

ANNUAL PROGRAM REVIEW

FY-1964 - FY-1965 - FY-1966

GREAT LAKES-ILLINOIS RIVER BASINS PROJECT

December 31, 1963

Project Directory

Names and Addresses

Telephone

Project Headquarters

Department of Health, Education & Welfare
Public Health Service
Great Lakes-Illinois River Basins Project
1819 West Pershing Road
Chicago, Illinois 60609

Lafayette 3-5500
Area Code 312

Project Director

W. Q. Kehr

Office Exts. 2271, 2272
Home TE-2-5388

Deputy Project Director

S. Megregian

Office Exts. 2271, 2272
Home TE-3-7592

Planning and Reports Branch

C. R. Ownbey

Office Ext. 2230
Home FL-4-2088

Field Operations Branch

C. Pemberton

Office Ext. 2210
Home WO-8-0381

Laboratory Branch

C. Risley

Office Exts. 2176-
2175, 2178
Home 964-0765

Lake Erie Field Station

Great Lakes-Illinois River Basins Project
Lake Erie Field Station
7298 York Road (Bldg. 49-A)
Cleveland 30, Ohio

845-2200
Area Code 216

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Field Station Director

C. W. Northington

Office 845-2200

Home 234-2032

Deputy Field Station Director

G. L. Hubbs

Office 845-2200

Home 845-0638

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PROJECT DESCRIPTION

The Great Lakes-Illinois River Basins Project, in cooperation with other Federal, State, and local agencies is engaged in a comprehensive study of water quality of the Great Lakes and Illinois River Basins. This study, one of several being undertaken in the nation's major drainage basins under provisions of the Federal Water Pollution Control Act, is a part of the program of the Division of Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare.

For study and reporting purposes, the area has been divided into six major parts, consisting of the Illinois River Basin and each of the five Great Lakes basins. Each major part is further subdivided into subdrainage basins for water resource and water quality considerations, and into subregions - generally along county lines - for economic base studies. Boundary lines of the six major parts are shown on the study area map (Fig. 1).

The general objectives of the Project have been described as follows:

- A determination of the causes of water pollution and the effects of such pollution on the quality of water resources and on beneficial uses.

- The development of agreements on the desired beneficial uses and the water quality required to accommodate those uses,

- The development of water quality control measures to achieve the desired objectives, including the establishment of a time table for their accomplishment.

The specific objectives of the Project are:

- To determine the present quality of the waters of the Illinois River Basin and the five Great Lakes Basins and their tributaries. This is being accomplished by a review of existing records supplemented by extensive field sampling and laboratory programs.

- To inventory water uses and trends of usage in each Basin for municipal and industrial water supply, recreation, aquatic and wildlife, navigation, agricultural, and other purposes.

To identify sources of wastes, and compile data on quantities and characteristics of water-borne wastes, in each sub-drainage basin, catalogued by sources and points of discharge.

To appraise the adequacy of present practices in land use, water use, and waste disposal in relation to water quality protection.

To measure the Great Lakes currents and establish their patterns as an aid to predicting the fate of pollutants discharged into the Lakes and resultant effects on the Lakes.

To make economic and demographic studies leading to projections of future growth, accompanying water demands, and associated water-borne wastes.

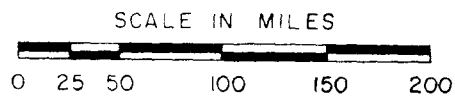
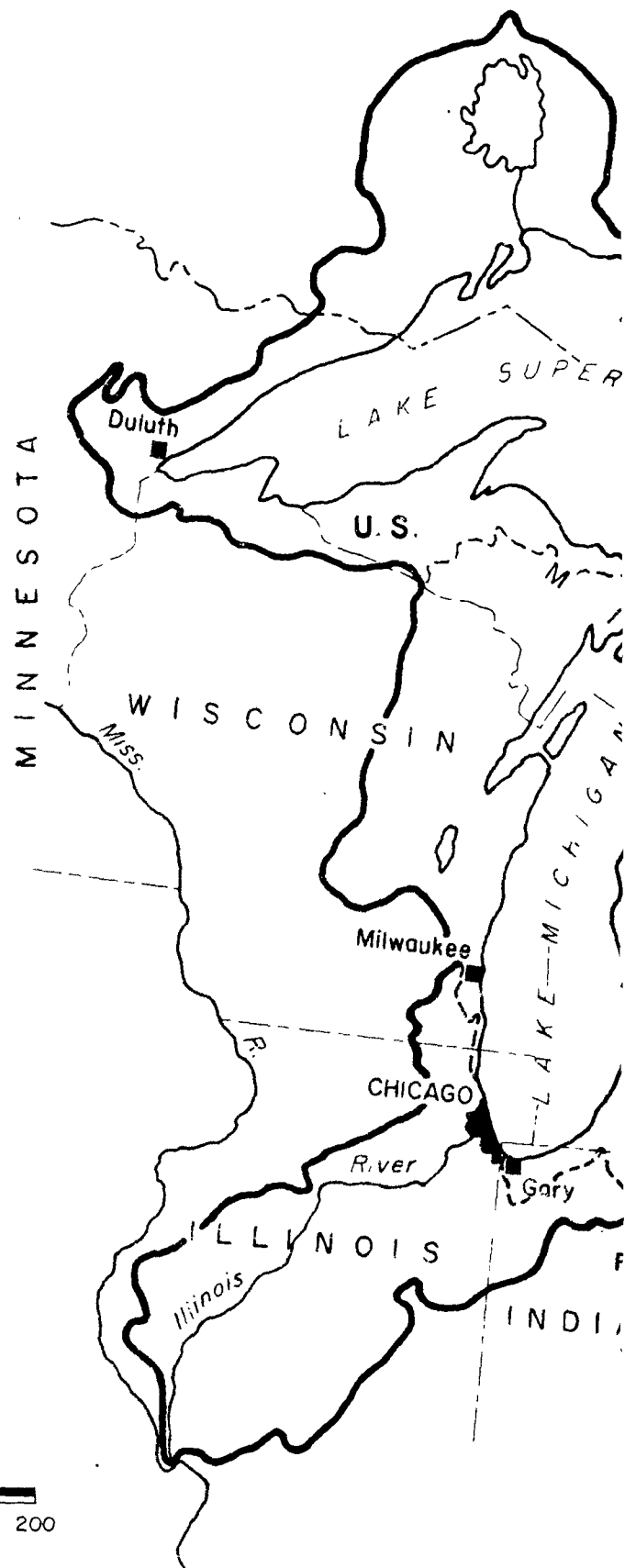
To determine the existing and potentially developable water resources, ground and surface, within each Basin.

To formulate a plan for guidance of a cooperative program aimed at improving and protecting the quality of waters in each Basin. This includes development of agreements on the water quality goals, analysis of measures for achieving these goals, and time tables for their accomplishment.

To publish a series of comprehensive reports, one on each major Basin, to present the information developed by the Project for basic reference and guidance in establishing "Water Supply and Pollution Control" management programs.

For assistance in meeting these objectives, the Project has solicited participation, advice, assistance, and cooperation on the part of: other Federal agencies; State agencies concerned with public health, water pollution control, water resource management and related fields; interstate agencies; municipalities; industry; and many other interested groups, both public and private. Most gratifying, also, has been the coordination of effort with our Canadian counterparts achieved through both official and informal channels of communication. Thus it is proving possible to study each of the international boundary lakes as a physical entity.

At this time (December 1963) the intensive phase of work has been completed in the Illinois River Basin, is approaching completion in the Lake Michigan Basin, and is well under way in the Lake Erie Basin. The Lake Huron and Lake Ontario Basins are next on the schedule for detailed study.



CONSULTANTS AND FORMAL COORDINATING GROUPS

The Consultants presented below are divided into two groups, those paid from Project funds for their services and those consulted informally. In addition, a separate listing is included of Consultants utilized only by the Lake Erie Field Station.

Paid Consultants

Dr. Donald J. O'Connor, Associate Professor of Civil Engineering, Manhattan College, New York, N. Y.

Advises on methods and procedures for lake and stream quality analyses. Assists in the development of mathematical models for predicting water quality. Periodically reviews completed analyses and renders comments thereon.

Assists project in planning sampling programs and field surveys. Advises on techniques, frequency parameters and other pertinent matters.

Professor Fred A. Clarenbach, Professor of Regional Science, Department of Urban and Regional Planning, University of Wisconsin, Madison, Wisconsin.

Professor Clarenbach is consulted to provide guidance and judgment concerning appropriate scope and content of economic and related studies pertaining to the GLIRBP study area activities.

Dr. LaVerne Curry, Head of Biology Department, Central Michigan University has been consulted on the specific identifications of a large group of organisms known as the Tendipedidae. His knowledge of this group of aquatic insects has made possible a more accurate evaluation of the effects of wastes on the water quality conditions in Lake Michigan.

Mr. Roy D. Gaul, Texas A&M College - consulted on specific oceanography problems.

Drs. Blair Kinsman and Donald Pritchard, Chesapeake Bay Institute, Johns Hopkins University, and Mr. Emanuel Mehr, New York University - were used in connection with data processing and development of mathematical models on lake current studies.

Others Consulted

Dr. W. M. Ingram, Taft SEC was consulted on several occasions relative to the merits of the Lake Michigan biological work, and in regard to algal problems in Indiana and Illinois lakes.

Paul Kabler, Microbiologist, M.D., and Harold Clark, Microbiologist, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. The chief services provided by Kabler and Clark are advice to the Project on the feasibility of various phases of its microbiological studies and review of the finished reports.

W. H. Ewing, Microbiologist, Ph.D., Communicable Disease Center, Atlanta, Ga. Provides technical services in the serological identification of strains of Salmonella isolated in the GLIRBP laboratory.

Tom D. Y. Chin, Virologist, M.D., Communicable Disease Center, Kansas City. Provides technical service in the isolation and identification of enteroviruses isolated from the polluted waters of the Chicago Metropolitan Area and the Illinois River.

John R. Baylis, Engineer, Nicholas Kuehn, Engineer, James C. Vaughn, Chemist, City of Chicago, Department of Water and Sewers, contributed basic data from their records which was incorporated into our reports.

Glen Metcalf, Engineer, Chicago Park District, submitted basic data on the water quality of Chicago beaches.

Philip Fragassi, Chemist, City of Evanston, Filtration Plant, submitted basic data on the water quality in the Evanston water intakes.

E. R. Krumbiegel, M.D., City of Milwaukee, Public Health Department, conducted special studies in cooperation with GLIRBP on the water quality occurring at the Milwaukee beaches.

Dwight Ballinger, Chemist, R. A. Taft SEC. Used in regard to polarographic techniques on metal analysis and dissolved oxygen. Also field instrumentation for dissolved oxygen.

Jesse Cohen, Chemist, R. A. Taft SEC. Consultation in regards to modifications on Technicon Auto-Analyzer and polarographic methods of dissolved oxygen.

Ferdinanc J. Ludzack, San. Eng., R. A. Taft SEC. Consultation on Technicon Auto-Analyzer procedures for C.O.D., kjeldahl nitrogen and other parameters.

A. A. Rosen, Ph.D., R. A. Taft SEC. Consultation in regards to organic analysis, infra-red interpretation and gas chromatography.

A. W. Breidenbach, Ph.D., R. A. Taft SEC. Consultation on carbon filter studies, organic contaminants, infra-red spectroscopy.

Robert A. Kroner, R. A. Taft Center. Consultation on analyses of trace metals and general analytical procedures.

H. P. Nicholson, Ph.D., Chief, Pesticide Control Laboratory, Atlanta, Ga., Region IV. Consultation in regards to analysis of pesticides, gas chromatography, and column chromatographic "clean up" processes.

Lee Hausler, Plant Supt., Ernie Murray, Health Physicist, and Cy Hartman, Radiochemical Engineer of the Big Rock Point Nuclear Reactor of the Consumers Power Co., Charlevoix, Michigan - consulted about the radiological effects of the reactor on Lake Michigan and the potential hazards of the reactor.

Robert F. Sullivan of the AEC Division of Compliance, Denver, Colorado - consulted regarding the safeguards imposed by the AEC on the Big Rock Point Reactor.

Harry Thornburg, of the AEC Division of Compliance, Chicago Operations Office, Oak Brook, Illinois - consulted to determine what agencies bore the responsibility for safeguarding the environment in the area of the Big Rock Point Reactor, and the potential hazards of the Dresden reactor, Armour reactor and Argonne reactors.

Jacob Sedlet, Radiochemist, Industrial Hygiene and Safety Division, Argonne National Lab., Argonne, Illinois - consulted regarding procedures for specific radionuclide analysis of water samples, results of samples analyzed by Argonne National Lab., and procedure for disposal of radioactive waste materials held by the GLIRBP Laboratory.

Henry Lucas, Radiological Physics Division, Argonne National Lab., Argonne, Illinois - consulted regarding the radium content of ground and surface waters in the Chicago Area and procedures for determining Radium in water.

Enrico Conte and Bill Brobst, Health Physicists, AEC Chicago Operations Office, Argonne, Illinois, were consulted regarding the disposal of radioactive wastes from the Argonne National Laboratory.

Conrad Straub, Chief, Radiological Health Research Activities, Taft Sanitary Engineering Center, Cincinnati, Ohio, consulted concerning the future direction which radiological studies on the Great Lakes should take. His staff also was used to review reports and publications of the section.

Geery Karches, Physicist, Taft SEC, Cincinnati, Ohio, was consulted regarding calibration and characteristics of the GLIRBP laboratories radiation equipment.

Mr. Ed Fredkin, President, Information International, and Mr. M. L. Greenough, U. S. Bureau of Census, were consulted in developing a readout system for translating current meter data for machine processing.

Dr. G. E. Hutchinson, Dept. of Biology, Yale University; Prof. Henry Stommel, Department of Oceanography, Harvard; and Dr. William Richardson and Mr. N. Fofonoff, Woods Hole Oceanographic Institution - were consulted on various aspects of lake current studies.

Lake Erie Field Station

Dr. Robert Thoman, Technical Director, of the Delaware Estuary Study has been consulted in person and via telephone on several occasions. These consultations have been most fruitful and have tended to elucidate the use of mathematical models as water quality management tools.

Plans are to continue these consultations with Dr. Thoman as the need arises and as his primary duties permit.

Coordinating Groups

Lake Erie Study Group

The Lake Erie Study group is composed of agencies and universities both Canadian and U. S. (including Great Lakes-Illinois River Basins Project), who are actively engaged in studies in Lake Erie and its drainage basin.

The group has banded together for the purpose of assisting one another where possible and to provide for inter-change of data and services.

Some of the advantages that have accrued to the Lake Erie Field Station to date are as follows:

1. The Canadian agencies persuaded their government to invite the U. S. government to participate in a joint study of the Lake.
2. Several cooperative sampling cruises embracing the entire lake on both U. S. and Canadian laboratory vessels.
3. Plans for a central data repository.
4. Contacts from whence is coming valuable data.

The following is a list of the Group Members:

U. S. Members

U. S. Army Engineer Division
North Central, Corps of Engineers
536 South Clark Street
Chicago 5, Illinois
Commanding Officer

U. S. Weather Bureau
Washington 25, D. C.
Mr. D. Lee Harris

U. S. Bureau of Commercial Fisheries
5 Research Drive
Ann Arbor, Michigan
Dr. J. W. Moffett

Director, Engineering Experiment Station
Water Resources Center
Ohio State University
1791 Neil Avenue
Columbus 10, Ohio
Mr. George P. Hanna, Jr.

U. S. Army Engineer District
Lake Survey
630 Federal Building
Detroit 26, Michigan
Lt. Col. L. F. Kengle

Natural Resources Institute
Ohio State University
1885 Neil Avenue
Columbus 10, Ohio
Dr. Charles A. Dembach, Director

Great Lakes Research Division
University of Michigan
Ann Arbor, Michigan
Dr. David C. Chandler, Director

Department of Natural Resources
Ohio Departments Building
Columbus 13, Ohio
Mr. Fred E. Morr

Great Lakes-Illinois River Basins Project
Region V, Dept. of Health, Educ. and Welfare
Room 712, New P.O. Building
433 W. Van Buren Street
Chicago 7, Illinois
Mr. William Q. Kehr, Project Director

Lake Erie Field Station
7298 York Road, Bldg. 49-A
Cleveland 30, Ohio
Mr. C. W. Northington

Canadian Members

Lake Erie Study Group
Great Lakes Institute
University of Toronto
Toronto 5, Canada
Mr. G. K. Rodgers
Dr. G. B. Langford

Department of Northern Affairs and Natural Resources
Ottawa, Canada
Mr. R. H. Clark

Essex College
Assumption University of Windsor
Windsor, Ontario
Canada
Mr. G. T. Csanady

University of Western Ontario
Department of Geology
London, Canada
Mr. James R. Kramer

University of Toronto
Botany Department
Toronto, Canada
Mr. H. P. Badenhuizen

Ontario Water Resources Commission
801 Bay Street
Toronto 5, Canada
Dr. A. E. Berry

Department of Transport
315 Bloor Street West
Toronto 5, Canada
Mr. P. D. McTaggart - Cowan

Coordinating committees have been established with a member from each country.

Agreements with the Group of States

The Project has agreed to meet with the states individually and collectively to develop study plans and discuss management plans and policy plans.

The intent is to prepare detailed study plans with the states individually with a possible collective review.

States are encouraged to participate as much as their other responsibilities will permit.

Special Arrangements with Individual States

Formal arrangements for collecting data from the state of Michigan files have been made with the Detroit River-Lake Erie Project who will collect the data upon written request.

Routine field station contacts will be with the Michigan water pollution control agency.

Formal agreements have been made with the New York agencies that permit us to operate through contacts with the water pollution control agency. Most of the field work is handled directly with their regional engineer in Buffalo. The water pollution control agency is furnished copies of all correspondence within the state.

The agreements in Pennsylvania permits us to deal through the water pollution control agency. A great deal of our field contact is made with their regional engineer in Meadville.

The water pollution control agency is furnished copies of all correspondence within the state.

All contacts and arrangements in Ohio are made through the water pollution control agency. Contact with the regional engineers to date have been through the State office. Contacts with the City of Cleveland are made directly with the Public Health Service being responsible for keeping the state abreast of activities.

Copies of all direct correspondence in the state are furnished to the State water pollution control agency.

Contacts within the State of Indiana are made through the water pollution control agency.

The inventory data from the State of Indiana have been collected by the Chicago office.

Public Health Service Region II

Close liaison and cooperation is maintained with the Region II Water Supply and Pollution Control Director in New York. Initial contacts with state agencies were made through the Region II office. They are invited to all meetings with the water pollution control administrators. Copies of all official correspondence and contact reports are furnished to the Region II office. This arrangement has been most helpful in guiding the Field Station personnel away from internal conflicts within the State of New York.

Inventory data collection is coordinated through the Region II office.

TECHNICAL COMMITTEES

This is a brief statement concerning the organization, objectives and activities of the Technical Committees to the Great Lakes-Illinois River Basins Project. Members of these committees are men in responsible positions in State water resource and water pollution control agencies, municipal water and sewer departments, private research organizations, conservation groups, and industry.

Lake Michigan-Illinois River Basins Technical Committee

The purpose of the Technical Committee was stated by the Surgeon General in a letter to prospective members, in which he asked if they would be willing to serve as members of a technical committee "... to work with and assist the Public Health Service on a study to develop long term plans for the control of pollution affecting Lake Michigan and the Illinois Waterway." He indicated further, "We wish to carry on this study in cooperation with the States, municipalities and industries in the area so that we can develop a program which will protect these waters for the best uses of all concerned." He also pointed out that a "... high degree of communication and understanding, as well as the dissemination of reliable information, is a necessity."

At the first meeting of the committee on March 10, 1961, Dr. Gordon McCallum, Chief, Division of Water Supply and Pollution Control reviewed the need and authorization for comprehensive studies of water pollution and said "the people in an area should decide what kind of water they want and the uses to be made of it. It would not be meaningful to prepare a theoretical plan if the plan did not meet the needs of the area or was not feasible."

To carry out its mission the committee engages in principal activities as follows:

1. Periodically reviews progress of studies and activities of GLIRBP, usually at scheduled meetings.
2. Reviews work plans for future work and suggests desirable modifications, if any.
3. Suggests problems that need to be studied.
4. Participates in the development of agreements on beneficial water uses.

5. Studies and suggests water quality parameters and limits therefor, appropriate to particular uses.

6. Assists in the acquisition of information pertinent to project studies.

7. Reviews comprehensive and/or special reports and provides critical comments.

8. Disseminates to respective groups represented the results of committee activities, activities and accomplishments of GLIRBP and any other matters of mutual interest or concern.

To accomplish Item No. 5 the Technical Committee organized four sub-committees called Water Quality Work Groups. Each work group was assigned the task of determining parameters suitable as indicators of water quality for a particular use or group of uses. In addition, the work groups determined limits for each parameter which could be used in establishing water quality goals necessary to accommodate desired beneficial uses of surface waters.

Work group members are men in responsible positions in municipal water and sewer departments, research organizations, universities, conservation groups, industries, and State and Federal Agencies. They have technical knowledge and familiarity with water quality requirements for uses under consideration and in many cases have on their staffs specialists who assist them in the work group efforts. Each work group chairman is a member of the Technical Committee and in this capacity he reports on the activities and accomplishments to the committee.

Membership of the Technical Committee for Lake Michigan and Illinois River Basins is listed on the following pages.

