assessment of water quality conditions.

In the 1975 survey, the benthic organism populations were found to be "unbalanced" throughout most of the creek, although one "polluted" reach was recorded. In comparison

Figure 13-4: POINT SOURCE DISCHARGES



Revised 2/15/79

with other streams in the Little Calumet Basin, these conditions are relatively good, although no "balanced" (highest level) conditions were recorded.

13.04 PCINT SOURCES: EXISTING CONDITIONS

a. Municipal-Type Wastewater Treatment Plants

Currently, eight municipal-type wastewater treatment facilities discharge into the Little Calumet River Basin. Three plants are publicly owned, four are private utilities, and one is owned by a federal agency. Table 13-18(A,B,C,D, and E) contains data on municipal-type plants and Figure 13-4 shows all point sources in the basin. The Sanitary Dist rict cf Bloom Township (SDBT) is the largest discharger in the basin. This facility, located near Chicago Heights, has a n average design capacity of 12.1 MGD and receives an average daily flow of 9.3 MGD. Plant facilities were recently upgraded to include nitrification and tertiary filtration. The excess flow capacity of the plant was recently expanded to 30.25 MGD. The SDBT serves five communities with a connected population of 80,000. The Crete Greenbriar, Crete Main, and Crete Swiss Valley plants completed phase out to the SDBT system in early 1978.

The Village of Homewood owns and operates a 3.5 MGD average design capactiy plant which currently serves 20,500 people and treats an average daily flow of 4.32 MGD. The plant was placed on restricted status in May of 1977. Wastewater is given secondary treatment by means of two parallel flow streams, one utilizing activated sludge and the other two trickling filters located in series. Effluent is given tertiary treatment by means of settling ponds.

The Village of Thornton owns and operates a 0.4 MGD average design capacity plant which serves a connected population of 3,800 and provides secondary treatment for an average daily flow of 0.24 MGD.

Twenty -one communities in the basin are served by the MSDGC and are tributary to the Calumet Sewage Treatment Works. The Calumet plant discharges to the Chicago River/Sanitary and Ship Canal Basin. Of the 181 square miles in the Little Calumet Basin, in Illinois 83 are in the MSDGC's jurisdiction.

Park Forest South is served by the former Park Forest South Utility Company plant which is now owned by the U.S. Department of Housing and Urban Development. The plant has an average design capacity of 1.45 MGD, serves 5,600 people and treats an average daily flow of 0.79 MGD. Facilities include tertiary filtration devices.

The Selym Utilities, Utilities Unlimited, and the two Willowbrook Utility Company plants are also described in Table 13-18.

TABLE 13-18A: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

LITTLE CALUMET RIVER BASIN

MAP CODE	FACILITY NAME	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	RECEIVING STREAM			PUBLICLY OWNED TREATMENT WORKS		
				NAME	7 DAY 10 YR. LOW FLOW (MGD)				
					1970	2000	NO	YES	IEPA FY 78 PRIORITY NO.
C1	Bloom Township S.D.	Bloom Township / Bloom Twp. S.D.	Chicago Heights	Thorn Creek	0.3			X	17
W12	Crete Greenbriar	Bloom Township / Bloom Twp. S.D.	Crete	Deer Creek	0.4			X	17
W13	Crete Swiss Valley	Bloom Township/ Bloom Twp. S.D.	Crete	Deer Creek	0.4			X	17
W14	Crete Main	Bloom Township/ Bloom Twp. S.D.	Crete	Creek to Deer Creek	0			X	17
C2	Homewood	Homewood/Homewood	Homewood	Butterfield Ck	0.7			X	603
W30	Park Forest South U. C. (a)	Bloom Township/ Bloom Twp. S.D.	Park Forest	Deer Creek	0			X	346
W38	Selym Utilities Calumet Gardens	Bloom Township/ Bloom Twp. S.D.	Crete	Plum Creek	0		X		-
C13	Thornton	Thornton/Thornton	Thornton	Thorn Creek	13.8			X	971
W39	Utilities Unlimited Co.	Bloom Township/ Bloom Twp. S.D.	Crete	Plum Creek	0		X		-
W40	Willowbrook U. C. Dixie Dells	None	Crete	Plum Creek	0		X		-
W41	Willowbrook U. C. K.K.K.	None	Sauk Village	Klemme Creek	0		X		-
	(a) Plant owned by U.S. Dept. of HUD								

TABLE 13-18B: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

LITTLE CALUMET RIVER BASIN

MAP CODE	NPDES PERMIT			EFFLUENT REQUIREMENTS (mg/l)														COMMENTS
	NUMBER	DATE		INTERIM (A)				FINAL (A)					YEAR 2000 (B)					
		ISSUED	EXPIRES	BOD_5	TSS	P	NH_3N	EFFECTIVE DATE	BOD_5	TSS	P	NH_3N	BOD_5	TSS	P	NH_3N		
C1	0027723	10-21-77	7-31-82						10	12			8	7		(b) 1.5		(a) Not issued.
W12	0033421	6-20-75	9-15-79						4	5								(b) In-stream after mixing.
W13	0033430	10-13-76	12-31-77.						10	12								
W14	0028266	6-9-75	9-15-79						10	12								
C2	0029211	6-29-77	1-31-82						10	12								
W30	0024473	6-9-75	12-31-79						4	5			10	12		(b) 1.5		
W38	(a)																	
C13	0031411	3-27-75	6-1-78						20	25								
W39	0054798	9-6-77	11-31-81						4	5								
W40	0050202	Draft	10-31-82						4	5								
W41	0031798	6-9-75	12-31-79						4	5								

TABLE 13-18C: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

LITTLE CALUMET RIVER BASIN

MAP CODE	STATUS OF TREATMENT PLANT					WASTEWATER TREATMENT PLANT (MGD)										COMMENTS
	INTERIM		PERMANENT			AVERAGE FLOWS (d)						DESIGN CAPACITIES				
	YES	PHASE OUT DATE	EXISTING	PROPOSED NEW YES	PROPOSED NEW EST. DATE IN SERVICE	1975	1980	1985	1990	1995	2000	1975	1985	OTHER YEAR	2000	
C1			X			9.11	9.66	10.22	10.77	11.33	(e) 11.88	12.1	12.1		12.1	(a) Phased out to Bloom Twp. S.D.
W12		(a) 2-21-78				0.03	–	–	–	–	–	0.3				
W13		(a) 2-7-78				0.01	–	–	–	–	–	0.08				(b) Will phase out to MSDGC-Calumet plant.
W14		(a) 2-1-78				0.60	–	–	–	–	–	0.60				
C2	X	(b) 12-79				4.32	–	–	–	–	–	3.5				(c) Has applied to MSDGC-Calumet for phase out.
W30			X			0.79	1.43	2.07	2.72	3.36	4.00	1.45	2.70		4.00	
W38			X			0.01	0.01	0.01	0.01	0.01	(f) 0.01	0.03			0.03	(d) From facility planning or needs analysis documents unless otherwise noted.
C13	X	(c) 12-79				0.24	–	–	–	–	–	0.04				
W39			X			0.03	0.03	0.03	0.03	0.03	(f) 0.03	0.03			0.03	
W40			X			0.04	0.04	0.04	0.04	0.04	(f) 0.04	0.08			0.08	(e) NIPC estimate
W41			X			0.02	0.02	0.02	0.02	0.02	(f) 0.02	0.08			0.08	(f) Private utility flows in year 2000 assumed to be same as 1975 due to lack of future plans.

TABLE 13-18D: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANT

LITTLE CALUMET RIVER BASIN

MAP CODE	POPULATION SERVED (1000's)						PROPOSED PROJECTS (C)								CAPITAL COSTS (million $)		
							PLANT				SEWERS						
	1975	1980	1985	1990	1995	2000	Exp.	UpG	New	Out	I/I	SSE	New	Reh	Initial	Future	Total
C1	80.0	94.0	96.5	99.8	101.8	103.9									4.0	-	4.0
W12	0.2									X			X				
W13	0.6									X			X				
W14	4.3									X			X				
C2	20.5									X	X	X	X		7.9	-	7.9
W30	5.6	11.2	16.5	21.0	28.0	35.0	X	X			X				2.56	1.28	3.84
W38																	
C13	3.8									X			X		Unknown		
W39																	
W40																	
W41																	

(C) PROPOSED PROJECTS

SEWER(S): I/I - Infiltration/Inflow Study; SSE - Sewer System Evaluation; New - New Sewer Construction; Reh - Rehabilitation of Existing Sewers

PLANT: Exp - Expansion; UpG - Upgrading; New - New plant; Out - Phase out

TABLE 13-18E: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

LITTLE CALUMET RIVER BASIN

MAP CODE	FACILITY PLANS												COMMENTS
	TYPE		STATUS			REVIEWS / APPROVALS							
						NIPC			IEPA				
	NEEDS ANALYSIS	STEP ONE STUDY	COMPLETED	UNDER WAY	LOCAL ISSUES	NUMBER	ENDORSED	UNDER REVIEW	NUMBER	APPROVED	UNDER REVIEW	UNRESOLVED ISSUES	
C1		X	X (b)						C17-1420	X			(a) Being prepared by Village of Park Forest South (b) Facilities planning exemption
W12		X	X (b)						C17-1420	X			
W13		X	X (b)						C17-1420	X			
W14		X	X (b)						C17-1420	X			
C2		X	X			77-655			C17-2193		X		
W30		X (a)		X					C17-1409				
W38													
C13		X		X					C17-2407				
W39													
W40													
W41													

TABLE 13-19A: MISCELLANEOUS WASTEWATER TREATMENT PLANTS

LITTLE CALUMET RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS(1)	WASTEWATER LOADS MGD			
						CURRENT		1985	2000
						DESIGN CAPACITY	1975 LOAD		
W1	American Lock Junkunc Bros.	0034789	Bloom/Bloom Twp./ Twp.S.D.	Crete	A,E	0.005	0.002	-	0.002
W3	Balmoral Race Track	0055964	None	Crete-Monee	LO	0.052			
W4	Balmoral Woods Inn	0050652	None	Crete-Monee	A,E	0.005			
W12	Crete Hiawatha KOA		None	Crete	A,L	0.010			
C11	Ely's Trailer Park	0056065	Homewood/ Homewood	Chicago Heights	A,E	0.065	0.020	-	0.020
C15	Idlewild Country Club	0056014	MSDGC/MSDGC	Flossmoor	AD,L,E	0.025			
W25	LaPosada Restaurant	0049701	Frankfort-Mokena/Frankfort	Frankfort	E		0.0015		
W28	Lincolnshire Country Club	0053121	Bloom/Bloom Twp./ Twp.S.D.	Crete	A,E	0.0015	0.004		
W30	Longwood Country Club	0050571	None	Steger	A,L,E	0.003			
C27	Paradise Mobile Homes	0026794	MSDGC/MSDGC	Chicago Heights	A,E	0.065	0.020	-	0.020
W34	Pheasant Meadows MHP	0050288	None	Monee	AD,F,E	0.066			
W40	Spanos Super Market	0047627	Bloom/Bloom Twp./ Twp.S.D.	Crete	S		0.0003		
C36	Union Oil of Calif. Calumet Truck Stop	0032492	MSDGC/MSDGC	South Holland	LO,E	0.005			
C39	U.S. Army Reserve Ctr.	0032956	MSDGC/MSDGC	Harvey					
	(1): Activated sludge (A); extended aeration (AD); chlorination (E); tertiary filter (F); tertiary lagoon (L); stabilization lagoon (LO); septic (S).								

TABLE 13-19B: MISCELLANEOUS WASTEWATER TREATMENT PLANTS

LITTLE CALUMET RIVER BASIN

MAP CODE	RECEIVING STREAM NAME	7 DAY-10 YR. LOW FLOW (MGD) 1970	7 DAY-10 YR. LOW FLOW (MGD) 2000	NPDES PERMIT DATES ISSUED	NPDES PERMIT DATES EXPIRES	EFFLUENT REQUIREMENTS (mg/l) 1976(1) BOD	1976(1) TSS	1976(1) P	1976(1) NH_3-N	2000 BOD	2000 TSS	2000 P	2000 NH_3-N	COMMENTS
W1	ditch to Thorn Creek	0		5-19-75	12-31-79	4	5							
W3	Plum Creek	0												
W4	Fairwinds Lake to Plum Creek	0		Draft	1-1-81	4	5							
W12	Stream to Plum Creek	0												
C11	ditch to Butterfield Ck.	0		Draft	9-30-82	4	5							
C15	Butterfield Ck.	0.65												
W25	Butterfield Ck.	0		Draft	12-31-81	4	5							
W28	Deer Creek	0.26		Draft	6-30-80	30	30							Phased out 2-7-78 to Bloom Twp.S.D.
W30	Hart Creek	0		Draft	2-28-82	4	5							
C27	Lansing ditch to North Ck.	0		6-9-75	12-31-79	30	30							
W34	Tributary to Plum Creek	0		8-30-77										
W40	Deer Creek	0		10-21-77	1-31-82	4	5							Septic tank overflow
C36	Little Calumet			Draft	11-30-81	30	30							
C39	Storm Sewer	0		1-14-74	1-6-78									

(1) From NPDES Permits

TABLE 13-20A: OTHER POINT SOURCE DISCHARGES

LITTLE CALUMET RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	LOCATION AND NEAREST MUNICIPALITY	FLOW (MGD) 1976	NPDES PERMIT DATES	
						ISSUED	EXPIRES
C2	Alco Spring Ind. Chicago Heights	0001481	Bloom /Bloom Township/ Twp.S.D.	Chicago Heights	0.054	1-23-75	10-31-79
C12	Benjamin Harris & co.	0035181	Bloom /Bloom Township/ Twp.S.D.	Park Forest		3-6-75	8-31-79
C20	Certain Teed Corp. #002	0038059	Bloom /Bloom Township/ Twp.S.D.	Chicago Heights	0.288	5-14-75	10-1-79
C33	Columbia Tool Steel Co.	0046612	Bloom /Bloom Township/ Twp.S.D.	Chicago Heights		6-18-75	12-31-79
W12	Desa Industries	0005096	Bloom /Bloom Township/ Twp.S.D.	Park Forest South	0.035	6-17-75	4-17-79
C49	Flintkote	0035467	Bloom /Bloom Township/ Twp.S.D.	Chicago Heights	0.10	Draft	9-30-82
C54	Gallagher Asphalt	0034584	MSDGC/MSDGC	Thornton			
C55	Gen'l Dynamics Marblehead Lime	0035408	MSDGC/MSDGC	Thornton		6-30-75	9-30-79
C66	Ill. Central RR Hazelcrest	0037982	MSDGC/MSDGC	Hazelcrest	0.250	6-17-75	5-31-80
C67	Ill. Central RR Woodcrest	0005193	MSDGC/MSDGC	Homewood	0.090	4-15-75	6-1-79
C78	Keystone Steel and Wire Co.	0001678	Bloom /Bloom Township/ Twp.S.D.	Chicago Heights	0.030	8-20-74	9-1-78
C89	Marblehead Lime Co. #001	0035408	MSDGC/MSDGC	Thornton	0.001	6-30-75	9-30-79
C89	Marblehead Lime Co. #002	0035408	MSDGC/MSDGC	Thornton	0.220	6-30-75	9-30-79
W27	Monsanto	0049069	Bloom /Bloom Township/ Twp.S.D.	Park Forest South	0.004	4-6-76	12-31-79
C105	Owens Ill.Inc. Kimble Prod. Div.	0033987	Bloom /Bloom Township/ Twp.S.D.	Chicago Heights			
C127	Stauffer Chemical #001	0035220	Bloom /Bloom Township/ Twp.S.D.	Chicago Heights	0.800	6-6-75	12-31-78
C109	Park Forest Water Plant	0054291	Bloom /Bloom Township/ Twp.S.D.	Park Forest		11-3-76	12-31-79
C133	Thornton Pump House #5	0053261	Thornton/ /Thornton	Thornton		9-28-76	12-31-79

revised 2/15/79

TABLE 13-20B: OTHER POINT SOURCE DISCHARGES

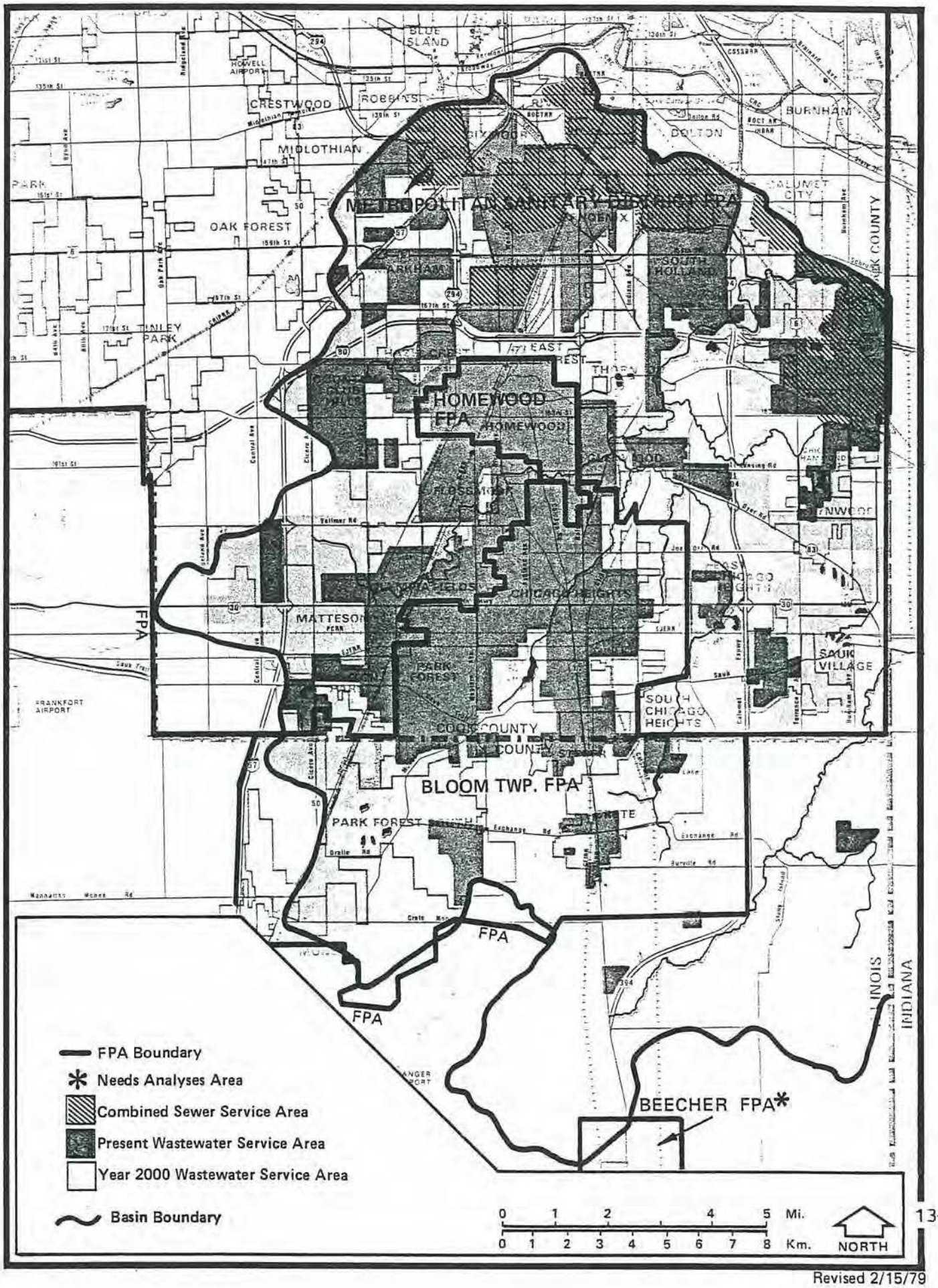
LITTLE CALUMET RIVER BASIN

MAP CODE	RECEIVING STREAM NAME	7 DAY-10 YR. LOW FLOW (MGD) 1970	2000	EFFLUENT REQUIREMENTS(1) (mg/l)	COMMENTS
C2	ditch to Thorn Creek	0		15 TSS, 15 oil/grease (o/g), Temp.,2 (tot) Fe, 0.5 (dis) Fe	Cooling water discharge
C12	recirculation-no discharge	-		Temp., Daily Maximum (DM): 15 TSS	Emergency discharge only
C20	Storm sewer to State St. ditch	0.84		Temp., Daily Maximum: 15 TSS,0.025 Cn,0.3 (tot) Fe, 2.5 Fluoride,0.1 (tot) Pb	Cooling water discharge
C33	ditch to Thorn Creek	0		Daily Maximum: 25 TSS, 30 o/g,0.25 As,0.025 Cn, 1 Cr^{+}_{3}, 0.3 Cr^{+}_{6}, 2 (tot) Fe	Cooling water discharge
W12	ditch to Thorn Creek	0		Temp.	Cooling water discharge
C49	Storm sewer to State St. ditch	0		15 (DM)o/g, 3500 TDS, Temp	Cooling water discharge
C54	Thorn Creek	0			Stormwater runoff
C55	ditch to Thorn Creek	0		15 (DM) TSS, 750 TDS, Temp	Cooling water discharge
C66	Homewood Drain to Cal-Union	0		10 BOD, 15 (DM)TSS, 15 (DM) o/g	Stormwater runoff
C67	Homewood Drain to Cal-Union	0		15 (DM) o/g	Stormwater runoff
C78	Storm sewer to State St. ditch	0		15 (DM) TSS, 10 (DM) o/g, monitor (tot) Fe	Cooling water discharge
C89	ditch to Thorn Creek	0		15 (DM) TSS, 750 TDS, Temp	Cooling water discharge
C89	ditch to Thorn Creek	0		15 (DM) TSS, 750 TDS, Temp	Cooling water discharge
W27	Tributary to Deer Creek	0		Temp.	Cooling water discharge
C105	Storm sewer to State St. ditch	0		15 TSS, 750 TDS, Temp	Cooling water discharge
C127	Storm sewer to State St. ditch	0		15 TSS, 750 TDS, 1 As,0.5 Hg, Temp	Cooling water discharge
C109	Tributary to Thorn Creek	0		Daily Maximum: 15 TSS, 1000 TDS, 2 (tot) Fe, 500 Chlorides	
C133	Thorn Creek			Daily Maximum: 15 TSS, 1000 TDS, 2 (tot) Fe, 500 Chlorides	

(1) From NPDES Permits

revised 2/15/79

Figure 13-5: WASTEWATER SERVICE AREAS



Revised 2/15/79

b. Industrial Wastewater Plants

There are no industrial plants in the basin treating their own process wastes; all industries discharge to either the MSDGC or to other systems. However, a number of industries have NPDES permits for discharging cooling water and stormwater and are discussed below under "other point sources."

c. Miscellaneous Wastewater Treatment Plants

There are 14 miscellaneous wastewater treatment facilities currently discharging within the Little Calumet Basin. These plants serve a diverse assortment of land uses and all are small in size. Current information available for these facilities, including treatment units, flows and effluent limitations is presented in Tables 13-19 (A and B).

d. Other Point Sources

Eighteen other NPDES permitted discharges occur in the Little Calumet Basin. They include 16 cooling water and storm water discharges and two water treatment plant discharges. Cooling water and stormwater discharges are found both in the MSDGC and SDBT services areas in equal numbers, with the community of Chicago Heights having the largest number of discharges. Current information available for these dischargers is in Table 13-20 (A and B).

e. Combined Sewer Overflows

Combined sewer overflows occur in eight municipalities in the MSDGC facility planning area. Over 3 square miles of the basin have combined sewers. It is anticipated that the overflows in the MSDGC area will be discontinued upon completion of the MSDGC Tunnel and Reservoir Plan (TARP).

f. Local Facilities Planning

Water quality in the basin is influenced by the facilities planning activities of five FPAs, inputs from Indiana, and areas outside of established FPAs. As can be seen from Figure 13-5, the basin is impacted by portions of the MSDGC FPA, the bulk of the Sanitary District of Bloom Township FPA, all of the Homewood, Thornton and Park Forest South planning areas and the northwest corner of the Beecher FPA. Since the impacts of the Beecher FPA on the Little Calumet River Basin are minute, this area will be discussed in the Kankakee River Basin chapter.

The Sanitary District of Bloom Township (SDBT) has not completed a formal facilities plan. Previous engineering documents were judged sufficient by the IEPA and the USEPA to satisfy facilities planning requirements under 40 CFR 35.917(c) and 35.925-7 and 35.925-8. The SDBT began construction of 23.88MGD excess flow treatment facilities in mid - 1978.

A facilities plan has recently been completed for the Homewood FPA which recommends that the Homewood plant be phased out to the MSDGC's Calumet Sewage Treatment Works as the most cost effective wastewater treatment alternative. The Village of Homewood has requested annexation by the MSDGC. Phase out is projected to be completed by 1980.

The Park Forest South sub-FPA is a subdivision of the Sanitary District of Bloom Township FPA. A preliminary facilities plan has been prepared for the Park Forest South sub-FPA. It calls for the existing federally owned Park Forest South plant to be acquired by the Village of Park Forest South and expanded to 2.7 MGD by 1980. The extended aeration secondary treatment process would be used in order to achieve nitrification. Tertiary filtration and phosphorous removal would also be provided. In 1990 the plant would be further expanded to to 4.0 MGD. Capacity to serve Monee is being reserved in the plant. The plan does not, however, address the local sewer needs of the Monee area.

A facilities plan is currently being prepared for the Thornton FPA. Thornton has requested annexation by the MSDGC and it appears likely that the Thornton plant will be phased out by 1980 to the MSDGC's Calumet Sewage Treatment Works.

The village of Monee has submitted a request for a federal grant to prepare a facility plan for its area which is an element of the Park Forest South FPA. The community is on seplics and the detailed study will be incorporated within the Park Forest South facility plan.

The MSDGC service area within the Little Calumet Basin is tributary to the Calumet Sewage Treatment Works, which discharge to the Chicago River/Sanitary and Ship Canal Basin. The MSDGC facilities plan is discussed in more detail in Chapter Twenty. Combined sewer overflows at Calumet City, Dixmoor, Dolton, Harvey, Lansing, Park Forest, Riverdale, and South Holland are planned to be eliminated by connection to the MSDGC's (TARP).

13.05 NONPOINT SOURCES: EXISTING CONDITIONS

a. Urban Stormwater Systems

The separate storm sewer systems in the basin serve all or portions of approximately 21 municipalities and numerous unincorporated areas. It is estimated that 27 square miles, or 15 percent of the basin area, are served by separate storm sewers. These systems follow natural drainage courses and discharge either directly into the Little Calumet River or indirectly via ditches, ravines, or streams that are tributary to the Little Calumet River.

Combined sewer systems serve all or portions of approximately ten Cook County municipalities in the basin. It is estimated that 3.2 square miles, 1.8 percent of the basin, are tributary to combined sewer overflows. There are no combined sewers in the Will County part of the basin.

The areas within the basin not served by separate storm sewer systems are estimated to comprise 151 square miles or 83 percent of the basin area. Stormwater falling upon these areas enters the Little Calumet by overland flow, ditches, or other small water courses and tributary streams.

b. Construction Activities

As discussed in Chapter Six, construction operations, coupled with stormwater runoff and resultant erosion, can contribute sediments, chemicals and biological organisms to local waterways. However, none of these activities is known to be causing water pollution problems in this basin.

The potential for damage to water quality as a result of construction activities will not diminish in future years in the basin. Changes in population and land use, as forecasted, will generate substantial residential and commercial construction accompanied by other surface disturbances for roads and utilities.

c. Air Deposition

As was discussed in Chapter Six, the impacts of air pollution fallout on water quality depend on several factors. One critical factor is the area-volume ratio of the water body. In general, the impact of fallout is greater on large water bodies like Lake Michigan. The relative impact of fallout pollution on water bodies, compared to other pollution sources, will be more easily determined when these other sources have been eliminated.

d. Septic Systems

Septic systems are used widely in the basin. Presently, there are 3,432 residential septic systems serving about 12,706 persons. In addition, the basin has 61 non-residential septic systems serving a population equivalent of 336 persons. Approximately 61 percent of the septic systems are located in Cook County and 39 percent are in Will County. Table 13-21 summarizes these data. Twenty-five out of the 32 septic areas are considered to be located in areas with existing or potential limitations, where there are unsatisfactory soil conditions, small lots, old systems, high water tables, or a combination of these factors. The largest septic problem area is in Monee, which contains 425 residential systems serving 1,488 persons. It is reported that many of the systems do not have soil absorption fields, and discharge into low spots around the village. All these areas are identified on Figure 13-6 and described in Table 13-22.

e. Surface Waste Disposal Sites

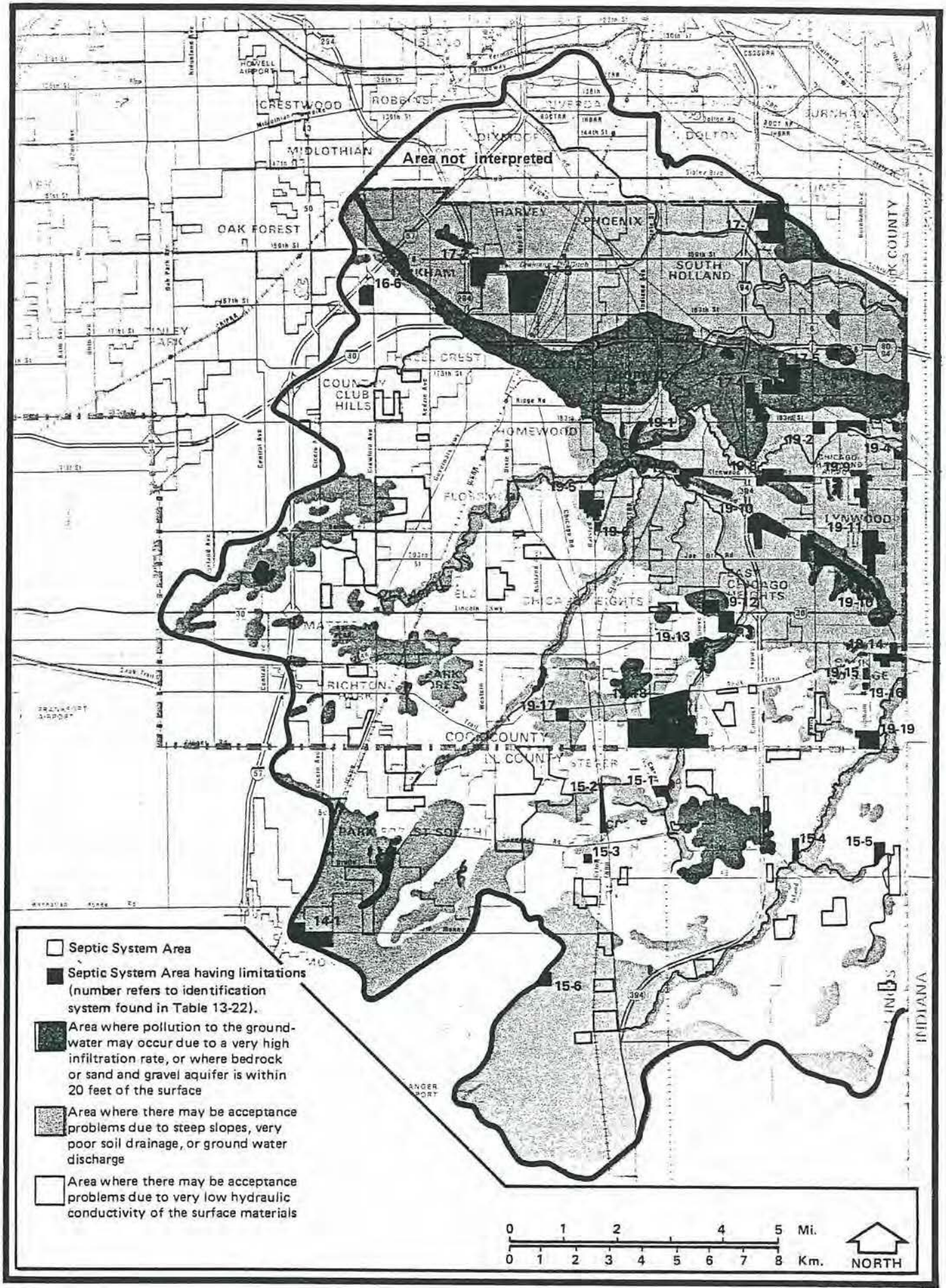
There are two surface waste disposal sites in the basin. The first, is a 182-acre active sanitary landfill in Will County. Although residents in the area have filed water pollution complaints, there is no documentation of surface or groundwater pollution from the site. The second is a dredge spoil disposal site used by the Corps of Engineers, located at 138th and Halsted Streets.

TABLE 13-21: SUMMARY OF SEPTIC TANK INSTALLATIONS

Little Calumet River BASIN

COUNTY	NUMBER OF SEPTIC SYSTEMS			POPULATION SERVED		
	RESIDENTIAL	NON RESIDENTIAL	TOTAL	RESIDENTIAL	NON RESIDENTIAL (PE)	TOTAL
Cook	2,089	53	2,142	7,999	226	8,225
Will	1,343	8	1,351	4,707	110	4,817
Total	3,432	61	3,493	12,706	336	13,042

Figure 13-6: LOCATION OF SEPTIC AREAS



Revised 2/15/79

f. Hydrologic Modifications

In the Little Calumet River Basin, both dredging and channelization are of concern. Private individuals, drainage districts, and the state have channelized streams and drainage ditches extensively. Sediment placed in suspension by dredging and channelization can have a pronounced effect on water quality and aquatic life.

The Illinois Department of Conservation has identified six streams, all in Cook County, that have undergone some channel modification: Butterfield Creek, Calumet Union Drainage Ditch, Deer Creek, Flossmoor Road Drainage Ditch, Lansing Drainage Ditch, and the Little Calumet River itself. This type of activity is expected to continue in the basin, although where, when, and what impact it will have on water quality is unknown. Apparently no streams have been hydrologically modified in the Will County portion of the basin. The proposed dredging by The Corps of Engineers of the main stem of the Little Calumet River was discussed in Section 13.02 b (1).

13.06 DISPOSAL OF RESIDUALS

a. Point Sources

A summary of the annual volumes and composition of residuals from point sources is contained in the Commission's "Regional Sludge Management Report", published as Staff Paper No. 30. No specific problems have been noted.

b. Non-point Sources

The only non-point source of residuals in the basin are septic tanks. Many variables make it difficult to accurately estimate the present annual volume of septic sludge produced in this basin. However, using an average annual volume of 70 gallons of septage per person, it is possible to make a rough approximation. There are 12,706 persons in the basin served by residential septic systems. Thus, 12,706 X 70 gallons = 889,420 or about 0.9 million gallons of residential septage are produced each year. This figure would be higher if no n-residential septage were included. In Cook County septage can be discharged into MSDGC interceptors. The SDBT plant also will accept septage. The disposition of other septage is not known.

TABLE 13-22: SEPTIC SYSTEM AREAS HAVING LIMITATIONS

LITTLE CALUMET RIVER BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Cook	Bremen		31	126	16-6
Cook	Thornton		83	308	17-1
Cook	Thornton		94	349	17-2
Cook	Thornton	Markham	70	210	17-3
Cook	Thornton		28	104	17-4
Cook	Thornton		150	556	17-5
Cook	Bloom	Vincennes Road	15	58	19-1
Cook	Bloom		50	192	19-2
Cook	Bloom		20	77	19-3
Cook	Bloom		22	85	19-4
Cook	Bloom		95	365	19-5
Cook	Bloom		8	31	19-6
Cook	Bloom		33	127	19-7
Cook	Bloom	Glenwood - Lansing Rd	38	146	19-8
Cook	Bloom	partially in Lynwood Burnham Ave.	33	122	19-9
Cook	Bloom	partially in Lynwood Glenwood - Dyer Rd.	175	795	19-10
Cook	Bloom	partially in Lynwood Burnham Ave.	51	193	19-11
Cook	Bloom	East Chicago Heights	97	353	19-12
Cook	Bloom		11	37	19-13
Cook	Bloom		28	97	19-14
Cook	Bloom		7	27	19-15
Cook	Bloom	Katz Corner School	1	32	19-16
Cook	Bloom	South Chicago Heights	8	31	19-17
Cook	Bloom		150	578	19-18
Cook	Bloom		18	70	19-19
Will	Monee	Village of Monee	425	1488	14-1*
Will	Crete	Unit#8 Lincolnshire Subdiv.	20	70	15-1
Will	Crete	Village of Crete	13	46	15-2
Will	Crete	Village of Crete	6	21	15-3
Will	Crete		24	84	15-4
Will	Crete	Burville Estates	16	56	15-5
Will	Crete		12	42	15-6

revised 2/15/79

c. Residual Disposal Facilities

Within the six-county region of northeastern Illincis, land disposal of residuals is the most acceptable and most economical means of sludge disposal. The land disposal practices most commonly used are landfilling and land application. Within Will County, one landfill site, and two land application sites have been identified: the Goodenow Landfill, Balmoral Park Race Track, and Balmoral Golf Course.

There is a lack of reliable information on the volume, characteristics and ultimate disposal of residuals produced in the basin. The absence of this information makes an evaluation of problems difficult. Further information on residuals is contained in Chapter Seven.

13.07 EXISTING MANAGEMENT PROGRAMS

The major features of the existing water quality management system in northeastern Illinois have already been discussed in the areawide chapters of this report. In this section, management programs within the Little Calumet Basin are presented, but only to the extent that it is necessary to clarify the previous areawide discussion.

Table 13-23 is a list of the public agencies in the basin which are involved in water-quality-related activities. Variations in programs and responsibilities between these agencies are indicated by a numerical code.

13.08 MODELING PROCESSES: FUTURE CONDITIONS

The first major use of the computer model and the process of simulation was to develop an overview of existing water quality conditions in the basin. The statistical picture that was produced showed the waters in the basin to be among the most polluted in the region.

In each of four reaches there are times when dissolved oxygen levels fall to zero. State standards, which call for at least 5 mg/l of dissolved oxygen are violated continuously.

The amount of biochemical oxygen demand (BOD) in the streams in this basin also is far in excess of acceptable levels. About 7,000 tons of BOD are entering the streams each year; this volume would have to be cut by about 90 percent before BOD levels would be low enough to allow good water quality.

The basin is equally distressed with respect to ammonia, more than 1,000 tons of which enter the Little Calumet River each year.

In addition to the pollutants coming from Indiana, significant loads are generated by Illinois sources. Included in Illinois' annual contribution are 4,000 tons of BOD, nearly 700 tons of ammonia, 240 tons of nitrate and about 120 tons of phosphate.

The Illinois sources of these pollutants are overflows from combined sewers (which alone account for nearly one-third of the BOD in the basin), discharges from wastewater treatment plants, and stormwater runoff (also the source of large volumes of BOD).

TABLE 13-23: EXISTING LOCAL WATER QUALITY MANAGEMENT AGENCIES AND PROGRAMS: LITTLE CALUMET BASIN*

MUNICIPALITIES			
Calumet City (Sanitary & Ship Canal)	1,3,6 +	Matteson (Hickory Creek)	1,6
Chicago Heights	1	Midlothian (Sanitary & Ship Canal)	1,6
Country Club Hills (Sanitary & Ship; Hickory Creek)	1,6	Monee (Kankakee)	
Crete	1	Olympia Fields	1,6
Dixmoor	1,3,6	Park Forest	1
Dolton (Sanitary & Ship Canal)	1,3,6	Park Forest South (Hickory Creek; Kankakee)	1
East Chicago Heights	1,6	Phoenix	1,3,6
East Hazelcrest	1,6	Posen	1,3,6
Flossmoor	1,6	Richton Park (Hickory Creek)	1,6
Glenwood	1,6	Riverdale (Sanitary & Ship Canal)	1,6
Harvey	1,3,6	Sauk Village	1,6
Hazelcrest	1,5,6	South Chicago Heights	1
Homewood	1,2,4,5	South Holland	1,6
Lansing	1,3,6	Steger	1,5
Lynwood	1,6	Thornton	1,2
Markham	1,3,6		

COUNTIES			
Cook	4	Will	

SANITARY DISTRICTS
Kimberley Heights Sanitary District - 1,6
Metropolitan Sanitary District of Greater Chicago - 2
Sanitary District of Bloom Township - 2

OTHER SPECIAL PURPOSE DISTRICTS
Will-South Cook Soil and Water Conservation District
Cook County Forest Preserve District
Will County Forest Preserve District

* Additional basins shown in parentheses for those municipalities which cross basin boundaries.

\+ Numbers indicate existing water quality activities as follows:

1. Wastewater collection agency
2. Wastewater treatment agency
3. To be included in MSDGC TARP system
4. Has enacted erosion and sediment control regulations
5. Has enacted stormwater detention regulations
6. MSDGC stormwater detention regulations apply

Thus, four sources: Indiana, combined sewers, treatment plants and stormwater runoff, became the focus of efforts to develop first and second test plans, and finally, a recommended plan for the basin. The result of those efforts and of public discussions, are described in the next sections of this chapter.

a. First Test Plan Assumptions

During the initial round of meetings on the development of a Little Calumet River Basin plan, Commission staff members and consultants identified existing water quality conditions and major water pollution sources. Basin residents at those meetings suggested water pollution control strategies to be included in a "first test plan" for

the year 2000. These suggestions were reviewed by Local Steering Committees for the basin, and approved for testing by the Commissions' 208 Steering Committee.

In addition, the first test plan was shaped by assumptions made to reflect forecasted pollution increases; land cover changes; improvements in wastewater and stormwater treatment; flood control and channelization; and changes in agricultural practices.

The information that follows is a summary of assumptions used in the first test plan.

(1) Population and Land Use: NIPC population forecasts for the year 2000 were used to determine the land cover changes and wastewater loads. For the Little Calumet River Basin, a 50.7 percent increase in population was forecast.

Present land use in the basin was determined by satellite photography and field surveys. This information was divided into four categories: lowlands--marshes, swamps and forests lying close to rivers and streams; grasslands--open to the infiltration of rainwater and snowmelt, but not tilled regularly, including pastures, parks, golf courses and upland forests; croplands--regularly tilled for agricultural purposes (there is some exchange between cropland and grasslands due to crop rotation); and impervious surfaces--covered with buildings, roads and parking lots. For the first test plan, estimates of land cover changes were made using population forecasts and their attendant housing and employment assumptions. Land required for new urbanization in the basin was taken from the grassland and cropland categories first. When this land was largely depleted, land from the lowland category was taken for urban purposes. Table 13-24 shows the assumptions that resulted from this process.

(2) Local Facilities Plans: Extensive planning has been conducted in recent years for the improvement of existing wastewater treatment facilities, both public and private,

TABLE 13-24 : CHANGES IN LAND COVER, 1976-2000

Category	1976 Land Cover Estimates	Year 2000 Land Cover Forecast	% Change
Lowlands	59.65 sq.mi.	53.56 sq.mi.	-10.2%
Grasslands	40.74 sq.mi.	58.88 sq.mi.	+20.0%
Croplands	19.53 sq.mi.	8.02 sq.mi.	-58.9%
Impervious	10.43 sq.mi.	19.86 sq.mi.	+90.4%
TOTAL	130.35 sq.mi.	130.32 sq.mi.	

and the creation of new facilities to serve newly developing areas. These plans were included in the estimate of water quality conditions for the year 2000. In general, it was assumed that all planned improvements in municipal wastewater treatment plants (201 facilities plans) would be in operation, and that industrial and miscellaneous treatment plants would meet required water quality standards in their effluent discharges. At the time the first plan was modeled the future status of the Homewood plant was unknown and so it was assumed it would remain in operation and be expanded.

(3) Phosphate Reductions: The City of Chicago and several suburbs in the basin have enacted ordinances limiting the phosphate content of home laundry detergents. Because such a substantial portion of the metropolitan area market has enacted limitations on phosphate in detergents, most distributors have withdrawn phosphate detergents from the entire area. More than three-fourths of the detergent sold for domestic purposes in the Chicago metropolitan area is now phosphate free. In considering changes in wastewater treatment practices for the year 2000, it was assumed that regulations limiting the amount of phosphate in domestic detergents would be expanded to cover all communities and to include, in part, commercial and industrial uses as well. Based upon studies of the effect of detergent phosphate reductions on wastewater treatment plant operations, it was assumed that phosphate concentrations in plant effluents for the year 2000 would be two-thirds of existing levels.

(4) Combined Sewer Overflows: It was also assumed that combined sewer overflow in the Little Calumet River Basin would be eliminated by the year 2000, either by the diversion of these flows to the completed TARP System of the MSDGC, or by other means in areas not within the MSDGC.

(5) Boundary Conditions: The Little Calumet River as it enters the state from Indiana was considered to be a "point source" of pollution. In simulating future water quality conditions it was assumed that water entering the basin from Indiana in the year 2000 would meet certain standards on the average: This meant that significant and frequent excursions above and below these values were modeled. The following standards were used:

Dissolved Oxygen	5.0 milligrams per liter
Ammonia	1.5 milligrams per liter
Biochemical Oxygen Demand (BOD_5)	4.0 milligrams per liter*

*There is no State standard for BOD in streams. This level was assumed as desirable and indicative of reasonably good water quality.

(6) Urban Stormwater Runoff: The conditions set for the year 2000 in simulating future water quality assumed that 25 percent of the BOD in urban stormwater runoff would be removed from the existing (1976) urban land surface (largely through street sweeping and vacuuming) and prevented from entering the Little Calumet River. In newly developed urban areas, it was assumed that 50 percent of the BOD would be captured.

(7) Air Deposition of Pollutants: In the first test plan for the year 2000, it was not possible to make an adjustment for a change in the amount of pollutants that fall out or are washed out of the air. Pollution washoff from rural grasslands, for example, is assumed to derive from decaying vegetal matter, animal grazing and feeding, and air deposition. However, at this stage in planning technology, we do not know enough about the nutrient cycle to enable us to isclate the individual water quality impacts of these sources.

(8) Septic Systems: The impact of septic systems on water quality was also considered in the simulation of conditions in the year 2000. In the first test plan, it was assumed that the adverse effects of septic systems on water quality would be eliminated--either by the connection of these systems to sewage collection and treatment systems, or by improvements and control of the remaining systems.

(9) Soil Conservation: The increase in agricultural land conservation practices was included in the calculation of future water quality in the Little Calumet River Basin. U.S. Department of Agriculture staff members in the area estimated how much land would be brought under conservation practices and which practices would best reduce pollutant concentration. These conservation practices were contour plowing and terracing of farm lands, which incidently also would reduce soil erosion . In the Little Calumet River Basin, 2,370 acres of land not under conservation practices in 1976 were forecasted to be under conservation practices by the year 2000.

(10) Livestock Populations: The changes in livestock populations were calculated for each township in the region. However, these changes could not be reflected in the first test plan because not enough is known about the impact of animal pasturing and feedlot operations to describe their influence separately in the water quality model.

(11) Fertilizer Applications: Studies of fertilizer applications revealed high degrees of efficiency in its present use in agricultural areas. No change in rates of application were forecasted in the simulations of year 2000 water quality conditions.

(12) Streamflow Changes: Three reservoirs were assumed to be in place in the year 2000 that are proposed in connection with flood control plans. These were:

(a) Calumet-Union Drainage Ditch Retention Reservoir (approximate location - 165th Street and I-294)

(b) Thorn Creek Reservoir (Thornton Quarry)

(c) Lansing Ditch Reservoir (approximate location - Lincoln Highway and Glenwood-Dyer Road)

(13) Channel Improvements: One channel change was assumed in the first test plan relative to proposed flood control plans. This involved the Calumet Union Drainage Ditch.

(14) Shading of Streams: In the first test plan simulation, no changes were made in the factors used to represent the shading of waterways by trees and bushes.

b. First Test Plan, Simulated Results

If the actions and assumptions in the first test plan were put into effect over the next 20 years, water quality in every reach in the Little Calumet basin would be improved by a substantial margin. A comparison of present and year 2000 water quality conditons for Reach 31 provides a good example, in one sense, because it is the farthest downstream reach for which data were developed. (Complete comparisons of existing and simulated future conditons for all reaches are contained in the tables that follow.)

(1) BOD: The results of the year 2000 simulation for Reach 31 show that the first test plan would produce major reductions in the amounts of BOD ammonia in the Little Calumet at that point. Today, the BOD load to Reach 31 is about 7,000 tons per year (see Table 13-25). In the year 2000, under simulated conditions, the load would be only 1,600 tons per year. Such a reduction, more than 75 percent, is impressive. Tables 13-26 and 13-27 summarize the water quality impacts of the first test plan and compare them to existing conditions. Table 13-26 shows that under the first test plan, mean BOD concentrations would be decreased 50 to 70 percent except in Reach 11, where an increase of 27 percent was noted. This was due to the then-projected increased year 2000 contribution of the Homewood wastewater treatment plant.

(2) Ammonia: Table 13-25 shows that ammonia loads to Reach 31 would be 197 tons per year in the year 2000, down from 1,040 tons per year under existing conditons, also an impressive reduction. Table 13-26 shows that mean ammonia nitrogen levels would be reduced in all reaches to about the

state standard of 1.5 mg/1. However, maximum levels, although reduced by 70 to 90 percent, would still cause frequent violations, although shorter duration than under existing conditions.

(3) Nitrate and Phosphorus: Table 13-26 also contains information on the changes in nitrate and phosphorus levels that would result in Reach 31 under the first test plan. The reason instream nitrate levels would go up is that treatment plants, under the first proposal, would convert most of the ammonia in wastewater to nitrate before discharging it to the stream. However, nitrate is non-toxic; ammonia generally is toxic.

(4) Dissolved Oxygen: Table 13-27 shows that water quality, as represented by dissolved oxygen, would improve in all reported reaches in the basin as a result of first test plan assumptions. Mean DO levels are all well above state standards. However, minimum DO concentrations in all reaches would be below state standards, particularly in Reach 31 where it reaches 0 mg/1. The frequency and duration of these low DO events were greatly reduced in all reaches except Reach 11 where there were slight increases. The overall water quality of Reach 11 improved from "fair" to "good", however.

(5) Percent of Time That Standards Are Violated: The Commission is basing its assessment of the plans tested in each basin on the extent to which a given plan reduces the total time that instream water quality standards are violated.

In the formulation of strategies in the initial areawide plan, the Commission attempted to develop plans that would allow all streams to comply with state minimum DO standards 95 percent of the time. Table 13-28 illustrates the effect that the first test plan would have in Reaches 7, 11, 19, and 31. The final three columns in each table show the percent of time that standards for each pollutant indicator would be violated in each reach. The objective was to have all figures in this column below 5 percent.

With respect to DO, the first test plan would produce significant improvements. For example, whereas conditions in Reach 31 now violate 5.0 mg/1 DO levels about 76 percent of the time, that level would be violated only nine percent of the time in the year 2000.

(6) Summary: If a water quality plan that contained all the features of the first test plan described in the preceding section of this report were actually implemented, the Little Calumet would be a much improved stream. However, it would not be a "clean" stream and it would not support a great diversity of fish. That was the conclusion reached by the Commission staff and consultants after a review of the

TABLE 13-25: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS
REACH 31

Pollutant Indicator and Source	Existing Conditions				First Test Plan				*Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
BOD (tons/yr.) Boundary Cond.	2490	36			468	26			468	26		
Treatment Plants	1520	22			469	26			469	26		
Comb. Sewer Over.	2080	30			0	0			0	0		
Lowland	3.42	0	113	2	3.08	0	101	6	3.08	0	101	6
Cropland	102	1	92.7	1	31.9	2	35.5	2	38.5	2	37.1	2
Grassland	166	2	202	3	212	12	242	14	212	12	242	14
Impervious	172	2	0	1	208	12			208	12		
TOTAL	6533	94	408	6	1309	79	378	21	1400	79	380	21
Ammonia (tons/yr.) Boundary Cond.	364	35			106	54			106	54		
Treatment Plants	477	46			50.8	26			50.8	26		
Comb. Sewer Over.	170	16			0	0			0	0		
Lowland	.12	0	1.04	0	.11	0	.93	1	.11	0	.93	0
Cropland	7.67	1	.84	0	2.63	1	.36	0	2.95	2	.35	0
Grassland	20.7	2	.83	0	26.5	14	2.20	1	26.5	14	2.20	1
Impervious	4.58	0			5.58	3			5.58	3		
TOTAL	1044	100	2.71	0	192	98	3.49	2	192	98	3.48	2

*Data are from the first simulation of the 2nd Test Plan

TABLE13-25:COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS (Continued)
REACH 31

Pollutant Indicator and Source	Existing Conditions				First Test Plan				*Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Nitrate (tons/yr.) Boundary Cond.	70.0	21			339	37			339	37		
Treatment Plants	68.2	21			442	46			442	46		
Comb. Sewer Over.	16.1	5			0	0			0	0		
Lowland	.35	0	23.1	7	.32	0	20.6		.32	0	20.6	2
Cropland	17.6	5	18.8	6	5.07	1	8.15		6.49	1	7.73	1
Grassland	21.3	7	40.8	13	27.3	3	49.0		27.3	3	49.0	5
Impervious	49.6	15			48.1	5			48.1	5		
TOTAL	243	75	82.7	25	842	92	77.8		843	92	77.4	8
Phosphorous (tons/yr.) Boundary Cond.	67.0	34			67.1	57			67.1	57		
Treatment Plants	71.4	36			42.1	36			42.1	36		
Comb. Sewer Over.	48.3	25			0	0			0	0		
Lowland	.03	0	1.42	1	.03	0	1.27		.03	0	1.27	1
Cropland	1.02	1	1.17	1	.31	0	.51		.38	0	.48	0
Grassland	1.58	1	2.57	1	2.05	2	3.08		2.05	2	3.08	3
Impervious	1.33	1			1.26	1			1.26	1		
TOTAL	191	97	5.16	3	113	96	4.86		113	96	4.83	4

*Data are from the first simulation of the 2nd Test Plan

TABLE 13-26: COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 7			REACH 11		
		Existing	1st	*2nd	Existing	1st	*2nd
BOD (mg/l) Maximum	None	**	34.8		60.2	192	
Minimum		4.23	2.69		1.65	1.94	
Mean		31.3	9.53		6.91	8.77	
Ammonia (mg/l) Maximum		16.8	2.23		10.0	3.30	
Minimum		.57	0.20		.25	.29	
Mean		9.71	1.25		4.25	1.55	
Frequency of Violation	1.5[1]	45	84		77	94	
Average Duration of Violations (hours)	1.5[1]	582	88		323	134	
Nitrate (mg/l) Maximum	None	5.44	37.5		5.73	13.0	
Minimum		.44	.96		.90	.76	
Mean		1.45	10.36		1.95	4.26	
Frequency of Violation	10.0	0	70		0	14	
Average Duration of Violations (hours)	10	0	157		0	84.9	
Phosphate (mg/l) Maximum		3.03	2.38		4.13	3.44	
Minimum		.10	.08		.13	.11	
Mean		1.90	1.39		1.54	1.32	
Frequency of Violation	.05	1	1		1	1	
	.20	40	21		16	23	
Average Duration of Violations (hours)	.05	26,300	26,300		26,300	26,300	
	.20	653	1,250		16,400	1,130	

(1) Illinois Pollution Control Board Standard

*Data are from the first simulation of the 2nd Test Plan

** Exceeded expected range

TABLE 13-26: COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 19			REACH 31		
		Existing	1st	*2nd	Existing	1st	*2nd
BOD (mg/l) Maximum	None	**	112		**	81.2	
Minimum		4.50	2.42		2.63	1.69	
Mean		13.2	7.55		15.2	8.71	
Ammonia (mg/l) Maximum		11.6	2.86		10.3	2.47	
Minimum		.88	.28		1.38	.41	
Mean		5.39	1.45		4.61	1.24	
Frequency of Violation	1.5[1]	40	73		4	66	
Average Duration of Violations (hours)	1.5[1]	644	155		6,560	108	
Nitrate (mg/l) Maximum	None	4.07	21.3		3.98	14.9	
Minimum		.76	.96		0	1.15	
Mean		1.49	6.34		1.33	5.41	
Frequency of Violation	10.0	0	27		0	14	
Average Duration of Violations (hours)	10.0	0	168		0	146	
Phosphate (mg/l) Maximum		3.49	2.90		3.28	2.77	
Minimum		.15	.12		.37	.22	
Mean		1.75	1.33		1.44	1.12	
Frequency of Violation	.05	1	1		1	1	
	.20	8	18		1	1	
Average Duration of Violations (hours)	.05	26,300	26,300		26,300	26,300	
	.20	3,280	1,450		26,300	26,300	

(1) Illinois Pollution Control Board Standard

*Data are from the first simulation of the 2nd Test Plan

** Exceeded expected range

results of the simulation for the year 2000 conditions in the basin.

c. The Second Test Plan: Assumptions and Results

The second test plan was developed through much the same process described earlier in this section for the development of the first test plan. Simulation results for the first test plan were publicized and discussed at a series of public meetings in the basin. Through the areawide planning committee structure, a second test plan evolved out of suggestions for improving the first test plan. The second test plan is a set of six modifications to the first test plan.

(1) Test A: Evaluate loads which would result from a reduction of impervious areas in the year 2000 due to performance zoning for new developments.

(a) Assumptions: It was assumed that new impervious areas would be reduced by 32 percent by using swales and percolation to dispose of stormwater in residential areas instead of sewers.

(b) Results: Computer simulation of this proposal revealed that performance zoning would be of little water quality benefit. The results showed that about the same pollutant loads would flow from the additional grassland produced by performance zoning as would flow from well-swept impervious surfaces. However, if the efficiency of BOD removal practices from impervious areas falls short of the first test plan assumptions, performance zoning might be beneficial.

(2) Test B: Quantify by computer simulation the reaeration requirements to maintain minimum DO at 5 mg/1.

(a) Assumptions: It was assumed that the calculated quantities of oxygen would be supplied by a system of four instream aeration devices in Reaches 7, 11, 19, and 31.

(b) Results: Maintaining the 5 mg/1 DO level would benefit stream life by allowing a larger, healthier, and much more diverse population of fish to inhabit the waters.

(3) Test C: Calculate loads resulting from diversion of the Homewood Sewage Treatment Plant flows to the MSDGC. While this test was being evaluated the Village of Homewood decided to adopt this recommendation in its facility plan.

(a) Assumptions: None

TABLE 13-27: CHANGES IN DISSOLVED OXYGEN LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

(All data in mg/l)	REACH 7			REACH 11		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	13.7	13.4		13.5	13.3	
Minimum	0	3.92		0	3.03	
Mean	6.04	7.29		8.58	8.71	
* Violations	217	23		7	8	
Average Duration	24	12		12	5	
** Overall Assessment	Bad	Good		Fair	Good	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

(All data in mg/l)	REACH 19			REACH 31		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	12.6	12.7		10.7	11.3	
Minimum	0	2.30		0	0	
Mean	6.53	7.97		3.10	7.33	
* Violations	166	21		216	147	
Average Duration	20	8		92	16	
** Overall Assessment	Poor	Good		Bad	Poor	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

TABLE 13-28: WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

REACH 7

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan
Temperature °C	32.2	1	1		1	2		*	*	
Dissolved Oxygen as O, mg/l	5.0	217	23		24	12		20	1	
BOD_{20} Carbonaceous as O, mg/l	10									
Ammonia as N, mg/l	1.5	45	84		582	88		99	28	
Nitrate as N, mg/l	10	0	70		0	157		0	42	
Phosphorus Soluble as P, mg/l	.05	1	1		26,300	26,300		100	100	

REACH 11

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan
Temperature °C	32.2	8	6		5	3		*	*	
Dissolved Oxygen as O, mg/l	5.0	7	8		12	5		*	*	
BOD_{20} Carbonaceous as O, mg/l	10									
Ammonia as N, mg/l	1.5	77	94		323	134		95	48	
Nitrate as N, mg/l	10	0	14		0	84.9		0	5	
Phosphorus Soluble as P, mg/l	.05	1	1		26,300	26,300		100	100	

REACH 19

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan
Temperature °C	32.2	0	0		0	0		0	0	
Dissolved Oxygen as O, mg/l	5.0	166	21		20	8		13	*	
BOD_{20} Carbonaceous as O, mg/l	10									
Ammonia as N, mg/l	1.5	40	73		644	158		98	44	
Nitrate as N, mg/l	10	0	27		0	168		0	17	
Phosphorus Soluble as P, mg/l	.05	1	1		26,300	26,300		100	100	

REACH 31

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan	Existing Conditions	1st Test Plan	*2nd Test Plan
Temperature °C	32.2	4	3		5	6		0	0	
Dissolved Oxygen as O, mg/l	5.0	216	147		92	16		76	9	
BOD_{20} Carbonaceous as O, mg/l	10	104	62		199	91		79	21	
Ammonia as N, mg/l	1.5	4	66		6,560	108		100	14	
Nitrate as N, mg/l	10	0	14		0	146		0	8	
Phosphorus Soluble as P, mg/l	.05	1	1		26,300	26,300		100	100	

*: Less than one per cent

revised 2/15/79

(b) Results: The diversion of the Homewood plant flows would be very beneficial to the overall water quality of Butterfield Creek (Reach 11) and Thorn Creek (Reach 19), but would be of marginal benefit to the quality in the Little Calumet River (Reach 31), according to computer simulation of this proposal.

(4) Test D: Determine how much low-flow augmentation would be required from Indiana with oxygen-saturated water to maintain minimum dissolved oxygen at 5 mg/1 at Reach 31.

(a) Assumptions: One method that could be used to improve the water quality of the stream would be to dilute oxygen-poor water with water from wells or Lake Michigan.

(b) Results: Based on computer simulation of quantities of oxygen-rich water necessary to maintain 5 mg/1 DO at Reach 31, 175 wells, each producing 100 gpm from local sand and gravel aquifers, would be required. The water quality benefits in all reaches would be similar to those in Test B.

(5) Test E: Calculate loads which would result from adding those areas identified for conservation tillage to the agricultural conservation segment.

(c) Assumptions: Conservation tillage has a beneficial effect on water quality.

(b) Results: Pollutants from croplands are such a small part of the pollution load in the basin waterways that Test E had little effect on the pollutant loads in the basin. There is a relatively small amount of cropland in the basin, with water quality being dominated by point source discharges and inflows from Indiana.

(6) Combine Tests C & E: - If Test C were combined with Test E, this additional conservation tillage might show significant benefits in Reach 19 and Reach 11 since the dominating influence of the Homewood Sewage Treatment Plant would be removed.

(7) Summary: The results of the simulation of the second test plans are shown for Reach 31 in Table 13-25. All of the results achieved in the simulation of second test plan proposals were reviewed at additional public meetings in the basin. Comments and suggestions from the public were solicited and recorded. The Commission staff, considering all available simulation results and other information, then prepared the recommended basin plan.

13.09 PROBLEM ASSESSMENT

In Part I of this report, a number of problems were identified and solutions recommended. Those findings are applicable to all basins. Noted below are certain problems specifically associated with the Little Calumet Basin.

a. Excessive Infiltration/Inflow (I/I)

In order to qualify for construction grants related to wastewater system improvements, regulations issued after the enactment of PL 92-500 require applicants to follow certain procedures. Federal regulations 40 CFR 35.927 require evidence that the treatment works for which grant assistance is sought will not be subject to excessive infiltration or inflow. (I/I) An I/I analysis is performed to demonstrate the existence or non-existence of excessive infiltration and/or inflow in each sewer system. If excessive flows are found, the next step is a Sewer System Evaluation Survey (SSES). If corrective measures are justified to remedy in whole or in part the identified problems, a sewer rehabilitation project may be authorized as part of the facilities planning project.

Within the MSDGC area, the initial I/I study was performed by that District and excessive flows were found to exist. Because of the large number of individual SSES studies that had to be made in each municipal and separate sanitary district sewer system, the work will be done by the local governments. Grants for 75 percent of allowable costs are available upon the submission of applications and their approval covering work in the separate sewer areas.