TECHNICAL COMMITTEE

Lake Michigan and Illinois River Basins

Mr. Loring F. Oeming
Executive Secretary
State of Michigan
Water Resources Commission
200 Mill Street
Lansing 13, Michigan

Mr. C. W. Klassen
Technical Secretary
State of Illinois
Sanitary Water Board
Springfield, Illinois

Mr. Norval E. Anderson
Chief Engineer
The Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago 11, Illinois

Dr. C. S. Boruff
Technical Director
Hiram Walker & Sons, Inc.
Peoria 1, Illinois

Mr. R. A. Hirshfield
General Hydraulic Engineer
Commonwealth Edison Company
Chicago 90, Illinois

Mr. B. A. Poole
Technical Secretary
Stream Pollution Control Board
1330 W. Michigan Street
Indianapolis 7, Indiana

Mr. O. J. Muegge
State Sanitary Engineer
The State of Wisconsin
Board of Health
State Office Building
Madison 2, Wisconsin

Mr. Ross L. Harbaugh
Superintendent, Chemical Department
Inland Steel Company
Indiana Harbor Works
East Chicago, Indiana

Mr. A. F. Endres
Manager
Whiting Refinery
American Oil Company
2400 New York Avenue
Whiting, Indiana

Mr. Burton H. Atwood
National Treasurer
Izaak Walton League
Crystal Lake, Illinois

Mr. Horace R. Frye
Superintendent, Water & Sewer Dept.
City of Evanston
Evanston, Illinois

Mr. Edward C. Logelin
Vice President
U. S. Steel Corporation
208 South La Salle Street
Chicago 90, Illinois

Mr. P. J. Marshall
Vice President in charge
of Engineering
Abbott Laboratories
14th and Sheridan
North Chicago, Illinois

Mr. H. H. Gerstein
Chief Water Engineer, Bureau
of Water
Department of Water and Sewers
City of Chicago
Chicago 2, Illinois

Mr. C. J. McLean
c/o Northeastern Illinois Metro-
politan Area Planning Commission
72 West Adams Street
Chicago 3, Illinois

Mr. Marvin Fast
Executive Director
Great Lakes Commission
Rackham Building
Ann Arbor, Michigan

Lake Erie Basin Technical Committee

A great deal has been accomplished towards the formation of a technical committee to assist the Field Station and the Great Lakes-Illinois River Basins Project in accomplishing their goal of attaining full cooperation of state and local agencies, municipalities, universities, other federal agencies and the general public in developing a program for water quality management.

The ultimate need for this committee is its aid in gaining acceptance of the final water quality management plan.

This 15-member committee will be composed of the water pollution control administrators from the five states, representatives from: (1) the major industries within the basin, (2) interest groups, (3) municipalities, and (4) the public at large.

The representative members will be chosen from men in managerial capacities. Each member will be afforded the privilege of bringing technical consultants or colleagues to meetings. Also a member may send a substitute to meetings on occasions.

The present thinking is that a Committee Member's tenure of office should expire if he disassociates with the group he represents or if he ceases to have a direct interest in the Lake Erie Basin.

The committee should be functional through the life of the Public Health Service study.

Names of persons recommended to the Surgeon General for appointment to the Lake Erie Basin Technical Committee are listed on the following pages.

LAKE ERIE BASIN TECHNICAL COMMITTEE

Proposed Membership List

INDIANA

1. Mr. B. A. Poole, Director
Bureau of Environmental Sanitation
Indiana State Board of Health
1330 West Michigan Street
Indianapolis 7, Indiana

MICHIGAN

1. Mr. Loring F. Oeming, Chief Engineer
Water Resources Commission
Reniger Building
200 Mill Street
Lansing 13, Michigan
2. Mr. C. H. R. Johnson, President
Consolidated Paper Company
Monroe, Michigan
3. Mr. Marvin Fast
Great Lakes Commission
Ann Arbor, Michigan

PENNSYLVANIA

1. Mr. Karl M. Mason, Director
Bureau of Environmental Health
Pennsylvania Department of Health
Health and Welfare Building
Harrisburg, Pennsylvania
2. Mr. Michael E. Wargo
Park Superintendent
Presque Isle State Park
Box 1115
Erie, Pennsylvania

NEW YORK

Dr. Meredith H. Thompson
Assistant Commissioner
Division of Environmental Health Services
State Department of Health
84 Holland Avenue
Albany 8, New York

OHIO

1. Mr. George Eagle, Chief
Division of Sanitary Engineering
Ohio State Department of Health
101 North High Street
Columbus 15, Ohio

2. Mr. R. H. Ferguson, Assistant
Director of Industrial Relations
Republic Steel Corporation
Cleveland, Ohio

Mr. R. H. Ferguson is in charge of all the water pollution control activities for the Republic Steel Corporation.

3. Mr. Charles E. Spahr, President
Standard Oil Company
Midland Building
Cleveland, Ohio

Mr. C. E. Spahr is President of the Standard Oil Company of Ohio. By reason of their refinery activities in Ohio, they are quite interested in water quality as well as water pollution problems from the oil refining industry.

4. Mr. Walter Gerdel
Commissioner of Sewage Disposal
City of Cleveland
City Hall
Cleveland, Ohio

5. Mrs. Donald Francis
League of Women Voters of Ohio
2228 Woodmere Drive
Cleveland, Ohio

ACTIVITIES AND ACCOMPLISHMENTS - FY 1964

The activities and accomplishments of the Great Lakes-Illinois River Basins Project for FY '64 are presented by major areas of activity with each of the major areas further subdivided to show degree of accomplishment by basins, and by Project organization group, where appropriate. Some of the material presented herein includes work done in earlier years which had not been previously summarized. The major areas of activity are: Basic Data Collection; Economic and Demographic Studies; Field Operations; Lake Current Measurements; Laboratory Activities; Engineering Analysis and Evaluation; Flow Regulation Studies; Cooperative Studies by other Agencies; Bibliography; Departures from FY '64 Plans; and Significant Progress toward Pollution Abatement.

Basic Data Collection

The principal activities and work items are as follows: (1) Location and identification of waste sources - Compilation of data in inventory forms and report summaries; (2) Inventory of municipal, industrial and other water uses; (3) Acquisition and compilation of water quality data of record; (4) Index-coding for Data Storage and Retrieval System; and (5) Data Processing. In the subsequent paragraphs there is presented by separate drainage basins a summary of significant accomplishments and the current status of work activities.

Illinois River Basin

The inventory of municipal sewerage facilities contains information on nearly 600 communities. Over 200 of the communities and waste data therefore are listed separately in the basin report summary. Work is completed.

An industrial wastes inventory, listing 186 industries with independent outfalls, was completed. Information was obtained from State and Sanitary District records and supplemented with visits to 54 plants and field measurements at 12 plants or locations.

The inventory of municipal water supplies is completed and covers approximately the same communities as the municipal sewerage inventory. The inventory of industrial process water supplies and other water uses is completed.

Water quality data from about 75 State of Illinois monitoring stations was abstracted and compiled. Available data from other agencies was obtained and work activity is now completed.

Index-coding on 157 U.S.G.S. quadrangle maps is nearing completion. Over 1,500 codings are shown, including nearly 600 communities. Overall work about 80% complete. Estimate completion by 2/1/64.

Systems were developed to code and store on punch cards all raw laboratory data and field observations of physical data. Approximately 70 computer programs were written to transfer the stored data to magnetic tape, to calculate stream loadings, and to perform statistical analyses to determine maximum, minimum, and average loadings, standard deviation, variance, coefficient of variance, and standard error of each set of data. These programs have been used to transfer approximately 35,000 items of data to magnetic tape, and to perform statistical analyses on these data.

Programs were also written for machine calculation of the oxygen-sag equation, for calculation of alpha and beta radio-activity from radio-chemistry data, and for statistically analyzing data from the bacteriological laboratory.

Lake Michigan Basin

The inventory of municipal sewerage facilities will contain information on over 1,000 communities of which about 400 will be listed separately in the comprehensive report. Work is about 60% complete. Estimate completion by 6/30/64.

The industrial wastes inventory at present lists about 360 industries with independent outfalls. Information was obtained from State agencies and supplemented with visits to 20 plants and field measurements at 15 plants. The work is about 60 percent completed. Estimate completion by 6/30/64.

A study of pollution of Lake Michigan by vessels was completed. Information was obtained from Port Commissions, U. S. Army Corps of Engineers, and Park Districts. Commercial vessels carry 95,000,000 tons of cargo on 67,000 trips in a year. An estimated 20,000 pleasure craft use Lake Michigan for about 400,000 trips.

The inventory of municipal water supplies will include the same communities covered in the municipal sewerage inventory. Work is about 60% complete and is expected to be complete by 6/30/64.

Record water quality data in published form has been obtained. Abstraction of data from file records is still in progress. Work is about 40% complete and completion is expected prior to 6/30/64.

Index-coding on over 400 U.S.G.S. quadrangle maps is in progress. Over 4,000 individual codings will be required of which about 1,000 will be for communities. Table 1 is a list of special maps needed for coding purposes. Work is about 20% complete. About 75% completion is expected by 6/30/64.

Variations of the Illinois River programs have been used to store about 15,000 items of Lake Michigan data on magnetic tape, and printouts of these data have been supplied for use of Project personnel.

Lake Erie Basin

The Municipal Water Supply Inventory is essentially complete for the States of New York, Pennsylvania, Ohio, and Indiana. Approximately 490 water supplies have been inventoried in this program.

The Municipal Sewage Inventory is essentially complete for the State of New York, Pennsylvania, Ohio, and Indiana with 550 municipalities having been inventoried.

The Industrial Waste and Water Use Inventory is essentially complete for the States of New York, Pennsylvania, and Indiana. The inventory for Ohio is approximately 20% complete. Data has been collected from a total of 187 industries.

A considerable number of published reports pertaining to Lake Erie and its tributaries have been collected and reserved for pertinent water quality data. The reports have been catalogued and filed in the Field Station's library.

Data for the land use study were collected for the States of Ohio, Pennsylvania, and New York.

The inventory data will be tabulated by tributary drainage subbasins to depict the waste load to the Lake and/or to the water sources. This tabulation will be according to the method outlined in "The Storage and Retrieval of Data for Water Quality Control" by R. S. Green, Chief, Basic Data Branch, January, 1963.

The program is essentially divided into two phases; storing and retrieving. Data is stored on magnetic tape according to stream level and mileage from the mouth of the stream and it is retrieved by utilizing control points identified by stream level and mileage.

This Project has been computing river mileage indices which are the backbone of the program. These indices are being computed from and recorded on U.S.G.S. 1:24,000 topographic maps and 1:62,500 when

the larger scale maps are not available. However, these large scale maps are not available for the northeast section of Indiana and the southeast section of Michigan. We have not computed mileage indices for the 1:250,000 topographic maps for these areas because of the limited accuracy but will wait until the larger scale maps become available.

River mileage indices have been computed for all of the major rivers and streams tributary to Lake Erie in the States of Ohio and Pennsylvania. Water course mileage from the mouth to the confluence of all streams have been computed for all levels of the streams.

Watercourse mileages have also been computed to U.S.G.S. gaging stations, municipal sewage treatment plants and water treatment plants. Mileages to industrial waste outlets will also be computed as part of the inventory of industrial waste discharges.

The next phase of the program will be the final coding of the streams according to levels. This phase of the program will be getting underway as soon as personnel are available.

The report will consist of a relatively short narrative emphasizing the major or critical sections of the inventory depicted in the tabulation. Special waste sources will be evaluated separately in the report. The inventory section will be essentially complete by the end of FY 1964.

Economic Studies

Illinois River Basin

A preliminary chapter was prepared describing the major population and economic aspects of the 15 economic subregions of the Basin. Items covered included trends in value added by manufacture, population (total and municipal), employment, agriculture and trade and services. Five state regional trends (East North Central) were also analyzed and charted. Population projections (total and municipal) were also made for subregions to the year 2010. Supporting data was also prepared and analyzed. To the extent available projections by local government agencies were utilized.

A preliminary study was completed of the Legal, Administrative and Regulatory aspects of water pollution control in the Illinois River Basin. Items covered included a description of State and local organizations concerned with water pollution control and a description of the major statutory authorities and responsibilities of these organizations together with citations of court decisions. The first draft of this report has been prepared.

TABLE 1

SPECIAL QUADRANGLE MAPS FOR LAKE MICHIGAN DRAINAGE BASIN*
State of Michigan

15-Minute

Michigamme	Foster City	Grayling	Elsie
Herman	Gladstone	Bar Lake	Chesaning
Sidnaw	Rapid River	Onkema	Durand
Champion	Garden	Copemish	Corunna
Negaunee	Cooks	Mesick	Laingsburg
Keweenaw Bay	Fairport	Caddilac North	De Witt
Skanee	Peninsula Pt.	Lake City	Portland
Huron Mtn.	Escanaba	Houghton Lake	Ionia
Big Bay	Wausaukee	Manistee	Lowell
Marquette	Stephenson	Freesoil	Grand Rapids
Thayer	Marinette	Wellston	Grandville
Watersmeet	Cross Village	Luther	Holland
Kenton	Kellston	Cadillac South	Fennville
Roussea	Mullett Lake	Marion	Allegan
Perch Lake	Tower	Harrison	Wayland
Ned Lake	Petoskey	Ludington	Hastings
Witch Lake	Beaver Isl.	Custer	Nashville
Republic	Gull Isl.	Baldwin	Charlotte
Ishpeming	Hog Isl.	Reed City	Lansing
Gwinn	South Fox Isl.	Evart	Mason
Skandia	Charlevoix	Lake	Fowlerville
Laughing Fish Pt.	Bayshore	Clare	Lowell
Au Train	Wolverine	Hart	Dexter
Wood Island	North Manitou	Hesperia	Stockbridge
Grand Portal Pt.	Northport	White Cloud	Rives Jct.
Munsing	Central Lake	Woodville	Springport
Shingleton	Cheboygan	Big Rapids	Marshall
Echerman	Gaylord	Mt. Pleasant	Battle Creek
Strong	Empire	Montague	Kalamazoo
Shell Drake	Maple City	Twin Lake	Gobles
Brimley	Traverse City	Fremont	Bango
Sault St. Marie	Elk Rapids	Sand Lake	South Haven
Lake George	Mancelona	Howard City	Manchester
Steuben	Alba	Alma	Saline
Corner Lake	Frankfort	Merrill	Jackson
Trenary	Thompsonville	Lake Harbor	Spring Arbor
Rock	Kingsley	Muskegon	Homer
Northland	Fife Lake	Ravenna	Union City
Ralph	Kalkaska	Cedar Springs	Leonidas
Sagola	Fletcher	Perrington	Schoolcraft
Three Rivers	Benton Harbor	Hartford	Marcellus
Vandalia	Cassopolis	Niles	Three Oaks

*Note: All Lake Michigan Basin maps needed prior to 1/1/64

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TABLE 1 (Cont'd.)

SPECIAL QUADRANGLE MAPS FOR LAKE MICHIGAN DRAINAGE BASIN
State of Michigan

7½-Minute

Michigamme	Brimley	Rapid River SW	Camden
Lake Mary	Paco	Rapid River SE	California
Champion	Kinross	Bark River NE	Kinderhook
Diorte	Shallows	Bulcan	Bronson S.
Marquette	Sault Ste. Marie S.	Vermilion	Burr Oak
Marquette NW	Lafter	Vermilion SE	Sturgis
Negaunee SW	Barbeau	Whitefish Point	Nottawa
Negaunee	Payment	Otsego Lake	Colon
Witch Lake	Baiede de Wasai	Turtle Lake	Bronson N
Republic	Oak Ridge	Big Bradford Lake	Coldwater W
Ishpeming	Helena NW	K P Lake	Coldwater E
Greenwood	Helena NE	Black Creek	
Palmer	Helena SW	Fletcher	
Sands	Helena SE	Cote Dame Marie	
Gwinn	Ralph NW	Grayling	
Fibre	Ralph NE	Wakeley Lake	
Rudyard	Kiernan	Perecheney	
Pickford	Channing	Roscommon North	
Pickford NW	Lake Margrethe	Baldwin NW	
Munusson	Sagola	Baldwin NE	
Munusson NE	Amas	Baldwin SW	
Moran NW	Kels Jct.	Baldwin SE	
Moran NE	Fortune Lakes	Bedford	
Big Beaver Creek	Crystal Falls	Bellevue	
Piatt Lake	Sunset Lake	Ceresco	
Hulbert	Gibbs City	Battle Creek	
Eckerman	Iron River	Delton	
McNearing Lake	Gaastra	Galesburg	
Strongs	Naults	Augusta	
Pendills Lake	Stagger	Banfield	
Sullivan Creek	Commonwealth	Hillsdale	
Sheephead Lake	Randville	North Adams	
Timberlost	Iron Mtn.	Reading	
Shell Drake	Gladstone NW	Frontier	
Emerson	Gladstone SW		
Dollar Settlement	Gladstone NE		
Norway	Gladstone SE		

Michigan areas needed but not shown as available on state index map:

<u>Counties</u>		
<u>Portions</u>		
of:		
Luce	Dickerson	Gratiot
Schoolcraft	Charlevoix	Hillsdale
Mackinac	Roscommon	Branch
Menominee	Clare	St. Joseph
Montcalm		

TABLE 1 (Cont'd.)

SPECIAL QUADRANGLE MAPS FOR LAKE MICHIGAN DRAINAGE BASIN
State of Wisconsin

15-Minute

Star Lake	Green Bay	Ellison Bay
Phelps	New Franken	Washington Island
Beechwood	Casco	Sister Bay
Minocqua	Algoma	Sturgeon Bay
Robbins	Sheboygan Falls	Jacksonport
Three Lakes	Sheboygan South	Merton
Alvin	Mauston	Oconomowoc
Long Lake	Oxford	Hartland
Florence	Montello	Sussex
Iron Mountain	Keshkoro	Menominee Falls
Norway	Ripon	Waukesha
Cassian	Rosendale	Wauwatosa
Rhineland	Fond Du Lac	Thiensville
Monico	Kiel	Milwaukee
Crandon	Howards Grove	Port Washington W.
Laona	Sheboygan North	Port Washington E.
Goodman	Arkdale	Cedarburg
Dunbar	Coloma	Appleton
Pembine	Necedah	De Pere
Tomahawk	Wautoma	Bellevue
Parrish	Redgranite	Green Bay West
Elcho	Neenah	Green Bay East
Wisconsin Rapids	Chilton	Oshkosh
Whiting	Reedsville	
Amherst	Manitowoc	
Waupaca	Racine	
Weyauwega	Silver Lake	
New London	Lake Geneva	
Appleton	Eagle	
De Pere	Hales Corners	
Denmark	South Milwaukee	
Kewaunee	Hartland	
Milladore	Waukesha	
Stevens Point	Milwaukee	
Rosholt	Horicon	
Tigerton	Hartford	
Clintonville	West Bend	
Embarass	Port Washington	
Seymour	Reedsburg	

Wisconsin areas needed but not shown as available on state index map:

Adams County
Winnebago County
A Portion of Door County

TABLE 1 (Cont'd.)

SPECIAL QUADRANGLE MAPS FOR LAKE MICHIGAN DRAINAGE BASIN
State of Wisconsin

7½-Minute

Wisconsin Dells	Iron River
Briggsville	Gaastra
Portage	Fortune Lakes
Randolph	Naults
Fox Lake	Stager
Waurun	Commonwealth
Campbellsport	Randville
Kewaskum	Norway
Lily	Vulcan
Wabeno	Sheboygan Falls
Thunder Mountain	Sheboygan South
Athelstane	School Hill
Wausaukee	St. Wendell
Stephenson	Franklin
Merrill	Howards Grove
Doering	Cleveland
Antigo	Sheboygan North
White Lake	Manitowoc
Langlade	Sturtevant
Mountain	Racine South
Coleman	Pleasant Prairie
Porterfield	Kenosha
Marinette	Paddock Lake
Marathon	Muskego
Wausau	Hales Corners
Hatley	Waterford
Wittenburg	North Cape
Gresham	Greendale
Shawano	S. Milwaukee
Gillett	Frandsville
Oconto Falls	Racine North
Oconto	
Stonebank	

TABLE 1 (Cont'd.)

SPECIAL QUADRANGLE MAPS FOR LAKE MICHIGAN BASIN
State of Indiana

15-Minute

Tolleston
Porter

7½-Minute

Schneider
Shelby
DeMotte
Weatfield
Lowell
Leroy
Hebron
Kouts
La Crosse
St. John
Crown Point
Palmer
Valpariso
Wanatah
Hanna
Kingsford Hts.
Hamlet
Walkerton
Lapaz
Bremer
Nappanee West
Nappanee East
Milford
Wawasee
Ligonier
Ormas
North Webster
Leesburg
Bourban
Inwood
Donaldson
Knox East
Knox West
Warsaw
Pierceton
Lorane
Plymouth

7½-Minute (Cont'd.)

Lydick
South Bend West
South Bend East
Osceola

Indiana areas needed but not shown
as available on state index map:

Newton County
Jasper County
Starke County
Fulton County
Kosciusko County
Whitley County
Wabash County
Pulaski County
White County
Marshall County
La Porte County
St. Joseph County

TABLE 1 (Cont'd.)

SPECIAL QUADRANGLE MAPS FOR LAKE MICHIGAN BASIN
State of Illinois

15-Minute

McHenry
Gray's Lake
Waukegan
Elgin
Barrington

7 $\frac{1}{2}$ -Minute

Wheeling
Highland Park
Arlington Heights
Park Ridge
Evanston

Lake Michigan Watershed

Information was compiled on past economic and population trends (total and municipal) for the 17 subregions of this watershed. Major economic items for which trend data was analyzed included value added by manufacture and employment. Descriptions of the agricultural economy were also included. Preliminary population projections were made for economic subregions.