In the combined sewer areas, the grant procedures are more complicated because the sewers are considered to serve multiple purposes. In addition to pollution abatement, the sewers provide local stormwater drainage and may have some flood control implications. According to the USEPA Program Guidance Memo PG-61, dated December 16, 1976, rehabilitation and/or construction grants will be made available only for the *pro rata* costs allocable to pollution abatement. However, the SSES studies themselves are fundable as are any concurrent special studies necessary to determine the causes of and alternative corrective measures related to combined sewer overflows and sewer backups.

As of December, 1978 only 71 applicatons for SSES grants have been received from the 130 municipal governments and separate sanitary districts located within the MSDGC area. Local units of government which have not already done so should submit applications for grants to undertake Sewer System Evaluation Surveys.

b. Sampling

The Commission's instream sampling results indicated severe problems with respect to DO and ammonia at all stations. IEPA instream sampling results also indicated severe violations of the DO and ammonia standards at all stations, as well as problems with fecal coliform and copper. SCD analyses on benthic samples indicated "moderate" pollution to "sewage sludge-like" conditions. Biological classification of benthic samples using the Shannon-Weaver index method indicated moderate to severe pollution. Conditions were found to range from semi-polluted to polluted using the IEPA biological classification system. Analyses of stream-bottom sediments in the main stem of the Little Calumet River showed extensive deposits of thick septic muck and sludge-type deposits. Fish samples generally indicated poor aquatic habitats and limited species diversity in the downstream sections of all reaches.

c. Computer Simulation - Existing Conditions

Water quality in the Little Calumet River system is generally quite poor, as simulated for existing conditions. The basin contains significant urbanization, resulting in major pollutant loads associated with point sources, combined sewer overflows, and stormwater runoff. Numerous dry weather violations of dissolved oxygen and ammonia standards are associated with point source loads, particularly from the SDBT plant. Contributing to the dry weather water quality problems is the relatively poor assimilative capacity of the mainstem associated with low velocity flow conditions. In addition to their BOD and ammonia loads, point sources contribute large quantities of nitrate and phosphate which serve as nutrients for algal growth.

Severe wet weather violations of DO and ammonia standards are due primarily to combined sewer overflows along the mainstem Little Calumet. Wet-weather problems are less severe in tributary reaches where the major wet-weather pollutant loads are attributable to surface runoff from both pervious and impervious surfaces.

Pollutant loads entering the basin from Indiana are very high, also. These are associated with combined sewer overflows to a large extent.

Other problems in the basin are algal blooms and occasional violations of the temperature standard.

d. Point Sources

The MSDGC has a completed and approved facilities plan. The Homewood FPA has completed its facility plan, but it has

not been approved. The SDBT was granted an exemption from formal facilities planning requirements under 40 CFR 35.917 (c) and 35.925-7 and 35.925.8. This exemption was based on the fact that equivalent studies had been undertaken prior to the enactment of PL 92-500. Facilities planning is still underway in the Thornton FPA. A preliminary facilities plan has been prepared for the Village of Park Forest South sub-FPA. This plan does not address the future plans of Monee other than to reserve capacity in an expanded Park Forest South plant. In addition, the acquisition of the Park Forest South plant, presently owned by HUD, is still to be determined through negotiations.

Infiltration/inflow (I/I) studies have been completed or are underway in the MSDGC, Homewood, Park Forest South, Thornton, and SDBT FPAs. The separately sewered municipalities of Country Club Hills, East Chicago Heights, East Hazel Crest, Hazel Crest, Olympia Fields, and Riverdale have not applied for funds to complete Sewer System Evaluation Surveys (SSES) to supplement the completed MSDGC I/I study. The combined sewer municipalities of Calumet City, Dixmoor, Dolton, Harvey, Markham, Phoenix, Posen, Riverdale and South Holland should apply for grants to perform SSES studies and connections to the MSDGC TARP. The remaining communities owning collection systems in the basin have completed or are undertaking SSES studies. These include Dolton, Harvey, Markham, and South Holland, which have both separate and combined sewers.

Until facilities plans have been completed and approved for the Homewood, Park Forest South, and Thornton FPAs, the future status and level of treatment in the Little Calumet Basin remains uncertain. The completion of SSES studies in the communities that have not done so is also very important, since it affects their capital and operating costs. Completion of connections to TARP by combined sewer communities is vital to the elimination of overflows and to the identification of local problems connected with sewer-backup. Combined sewer overflows from the MSDGC area are estimated to contribute nearly one-third of the BOD entering the basin.

e. Non-Point Sources

Urban stormwater runoff, construction activities, air pollution, septic systems, surface waste disposal sites, hydrologic modifications, and agricultural runoff all contribute pollutant loads to the Little Calumet Basin.

Of particular importance is runoff from impervious surfaces in the basin since these areas are forecasted to increase by 90 percent by the year 2000.

Unsatisfactory soil conditions, small lots, old systems, high water tables or combinations of these factors identified 25 of the 32 septic areas in the basin as

existing or potential problem areas. The largest septic problem area is Monee, where many systems are reported to discharge to low areas without filtration.

f. Problems Remaining After Implementation of Test Plans

Even after the implementation of both the first and second test plan assumptions, water quality in Reach 31 would still be classified as "poor". As previously mentioned, the elimination of the Homewood plant would have a marginal benefit on the DO concentrations in Reach 31. The Commissions's modeling consultant has indicated that if the boundary conditions for flow from Indiana were to meet a minimum DO of 5.0 mg/1 and a maximum BOD of 4 mg/1 instead of the average values assumed in the first and second test plans, DO concentration in Reach 31 would not drop below 5 mg/1 more than 5 percent of the time. This would change Reach 31's classification from "poor" to "good".

Chlorophyll a concentrations are projected to increase in the basin as a result of the first test plan indicating an increase in algae concentrations. The Commission's modeling consultant has indicated that the phase out of the Homewood plant, as suggested in the second test plan, will reduce algae growth in Reaches 11, 19 and 31. However, algae problems will still remain.

Significant viclations of the ammonia standard of 1.5 mg/1 will also continue despite implementation of proposals contained in the first and second test plans.

Phosphate levels in excess of .05 mg/1 will continue 100 percent of the time in all reaches of the basin.

13.10 EASIN RECOMMENDATIONS

a. Overview

The recommended plan for this basin covers a wide range of proposed actions. Under 201 facility planning, these will vary from the control of combined sewer overflows by the MSDGC TARP system, thrcugh the acquisition of the Park Forest South Utility Company and the phase-out of two municipal plants. The MSDGC and the Sanitary District of Bloom Township will operate the only publicly owned wastewater systems except for the Park Forest South Utility Company plant, which is recommended for acquisition by the Village of Park Forest South. A further recommendation calls for that treatment plant to be operated by the Sanitary District of Bloom Township under a mutually satisfactory contractural agreement.

Perhaps the most sensitive element of the 208 plan itself concerns the achievement of instream water quality standards for the Little Calumet River as it enters Illincis from Indiana.

Dredging of certain reaches of the Little Calumet River is recommended to be postponed until the combined sewer overflows, which generate the bottom deposits, have been brought under control by the MSDGC TARP.

Street vacuuming, as well as other techniques, and agricultural best management practices are suggested to control stormwater pollution from urban and agricultural areas.

The above and other measures for protecting and improving water quality in the basin are derived from the considerations set forth in Part I of this plan and from the preceding sections of this chapter.

b. Point Sources

(1) Publicly Owned Wastewater Systems

(a) The MSDGC, the Bloom Township Sanitary District and the villages of Homewood, Thorton, Park Forest South and Monee should implement their respective portions of their 201 plans as they have been or may be approved by the Illinois and/or U.S. Environmental Protection Agencies. A Summary of the current status of these plans appears in Section 13.04f and suggested changes thereto or features to be included are noted below. In the absence of completed and/or approved facility plans, certain assumptions had to be made as to the expected locations and/or sizes of treatment plants, their estimated costs and designated management agencies. This information must not be construed as binding in the Areawide Plan until the 201 facility plans have been finalized.

(b) The following listed Cook County communities having separate sewers should seek federal grants and initiate and/or complete by July 1, 1981 sewer system evaluation studies as required by 40 CFR 35.927: Riverdale, Country Club Hills, Hazelcrest, East Hazelcrest, Olympia Fields, and East Chicago Heights.

(c) The following listed communities having combined sewers in all or portions of their corporate limits should complete the same studies plus supplementary studies by July 1, 1981 to optimize local systems in order to take advantage of TARP capacity: Calumet City, Phoenix, Posen, Dixmoor, Riverdale, Dolton, Harvey, Markham and South Holland.

(d) The Village of Park Forest South should give serious consideration to the acquisition by July 1, 1979, of the former Park Forest South Utility Company plant now operated by the U.S. Department of Housing and Urban Development.

(e) If the Park Forest South Utility Company plant is acquired by the Village of Park Forest South, within one year thereafter, negotiations should be undertaken with the Sanitary District of Bloom Township for the latter's operations of the plant under a contractual agreement.

(f) By July 1, 1980, the Village of Monee should complete a study to supplement the Village of Park Forest South facilities plan to determine the future course of wastewater treatment for Monee. A sewer system should be constructed with treatment by Park Forest South unless the study shows that innovative on-site disposal techniques can eliminate and prevent malfunctioning septic systems.

(g) All municipalities and the counties of Cook and Will should seek to conserve water resources and to reduce wastewater flows at all publicly owned treatment plants. This should be accomplished through the modification of building codes to require water conserving plumbing fixtures, metering of all new developments, pricing policies and public education to reduce consumption in already developed areas.

(h) By July 1, 1983 all treatment plants whose seven-day ten-year low flow dilution ratio is 10 to 1 or less should provide or continue to provide not less than 80 percent oxygen saturation in their effluents. Monitoring of wastewater quality after aeration should be conducted. However, during the continuing planning program, studies should be undertaken to determine where this requirement may be waived without detriment to instream water quality standards.

(i) Municipal type sewer service required to serve future growth within service areas identified for the year 2000 should be provided only by treatment authorities listed above except where this is impractical or not cost-effective.

(j) Projected five-year service areas should be identified in the NPDES permits issued by the IEPA. No NPDES permit should be issued for municipal-type wastewater service within the five-year service area, other than to the treatment authority, except on a finding by IEPA that the proposed facility is the most cost-effective means of providing service, is an interim facility pending extension of service by the treatment authority, or is intended to serve an isolated location.

(k) Treatment plant operators should assure the very high standard of performance for wastewater treatment

plants which the 201 plans assume. The IEPA should monitor treatment plant operation and performance and its effect on instream water quality. The IEPA should establish at technical assistance program to aid operators and laboratory technicians of small public and private treatment plants in dealing with technical problems and assuring a consistent high level of performance in treatment operations.

(2) Industrial Wastewater Treatment Plants

(a) The IEPA should continue to enforce all requirements of NPDES permits for all industries in the basin and assure that treatment plants achieve and maintain required standards of plant performance. This can be achieved through IEPA standards for treatment plant personnel and through frequent sampling and analysis of treatment plant effluent by the IEPA for the purpose of monitoring compliance with NPDES permits.

(3) Miscellaneous Wastewater Treatment Plants

(a) Miscellaneous publicly and privately owned wastewater treatment plants should continue in operation until such time as wastewater service can be provided by publicly owned municipal-type wastewater systems on a cost-effective basis.

(b) Service areas of privately owned treatment systems should not be expanded or their treatment capacities increased when service can be provided on a cost effective basis by publicly owned municipal-type wastewater systems.

(c) The IEPA should continue to enforce all requirements of NPDES permits and assure that treatment plant operators achieve required standards of plant performance.

(4) Combined Sewer Overflows

(a) The MSDGC should control combined sewer overflows in the 3.2 square mile combined sewer area as provided by its TARP. The implementation of TARP is critical to water quality throughout the combined sewer area and in downstream rivers and canals.

(5) Other Wastewater Dischargers

(a) Other dischargers of wastewaters such as cooling water, stormwater, or water treatment residuals should continue in operation. The IEPA should enforce all requirements of NPDES permits and assure that any treatment operations employed achieve the required performance standards.

c. Non-Point Sources

(1) Urban Stormwater Runoff

(a) By July 1, 1983 Cook and Will counties and all municipalities in the basin should implement measures to work toward a reduction of BOD in stormwater runoff. In existing separately-sewered urbanized areas, reductions of 25 percent of 1976 loadings on impervious surfaces are recommended as a target. In areas to be urbanized in the future, target reductions of 50 percent of 1976 surface loadings are recommended. The implementing agencies should work through the countywide water quality committees to develop plans and standards to achieve these objectives. Potential measures include street cleaning and catch for the implementation of appropriate measures such as catch basin cleaning, performance zoning, street cleaning, use of pervious pavement surfaces, increased vegetation cover, grass waterways, wetland storage of stormwater, stormwater detention, sedimentation and erosion control, and other appropriate measures to achieve the desired pollutant reductions.

(b) Township county and state highway organizations, the Illinois State Toll Highway Authority, and facility engineering departments at state and federal installation should participate in the programs described above by implementing accelerated roads and highways that are hydraulically connected to perennial streams or permanent lakes via stormwater conveyance systems.

(c) During the period up to July 1, 1983 agencies should utilize voluntary exploratory programs, implementing techniques to control pollutants from urban non-point sources.

(d) Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should adopt and enforce adequate stormwater detention ordinances. These ordinances should include provisions which clearly establish long-term responsibilities for maintenance of detention facilities. All such local ordinances also should be consistent with minimal areawide standards set forth in the model ordinance.

(e) Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should develop and enforce adequate erosion and sedimentation control ordinances. All such local ordinances should be consistent with minimal areawide standards set forth in the model ordinance.

(f). Within one year following the preparation by NIPC of a model ordinance, Cook and Will counties and all municipalities in the basin should adopt measures to control surface runoff from open storage yards containing industrial stockpiles and other materials which may go into solution or which may be carried away by stormwater runoffs and pollute streams and other water bodies.

(g) Municipalities, townships, counties, and state highway departments responsible for de-icing streets and highways should develop programs to control the application of de-icing materials, to train personnel in proper application methods, and to use proper equipment in order to minimize any negative water quality impacts. The impact of de-icing agents on water quality should be given further study by NIPC in the continuing planning program.

(2) Agricultural Runoff

(a) By July 1, 1980, the Will-South Cook Soil and Water Conservation District, in conjunction with agencies of the United States and Illinois Departments of Agriculture and the countywide water quality committees, should identify the best management practices necessary to implement the agricultural aspects of the 208 plan, including conservation tillage, contour plowing, terracing, and conversion of cropland to grass land.

(b) By July 1, 1981, agricultural lands on which BMP's should be applied should be identified by the Soil and Water Conservation District. Agencies of the U.S. Department of Agriculture and countywide water quality committees should be consulted.

(c) By July 1, 1985, a comprehensive conservation plan should be prepared for each farm in the basin which has soil erosion losses in excess of standards set by the Illinois Department of Agriculture and the Soil and Water Conservation District, under House Bill 818.

(d) Using available cost sharing and technical assistance programs, the soil and water conservation districts should ensure implementation of the BMP program according to the following schedule on approximately 13,800 acres of agricultural lands:

By 1985 - 30% of the identified land.
By 1995 - 70% of the identified land.
By 2000 - 100% of the identified land.

(e) The IEPA and NIPC should provide the results of their instream water quality monitoring to the Soil and Water Conservation District and to the Departments of Agriculture so that priority can be given to the areas most sensitive from a water quality standpoint in order to maximize the impact of the best management practices.

(f) The IEPA should enforce the IPCB regulations which require permits for feedlots and should use the IEPA draft technical policy WPC-2 "Design Criteria for Field Application of Livestock Wastes" as a guide.

(g) Illinois Department of Agriculture, Illinois Department of Public Health, and USEPA regulations on the use of pesticides and disposal of containers, and Illinois Department of Agriculture regulations on the training and licensing of pesticide applicators and operators should be continued.

(h) Farmers should implement good pasture management practices, utilize grass waterways, vegetative filter strips, and field borders, and make wise use of fertilizers wherever possible in accordance with the Illinois Agronomy Handbook to reduce the dangers of pollution. The U.S. Department of Agriculture agencies should assist farmers in recognizing the water quality problems posed by improper practices, and assist them in the use of proper practices.

(i) By July 1, 1979, the countywide water quality committees in conjunction with agencies of the U.S. and Illinois Departments of Agriculture should identify localized pollution problems resulting from cattle grazing. By July 1, 1980, NIPC, as part of its continuing planning responsibilities, should recommend measures for the correction of those problems through established programs.

(3) On-Site Disposal Systems

(a) Individual malfunctioning on-site disposal systems outside of the five-year service areas should be repaired wherever possible upon complaint to the appropriate county authorities or replaced with a new system if necessary.

(b) By July 1, 1983, special service areas should be established under the initial sponsorship of municipal governments (for sites located within corporate limits) and by the counties (in unincorporated areas), where necessary, to aid in the financing of any innovative-type systems or other on-site improvements necessary to correct or replace malfunctioning systems in areas outside the five-year projected service areas.

(c) The minimum requirements of the Illinois Private Sewage Disposal Code should be upgraded to require more innovative site analysis techniques, and Cook and Will County Health Departments should require a construction permit to regulate the design, location, and installation of every new on-site system in incorporated as well as unincorporated areas.

(d) Local officials should inspect all septic systems known to be failing, threatening public health or causing nuisance conditions. The inspection should result in the issuance of a repair permit for corrective measures which are to be undertaken and paid for by the septic system owner.

(e) Septic systems also should be inspected by local officials prior to the transfer of ownership of

properties where such systems are installed. The results of the inspections shoould be made known to the lending institutions which are furnishing the mortgages.

(4) Air Pollution

(a) As part of the continuing planning program the IEPA in cooperation with the Illinois Institute for Natural Resources, the Illinois State Water Survey, and local air quality management agencies should analyze the relationship between air pollution and water quality in all of its aspects. The IEPA should cooperate with NIPC in devising strategies for correcting present negative effects and preventing future problems through the 208 continuing planning program.

(5) Sanitary Landfills

(a) The IEPA will ensure that every sanitary landfill complies with all regulations of the IPCB for its siting, design, construction and operation. As a substitute for existing state regulations, the IEPA and IPCB should consider certification of local solid waste disposal programs that comply with areawide plans to be prepared under the Federal Resource Conservation and Recovery Act. Alternatives to land disposal of solid wastes, including recycling, should be considered and utilized wherever possible.

(6) Waterways

(a) The Army Corps of Engineers should initiate studies for dredging the Little Calumet River main stem, upstream of its confluence with the Federal channel. Completion of plans, acquisition of spoil disposal sites and assurance of Congressional appropriations should be phased so as to permit dredging operations to be completed at approximately the same time that TARP I in this area has been completed.

(b) The possible negative impacts on water quality should be assessed against the flood control, drainage, or navigation benefits of any proposed dredging project.

(c). NIPC, in conjunction with the countywide water quality committees, in the continuing planning program, should develop recommendations to simplify the fragmented system for channel maintenance and

improvement in the Little Calumet River Basin. Present responsibilities for such maintenance functions as debris removal, streambank stabilization, public access, dredging, disposal of dredge spoil, protection and augmentation of habitat, tree shading and vegetation are shared between a host of Federal, State and local authorities.

(d) Will County should develop an organization similar to the Cook County Clean Stream Committee, consisting of volunteers and organizational representatives who maintain surveillance over water bodies for activities adverse to water quality, flood control, recreation, fish, wildlife, and/or navigation.

(e) In-stream water quality data collected by local treatment plant operators should be periodically published by the IEPA.

(7) Boundary Conditions

(a) The USEPA, the Indiana Stream Pollution Control Board, and the Northwestern Indiana Regional Planning Commission, should assure that the Little Calumet River as it flows into Illinois will meet the prescribed boundary water quality standards as follows: dissolved oxygen concentrations of 5.0 mg/l or greater at least 95 percent of the time; a mean concentration of 4.0 mg/l of BOD_5 ; and a maximum of 1.5 mg/l ammonia nitrogen (NH_3 -N).

d. Residuals

(1) As regulated by the IEPA, present methods for the disposal of sludge from treatment plants are adequate to handle present and anticipated future volumes, and should continue to be administered by the IEPA.

(2) Highest priority should be given to the use of sludge as a soil conditioner. The IEPA should assure proper practices in the utilization of sludge on agricultural lands through implementation of the draft standards in IEPA Technical Policy WPC-3 "Design Criteria for Municipal Sludge Utilization on Agricultural Land."

(3) The preferred method for the disposal of domestic septage is through land application, and this method should be encouraged and used whenever possible. Recognizing a continuing need for the disposal of large volumes of septage at wastewater treatment plants, specific facilities should be designated by the IEPA to

receive domestic septage on recommendation by NIPC through the continuing planning process.

(4) The USEPA standards and the IPCB regulations for permits for the disposal of hazardous or toxic substances should continue to be enforced by the IEPA.

e. Grcundwater

(1) By July 1, 1980, the Illinois State Water Survey and the Illinois State Geological Survey should undertake a coordinated well sampling program to mcnitcr groundwater quality in areas where a potential fcr infiltration by pollutants now exists or might exist in the future.

f. Inland Lakes

(1) By July 1, 1979, in accordance with Section 314 of PL 92-500, the IEPA should undertake expanded lake sampling to identify eutrophic conditions and, in ccnjunction with NIPC and the countywide water quality committees, develop plans to control sources of pollution and restcre water quality.

g. Mining

(1) The present IPCB regulations for the control of pollution from aggregate-producing activities are ccnsidered generally satisfactory. However, the IEPA should continue to study the types and volumes of pcllutants associated with these activites and their pctential effects on surface and groundwater quality. Any needed changes in present regulations should be identified by July 1, 1980.

13.11 CCSTS OF RECOMMENDED PLAN

a. Facility Plans

(1) General Table 13-29 shows pertinent capacities in the year 2000 for the basin's two surviving municipal wastewater treatment plants, their effluent standards, and construction costs. Also shown are total MSDGC costs allocated to the basin.

Cost data were assembled from various sources as noted below and in the tables that follow. The processing of this information and its allocation to the Little Calumet Basin are described, where applicable.

TABLE 13-29: RECOMMENDED PLANS, PUBLICLY OWNED TREATMENT SYSTEMS LITTLE CALUMET RIVER **BASIN**

MAP CODE	FACILITY NAME	DESIGN CAPACITIES (MGD)		EFFLUENT STANDARDS (Year 2000) (mg/l)				CAPITAL COSTS (million $)			COMMENTS
		1975	2000	BOD_5	TSS	P	NH_3N	INITIAL	FUTURE	TOTAL	
C1	Bloom Township S.D.	12.10	12.10	8	7		(1) (2) 1.5	(3) 4.0	-	4.0	
W30	Park Forest South	1.45	4.00	(4) 10	(4) 12	(5) 1	(1) (6) 1.5	2.6	1.3	3.9	
C2	Homewood	3.5	(7)	-	-	-	-	(8) 7.9	-	(8) 7.9	
C13	Thornton	0.4	(7)	-	-	-	-	(9) 0.5	-	(9) 0.5	
N/A	MSDGC	-	-	-	-	-	-	99.2	0.8	100.0	
N/A	Local Improvements, MSDGC Service Area	-	-	-	-	-	-	25.5	4.2	29.7	
N/A	Monee, Local Sewers	(10)						(10)			

(1) In-stream, after mixing.

(2) Nitrification by activated sludge process.

(3) Costs are for the construction of 23.88 MGD excess flow treatment capacity.

(4) Pfeffer Exemption

(5) Phosphorus removal required because plant discharges upstream of Deer Lake.

(6) Nitrification by extended aeration.

(7) Plant to be phased out; interceptor service by MSDGC.

(8) Costs for plant, pumping station and trunk sewer costs for connection to MSDGC interceptor under review.

(9) NIPC order of magnitude cost estimate to cover connection to MSDGC interceptor

(10) Costs for Monee's local improvements to correct unsatisfactory septic systems are not available

Except for the MSDGC area, "Initial" costs of facility plans listed in Table 13-29 apply to the first phase of any project which is to be followed at some future date by programmed expansions or extensions. Under this definition, the total cost of works currently under construction fall under the classification "initial", even though the project has not yet been completed and future payments to contractors will be made. Except for the MSDGC area, "future" costs in Table 13-29 cover phased work scheduled at later dates.

(2) MSDGC Area Because of their magnitude and complexity, special procedures were followed in depicting MSDGC costs.

Total costs of MSDGC improvements and locally funded improvements were taken from Table U7-IX-1 and from page 229 in MSDGC's 1977 Facilities Plan Update Supplement. They were revised and brought up to date in a conference with MSDGC staff representatives. The cost of all MSDGC improvements was assumed to be spread throughout the MSDGC service area on an ad valorem basis. Thus, each basin's share of the cost was assumed to be proportional to the share of total district assessed valuation in that basin.

For locally funded improvements, the estimates for Local Sewer Upgrading are current 1977 values from page 229 of the MSDGC 1977 Plan Update Supplement, updated as noted above. For other local improvements, the estimates in pages XI-18 and XI-19 of the MSDGC Overview Report are as of January 1, 1975, also updated as noted above. Where applicable, costs were also updated at six percent compounded for the intervening period to January, 1977 levels.

The costs of local improvements were allocated differently, depending upon the particular type of project. Local Sewer Upgradings required as supplements to the TARP apply only to the 49 communities in the TARP area. A basin's share of the total cost of these upgradings was assumed to be equal to the percentage share of the total TARP area assessed valuation in TARP communities in that basin.

(3) Future Costs Table 13-30 distributes capital costs within five-year time frames. Annual operation and maintenance (O&M) costs are also shown, which are based on data included in current reports, where available, or from data furnished by operating agencies. In their absence, they were estimated based on information in Staff Paper No. 20, "Wastewater Treatment Processes and Cost Data." The cost for bonded indebtedness of previous system improvements are not included in the O&M costs listed in Table 11-30. The costs for constructing TARP II are included in this table. Construction costs do not differentiate between grant-eligible and local shares.

(4) Local Costs Table 13-31 shows annualized local costs.

(5) Increased Costs Tables 13-32, -33, -34 show the estimated annual increases in wastewater charges per household: for non-MSDGC service area residents in Cook County; for Will County residents in the basin; and for the basin as a whole, respectively for the previously described improvements and/or expansions.

(6) Basin Specifics Costs for the communities in Cook County to complete sewer system evaluation surveys and to study connections to the MSDGC TARP are so site specific that they are impossible to estimate. It is likely however that in aggregate they could be substantial.

Phase out of the Homewood plant to the MSDGC would result in a savings of $180,000/year in operation and maintenance costs and a total savings of $3.78 million by the year 2000.

Costs are presently unavailable for phase out of the Thornton plant to the MSDGC. An accurate estimate of these costs is dependent on site specific conditions and will be developed by the local facility plan. Capital costs are likely to be greater than $0.5 million.

The costs for the Village of Park Forest South to acquire the existing facility now owned by HUD have not been determined. Since this price will be the subject of negotiations, it is impossible to determine but probably will be significant.

The cost for Monee to provide a collection system and an interceptor to Park Forest South are also unknown. If an alternative plan is developed to make on-site improvements to the existing septic systems, the costs should be materially less.

b. Urban Stormwater

Methods for controlling urban stormwater runoff pollution include: street sweeping, catch basin cleaning, performance zoning, use of porous pavements, increased vegetation, grass waterways, wetland storage of stormwater, stormwater detention, and erosion and sediment controls. The goals of a 25 percent decrease in BOD loads from existing (1976) impervious areas and a 50 percent decrease in BOD loads from impervious areas built between 1976 and 2000 are to be achieved by combinations of the above practices. The cost of the mix of specific practices which would meet these goals is dependent upon the practices selected and the intensity of their individual use. An estimate of the total cost is shown in Table 13-30. It is based solely on street cleaning utilizing vacuum sweepers and amounts to $17,656,000 through the year 2000, increasing from $425,300/year in 1978, to $1,110,000/year in the final year. The frequency of cleaning streets with vacuum sweepers averaged about once every 7 days during the year 2000, excluding the three winter months of December through

TABLE 13-30: :SUMMARY OF FUTURE COSTS (All data in 1977 dollars in millions)

Jurisdiction	Capital Costs						Annual Operations & Maintenance Expense				
	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	Total	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)
SANITARY DISTRICT OF BLOOM TOWNSHIP	4.00					4.00					
PARK FOREST SOUTH	2.60	0.17	0.43	0.43	0.27	3.90	0.20	0.37	0.43	0.43	0.43
MSDGC	99.20	0.80				100.0	0.22	0.87	0.91	0.91	0.91
LOCAL IMPROVEMENTS RELATED TO MSDGC	25.50	4.20				29.70					
AGRICULTURAL BMPs							0.03	0.06	0.08	0.12	0.14
URBAN STORMWATER MANAGEMENT EXPENSE							0.56	0.70	0.84	0.97	1.08
TOTAL	131.3	5.17	.43	.43	.27	137.6	1.01	2.00	2.26	2.43	2.56

revised 2/15/79

TABLE 13-31: PROJECTED ANNUALIZED LOCAL COSTS (All data in 1977 dollars in millions) LITTLE CALUMET

Jurisdiction	CAPITAL COSTS			LOCAL CAPITAL PLUS O & M ANNUALIZED Costs (Mil./yr.)*					Total Cost** 1978-2000	Comments
	Cost Total Through Yr. 2000	Est. Fed'l. Share	Est. Local Share	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000		
S.D.OF BLOOM TOWNSHIP	4.00	3.00	1.00	0.24	0.24	0.24	0.24		4.80	
PARK FOREST SOUTH	3.90	2.92	.98	0.25	0.44	0.51	0.52	0.46	9.98	
MSDGC	100.0	75.0	25.0	2.56	3.23	3.27	3.27	0.93	64.44	
LOCAL IMPROVEMENTS RELATED TO MSDGC	29.70	22.28	7.42	0.60	0.70	0.70	0.70	0.10	13.80	
AGRICULTURAL BMPs				0.03	0.06	0.08	0.12	0.14	1.87	
URBAN STORMWATER MANAGEMENT EXPENSE				0.56	0.70	0.84	0.97	1.08	18.59	
TOTAL	137.6	103.2	34.4	4.24	5.37	5.64	5.82	2.71	113.48	

*Local Capital Amortized @ 7% for 20 yrs.

**Sum of Local Capital Plus O & M Annualized Costs, in million $

R Sept. 20/78

TABLE 13-32: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST Cook County - Non MSDGC

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	249.0	273.3	295.1	321.8	341.2	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.134	.133	.136	.129		
O & M Related						
Total Rate:	.134	.133	.136	.129		
Additional Cost per Home of $45,000 FMV ($/yr.)	20.10	19.95	2040	1935	0	
Existing Av. Annual WW Cost ($/Household yr.)	78.64					
Total Av. Annual WW Cost ($ / Household yr.)	98.74	98.59	99.04	97.99	78.64	
Percent Av. Increase* in WW Costs per Household (%)	25.6	25.4	25.9	24.6	0	

*Total Rate Used

revised 2/15/79

TABLE 13-33: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST Will County

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	96.3	105.7	114.1	124.4	131.9	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.053	.066	.079	.072	.023	
O & M Related	.245	.395	.419	.401	.384	
Total Rate:	.298	.461	.498	.473	.407	
Additional Cost per Home of $45,000 FMV ($/yr.)	44.70	69.15	74.70	70.95	61.05	
Existing Av. Annual WW Cost ($/Household yr.)	68.85					
Total Av. Annual WW Cost ($ / Household yr.)	113.55	138.00	143.55	139.80	129.90	
Percent Av. Increase* in WW Costs per Household (%)	64.9	100.4	108.5	103.1	88.7	

*Total Rate Used

revised 2/15/79

TABLE 13-34: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST Basin Total

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	1546.1	1697.0	1832.0	1997.8	2118.3	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.209	.198	.185	.169	.007	
O & M Related	.065	.118	.123	.122	.121	
Total Rate:	.274	.316	.308	.291	.128	
Additional Cost per Home of $45,000 FMV ($/yr.)	41.10	47.40	46.20	43.65	19.20	
Existing Av. Annual WW Cost ($/Household yr.)	72.60					
Total Av. Annual WW Cost ($ / Household yr.)	113.70	120.00	118.8	116.25	91.80	
Percent Av. Increase* in WW Costs per Household (%)	56.6	65.3	63.6	60.1	26.4	

*Total Rate Used

revised 2/15/79

February. The above costs did not include street cleaning in combined sewer areas where the stormwater runoffs would be treated. Naturally, some street cleaning activities would be required in those areas for sanitary, public relations or other reasons. Costs for that cleaning are not included in the above figures.

c. Agricultural Runoff

Agricultural croplands presently amount to 29,800 acres in the Little Calumet River Basin, and are projected to decrease to 21,700 acres by the year 2000. In order to eliminate or reduce agricultural pollution from croplands, BMPs are targeted for implementation by 2000 on 13,800 acres at a total cost over the years of $2,676,000. Although a comprehensive farm plan would include a wide range of BMPs, the following four practices and combinations thereof have been recommended for implementation: conservation tillage, contour plowing, terracing and cropland conversion to pastureland. These BMPs were selected because of their direct effects on water quality as well as their ability to reduce soil erosion. Many other practices which would be contained in a farm plan, but not considered by the Commission, are either too localized or difficult to assess regarding their effects on water quality.