An outline and a proposed contract was prepared relative to Legal, Administrative and Regulatory aspects of water pollution control. Items to be covered include organizational structures, statutory provisions and analysis of the adequacy of these factors.

Lake Erie Watershed

Information was compiled on past population and economic trends for the 17 subregions of this watershed. Major economic items included value added by manufacture and employment.

Detroit River-Lake Erie Study

In connection with the Enforcement Study of this area, past and future population growth characteristics were summarized. Past trends in manufacturing activity were also summarized, and analyzed. A report draft was prepared for the Detroit River-Lake Erie Project.

Field Operations

In support of the Project's objectives to obtain factual water quality data for use in comprehensive basin planning activities, the Field Operations Branch has been engaged in an intensive program of sample collection, stream flow measurement, lake current studies and data processing responsibilities. The activities and accomplishments of the first three sections of this Branch are reported below. The activities and accomplishments of the Data Processing Section have been incorporated in the report on Basic Data Collection.

Illinois River Basin

Field operations in the Illinois River Basin in FY '64 consisted mainly of completing activities which had been started earlier.

Eight stations on the Illinois River, for the purpose of collecting virus and bacteria by the Moore gauze pad technique, were discontinued in November, 1963 at the conclusion of this study. These stations had been serviced weekly for more than one year.

Carbon filters installed on the Illinois Waterway at Wilmette and Lockport, and continuous dissolved oxygen analyzers at Wilmette, Lockport and Peoria were removed in October, completing this phase of the study.

An investigation of bottom deposits in the upper waterway, Wilmette to Lockport, was made in February and March. A previous study, made in August 1961, indicated that sludge deposits five to seven feet in depth existed in most of the waterway. In the later study, sediment depths were found to be significantly less than those found previously. It is believed that high flows which occurred during September 1961, as a result of over 14 inches of rain, scoured the channel, and that deposits have not yet built up to the depths which obtained earlier.

In connection with the sewer overflow studies, water level gages were operated in the Roscoe Street sewer during the first half of FY 64, while gages were removed from the Union Avenue sewer. Rainfall has been very sparse throughout the fall, producing very few overflows. All gages will be removed by January 1.

First drafts of sections of the basin report have been written, covering sampling activities, hydraulic measurements and computations, and special studies conducted by the Branch.

Lake Michigan

The major emphasis in collection of samples and hydraulic measurements was in the following areas of activity in the Lake Michigan Basin during the year. These were lake sampling, tributary sampling, Calumet area, Menominee River, and Beach and Marina Studies.

Lake Sampling - Sampling of Lake Michigan was conducted throughout the working season, using three vessels operated by the Corps of Engineers, and one operated by the Fish and Wildlife Service. A total of 1,410 station stops were made, with an average of about 4 depths sampled at each station. In general, extended range stations were visited once, and harbor and inshore stations several times each. In addition, various physical observations and measurements were made for meteorological and oceanographic purposes. This activity is 95% complete, and will be completed during the 4th quarter, FY 64.

During the past season, most of the sampling in Lake Michigan has been accomplished using the vessel T-509 which is equipped with a laboratory and quarters for a crew of eight. The vessel T-501, a sister ship to the T-509, will be equipped with a laboratory and

crew's quarters this winter at the Corps of Engineers' boatyard in Kewaunee, Wisconsin. Thus, the Project will have two lab boats available during the 4th quarter FY 1964. The T-509 will be assigned to the Lake Erie Field Station for full time work in Lake Erie next season. The T-501 will be used for deep water sampling in the areas occupied by current meter stations in Lake Erie and Lake Ontario.

Tributary Sampling - Sampling of Lake Michigan tributaries on a weekly basis was begun in April 1963 and is scheduled to continue for one year. Twenty-nine stream stations were established, generally near the mouths of the tributaries. However, selected stations were located inland to determine waste loads from runoff from areas with different types of land use. In connection with this program, it was necessary to establish and operate four stream gaging stations in order to determine daily flows on those streams for which the U. S. Geological Survey could not furnish the data.

Calumet Area, Illinois and Indiana - An intensive survey of the streams and lake front in the Calumet area was made during August and September. The study was conducted for two ten-day periods with a four-day break in between. A total of 35 river stations were sampled daily, and 50 lake stations were sampled five times during the survey. Stream flow was measured at four locations during the study.

The industrial complex in the Calumet area was the subject of a screening survey for industrial wastes during October, November, and December. A total of 95 outfalls and 10 water intakes were sampled at selected industries on Calumet Harbor and Indiana Harbor. Stream samples were also collected at selected locations. Samples were collected at 2 or 3-hour intervals and composited on a 24 or 48-hour basis for each industry sampled. A flow measurement was made at the time each sample was collected. Results of this survey will be used to determine which industries will be intensively studied in the coming months.

Inshore and harbor stations in the Calumet area of Lake Michigan were investigated on three occasions for phenolics concentration. Samples were collected in October, November and December at 42 locations from Calumet Harbor to Burns Ditch. Particular emphasis was placed on areas adjacent to municipal water intakes.

Menominee River Sampling - During August, field support was furnished to personnel from R. A. Taft Sanitary Engineering Center, in a joint sampling program of the Menominee River and Menominee Harbor. Data was collected on the water quality of the area to

support an enforcement study by PHS. Technical and scientific personnel and equipment were furnished for a two-week period. Twenty stations were sampled twice a day for ten days.

Beach and Marina Sampling - A study of water quality in bathing areas of public beaches and at marinas in Milwaukee and the Chicago area was made in late August. Samples were collected in the morning and afternoon, for 5 days including a weekend, at four beaches in the Chicago area. At Milwaukee beach samples were collected for 14 days. Samples were also collected once daily at marinas located in the general vicinity of the beaches.

Lake Erie Basin

Reconnaissance Activities - During the year a development sampling program was undertaken. Nine harbor and lake-affected tributary areas were sampled at 140 stations for a total of 1,000 samples.

During the year two cruises were made of the inshore and extended range stations in the U. S. and Canadian portions of Lake Erie.

Samples were collected from three depths at the extended range stations and from mid-depth at inshore stations. Selected chemical, bacteriological and biological analyses were made on the samples.

Five-hundred samples were collected from 150 stations in U. S. Waters and 33 stations in Canadian Waters.

In addition, 200 samples were collected in dispersion studies at two areas of river confluence with the Lake.

Tributary Sampling Program - The Lake Erie Basin Tributary Program will begin during the 3rd quarter and will consist of studying the significant streams to furnish a water quality management plan that can be used to control the quantity and quality of water at the desired levels.

In order to prepare such a water quality management plan, one must be able to predict the water quality and water quantity under varying conditions of weather, waste loading, and flow rates. These predictions can be made through judicious use of mathematical models or formulas derived from data collected from the stream under varying conditions. The tributary sampling program will be designed to collect data necessary for the derivation of these mathematical models.

The following streams will be studied:

Maumee River
Ottawa River
Portage River
Sandusky River
Black River
Rocky River
Cuyahoga River
Clinton River

Tributary Load Contribution Studies - The tributary load contribution studies will begin in January, 1964. These studies will be conducted for the purpose of determining the waste contributed to the lake by the streams. A principal use of this data will be the construction of long term water quality models on the lake

A great deal of study has resulted in the conclusion that the most practical way of determining the waste contribution of streams to Lake Erie is to add the waste contributions to the lake-affected area to that coming into the area from upstream.

Specifically, the proposal is to establish sampling points at convenient points above the lake-affected areas where fairly accurate flow measurements can be made. Analysis will be made for phosphorous, nitrogen, BOD, DO, and other routine waste parameters plus other parameters of local significance.

The load contribution from the lake-affected area will be determined from the inventory supplemented by data collection in the tributary model studies.

In addition to the streams listed above, the St. Clair River and Lake St. Clair will be included in this phase of the study.

Results obtained by the Detroit-Lake Erie Project will be incorporated into these studies also.

Harbor and Inshore Sampling Program - The inshore sampling program will begin during the 4th quarter. This program is designed to collect data that can be mathematized into a formula or model to be used as a tool in managing the water quality of areas with critical water uses.

Intensive or synoptic type surveys will begin during the 4th quarter. This program will furnish data necessary to construct a prediction model for areas of the lake adjacent to areas with critical water uses and will consist of sampling a large number of stations for a few significant parameters over a two day period.

When particular conditions exist causing the waste to "plume" into the lake, special studies will be made to collect data to mathematize and to describe the effects on water quality. The parameters measured will depend upon the character of the waste under study. Several parameters easily and quickly determined such as specific conductivity, chlorides and temperature will be used to guide the sampling and confine it to the plume, except for control samples taken from the surrounding waters. We estimate two to three such studies will be made. Meteorological data, such as wind velocity, duration, temperature, sunshine, precipitation, etc., will be collected for each study period.

Four of the synoptic studies will be made in each area under study. Twelve general areas are considered for study -- four from Detroit and eight from Cleveland. The four from Detroit are: two in Lake St. Clair, Detroit, and Toledo. The eight from Cleveland are: Sandusky, Lorain, Cleveland, Fairport, Ashtabula, Erie, Irving, and Buffalo. There will be one to three synoptic survey areas in each of the general areas.

This program may be conducted in conjunction with a two weeks per season type inshore sampling program.

Samples will be analyzed for phosphorous, nitrogen, BOD, DO and other routine waste parameters of local significance.

Extended Range Sampling - The extended range cruises will furnish data to supplement existing data for the construction of a long-term prediction model.

One such cruise will be conducted in each of the three seasons, spring, summer and fall, using a T-boat with laboratory.

Special Studies - These studies will be designed to assist in the evaluation of special problems that will arise during the course of the study, to establish significant sources of pollution, and the development of the comprehensive water quality management program. The need for special studies will be determined as each individual phase of the study is completed and evaluated.

At the present time it is unknown exactly how many special studies will be undertaken. The following activities will be considered: Storm water overflows, Carbon filter studies, Bathing beach surveys and Industrial waste surveys.

In general, the special studies will be joint efforts with state, county, city and local agencies. The Public Health Service will act as coordinator and furnish laboratory and technical assistance as required to facilitate the programs.

Combined Sewer and Storm Run-off studies planning is in the formative stage at this time. Present thinking is that the Combined Sewer studies are likely to be confined to compilation, review, and analysis of existing data and reports. Such a program should include the Cities of Detroit, Toledo, Cleveland, Erie, and Buffalo. On the other hand, if legislation presently before Congress should secure early passage, special emphasis will be placed on the Combined Sewer study in Cleveland. A special survey has been conducted in conjunction with the City of Cleveland to collect and sort data on its combined sewer system. The results of this survey have been forwarded to the Basic Data Branch in Washington.

Carbon filter stations will be located at tributary sites and at such places along the watercourse as would be subject to changing conditions of organic loading. No valid and firm location of the carbon filter stations can be made without an on-site survey. The following locations indicate the sites of existing or proposed stations: Detroit River, Maumee River, Cuyahoga River, Niagara River (2 locations), and Buffalo River.

The following locations will be considered in selecting sites for additional carbon filter units: Black River, Grand River and Lake Erie - Selected water intakes.

It is anticipated that sampling of bathing beaches will be undertaken to determine the extent of bacteriological pollution. Sampling at the beaches will involve determination of the bathing loads, weather conditions, and the bacteriological quality.

It is anticipated that this study will be a cooperative effort with state, county, city, and local agencies and the field station will coordinate the activities.

It is anticipated that sampling of waste water outlets from selected industrial waste sources discharging separately to the watercourses under study will be required.

Industrial waste sampling would include the installation of special flow measuring equipment and other sampling and monitoring equipment as required by the waste being sampled.

It is anticipated that this will be a cooperative program with the various industries and state agencies.

Lake Current Studies

Lake Michigan Basin

Current Measurements - The current meter program for FY 1964 included a total of 32 stations. These stations were removed from the lake in October and November and 18 new stations were set for operation through the winter of 1963-64. The data from the summer-fall stations will be processed in the third and fourth quarter.

A typical setting is described by reference to Figure 2. The station is set and descriptive information included with a sketch similar to Figure 2 for each station. This is filed in the master log book as an "out" station. The station is allowed to remain in the lake for a period of 3-4 months, on a predetermined schedule.

Upon retrieval, an identification sheet, Figure 3, is made out for each meter, and is sent with the film to the film processor. The film is removed from the meters, checked for distance moved, indexed to the meter number and forwarded to Cine Service for processing. Cine Service sends two copies of the film to the Geodyne Corporation who previews the film stores the original and forwards the previewed film to Information International. The preview discloses the exact start, film irregularities, unusual changes, etc.

Information International reads the film according to the New York University instructions and places the data on magnetic tape. The tape is sent to N.Y.U.

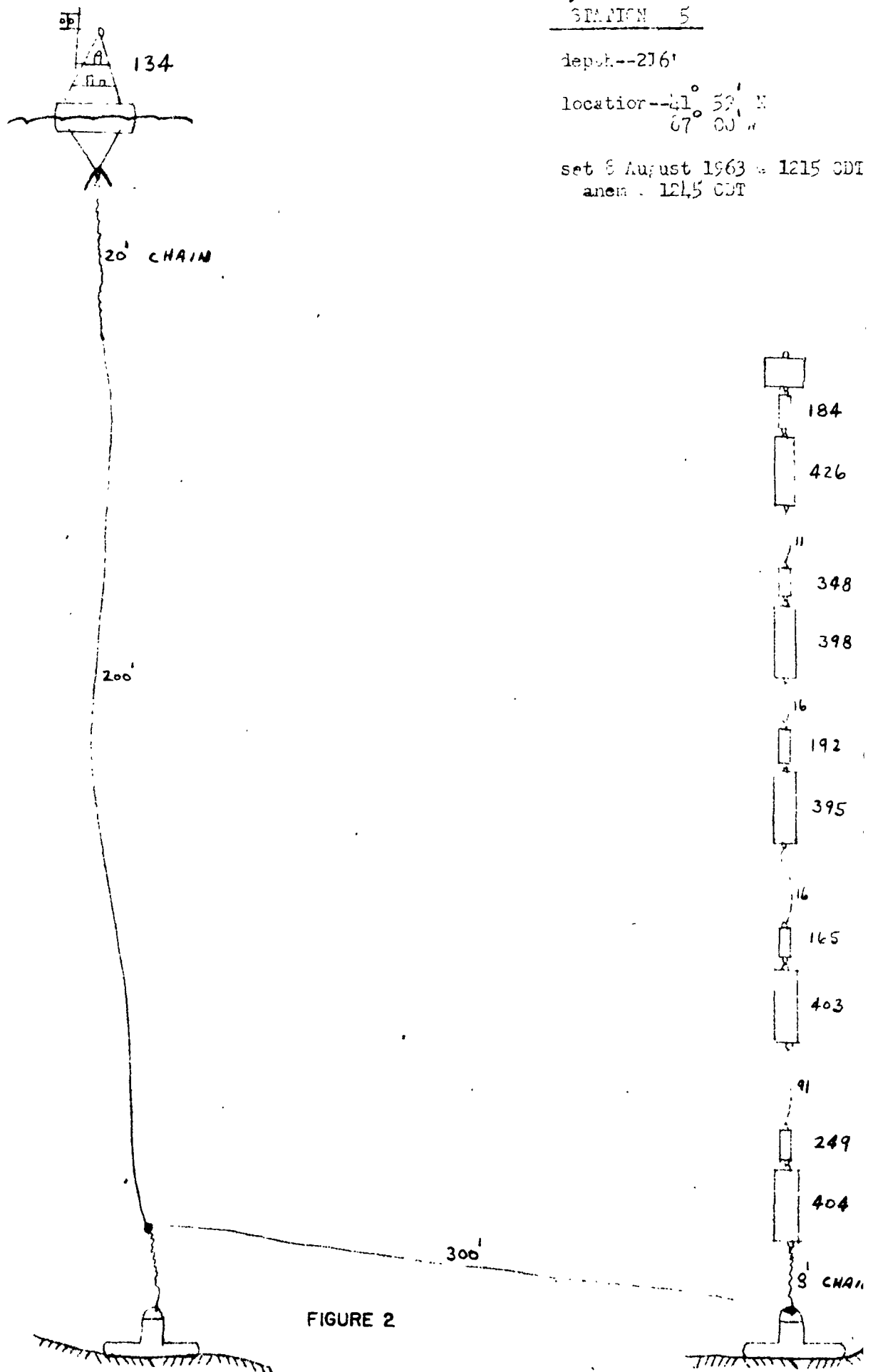
New York University runs the tape on any of several programs constructed by the staff of GLIRBP. The contract with N.Y.U. has only been in force for one month and further programming has not been completed. At present, we now program a two hour envelope of speed and direction, standard deviation, histogram - bivariate frequency distribution of speed and direction, data printout, and 6, 12, 24, and 48-hour averages.

STATION 5

depth--216'

location-- $41^{\circ} 53' N$
 $67^{\circ} 00' W$

set 8 August 1963 @ 1215 CDT
anem. 1215 CDT



Date _____
 Film Serial No. _____ Emulsion No. _____
 Type of Inst. _____ Serial No. _____
 Date/Time Started _____ Station No. _____
 Date/Time Ended _____ Depth _____
 Speed of Film (Cont.) _____ Time (Interval) _____
 Lat: _____ Long: _____
 Lake: _____ Job: _____
 Beginning Ft. Mark _____ Frames Skipped _____
 Batch No. _____
 Processing Neg. _____ Positive _____ Quantity _____
 Edge No's Original _____ Prints _____
 Original Stored _____
 1st Print Stored _____
 2nd Print Stored _____
 Film to be read
 Continuous _____ Interval _____
 Recovery Buoy # _____ Temperature Recorder # _____
 Copy
 _____ Geodyne
 _____ Information International
 _____ NYU
 _____ Permanent File
 _____ Other Files

GREAT LAKES & ILLINOIS
RIVER BASINS PROJECT

IDENTIFICATION SHEET AND LOG

U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
 PUBLIC HEALTH SERVICE
 REGION V CHICAGO, ILLINOIS

Perhaps the unique accomplishment is the collection and tabulation of nearly one million current meter readings and the collection of nearly one million temperature records to date. The data has disclosed several important factors:

1. The presence of high speed (1.6 mph) currents at the 800 foot depth.
2. The presence of rotating or wave form movements at nearly all depths with a period near the inertial period (17+ hours). This period is induced by the earth's rotation.
3. The presence of long and short period internal waves on the thermocline over the entire lake. These periods vary from 20 minutes to over 17 hours (the inertial period). The wave heights on the thermocline appear to be about 25 feet high during August.
4. Southern Lake Michigan has two principal circulations, clockwise in winter and counterclockwise in summer.
5. The winter '62-'63 data have been analyzed in some detail and the circulation appears to be wind dependent.

In addition to the earlier reports of Lake Current Studies, LM Series 7 thru 11, submitted to the Department of Justice, the Section has submitted LM 12, "Currents in the Southern Basin" which was also entered in evidence.

The Section has completed, in draft form, a report on the initial studies in Lake Michigan covering the Period December 1962 to April 1963. This report includes the types and kinds of equipment being used and methods of processing the data. It is expected to be available by February of this year.

Wind and Current Relationships - Progress was made in developing a general model of lake currents produced by several of the possible wind regimes for Lake Michigan. A computer program has been written for this purpose. Availability of buoy and aerovane wind data with some of the current data, and development of a method of systematically relating this wind observation to the air pressure field over the lake, assisted in this task.

Comparative Rainfall Studies - (a) A comparative rainfall study, warm season only, between the Chicago area and the 68th Street Crib, 3 miles offshore in Lake Michigan, is being conducted to develop better understanding of shore to over water rainfall.

(b) Rainfall data, warm season only, is being recorded on three Chesapeake and Ohio Railroad car ferries in central Lake Michigan to gain familiarity with over-water rain occurrence on this portion of the Lake. Additional data are needed to carry out meaningful analysis.

(c) A small network of 10 cooperative stations for observation of snowfall and temperature has been established on the southeastern shore of Lake Michigan. A study of these data is expected to provide a better understanding of conditions leading to the development of the different types of lake snow storms. This should lead to a method for estimating the amount of water which evaporates from the lake surface during periods of snowfall, and to an improvement in the prediction of lake snowfall intensities.

Comparative Cloud Observations - Cloud data for Lake Michigan were gathered by GLIRBP sampling crews while on the water. North Central Airlines also supplied over-water cloud cover data.

Comparison of over-water cloud cover to that over surrounding shore areas will permit estimation of radiation differences received by the water and by surrounding land areas. Reduction of these data by the meteorologist, at this time, is not planned.

Meteorological Tower - A steel tower rising 55 feet above the water surface, located a mile west of Muskegon, Michigan, in 50 feet of water, was erected by the Corps of Engineers. This tower provides a platform for the study of momentum flux between air and water. This tower, which is movable, will remain in the Lake, except during winter months when it is stored at Grand Haven, Michigan. Instrumentation during the fall of 1963 provided preliminary data, and studies will be carried on during next spring, summer and fall. The meteorologist will keep the Project advised of the progress of this study.

Laboratory Activities

In support of this Project's objectives to obtain factual water quality data for use in comprehensive basin planning activities, the Laboratory Branch has been engaged in an intensive analytical program consisting of biological, microbiological, chemical and radiochemical analysis of samples collected for these purposes, and reports incorporating the findings resulting from these analyses. These activities and accomplishments are reported below by the various sections of the Laboratory Branch.

Illinois River Basin

Biology - Four seasonal field studies of the Illinois River System were completed prior to July 1, 1962, and laboratory analyses of approximately 915 collections were completed in May, 1963. Some of these data were used to report effect of Chicago Metropolitan Area wastes to the Special Master in the U. S. Supreme Court diversion hearings. Tabulations and graphic presentations of the data are finished and a final report evaluating biological conditions of the Illinois River System is in progress.

A study was made to determine the causes of severe algal problems in the Fox River Chain of Lakes. About forty phytoplankton and water chemistry samples were analyzed to better define the severity of bloom. The history of the lakes was gleaned from the file of several agencies and from field inspections. A report was completed that discussed the elements of the problem and outlined immediate and long-term remedial measures.

A similar study was made at Cedar Lake but only six sets of samples were analyzed. Previous work at the lake by the Project biologist obviated the necessity for a large sampling program. A report was prepared that defined the problem and suggested remedial measures.

Microbiology - This activity involved intensive field samplings collected throughout the basin, beginning in 1961 and continuing through 1962, with a study of virus prevalence continuing through 1963. Included in this activity were the basic microbiological investigations of the principal streams in terms of coliform and fecal strep density, studies of storm water overflow, sewage treatment plant effluents, effect of chlorination on treatment plant effluents, survival of indicator organisms in various environments, and occurrence of entero-pathogenic bacteria and virus. Approximately 22,000 analyses were performed on the samples obtained.

Special reports were prepared on the findings of the above studies and have been incorporated in the Project's report to the Department of Justice and in the "Chicago and Environs" report to the Jones Committee.

The report of microbiological findings to be incorporated in the Illinois River Basin Comprehensive Plan is in its terminal stage of completion.

Chemistry - The primary objective of the Chemistry laboratory was to determine the physical and chemical quality of waters in this basin. This study which included Lake Michigan, the upper and lower Illinois River, storm water overflows, tributaries, industrial wastes, and sewage treatment plants consisted of the collection of over 11,300 samples and over 200,000 analytical tests. The major tests are listed as follows:

Biochemical Oxygen Demand	ABS
Dissolved Oxygen	Iron
Chlorides	Toxic Metals
Sulfates	Suspended Solids
Ammonia Nitrogen	Dissolved Solids
Organic Nitrogen	Alkalinity
Nitrate Nitrogen	Organic Contaminants
Phosphates	(a) Carbon Chloroform Extracts
Phenols	(b) Carbon Alcohol Extracts

The data programmed on an electronic computer was printed out and analyzed. Graphic illustrations and tabulations have been made. The final report of findings in the Illinois River Basin is now under preparation and will be completed in January 1964.

The laboratory was enabled to complete this tremendous volume of analyses through the acquisition of two Technicon Auto-Analyzers and the intensive use of other instrumentation on many of the analytical procedures.

Radiochemistry - The study of radiochemical quality of water in the basin has consisted of direct laboratory analyses and collection of information from State, local and private records. Laboratory analyses, consisting of gross alpha and beta counts of samples of suspended and dissolved solids, bottom muds, algae and bottom dwelling organisms, have resulted in a total of 2700 determinations. Laboratory automation and data processing by computer techniques has minimized the cost and manpower needs of this activity. Preliminary results of the findings have already been incorporated

into the reports to the Department of Justice. The final report, for inclusion in the Illinois River Comprehensive Plan, is scheduled for completion by January 1964.

Lake Michigan Basin

Biology - Lake sampling began in 1962 and carried through to December 1963. In order to determine the lake areas adversely affected by wastes, and the general biological condition of the lake, approximately 2,250 collections were made of three principal parameters: the benthic fauna to evaluate localized effects of pollutants and to determine the progress of eutrophication; net plankton to assay biological productivity and to measure the standing crop of photosynthetic materials; and phytoplankton to determine the species distribution of the standing crop. Related limnological measurements such as secchi disc readings, temperature, and pH were made in the field.

All of the laboratory examinations for 1962 lake specimens are complete and about 60% of the 1963 examinations are complete. All of the Lake Michigan data will be ready for tabulation in April 1964.

In November and December, 1963 a wildfowl kill involving an estimated 10,000 birds occurred on the southeastern shore of Lake Michigan. Project biologists devoted many days to a study of the kill, including the dissection of birds, analysis of their organs and gut contents. Early coordination of the investigation by several federal and state agencies was assumed.

Bioassays were made of 56 industrial waste samples as a part of the Calumet area survey. Tests are continuing but an interim report has been completed and submitted to the Engineering Section.

Studies were made of the biota of three Michigan streams as a part of a study of pesticides. All aquatic organisms except fish were collected for evaluation of stream damage. An estimated collection of 60 specimens was involved. Laboratory analyses are complete and tabulation of data is in draft form.

A special study of midge larvae (Bloodworms) is being carried out in cooperation with Central Michigan University by a \$2,300 purchase of services. These organisms have special meaning in pollution tolerance evaluations and the information obtained on their occurrence in some areas of Lake Michigan is specific.

Special investigations were made in July and August, 1963 of an infestation of Lake Michigan littoral waters by filamentous algae, generally Cladophora. Project biologists were in contact with the Chicago South District Filtration Plant where the material clogged water plants intake screens.

Microbiology - A comprehensive survey of the distribution of certain bacterial forms in Lake Michigan is being made to detect the extent of existing pollution and the general organic enrichment of these waters. These include the incidence and distribution of coliform, fecal streptococci, and bacterial flora capable of growth at 20°C and 35°C. Generic identification of the growths at 20°C and 35°C was also undertaken. Special laboratory vessels, fitted with oceanographic equipment, were necessary for this activity.

Short-term investigations were made on several streams tributary to Lake Michigan, with greatest emphasis on the network of streams at the southern tip of the Lake in Illinois and Indiana where the largest industrial complex in the entire study area is located. This activity is completed. The results will be included in the Lake Michigan Comprehensive Report.

A special field laboratory with professional personnel was provided for a short-term study of the Menominee River in Michigan as part of an anti-pollution enforcement action.

Five beaches and five marinas were studied. The beaches and marinas were located in Wisconsin, Illinois, Indiana, and Michigan. The objective was to determine the present water quality in these areas and to study the effect of the respective recreational usages of the waters.

The Microbiology Section has prepared reports of its findings in the study of Lake Michigan for inclusion in the Project's report to the Department of Justice and also in the "Chicago and Environs" report to the Jones Committee. It has also prepared several reports for publication as listed elsewhere. Its report on findings in Lake Michigan, for the Lake Michigan Comprehensive report is scheduled for completion by July, 1964.

Chemistry - The objective was to determine the existing chemical quality of the lake waters and to determine the effects of additional pollutional loads on the quality in future years. Approximately 1200 samples have been collected since the beginning

of the fiscal year. Over 5,000 analyses have been completed to date. The total analyses when completed on all collected samples will approximate about 25,000 determinations. The parameters under study are essentially those listed earlier for the Illinois River basin.

The data are processed electronically at the facility in SEC and will be analyzed and presented in a comprehensive report to be completed in July 1964.

A study was made to determine the concentration of phenolics, oil, and ammonia, and the pattern of distribution of these pollutants in the southern basin of Lake Michigan. This activity has entailed the collection of 465 samples and 1400 analyses to date.

Tributaries studies were undertaken on the tributaries discharging into Lake Michigan, to measure the loads of pollution entering the lake from this source. Over 900 samples have been collected to date and 3,960 analyses made. The completion of this study will entail the collection of approximately 1,600 samples and 33,000 analytical determinations. In the tributaries program, special attention was devoted to the Calumet River system, since this is perhaps the most heavily industrialized area. This study included collection of about 700 samples with 16,000 analytical determinations.

The primary objective of the industrial wastes survey was to determine the effect and extent of pollution from industrial outfalls discharging wastes into the tributaries and also the lake. This study began in October 1963. Approximately 130 samples have been collected to date and 780 chemical determinations performed. Included in these analyses have been tests for phenols, cyanides, sulfides, phosphates, D.O. and iron. The complete study will approximate around 2,600 chemical determinations.

A comprehensive study of chemical pollution indicators was undertaken on five beaches and five marinas located in Illinois, Indiana, Michigan, and Wisconsin. The principal objective of the study was to determine the chemical quality of the water in respect to recreational usage and requirements.

A special pesticide residual testing program was conducted along the streams discharging from the fruit country in lower Michigan. Three streams were sampled a total of 14 times from June thru September. The samples were processed in GLIRBP laboratories and later sent to Atlanta, Georgia for analysis by gas chromatography.

A study of taste and odor problems at six Chicago and vicinity water intakes was begun FY 64. The carbon filter is used in this study to determine the organic contaminants. Sixty-four samples have been analyzed to date.

Radiochemistry - Radiochemical levels are being investigated as a part of the study of water quality of the lake and its tributaries, using the same parameters as in the Illinois River. Some Sr-90 analyses are also being carried out on samples from tributaries discharging to the Lake. Approximately 17,000 analytical determinations will result from this study.

A preliminary report of radiochemical findings in Lake Michigan has been incorporated in the Project's report to the Department of Justice. The report of findings in Lake Michigan is scheduled for completion by July 1964, for inclusion in the Lake Michigan Comprehensive Plan.

Special sampling of Lake Michigan in the area near the Big Rock Point Nuclear Reactor was planned for December 1963 and April of 1964. The December study was cut short by bad weather. The April study will be of five days duration. This study will include sampling for water, plankton, algae, bottom muds and biological specimens, which will be analyzed for gross alpha and beta activity and for specific radionuclides when gross activities are high.

Approximately 100 water samples, 100 plankton samples, 100 bottom muds and over 100 biological specimens will be collected. Over 1,000 analyses will be made at a laboratory cost of 45 man days and \$4,000. The report of this study will be included in the Lake Michigan Comprehensive Report.

Lake Erie Basin

Biology - Biological investigations in the Lake Erie area will be undertaken with four ultimate objectives:

To evaluate the general biological conditions of the lake; to define local or zonal effects from tributaries and waste discharges; to provide the biological information required for explanation and interpretation of certain chemical, bacterial and physical data; and to guide the development of water quality control measures that will promote desirable, and inhibit undesirable aquatic life.

Samples of benthic animals, attached flora, and phytoplankton will be collected at stations selected to coincide with stations where chemical, physical and bacteriological measurements will be made.

A minimum program would involve studies of the biological parameters as outlined below:

<u>Parameters</u>	<u>Frequency</u>
Phytoplankton	Bi-weekly in streams All samples from lake
Benthic fauna	Seasonal
Attached algae	Seasonal
Rooted weeds	Seasonal

The following activities have been begun, completed, or scheduled for FY 1964:

1. Biological investigations will be extended to the Detroit and St. Clair Rivers, and Lake St. Clair in the spring of 1964. Also upstream portions of Lake Erie tributaries, selected for study by Field Operations will be sampled.
2. All navigable portions of major Lake Erie tributaries and harbors have been sampled for bottom fauna and attached algae two to three times, and for aquatic weeds once. The final survey of bottom fauna and attached algae in this area is planned for spring 1964.
3. During the past year biologists were aboard three Lake Erie inshore cruises and one extended range cruise collecting benthic and plankton samples. One extended range cruise is scheduled for the spring of 1964.
4. Bi-weekly plankton sampling of 31 stations in 14 Lake Erie tributaries has begun and will continue for at least one year.
5. Laboratory personnel have begun processing benthic samples and this will continue for the remainder of the year. Plankton samples are being counted by biologists in the Chicago laboratory.

6. One preliminary report has been prepared on the first tributary sampling trip.
7. A literature survey of reports, papers, etc. pertinent to aquatic biology in Lake Erie will begin in January 1964.

Approximately 130 stations in 15 river and 15 harbor areas have been sampled twice each. In addition approximately 250 benthic samples and 250 plankton tows have been collected from the lake.

Microbiology - The following parameters are being studied by Field Station Microbiologist in FY 1964:

Coliform determinations, Coliform differentiations, Fecal Streptococcus, Total Plate Count, and special studies, which include Pathogen detection and Survival studies. Approximately 1500 samples have been analyzed for bacteriological parameters.

Chemistry - The chemistry laboratory program consists of the analysis of the following parameters, distributed between Cleveland and Chicago in accordance with established laboratory capabilities as follows:

Cleveland - pH, alkalinity, specific conductance, dissolved oxygen, chloride, BOD, COD, dissolved and suspended solids, cyanide, phenols, and turbidity.

Chicago - composited samples of gross minerals (Na, K, Ca, Mg, Si, SO_4 , F), carbon, chloroform extracts, ABS, nitrogen, phosphate, oil, heavy metals (Cu, Cr, Cd, Zn, Pb). About 12,000 analyses have already been made on approximately 1700 samples.

Because of the large backlog of preserved samples in Chicago, it is estimated that much of the chemical data will not be available for several months after collection.

Radiochemistry - The investigation of Lake Erie will follow essentially the same pattern as that of Lake Michigan. Sample collection started in April 1963 and continued throughout FY 64. Samples were collected for Radiochemistry at the same time and location as those collected for chemical, physical, biological and

microbiological studies. Water samples, plankton, algae samples and bottom sediment samples were collected and analyzed for gross alpha and beta activities, and selected samples were analyzed for Strontium-90. All analyses are being conducted at the Chicago laboratory.

Three hundred and thirty analyses were completed by the end of FY 1963 and 2,000 analyses will be completed by the end of FY 64.

Special sampling of Lake Erie in the area near the Fermi Reactor will be conducted in May 1964. The study will be similar in scope and cost to the Big Rock Point study. The report of this study will be included in the Lake Erie Comprehensive Report.

Headquarters laboratory Cooperative Activities

Since June 1963, 272 samples received and 3000 analytical determinations were performed for the Detroit-Lake Erie Enforcement Project.

A regular program of carbon filter studies is being conducted for the International Joint Commission. This program includes infra-red characterization of carbon chloroform extracts. To date 450 determinations have been made on 48 samples received.

The Laboratory Branch is providing support services to the Indianapolis recreational water quality study.

Engineering Analyses and Plan Formulation

Principal activities included under this section are detailed as follows:

Hydrology - Appraisal of adequacy of ground and surface water sources to supply present and future demands; low-flow frequency analyses to determine design drouth conditions for relating stream flow to water quality objectives; estimation of flow regulation for water quality control; and water balance studies.

Land Use - Analysis of present and future land use practices as related to water quality; determination of pollutional characteristics of surface runoff from urban and rural areas.

Water Demands and Waste Return Flows - Evaluation of factors for association with economic projections to determine future water demands and waste flows.

Water Quality Goals - Development of water quality guides for selected categories of use; determination of desirable beneficial uses for stream or lake sectors; and establishment of water quality goals to accommodate uses.

Stream and Lake Quality Analyses - Determination of the waste assimilation capacity of principal streams and significant tributaries by means of mathematical formulation or models; evaluation of effects of present and future waste loads on lakes and streams; identification of present and potential problem areas; and estimation of flow regulation or other control measures required to achieve water quality goals.

Water Quality Control Measures - The analysis and development of measures to improve or preserve water quality and the establishment of a timetable for accomplishment.

Illinois River Basin

Hydrology work is about 90% complete and over-all completion is expected by 2/1/64. Low-flow frequency analyses were performed for several stream gaging stations on the main stem and at least one station in each of 10 subbasins. Water resource studies and report drafts are completed. Curves showing stream temperatures throughout the year were prepared for representative locations in the basin. Also prepared were flow-velocity and depth-velocity curves for use in conjunction with stream quality analyses.

A draft of Appendix IX, Water Quality Related to Land Use and Agricultural Water Needs, has been completed. Land use practices that harm water quality have been determined and are discussed along with recommended improvement measures. Present and projected land uses are tabulated for each of the 16 subbasins. Present and projected water uses for irrigation, domestic supply and stock watering have been determined and are tabulated for each subbasin. The quality of runoff and the adverse effects of significant impurities have been determined and are presented.

Determination of water demands and waste return flows is essentially completed. Water use factors were derived from a study of records of 15 selected communities, each of which were contacted to obtain operational data for a ten-year period. Waste return flow factors for the same communities were derived from 10 years of operational data for the sewage treatment facilities. Factors for the ten-year period, together with other

indicator trends, were used to develop factors for estimating future water demands and waste flows. A draft of Appendix V, Correlation of Water Use and Waste Factors, is completed.

The Technical Committee, assisted by Project staff, has about completed its task in developing water quality goals for the basin. Each of the Work Groups determined quality guides for assigned categories of use, irrespective of location. It is believed substantial agreement and acceptance have been obtained for proposed water uses and related water quality goals. Uncompleted work consists of preparation of the draft of a Chapter and an Appendix, both titled: "Water Quality Goals," for the basin report. The drafts are expected to be ready for review by 2/1/64.

Stream quality analyses are being conducted for the Upper Illinois River System, the Cal-Sag Channel System, the Lower Illinois River and 10 principal tributary streams. Extensive studies and analyses have been undertaken on the Upper River for which mathematical formulation includes effects of combined sewer overflow loads and bottom sludge deposits. Numerical solutions for dissolved oxygen and flow regulation are calculated by electronic computer. Similar but less involved analyses have been completed for the Fox and Sangamon Rivers. For the remaining tributary streams, analyses have been made at significant waste discharge locations to determine stream deficiencies and flow regulation requirements. The results of stream quality analyses will be summarized in Chapter 10, Impact of Waste Loads on Streams. The analyses and the Chapter draft are expected to be completed by 2/15/64.

Lake Michigan Basin

The water balance studies for Lakes Michigan and Huron are essentially completed. Other studies are expected to start in February, 1964. It is estimated Hydrology activities will be 75% completed by 6/30/64.

A draft of the Appendix on Land Use has been completed. Included in the draft is a review of soil types and a map of the basin showing major soil groups. Types of farming are depicted on a map on which the basin is subdivided into 9 sub-areas. Land use practices and their effects on water quality, together with recommended improvement measures, are detailed in the draft.

Efforts to determine water demands and waste return flows will commence in February 1964. Completion is expected by 6/30/64.

It is expected approximately 10 selected communities will be contacted to obtain operational data from water and sewerage systems. Information developed for the Illinois River Basin will be utilized in evaluating water use and waste return flow factors.

Development of water quality goals will require employment of procedures similar to those followed for the Illinois River Basin. Much of the background data, literature review and Project staff reports on hand should be useful. Work groups require re-organizing for equitable representation. Assuming commencement of activities in February 1964, work should be about 60% complete as of 6/30/64.

Stream quality analyses will be conducted on approximately 18 principal tributaries to the Lake. Extensive analyses are contemplated for the Fox, Grand, Kalamazoo and St. Joseph Rivers. Limited analyses are expected to suffice on the balance of the principal tributaries to evaluate stream deficiencies and flow regulation requirements. Work is expected to start about 2/15/64 and progress to about 60% completion by 6/30/64.

Lake quality analyses will be designed to determine local and lake-wide effects of pollutants on water quality. Estimates of long term trends and critical concentration levels will be made. Work is expected to start about 4/1/64 and progress to about 50% completion by 6/30/64.

No work is expected on water quality control measures prior to 6/30/64.

Lake Erie Basin

The engineering analysis section is responsible for the evaluation of the data generated by the Project as well as evaluating the historical data. This activity has been recently started. Accomplishments are limited to defining the problems and setting forth the methods used to solve these problems.

The evaluation will include the determination of needs for further studies, preparation of detailed study plans to obtain specific information, formulation of mathematical models of both tributaries and Lake Erie, and coordination of activities for the preparation of reports.

The initial activities will be involved with determining the adequacy of existing data and the design of detailed study plans to complete the data.

This activity will continue for the duration of the Project. The additional responsibility of report preparation will be assigned to this section at the conclusion of field activities.

Flow Regulation Studies

Reports to construction agencies on the needs and value, if any, of municipal and industrial water supply and/or water quality storage in proposed reservoirs are made by the Cooperative Studies Section, Planning and Reports Branch of the Project Headquarters, are now in progress. Studies have been made, for areas of Region V outside of the GLIRB Projects study area and for areas of Region II that are included within the GLIRB Project Study area. Two of our current projects in this program are comprehensive water resources studies covering a full river basin. In each of these two basin studies, the Grand in Michigan and the Genesee in New York and Pennsylvania, the Corps of Engineers has established a Coordinating Committee consisting of representatives of all interested Federal Agencies and the state or states in which the basin lies. The principal states involved have formed their own Coordinating Committees to aid in the coordination and development of the plan for the water resources. Although there will be direct cooperation between state and federal agencies having similar responsibilities, the state Coordinating Committee will be represented on the Federal Coordinating Committee by its one representative. Public hearings have been used to make the public aware of the scope of the study with coordinating committees at the state and federal level and to enlist the aid and cooperation of municipal and local agencies, so that the program will be responsive to the desires and needs of local interests.

In FY 1964, Flow Regulation Studies represent $2\frac{1}{2}$ man years of work, or less than 2% of the overall project effort in terms of manpower.

Little Miami River Basin, Ohio

Preliminary Water Resources Studies were reported for proposed reservoirs on the East Fork of the Little Miami River Basin and Caesar Creek. These two reports were approved for release on December 4, 1963. The Little Miami River drains an area of 1700 square miles. It flows into the Ohio River at the eastern suburbs of Cincinnati.

Whiteoak Creek Basin, Ohio

It is anticipated this report on a Water Resources Study will be cleared for release in FY 1964. Whiteoak Creek drains an area of 234 square miles. It flows into the Ohio River about thirty miles southeast of Cincinnati.

Hocking River, Ohio

This study pertains to the Logan Reservoir on Clear Creek. If manpower requirements are filled, it is anticipated that this study will be completed in FY 1964. The Hocking River drains an area of 1200 square miles. It flows into the Ohio River in southeastern Ohio.

Tonawanda Creek, New York

Region II negotiated this reservoir study with the Corps of Engineers since the study area is within their Region. It is anticipated that this study will be completed in FY 1964. Tonawanda Creek drains an area of over 360 square miles before it becomes a portion of the New York State Barge Canal. Tonawanda Creek drains to the Niagara River, during periods of high flow. Low flows are used to augment the flow in the barge canal.