Of the above total costs, $998,000 represents initial installation or capital expenditures for which grants may be made available from the federal government. The cost-sharing ratios are not yet defined, but will probably be on the order of 50 percent. The balance of $1,677,000 presents operating and maintenance costs to the farmer over and above straight up and down plowing.

For estimating purposes, it is assumed that 30 percent of the BMP's would be installed by 1985, 70 percent by 1995, and 100 percent by the year 2000.

d. Boundary Conditions

The costs to clean up the Little Calumet River in Indiana to the standards recommended in this plan would be included in the Northwestern Indiana 208 Plan. It is expected that these costs will be substantial.

e. Other Costs

The recommendations for residuals, groundwater, inland lakes, and mining would result in additional costs. In some cases, these would be minor administrative costs and in others, the costs are too variable to be quantified. Overall, these costs most likely will be only a small

fraction of the costs estimated for recommendations concerning point and non-point sources.

13.12 WATER QUALITY CONDITIONS IN 1983

a. Introduction

Public Law 92-500 includes the statement Wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water be achieved by July 1, 1983." The water quality standards of the Illinois Pollution Control Board for General Use streams, such as the Little Calumet before its junction with the Cal Sag Channel were adopted to "protect the State's water for aquatic life,...primary and secondary contract use,..." This Commission is using the Illinois standards, as modified by this plan, to judge compliance with the 1983 national goal. This section assesses the feasibility of compliance with the dissolved oxygen and ammonia standard by 1983 in the Little Calumet River Basin.

b. Assumptions of changes in the Basin

(1) Land Cover: Land cover estimates for the years 1976, 1983, and 2000 are summarized in Table 13-35. It should be noted that impervious area is forecast to increase by 91 percent from 1976 to 2000. Also forecast is some shifting from lowland and cropland to grassland. The cropland areas listed under "conservation" indicate those lands where additional soil conservation practices are expected to be implemented.

(2) Urban Runoff Controls: Management measures are to be implemented with the objective of reducing runoff-related BOD from existing urbanized areas by 25 percent of loadings found to be present in 1976. The BOD loadings from areas urbanized after that year are to be reduced by 50 percent of 1976 loads. This will result in an overall 30 percent reduction in urban runoff BOD loads by 1983.

(3) Point Sources: Effluent characteristics of point sources are given for 1976 and 1983 in Table 13-36.

c. Expected Water Quality in 1983

The water quality model was used indirectly to estimate 1983 water quality conditions. Results of 1976 and year 2000 First Test Plan conditions served as the basis for estimating 1983 values. In the process, pollution loads to the River were calculated for each of those three years.

TABLE 13-35: LAND COVER CHANGES

Cover Type	Area in Square Miles		
	1976	1983	2000
Lowland	59.7	57.8	53.6
Cropland	19.5	16.0	8.0
Conservation	(0)	(0.6)	(3.3)
Grassland	40.7	43.3	48.9
Impervious	10.4	13.4	19.9

revised 2/15/79

These loads are reported in Table 13-37 for four reaches, along with the water quality ratings for dissolved oxygen and ammonia associated with the loads. The ratings for 1976 and 2000 are from previous water quality modeling results. The 1983 ratings are informed judgments.

TABLE 13-36: POINT SOURCES IN THE LITTLE CALUMET BASIN

Plant Name	Reach	Effluent Characteristics					
		Flow, cfs		BOD_5 (mg/l)		Ammonia (mg/l)	
		1976	1983	1976	1983	1976	1983
Crete Main	19	1.39	P/O	9.0	P/O	19.8	P/O
Crete Swiss Valley & Greenbriar	19	0.17	P/O	44.3	P/O	8.9	P/O
Steger	19	1.60	P/O	9.0	P/O	19.8	P/O
Sanitary Dist. of Bloom Tnshp (SDBT)	7	17.46	19.05	31.0	10.0	16.0	1.5
Homewood	11	5.37	P/O	11.0	P/O	9.9	P/O
Thornton	19	0.65	P/O	7.0	P/O	11.1	P/O
Park Forest S. Utility Company	7	0.78	2.28	9.0	4.0	19.8	1.5
Lansing Combined Sewer Overflows	31	2.20	P/O	200.0	P/O	25.0	P/O
Desa Industries	19	0.37	0.37	20.0	20.0	0.1	0.1
Stauffer Chemical	19	1.68	1.68	20.0	20.0	0.1	0.1
Alco American	7	0.09	0.09	2.5	2.5	13.6	13.6
I.C.G.R.R. Yard	31	0.51	0.51	2.5	2.5	13.6	13.6
Paradise Mobile Home Park	19	0.09	0.09	3.0	3.0	3.4	3.4
Indiana Boundary Conditions	31	77.00	77.00	21.0	21.0	5.1	5.1

P/O = Phased Out

revised 2/15/79

TABLE 13-37: WATER QUALITY RATINGS IN 1983

Reach 7, Headwaters Thorn Creek			
Loads & Ratings	1976	1983	(1) 2000
BOD_{20}, tons/yr	986	423	398
Ammonia, tons/yr	282	35	31
Dissolved Oxygen	Bad	Fair	Good
Ammonia	Bad	Poor	Poor

Reach 11 Butterfield Creek above Thorn Creek			
Loads & Ratings	1976	1983	(1) 2000
BOD_{20}, tons/yr	234	141	257
Ammonia, tons/yr	58	5	16
Dissolved Oxygen	Fair	Good	Good
Ammonia	Bad	Good	Bad

Reach 19 Lower Thorn Creek			
Loads & Ratings	1976	1983	(1) 2000
BOD_{20}, tons/yr	2178	987	1116
Ammonia, tons/yr	497	66	78
Dissolved Oxygen	Poor	Good	Good
Ammonia	Bad	Bad	Bad

Reach 31 Farthest downstream portions of the Little Calumet			
Loads & Ratings	1976	1983	(1) 2000
BOD_{20}, tons/yr	6937	3860	1775
Ammonia, tons/yr	1043	457	195
Dissolved Oxygen	Bad	Bad	Poor
Ammonia	Bad	Bad	Poor

revised 2/15/79

(1) First test plan year 2000 conditions: Does not consider results of the phase out of the Homewood plant second test plan.

The goal (expressed in terms of achievement of water quality standards) is considered to be met satisfactorily when a rating of "good" or "excellent" is achieved. Assignment of these adjective ratings was based on the following criteria:

Excellent = no dissolved oxygen concentrations below 5 mg/1

Good = dissolved oxygen remains above 5 mg/1 95 percent of the time or more.

Fair = dissolved oxygen remains above 5 mg/1 85 percent of the time or more

Poor = dissolved oxygen remains above 5 mg/1 70 percent the time or more

Bad = dissolved oxygen remains above 5 mg/1 less than 70 percent of the time

In any reach where the dissolved oxygen drops tc zero, the qualitative state of the reach is lowered by one category.

Ammonia ratings are based on a maximum concentration of 1.5 mg/l for the same criteria as dissolved oxygen.

Adjective ratings for dissolved oxygen and ammonia in 1983 are noted in Table 13-38.

d. Evaluation

The "bad" dissolved oxygen and ammonia ratings for Reach 31 could possibly be raised to "good" if Indiana is able to meet the water quality criteria specified in this plan. As modeled, it was assumed that Indiana waters entering Illinois would meet mean values of 1.5 mg/l ammonia and 5.0 mg/l DO, rather than having these values as limits. In this plan, the expected standards call for the maximum ammonia concentration not to exceed 1.5 mg/l and the minimum DO concentration not to be below 5 mg/l 95 percent of the time.

Boundary conditions contribute 36 percent of the BOD and 35 percent of the ammonia entering the basin as noted on Table 13-16. This figure becomes even more significant when the combined sewer inputs are eliminated and treatment plants are upgraded, as assumed in the First Test Plan.

The "bad" rating for ammonia in Reach 19 is questionable. According to Table 13-16, treatment plants contribute 94 percent of the ammonia to Reach 19. The phase out of the Homewood and Thornton plants would remove about 11 tons/year as previously mentioned. The SDBT plant has installed ammonia removal facilities which are designed to ensure that the State water quality standard of 1.5 mg/l will not be violated. Park Forest South is also expected to have ammonia removal facilities by 1983. In view of these facts it is suggested that the rating for ammonia in Reach 19 would be better than "bad", and that modeling assumptions concerning ammonia in Reach 11 should be reviewed.

The previous argument can also be applied to the "poor" rating for ammonia in Reach 7. Virtually the only sources of ammonia in Reach 7 are the SDBT and the Park Forest South plants. Since these plants are required to meet state standards as called for by their NPDES permits and both will have ammonia removal facilities by 1983, violation of the ammonia standard should be infrequent. Again modeling assumptions should be examined and perhaps refined.

TABLE 13-38: AMMONIA AND DISSOLVED OXYGEN RATINGS IN 1983

Stream	Reach	Dissolved Oxygen	Ammonia
Thorn Creek	7	Fair	Poor
Butterfield Creek	11	Good	Good
Thorn Creek	19	Good	Bad
Little Calumet	31	Bad	Bad

revised 2/15/79

The "fair" rating for dissolved oxygen in Reach 7 will improve to "good" by 2000 as a result of stricter control of nonpoint BCD and ammonia contributions as assumed in the First Test Plan. Further point source control does not appear practicable since both Park Forest South and the SDBT will have tertiary treatment facilities.

In view of the foregoing, judgment with respect to 1983 goals is restrained. Additional modeling runs will need to be made to reflect latest 201 plans and more conservative assumptions with respect to water quality expected in stream flows from Indiana. In short, the goals will be met in portions of the streams, as reported above, which areas may be substantially increased when confirmed by modeling runs.

CHAPTER 14

Kishwaukee River

TABLE OF CONTENTS

	Page
14.01 DESCRIPTION OF BASIN	14-1
a. Physical Characteristics	14-1
(1) Geography	14-1
(2) Waterways	14-1
(3) Geology and Soils	14-1
(4) Fish Species and Habitat	14-3
b. Socio-Economic Characteristics	14-3
(1) Population	14-3
(2) Land Use	14-3
(3) Economy	14-4
(4) Water Supply	14-4
(5) Government	14-4
(6) Recreation	14-4
14.02 IMPACTS OF OTHER PROJECTS	14-6
a. Introduction	14-6
b. Corps of Engineers	14-8
(1) Navigation	14-8
(2) C-SELM Study	14-8
(3) Dredge and Fill Permits	14-8
c. U.S. Department of Agriculture	14-9
(1) PL-566 Projects	14-9
(2) Conservation Program	14-9
d. Illinois Department of Transportation	14-9
(1) IDWR	14-9
(2) DOH	14-9
14.03 WATER QUALITY IN THE BASIN	14-10
a. Stream Classifications and Applicable State Standards	14-10
b. IEPA Stream Segment Classifications	14-10
c. Sources of Water Quality Information	14-10
(1) In-Stream Sampling Program	14-10
(a) Results	14-11
(2) Other Sampling Programs	14-11
(a) Land Use Runoff Sampling	14-11
(b) Sediment Oxygen Demand Analyses	14-11
(3) Computer Simulation of Existing Conditions	14-13
d. Results of Water Quality Modeling	14-15
(1) Pollutant Concentrations	14-15
(2) Pollutant Loadings and Sources	14-16
(a) Point Sources	14-16
(b) Pervious Sources	14-18
(c) Impervious Sources	14-18
(d) Summary	14-21

	Page
14.04 POINT SOURCES: EXISTING CONDITIONS	14-22
a. Municipal Type Wastewater Treatment Plants	14-22
b. Industrial Wastewater Treatment Plants	14-22
c. Miscellaneous Wastewater Treatment Plants	14-22
d. Other Point Sources	14-22
e. Combined Sewer Overflows	14-22
f. Local Facilities Planning	14-22
14.05 NON POINT SOURCES: EXISTING CONDITIONS	14-27
a. Urban Stormwater Systems	14-27
b. Construction Activities	14-27
c. Septic Systems	14-28
d. Hydrologic Modifications	14-28
e. Mining	14-28
f. Surface Waste Disposal Sites	14-28
14.06 DISPOSAL OF RESIDUALS	14-30
14.07 EXISTING MANAGEMENT PROGRAMS	14-31
14.08 MODELING PROCESSES: FUTURE CONDITIONS	14-31
a. First Text Plan Assumptions	14-33
(1) Population and Land Use	14-33
(2) Local Facilities Plans	14-33
(3) Phosphate Reductions	14-34
(4) Combined Sewer Overflows	14-34
(5) Boundary Conditions	14-34
(6) Urban Stormwater Runoff	14-35
(7) Septic Systems	14-35
(8) Soil Conservation	14-35
(9) Stream Flow Changes	14-35
b. First Test Plan, Simulated Results	14-35
(1) BOD	14-35
(2) Ammonia	14-36
(3) Dissolved Oxygen	14-36
(4) Summary	14-36
c. Second Test Plan Assumptions and Results	14-37
(1) First Simulation Assumptions	14-37
(2) First Simulation Results	14-37
(3) Second Simulation Assumptions	14-49
(4) Second Simulation Results	14-49
14.09 PROBLEM ASSESSMENT	14-49
a. Sampling Programs	14-49
(1) In-Stream Samples	14-49
(2) Sediment Conditions	14-49
(3) Biological Conditions	14-50
b. Simulation Modeling Results	14-50
c. Point Sources	14-50
d. Non Point Sources	14-51
e. Residuals	14-51

	Page
14.10 BASIN RECOMMENDATIONS	14-51
a. Overview	14-51
b. Point Sources	14-52
(1) Publicly Owned Wastewater Systems	14-52
(2) Private Utilities	14-53
(3) Industrial Wastewater Treatment Plants	14-53
(4) Miscellaneous Wastewater Treatment Plants	14-54
c. Non-Point Sources	14-54
(1) Urban Stormwater Runoff	14-54
(2) Agricultural Runoff	14-55
(3) On-Site Disposal Systems	14-57
(4) Air Pollution	14-57
(5) Sanitary Landfills	14-58
(6) Waterways	14-58
d. Residuals	14-59
e. Groundwater	14-59
f. Mining	14-60
14.11 COSTS OF RECOMMENDED PLAN	14-60
a. Facility Plans	14-60
(1) General	14-60
(2) Future Costs	14-60
(3) Local Costs	14-60
(4) Increased Costs	14-60
b. Urban Stormwater	14-65
c. Agricultural Runoff	14-65
14.12 WATER QUALITY CONDITIONS IN 1983	14-66
a. Introduction	14-66
b. Assumptions of Changes in the Basin	14-66
(1) Land Cover	14-66
(2) Urban Runoff Controls	14-67
(3) Point Sources	14-67
c. Expected Water Quality in 1983	14-68
d. Evaluation	14-70

FIGURES

No.		
14-1	Basin Location	14-2a
14-2	Water Sampling Stations	14-12a
14-3	Basin Modeling Segments	14-14a
14-4	Point Source Discharges	14-22a
14-5	Wastewater Service Areas	14-26a
14-6	Location of Septic Areas	14-28a

TABLES

No.		Page
14-1	Stream Inventory	14-2
14-2	Lake and Pond Inventory	14-4
14-3	Predominant Soil Unit Characteristics For Northeastern Illinois	14-5
14-4	Population Change 1975-2000	14-6
14-5	1970 Land Use	14-7
14-6	Land Use Forecasts (Acres)	14-7
14-7	Employment Forecast	14-12
14-8	In-Stream Water Quality Analyses - Summary Data	14-12
14-9	Generalized Benthic Sediment Conditions	14-14
14-10	Biological Stream Site Classifications	14-14
14-11	Data Output Points	14-14
14-12	Statistical Summary of Current Water Quality	14-17
14-13	Statistical Summary of Current Dissolved Oxygen Levels	14-18
14-14	Sources of Pollutants, Existing Conditions	14-19
14-15	Pollutant Contributions by Source Category, Existing Conditions	14-20
14-16	Municipal Type Wastewater Treatment Plants	14-23
14-17	Industrial Wastewater Treatment Plants	14-24
14-18	Miscellaneous Wastewater Treatment Plants	14-25
14-19	Summary of Septic Tank Installations	14-29
14-20	Septic System Areas Having Limitations	14-29
14-21	Existing Local Water Quality Management Agencies and Programs	14-32
14-22	Changes in Land Cover, 1976-2000	14-34
14-23	Comparison of Sources and Volumes of Pollutants	14-38
14-24	Comparison of Pollutant Concentrations, Existing Conditions - First Test Plan - Second Test Plan	14-42
14-25	Changes in Dissolved Oxygen Levels Under Alternative Test Plan Conditions	14-47
14-26	Water Quality Events in Violation of Desired Levels Under Alternative Test Plan Conditions	14-48
14-27	Recommended Plans, Publicly Owned Treatment Systems	14-61
14-28	Summary of Future Costs	14-62
14-29	Projected Annualized Local Costs	14-63
14-30	Projected Average Annual Increase in Household Wastewater Costs - McHenry County	14-63
14-31	Projected Average Annual Increase in Household Wastewater Costs - Kane County	14-64
14-32	Projected Average Annual Increase in Household Wastewater Costs - Basin Total	14-64
14-33	Land Cover Changes	14-66
14-34	Point Sources	14-67
14-35	Water Quality Ratings in 1983	14-68
14-36	Ammonia and Dissolved Oxygen Ratings in 1983	14-69

CHAPTER FOURTEEN
KISHWAUKEE BASIN

14.01 DESCRIPTION OF THE BASIN

a. Physical Characteristics

(1) Geography: The Kishwaukee River basin drains 1,300 square miles of northern Illinois and southern Wisconsin. Only about one-third of the basin, 444 square miles, lies within the six-county region covered by this areawide plan. This area is in western McHenry County and northwestern Kane County (see Figure 14-1).

The Kishwaukee River and the Coon Creek tributary originate in northeastern Illinois. Piscasaw Creek, another tributary, originates in Wisconsin. The three stream systems converge outside northeastern Illinois in Boone County. Water quality analysis discussed in this plan, therefore, does not reflect the total interaction of the major elements of the Kishwaukee River system.

Certain areas in the basin are environmentally sensitive and deserve special attention in clean water planning. A large groundwater recharge area in southern McHenry County, which extends to the eastern edge of the basin, and a large sand and gravel aquifer in the vicinity of Marengo and Union, also in McHenry County, are two areas particularly susceptible to damage by pollutants.

Wetland areas also are environmentally sensitive. There are more than 100 wetland areas in the basin greater than 10 acres in size, many of which are glacial lakes and marshes that provide important wildlife habitat.

(2) Waterways The drainage system includes six lakes or ponds with surface areas of 10 acres or more and eight tributaries, including the North and South Branches of the Kishwaukee River. Five of these tributaries flow directly into the Kishwaukee River: two are tributary to Piscasaw Creek; and one is tributary to the South Branch of the Kishwaukee River. These waterways are described in Tables 14-1 and 14-2. Union Drainage Ditch does not join the Kishwaukee main stem until it has traversed a considerable distance beyond the limits of Kane and McHenry counties. For this reason, it was not included in the water quality modeling, described later in this chapter.

(3) Geology and Soils: The dominant geologic deposit is till, found most extensively in the central and northern portions. Till is relatively impermeable, water recharge capability is limited, and it poses a risk of pollutant runoff to surface waters from the application wastes, fertilizers, or agrichemicals.

Extensive sand and gravel deposits are found in stream valleys and are most widespread in the northern half of the basin. These deposits are highly permeable. Rapid

infiltration may permit pollutants to enter groundwater as a result of leachate from landfills, discharges from septic tanks, or surface applications of wastes, fertilizers, or agrichemicals.

Scattered throughout the basin are deposits of recent origin, as well as glacial lake and wind-blown deposits. These materials are generally good attenuators of wastes, but their insufficient thickness is usually a limiting factor. Both infiltration of pollutants to groundwater and pollutant runoff can be problems in these areas, depending on the thickness of the deposit.

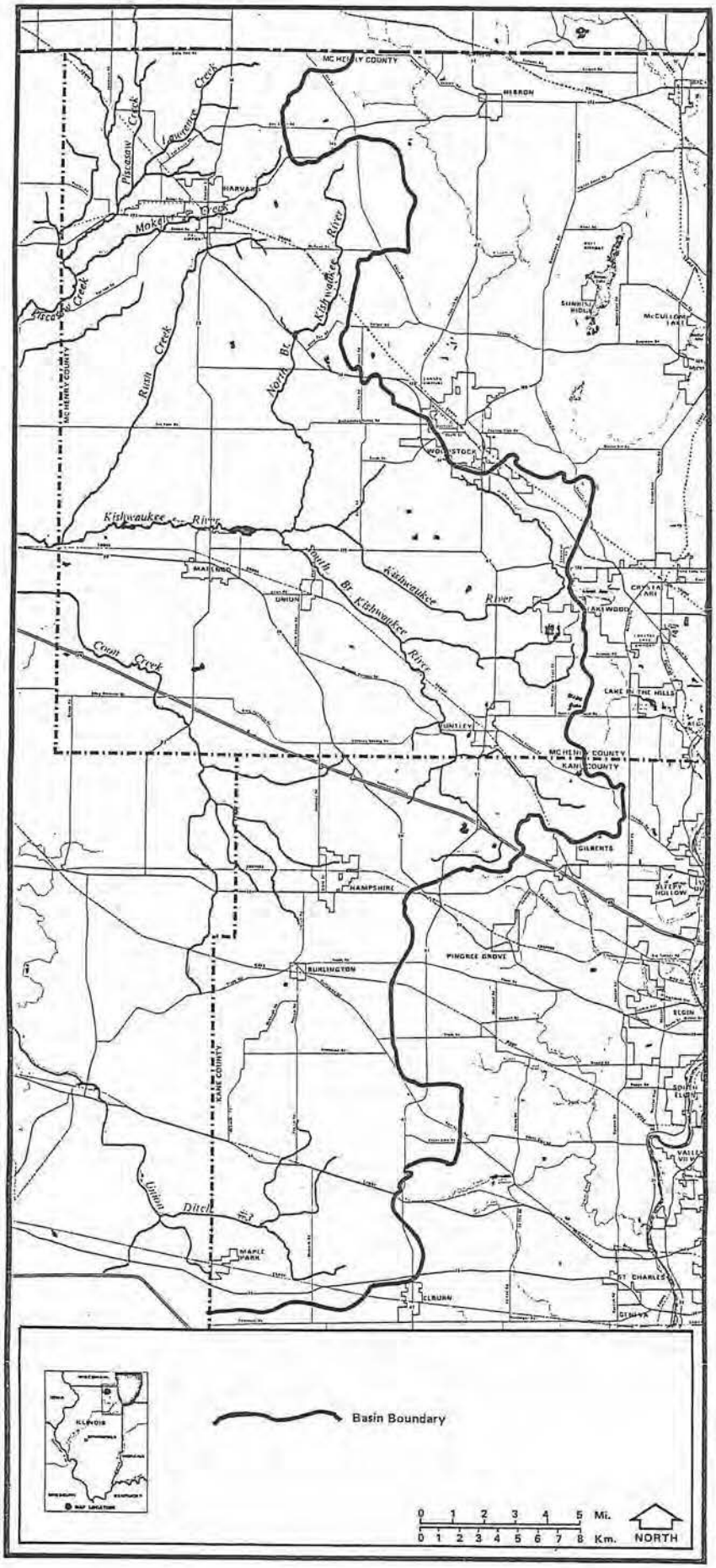
Geologic conditions present some limitations on septic tank usage almost everywhere in the basin. Waste acceptance problems are most severe in areas where sand and gravel and bedrock aquifers are near the surface, where infiltration rates of surficial materials are too high. Other limitations are the result of poor soil drainage or steep slopes.

Soils vary in this basin and in some areas have properties that could affect water quality under certain conditions. Predominant soils in northeastern Illinois were described in Chapter 3. Soils occuring in this basin are identified in Table 14-3.

TABLE 14-1 : STREAM INVENTORY, Kishwaukee **BASIN**

STREAM NAME	LENGTH (MILES)	AVG. WIDTH (FT.)	WATER SURFACE (ACRES)	GRADIENT (FT/MILE)	DRAINAGE AREA (SQ. MILES)	COMMENTS
Coon Creek	19.0	25	26.8	10.4	12	
Kishwaukee River North Branch	32.0	26	112.8	10.1	132	
Kishwaukee River South Branch	12.0	6	8.7	2.5	NA	
Lawrence Creek	7.3	8	7.0	22.8	18	
Mokeler Creek	10.0	2	4.8	24.3	9	
Piscasaw Creek	8.5	15	24.0	18.8	31.5	
Rush Creek	12.5	13	20.2	13.8	28	
Union Virgil Drainage Ditch	20.0	12	29.1	3.0	NA	

Figure 14-1: BASIN LOCATION



(4) Fish Species and Habitat: There was no fish sampling conducted in the Kishwaukee basin as part of the 208 program. However, the Illinois Natural History Survey (INHS) has periodically inventoried fish in the basin in recent years at 11 collection sites. In the survey's most recent inventory, 40 species were collected. Common shiners (a species requiring dissolved oxygen concentrations in excess of 6 mg/l) were the most abundant species collected, totalling 77 percent of the total number of fish collected.

One third of the collected species are considered sensitive to (or intolerant of) detrimental changes in the aquatic environment. The remaining two-thirds were equally divided between tolerant and moderately tolerant species. Overall, a high quality assemblage and diversity of fish exist in the river and its tributaries.

Follow-on work by the INHS as part of the 208 project involved computation of a toxicity index, relating water quality to fish habitat suitability. Included in the parameters for computing the toxicity index (using bluegills as the target species) are cadmium, nickel, arsenic, chromium, boron, mercury, cyanide, ammonia, and copper, among others. On the basis of its analysis, the INHS determined that the calculated bluegill toxicity index was well below the maximum level above which a diverse fishery cannot be maintained. The conclusion drawn is that existing water quality conditions do not adversely impact upon fish species in the basin.

b. Socio-Economic Characteristics

(1) Population: The estimated 1975 population of the basin was 31,586, representing 8 percent of Kane and McHenry counties' combined estimated 1975 population of 388,636. Population density (71 persons per square mile) is one of the lowest in northeastern Illinois. Most of the population is concentrated in the nine municipalities that are entirely or partly within the basin.

Table 14-4 provides population forecasts for the facilities planning areas in the basin. Projected wasteloads are based in part on these forecasts.

(2) Land Use: Corresponding with employment and population characteristics, land use in the Kishwaukee basin is dominated by the category of "vacant, agricultural, and forested," which comprises 94 percent of the basin (Table 14-5). Public open space accounts for less than 1 percent of the total, while the second largest land use category, residential, amounts to only 2.3 percent.

Land use forecasts anticipate that there will be increased urbanization in the basin and that this will be accompanied by changes in land use, as indicated in Table 14-6. However, vacant and agricultural land will decline by only about 2 percent by the year 2000. The largest

TABLE 14-2 : LAKE AND POND INVENTORY, KISHWAUKEE BASIN

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
BARD LAKE	43	7	11	69.8	3.3	10-15	NA	NATURAL	PRIVATE	
B.E.H. LAKE	43	5	18	14.0	0.6	30	NA	1956	ORG.	
BIRCHWOOD LAKE	45	6	20	20.0	0.9	12	NA	1956	PRIVATE	
GRIEBEL GRAVEL PIT	43	5	23	11.2	0.7	24	NA	1944	PRIVATE	
HAMILTON LAKE	44	7	32	22.0	1.9	20	NA	1966	PRIVATE	
VON ACKER LAKE	42	6	17	15.7	1.1	10	NA	1947	PRIVATE	

revised 2/7/79

proportionate increases will be in the land use categories of manufacturing and commercial.

(3) Economy: Non-agricultural economic activity is concentrated in the business districts of the basin's communities. These business districts are both farm service and industrial activity centers. Although manufacturing is generally on a small scale, in 1970, it provided more than half of the basin's total employment of 11,378 (Table 14-7). Employment in the basin is forecast to increase by 60 percent, to 18,244 employees, by the year 2000. Table 14-7 indicates continuing increases in all categories of employment. Projected increases in manufacturing employment are proportionately smaller than the projected increases in commercial and service related occupations.

(4) Water Supply: Groundwater is the sole source of potable water supply in the basin. Shallow sand and gravel aquifers provide more than 90 percent of the public water supply used; shallow dolomite and deep sandstone aquifers account for the balance.

(5) Government: The portion of the Kishwaukee basin covered by this areawide plan is within McHenry and Kane counties. Included in the basin are all or parts of 18 townships and nine municipalities. These nine communities, in general, are farming and commercial centers serving rural McHenry and Kane counties. The basin is also covered by the programs of the McHenry County and Kane-DuPage County Soil and Water Conservation Districts.

(6) Recreation: In recent years the clearing of lands and forests for agriculture, the filling of wetlands, and the decreasing access to waterways as a result of land subdivisions have reduced recreational resources in the basin. The few public recreational areas that are found are generally subject to intensive use. Water sports are limited but include fishing and canoeing. The basin is located in a major upland game area, and hunting is among the basin's popular outdoor activities. Most hunting is done on private farms or club lands. Some private campgrounds are also in operation.