Buffalo Creek, New York

Region II negotiated this reservoir study with the Corps of Engineers since the study area lies within their Region. If manpower requirements are filled, it is anticipated this study will be completed in FY 1964. Buffalo Creek drains an area of over 145 square miles before it flows into Buffalo River and hence to Buffalo harbor at the head of the Niagara River.

Grand River Basin, Michigan

This is a Comprehensive Water Resources Planning Study. This study initiated by the Corps of Engineers in the latter part of FY 1963 is anticipated to extend over a four to five year period.

Coordinating Committees have been formed to insure that adequate consideration will be given to present and anticipated future water needs in the basin. The Grand River Basin drains almost 6,000 square miles before it flows into Lake Michigan at Grand Haven.

Genesee River Basin, New York and Pennsylvania

This is a Comprehensive Water Resources Study. This study initiated by the Corps of Engineers in FY 1963, is expected to extend through FY 1965. The State of New York has taken an active interest in this basin study and is financing the economic study. The major portion of the 2,500 square mile drainage area is within New York State. The Genesee River flows into Lake Ontario at Rochester, New York.

Studies By Other Agencies

Fish and Wildlife

A report on fish and wildlife of the Illinois River Basin has been completed by the Bureau of Sport Fisheries and Wildlife, Department of the Interior. This was financed by a transfer of Project funds. The report contains a history of fish and wildlife, describes current extent of management programs, and states how poor water quality has damaged the resource. Areas are detailed where suitable habitat for desirable species exist if provided with water of better quality, and suggestions for management improvement are discussed.

A similar report is being developed for the Lake Michigan study area. Most of the field work is completed. This has involved a search of the literature and the files of the appropriate State and Federal agencies, inspection of the streams and wildlife areas, and interviews with local sportsmen and commercial fishermen. While preparation of the Lake Michigan report is in progress, the Bureau of Sport Fisheries and Wildlife investigators are beginning their preliminary work on Lakes Erie and Huron.

Close cooperation is maintained between the Fish and Wildlife biologists and the Project biologist who serves as liaison. Monthly progress reports are received and frequent conferences are held to assure maximum efficiency in reporting, and to apprise the investigators of water quality conditions in each section of the study areas.

Recreation

A study of water-oriented recreation in the Illinois River Basin was completed by the Bureau of Outdoor Recreation of the U. S. Department of the Interior. Items covered included recreation resources and their use, recreation needs, problems related to recreation development and summary of findings as to water pollution and water recreation. A similar study has been started for Lake Michigan in FY 1964.

Bibliography

Project Reports Published

A series of special reports on the Illinois River System was published for the Justice Department in FY 1963 but not listed in a bibliography in the previous Annual Program Review. The series consisted of five reports listed below:

Title and Date	Report Number
Water Quality Conditions (4 Vols.)(1-63)	IRB-1
Special Report On Water Quality Goals For Upper Illinois River System (3-63)	IRB-2
Recommended Measures For Improving Water Qualities (1-63)	IRB-3
Effects On Water Quality Of Recommended Improvement Measures (1-63)	IRB-4
Stream Flows Required For Water Quality Control (3-63)	IRB-5

A series of special reports on Lake Michigan Studies was published for the Justice Department starting in FY 1963 and ending in June 1963. These reports were discussed but not all listed in the previous Annual Program Review. The series consisted of 12 reports listed below:

Title and Date	Report Number
Trends In Water Quality - Southern Basin (4-63)	LM-1
Sampling Surveys (4-63)	LM-2
Physical And Chemical Investigations (4-63)	LM-3
Biological Investigations (4-63)	LM-4
Microbiological Investigations (4-63)	LM-5
Radiochemical Investigations (4-63)	LM-6

Title and Date	Report Number
Introduction To Lake Current Studies (4-63)	LM-7
Lake Temperatures (4-63)	LM-8
Lake Currents At A Single Station (4-63)	LM-9
Drogue Surveys Of Lake Currents Near Chicago (5-63)	LM-10
Currents At Fixed Stations Near Chicago (5-63)	LM-11
Currents In The Southern Basin (6-63)	LM-12

Other special reports were published for various purposes and are listed below:

Title and Date
Infectious Hepatitis In Peoria, Illinois From 1957 to 1961 (3-63)
Lake Erie Watershed Study Plan (3-63)
Fox Chain-O-Lakes, Illinois, Algal Problem (8-63)
Memorandum Report - Water Discharged To Milwaukee Harbor (6-63)
Statement On Water Quality Conditions - Chicago and Environs, Jones Committee (8-63)
Special Report On Water Quality In Green Bay, Wisconsin (12-63)
Fox Chain Of Lakes Algal Problem, G. Cook, October, 1963, to Congressman Robert McClory
Report On Sanitation And Algal Problems, Cedar Lake, Indiana, G. Cook, December, 1963, submitted to Congressman Ray S. Madden
U.S. Public Health Service Report To The Subcommittee On Water Pollution Of The Upper Mississippi River Conservation Committee, Peoria, Illinois, by Grover Cook, January, 1964

Papers and Presentations

"A Comprehensive Water Quality Study," prepared and given by J. Verber for H. W. Poston, September 26, 1961, The Illinois Garden Club, Monticello, Illinois.

"The Proposed Study of Currents in Lake Michigan," J. Verber, January 18, 1962, Coordinating Committee on Oceanography, Washington, D.C.

"Biological Investigations on the Illinois River," by G. Cook, February 2, 1962, PHS, WS&PC Research Advisory Committee, Chicago, Illinois.

"A Description of GLIRBP Organization, Activities, and Objectives with Emphasis on Biological Investigation," by G. Cook, March 1, 1962 Seminar, Illinois Normal University, Bloomington, Illinois, and March 2, 1962 Seminar, Central Michigan University, Mt. Pleasant, Michigan.

"Studies of Currents in Lake Michigan and Related Activities," by J. Verber, April 10, 1962, 5th Conference on Great Lakes Research, Toronto, Canada.

"Some Scientific Aspects of a Physical Oceanographic Survey of Lake Michigan," by J. S. Farlow III, May 18, 1962, University of Chicago, Chicago, Illinois.

"Proposed Biological Investigations in Lake Michigan," by G. Cook, June 5, 1962, Conference on Lake Michigan Fisheries, Chicago, Illinois.

"Studies of Currents in Lake Michigan," by J. Verber, August 11, 1962, XV Conference of Limnology, Madison, Wisconsin.

"Automatic Dissolved Oxygen Titration Apparatus," by W. D. Johnson, B. L. Lurie and S. Megregian, August 23, 1962, Journal of Water Pollution Control Federation.

"Electronic Instrumentation for the Great Lakes Water Quality Study," by J. Verber, October 10, 1962, National Electronics Conference, Chicago, Illinois.

"Brief Description of GLIRBP Biological Activities," by G. Cook, November 7, 1962, Fish and Wildlife Biologists, Abbott Laboratories, North Chicago, Illinois.

"The Biological Condition of the Illinois River; a Preliminary Report," by G. Cook, January 15, 1963, Illinois Department of Conservation, U.S. Fish and Wildlife Service, Bureau of Outdoor Recreation, and PHS, Peoria, Illinois.

"Investigative Techniques in Water Pollution Surveys," by S. Megregian, April 18, 1963, Illinois Public Health Association, Chicago, Illinois.

"Lake Michigan Current Studies," prepared by J. Verber for Mr. W. Q. Kehr, May 14, 1963, ASCE Water Resources Engineering Conference, Milwaukee, Wisconsin.

"Combined Sewer Overflows," by C. Pemberton, Jr., May 14, 1963, ASCE Water Resources Engineering Conference, Milwaukee, Wisconsin.

"Radioactivity Levels in Lake Michigan: A Preliminary Report" by C. Risley, June 13, 1963, 26th Annual Meeting of American Society Limnology and Oceanography (ASLO) and 6th Conference on Great Lakes Research, Ann Arbor, Michigan.

"Radioactivity Levels in Lake Michigan," by C. Risley, September 10, 1963, American Chemical Society National Meeting, New York, N.Y.

"Chemical Characteristics of Lake Michigan, A Preliminary Report," by Stephen Megregian; Frederic Fuller; and Clifford Risley, September 10, 1963, American Chemical Society National Meeting, New York, N.Y.

"Microbiological Survey of Lake Michigan: The Distribution of Bacterial Densities," L. E. Scarce, September 9, 1963, American Chemical Society.

"The Distribution of Benthic Fauna and Phytoplankton in Lake Michigan: A Preliminary Report," G. Cook, September, 1963, American Chemical Society Annual Meeting, New York City.

"Currents in Lake Michigan," by J. Verber, September, 1963, American Chemical Society Meeting, at New York City, New York.

"Isolations of Enterovirus from Sewage and River Water in a Metropolitan Area," by Chin, Lamb, and Scarce, November 14, 1963, American Public Health Association.

"Fresh Water: Temperature of Maximum Density Calculated from Compressibility," by H. Eklund, was published in Science, 142, 1457 (1963).

"The Use of Fixed Systems For Current Measurements in Lake Michigan," by J. Verber, October 29, 1963, National Electronics Conference, Chicago, Illinois.

"Scientific Research and Water Quality Management," by H. W. Poston, W. Q. Kehr, and C. R. Ownbey, American Society of Limnology and Oceanography and the Sixth Great Lakes Research Conference, June 15, 1963, at the University of Michigan, Ann Arbor, Michigan.

"The Biology of Polluted Lakes and Streams," G. Cook, November, 1961, Indiana Water Pollution Control Association Annual Meeting, Indianapolis, Indiana.

"U.S. Public Health Service Report to the Subcommittee on Water Pollution of the Upper Mississippi Conservation Committee," G. Cook, January, 1963, Winona, Minnesota.

"Public Health Considerations in Water Supply Reservoir Management," G. Cook, February, 1963, Illinois Section American Water Works Association Reservoir Managers Meeting, Bloomington, Illinois.

"Algae and Weeds in Surface Water Supplies," G. Cook, December, 1963, Southern Illinois Water Works Meeting, Carbondale, Illinois.

"Biological Aberrations in Lake Michigan," G. Cook, December, 1963, Chicago Council on Adult Education, Chicago.

"Wind and Current Relationships in Southern Lake Michigan," by James L. Verber and George C. Williams, December 27, 1963, The American Meteorological Society Meeting at Cleveland, Ohio.

"Some Unmanned Weather Buoy and Current Meter Mooring Systems," by John S. Farlow and Paul Farris Smith, December 27, 1963, The American Association for the Advancement of Science Meeting at Cleveland, Ohio.

"Lake Erie Water Quality Studies," by H. W. Poston and C. W. Northington, June, 1963, Ohio Water Pollution Control Conference, Toledo, Ohio.

Significant Progress Toward Pollution Abatement

The Great Lakes-Illinois River Basins Project in its three years of existence has been recognized by governmental, scientific and local groups for significant contributions toward pollution abatement, even though its principal mission, the development of water quality management plans for the basins has not yet been accomplished. In the paragraphs below are described some of the more significant achievements attributable to the presence of the Project in the Great Lakes area.

Recognition in the Chicago Diversion Controversy

The first and most important of these has been its work for the U. S. Department of Justice, wherein it presented factual data, and recommendations concerning the diversion of Lake Michigan waters by Chicago, and testimony before the Supreme Court relative to its findings in this case. These findings have been received with substantial interest by all parties to this case. The magnitude of this effort has been documented by admission as evidence of 17 separate volumes of findings and recommendations resulting from the Project's studies. The importance of the Service's contribution was officially recognized by the Solicitor General of the United States in a communication to the Surgeon General, from which is quoted as follows -- "Only by such cooperation was it possible to present in these proceedings substantial results of the Great Lakes-Illinois River Basins Project, results which I am confident will be extensively relied upon by the Special Master and the Supreme Court in the ultimate disposition of this litigation."

Breakthroughs in Unique Oceanographic Studies

The Project has been conducting the largest and most comprehensive study of current measurements ever undertaken in a major body of water. In this study, it is using techniques and methods never before applied on such a massive scale, even in the study of ocean currents. As a result, many agencies of the Government, including the Department of the Navy, the National Oceanographic Data Center, the U. S. Lake Survey, the Weather Bureau --- and others, have maintained close liaison with the Project. Findings to date have shown the influence of prevailing wind on water movement, clockwise and counterclockwise currents in Lake Michigan, the variability of the thermocline, large internal waves, and rotary currents. This study will result in invaluable information which can be applied to the water quality management program of the Great Lakes, particularly in the location of water intake points and waste outfalls, and in predicting the effect of waste discharges on water quality at various locations, resulting from the physical forces that influence water movement.

Cited by City of Chicago

The Mayor of Chicago, Richard J. Daley, in a statement before the Natural Resources and Power Subcommittee, U. S. House of Representatives, (Jones Committee), holding hearings in Chicago on September 6, recognized the contributions of the U. S. Public Health Service and particularly the Great Lakes-Illinois River Basins Project in the following statement: "Chicago has received much technical aid from the United States Public Health Service in the study of sources of lake pollution. At present the United States Public Health Service - Great Lakes-Illinois River Basins Project is carrying on extensive studies to obtain basic information regarding lake currents and how they cause the drift of pollution in the lake, and regarding the long range effects on lake water quality caused by continued discharge of wastes. The results of these studies will be very helpful to the various agencies in this area in planning their future actions for the control of pollution in the southern end of Lake Michigan." - -

Pioneering in Development of Water Quality Goals

One of the important "firsts" initiated by the Project for its water quality management programs in the technique for the development of water quality goals in the basins under study. In the first attempt of this kind, the Project sponsored, guided and supported through its Technical Committee, an extensive review, by interested water users of the Illinois River Basin, of the water quality factors influencing water uses in this basin. Committee activities resulted first, in the development of water quality guides, in which each water quality parameter was assessed with respect to the particular water use under consideration, and limits set; second, in the study of present uses and anticipated future uses of the water of the basin; and third, the development of water quality goals for the basin, taking into consideration these uses. These deliberations have resulted in the achievement of a series of water quality guides, agreed to by all water users with respect to the critical parameters listed, by which the water quality management plan can be focused in time and space to the attainment of the needed water quality to accommodate the most critical of the water uses expected.

Other Accomplishments

As a result of evidence presented in testimony by the Project, The Metropolitan Sanitary District of Great Chicago has intensified its activities toward elimination of direct discharges of untreated industrial wastes to the Upper Illinois Waterway. As a first step, it is bringing direct pressure on those industries, now discharging to the canal, to connect to available sewers. Where sewerage facilities are not yet available, it has stepped up its program of extending trunk lines to provide connections to those industries not now served. Where sewerage is not

available, treatment facilities are being required. The Project had reported in its testimony that the Upper Waterway was receiving 22,000 pounds per day of BOD from directly discharged industrial wastes.

The Sanitary District has also corrected a malfunctioning storm relief sewer which was shown to be discharging 32,000 pounds per day of untreated sewage BOD into the Waterway. It has stepped up its monitoring activities by means of a new laboratory equipped vessel to patrol the Waterway for purposes of detecting illicit discharges and malfunctions. This has resulted in a noticeable reduction in visible pollution, especially in the downtown Chicago portion of the Waterway.

The Sanitary District has shown a keen interest in its storm water problem. It has presented testimony before Congress, in support of studies of this problem, with a direct request of 3 million dollars for study in the Chicago area. One of the proposed study plans would be the impoundment of stormwaters in upstream areas, for later release to the stream.

It has also made application to the PHS for \$600,000 in support of a new research facility to study problems related to further treatment and reduction of waste loads into the Waterway.

One industry (Hills-McCanna) has informed the Project that, as a result of its visit to this plant, the company has proceeded with steps to connect to the city sewerage system.

In the Lockport-Joliet area, several industries have taken steps to review their waste problems, either through hiring of consultants or by inplant improvements.

In the downstream Illinois River area, and as the result of Project investigations, four major industries at Pekin, Ill. (Quaker Oats, Standard Brands, Corn Products and American Distillers) have undertaken inplant studies toward reduction of their waste loads and are studying the feasibility of connecting with the city of Pekin or of providing collective treatment of their wastes. The daily waste loads from these plants were determined by survey to total about 40,000 pounds of 5-day BOD.

At Peoria, major effort is being expended to connect all industrial wastes to the city system. Already two companies have connected and one large waste source (Hiram Walker) has initiated plans for connection to the city which should bear fruit in about 2 years. Daily waste loads of about 16,000 pounds of 5-day BOD would be eliminated.

In Milwaukee, Wis., the Project has provided technical assistance and manpower to the Milwaukee Health Department in a study of the pollution of lake front beaches. The purpose of this study was to develop monitoring techniques whereby the Health Department could minimize the closing of beaches affected by pollution. The Project provided two part-time personnel for two summers, additional laboratory supplies in the form of membrane filters and radiotagged chemicals, and loaned laboratory equipment for this study. The Health Department will provide the Project with a report of its studies.

The Southeast Wisconsin Planning Commission has asked the Project for technical assistance in its study and development of water resources for this area of the state. The expected assistance will be in the form of laboratory support and technical advice for this Project.

At the Jones Committee hearings in Chicago, the Chief Sanitary Engineer of Indiana stated that his state is awaiting

the results of GLIRBP surveys and its recommendations to help guide further action to update water pollution control measures in the Calumet area of Indiana.

Public awareness of pollution problems coupled with publicity resulting from the Project's activities have brought to the Project's attention many incidents directly attributable to pollution or suspected of being pollution-related. Fish kills in Lake Michigan; the nuisances resulting from algae washed ashore on beaches; a wildfowl kill resulting in the death of about 10,000 fish-eating birds; taste and odor problems affecting municipal water supplies; and nuisances resulting from industrial discharges are some of the problems which the Project has investigated.

Departure from 1964 Plans

The following factors have necessitated some readjustment in the Project's plans for FY 64, and have influenced plans for FY 65. 1. Extended requirements of the Dept. of Justice relative to the Chicago Diversion Hearings. 2. Inability to complete contract negotiations for boat services for the Oceanography program. 3. Reduction in anticipated funds. 4. Recruitment problems. 5. Incidental diversions from Project schedules. 6. Availability of Detroit-Lake Erie Project for GLIRBP programs.

1. The Project has been most grateful and proud of its involvement in the Chicago Lake Water Diversion hearings, and has placed this above all other program commitments in priority and effort. Its accomplishments are well known and appreciation for the effort expended has been liberally acknowledged. However, the impact of this effort on Project programs has been felt by all activities and schedules, and has resulted in many readjustments.

When originally scheduled, it was anticipated that Project participation would be essentially completed by spring of 1962. In actual fact, Project involvement was extended through the summer of 1963, and reached a climax with the appearance of the Project Director and two staff members to give testimony. The intensive preparations required for this effort necessitated the full time of the Project Director, key members of the Project staff, and a large portion of staff time, in support services. This has resulted in reappraisal of the scope of the

activities programmed for Lake Michigan, a delay in organization and implementation of the Lake Erie study and rescheduling of the Illinois River Report. Although this type of diversion in the Project's future schedules is not expected to recur, its effects will continue to be felt on future programs.

2. The oceanographic study of Lake Michigan was seriously handicapped in the spring and summer of 1963 by failure to negotiate a contract for boat services for this activity. Severe curtailment in the installation and retrieval of current metering stations has resulted in a three month lag in this program. The Project has therefore adjusted its plans to reduce the time period for the Lake Michigan study in order that it can return to schedule for the remaining lakes. How could this delay in contract negotiations have been avoided? It is felt that ample time was available when the contract negotiations were initiated, in February 1963, with an anticipated award date in April. Delays, resulting in failure to complete the award, were in hands other than Project personnel.

3. The working budget requested for FY 64 was 2.3 million. The resulting budget of 2.17 million, coupled with increased cost of personnel due to pay increases, has resulted in some curtailment of FY 64 plans, particularly with respect to the scope of the activities planned. The two principal areas curtailed have been the number of current meter stations occupied in Lake Michigan, and a delay in development of staff for the Lake Erie Study. In the first case, the current meter stations were reduced from 60 to 40, because funds were not available to procure the additional meters. In the second case, the time table for the Lake Erie study has been extended particularly with respect to field activities, from the end of FY 64 into the second quarter FY 65.

4. Recruitment problems continue to plague the Project in two specific areas; first, unavailability of experienced personnel, particularly engineers, for key positions at field station and headquarters; second, lack of trained scientific manpower, particularly microbiologists. In the latter instance, other personnel are being trained to carry out routine functions under supervision of senior scientists, but this can result in work of lesser quality due to the lack of the judgment value inherent in professional training. The lack of experienced manpower has resulted in the doubling up of responsibility of key personnel on duty, resulting in less attention to the principal responsibility of these individuals.

5. Incidental diversions from scheduled Project activities can be considered a normal function of all projects working in areas of deep public interest. This project is no exception. It has been called upon for special reports of many kinds, and is most anxious to comply wherever and whenever its competencies and interests apply. In many instances these result in gains for the project and the Water Pollution Control program of the Public Health Service in terms of public awareness of the work going on and the benefits to be derived therefrom. These diversions however have a price, which in many instances is paid by the individuals detailed, in terms of extra and uncompensated time, since there is little or no provision in the Project's schedule for time spent in these areas. Examples of diversions experienced at GLIRBP in the past year are:

The Report to the Jones Committee entitled, "Water Quality Conditions - Chicago and Environs"

Report on the Chain O'Lakes region, Fox River, Illinois

Report on Cedar Lake, Indiana

The Bird Kill in Lake Michigan

Fish Kill incidents in Lake Michigan

Algae nuisance incidents

Menominee River enforcement study

Popcorn slag investigation

Report on Water Quality Conditions in Green Bay

Numerous papers and presentations before technical and lay groups

6. The availability of the Detroit-Lake Erie Project personnel and facilities for work in the Lake Erie Study area and for the Lake Huron study has provided GLIRBP with an opportunity to return to its initial schedules. Therefore, this departure from program schedules submitted last year is in the nature of a major benefit. It will enable the Lake Erie Study to proceed at full speed during its period of critical need for manpower, without reduction in scope of work planned for

that basin. It will enable GLIRBP to carry out studies in both Lake Huron and Lake Ontario simultaneously, by eliminating much of the lead time necessary to equip and staff a field station in this area.