TABLE 14-3: PREDOMINANT SOIL UNIT CHARACTERISTICS FOR NORTHEASTERN ILLINOIS

Unit In Basin	Soil Unit	Soil Color	Soil Texture	Permeability	Drainage	Subsoil Texture	Underlying Materials	Agricultural Usage Limitations	Approximate Percentage of Prime Agri. Land	Development Usage Limitations
Yes	Fox-Dresden-Casco	brown	loam	mod-rapid	well	loam	sand and gravel	E, D, LF	12	S, E, ST
Yes	Warsaw-Rodman-Lorenzo	brown	loam	moderate	well	loam	sand and gravel	E, D	50	S, E, ST
	Volinia-Selma-Lomax	brown	loam	moderate	excessive	loam	sand	WE, D, W	80	W, S, P
	Maumee-Watseka-Plainfield	black	loamy sand	rapid	excessive	sand	sand	W, WE, D	30	S, W
Yes	Zurich-Grays-Wauconda	gray	silt loam	moderate	moderate	clay loam	silt loam	W, E, LF	90	S, W, ST
Yes	Drummer-Brenton-Proctor	brown	silt loam	moderate	moderate	clay loam	loam	W, E	100	W, S, P
Yes	Miami-Kidder-McHenry	gray-brown	loam	moderate	well	clay loam	loam	E, ST, LF	40	ST, S, SS
Yes	Drummer-Saybrook-Lisbon	dark gray	silt loam	moderate	moderate	clay loam	loam	W, E	80	W, S, SP, SS
Yes	Ringwood-Griswold	brown	loam	moderate	well	clay loam	sandy loam	E, W	85	S, W, ST
	Morley-Markham-Ashkum	gray	loam	slow	moderate	silty clay	clay loam	E, W, LF	60	ST, SP, SS, W, HC
Yes	Elliot-Ashkum-Beecher	dark gray	silt loam	slow	moderate	silt loam	clay loam	W, E	85	W, SP, CS, SS
	Milford-Martinton	black	silt loam	mod. slow	poor	silty clay	calcareous sediment	W	95	W, HC, P, SP, SS
	Symerton-Andres-Ashkum	black	silt loam	moderate	moderate	clay loam	clay loam	E, W	95	W, SP, SS
	Nappanee-Peotone-Del Rey	dark gray	silt loam	slow	well	silt loam	calcareous sediment	W, T, LF, E	50	W, SP, HC, P
	Frankfort-Bryce-Montgomery	dark brown	silt loam	slow	poor	silty clay	calcareous sediment	W, T, LF, E	5	W, SP, HC, P
	Romeo-Joliet	black	loam	moderate	poor	loam	limestone	W,STN, FL	60	W, SH, FL, SS
Yes	Otter-Huntsville-Millington	black	loam	moderate	moderate	loam	loam	FL, W	95	W, FL
	Fox-Wauconda-Sawmill	dark gray	silt loam	moderate	poor	loam	sand	W, FL, E	75	W, FL
Yes	Houghton-Lena	black	muck/peat	rapid	poor	muck/peat	sand/silt	HWT, W	0	W, P, S, HWT, LS

USAGE LIMITATION CODES

CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION
CS	Clayey Subsoil	D	Drouthiness	E	Erosion	FL	Flooding
HC	Heavy Clayey Subsoil	HWT	High Water Table	LF	Low Fertility	LS	Low Strength
P	Ponding	S	Seepage	SH	Shallowness to Bedrock	SP	Slow Percolation
SS	Shrink-Swell	ST	Steepness	STN	Stoniness	T	Soil Tilth
W	Wetness	WE	Wind Erosion				

TABLE 14-4 : POPULATION CHANGE 1975-2000

FACILITY PLANNING AREAS		1975	1980	1985	1990	1995	2000	% Change 1975-2000
*WOODSTOCK	FPA 1/	14,020	15,450	18,170	20,890	24,280	27,660	97.3
HARVARD	FPA	5,760	6,430	7,280	8,130	8,520	9,500	64.9
MARENGO	FPA	6,190	6,630	7,280	7,840	8,540	9,240	49.3
HUNTLEY	FPA	1,560	1,640	1,660	1,680	1,690	1,710	9.6
HAMPSHIRE	FPA	1,850	2,050	2,810	3,510	4,240	4,920	165.9
BURINGTON	FPA	700	770	1,000	1,250	1,420	1,600	128.6
UNION	FPA	1,500	1,560	1,830	2,000	2,320	2,640	76.0
MAPLE PARK	FPA	880	1,060	1,190	1,330	1,470	1,610	82.9
FPA TOTAL		32,460	35,590	41,220	46,630	52,480	58,880	81.4
BASIN AREA TOTAL		31,586	33,903	37,194	40,484	45,731	50,977	61.4

1/ Facility Planning area is located in more than one basin
Source: Northeastern Illinois Planning Commission

*Note: Woodstock is located in two basins. Total Facility Planning Areas Population shown.

14.02 IMPACTS OF CTHER PROJECTS 188

a. Introduction 190

In many river basins there are studies, projects, or other activities underway by various agencies which may impact directly or indirectly on surface and/or ground water quality. Most of these will have indirect effects since they usually pertain to water quantity or hydrologic modifications conducted in the course of flood control projects. Another potential impact results from the construction or improvement of roads and highways. In these 192 193 195 196 197 198

TABLE 14-5: 1970 LAND USE

Land Use Category	Total Acres	% of Total
Single Family Residential	6,670.8	2.3
Multi Family Residential	30.4	*
Mobile Home Parks	17.3	*
Manufacturing and Processing	263.0	0.1
Transportation, Communications, & Utilities	538.0	0.2
Railroad Rights-of-way	934.8	0.3
Airports	158.7	0.1
Streets & Parking	5,551.1	2.0
Trade	158.6	0.1
Services-Private	152.1	0.1
Services-Institutional	219.1	0.1
Military Services	None	
Cemetaries	143.2	0.1
Entertainment Assembly	10.2	*
Public Buildings	62.3	*
Public and Quasi-Public Open Space	1,815.7	0.6
Mining and Quarries	407.5	0.1
Vacant, Agricultural & Forest Areas	266,253.7	93.6
Vacant-Under Development		
Water	705.0	0.2
Warehousing	133.1	*
Shopping Centers	None	
Hotels-Motels	41.6	*
Parking Lots	88.4	*
Total	284,354.6	

revised 2/7/79

Source: Northeastern Illinois Planning Commission Land Use Survey
*: Less than 0.1 percent

TABLE 14-6: LAND USE FORECASTS (ACRES)

Land Use Category	1980	1985	1990	1995	2000
Residential	7,208	7,530	7,851	8,286	8,721
Manufacturing	948	1,104	1,259	1,630	2,002
Commercial	632	918	1,204	1,568	1,932
Transportation/Communication, etc.	3,007	3,490	3,974	4,576	5,171
Open Space, Vacant Agriculture, etc.	272,560	271,313	270,067	268,295	266,529
Total	284,355	284,355	284,355	284,355	284,355

SOURCE: Northeastern Illinois Planning Commission, 1976

instances, drainage patterns may be altered, local farm tiles may be interrupted, silt may be introduced into waterways during construction, and vehicular pollutants may be conveyed to local water bodies, all affecting water quality. Stream crossings by highways and by various public and private utilities all may affect water quality to varying degrees and for various lengths of time. The Kishwaukee River thus far has not been as severely impacted by these activities as have other basins nearer the urban core. Nevertheless, the potential for adverse water quality from these projects should be anticipated and provided for.

b. Corps of Engineers

The U.S. Army Corps of Engineers has a variety of responsibilities relating primarily to navigation and flood control, as well as ancillary activities related to water quality.

(1) Navigation: The Corps has general jurisdiction over navigation in the waters of the United States. However, the Corps does not consider the Kishwaukee to be navigable. As a result, the river does not fall within the purview of Corps permit authority in so far as control over obstructions to navigation is concerned.

(2) C-SELM Study: Pursuant to Section 206 of the Flood Control Act of 1958 and Congressional resolutions adopted in 1971, the Corps was involved in a planning study on alternative wastewater management systems for the Chicago-South End of Lake Michigan (C-SELM) area, which covered portions of northeastern Illinois and northwestern Indiana. Specifically, the study was directed at the evaluation of various regional wastewater management systems, including plans which would result in the elimination of pollution discharges to water bodies. An initial pilot study was completed in 1974 which included the designation of significant areas in McHenry County for use in the land treatment of wastewaters, both locally generated and those transported from the urbanized areas further east. However, since C-SELM was only a planning study, the report contained no recommendations for federal action with respect to any of the specific wastewater management systems evaluated. The intent of Congress was for these studies to be presented to local units of government for their consideration and adoption, as desired.

Given the widespread public opposition to the study, the possibility for its implementation must be regarded as extremely remote.

(3) Dredge and Fill Permits: Under Section 404 of PL 92-500, the Corps is authorized to issue permits for the placement of dredged or fill materials into navigable waters

or on adjacent land sites. Small scale projects such as those routinely conducted by farmers in the course of drainage improvements are not subject to the 404 program. No 404 permits outstanding have been issued for the portion of the Kishwaukee basin in northeastern Illinois.

c. U.S. Department of Agriculture

The Agricultural Stabilization and Conservation Service (ASCS) and Soil Conservation Service (SCS) are two units of the U.S. Department of Agriculture directly involved in the conservation of land and water resources.

(1) PI-566 Projects: The small watershed program of the SCS (authorized by PL 83-566) provides a framework through which federal, state, and local units of government can deal with local water resources problems on a cooperative basis. The program is principally oriented toward the prevention of soil erosion and the control of flooding and sedimentation damages. The SCS has no active or planned PL-566 programs in the Kishwaukee Basin.

(2) Conservation Program: The SCS and ASCS also perform a variety of other functions related to soil and water conservation. The SCS, for example, offers extensive technical assistance to individuals, local soil and water conservation districts, and others. The ASCS gives assistance through cost-sharing to farmers in order to control erosion and agriculturally related water pollution. Various site specific control techniques are available for implementation under this program, depending upon the nature of problems locally.

d. Illinois Department of Transportation

Two divisions of the Illinois Department of Transportation have duties and responsibilities related to water quality management: the Division of Water Resources (IDWR) and the Division of Highways (DOH).

(1) IDWR: This division has statutory responsibility for navigation and flood control projects on water bodies throughout the state, as well as permit authority for private and public projects which enter or cross over or under such waters. IDWR also has underway a number of flood control projects in the region. None, however, is in the Kishwaukee basin, nor are any planned for the future.

(2) DOH: This division is responsible for the construction and maintenance of state highways. These projects have associated water quality impacts during both construction and use. There are a number of state highways and one

tollway in the basin. No new state roadway construction is planned for the future in the basin, although there will be routine resurfacing and widening projects having some expected localized water quality impacts.

14.03 WATER QUALITY IN THE BASIN

a. Stream Classifications and Applicable State Standards

All waterways in the basin are designated as "general use, protected for public and food processing water supply," and are subject to state standards for waterways with such designations. A full discussion on General Use standards and other standards applicable to water quality is given in Chapter Four.

b. IEPA Stream Segment Classifications

The state has been divided by the Illinois EPA into hydrologic units that coincide with major river basins. These units have been further divided on the basis of common characteristics. The Kishwaukee basin is within segments A-2 and A-3, which are two of 11 segments in the Rock River hydrologic unit as defined by the IEPA. These segments, like all others in the state, have been designated "water quality limited." This designation means that water quality in the waterways of the basin does not currently meet standards and/or is not expected to meet those standards even after the minimum statutory limitations have been applied to effluents discharged to the water body.

c. Sources of Water Quality Information

Assessment of current water quality conditions in the Kishwaukee River and its tributaries is based entirely on information developed in the Commission's water quality sampling programs since the IEPA does not have an active water quality sampling program in the basin. These sampling programs and the results they produced are described below. The simulation of existing conditions by the water quality model also provides a description of water quality in the basin.

(1) In-stream Sampling Program: The sampling program conducted by the Commission involved a total of 48 instream sampling stations, one of which was in the Kishwaukee basin. This station was located on the Kishwaukee River at Stone Quarry Road in Belvidere. The location outside the designated six-county planning area was selected so that samples would reflect the influences of all three major streams in the basin and at a point where a U.S. Geological

Survey stream gaging station was present. The confluences of these streams, as explained earlier, are in Boone County.

Data were collected at seasonal intervals over a 13-month period (April 1976-April 1977). Sampling results were used in calibrating the water quality model. They also represent important information on the characteristics of streams in the basin. Samples were analyzed for 19 pollution parameters.

(a.) Results: The Kishwaukee River system, although it does experience a variety of pollution problems, is one of the cleanest in northeastern Illinois. The evidence on which this assessment is based is primarily the results of the Commission's in-stream sampling program, as summarized in Table 14-8.

Of the 19 parameters evaluated, Illinois has established standards for these four: pH, temperature, dissolved oxygen (DO), and ammonia. Violations of state standards have been used in this study as a measure of the relative water quality of rivers and streams. The Commission's sampling and analyses programs identified no violations of existing standards.

(2) Other Sampling Programs: In addition to the in-stream sampling program, the Commission conducted several other monitoring programs as part of the overall study. These were:

--Stormwater runoff sampling and analysis at 16 sites representing a cross section of land uses in the region and at two ravine sites tributary to Lake Michigan.

--Sediment oxygen demand (SOD) measurements from bottom deposits at 110 stations.

--Benthic community (macroinvertebrate) sampling from bottom deposits at 116 stations.

--Dam aeration/de-aeration measurements at 48 structures.

--Fish population surveys at 60 sites.

(a) Land Use Runoff Sampling: Two of the stormwater runoff sampling sites (both agricultural in nature) were located within the Kishwaukee River basin. However, the data from the stormwater sampling program are not intended to be basin-specific. Rather, they indicate characteristics of runoff from particular kinds of land uses, wherever they are found in the region. Results of the runoff sampling effort were discussed in Chapter Six.

(b) Sediment Oxygen Demand Analyses: Three of the sites where SOD was measured are in this basin (Figure 14-2). In

TABLE 14-7 : EMPLOYMENT FORECAST

CATEGORY	1970	1980	1985	1990	1995	2000	1970-2000 % Increase
Manufacturing	6,849	9,456	9,550	9,644	9,810	9,975	45.6
Local Retail	1,221	1,226	1,251	1,276	1,304	1,332	9.1
Other	3,308	4,248	5,176	6,104	6,521	6,937	109.7
Total	11,378	14,930	15,977	17,024	17,634	18,244	60.3

Source: Northeastern Illinois Planning Commission

TABLE 14-8 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

KISHWAUKEE RIVER BASIN

STATION NO. 4

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		pH (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5[2]	BOD_{20}[2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
April 5-14 1976	No. of Analyses	30	11	30	30	30	30	29	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.5	282	24	78	606	11	13	16	5	17			2.5	0.3	4.0	0.3	8	389	12	
	Minimum	7.9	248	7	11	364	1	4	10	2	3			0.0	0.0	2.6	0.05	5	388	2	
	Mean	8.2	262	11	28	488	5	9	11	3	6			0.8	0.2	3.0	0.11	7	388	7	
July 5-15 1976	No. of Analyses	30	10	30	30	30	30	29	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.5	278	14	49	584	14	29	13	4	10			1.1	0.1	2.0	0.3	6	364	57	
	Minimum	6.5	210	8	11	454	2	23	7	1	4			0.3	0.0	0.9	0.0	5	360	21	
	Mean	8.1	258	11	26	542	8	25	10	2	5			0.7	0.1	1.5	0.12	6	362	36	
October 4-13 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.5	288	16	42	540	12	19	13	6	9			1.0	0.1	1.6	0.14	9	392	19	
	Minimum	8.0	222	5	6	408	1	10	8	1	2			0.0	0.1	0.1	0.06	5	382	5	
	Mean	8.2	263	7	15	475	4	13	11	3	4			0.4	0.1	1.3	0.09	7	387	10	
January 4-11 1977	No. of Analyses	9	5	9	9	9	9	9	8	5	5			9	9	9	9	5	0	5	
	Maximum	7.8	322	8	14	552	10	0	12	7	12			1.0	0.2	2.5	0.13	11		3	
	Minimum	7.0	279	2	2	438	1	0	11	1	2			0.3	0.1	2.3	0.07	11		2	
	Mean	7.6	299	4	6	488	3	0	12	3	5			0.6	0.2	2.4	0.09	11		3	
April 4-9 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	
	Maximum	8.1	266	8	22	582	11	10	13	5	8			0.8	0.1	3.2	0.07	8	439	19	
	Minimum	7.7	257	4	11	468	2	6	10	2	2			0.5	0.1	2.5	0.02	6	437	8	
	Mean	8.0	261	5	16	516	5	8	12	4	5			0.6	0.1	2.8	0.05	7	438	14	

STATION NO. _____

	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				

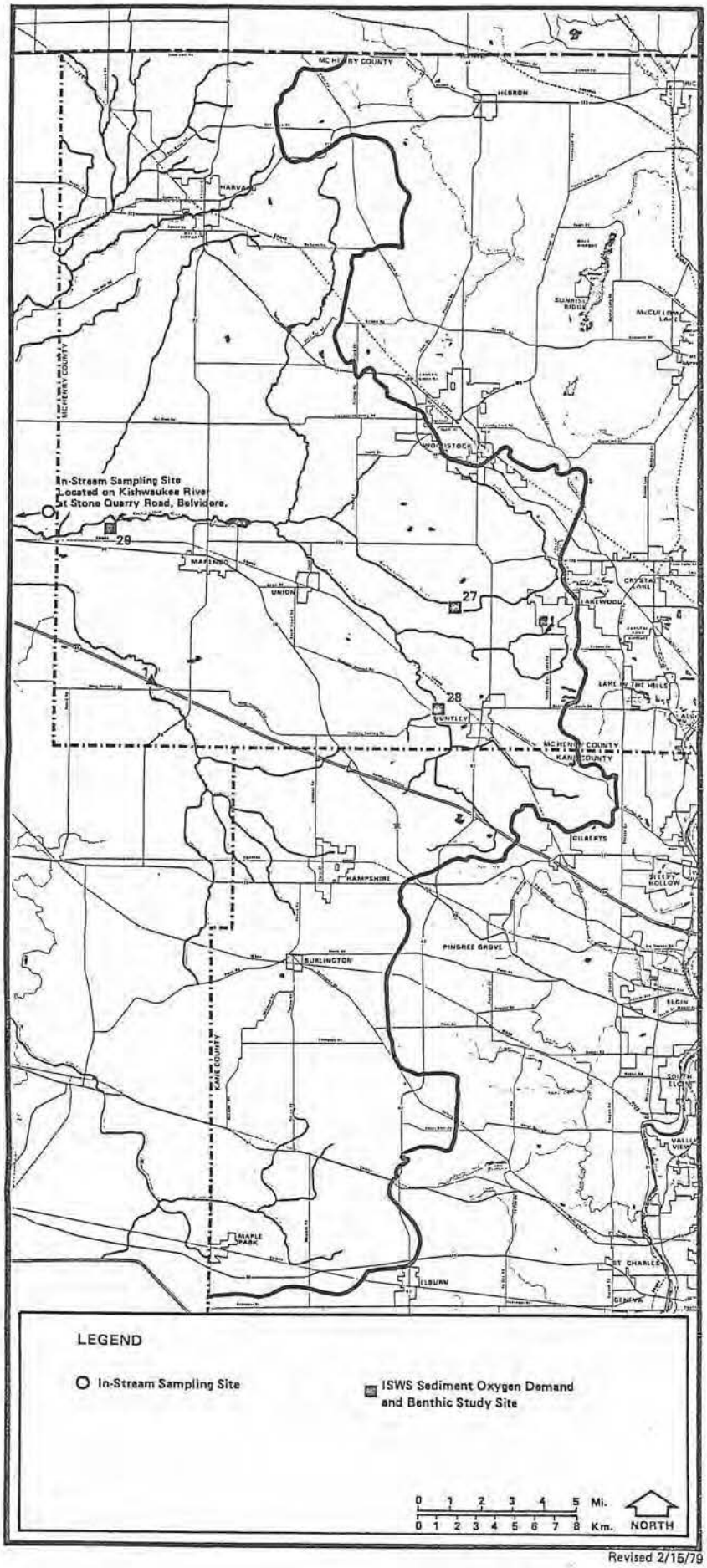
(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) BOD's are inhibited.

(3) Analyses by Nalco.

revised 2/7/79

Figure 14-2: WATER SAMPLING STATIONS



Revised 2/15/79

addition to measuring the oxygen demands of various organisms, bottom sediment samples were collected, analyzed, and described as being representative of one of the following generalized conditions: clean, moderately clean, slightly degraded, moderately polluted polluted, heavily polluted, or sewage sludge-like. Ratings developed for the sites based on SOD analyses are shown in Table 14-9.

At these same three sites, benthic communities were analyzed, and mathematical indices reflecting the nature and diversity of these communities were developed according to standard formulas. Shannon-Weaver indices above 3.0 are indicative of generally clean water; values between 1.0 and 3.0 are indicative of moderately polluted water; and values below 1.0 are indicative of seriously polluted water. The Shannon-Weaver indices, as well as the IEPA's biological ratings of these sites are shown in Table 14-10.

(3) Computer Simulation of Existing Conditions: For water quality modeling purposes, as shown in Figure 14-3, the basin was divided into a number of areas called "reaches." Each reach is composed of a segment of a major stream, the waterways tributary to that segment, and the land area drained by the major stream segment and its tributaries. Each is a direct tributary to the reach immediately downstream from it along the same major stream and an indirect tributary to other downstream reaches.

Both the Coon Creek and Piscasaw Creek drainage areas feed into the mainstem, although they meet the mainstem downstream from the western limits of the study area. Thus, water quality conditions in these creeks influence conditions in the downstream portions of the mainstem. The Coon and Piscasaw systems do not connect directly with one another, and therefore, conditions in one do not affect the other.

The map also indicates the most downstream limits of six tributary drainage areas, for which water quality data have been developed in detail. The numbers used to identify them are based on the computer programs used and otherwise have no special significance. Table 14-11 describes the locations of the six "data output points" for which water quality data have been reported.

As described in Chapter Four, the computer simulation model uses mathematical formulas to replicate the hydrologic and water quality characteristics of the Kishwaukee River basin. To ensure that the model is an accurate representation of the basin, the behavior of the model was balanced against measurements and observations of actual conditions. For example, the model's simulation of existing water quality conditions was based on the water samples collected and analyzed during 1976 and 1977.

Sources of pollutants were categorized in the modeling process as follows:

TABLE 14-9 : GENERALIZED BENTHIC SEDIMENT CONDITIONS

Kishwaukee River BASIN

STATION NUMBER	STREAM NAME	BENTHIC CONDITION*
27	Kishwaukee River	Sewage Sludge Like
28	S. Br. Kishwaukee River	Moderately Polluted
29	Kishwaukee River	Polluted

*Based on SOD value

revised 2/13/79

TABLE 14-10 : BIOLOGICAL STREAM SITE CLASSIFICATIONS

Kishwaukee River BASIN

Station Number	Stream Name	IEPA Classification(1)	Shannon-Weaver	
			Index	Classification(2)
27	Kishwaukee River	SP	1.38	MP
28	S. Br. Kishwaukee R.	SP	0.64	SeP
29	Kishwaukee River	SP	0.32	SeP

(1) Polluted (P); Semi-polluted (SP); Unbalanced (U); Balanced (B).

(2) Severe pollution (Se P); Moderately polluted (MP); Clean (C).

revised 2/13/79

TABLE 14-11: DATA OUTPUT POINTS

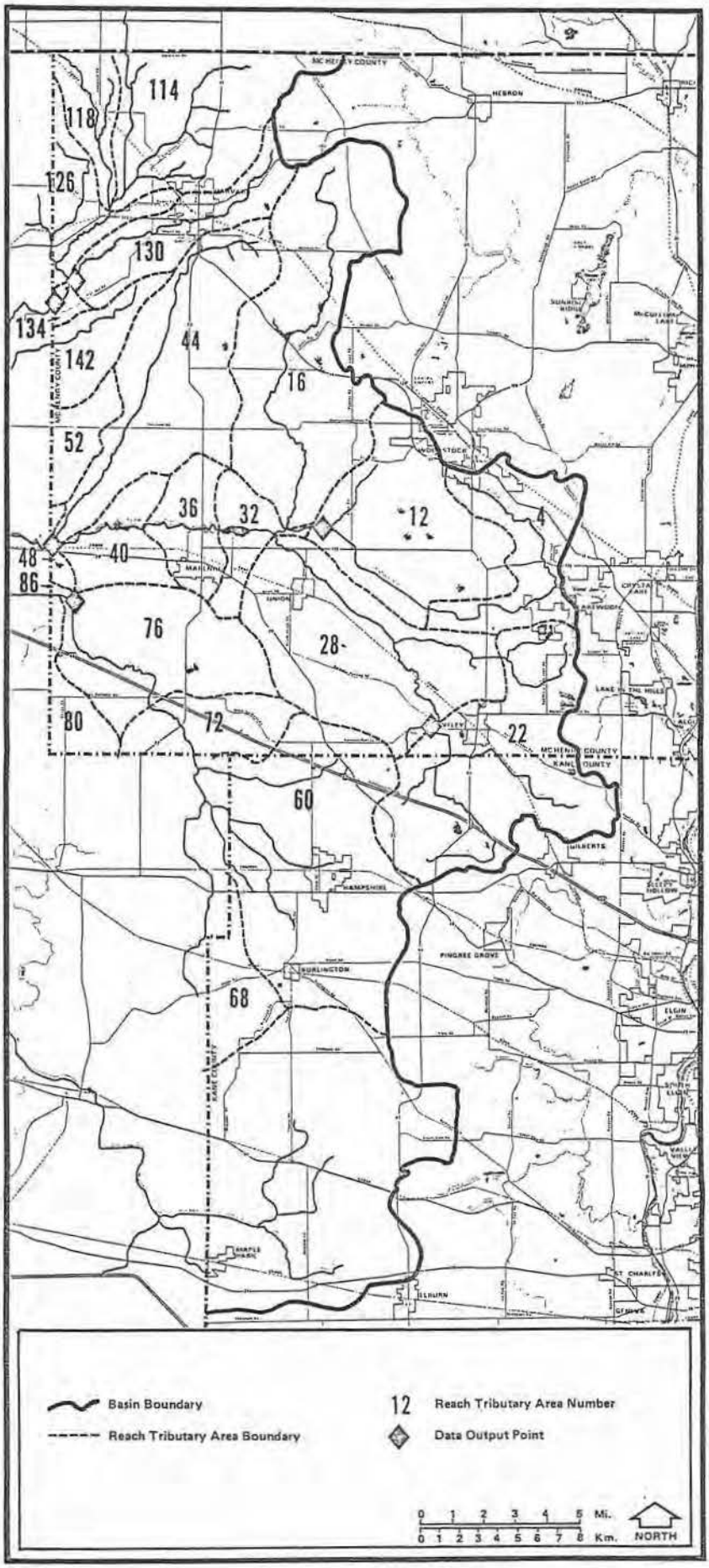
419

Reach 12 - Main branch of the Kishwaukee River, two miles north of Union.	Reach 76 - Coon Creek, near the McHenry-Boone county line.	422 423 424
Reach 22 - South branch of the Kishwaukee River at Huntley.	Reach 130 - Mokeler Creek, near McHenry-Boone county line.	426 427 428
Reach 48 - Kishwaukee River at the McHenry-Boone county line.	Reach 134 - Piscasaw Creek at the McHenry-Boone county line.	430 431 432

--Point sources: treatment plants and other discrete discharges. 454

--Nonpoint sources: surface runoff and grcundwater seepage from developed and undeveloped areas. 456 457

Figure 14-3: BASIN MODELING SEGMENTS



--Boundary conditions: the amount of flow and pollutants entering the basin from another basin or another state. Although a small portion of the drainage in this basin comes from Wisconsin, no attempt was made to segregate the Wisconsin elements in the analysis of Reach 134.

d. Results of Water Quality Modeling

The simulation of existing conditions provides a more comprehensive summary of water quality than do the results of sampling programs. Not only are pollutant concentrations determined and related to state standards, the relative amounts of pollutants contributed by various sources also can be described. Most importantly, the model computer data is on a continuous basis, thus bridging the gaps between discrete sampling events.

(1) Pollutant Concentrations: Although the Commission sampled for 19 parameters, simulation reports on existing conditions were prepared only for eight: streamflow, temperature, chlorophyll a, dissolved oxygen, biochemical oxygen demand (BOD), ammonia (NH_3), nitrate (NO_3), and phosphate (PO_4). The last four of these represent pollutants that can be quantified and tied to specific categories of sources using the model.

Table 14-12 summarizes pollutant levels simulated for the Kishwaukee under current conditions. Assessments of conditions with respect to each parameter or pollutant are based on state in-stream standards where these exist. Statistical values express the minimum, maximum, and average concentrations of pollutants. Values also describe the number of times that simulated concentrations violated state standards and the average duration of the violations.

The simulation was continuous, with hourly outputs over a 5-year period. Therefore, if a standard for a particular pollutant were constantly violated over the entire simulation period, that would be reflected in the statistics for the number and frequency of violations as follows:

--number of violations: one (because there was only one violation, even though it was of 5 years' duration)

--average duration: 43,824 hours (the total number of hours in the 5-year period).

Maximum ammonia levels were above the standard of 1.5 mg/l in all six of the reaches covered in the table.

The phosphate standard of .05 mg/l, although it does not apply to rivers and streams in this basin, was violated in all six reaches. There are no state standards for in-stream BOD.

Dissolved oxygen has been used by the Commission as a general indication of water quality. Conditions with respect to DO in the Kishwaukee are described by the statistics in Table 14-13. The 5.0 mg/l standard is violated frequently in five of the reaches but is rarely violated in the sixth, Reach 134.

There are numerous violations of the dissolved oxygen standard in most reaches. These typically occur during high-flow events and are associated with surface wash-off of oxygen demanding pollutants (BOD and ammonia). The average durations of violations are surprisingly long. Very few violations occur in Reach 134 in Piscasaw Creek. A possible explanation for this is the steeper stream gradient, which allows for better re-aeration than in the other two sub-basins.

2. Pollutant Loadings and Sources In general, pollutant loadings in the Kishwaukee River basin are relatively low. The basin is largely rural and thus avoids many of the severe water quality stresses associated with an urbanized watershed. The major land cover is cropland, followed by grassland, lowland, and impervious cover, respectively. An analysis of pollutant loads is presented below for reaches in the three major branches of the system. These are: Reach 48 on the Kishwaukee mainstem; Reach 134 on Piscasaw Creek; and Reach 76 on Coon Creek. Table 14-14 is a summary of pollutant loads, by source, expressed as percentages of the total, as simulated in these three reaches. While the data are more meaningful when combined with information on the contributing area and volume of flow, Table 14-14 does give an accurate general picture of the relative significance of various sources of pollutants in the basin.

Table 14-15 shows the total loads coming from various sources in Reaches 48, 76, and 134 and their relative percentages of the total.

(a) Point Sources: Only a very small portion of the total flow in Reaches 48, 76, and 134, is contributed by point sources, as indicated by the data in Table 14-14. Point sources account for a disproportionate share of the total pollutant load, however, due to their relatively high pollutant concentrations.

Point sources have not been found to cause dissolved oxygen problems in the Kishwaukee basin. There are few, if any, violations of the 5.0 mg/l dissolved oxygen standard

TABLE 14-12: STATISTICAL SUMMARY OF CURRENT WATER QUALITY

Parameter (Standard) (All data in mg/l)	REACHES					
	12	22	48	76	130	134
BOD (No Standard) Maximum	39.2	34.2	32.8	32.5	29.9	31.6
Minimum	.88	.99	.66	.89	1.14	.98
Mean	4.87	4.01	5.30	4.06	5.50	3.42
AMMONIA (1.5 mg/l) Maximum	2.36	2.08	1.74	2.08	4.84	3.50
Minimum	0	.06	.02	.05	.54	.52
Mean	.31	.32	.26	.22	1.04	.42
No. Violations	15	9	4	23	161	43
Avg. Duration Viol.	6	4	5	4	50	22
NITRATE (No Standard) Maximum	5.95	5.38	6.02	5.90	4.72	6.47
Minimum	0	.18	0	0	.22	.40
Mean	2.13	2.18	2.13	2.16	2.26	2.32
PHOSPHATE (.05 mg/l) Maximum	.95	.90	.87	.98	2.03	1.52
Minimum	0	.03	0	0	.05	.06
Mean	.16	.15	.14	.12	.34	.18
No. Violations	235	3	293	209	2	2
Avg. Duration Viol.	173	14600	122	187	21900	21900

revised 2/13/79

TABLE 14-13: STATISTICAL SUMMARY OF CURRENT DISSOLVED OXYGEN LEVELS

SIMULATED DO CHARACTERISTICS (Expressed in mg/l)	REACH					
	12	22	48	76	130	134
Maximum	15.1	13.0	15.7	14.7	13.6	14.0
Minimum	1.51	1.33	2.24	1.89	2.61	4.97
Mean	8.48	6.99	9.36	8.77	9.02	10.0
*No. of Violations	87	105	57	65	59	3
Avg. Duration	26	36	50	32	36	1
**Overall Assessment	Fair	Poor	Fair	Good	Fair	Good

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time DO levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

during low-flow conditions when point sources contribute the major oxygen demanding load. Point sources may, however, be responsible for some violations of the 1.5 mg/l ammonia standard during dry weather periods when there is little dilution in the stream. In addition, point sources contribute significant amounts of nitrate and phosphate during low-flow conditions, which could help to promote algal blooms in any future reservoirs.