PLANS AND SCHEDULES, FY 65

Introduction

In anticipation of a working budget of 2.5 M with 183 positions, the FY 65 general plan of work for the Great Lakes-Illinois River Basins Project is as follows:

In the Illinois River Basin, detailed plans are being made pending implementation efforts of the Comprehensive Plan for this basin. Initiation of surveillance activities for upgrading the plan and to provide the Basic Data Branch with changes as they occur, will begin in FY 65.

In the Lake Michigan Basin, completion of the first draft of the Report for this basin is scheduled for December 1964. All field activities will have been terminated by the beginning of FY 65, except for tributary studies related to Corps of Engineers needs, and surveillance.

In the Lake Erie Basin, the full scale study of water quality of the Lake will be in progress. Field sampling activities will be completed by December 1964. The Lake Erie Field Station will be assisted by personnel from Detroit in the studies of the western portion of this basin. Lake Current studies will begin in spring of 1964 and continue for one year.

In the Lake Huron Basin, study will begin in the fall of 1964, using the facilities and residual personnel, augmented as necessary, of the existing Detroit-Lake Erie Project. With the exception of possible suboffices in the Bay City and Sault Ste. Marie areas, the study will operate out of the Grosse Ile office. The intensive field activities of this study will begin in spring 1965 and continue for one year. The lake currents study will begin in the spring of 1965. Appended to this program review is the study plan proposed for the Lake Huron basin.

In the Lake Ontario Basin, efforts to procure space and facilities for this study will be initiated early in 1964 and a small staff, about 5 positions, will be established to prepare the space and facilities, develop operating plans and make advance contacts. Full scale field activities will be initiated in spring of 1965 and continue for one year. It is anticipated

that manpower released from the Lake Erie study will be available for this study. The lake current study in Ontario will begin in spring of 1964, concurrently with the Lake Erie study, and continue for one year. Concurrent study of these two lakes appears feasible, because of their relatively small size and proximity to each other. Also, savings in new instrumentation will result, since the number of meters available from the Lake Michigan study can be used to instrument both lakes.

Detailed plans for accomplishing the objectives in FY 1965 are described below.

Basic Data Collection

Lake Michigan Basin

The water supply and municipal and industrial wastes inventories for Lake Michigan will be essentially completed prior to the beginning of this FY. Index coding on USGS quadrangle maps and other work related to the data storage and retrieval system in the Lake Michigan Basin is expected to be completed by 9/1/64. A minimum program of surveillance will be initiated to provide up-to-date data for the Basic Data Branch. The laboratory data from the 1963 lake sampling program will be processed by computer as described earlier for FY 1964.

Lake Erie Basin

The municipal water supply and waste inventories have been essentially completed for the basin. Intensive effort will be given to complete the industrial waste inventory, which has lagged behind primarily due to the reluctance of the State of Ohio in releasing available data. Headquarters will continue to give close support to the Field Station on technical problems of data processing.

Lake Huron Basin

The program for Lake Huron will be initiated early in this fiscal year, in accordance with the enclosed Lake Huron Study Plan.

Inventories of municipal and industrial waste sources will commence on or about 9/1/64 and progress to about 60% completion by 6/30/65.

Inventories of municipal water supplies, industrial process water supplies and other water uses will start on or about 9/1/64 and progress to about 60% completion by 6/30/65.

Index-coding will be performed on about 150 USGS quadrangle maps. Over 1,500 individual codings will be required of which about 600 will be for communities. Table 2 is a list of special maps in order of priority. Work is expected to start about 1/1/65 and be completed by 6/30/65.

Personnel of the Lake Huron Field Station will be instructed in the data processing methods used by the Project. Data generated by the lab-boat activity on Lake Huron will be handled directly by headquarters data processing staff.

Lake Ontario Basin

The Lake Ontario work schedule has not yet been established, but basic data collection is expected to begin about July 1964.

As the Field Station is being organized and staffed, headquarters will provide technical assistance in setting up data processing procedures in the Field Station, similar to those in use for Lakes Michigan and Erie.

Economic Studies

In the Lake Erie Watershed, economic and population studies by Project staff will be carried through to completion of projections for each subregion and preparation of drafts of appropriate report sections. Detailed studies will be started in the Lake Huron and Lake Ontario Basins, and continued into FY 1966. The scope and depth of such studies will be as described in previous program reviews and as outlined in the LAKE HURON WATERSHED GENERAL STUDY PLAN which accompanies this report. The time table for completion of the economics section of the final updated Lake Michigan basin report is contingent upon a decision as to contracting for a broad-based economic study, as discussed below.

The Economics Section, Technical Services Branch, Washington, has recommended reconsideration of an Economic Base Study to be made by an outside contractor such as the National Planning Association, Arthur D. Little Company, or Battelle Institute. The question of required scope and depth of economic base studies

in support of future projections has been the subject of periodic discussion and correspondence over the past two and a half years. Project effort in this aspect of the program has been geared to procedures that evolved from those discussions. The scope of this effort has been substantially as described in an outline for the Illinois River Basin report which was submitted for review in the spring of 1962. The Project's consultant on regional planning and economics, Professor Fred Clarenbach of the University of Wisconsin, has reviewed and approved the work as appropriate to and sufficient for its purpose. Nevertheless, the Project staff is planning to proceed with implementation of the recommendations from headquarters, recognizing the importance of being sure that this vital area is not slighted. Although an accurate estimate of the time required for a contractor to make a broad-based economic study has not been obtained, it seems clear that some adjustment would be required in time tables for final reports of some major sub-basins. Our present thinking is as follows: 1) if such a study is made, it should be confined to the Great Lakes Basin including the Chicago area but excluding the remainder of the Illinois River Basin; 2) the Illinois River Basin and Lake Michigan reports should be completed and published in a tentative form without awaiting the results of the study, the Project's economic base data would be used for projections; 3) the final report for the Lake Erie Basin should be deferred as necessary to incorporate the results of the study; and 4) the results would be available in time to be included in reports for the remaining basins, Ontario, Huron, and Superior, assuming an early decision, availability of funds, and an early start; 5) in FY 1967, the Illinois River and Lake Michigan reports would be updated and any necessary revisions made to incorporate new data based on the economic base study.

Field Operations

Lake Erie Basin

The field operations program will consist of intensive sampling, with hydraulic measurements support, of the tributary, harbor and inshore, extended range studies of the Lake, and special studies as described under FY 64 activities and accomplishments.

Lakes Huron and Ontario Basins

The major activities of FY 1965 will be staffing and equip-

TABLE 2a

SPECIAL QUADRANGLE MAPS OF LAKE HURON BASIN*
STATE OF MICHIGAN

15-Minute

Alma	Big Rapids	
Merrill	Woodville	Harrison
St. Charles	Mt. Pleasant	Marion
Saginaw	Shepherd	Reed City
Perrinton	Sanford	Evart
Elsa	Bay City	Lake
Chesaning	Grace	Clare
Burt	Cross Village	Strongsville
Flint	Pellston	
Laingsburg	Mullet Lake	
Corunna	Bayshore	
Durand	Petoskey	
Holly	Wolverine	
Mason	Tower	
Fowlerville	Onaway	
Lowell	Gaylord	
Milford	Hetherton	
Rives Junction	Atlanta	
Stockbridge	Hillman	
South Lyon	Mancelona	
Ypsilanti	Alba	
Saline	Otsego	
Jackson	Lewiston	
Spring Arbor	Comins	
Blissfield	Kalkaska	
Dundee	Fletcher	
Vermillion	Grayling	
Brimley	Glennie	
Sault Sainte Marie	Harrisville	
Lake George	East Tawas	
Sheldrake	Tawas City	
Eckerman	Houghton	

Portions of Counties showing no quadrangle map area:

Luce	Alpena	Arenac	Oscoda	Huron (Entire
Mackinac	Crawford	Mecosta	Alcona	County)
Presque Isle	Roscommon	Clare	Midland	
Charlevoix	Ogemaw	Gladwin	Isabella	

*Maps needed on or before 7/1/64

TABLE 2b

SPECIAL QUADRANGLE MAPS OF LAKE HURON BASIN*
STATE OF MICHIGAN7½-Minute

North Adams	Pontiac South	Big Bradford	Sault St. Marie
Hillsdale	Birmingham	Lake	South
Allen	Warren	K.P. Lake	Barbeau
Kinderhook	Mt. Clemens W.	Lovells	Pickford NW
California	Mt. Clemens E.	Comstock Hills	Pickford
Camden	Rudyard	Black Creek	Baie De Wasai
Reading	Moran NW	Lake Margrethe	Payment
Frontier	St. Clair Flats	Grayling	Oak Ridge
Yale	Algonac	Munusson	Fibre
Capac	Salem	Munusson NE	Moran NE
Brookway	Northville	Wakeley	
Hadley	Redford	Cote Dame	
Metamora	Royal Oak	Marie	
Thornville	Highland Pk.	Fletcher	
Almont	Grosse Pointe	Perecheney	
Allenton	Denton	Roscommon N.	
Memphis	Wayne	Vermilion	
Goodell	Inkster	Vermilion SE	
Smiths Creek	Dearborn	Sheephead Lake	
Port Huron	Detroit	Shelldrake	
St. Clair	Belle Isle	Whitefish Pt.	
Rattle Run	Ypsilanti	Timberlost	
Adair	Telleville	Emerson	
Armada	Detroit Wayne Airport	Big Beaver	
Romeo	Wyandotte	Creek	
Lake Orion	Rockwood	Piatt Lake	
Oxford	Flat Rock	Hulbert	
Ortonville	Carleton	Eckerman	
Marine City	Maybee	Strongs	
New Baltimore	Estral Beach	McNearney Lake	
New Haven	Stony Point	Pendills Lake	
Waldenburg	Monroe	Sullivan Creek	
Utica	Ida	Dollar	
Rochester	Samaria	Settlement	
Pontiac North	Erie	Paco	
Clarkston	Otsego Lake	Kinross	
Milford	Turtle Lake	Brimley	
Highland	Johannesburg	Shallows	
Walled Lake	Lewiston	Lafter	

Portions of Counties showing no quadrangle maps area:

Montcalm	Hillsdale
Tuscola	Lenawee
Sanilac	Lapeer

*Maps needed on or before 7/1/64

ping the Lake Ontario Field Station, establishing a sub-office on Lake Huron for operation of sampling vessel equipped with laboratory, and providing technical assistance and advice to personnel at field stations.

Transfer of personnel and equipment to Lake Ontario Field Station will be started by the 4th Quarter, FY 64. It is planned to operate a sampling vessel in Lake Ontario during September-November, and preserved samples will be shipped to the headquarters laboratory. Full scale field operations will be started in the spring of 1965, using techniques developed and tested in Lakes Michigan and Erie. One lab boat will be assigned full time to Lake Ontario.

It will be necessary to establish a sub-office on Lake Huron as a home port for lake sampling operations about February 1965. One lab boat will be assigned full time to Lake Huron, and full scale field operations will be started in the spring of 1965, with sampling under the direction of the Lake Huron Field Station at Detroit. The Field Station will consist of personnel, equipment and space which now comprises the Detroit-Lake Erie Project, augmented as required to conduct the field work for the Lake Huron basin study.

Key personnel remaining at Project headquarters will spend considerable time at the Field Stations rendering technical assistance.

Lake Current Studies

Lakes Erie and Ontario will be instrumented beginning in the 4th Quarter, FY 64, using operational techniques similar to those used in Lake Michigan. Instrument shops will be located in the Cleveland area and at a suitable port on Lake Ontario. The processing and computer techniques for data analysis are expected to be the same as used for Lake Michigan. The proposed locations of current meter stations are shown on Figures 4 and 5, and the work schedule is shown on Figure 6.

Laboratory Activities

Lake Erie Basin

Laboratory activities in FY 1965 will be essentially a continuation of the programs initiated in FY 1964.

It is anticipated that analyses of preserved samples in Chicago will be accelerated and lag time reduced. Since sampling is scheduled to terminate in December, the remainder of FY 1965 will be used in processing the backlog of chemical samples.

The Microbiology Section will continue its FY 1964 activities until the end of sampling in December. At this time, plans are to accelerate special studies, e.g. survival and enteric pathogens, and to begin work on reports.

The Biology Section plans to continue sampling upstream areas of Lake Erie harbors and tributaries in addition to the St. Clair River and Lake St. Clair. All sampling will be completed in these areas by December 1, 1964.

Two extended range cruises in Lake Erie will be made in the summer and fall of 1964. Benthic sampling will have been completed but plankton and plankton tow samples will be collected. Benthic samples will be collected on one inshore sampling cruise and plankton samples on all inshore sampling cruises.

No doubt special studies will develop as a result of literature surveys or laboratory findings, but the exact nature of these studies is not known at this time.

After completion of field work in December 1964 the remainder of FY 1965 will be required in processing samples and writing reports.

Lake Huron Basin

Intensive laboratory activities in Lake Huron will begin in the fourth quarter FY 1965 in accordance with the Lake Huron Study Plan. Tributary, harbor and inshore studies, and extended range sampling of the lake will be the principal activities, with special programs of industrial waste, storm water, organics and others as needed. The Grosse Ile field station laboratory, supplemented by sub-laboratories as needed at Bay City and Sault Ste. Marie, will analyze those parameters within its present capabilities. Preserved samples will be delivered to the Chicago laboratory. Chemistry, Bacteriology, and Biology will be the principal activities of the field station laboratories. Organics analyses and radiochemical determinations will be carried out at Chicago. Laboratory services will also be available on the lake

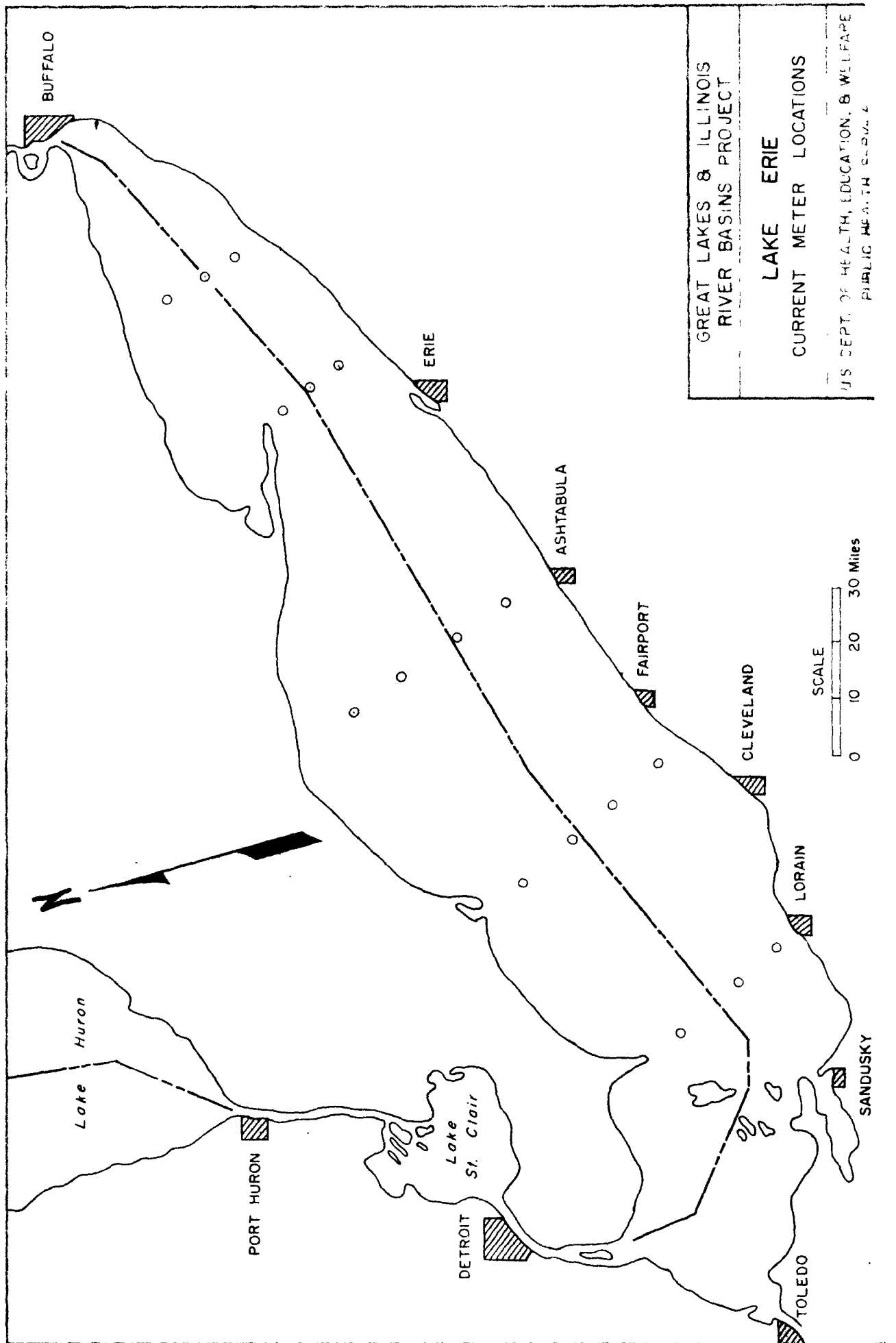
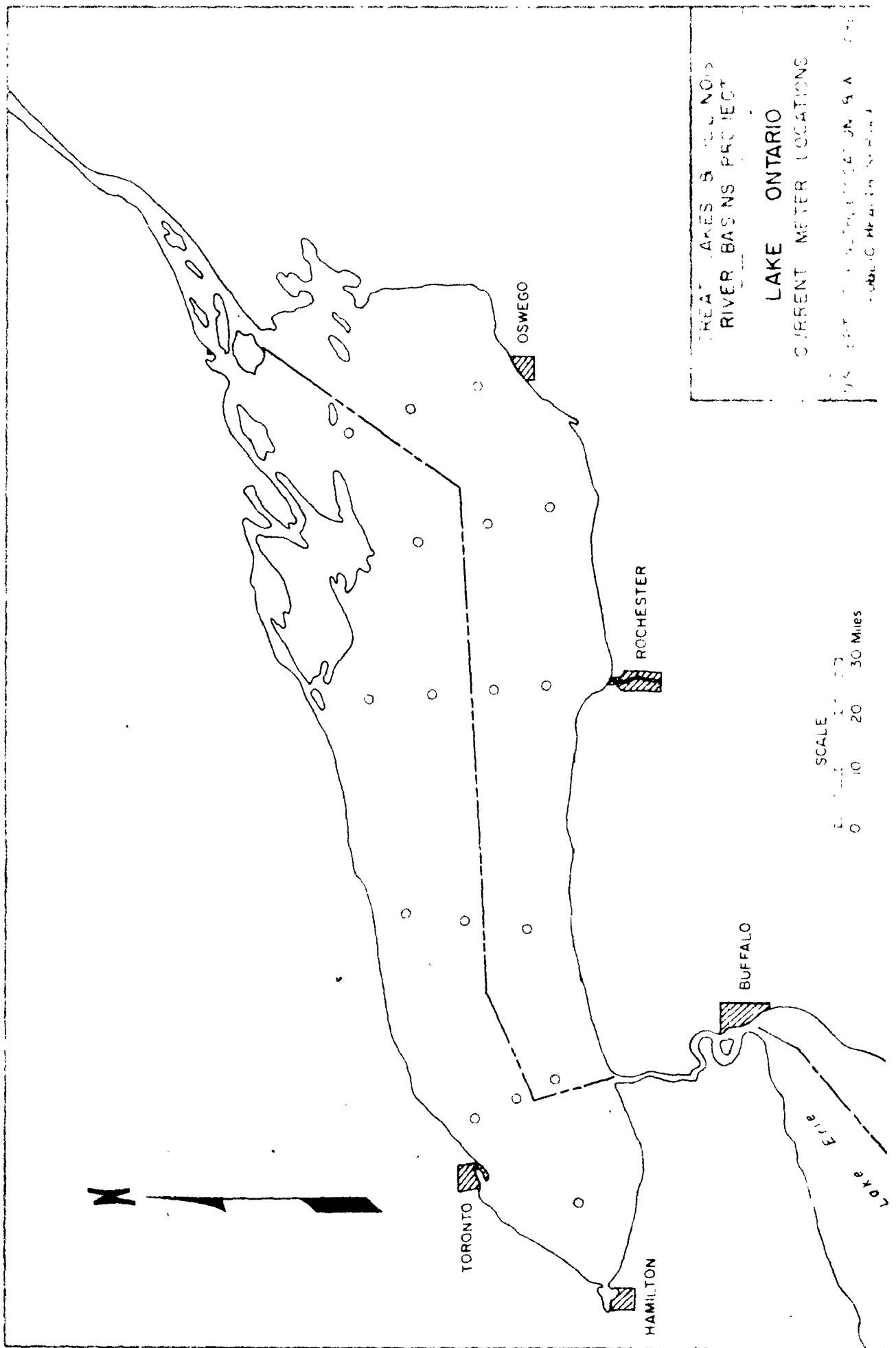


FIGURE 4



	FISCAL				
	1963	1964	1965	1966	1967
Planning & Procurement			10/1 [REDACTED] 8/1		
Contracts		2/1 [REDACTED]	7/1		
Recruiting		4/1 [REDACTED]	8/1		
Established Field Site		4/1 [REDACTED]	8/1		
Personnel Transfer		6/1 [REDACTED]	8/15		
Equipment-boat transfer		6/1 [REDACTED]	8/15		
Full Scale Operations		7/15 [REDACTED]	9/1		
Data Readout			10/1 [REDACTED]	7/1	
Data Analysis			4/1 [REDACTED]	8/1	
Report Preparation				12/1 [REDACTED]	12/1
Final Report				4/1 [REDACTED]	2/1
Locate New Field Site			4/1 [REDACTED]	8/1	

GREAT LAKES & ILLINOIS
RIVER BASINS PROJECT

LAKE ERIE AND LAKE ONTARIO

U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V CHICAGO, ILLINOIS

FIGURE 6

vessel assigned to Lake Huron.

Lake Ontario Basin

Acquisition of laboratory space and modification to provide field station laboratory facilities will begin in the 4th Quarter of FY 1964. Laboratory services, as developed for the Lake Erie Field Station, will be available by spring of 1965. The laboratory program in Lake Ontario will be patterned closely to that now existing in Lake Erie, with chemistry, biology, and microbiology the principal activities. Also, some provision will be made for early laboratory support (possibly 3 chemists) for the Genesee River Cooperative Study. As in other field station operations, laboratory activities will be limited to those tests requiring immediate attention. Preserved samples will be analyzed in Chicago. However, extended range sampling will precede the other laboratory programs, beginning in the first quarter FY 1965, because of the availability of a laboratory vessel for this purpose, and because the lake currents program will begin to place metering stations in the lake at that time.

Headquarters Laboratory Cooperative Activities

In addition to lab support for field operations in Lake Erie, Huron, and Ontario, the headquarters laboratory provides or will provide support to other programs in Region V. Included are: Recreation Water Quality Study - Indianapolis, Upper Mississippi (Twin Cities) Enforcement Project, I.J.C. - Detroit, S.E. Wisconsin Water Quality Study (support to local agency), Genesee River Cooperative Study, and Surveillance operations, Illinois River and Lake Michigan.

Engineering Analyses and Plan Formulation

Lake Michigan Basin

Activities expected to be in progress and not completed as of 7/1/64 include hydrology, water quality goals, stream and lake quality analyses, and water quality control measures. These activities, including report drafts therefor, are expected to be completed by 10/1/64.

Lake Erie Basin

This program will be a continuation of the activity previously described under FY 1964, Activities and Accomplishments.

In the analysis of stream flow and assimilation program, the initial phase will be to determine the adequacy of existing published data and the design of sampling programs to fill existing gaps in the data. This study will include the calculation of critical drought flows as well as the formulation of oxygen sag curves for the major tributaries.

The initial phase of the analysis of lake data will be the tabulation of historical data pertaining to water quality; the design of sampling programs to fill gaps in existing data; the continuation of existing lake study programs; and the obtaining of data necessary to produce mathematical models of Lake Erie. This study will also include the formulation and calculation of various mathematical models of Lake Erie.

Lake Huron Basin

Water balance studies will have been completed in conjunction with Lake Michigan studies. Other hydrology work is expected to commence about 11/1/64 and progress to about 60% completion by 6/30/65.

Work on land use and related water quality is expected to start about 1/1/65 and be completed by 6/30/65.

Analyses of water demands and waste return flows are estimated to start about 11/1/64 and be completed by 5/1/65.

Efforts on water quality goals are expected to start about 1/1/65 and progress to about 75% completion by 6/30/65.

Stream quality analyses will be conducted for approximately 10 principal tributaries. Extensive analyses are planned for the Saginaw River, and may be indicated also for the St. Marys and Cheboygan Rivers, depending upon results of findings from field surveys. The balance of the streams will be given limited analyses in sufficient detail to evaluate stream deficiencies and flow regulation requirements. Analyses will commence about 1/1/65 and be about 60% complete as of 6/30/65.

Work on lake quality analyses and water quality control measures is not expected to start prior to 6/30/65.

Lake Ontario Basin

The Lake Ontario time schedule has not yet been established but can be expected to follow the general pattern of activities described for Lake Huron.

Flow Regulation Studies

In FY 1965 Flow Regulation Studies will represent about $4\frac{1}{2}$ man-years of work, or less than 3% of the overall Project effort in terms of manpower. Individual studies planned at this time are listed below.

Grand River Basin, Michigan - This study is scheduled to continue through FY 1966 and possibly FY 1967. Stream sampling and analysis of data will continue through FY 1965.

Genesee River Basin, New York and Pennsylvania - This study is scheduled to continue through FY 1965 with stream sampling and analysis of data.

Saint Joseph River Basin, Michigan and Indiana - The Corps of Engineers has held a Public Hearing on this basin. A full comprehensive water resources planning study has been scheduled, but due to lack of funds, the scope has been reduced to a study of individual projects. Based on the public concern over the water quality in this river at the public hearing, it is anticipated that a complete water quality study may be required.

Fox River, Wisconsin - A comprehensive study had been scheduled for FY 1964 by the Corps of Engineers, but it had to be cancelled due to lack of funds. Individual projects could be authorized in FY 1965.

Sandusky River, Ohio - The Corps of Engineers has a project planned which could require a PHS study.

PLANS - FY '66

(As Submitted to Headquarters - 11/20/63)

Introduction

Establishment of the Great Lakes-Illinois River Basins Project in 1961 launched the largest of the comprehensive water quality management programs undertaken by the Public Health Service. The need for protection of this vast water resource was recognized by Congress in the Federal Water Pollution Control Act (PL 660 - 84th Congress), which authorized this important program and spelled out, in Section 4(f), specific requirements that studies with respect to the quality of these waters include an analysis of present and projected future water quality under varying conditions of waste treatment and disposal, an evaluation of the water quality needs of those to be served, an evaluation of municipal, industrial, and vessel waste treatment and disposal practices, and a study of alternate means of solving water pollution problems (including additional waste treatment measures) with respect to such waters.

An important activity of the Project since its inception has been its studies of water quality of the Chicago drainage system and adjacent Lake Michigan waters, to provide the Department of Justice with factual information and judgment for its use in litigation between the Lake States and Illinois concerning the diversion of water at Chicago. In this regard the Project has already provided expert testimony and a total of seventeen special reports, including reports on the present water quality of the Chicago drainage system and the Illinois River, water quality of adjacent waters of Lake Michigan, recommendations of corrective measures needed to reduce existing pollution, and studies of Lake Michigan currents. Each of these reports have been entered in evidence by the Department of Justice.

With respect to comprehensive water quality management activities, the Project has completed the study of the Illinois River Basin and is engaged in the preparation of the comprehensive plan. It will complete all field activities associated with the study of Lake Michigan, except oceanography by spring of 1964, with oceanography to be completed by July. The comprehensive plan for Lake Michigan will be completed by December 1964. Field activities have been initiated in Lake Erie and are scheduled for completion by fall of 1964, with the plan to be available by December 1965. Study plans for Lakes Huron, Ontario, and Superior are now being developed. Present scheduling calls for initiating field activities in Lake Huron in the summer of 1964; in Lake Ontario by spring of 1965; in Lake Superior by spring of 1966.

The scope of these activities will be patterned after the studies now in progress in Lake Michigan; namely, economic and demographic studies, studies of water use and waste disposal practices, the present water quality of the lakes and tributary waters, studies of lake currents, the corrective measures necessary to preserve water quality for legitimate uses, and a water quality management plan for maintenance of adequate water quality for future uses, and any special studies peculiar to the lake basin under study.

Comprehensive Program

GLIRBP -

<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>
<u>Pos. Amt.</u>	<u>Pos. Amt.</u>	<u>Pos. Amt.</u>	<u>Pos. Amt.</u>	<u>Pos. Amt.</u>	<u>Pos. Amt.</u>
200 2,780,000	216 3,000,000	165 2,300,000	86 1,200,000	43 600,000	36 500,0

<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>Change</u>
<u>Pos. Amt.</u>	<u>Pos. Amt.</u>	<u>Pos. Amt.</u>	
200 2,780,000	216 3,000,000	165 2,300,000	-51 -700,000

Long-Range Goal

To provide programs for the management of water quality in the Great Lakes-Illinois River Basins through studies of water resources, water use and waste disposal practices, and economic and demographic factors. To provide such programs for each of the basins and to provide surveillance for updating these programs as progress is made in the implementation and operation of these programs.

The need for this program has been expressed by many interests, including the Great Lakes Commission, the larger cities, and various conservation groups. The Department of Justice and the Special Master appointed by the Supreme Court for the diversion litigation have special interests. A most recent statement by the Chief Sanitary Engineer of Indiana before the Jones Committee hearings in Chicago indicated that his State is awaiting the Lake Michigan report to provide him with the information needed to update water pollution control activities in that portion of Indiana.

Authority - PL 660-84, Section 2(a) and Section 4(f).

Program for Achieving Long-Range Goal

Our long-range goal for the management of water quality of the Great Lakes and Illinois River Basins is to provide a practical, workable program which spells out:

- a. The causes of water pollution and its effects on the quality of the water resources and on beneficial water uses.
- b. The development of agreements on the desired beneficial water uses and the water quality objectives necessary to accomodate these uses.
- c. The development and implementation of pollution control measures to achieve the desired objectives, including the establishment of a timetable for their accomplishment.
- d. Surveillance for updating of the program in order that it remain capable of accommodating changing technology and changing water quality needs.

The six-year program, including the completion of efforts to determine causes and effects of water pollution in the basins, the completion of the management plans for these basins and initiation of methods for implementation of these plans. The six-year plan will also provide for initial activities in surveillance and updating of the programs already under way. Areas to be covered will include changes in requirements for additional waste treatment facilities, changes in needs for augmentation of stream flow, and review and revision of water quality requirements based on changes in water uses.

Relation of FY 1966 Program to Long-Range Goal

By FY 1966 Project activities will have progressed through to the completion of management programs for the Illinois River and Lake Michigan Basins. The Lake Erie Basin report should be in its first draft stage. Active field studies will be in progress in Lakes Huron and Ontario, and the first phases of the Lake Superior Study will be initiated. All major capital expenditures will have been completed except for field station development for the Lake Superior Study.

Project Schedule

Figure 7 and 8 present graphically the general Project Schedule for the remainder of the GLIRBP Study Program and a PERT diagram of the Lake Erie Field Station Program, respectively. The general Project Schedule does not include surveillance programs for the basins. These programs, although minimal in scope, will be expected to continue throughout the life of GLIRBP and should be continued, following expiration of GLIRBP, by regional laboratory programs or other support.

Organization Charts

The enclosed organization charts Figures 9 and 10, represent the current line relationships for Project Headquarters and for Lake Erie Field Station, without significant change from previous submittals. The functions of these positions are described in subsequent paragraphs.

Functional Statements

The Great Lakes-Illinois River Basins Project has the responsibility for development of comprehensive programs for the improvement of water quality in the Great Lakes and Illinois River Basins, taking into consideration the conservation and use of these waters for public water supply; propagation of aquatic and wildlife, recreation, agriculture, industry, and other legitimate uses. Activities involved in carrying out these responsibilities are the operation of extensive laboratories involving scientists of various disciplines such as chemistry, biology, microbiology, and radiochemistry; conducting studies of mass water movements using complex oceanographic techniques; conducting hydrologic studies of water resources; conducting economic and demographic studies needed to determine projections of future growth and related water uses; operation of extensive field sampling and measurement activities in support of project studies; conducting numerous special studies such as waste loads from combined sewer overflows, survival of fecal bacteria under various conditions; negotiating contracts for technical studies; reviewing, correlating and coordinating the data from all Project activities and preparing numerous technical reports in fulfillment of the Project's responsibilities.

Project Director's Office

This office provides overall direction in the conception, development and planning of the broad framework of the GLIRBP comprehensive water quality studies. It directs the activities of the Project, making major decisions and recommendations involving engineering, administration and scientific aspects of the Project's work. It exercises line authority in directing the overall activities of the Project's personnel.

It coordinates and directs the activities of the Branches of the Project including the Field Stations. It receives consultation through various consultant groups, including its Technical Committees. It represents the Project in meetings with Federal, State, and local government officials, members of industry, and lay groups and others having common interests in water quality management.

Administrative Services

Provides personnel management and advice to all Project and field station personnel. This includes evaluation of qualifications, implementation of department regulations, working with Civil Service Commission certificates, and related personnel functions.

Provides financial management assistance to key Project personnel. Maintains commitment registers showing unobligated funds for each major organizational activity. Develops working budgets for each major organizational component or field station within the Project.

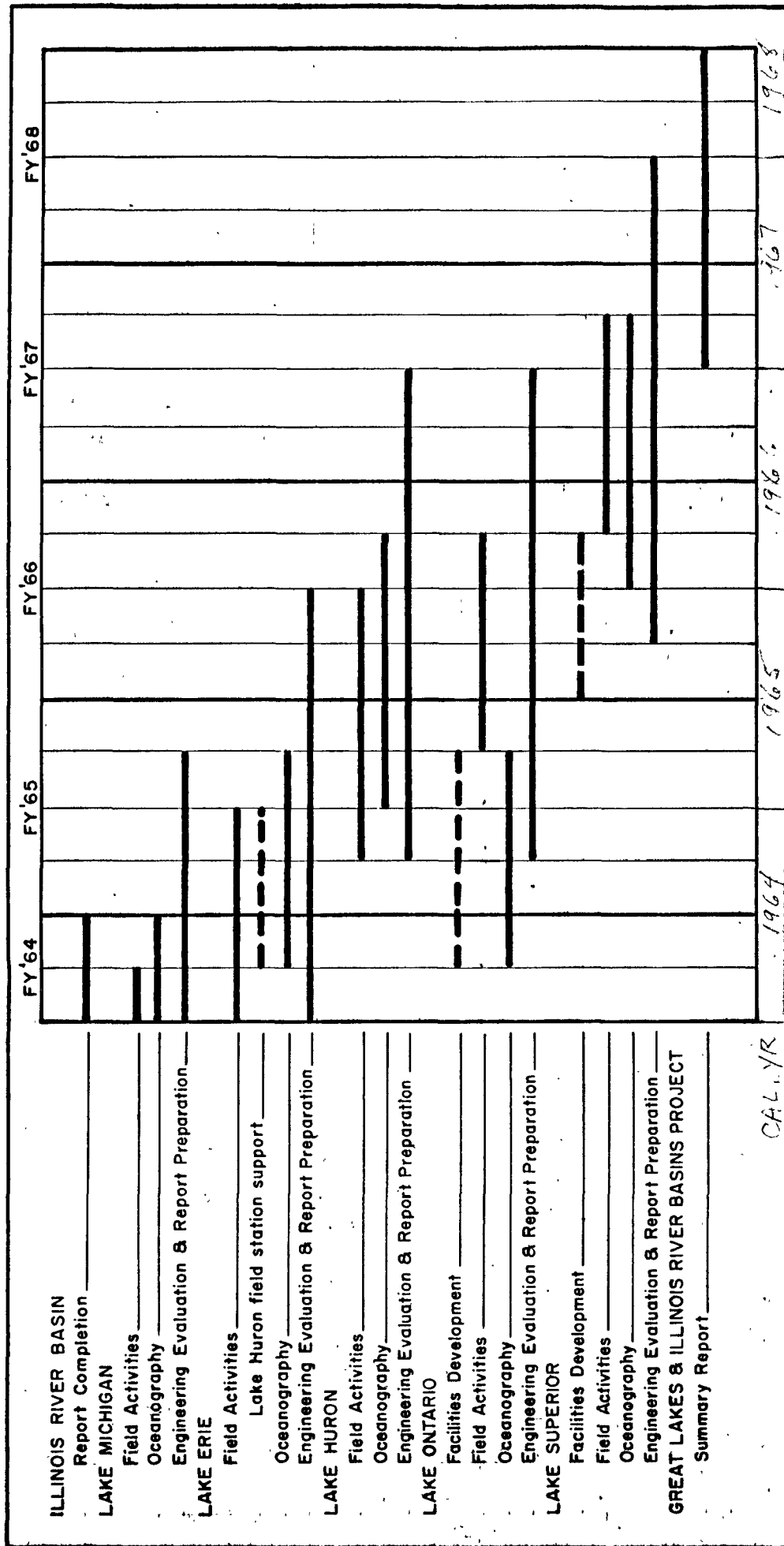
Provides procurement services for supplies and equipment including the issuance, evaluation, and award of requests for quotations and formal invitations for bid.

Maintains property accounting system for all field, office, and laboratory equipment in the Project and its Field Stations.

Initiates the acquisition and development of new raw space in the establishment of Field Stations. This includes the procurement and installation of all facilities necessary to convert raw space to working Project facilities.

Planning and Reports Branch

This Branch is responsible for the synthesis of all elements of Project work into a plan for the guidance of water quality management programs, and for preparation, editing, and publication of Project reports. Elements of work performed directly within the Branch include the collection of basic data on water uses, waterboard wastes, and historical water quality, engineering and economic analyses including projections of future conditions, the development of water quality goals to accommodate present and anticipated water uses, determination of the need for and value of storage for municipal and industrial water supply and flow regulation for water quality control on major streams and tributaries and at specific reservoir sites requested by the Corps of Engineers, and evaluation of alternative measures for attaining water quality goals. The Branch negotiates reimbursable agreements with other Federal agencies and acts as Project liaison for special studies and reports by cooperating agencies such