(b) Pervious Sources From Table 14-14, it can be seen that approximately 93 percent of the total streamflow in Reach 48 is from pervious sources. Of this portion, the majority is groundwater runoff, with a lesser amount contributed by surface runoff. However, the majority of the pollutant loads of BOD, ammonia, and phosphate are associated with surface runoff, reflecting the highly concentrated nature of surface runoff relative to groundwater. The majority of the nitrate from pervious surfaces enters through groundwater, reflecting the conversion of ammonia to nitrate.

(c) Impervious Sources Impervious surface runoff comprises a small portion of the total streamflow because of the small amount of urbanization in the basin. However, the impervious surface BOD contribution is disproportionately large. Table 14-14 shows that contributions to streamflow in the three reaches which are listed vary from 4 to 6 percent of the total, while BOD contributions vary from 12

TABLE 14-14 : SOURCES OF POLLUTANTS, EXISTING CONDITIONS

REACH/SOURCE	PERCENTAGES					
	AREA	STREAM FLOW	POLLUTANTS			
			BOD	NH_3	NO_3	PO_4
1. Kishwaukee (Main Stem)						
(REACH NO. 48)						
BOUNDARY CONDITIONS						
POINT SOURCES		1	6	16	<1	7
COMBINED SEWERS						
PERVIOUS COVER	97					
Surface Runoff		14	49	70	23	62
Groundwater		79	27	10	77	26
IMPERVIOUS COVER	3	6	18	4	<1	5
2.Piscasaw Creek						
(REACH NO. 134)						
BOUNDARY CONDITIONS						
POINT SOURCES		2	18	30	<1	14
COMBINED SEWERS						
PERVIOUS COVER	99					
Surface Runoff		12	42	58	24	56
Groundwater		82	28	9	76	27
IMPERVIOUS COVER	1	4	12	3	<1	3
3. Coon Creek						
(REACH NO. 76)						
BOUNDARY CONDITIONS						
POINT SOURCES		<1	5	7	<1	3
COMBINED SEWERS						
PERVIOUS COVER	98					
Surface Runoff		13	48	75	20	58
Groundwater		83	32	14	80	35
IMPERVIOUS COVER	2	4	15	4	<1	4

TABLE 14-15 POLLUTANT CONTRIBUTIONS BY SOURCE CATEGORY, EXISTING CONDITIONS

REACH: 48

PARAMETER	POINT SOURCES			NON-POINT SOURCES			Total Loads
	Comb Sewers	Treatment Plants	Boundary Conditions	Pervious Surfaces		Impervious	
				Surface	Ground	Surface	
BOD Load (tons/year)	0	45.0	N/A	396	216	140	797
% Total Load	0	6.0	N/A	50	27	18	100
AMMONIA Load (tons/year)	0	17.3	N/A	78.5	10.8	4.73	111
% Total Load	0	16	N/A	71	9	4	100
NITRATE Load (tons/year)	0	.76	N/A	140	474	2.37	617
% Total Load	0	0	N/A	23	77	0	100
PHOSPHATE Load (tons/year)	0	3.46	N/A	31.4	12.9	2.37	50.1
% Total Load	0	7	N/A	63	26	5	100

REACH: 76

PARAMETER	POINT SOURCES			NON-POINT SOURCES			Total Loads
	Comb Sewers	Treatment Plants	Boundary Conditions	Pervious Surfaces		Impervious	
				Surface	Ground	Surface	
BOD Load (tons/year)	0	17.1	N/A	151	102	46.9	317
% Total Load	0	5	N/A	48	32	15	100
AMMONIA Load (tons/year)	0	2.50	N/A	27.1	5.07	1.58	36.3
% Total Load	0	7	N/A	75	14	4	100
NITRATE Load (tons/year)	0	.11	N/A	67.2	224	.79	292
% Total Load	0	0	N/A	23	77	0	100
PHOSPHATE Load (tons/year)	0	.50	N/A	10.4	6.09	.79	17.8
% Total Load	0	3	N/A	58	34	5	

TABLE 14-15 POLLUTANT CONTRIBUTIONS BY SOURCE CATEGORY, EXISTING CONDITIONS
REACH: 134

PARAMETER	POINT SOURCES			NON-POINT SOURCES			Total Loads
	Comb Sewers	Treatment Plants	Boundary Conditions	Pervious Surfaces		Impervious	
				Surface	Ground	Surface	
BOD Load (tons/year)	0	41.8	N/A	97.2	65.8	27.5	232
% Total Load	0	18	N/A	42	28	12	100
AMMONIA Load (tons/year)	0	10.7	N/A	21.1	3.32	.93	36.1
% Total Load	0	30	N/A	59	9	3	100
NITRATE Load (tons/year)	0	.72	N/A	36.2	145	.47	182
% Total Load	0	0	N/A	20	80	0	100
PHOSPHATE Load (tons/year)	0	2.06	N/A	8.44	3.98	.41	14.9
% Total Load	0	14	N/A	57	27	3	100

to 18 percent. Thus, impervious wash-off may be a significant contributor to the wet weather DO problems.

(d) Summary Although water quality in the Kishwaukee basin is fairly good overall, there are several problem areas. First, DO violations, which are associated with surface washoff of pollutants during storm events, occur rather frequently throughout most of the modeled basin. Second, there are some violations of the ammonia standard, which are probably associated with point source effluents during low-flow conditions and sometimes with stormwater runoff. In certain reaches these violations are rather frequent. Third, in general, nitrate and phosphate levels are high enough to support algal blooms. However, it does not appear that algal blooms are responsible for significant dissolved oxygen viclations. Viclation of the summer water temperature standard is a minor problem throughout the basin.

14.04 POINT SOURCES: EXISTING CONDITIONS

a. Municipal-Type Wastewater Treatment Plants

Within the Kishwaukee basin there are six municipal-type wastewater treatment facilities: Harvard, Woodstock, Marengo, Hampshire, Huntley, and the privately owned Turnberry Utility Company plant in the Crystal Lake sub-FPA. These plants are described in Table 14-16, Parts A thru E, and are spatially depicted in Figure 14-4.

b. Industrial Wastewater Treatment Plants

There are five industrial plants in the basin treating their own process wastes. These are listed in Table 14-17, Parts A and B.

c. Miscellaneous Wastewater Treatment Plants

There are four miscellaneous wastewater treatment facilities currently discharging to the basin. Available information for these facilities, including treatment units, flows, and effluent limitations is presented in Table 14-18, Parts A and B.

d. Other Point Sources

A cattle raising operation, Hartman Farms, is the only other point source in the basin. The drainage area is composed of 3.5 acres of grassland. The NPDES Permit allows discharge (overflow) from the runoff structure either when rainfall exceeds 4.6 inches in any 24-hour period or when a series of rainfall events accumulate in the runoff control structure.

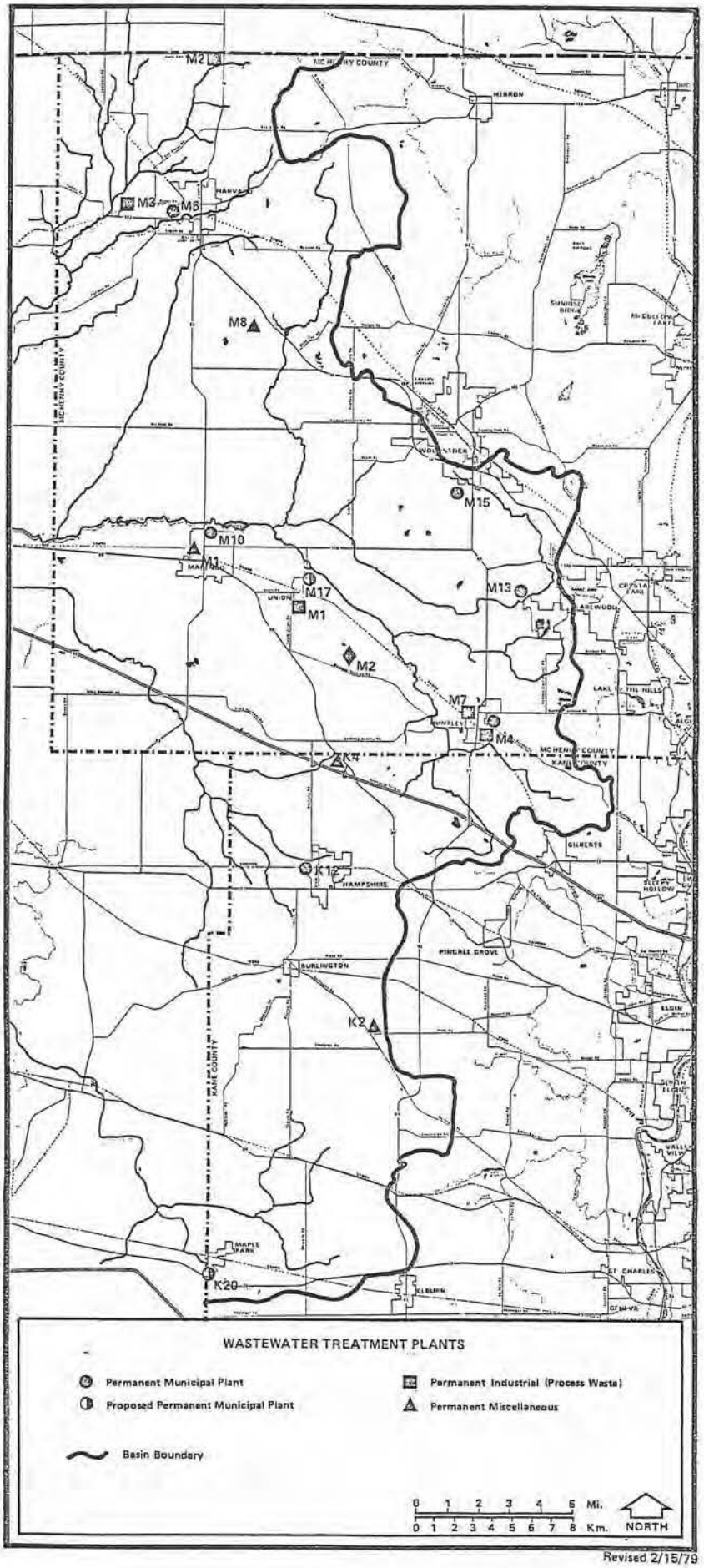
e. Combined Sewer Overflows

No combined sewer overflows are found in the basin.

f. Local Facilities Planning

The water quality of the basin is influenced by facilities planning activities in the Harvard, Woodstock, Marengo, Huntley, Hampshire, Maple Park, and Burlington FPAs. A portion of the southeastern McHenry and Gilberts FPAs are also in the basin. However, the Gilberts area is not expected to have any significant point source effects on the Kishwaukee basin. While there is a significant amount of non-FPA area in the basin, there are no municipal type

Figure 14-4. POINT SOURCE DISCHARGES



Revised 2/15/79

TABLE 14-16 A: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS KISHWAUKEE RIVER BASIN

MAP CODE	FACILITY NAME	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	RECEIVING STREAM NAME	7 DAY 10 YR. LOW FLOW (MGD) 1970	2000	PUBLICLY OWNED TREATMENT WORKS NO	YES	IEPA FY 78 PRIORITY NO.
K12	Hampshire	Hampshire/Hampshire	Hampshire	Coon Creek	0			X	366
M6	Harvard	Harvard/Harvard	Harvard	Moakler Creek	0			X	149
M8	Huntley	Huntley/Huntley	Huntley	ditch, S. Br. Fork Kishwaukee River	0			X	113
M10	Marengo	Marengo-Union/Union	Marengo	Kishwaukee R.	4.80			X	764
M13	Turnberry Utility Co.	Crystal Lake/ Crystal Lake	Crystal Lake	Kishwaukee R.	0.65		X		None
M15	Woodstock South	Woodstock/Woodstock	Woodstock	Middle Fork Kishwaukee R.	0			X	731
M17	Union	Marengo-Union/Union	Union	Kishwaukee R.	0.50			X	764
K20	Maple Park	Maple Park/Maple Park	Maple Park	Union Drainage Ditch No. 2	0			X	444

TABLE 14-16 B: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS KISHWAUKEE RIVER BASIN

MAP CODE	NPDES PERMIT NUMBER	DATE ISSUED	DATE EXPIRES	EFFLUENT REQUIREMENTS (mg/l) INTERIM (A) BOD_5	TSS	P	NH_3N	FINAL (A) EFFECTIVE DATE	BOD_5	TSS	P	NH_3N	YEAR 2000 (B) BOD_5	TSS	P	NH_3N	COMMENTS
K12	0020281	6-22-77	11-1-81						10	12			10	12		(a)	(a) 1.5 mg/l in-stream after mixing.
M6	0020117	7-1-77	1-1-82						10	12			10	12		(a)	
M8	0029238	7-1-77	2-28-82						10	12			10	12		(a)	(b) Lagoon exemption assumed.
M10	0020729	5-11-77	11-30-82						30	30			10	12		(a)	
M13	0045446	5-30-75	10-31-78						4	5			4	5		(a)	
M15	0034282	6-7-77	5-1-82						10	12			10	12		(a)	
M17	-	-	-						-	-			(b) 30	(b) 30		(a)	
K20	-	-	-						-	-			10	12		(a)	

(A) From NPDES Permits (B) From Facility Plans

TABLE 14-16C: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS KISHWAUKEE RIVER BASIN

MAP CODE	STATUS OF TREATMENT PLANT INTERIM YES	INTERIM PHASE OUT DATE	PERMANENT EXISTING	PROPOSED NEW YES	PROPOSED NEW EST. DATE IN SERVICE	WASTEWATER TREATMENT PLANT (MGD) AVERAGE FLOWS (a) 1975	1980	1985	1990	1995	2000	DESIGN CAPACITIES 1975	1985	OTHER YEAR	2000	COMMENTS
K12			X			0.20	0.25	0.30	0.35	0.40	0.46	0.25	0.46		0.46	(a) From facility plans or needs analysis documents unless otherwise noted.
M6			X			0.58	0.76	0.94	1.12	1.30	1.50	0.62	1.50		1.50	
M8			X			0.18	0.20	0.22	0.24	0.26	0.28	0.20	0.28		0.28	
M10			X			0.67	0.86	0.94	1.02	1.10	1.20	1.03	1.20		1.20	(b) Private utility year 2000 flows assumed to be the same as 1975 flows due to lack of information.
M13			X			0.01	0.01	0.01	0.01	0.01	(b) 0.01	0.05	-		0.05	
M15			X			0.53	0.74	0.95	1.16	1.37	1.56	0.75	1.13	1990 1.50	1.50	
M17				X	1-80	-	0.14	0.15	0.15	0.17	0.18	1980 0.18	0.18		0.18	
K20				X	1-80	-	0.08	0.08	0.09	0.10	0.11	1980 0.10	0.10		0.10	

revised 2/7/79

TABLE 14-16 D: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANT — KISHWAUKEE RIVER BASIN

MAP CODE	POPULATION SERVED (1000's)						PROPOSED PROJECTS (C)								CAPITAL COSTS (million $)		
							PLANT				SEWERS						
	1975	1980	1985	1990	1995	2000	Exp.	UpG	New	Out	I/I	SSE	New	Reh	Initial	Future	Total
K12	1.6	2.0	2.4	3.3	4.2	4.9	X				X	X		X	2.0	-	2.0
M6	5.8	6.4	7.3	8.1	8.5	9.5	X	X			X	X		X	3.4	-	3.4
M8	1.5	1.5	1.5	1.6	1.6	1.6	X	X			X	X		X	1.1	-	1.1
M10	4.1	5.1	5.5	5.8	6.2	6.6	X				X	X			-	1.2	1.2
M13	0.1																
M15	4.9	5.5	6.2	6.9	7.6	8.3	X	X			X	X	X	X	-	4.4	4.4
M17	-	0.8	0.8	0.8	0.9	0.9			X				X		-	1.1	1.1
K20	-	0.8	0.9	1.0	1.0	1.1			X				X		1.2	-	1.2

(C) PROPOSED PROJECTS

SEWER(S): I/I - Infiltration/Inflow Study; SSE - Sewer System Evaluation; New - New Sewer Construction; Reh - Rehabilitation of Existing Sewers

PLANT: Exp - Expansion; UpG - Upgrading; New - New plant; Out - Phase out

TABLE 14-16 E. MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS — KISHWAUKEE RIVER BASIN

MAP CODE	FACILITY PLANS												COMMENTS
	TYPE		STATUS			REVIEWS / APPROVALS							
						NIPC			IEPA				
	NEEDS ANALYSIS	STEP ONE STUDY	COMPLETED	UNDER WAY	LOCAL ISSUES	NUMBER	ENDORSED	UNDER REVIEW	NUMBER	APPROVED	UNDER REVIEW	UNRESOLVED ISSUES	
K12		X	X			None			C17-0964	X			(a) Additional study needed.
M6		X	X			None			C17-1779	X			(b) Treatment process undecided.
M8		X	X			None			C17-0663	X			(c) Private plant.
M10		X	X			77-166	X		C17-0416		X		
M13	(c)												
M15		X	X			None			C17-2093		X		
M17		X	X		X (a)	77-166	X		C17-0416		X	X	
K20		X	X		X (b)	76-552	X		C17-2068	X		X	

TABLE 14-17 A: INDUSTRIAL WASTEWATER TREATMENT PLANTS — KISHWAUKEE RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS(1)	WASTEWATER LOADS MGD			
						CURRENT		1985	2000
						DESIGN CAPACITY	1975 LOAD		
M1	Aubrey Mfg. Inc.	0038121	Marengo-Union /Union	Union	K, E	0.007	0.005	-	0.005
M2	Big Foot Packing Co.	0034070	None	Harvard	A, E	0.040	0.020	-	0.020
M3	Dean Foods-Chemung	0003395	Harvard/ /Harvard	Harvard	AD, L, E	0.400	0.230	-	0.230
M4	Dean Foods-Huntley	0003409	Huntley/ /Huntley	Huntley	AD, L, E	0.080	0.003	-	0.003
M7	Union Special Machine Co.	0003662	Huntley/ /Huntley	Huntley	O, K, E	0.080	0.070	-	0.070

(1): Activated sludge (A); extended aeration (AD); chlorination (E); special treatment (K); tertiary lagoon (L); oil and grease removal (O).

revised 2/7/79

TABLE 14-17 B: INDUSTRIAL WASTEWATER TREATMENT PLANTS KISHWAUKEE RIVER BASIN

MAP CODE	RECEIVING STREAM NAME	7 DAY-10 YR. LOW FLOW (MGD) 1970	7 DAY-10 YR. LOW FLOW (MGD) 2000	NPDES PERMIT DATES ISSUED	NPDES PERMIT DATES EXPIRES	SIC CODE	EFFLUENT REQUIREMENTS[1] (mg/l)	COMMENTS
M1	ditch to Kishwaukee R.	0		6-27-75	4-30-80	72-3444	4 BOD, 5 TSS, Temp; Daily Max: 0.025 Cn, 2.0 (tot) Fe, 1.0 tot. Cu, 0.25 As, 1 Zn.	
M2	Lawrence Ck.	0		4-14-75	1-31-79	67-5147	4 BOD, 5 TSS, Daily Max: 15 oil/grease (o/g)	
M3	ditch to Piscasaw Ck.	1.29		12-7-76	8-31-81	72-2026	10 BOD, 12 TSS, Temp.	
M4	storm sewer to So. Br.	0.06		5-20-75	12-31-77	72-2026	4 BOD, 5 TSS.	
M7	storm sewer to So. Br.	0.04		6-20-75	3-31-80	72-3636	4 BOD, 5 TSS, Daily Max: 0.3 Cr^{+6}, 2 (tot) Fe, 0.1 Pb, 1 Zn, 1 Cr^{+3}, 15 o/g	

(1) Current, from NPDES Permits

TABLE 14-18 A: MISCELLANEOUS WASTEWATER TREATMENT PLANTS KISHWAUKEE RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS[1]	WASTEWATER LOADS MGD CURRENT DESIGN CAPACITY	CURRENT 1975 LOAD	1985	2000
M1	Arnold Eng. Co.	None	Marengo/ Union / Union	Marengo	AD, H, IS				
K2	Burlington Central H.S.	0023761	None	Burlington	LO, E	0.0095	0.010		0.010
K4	Ill. Tollway Bldg. #6	0048682	None	Hampshire	A, F, E	0.003	0.003		0.003
M8	Plum Tree Golf Course	None	None	Harvard	IM, IS				
	(1): Activated sludge (A); extended aeration (AD); chlorination (E); tertiary filter (F); holding tank or pond (H); Imhoff tank (IM); subsurface application (IS); stabilization lagoon (LO).								

TABLE 14-18 B: MISCELLANEOUS WASTEWATER TREATMENT PLANTS KISHWAUKEE RIVER BASIN

MAP CODE	RECEIVING STREAM NAME	7 DAY-10 YR. LOW FLOW (MGD) 1970	7 DAY-10 YR. LOW FLOW (MGD) 2000	NPDES PERMIT DATES ISSUED	NPDES PERMIT DATES EXPIRES	EFFLUENT REQUIREMENTS (mg/l) 1976[1] BOD	TSS	P	NH_3-N	2000 BOD	TSS	P	NH_3-N	COMMENTS
M1	Subsurface	0		No surface discharge - no permit issued										
K2	Virgil ditch	0		6-18-75	12-31-79	4	5							
K4	ditch to Coon Creek	0		9-27-76	12-31-79	4	5							
M8	Subsurface	0		No surface discharge - no permit issued										

(1) From NPDES Permits

point sources in the non-FPA area. Figure 14-5 depicts the facilities planning areas.

(1) Harvard FPA The only municipal plant in this FPA is owned and operated by the City of Harvard. The completed and approved facilities plan calls for expansion of the existing facility from .62 mgd to 1.50 mgd and remodeling of plant processes for the year 2000.

(2) Woodstock FPA The City of Woodstock's South plant is the only municipal facility located in the Woodstock FPA which discharges to the Kishwaukee basin. A facilities plan has been prepared which recommends expansion of the South plant in two phases. Phase I expansion would occur immediately and add .375 mgd capacity to the existing .75 mgd facility. Phase II expansion would occur in 1990 and add another .375 mgd capacity for a total capacity of 1.5 mgd. Tertiary filtration and ammonia removal facilities at 1.5 mgd capacity would also be added as part of Phase I. The construction of new interceptor sewers tributary to the south plant is unresolved at this time, with cost estimates and justifications unavailable.

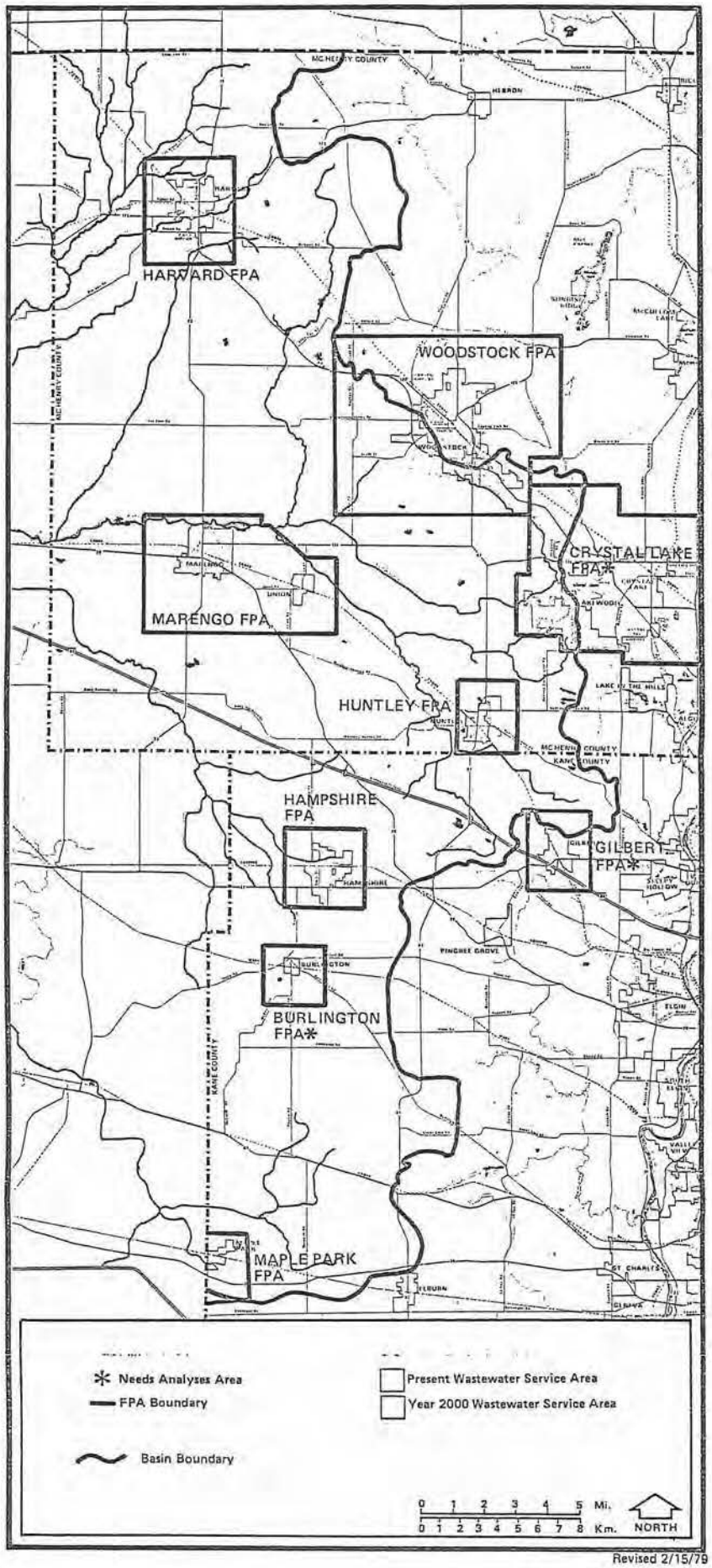
(3) Marengo FPA The City of Marengo owns the only municipal plant in the FPA. The facilities plan recommends expansion of the municipal plant by .17 mgd to 1.2 mgd to serve a year 2000 service area. The facilities plan also examined sewering the Village of Union. Construction of a new plant at Union was found to be more cost-effective than constructing an interceptor to the Marengo plant. At this time it is unresolved whether Union will build sewers and a treatment plant or continue to use septic systems. The facilities plan recommended further examination of continued use of septics. This plan concurs, and a supplemental 201 grant has been offered Union to make this additional study.

(4) Huntley FPA The Village of Huntley currently owns and operates the only municipal collection and treatment system in the FPA. The Huntley facilities plan recommends expansion of the existing .20 mgd plant to .28 mgd, including the installation of a new secondary treatment process using bio-discs. The facilities plan also recommends sewer rehabilitation work.

(5) Hampshire FPA The only municipal plant in the FPA is owned and operated by the Village of Hampshire. The current facilities plan recommends expansion and upgrading of the plant from .25 mgd to .46 mgd. The Village will also conduct sewer rehabilitation work.

(6) Maple Park FPA The Maple Park facilities plan recommends construction of a municipal plant having .10 mgd capacity. A local sewer system is also proposed. There is a difference of opinion between the IEPA and the Village

Figure 14-5: WASTEWATER SERVICE AREAS



Revised 2/15/79

over the best process for wastewater treatment. The IEPA wants to use a lagoon system to meet 30 mg/l of both BOD and total suspended solids (TSS); the Village wants to use an activated sludge plant to meet 10 mg/l BOD and 12 mg/l TSS. The Village position is strongly influenced by public comments against lagoons and their associated odors.

(7) Burlington FPA The needs analysis report for the Burlington FPA recommends that, because of the prohibitive cost of a sewage collection and treatment system, the area should remain on septic systems. A supplemental Step I grant should be pursued to study septic problems in the FPA and the means of correcting these problems.

(8) Southeastern McHenry FPA (Crystal Lake Sub-FPA) The only municipal type plant in the southeastern McHenry FPA discharging to the Kishwaukee basin is the Turnberry Utility Company wastewater treatment facility. The needs analysis report for this FPA did not recommend phase-out of this plant. It was therefore assumed that, although this plant is in Crystal Lake's projected year 2000 service area, it will continue to operate independently through the year 2000.

14.05 NONPOINT SOURCES: EXISTING CONDITIONS

a. Urban Stormwater Systems

Within the Kishwaukee River basin, separate storm sewer systems serve all or portions of nine municipalities and numerous unincorporated areas. It is estimated that 4.5 square miles, 1 percent of the basin area, are served by separate storm sewers. These systems follow natural drainage courses and discharge either directly into the Kishwaukee River or indirectly via ditches and tributary streams.

As noted previously, there are no combined sewers in the Kishwaukee basin.

Those areas within the basin not served by separate storm sewer systems are estimated to comprise 439.5 square miles, or 99 percent of the basin area. Stormwater falling upon these areas enters the Kishwaukee River system by overland flow via ditches or farm tile drainage systems.

b. Construction Activities

As discussed in Chapter Six, construction activities, coupled with stormwater runoff and soil erosion, can contribute sediments, chemicals, and biological organisms to rivers and streams. Construction activities are not known to be causing water pollution at present in this basin, but the potential for damage to water quality always exists.

Changes in population and land use, as forecasted, will generate additional residential and commercial construction, accompanied by surface disturbances for roads and utilities.

c. Septic Systems

Septic systems are used widely in the basin. Presently there are 4,276 residential septic systems serving about 13,865 persons (see Table 14-19). In addition, the basin has 218 nonresidential septic systems serving a population equivalent of 1,542 persons.

Figure 14-6 shows the locations of all septic systems, and Table 14-20 provides a general description of areas known to have limitations for septic system usage.

d. Hydrologic Modifications

Many rivers in northeastern Illinois contain channels, dams, weirs, and other structures which significantly influence dissolved oxygen concentrations. Consideration was given to these structures in the water quality model. The influence of a channel dam on water quality can often be dramatic. Weirs and dams create pools which have DO levels below or above those normally expected when a stream is free flowing. Forty-eight dams were analyzed in the region, none of which are located in the Kishwaukee basin. However, there has been extensive channelization of natural drainageways in the basin, and a number of artificial ones have been constructed in connection with agricultural drainage.

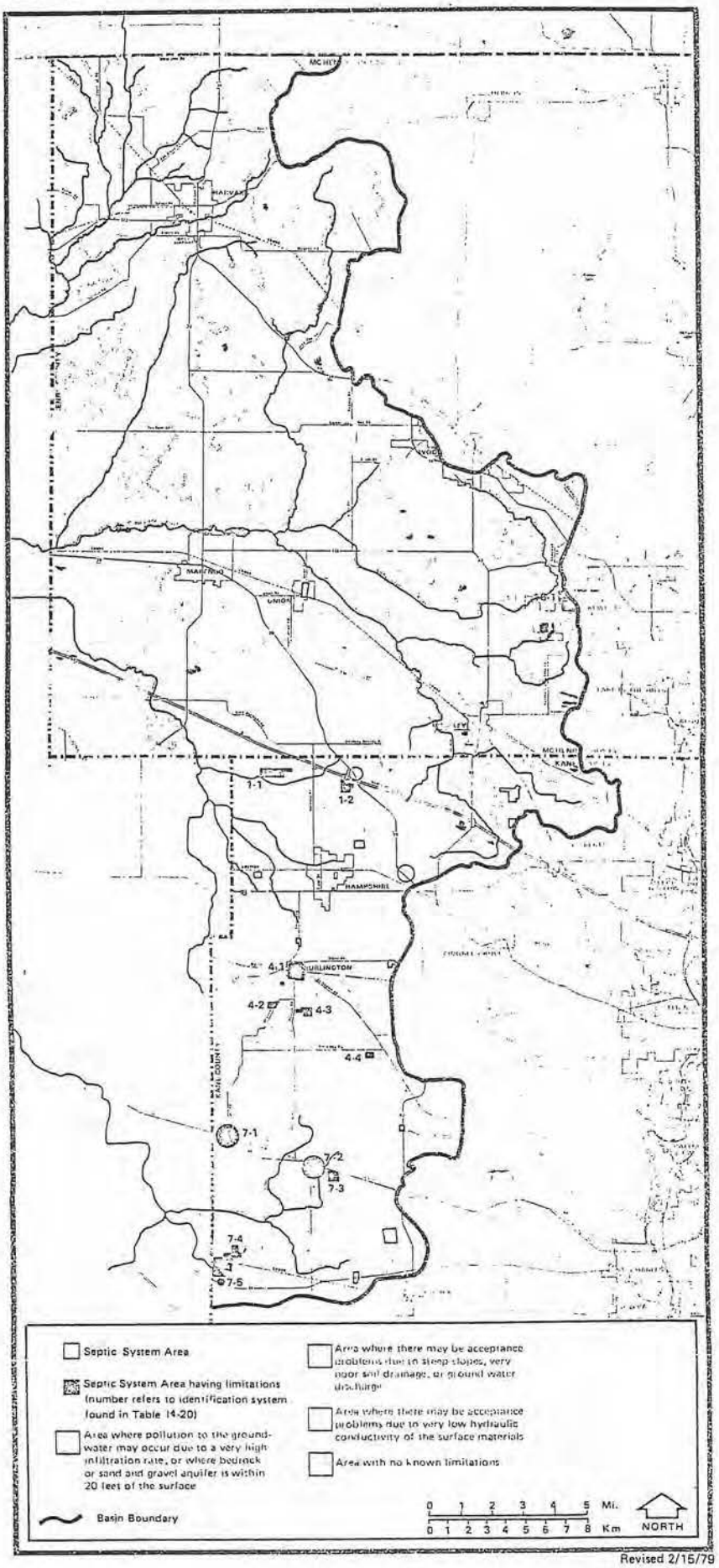
e. Mining

Twenty-six active and 48 inactive gravel pits have been identified in the basin. Eighteen of these could pollute groundwater, depending on site geology and, in some cases, the nature and extent of wastes which might possibly be disposed of in these locations. The remaining sites do not appear to be water pollution hazards at this time.

f. Surface Waste Disposal Sites

Runoff from active and inactive refuse dumps, sanitary landfills, and junkyards can contribute to groundwater and surface water pollution. Some landfills and old dumps were sometimes located in topographically low areas. In these locations, the refuse was placed very close to or even below the water table. In some instances, surface runoff of pollutants from the sites entered adjacent streams. Present sanitary landfill regulations enforced by the IEPA are much

Figure 14-6: LOCATION OF SEPTIC AREAS



Revised 2/15/79

TABLE 14-19 : SUMMARY OF SEPTIC TANK INSTALLATIONS

Kishwaukee River BASIN

COUNTY	NUMBER OF SEPTIC SYSTEMS			POPULATION SERVED		
	RESIDENTIAL	NON RESIDENTIAL	TOTAL	RESIDENTIAL	NON RESIDENTIAL (PE)	TOTAL
McHenry	3,708	193	3,901	12,114	1,058	13,172
Kane	568	25	593	1,751	484	2,235
Total	4,276	218	4,494	13,865	1,542	15,407

revised 2/13/79

TABLE 14-20 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Kishwaukee River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Kane	Hampshire	Casa De Aero Sub-division	18	63	1-1
Kane	Hampshire		11	38	1-2
Kane	Burlington	Village of Burlington	170	570	4-1
Kane	Burlington		3	12	4-2
Kane	Burlington		2	7	4-3
Kane	Burlington		3	11	4-4
Kane	Virgil	Richardson	15	120	7-1
Kane	Virgil	Virgil	50	150	7-2
Kane	Virgil		7	24	7-3
Kane	Virgil	Village of Maple Park	239	705	7-4
Kane	Virgil		4	30	7-5
Kane	Campton	Lily Lake	46	152	8-6*
McHenry	Grafton	Crystal Lake	117	398	16-1*

*In more than one basin

revised 2/13/79

more restrictive and prohibit disposal at sites and elevations where water pollution may result.

In the Kishwaukee River basin, there are 16 surface waste disposal sites. These include sanitary landfills, old dumps, and junkyards. Of the 16 sites, seven are active and nine are closed. Some random dumping is evident at the closed sites.

The majority of the disposal sites are garbage dumps. There are three landfills and one auto junkyard. While some of these sites may have water pollution potential, none are presently known to be causing problems.

14.06 DISPOSAL OF RESIDUALS

The areawide aspects of residuals waste management were discussed in Chapter Seven. The information that follows pertains specifically to the Kishwaukee basin.

Residual wastes are generated by the municipal, industrial, and miscellaneous other point source dischargers within the basin.

There are two landfill sites which accept sludges in the McHenry County portion of the basin: Blazier's landfill, located east of Harvard, and another site located north of Marengo. A third site is in Kane County near Hampshire. In addition, there are three land application sites: Brooks farm, Gordon Heitman farm, and the Turnberry site, all in McHenry County.

Hampshire disposes its sludge on site; Harvard takes it to the Brooks farm, and at times to Blazier's landfill. Woodstock-South takes its sludge to the Veugler dump, located in McHenry County but outside the basin. Marengo makes sludge available to its residents, with the excess going to the nearby landfill. Huntley's sludge is applied to the Gordon Heitman farm; the Turnberry Utility Company operates a small composting activity, with the balance of the sludge being applied on site. The Bigfoot Packing Co. sludge is applied to the Brooks farm, while the Dean Foods-Huntley sludge is applied to the Bohl farm, located in McHenry County outside the Kishwaukee basin.

It is difficult to accurately estimate the present annual volume of septic sludge produced in the basin, due to the many variables involved. However, using an average annual volume of 70 gallons of septage per person, it is possible to make a rough approximation. With 13,865 persons in the basin served by residential septic systems, the volume comes to about 1 million gallons per year. The septage is collected by scavengers and is applied to local farms (with some going to the Terra Cotta Realty Treatment Plant, prior to its being applied to agricultural lands).

At the present time, there are no known problems associated with the management of residuals in this basin. As sludge volumes increase in the future because of increased waste loads and higher levels of treatment, costs

of processing, removing, disposing, or utilizing sludge materials will also increase.

Further details on sludge generation and disposal are contained in the Commission's 208 Staff Paper No. 30, "Regional Sludge Management Report."

14.07 EXISTING MANAGEMENT PROGRAMS

The major features of the existing water quality management system in northeastern Illinois have already been discussed in Part I of this report. In this section, management programs within the Kishwaukee basin are presented, but only to the extent that it is necessary to clarify the previous discussion.

Table 14-21 is a list of the public agencies in the basin which are currently involved in water quality related activities. Variations in programs and responsibilities between these agencies are indicated by a numerical code.

14.08 MODELING PROCESSES: FUTURE CONDITIONS

As described above, the first use of the computer model in the process of simulation was to develop details of existing water quality in the Kishwaukee basin. The statistical data that were produced showed the waters in the basin to be of good quality. However, streams do not consistently comply with state water quality standards, which require at least 5 mg/l of DO at all times.

About 800 tons per year of BOD are entering the Kishwaukee mainstem above Reach 48. It was estimated that this volume would have to be cut by about 15 percent before BOD levels would be low enough to contribute to good water quality. BOD levels in other parts of the basin are acceptable.

A larger proportion of the basin is affected by ammonia, with 184 tons entering the mainstem and Piscasaw and Coon Creeks each year.

Most of the pollution in the Kishwaukee River basin comes from nonpoint sources, primarily stormwater runoff from farmland (which accounts for 67 percent of the BOD in the basin) and runoff from impervious surfaces (22 percent).

Efforts to develop first and second test plans, as well as the recommended plan for the basin, therefore focused on farmland conservation practices and anticipated increases in point source discharges. The results of these efforts, and the test plans that grew out of staff work and public discussions, are described below.

TABLE 14-21: EXISTING LOCAL WATER QUALITY MANAGEMENT AGENCIES AND PROGRAMS: KISHWAUKEE RIVER BASIN*

MUNICIPALITIES			
Burlington		Maple Park	
Hampshire	1,2 +	Marengo	1,2
Harvard	1,2	Union	
Huntley	1,2,4	Woodstock (Fox)	1,2,4
Lakewood (Fox)	1		
COUNTIES			
Kane	3,4	McHenry	3,4
SOIL AND WATER CONSERVATION DISTRICTS			
Kane-DuPage County McHenry County			

* Additional basins shown in parentheses for those municipalities which cross basin boundaries

\+ Numbers indicate existing water quality related activities as follows:

1. Wastewater collection agency
2. Wastewater treatment agency
3. Has enacted erosion and sedimentation control regulations
4. Has enacted stormwater detention regulations

a. The First Test Plan Assumptions

Beginning in August, 1977 the Commission held a series of meetings in the basin to explain the water quality situation to residents and local officials and to allow them to participate in the development of the basin's component of the areawide plan.

At the initial meetings, the Commission staff reported on existing water quality conditions, identified sources of pollution, and assisted participants in developing appropriate strategies. The suggestions that were developed were reviewed by Local Steering Committees from Kane and McHenry counties. These committees, in turn, made recommendations to the Commission on alternative strategies to be evaluated using the water quality model and other techniques. The Commission's 208 Steering Committee reviewed the recommendations and formulated a "first test plan" for evaluation.

In addition to the recommendations developed through the process described above, the first test plan was shaped by assumptions made to reflect forecasted population increases, land cover changes, improvements in wastewater and stormwater treatment, and changes in agricultural practices. These assumptions are described below.

(1) Population and Land Use The Commission's 1976 forecasts for the year 2000 were used to determine future changes in land cover and wastewater loads. These forecasts were applied in each reach. Overall, a 61.4 percent increase in population by the year 2000 was forecast, as explained in Section 14.01.

Present land use in the basin was determined by satellite photography and field surveys. This information was classified into four categories: (1) lowlands--marshes, swamps, and forests lying close to rivers and streams; (2) grasslands--open to the infiltration of rainwater and snowmelt but not tilled regularly, including pastures, parks, golf courses, and upland forests; (3) croplands--regularly tilled for agricultural purposes (there is some exchange between cropland and grasslands due to crop rotation); and (4) impervious surfaces--covered with buildings, roads, and parking lots. For the first test plan, estimates of land cover changes were made using population forecasts and their attendant housing and employment assumptions. Land required for new urbanization in the basin was first taken from the grassland and cropland categories. When this land was largely depleted, land from the lowland category was taken for urban purposes. Table 14-22 shows the changes in land cover that resulted from this process.

(2) Local Facilities Plans Extensive planning has been conducted in recent years for the improvement of existing wastewater treatment facilities, both public and private,

and the construction of facilities to serve newly developing areas. These plans were used in the forecast of water quality conditions for the year 2000. In general, it was assumed that all planned improvements in municipal wastewater treatment plants (per local facilities plans) would be in operation and that industrial treatment plants would meet required standards in their effluent discharges.

(3) Phosphate Reduction The City of Chicago and several suburbs have ordinances limiting the phosphate content of home laundry detergents. Because a substantial portion of the metropolitan area market has limitations on phosphate in home laundry detergents, most distributors have withdrawn high phosphate detergents from the entire area. In considering changes in wastewater treatment practices for the year 2000, it was assumed that regulations limiting the amount of phosphate in domestic detergents would be expanded to cover commercial and industrial detergent uses as well. Based upon studies of the effect of phosphate detergent reductions on wastewater treatment plant operations, it was assumed that phosphate concentrations in plant effluents for the year 2000 would be two-thirds of existing levels.

(4) Combined Sewer Overflows There are no combined sewers in the Kishwaukee River basin, and none were assumed in the first test plan for the year 2000.

(5) Boundary Conditions That part of the Kishwaukee basin lying in Wisconsin was included in the modeling of water quality conditions and no boundary conditions were assumed.

TABLE 14-22 CHANGES IN LAND COVER, 1976-2000

Category	1976 Land Cover Estimates	Year 2000 Land Cover Forecast	% Change
Lowlands	59.86 sq.mi.	53.96 sq.mi.	- 9.9
Grasslands	117.52 sq.mi.	107.18 sq.mi	- 8.8
Croplands	236.52 sq.mi.	251.94 sq.mi.	+ 6.5
Impervious	10.22 sq.mi.	11.04 sq.mi.	+ 8.0
TOTAL	424.12 sq.mi.	424.12 sq.mi.	

(6) Urban Stormwater Runoff The conditions set for the year 2000 in simulating future water quality assumed that 25 percent of the materials constituting BOD in urban stormwater runoff would be removed from the existing urban land surface (largely through street sweeping and vacuuming) and prevented from entering the Kishwaukee system. In newly developed urban areas, it was assumed that 50 percent of the BOD materials would be captured before they could enter the urban stormwater runoff. A variety of techniques would be used, including street vacuuming, stormwater detention basins, greater use of performance zoning, and other methods.

(7) Septic Systems The impact of septic systems on water quality was also considered in the simulation of year 2000 conditions. In the first test plan, it was assumed that the adverse effects of septic systems on water quality would be eliminated by the year 2000, either by replacing these systems by municipal type sewage collection and treatment systems, or by eliminating problems in the remaining systems themselves.

(8) Soil Conservation The increase in agricultural land conservation practices recommended by this plan was included in the calculation of future water quality in the basin. In the Kishwaukee River basin, 145,000 acres were forecast to be brought under conservation practice by the year 2000.

(9) Stream Flow Changes No reservoirs or channel improvements are planned for the Kishwaukee River, and none were assumed in the first test plan.

b. First Test Plan Simulated Results

If a water quality program containing all the features of the first test plan actually were implemented, the overall water quality of the Kishwaukee River basin would be moderately improved, with Piscasaw Creek becoming relatively pollution free. Water quality in almost every reach in the Kishwaukee basin would improve.

However, as in other basins, the simulation showed the interaction of two competing trends. Efforts to improve water quality would compete against the expected greater volumes of pollutants caused by increased population and urban runoff.

(1) BOD: The results of the year 2000 simulation for Reach 48 (mainstem Kishwaukee) show that the first test plan would not produce significant reductions in the amount of BOD. Currently, the BOD load to Reach 48 is about 797 tons per year (see Table 14-23). In the year 2000, under the simulated first test plan conditions, the load would be 823 tons per year.

In Reach 76 (the Coon Creek area) and in Reach 134 (the Piscasaw Creek area), the existing BOD levels are already at acceptable levels and would be even more improved under the first test plan.

(2) Ammonia: Similar general observations can be made about ammonia in the three reaches. In Reach 48 the existing load of 112 tons per year would be reduced to 93 tons per year, a reduction of 16 percent. Unfortunately, ammonia would have to be reduced another 23 percent for water quality to be considered adequate. Reaches 76 and 134 currently exceed the ideal maximum level of ammonia but would drop below this level if the first test plan were implemented. Table 14-23 illustrates the effect the first test plan would have on total pollutant loads from various sources in the basin. Tables 14-24 and 14-25 summarize the water quality impacts of the first test plan and compare results to existing conditions. Results of the second test plan (discussed subsequently), are also shown in these tables.

(3) Dissolved Oxygen: With respect to dissolved oxygen, another important indicator of water quality, the first test plan would virtually eliminate violations of state DO standards in Reach 134 (Table 14-25).

The assessment of the effectiveness of the plans tested is based on the extent to which a given plan reduces the total time that in-stream dissolved oxygen standards are violated.

The Commission, in the formulation of strategies in the initial areawide plan, attempted to develop measures that would allow all streams to comply with state DO standards 95 percent of the time. Table 14-26 illustrates the effect that the first test plan would have on compliance with standards in all reported reaches of the Kishwaukee basin. The final columns in the table show the percent of time that standards for each pollutant indicator would be violated in each reach. The objective was to have all figures in this column below 5 percent.

Some violations of the DO standard (5.0 mg/l) would occur about 10 percent of the time in Reach 48 under the first test plan, down about 4 percent from existing conditions. Reach 76, which now violates the state standard about 5 percent of the time, would continue to do so at about that same level under the first test plan. The BOD and ammonia reductions in these reaches were not large enough to bring about a significant change in the DO pattern.

(4) Summary: Under the first test plan, some of the upper reaches (including 12 and 22) would experience a slight deterioration in water quality. Almost all of the pollution in these reaches comes from urban runoff. With so much new construction forecasted for these reaches, urban runoff pollution is expected to increase

despite assumptions that stormwater BOD content would be reduced through "housekeeping" measures by 25 percent in existing urban areas and by 50 percent in future development areas. Obviously, water quality in these reaches would be even worse in the year 2000 if the assumptions in the first test plan were not implemented.

c. Second Test Plan Assumptions and Results

The second test plan was developed through much the same process described earlier for the first test plan. Simulation results for the first test plan were publicized and discussed at a series of public meetings in the basin. Through the areawide planning committee structure, a second test plan evolved out of suggestions for improvements.

Because of the form of the suggestions approved by the 208 Steering Committee, three separate simulation processes were programmed.

(1) First Simulation Assumptions: The first of the two simulations assumed the following changes to the first test plan. For the main stream (Reaches 12, 22, and 48) only, assume the following:

(a) Change BOD_5 to 10 mg/l at Marengo sewage treatment plant.

(b) Factor phosphate loadings to be 50 percent of their historical levels.

(c) Reduce sewage treatment plant flows by 20 percent.

(d) Reduce the flows from the following plants in addition to (c) by:

-Marengo	.20cfs
-Woodstock	.06 cfs
-Huntley	.01 cfs.

(e) Add conservation tillage to the conservation segment.

(f) Assume 10 percent of grassland transferred to the conservation segment.

(2) First Simulation Results: The available results of the first simulation of the second test plan are shown in Tables 14-23 through 14-26. They show the extent to which the second test plan achieved its primary objective, which was to further improve the depressed DO levels in the basin. Water quality would be slightly improved over the first test plan results. However, Reaches 22 and 48 would remain in

TABLE 14-23A: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS
REACH 48

Pollutant Indicator and Source	Existing Conditions				First Test Plan				*Second Test Plan				**Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
BOD (tons/yr.) Boundary Cond.	0	0			0	0			0	0			0	0		
Treatment Plants	45.0	6			95.6	12			33.6	5			95.6	12		
Comb. Sewer Over.	0	0			0	0			0	0			0	0		
Lowland	72.8	9	22.5	3	65.6	8	20.3	2	65.6	9	20.3	3	65.6	8	20.3	3
Cropland	123	15	119	15	114	14	131	16	80.3	11	146	20	77.1	10	138	18
Grassland	200	25	74.7	9	183	22	68.2	8	163	22	60.8	8	183	23	68.2	9
Impervious	140	18			145	18			158	22			145	18		
TOTAL	581	73	216	27	603	74	220	26	501	69	227	31	566	71	227	29
Ammonia (tons/yr.) Boundary Cond.	0	0			0	0			0	0			0	0		
Treatment Plants	17.3	16			5.18	6			3.78	5			5.18	6		
Comb. Sewer Over.	0	0			0	0			0	0			0	0		
Lowland	3.69	3	1.14	1	3.32	4	1.02	1	3.32	4	1.02	1	3.32	4	1.02	1
Cropland	24.6	22	5.89	5	22.8	24	6.53	7	16.1	20	7.24	9	15.5	18	6.87	8
Grassland	50.2	45	3.74	3	45.8	49	3.42	4	40.9	51	3.05	4	45.8	53	3.42	4
Impervious	4.73	4			4.88	5			5.33	7			4.88	6		
TOTAL	101	91	10.8	9	82.0	88	11.0	12	69.4	86	11.3	14	74.7	87	11.3	13

*Data are from the first simulation of the 2nd Test Plan

**Data are from the second simulation of the 2nd Test Plan

revised 2/13/79

TABLE 14-23B: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS (Continued)
REACH 48

Pollutant Indicator and Source	Existing Conditions				First Test Plan				*Second Test Plan				**Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Nitrate (tons/yr.) Boundary Cond.	0	0			0	0			0	0			0	0		
Treatment Plants	.76	0			17.5	3			12.5	2			17.5	3		
Comb. Sewer Over.	0	0			0	0			0	0			0	0		
Lowland	3.67	1	49.5	8	3.31	1	44.6	7	3.31	1	44.6	7	3.31	1	44.6	7
Cropland	96.7	16	261	42	89.4	14	289	46	62.5	10	321	52	60.1	10	304	49
Grassland	40.1	7	164	27	36.6	6	150	24	32.7	5	134	22	36.6	6	150	24
Impervious	2.37	0			2.45	0			2.67	0			2.45	0		
TOTAL	144	23	475	77	149	23	484	77	114	19	499	81	120	19	499	81
Phosphorous (tons/yr.) Boundary Cond.	0	0			0	0			0	0			0	0		
Treatment Plants	3.46	7			3.02	6			1.56	4			3.02	7		
Comb. Sewer Over.	0	0			0	0			0	0			0	0		
Lowland	.39	1	1.34	3	.35	1	1.20	3	.35	1	1.20	3	.35	1	1.20	3
Cropland	9.87	20	7.09	14	9.10	20	7.88	17	6.32	15	8.79	21	6.07	14	8.34	19
Grassland	21.1	41	4.51	9	18.4	39	4.12	9	16.4	40	3.67	9	18.4	42	4.12	9
Impervious	2.37	5			2.45	5			2.67	7			2.45	6		
TOTAL	37.2	74	12.9	26	33.3	71	13.2	29	27.3	67	13.7	33	30.3	69	13.7	31

revised 2/13/79

*Data are from the first simulation of the 2nd Test Plan

**Data are from the second simulation of the 2nd Test Plan

TABLE 14-23C:COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS
REACH 76

Pollutant Indicator and Source	Existing Conditions				First Test Plan				** Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
BOD (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	17.1	5			12.9	4			12.9	5		
Comb. Sewer Over.	0	0			0	0			0	0		
Lowland	35.9	11	12.5	4	32.4	11	11.3	4	32.4	11	11.3	4
Cropland	71.3	23	73.0	23	63.6	22	77.6	27	47.1	17	80.5	28
Grassland	43.8	14	16.1	5	40.7	14	14.9	5	41.3	14	15.2	5
Impervious	46.9	15			37.9	13			45.4	16		
TOTAL	215	68	102	32	188	64	104	36	179	63	107	37
Ammonia (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	2.50	7			1.26	4			1.26	4		
Comb. Sewer Over.	0	0			0	0			0	0		
Lowland	1.82	5	.63	2	1.64	5	.57	2	1.64	6	.57	2
Cropland	14.3	40	3.64	10	12.8	39	3.87	12	9.47	32	4.01	14
Grassland	11.0	30	.80	2	10.03	31	.76	2	10.3	35	.76	3
Impervious	1.58	4			1.53	5			1.53	5		
TOTAL	31.2	86	5.07	14	27.5	84	5.20	16	24.2	82	5.34	18

**Data are from the second simulation of the 2nd Test Plan

revised 2/13/79

TABLE 14-23D: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS (Continued)
REACH 76

Pollutant Indicator and Source	Existing Conditions				First Test Plan				** Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Nitrate (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	.11	0			4.77	2			4.77	2		
Comb. Sewer Over.	0	0			0	0			0	0		
Lowland	1.82	1	27.5	9	1.64	1	24.8	8	1.64	1	24.8	9
Cropland	56.6	19	161	55	50.4	17	171	58	37.4	13	177	62
Grassland	8.78	3	35.3	12	8.27	3	33.4	11	8.27	3	33.4	12
Impervious	.79	0			.77	0			.77	0		
TOTAL	68.1	24	224	76	65.9	23	229	77	52.9	18	235	82
Phosphorous (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	.50	3			.78	5			.78	5		
Comb. Sewer Over.	0	0			0	0			0	0		
Lowland	.20	1	.74	4	.18	1	.67	4	.18	1	.67	4
Cropland	5.78	33	4.38	25	5.15	30	4.66	27	3.80	24	4.85	30
Grassland	4.40	25	.97	6	4.15	24	.92	5	4.15	26	.92	6
Impervious	.79	5			.77	4			.77	5		
TOTAL	11.7	66	6.09	34	11	64	6.25	36	9.68	60	6.44	40

**Data are from the second simulation of the 2nd Test Plan

revised 2/13/79

TABLE 14-23E: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS
REACH 134

Pollutant Indicator and Source	Existing Conditions				First Test Plan				** Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
BOD (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	41.8	18			23.5	11			23.5	11		
Comb. Sewer Over.	0	0			0	0			0	0		
Lowland	8.35	4	6.55	3	7.53	3	5.91	3	7.53	4	5.9	3
Cropland	29.2	13	38.6	17	30.9	15	41.8	20	27.2	13	42.2	20
Grassland	59.7	26	20.6	9	54.0	26	18.9	9	54.0	26	18.9	9
Impervious	27.5	12			28.6	13			28.6	14		
TOTAL	167	72	65.8	28	145	68	66.6	32	141	68	67.0	32
Ammonia (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	10.7	30			4.41	15			4.41	16		
Comb. Sewer Over.	0	0			0	0			0	0		
Lowland	.42	1	.33	1	.37	2	.29	1	.37	1	.29	1
Cropland	5.86	16	1.95	5	6.19	22	2.11	7	5.46	19	2.13	8
Grassland	14.9	41	1.04	3	13.5	47	.94	3	13.5	48	.94	3
Impervious	.93	3			.96	3			.96	3		
TOTAL	32.8	91	3.32	9	25.4	89	3.34	11	24.7	88	3.36	12

**Data are from the second simulation of the 2nd Test Plan

revised 2/13/79

TABLE 14-23F: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS (Continued)
REACH 134

Pollutant Indicator and Source	Existing Conditions				First Test Plan				**Second Test Plan			
	Surface		Ground		Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Nitrate (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	.72	0			8.15	4			8.15	4		
Comb. Sewer Over.	0	0			0	0			0	0		
Lowland	.42	0	14.4	8	.37	0	13.0	7	.37	0	13.0	7
Cropland	23.9	13	84.9	47	25.2	13	91.9	48	22.3	12	92.9	49
Grassland	11.9	7	45.9	25	10.8	6	41.6	22	10.8	6	41.6	22
Impervious	.47	0			.48	0			.48	0		
TOTAL	37.4	20	145	80	45	23	147	77	42.1	22	148	78
Phosphorous (tons/yr.) Boundary Cond.	0	0			0	0			0	0		
Treatment Plants	2.06	14			1.54	11			1.54	11		
Comb. Sewer Over.	0	0			0	0			0	0		
Lowland	.04	0	.39	3	.03	0	.35	3	.03	0	.35	3
Cropland	2.43	16	2.33	16	2.57	18	2.52	18	2.27	17	2.54	19
Grassland	5.97	40	1.26	8	5.40	39	1.14	8	5.40	39	1.14	8
Impervious	.41	3			.48	3			.48	4		
TOTAL	10.9	73	3.98	27	10	71	4.01	29	9.72	71	4.03	29

**Data are from the second simulation of the 2nd Test Plan

revised 2/13/79

TABLE 14-24 COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 12			REACH 22		
		Existing	1st	*2nd	Existing	1st	*2nd
BOD (mg/l) Maximum	None	39.2	42.5	41.2	34.2	28.1	27.4
Minimum		.88	.89	.87	.99	.47	.63
Mean		4.87	4.61	4.21	4.01	2.35	2.94
Ammonia (mg/l) Maximum		2.36	1.94	1.77	2.08	2.53	2.46
Minimum		0	0	0	.06	.04	.04
Mean		.31	0.2	.22	.32	.21	.21
Frequency of Violation	2.5 (1)	15	10	5	9	16	14
Average Duration of Violations (hours)	2.5 (1)	6	4	3	4	7	5
Nitrate (mg/l) Maximum	None	5.95	5.52	5.06	5.38	5.93	6.07
Minimum		0	0	0	.18	.17	.15
Mean		2.13	2.26	2.21	2.18	2.25	2.17
Frequency of Violation	10.0	0	0	0	0	0	0
Average Duration of Violations (hours)	10.0	0	0	0	0	0	0
Phosphate (mg/l) Maximum		.95	1.02	.94	.90	1.15	1.07
Minimum		0	0	0	.03	.02	0
Mean		.16	.14	.13	.15	.13	.12
Frequency of Violation	.05	235	238	234	3	12	104
	.20	187	177	159	186	161	144
Average Duration of Violations (hours)	.05	173	171	173	14,600	3,640	411
	.20	48	41	35	43	37	34

(1) Illinois Pollution Control Board Standard

*Data are from the first simulation of the 2nd Test Plan

TABLE 14-24 COMPARISON OF POLLUTANT CONCENTRATIONS,
EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 48			REACH 76		
		Existing	1st	**2nd	Existing	1st	**2nd
BOD (mg/l) Maximum	None	32.8	34.3		32.5	31.9	
Minimum		.66	.70		.89	.81	
Mean		5.30	5.25		4.06	3.77	
Ammonia (mg/l) Maximum		1.74	1.59		2.08	2.04	
Minimum		.02	.05		.05	.05	
Mean		.26	.21		.22	.20	
Frequency of Violation	(1) 2.5	4	2		23	6	
Average Duration of Violations (hours)	(1) 2.5	5	3		4	3.8	
Nitrate (mg/l) Maximum	None	6.02	6.65		5.90	6.30	
Minimum		0	0		0	0	
Mean		2.13	2.22		2.16	2.20	
Frequency of Violation	10.0	0	0		0	0	
Average Duration of Violations (hours)	10.0	0	0		0	0	
Phosphate (mg/l) Maximum		.87	.95		.98	1.01	
Minimum		0	0		0	0	
Mean		.14	.14		.12	.11	
Frequency of Violation	.05	293	370		209	246	
	.20	83	89		99	94	
Average Duration of Violations (hours)	.05	122	101		187	162	
	.20	72	75.6		40	38.6	

(1) Illinois Pollution Control Board Standard

**Data are from the second simulation of the 2nd Test Plan

TABLE 14-24 : COMPARISON OF POLLUTANT CONCENTRATIONS,
EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 12			REACH 22		
		Existing	1st	**2nd	Existing	1st	**2nd
BOD (mg/l) Maximum	None	39.2	42.5		34.2	28.1	
Minimum		.88	.89		.99	.47	
Mean		4.87	4.61		4.01	2.35	
Ammonia (mg/l) Maximum		2.36	1.94		2.08	2.53	
Minimum		0	0		.06	.04	
Mean		.31	.2		.32	.21	
Frequency of Violation	(1) 2.5	15	10		9	16	
Average Duration of Violations (hours)	(1) 2.5	6	4		4	7	
Nitrate (mg/l) Maximum	None	5.95	5.52		5.38	5.93	
Minimum		0	0		.18	.17	
Mean		2.13	2.26		2.18	2.25	
Frequency of Violation	10.0	0	0		0	0	
Average Duration of Violations (hours)	10.0	0	0		0	0	
Phosphate (mg/l) Maximum		.95	1.02		.90	1.15	
Minimum		0	0		.03	.02	
Mean		.16	.14		.15	.13	
Frequency of Violation	.05	235	238		3	12	
	.20	187	177		186	161	
Average Duration of Violations (hours)	.05	173	171		14,600	3,640	
	.20	48	41		43	37	

(1) Illinois Pollution Control Board Standard

**Data are from the second simulation of the 2nd Test Plan

TABLE 14-24: COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 48			REACH		
		Existing	1st	*2nd	Existing	1st	*2nd
BOD (mg/l) Maximum	None	32.8	34.3	31.5			
Minimum		.66	.70	.64			
Mean		5.30	5.25	4.55			
Ammonia (mg/l) Maximum		1.74	1.59	1.57			
Minimum		.02	.05	.03			
Mean		.26	.21	.19			
Frequency of Violation	2.5 (1)	4	2	2			
Average Duration of Violations (hours)	2.5 (1)	5	3	3			
Nitrate (mg/l) Maximum	None	6.02	6.65	6.53			
Minimum		0	0	0			
Mean		2.13	2.22	2.15			
Frequency of Violation	10.0	0	0	0			
Average Duration of Violations (hours)	10.0	0	0	0			
Phosphate (mg/l) Maximum		.87	.95	.94			
Minimum		0	0	0			
Mean		.14	.14	.12			
Frequency of Violation	.05	293	370	322			
	.20	83	89	85			
Average Duration of Violations (hours)	.05	122	101	113			
	.20	72	75.6	62			

(1) Illinois Pollution Control Board Standard

*Data are from the first simulation of the 2nd Test Plan

TABLE 14-24 COMPARISON OF POLLUTANT CONCENTRATIONS,
EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard[1] (or other level)	REACH 130			REACH 134		
		Existing	1st	**2nd	Existing	1st	**2nd
BOD (mg/l) Maximum	None	29.9	25.9		31.6	46.3	
Minimum		1.14	.99		.98	.98	
Mean		5.50	5.18		3.42	3.34	
Ammonia (mg/l) Maximum		4.84	4.24		3.50	3.02	
Minimum		.54	.04		.52	.05	
Mean		1.04	.45		.42	.34	
Frequency of Violation	(1) 2.5	161	60		43	32	
Average Duration of Violations (hours)	(1) 2,5	50	4.1		22	4.2	
Nitrate (mg/l) Maximum	None	4.72	5.49		6.47	7.40	
Minimum		.22	.18		.40	0	
Mean		2.26	3.23		2.32	2.46	
Frequency of Violation	10.0	0	0		0	0	
Average Duration of Violations (hours)	10.0	0	0		0	0	
Phosphate (mg/l) Maximum		2.03	1.76		1.52	1.41	
Minimum		.05	.03		.06	0	
Mean		.34	.33		.18	.18	
Frequency of Violation	.05	2	20		2	6	
	.20	283	189		144	128	
Average Duration of Violations (hours)	.05	21,900	6,260		21,900	7,300	
	.20	116	177		81	87.8	

(1) Illinois Pollution Control Board Standard

**Data are from the second simulation of the 2nd Test Plan

TABLE 14-25: CHANGES IN DISSOLVED OXYGEN LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

(All data in mg/l)	REACH 12			REACH 22		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	15.1	15.1	15.1	13.0	13.5	17.3
Minimum	1.51	1.86	2.18	1.33	1.4	1.61
Mean	8.48	8.41	8.32	6.99	7.02	7.69
* Violations	87.0	84.0	79.0	105.0	102.0	96.0
Average Duration	26.0	27.0	30.0	36.0	37.0	41.0
** Overall Assessment	Fair	Good		Poor	Poor	

(All data in mg/l)	REACH 48			REACH 76		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	15.7	15.7	15.7	14.7	28.7	
Minimum	2.24	2.23	2.29	1.89	2.09	
Mean	9.36	9.31	9.25	8.77	8.73	
* Violations	57.0	47.0	40.0	65.0	59.0	
Average Duration	50.0	57.0	64.0	32.0	36.0	
** Overall Assessment	Fair	Fair		Good	Good	

(All data in mg/l)	REACH 130			REACH 134		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	13.6	13.9		14.0	20.6	
Minimum	2.61	2.86		4.97	4.99	
Mean	9.02	9.06		10.0	10.01	
* Violations	46	42		3	1	
Average Duration	19	19		1	1	
** Overall Assessment	Fair	Good		Good	Excellent	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

TABLE 14-26: WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

REACH 12

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan
Temperature °C	32.2	3	4	4	3	3	3	*	*	*
Dissolved Oxygen as O, mg/l	5.0	87	84	79	26	27	30	5	5	5
BOD_{20} Carbonaceous as O, mg/l	10									
Ammonia as N, mg/l	1.5	15	10	5	6	4	3	*	*	*
Nitrate as N, mg/l	10	0	0	0	0	0	0	0	0	0
Phosphorus Soluble as P, mg/l	.05	235	238	234	173	171	173	93	93	92

REACH 22

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan
Temperature °C	32.2	0	0	0	0	0	0	0	0	0
Dissolved Oxygen as O, mg/l	5.0	105	102	96	36	37	41	9	9	9
BOD_{20} Carbonaceous as O, mg/l	10									
Ammonia as N, mg/l	1.5	9	16	14	4	7	5	*	*	*
Nitrate as N, mg/l	10	0	0	0	0	0	0	0	0	0
Phosphorus Soluble as P, mg/l	.05	3	12	104	14,600	3,640	411	100	100	100

REACH 48

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan	Existing Conditions	1st Test Plan	* 2nd Test Plan
Temperature °C	32.2	1	1	1	2	3	2	*	*	*
Dissolved Oxygen as O, mg/l	5.0	57	47	40	109	96	80	14	10	7
BOD_{20} Carbonaceous as O, mg/l	10									
Ammonia as N, mg/l	1.5	4	2	2	5	3	3	*	*	*
Nitrate as N, mg/l	10	0	0	0	0	0	0	0	0	0
Phosphorus Soluble as P, mg/l	.05	293	370	322	122	101	113	82	85	83

REACH 76

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	** 2nd Test Plan	Existing Conditions	1st Test Plan	** 2nd Test Plan	Existing Conditions	1st Test Plan	** 2nd Test Plan
Temperature °C	32.2	5	5		3	4		*	*	
Dissolved Oxygen as O, mg/l	5.0	65	59		32	36		5	5	
BOD_{20} Carbonaceous as O, mg/l	10	143	125		38	38		12	11	
Ammonia as N, mg/l	1.5	23	6		4	4		0	0	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	209	249		187	160		91	91	

REACH 130

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	** 2nd Test Plan	Existing Conditions	1st Test Plan	** 2nd Test Plan	Existing Conditions	1st Test Plan	** 2nd Test Plan
Temperature °C	32.2	0	0		0	0		0	0	
Dissolved Oxygen as O, mg/l	5.0	46	42		19	19		2	2	
BOD_{20} Carbonaceous as O, mg/l	10									
Ammonia as N, mg/l	1.5	161	60		50	4.1		19	*	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	2	20		21,900	6,260		100	100	

REACH 134

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	** 2nd Test Plan	Existing Conditions	1st Test Plan	** 2nd Test Plan	Existing Conditions	1st Test Plan	** 2nd Test Plan
Temperature °C	32.2	8	9		5	6		*	*	
Dissolved Oxygen as O, mg/l	5.0	3	1		1	1		*	*	
BOD_{20} Carbonaceous as O, mg/l	10	78	66		29	28		5	4	
Ammonia as N, mg/l	1.5	43	32		22	4		2	*	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	2	7		21,900	6,260		100	100	

**Data are from the second simulation of the 2nd Test Plan

*: Less than one per cent

revised 2/13/79

the fair category, and water quality in the Kishwaukee would still be less than ideal.

(3) Second Simulation Assumptions: In this test plan the conditions were the same as in the first simulation, except that conservation tillage was added to the rest of the basin, i.e., to reaches 76, 130, and 134. Since those reaches did not impact on the other reaches, the comparison to be made is with the first test plan for these same reaches.

(4) Second Simulation Results: As noted in Table 14-23, it was found that there were only minor reductions in BOD, ammonia, and phosphorus, except in Reach 76 where ammonia was reduced 13 percent and phosphorus, 7 percent.

All of the results achieved in the simulation of second test plan proposals were reviewed at additional public meetings in the basin. Comments and suggestions from the public were solicited and recorded. The Commission staff, considering all available simulation results and other information, then prepared the recommended basin plan described in section 14.10.

14.09 PROBLEM ASSESSMENT

In Part I, a number of areawide problems were identified and solutions recommended. Those findings are applicable to all basins. Noted below are certain problems specifically associated with the Kishwaukee River basin.

a. Sampling Programs

(1) In-stream Samples: The pH, temperature, DO and ammonia concentrations were compared with the established state standards for each of the sampling seasons. The total suspended solids concentrations (maximum and mean) and the volatile portion of these solids were periodically high. The other measured parameters were not excessive, although soluble phosphorus would be of concern if impoundments were involved.

(2) Sediment Conditions. The generalized sediment conditions based upon the sediment oxygen demand study indicates that all three sampling sites were polluted, with conditions ranging from moderately polluted (Station 28) to sewage sludge-like (Station 27) (see Table 14-9). At Station 27, the DO of the overlying water was only 3.83 mg/l, and the sediment depth was 8 inches; at the temperature of sample collection, the overlying water at DO saturation should have been about 11.3 mg/l.

(3) Biological Conditions. The IEPA biological classification of the three stream sites indicates that all three sites were semi-polluted. At Station 27, aquatic worms comprised 57 percent of the organisms collected.

b. Simulation Modeling Results. (See Tables 14-12 through 14-15).

(1) The maximum ammonia/nitrogen concentrations in all six reaches were high, ranging from 1.7 to 4.8 mg/l.

(2) The mean phosphorus concentrations in all reaches exceeded 0.05 mg/l.

(3) Minimum DO concentrations in all reaches were less than the standard of 5.0 mg/l. Overall assessments ranged from poor to good.

(4) Point sources may cause violations of the ammonia/nitrogen standard during dry weather periods.

(5) Point sources contribute nitrates and phosphorus which could cause algae blooms in any future reservoir.

(6) Nonpoint sources contributed approximately 92 percent of the BOD load (tons/yr); 83 percent of the ammonia/nitrogen load; 100 percent of the nitrate load; and 96 percent of the phosphate load.

(7) Surface wash-off during high flow events depressed the in-stream DO concentrations.

(8) The impervious surface portion of the wash-off contributed about 16 percent of the BOD.

c. Point Sources

(1) The upgrading and expansion of certain municipal type plants will be required to accommodate future growth and to comply with effluent standards.

(2) Details of certain facilities plans (e.g., Maple Park, Marengo-Union) need to be resolved.

(3) Information concerning the Turnberry Utility plant is lacking. Facilities planning information is needed for adequate long range planning.

(4) Information concerning the industrial wastewater treatment plants is lacking. Information is needed for adequate long range planning.

(5) Miscellaneous treatment plants with subsurface discharges need to be addressed and integrated into the planning process. These plants impact upon groundwater and, during certain circumstances, can impact upon surface waters.

d. Nonpoint Sources

(1) Construction activities resulting from growth can affect water quality.

(2) About 4,300 residential septic systems serve nearly 14,000 people in the basin. Approximately 15 percent of these systems are assessed as having limitations.

(3) Sixteen surface waste disposal sites may have water pollution potential.

(4) The impacts of urban and agricultural stormwater runoffs on water quality are presented in paragraph (b) above.

e. Residuals

Except for long term septage disposal needs, there are no known problems associated with residuals management.

14.10 RECOMMENDED PLAN

a. Overview

Recommended measures for improving and protecting water quality in the Kishwaukee River basin are consistent with recommendations in Chapters Five through Eight and are tailored to the specific problems in the basin. Of particular importance are agricultural lands and other pervious areas. Because of the small amount of urbanization in the basin, stormwater runoff from impervious surfaces is less significant as a source of pollution than in most other basins in the region.

The provisions of the local facilities plans that have been prepared by various municipal governments should eliminate problems from treatment plant effluents. It is imperative, however, that actual performance be consistent with plan provisions.

Additional measures, such as reduction of wastewater flows and post-treatment aeration also are recommended in this basin. Aeration should help correct the low DO levels now experienced in some reaches.

Recommendations with respect to nonpoint sources are basically the same as in the overall program outlined in

Chapter Six. Control of pollution from agricultural areas is of particular importance in this basin.

b. Point Sources

(1) Publicly Owned Wastewater Systems

(a) Municipal treatment authorities, including Hampshire, Harvard, Huntley, Marengo, and Woodstock should implement their respective portions of their 201 plans as they have been or may be approved by the Illinois and/or U.S. Environmental Protection Agencies. A Summary of the current status of these plans appears in Section 14.04f and suggested changes thereto or features to be included are noted below. In the absence of completed and/or approved facility plans, certain assumptions had to be made as to the expected locations and/or sizes of treatment plants, their estimated costs and designated management agencies. This information must not be construed as binding in the Areawide Plan until the 201 facility plans have been finalized.

(b) Maple Park should review its 201 plan to consider alternatives to the construction of sewers and a treatment plant.

(c) All municipalities and the counties of McHenry and Kane should seek to achieve continued reductions in water use in order to conserve water resources and to reduce wastewater flows at all publicly owned treatment plants. This should be accomplished through modification of building codes to require water conserving plumbing fixtures, metering of all new development, pricing policies and public education to reduce consumption in already developed areas.

(d) By July 1, 1983, all treatment plants whose 7-day 10-year low-flow dilution ratio is 10 to 1 or less should provide or continue to provide not less than 80 percent oxygen saturation in their effluents. Monitoring of wastewater quality after aeration should be conducted. However, during the continuing planning program, studies should be undertaken to determine where this requirement may be waived without detriment to instream water quality standards.

(e) Municipal sewer service required to serve future growth within service areas identified for the year 2000 should be provided only by treatment authorities listed above, except where this is impractical or not cost-effective.

(f) Projected 5-year service areas should be identified in the NPDES permit issued by IEPA. No NPDES permit should be issued for municipal type wastewater service within the 5-year service area other than to the treatment authority, except on a finding by IEPA that the proposed facility is the most cost-effective means of providing service, or is an interim facility pending extension of service by the treatment authority, or is intended to serve an isolated location.

(g) The community of Burlington, having had a needs analysis study prepared for it by this Commission through financial support of the IEPA, should submit an application for a federal grant to prepare a formal facility plan as described by 40 CFR 35.900 within 6 months after it has been notified of its eligibility. The facility plan should complement, revise, or expand but not duplicate the information developed in the needs analysis report.

(h) Treatment plant operators should assure the very high standard of performance for wastewater treatment plants which the 201 plans assume. The IEPA should monitor treatment plant operation and performance and its effect on in-stream water quality. IEPA should establish a technical assistance program to aid operators and laboratory technicians of small public and private treatment plants in dealing with technical problems and assuring a consistent high level of performance in treatment operations.

(i) The Village of Union should remain on septic systems until its revised facility plan has been completed and accepted.

(j) The dilution ratio for the Marengo plant was incorrectly used in 201 plan assessments. Subsequent effluent standards of 20 mg/l BOD and 25 mg/l SS caused DC violations, according to the model. The proper effluent standards of 10 mg/l BOD and 10 mg/l SS should apply for year 2000 plant loads.

(2) Private Utilities

(a) The Turnberry Utility Company should continue in operation but its service area should be extended only in cases where service cannot be provided by an existing municipal wastewater treatment authority.

(3) Industrial Wastewater Treatment Plants

(a) The IEPA should continue to enforce all requirements of NPDES permits for all industries in the basin and assure that treatment plants achieve and

maintain required standards of plant performance. This can be achieved through IEPA standards for treatment plant personnel and through frequent sampling and analysis of treatment plant effluent by the IEPA for the purpose of monitoring compliance with NPDES permits.

(4) Miscellaneous Wastewater Treatment Plants

(a) Miscellaneous publicly and privately owned wastewater treatment plants should continue in operation until such time as wastewater service can be provided by publicly owned municipal type wastewater systems on a cost-effective basis. Service areas of privately owned treatment systems should not be expanded or their treatment capacities measured when service can be provided on a cost-effective basis by publicly owned municipal type wastewater systems.

(b) The IEPA should continue to enforce all requirements of NPDES permits and assure that treatment plant operators achieve required standards of plant performance.

c. Non-Point Sources

(1) Urban Stormwater Runoff

(a) By July 1, 1983, McHenry and Kane counties and all municipalities should implement measures to work toward a reduction of BOD in urban stormwater runoffs from separately sewered areas of 25 percent of 1976 surface loadings from areas to be urbanized in the future, target reductions of 50 percent of 1976 surface loadings are recommended. The implementing agencies should work through the countywide water quality committees to develop plans and standards for the implementation of appropriate measures such as catch basin cleaning programs, performance zoning, street cleaning, use of porous pavement surfaces, increased vegetative cover, grass waterways, wetland storage of stormwater, stormwater detention, sedimentation and erosion controls, and other measures to achieve the desired pollutant reductions.

(b) Township and state highway organizations, the Illinois State Toll Highway Authority, and facility engineering departments at state and federal installation should participate in the programs described above by implementing accelerated and/or improved street sweeping programs for streets, roads and highways that are hydraulically connected to

perennial streams or permanent lakes via stormwater conveyance systems.

(c) During the period up to July 1, 1983 agencies should utilize voluntary exploratory programs, implementing techniques to control pollutants from urban nonpoint sources.

(d) Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should adopt and enforce adequate stormwater detention ordinances. These ordinances should include provisions which clearly establish longterm responsibilities for maintenance of detention facilities. All such local ordinances also should be consistent with minimal areawide standards set forth in the model ordinance.

(e) Within one year following the preparation by NIPC of a recommended model ordinance, all municipal and county governments should develop and enforce adequate erosion and sedimentation control ordinances. All such local ordinances should be consistent with minimal areawide standards set forth in the model ordinance.

(f) Within one year following the preparation by NIPC of a recommended model ordinance, McHenry and Kane counties and all municipalities in the basin should adopt measures to control surface runoff from open storage yards containing industrial stockpiles and other materials which may go into solution or which may be carried away by stormwater runoffs and which may pollute streams and other water bodies.

(g) Municipalities, townships, counties and state and county highway departments responsible for de-icing streets and highways should develop programs to control the application of de-icing materials, to train personnel in proper application methods, and to use proper equipment to minimize any negative water quality impacts. The impact of de-icing on water quality should be given further study by NIPC in the continuing planning program.

(2) Agricultural Runoff

(a) By July 1, 1980, the Kane-DuPage County and the McHenry County Soil and Water Conservation Districts in conjunction with agencies of the United States and Illinois Departments of Agriculture and the countywide water quality committees, should identify the best management practices necessary to implement tillage, contour plowing, terracing, and conversion of cropland to grassland.

(b) By July 1, 1981, agricultural lands on which BMP's should be applied should be identified by appropriate soil and water conservation districts. Agencies of the U.S. Department of Agriculture and countywide water quality committees should be consulted.

(c) By July 1, 1985, a comprehensive conservation plan should be prepared for each farm in the basin which has soil erosion losses in excess of standards set by the Illinois Department of Agriculture and soil and water conservation districts under House Bill 818.

(d) Using available cost sharing and technical assistance programs, the soil and water conservation districts should ensure implementation of the BMP program according to the following schedule on approximately 145,000 acres of agricultural lands:

By 1985 - 30% of the identified land.
By 1995 - 70% of the identified land.
By 2000 - 100% of the identified land.

(e) The IEPA and NIPC should provide the results of their in-stream water quality monitoring to the soil and water conservation districts and to the Departments of Agriculture so that priority can be given to the areas most sensitive from a water quality standpoint in order to maximize the impact of the best management practices.

(f) The IEPA should enforce the IPCB regulations which require permits for feedlots and should use the IEPA draft technical policy WPC-2 "Design Criteria for Field Application of Livestock Wastes" as a guide.

(g) Illinois Department of Agriculture, Illinois Department of Public Health, and USEPA regulations on the use of pesticides and disposal of containers, and Illinois Department of Agriculture regulations on the training and licensing of pesticide applicators and operators should be continued.

(h) Farmers should implement good pasture management practices, utilize grass waterways, vegetative filter strips, and field borders, and make wise use of fertilizers wherever possible in accordance with the Illinois Agronomy Handbook to reduce the dangers of pollution. The U.S. Department of Agriculture agencies should assist farmers in recognizing the water quality problems posed by improper practices, and assist them in the use of proper practices.

(3) On-site Disposal Systems

(a) Individual malfunctioning on-site disposal systems outside of the 5-year service areas should be repaired wherever possible upon complaint to the appropriate county authorities or replaced with a new system if necessary.

(b) By July 1, 1983, special service areas should be established where necessary under the initial sponsorship of municipal governments (for sites located within corporate limits) and by the counties (in unincorporated areas) to aid in the financing of any innovative-type systems or other on-site improvements necessary to correct or replace malfunctioning systems in areas outside the 5-year projected service areas.

(c) The minimum requirements of the Illinois private sewage disposal code should be upgraded to require more innovative site analysis techniques, and county agencies should require a construction permit to regulate the design, location, and installation of every new on-site system in incorporated as well as unincorporated areas.

(d) Local officials should inspect all septic systems known to be failing, threatening public health or causing nuisance conditions. The inspection should result in the issuance of a repair permit for corrective measures which are to be undertaken and paid for by the septic system owner.

(e) Septic systems also should be inspected by local officials prior to the transfer of ownership of properties where such systems are installed. The results of the inspections should be made known to the lending institutions which are furnishing the mortgages.

(4) Air Pollution

(a) As part of the continuing planning program, the IEPA, in cooperation with the Illinois Institute for Natoral Resources, the Illinois State Water Survey, and local air quality management agencies, should analyze the relationship between air pollution and water quality in all of its aspects. The IEPA should cooperate with NIPC in devising strategies for correcting present negative effects and preventing future problems through the 208 continuing planning program.

(5) Sanitary Landfills

(a) The IEPA should ensure that every sanitary landfill complies with all regulations of the IPCB for its siting, design, construction, and operation. As a substitute for existing state regulations, the IEPA and IPCB should consider certification of local solid waste disposal programs which comply with areawide plans to be prepared under the Federal Resource Conservation and Recovery Act. Alternatives to land disposal of solid wastes, including recycling, should be considered and utilized wherever feasible.

(6) Waterways

(a) NIPC, in conjunction with the countywide water quality committees in the continuing planning program, should develop recommendations to simplify the fragmented system for channel maintenance and improvement in the Kishwaukee River basin. Present responsibilities for such maintenance functions as debris removal, streambank stabilization, public access, dredging, disposal of dredge spoil, protection and augmentation of habitat, tree shading, and vegetation are shared between a host of federal, state, and local authorities.

(b) Kane and McHenry counties are encouraged to develop organizations similar to the Cook County and Lake County Clean Stream Committees, consisting of volunteers and organizational representatives who maintain surveillance over water bodies for activities adverse to water quality, flood control, recreation, fish, wildlife, and/or navigation.

(c) During the initial planning effort, no feasible plan was developed which would raise dissolved oxygen to at least 5.0 mg/l for 95 percent of the time in Reaches 22 (South Branch) and 48 (mainstem, county line). During the continued planning program, special attention will be given to these reaches to determine if actual conditions are in conformance with simulation modeling results. In Reach 22 an evaluation will be made to determine if the BOD effluent standard for the Huntley Wastewater Treatment Plant should be made more restrictive. Necessary preventive or corrective measures will be identified only if corroborating field data are obtained.

(d) Ammonia concentrations in Reach 130 (Mokeler Creek) will not meet in-stream standards of 1.5 mg/l until after 1983. Attention should be given during the continuing planning program to determine if actual

conditions confirm modeling results, and if ammonia removal facilities should be installed in the Harvard wastewater treatment prior to 1983.

(e) In-stream water quality data collected by local treatment plant operators should be periodically published by IEPA.

(f) Flows entering Illinois from Wisconsin should meet the following water quality criteria: a mean concentration of 4.0 mg/l BOD_5, and a maximum concentration of 1.5 mg/l of ammonia nitrogen (NH_3). Dissolved oxygen concentrations shall be in excess of 5.0 mg/l at least 95 percent of the time.

d. Residuals

(1) As regulated by the IEPA, present methods for the disposal of sludge from treatment plants are adequate to handle present and anticipated future volumes and should continue to be effectively administered by the IEPA.

(2) Highest priority should be given to the use of sludge as a soil conditioner and to the expansion of efforts to utilize sludge for that purpose. The IEPA should assure proper practices in the utilization of sludge on agricultural lands through implementation of the draft standards in IEPA Technical Policy WPC-3, "Design Criteria for Municipal Sludge Utilization on Agricultural Land."

(3) The preferred method for the disposal of domestic septage is through land application, and this method should be encouraged and used whenever possible. Recognizing a continuing need for the disposal of large volumes of septage at wastewater treatment plants, specific facilities should be designated by the IEPA to receive domestic septage on recommendation by NIPC through the continuing planning process.

(4) The USEPA standards and the IPCB regulations for permits for the disposal of hazardous or toxic substances should continue to be enforced by the IEPA.

e. Groundwater

(1) By July 1, 1980, the Illinois State Water Survey and the Illinois State Geological Survey should undertake a coordinated well sampling program to monitor groundwater quality in areas where a potential for infiltration by pollutants exists.

f. Mining

(1) The present IPCB regulations for control of pollution from aggregate producing activities are considered generally satisfactory. However, the IEPA should continue to study the types and volumes of pollutants associated with mining activities and their potential effects on surface and groundwater quality. Any needed changes in present regulations should be identified by July 1, 1980.

14.11 COSTS OF RECOMMENDED PLAN

a. Facility Plans

(1) General Table 14-27 shows pertinent capacities in the year 2000 for surviving wastewater treatment plants, their effluent standards and construction costs. Local collector sewer projects are shown if they have been processed for federal or state grants.

Cost data were assembled from various sources as noted below and in the tables that follow. The processing of this information and its allocation to the Kishwaukee River basin are described, where applicable.

The initial costs of the facility plans listed in Table 14-27 apply to the first phase of any project which is to be followed at some future date by programmed expansions or extensions. Under this definition, the total cost of works currently under construction fall under the classification initial, even though the project has not yet been completed. The "future" costs in Table 14-27 cover phased work scheduled at later dates.

(2) Future Costs Table 14-28 distributes capital costs within five year time frames. Annual O&M costs are also shown, which are based on data included in current reports, where available, or from data furnished by operating agencies. In their absence, they were estimated based on information in Staff Paper No. 20, "Wastewater Treatment Processes and Cost Estimating Data."

(3) Local Costs Table 14-30 shows annualized local capital costs.

(4) Increased Costs Table 14-30, 14-31 and 14-32 show the estimated annual increases in wastewater charges per household, for McHenry County residents in the Basin; for residents in Kane County; and for the Basin as a whole, respectively for the previously described improvements and/or expansions.

TABLE 14-27: RECOMMENDED PLANS, PUBLICLY OWNED TREATMENT SYSTEMS KISHWAUKEE RIVER **BASIN**

MAP CODE	FACILITY NAME	DESIGN CAPACITIES (MGD)		EFFLUENT STANDARDS (Year 2000) (mg/l)				CAPITAL COSTS (million $)			COMMENTS
		1975	2000	BOD_5	TSS	P	NH_3N	INITIAL	FUTURE	TOTAL	
K12	Hampshire	0.25	0.46	10	12		(1) 1.5	(2) 2.0	-	2.0	(1) In-stream water quality
M6	Harvard	0.62	1.50	10	12		(1) 1.5	(2) 3.4	-	3.4	standard after mixing.
M8	Huntley	0.20	0.28	10	12		(1) 1.5	(2) 1.1	-	1.1	(2) Ammonia removal facilities
M10	Marengo	1.03	1.20	10	12		(1) 1.5	1.2	-	1.2	included in costs.
M15	Woodstock South	0.75	1.50	10	12		(1) 1.5	1.3	1.2	2.5	(3) Status not finalized; may stay
K20	Maple Park	-	0.10	10	12		(1) 1.5	1.2	-	1.2	on septics.
M17	(3) Union	(4) 0.18	0.18	30	30		(1) 1.5	1.1	-	1.1	(4) 1980

revised 2/13/79

TABLE 14-28 SUMMARY OF FUTURE COSTS (All data in 1977 dollars in millions)

Jurisdiction	Capital Costs						Annual Operations & Maintenance Expense				
	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	Total	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)
Hampshire	2.00					2.00	0.02	0.05	0.05	0.05	0.05
Harvard	3.40					3.40	0.02	0.06	0.06	0.06	0.06
Huntley	1.10					1.10	0.01	0.04	0.04	0.04	0.04
Marengo	1.20					1.20	0.01	0.03	0.03	0.03	0.03
Woodstock South	1.30	1.20				2.50	0.04	0.05	0.07	0.07	0.07
Maple Park	1.20					1.20	0.01	0.02	0.02	0.02	0.02
Union	1.10					1.10	0.01	0.04	0.04	0.04	0.04
Agricultural BMP's							0.15	0.34	0.46	0.67	0.81
Urban Stormwater Management Expense							0.12	0.14	0.16	0.17	0.19
Total	11.30	1.20				12.50	0.39	0.77	0.93	1.15	1.31

revised 2/13/79

TABLE 14–29: PROJECTED ANNUALIZED LOCAL COSTS (All data in 1977 dollars in millions)

Jurisdiction	CAPITAL COSTS			LOCAL CAPITAL PLUS O & M ANNUALIZED Costs (Mil./yr.)*					Comments
	Cost Total Through Yr. 2000	Est. Fed'l. Share	Est. Local Share	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	
Hampshire	2.00	1.50	0.50	0.07	0.10	0.10	0.10	0.05	
Harvard	3.40	2.55	0.85	0.10	0.14	0.14	0.14	0.06	
Huntley	1.10	0.82	0.28	0.04	0.07	0.07	0.07	0.04	
Marengo	1.20	0.90	0.30	0.04	0.06	0.06	0.06	0.03	
Woodstock South	2.50	1.88	0.62	0.07	0.11	0.13	0.13	0.10	
Maple Park	1.20	0.90	0.30	0.04	0.05	0.05	0.05	0.02	
Union	1.10	0.82	0.28	0.04	0.07	0.07	0.07	0.04	
Agricultural BMP's				0.15	0.34	0.46	0.67	0.81	
Urban Stormwater Management Expense				0.12	0.14	0.16	0.17	0.19	
Total	12.50	9.37	3.13	0.67	1.08	1.24	1.46	1.34	

TABLE 14–30: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST McHENRY COUNTY

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	208.59	230.58	251.28	271.98	295.23	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.096	.100	.091	.085	.010	
O & M Related	.140	.252	.281	.320	.336	
Total Rate:	.236	.352	.372	.405	.345	
Additional Cost per Home of $45,000 FMV ($/yr.)	35.40	52.80	55.80	60.75	51.90	
Existing Av. Annual WW Cost ($/Household yr.)	85.01					
Total Av. Annual WW Cost ($ / Household yr.)	120.41	137.81	140.81	145.76	136.91	
Percent Av. Increase* in WW Costs per Household (%)	41.6	62.1	65.6	71.5	61.1	

*Total Rate Used

revised 2/13/79

The "fair" dissolved oxygen rating for Reach 22 in 1983 and 2000 appears difficult to improve because the streamflow is very small in that reach and frequently approaches zero. Additicnal BOD removal at the Huntley plant could be considered.

In reach 48, dissolved oxygen ratings now, in 1983, and in the year 2000 are all rated "fair", even with some reductions in the percentages of time that the NIPC standard would be violated. The key factor here appears to be the BOD effluent standard for the Marengo wastewater treatment plant. As described in the 201 assessments and continued throughout the modeling, 20/25 effluent standards were estimated for the year 2000 based on an average design load of 1.2 MGD. With the low flow being 4.65 MGD, the dilution ratio would be 4.65/1.2, or 3.88. Since this is less than 5:1, 10/12 effluent standards would apply, rather than the 20/25 standards which were used. With the revised effluent standard, the DO ratings would probably fall within the 95 percent target.

In Reach 130 61 percent of the ammonia comes from point sources. With the Harvard plant being the only treatment facility in the reach, the "poor" ammonia rating indicates that ammonia removal could be considered at the Harvard plant. The NPDES permit and facility plan call for ammonia not to exceed 1.5 mg/l after mixing in the receiving stream. This plan is based on the assumption that control equipment will not be installed by 1983. It should be noted that this is a small plant with a 1975 load of only 0.38 MGD. Significantly, no ammonia problems were identified in any other streams in this basin, including those where treatment plants were discharging to zero low flows. Given the emerging science of fish ecology, it is recommended that no immediate action be taken until modeling data can be confirmed by field observations.

d. Evaluation

On the basis of this evaluation, it appears that the 1983 goal will not be met in Reach 130 due to substandard ammonia concentrations. The goal also apparently will not be attained in Reach 22 due to substandard DO levels.

Despite these apparent problems, it should be noted that data compiled by the Illinois Natural History Survey indicate that a high quality assemblage and diversity of fish species exist in the river and its tributaries. Presumably, this classification can be maintained through 1983, since water quality conditions are expected to remain static or to improve in all reaches.

As was discussed in Chapter Four, the viability of indigenous fish is dependent on a number of factors, other than dissolved oxygen and ammonia concentrations. The contradictory information merely reinforces the earlier finding that much more research is needed at the national level in order to properly evaluate aquatic ecology.