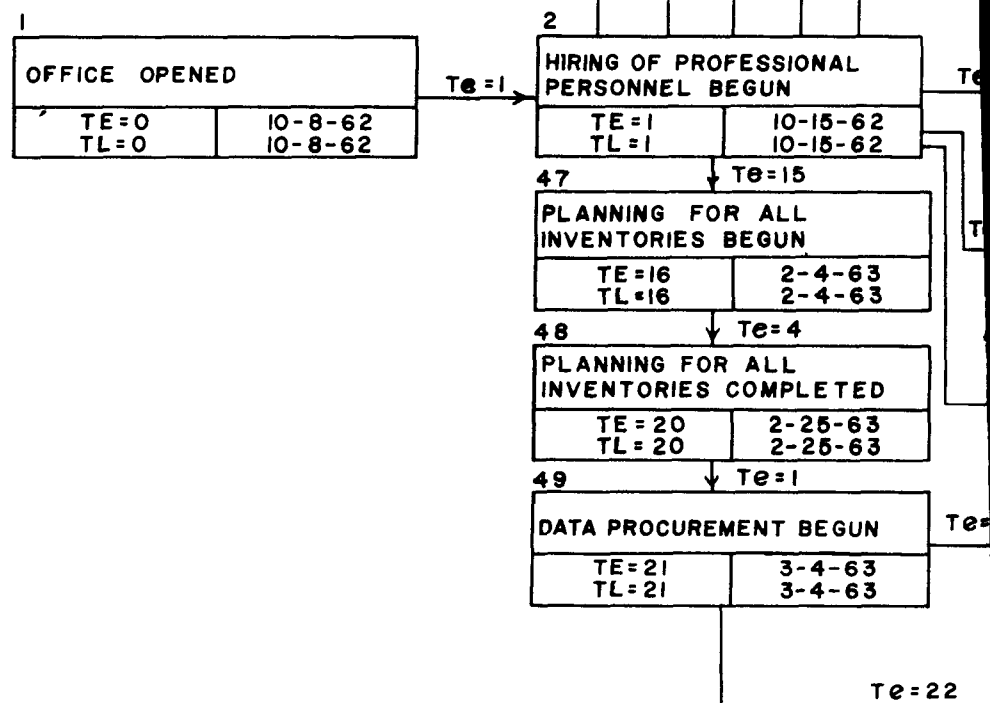


GREAT LAKES & ILLINOIS
RIVER BASINS PROJECT

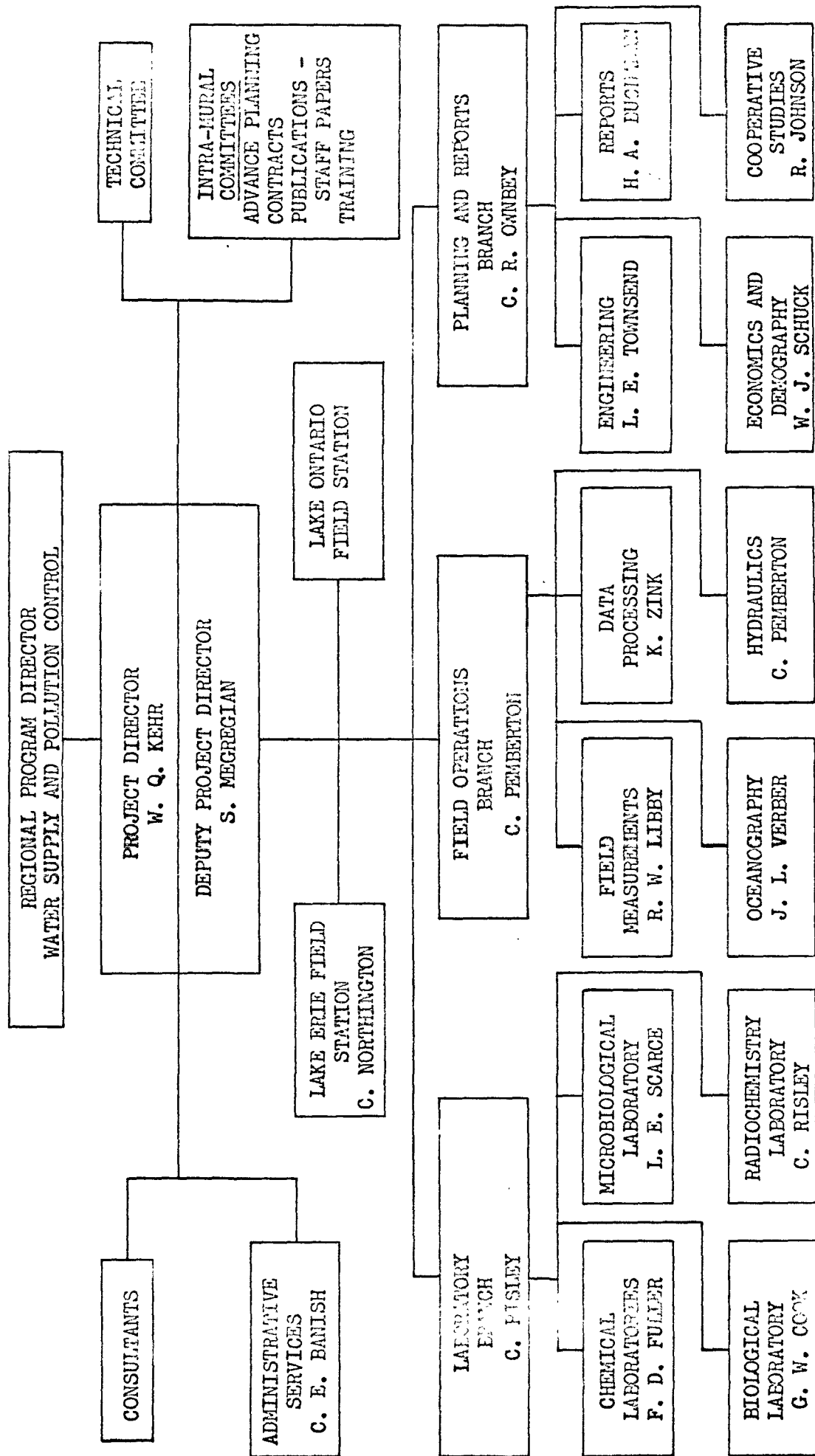
PROJECT SCHEDULE

U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE

FIGURE 7

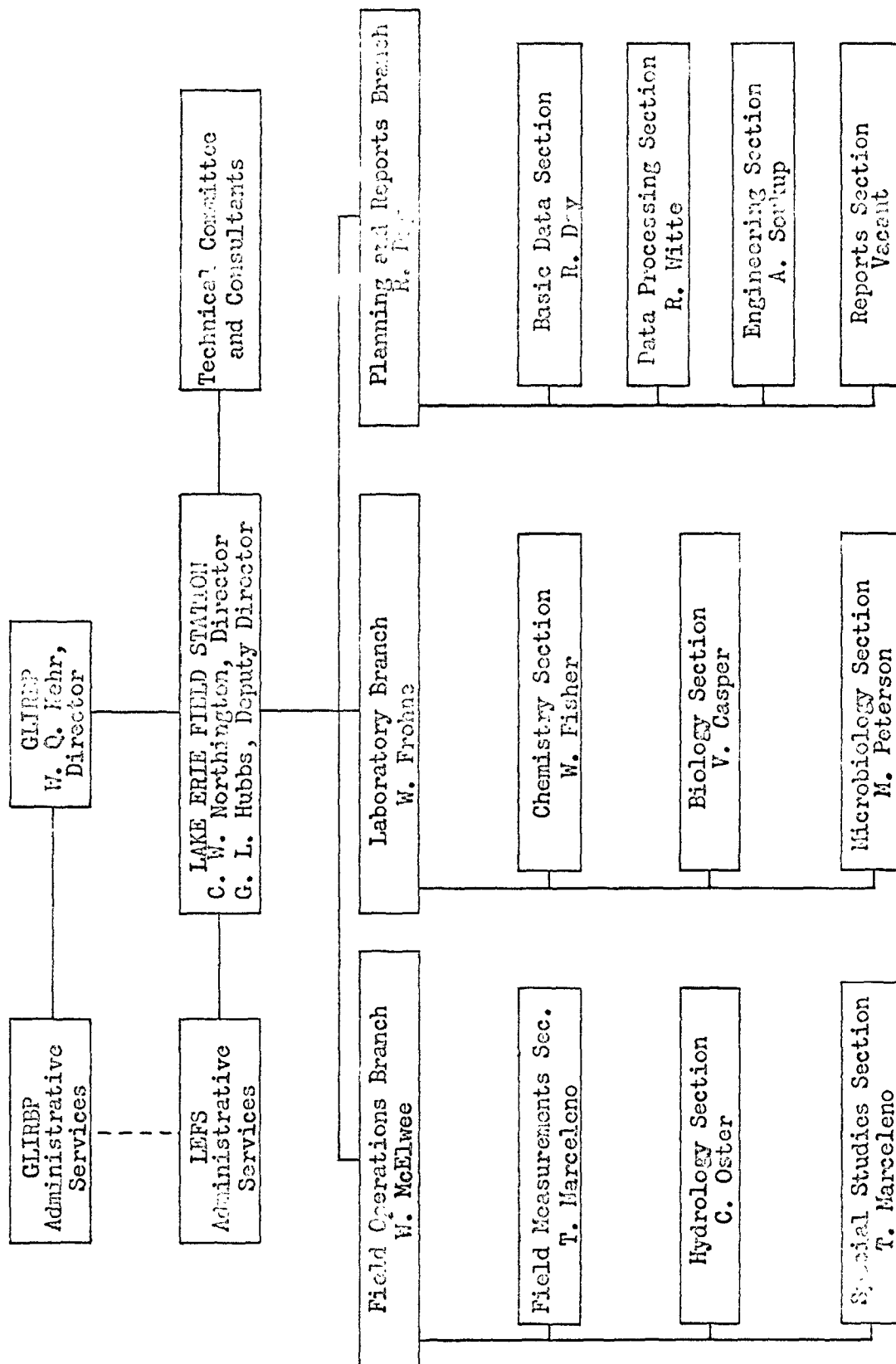


ORGANIZATION CHART - FY '64
GREAT LAKES-ILLINOIS RIVER BASINS PROJECT



FIGURE

GREAT LAKES-ILLINOIS RIVER BASINS PROJECT
LAKE ERIE FIELD STATION



FIGURE

as the Bureau of Outdoor Recreation and the Bureau of Sport Fisheries and Wildlife, USDI. The Branch is divided into four sections: Engineering, Economics, Cooperative Studies, and Report Preparation. The functions of each Section are described in greater detail below.

Engineering Section - This Section performs the detailed engineering investigations, studies and analyses required for developing comprehensive water quality management programs. The Section is composed of four operational units. The principal functions and work activities of each unit are presented in subsequent paragraphs.

The Basic Data Unit

- 1) Obtains data and prepares inventories of municipal sewerage facilities, including waste loads to receiving waters;
- 2) Compiles inventories of municipal and industrial water supplies;
- 3) Determines location and extent of other water uses;
- 4) Obtains water quality data of record from other agencies; and
- 5) Performs index-coding of river systems and lakes for data storage and retrieval system.

The Environmental Analysis Unit

- 1) Performs stream and lake water quality analyses, utilizing mathematical techniques;
- 2) Analyzes and develops water use and waste return flow factors;
- 3) Translates economic projections into future water demands and waste loads;
- 4) Assists the Technical Committee in developing water quality guides and goals;
- 5) Evaluates control measures required to achieve water quality objectives; and
- 6) Conducts benefit and cost studies.

The Industrial Waste Unit

- 1) Obtains and compiles data on amounts and character of industrial wastes;

- 2) Appraises industrial waste control facilities and practices;
- 3) Conducts special industrial waste surveys;
- 4) Determines factors for estimating waste discharge for various industrial processes; and
- 5) Evaluates effects of industrial wastes on water uses and determines corrective measures for problem conditions.

The Hydrology Unit

- 1) Appraises adequacy of surface and ground water sources to supply present and future needs;
- 2) Performs low-flow frequency analyses to determine design flows for stream quality analyses;
- 3) Analyzes the water balance in lakes and reservoirs; and
- 4) Conducts flow regulation studies in conjunction with stream quality analyses by others.

Cooperative Studies Section - This Section is responsible for studies and reports on the needs for and value of storage for municipal and industrial water supply and/or flow regulation for water quality control in reservoirs proposed by Federal construction agencies. This involves analysis of the factors that influence municipal and industrial water use and waterborne wastes, translation of population projections and economic growth into engineering estimates of water uses, the effect of accompanying waste loads on the receiving streams, the selection of proper water quality indicators, and recommendations for the establishment of water quality goals. The value of storage for water supply and flow regulation in proposed reservoirs is based on alternate costs, adjusted for differences in transmission, treatment, time of need, etc. The views of the Secretary of Health, Education, and Welfare are based on these reports.

The inventory of municipal and industrial water supplies and waste loads as determined for the GLIRBP Study will in most cases, be utilized. Where economic base studies are being made for the Corps of Engineers on sub-basin projects they will be coordinated with the GLIRBP Study. Mathematical models and computer programs developed for the GLIRBP Study will be utilized by the Cooperative Studies Section where applicable.

Economics Section - This Section is primarily concerned with the compilation and analyses of population and selected economic factors

having a bearing upon estimating future municipal and industrial water requirements and waste flows. To the extent practicable, study is also to be made of benefits (primarily intangible) from water quality control measures. Assistance will also be provided in the preparation of costs for implementing such control measures.

Report Preparation Section - This Section is mainly responsible for the report writing, illustration, and publishing activities of the Project. This requires: the planning, coordination, and direction of reporting activities; writing, editing, and assisting others in their reporting responsibilities; illustrating, reproducing and binding documents for publication; and, distributing reports, maintaining files, and keeping records of publication and distribution. This Section obtains review comments and approvals for publication and release of documents, from Washington headquarters. Technical papers and speeches are written or edited and also cleared for publication or delivery. On occasion, the Section Chief may appear as a Project Representative before groups and deliver prepared talks and speeches. Contacts with television and news media have been maintained and will be developed on occasion to promote the dissemination of news and information about the Project activities, particularly when any significant developments have occurred.

Laboratory Branch

The Laboratory Branch plans and coordinates several areas of separate scientific study including biological, bacteriological, chemical and radiochemical disciplines. The Branch evaluates the results which have been obtained by known analytical methods and may propose new techniques or approaches to solve problems under consideration. The Branch determines the role of each laboratory Section, exercises administrative supervision of these Sections and reviews and evaluates reports of each Section in terms of scientific soundness, accuracy and adequacy in meeting the objectives of the Project. The Branch prepares interpretations and reports for the Project Director, other Branch Chiefs, Field Station Directors, and others.

Chemistry Section - This Section is responsible for all chemical and related physical measurements resulting from Project activities. This includes the analysis of water samples at the Project headquarters and aboard laboratory vessels operating on the Great Lakes. The samples originate from the laboratory vessels, from tributary sampling, from industrial waste surveys, and samples collected in support of related studies. The laboratory reviews the results of the collected data and prepares narrative reports of physical and chemical findings for the use of the Project.

Biology Section - This Section is responsible for all biological activities of the Project. It establishes methods for conducting investigations and conducts field sampling and investigations of the Great Lakes and its watershed as well as laboratory analyses of the samples collected during the field investigations. The Section also performs special studies which require devising new techniques for determining the effects of sewage and industrial wastes upon aquatic life which normally inhabit the Great Lakes. The Section prepares results and interpretations of investigations and discusses these with other Laboratory Sections, the Laboratory Branch, other Branches of the Project, and the Project Director. These reports are made available for Project use.

Microbiology Section - This Section is responsible for the Microbiological Laboratory activities and field investigations. The Section performs routine identifications of microorganisms in the Great Lakes and their watershed and performs special complex studies requiring new approaches and techniques. These special studies involve determination of unusual microbiological forms, use of microorganisms to measure lake water movement and to determine water quality. The Section prepares reports and recommendations for future studies and for corrective action. These reports are used to advise the Laboratory Branch, other Branches of the Project, and the Project Director in the development of water quality studies.

Radiochemistry Section - This Section is responsible for the radiochemical activities of the Project in the Great Lakes and its watershed. The Section recommends which areas are to be studied and designates the type of samples to be collected. All samples are returned to the Laboratory for radiochemical analysis. The Laboratory also conducts special investigations and advises the Laboratory Branch, other Project Branches, and the Project Director on all aspects of radiological importance to the Project. Reports of the studies made are prepared and made available for Project use.

Field Operations Branch

This Branch conducts the field investigations and research necessary to collect data which is adequate for use as a basis for Project recommendations, and reduces the data to forms suitable for engineering and scientific analyses. The Branch Chief plans and coordinates activities of the Sections and reviews reports submitted by the Sections.

Field Measurements Section - The Section is responsible for collecting samples of river and lake water, sediment, sewage and industrial wastes, and transporting these samples in the proper condition to the laboratory. In addition, the Section makes observations and measurements

of a number of physical phenomena which are important to the meteorological and oceanographic phases of the Project studies. The Section prepares reports of activities and findings for inclusion in Project documents.

Hydraulics Section - The Section measures flows of streams, canals, sewers, outfalls, etc., in the field, and makes related computations of velocity of flow, time of water travel, average flows, and rainfall-runoff relationships. The Section coordinates these studies with Project activities so that pollution loadings are available when needed. The Section prepares reports of findings for use in preparation of Project reports.

Oceanography Section - The Section conducts oceanographic studies on the Great Lakes to determine mass water movements, and to develop relationships between lake currents and winds for use in predicting the fate of pollutants discharged to the lakes. The Section analyzes and interprets the results of investigations, and reports on these findings.

Data Processing Section - The Section plans data processing systems, develops computer programs necessary for analyzing the data, and interprets the results of computer analyses. The Section also provides for the storage and retrieval of data, so that the data are available to engineers and scientists for review and analysis. The Section prepares reports on data handling and results of analyses.

Lake Erie Field Station

The Field Station in Cleveland, Ohio, was opened for the purpose of conducting a study of the Lake Erie Basin which is one of the six major basins included in the Great Lakes-Illinois River Basin. The functions of this comprehensive program performed by the various branches and sections of the Field Station are described in the following paragraphs.

Field Station Director's Office - This office provides overall direction in the conception, development and planning of field station activities within the broad framework laid down by the GLIRB Project Director. It directs the activities of the Field Station, making major decisions and recommendations involving engineering, administration and scientific aspects of the Field Station work. Line authority is exercised in directing overall activities of field station personnel and in coordinating activities of its branches. This office receives consultation through various consultant groups, including the Lake Erie Study Group and the Lake Erie Technical Committee. It represents the Project in meeting with Federal, State, and local government officials, members of industry, lay groups and others having common interest in water quality management.

Field Operations Branch - The Branch plans and coordinates field activities. It conducts investigations and research necessary for Project recommendations and puts data into a form suitable for engineering and

scientific analysis. It reviews reports of all its sections.

The Field Measurements Section coordinates collection and measurement activities. It collects water and waste samples, performs related field measurements and reports findings.

The Hydrology Section conducts hydrologic studies; coordinating these studies with other Project activities. It reports on the results of its investigations including appropriate interpretation of these results.

The Special Studies Section conducts reconnaissance surveys as a preliminary to larger scale studies in order to determine the feasibility of the ranges to be sampled, travel times, various routes of travel, etc. In addition this section programs activities such as: carbon filter studies, storm water overflows, bacteriological studies, sludge studies and sewage and industrial wastes sampling surveys.

Laboratory Branch - The Branch plans and coordinates all laboratory activities. It reviews and evaluates all laboratory results besides assisting in planning the Field Station study program.

The Chemistry Section performs the required chemical analyses and makes the results available for Project use.

The Microbiology Section performs the required microbiological analyses and makes the results available for Project use.

The Biology Section conducts biological sampling of tributaries and harbors and makes the test results available for Project use.

Planning and Reports Branch - This Branch plans and coordinates activities of the various Sections. It correlates the interpretations and conclusions of all reports, and plans program for obtaining additional information. The Branch is responsible for directing the development of the final comprehensive Lake Erie Report.

The Inventory Section collects municipal water and sewage inventory data, industrial water and waste inventory data and historical basic data.

The Data Processing Section plans the data processing programs and develops computer programs necessary for the Field Station's activities. It interprets the results of computer analyses and reports the results.

The Engineering Section will conduct a comprehensive engineering analysis using all data collected by the Lake Study. These analyses include construction of a mathematical model of Lake Erie and its major tributaries. Short range and long range effects of waste loadings will be determined and water quality management programs formulated.

The Reports Section in addition to preparing and writing reports, plans the technical report writing activities of the Field Station. This Section will be responsible for the preparation of the final comprehensive report.

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL
TECHNICAL SERVICES BRANCH
GREAT LAKES-ILLINOIS RIVER BASINS PROJECT
(Comprehensive)
January 1, 1964

Title	Grade	Series	Pos. No.	Name	Duty Station
<u>OFFICE OF THE PROJECT DIRECTOR</u>					
Project Director	SE DIR			Kehr, W. Q.	Chicago, Illinois
Deputy Director	SAN DIR (R)(T)			Megregian, S.	"
Public Information Officer	GS-12	1081	EH-63-161	Vacant 3/	"
Secretary	GS-6	318	RO-353	Kristalyn, A.	"
Secretary (Steno)	GS-5	318	RO-574	Butgereit, J. E.	"
Clerk-Typist	GS-4	322	RO-438	Metker, B.	"
<u>ADMINISTRATIVE BRANCH</u>					
Administrative Officer	GS-12	341	BSS-5090	Banish, C. E.	"
Asst' Adm. Officer	GS-9	341	EH-63-454	Thorsteinsson, P.J.E.	"
Administrative Aide	GS-6	301	RO-320	Scelsi, M.	"
Personnel Clerk (Typing)	GS-5	203	RO-452	Ahamnos, C. J.	"
Secretary (Steno)	GS-5	318	RO-465	Morgan, A. F.	"
Procurement Clerk	GS-4	2020	RO-339	Krajicek, L.	"
Stock Control Clerk(Typ)	GS-4	2040	RO-458	Russo, C. M.	"
Storekeeping Clerk	GS-4	2033	RO-336	Griffin, C. S.	"
Storekeeping Clerk	GS-4	2033	RO-3361A	McGeehan, P. G.	"
Storekeeping Clerk	GS-3	2033	RO481	Cravens, J. C.	"
<u>FIELD OPERATIONS BRANCH</u>					
Supvry. Sanitary Engineer	GS-14	819	BSS-4337	Pemberton, C. (Actg)	"
Secretary	GS-5	318	RO-426	Gose, R.	"
<u>Field Measurements Section</u>					
Supvry. Sanitary Engineer	GS-13	819	BSS-3989	Libby, R. W.	"
Sanitary Engineer	ASE(R)(T)			Schieble, W.	"
Sanitary Engineer	ASE(R)(T)			Alessi, C. R.	"
General Mechanic	WB-11	4740	BSS-5317	Witt, S. A.	"
Supvry. Engr. Tech.	GS-7	802	EH-63-120	Summey, Richard D.	"
Secretary (Steno)	GS-5	318	RO-535	Kwiat, L. C.	"
Aquatic Sample Collector	WB-4	3501	BSS-42371A	Box, A. Jr.	"
"	"	"	"	Degutis, W. J.	"
"	"	"	"	Demske, E. P. B/	"
"	"	"	"	Edwards, P. C/	"
"	"	"	"	Harrison, Z. D., Jr.	"
"	"	"	"	Kampinnen, T. L. D/	"
"	"	"	"	Kash, A. A.	"
"	"	"	"	O'Connell, E. M., Jr.	"
"	"	"	"	Slovick, J.	"
"	"	"	"	Winslow, P. P.	"
"	"	"	"	Baldwin, W. F.J. X/	"
"	"	"	"	Maurer, J. J. X/	"
"	"	"	"	Chorowicki, D. W. X/	"
"	"	"	"	Stockdale, B. E. X/	"

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL
TECHNICAL SERVICES BRANCH
GREAT LAKES-ILLINOIS RIVER BASINS PROJECT
(Comprehensive)
January 1, 1964

Title	Grade	Series	Pos. No.	Name	Duty Station
<u>FIELD OPERATIONS BRANCH (Cont'd)</u>					
<u>Hydraulics Section</u>					
Hydraulic Engr. (Gen.)	GS-13	813	BSS-3966	Pemberton, C.	Chicago, Illinois
Sanitary Engineer	GS-12	819	BSS-6724	Tellekson, M. W.	"
Sanitary Engineer	ASE(R)(T)			Martin, B. F.	<u>D/</u> "
Hydraulic Engr. Tech.	GS-5	802	BSS-6690	Callier, J.	"
<u>Oceanography Section</u>					
Hydrographer	HSO (R)			Verber, J. L.	"
Hydrographer	HSO(R)(T)			Farlow, J. S. III	"
Sanitary Engineer	ASE(R)(T)			Rasmussen, J. H.	"
Sanitary Engineer	ASE(R)(T)			Farmer, V. H.	"
Hydrographer	GS-12	1360	BSS-6668	Vacant, 5/	"
Engineering Technican	GS-5	802	EH-63-360	Hutchinson, C. K.	"
Secretary (Steno)	GS-5	318	RO-480	Bryant, C. J.	"
Cartographic Draftsman	GS-4	816	BSS-41101A	Martin, M. J.	B "
Hydrographer (Physical)	GS-9	1360	BSS-5315	Vacant 5/	"
Hydrographer (Physical)	GS-7	1360	BSS-6671	Reilly, B. J.	"
<u>Data Processing Section</u>					
Supvry. Digital Comp. Prog.	GS-12	331	BSS-4226	Zink, K. W.	"
Digital Computer Prog.	ASE(R)(T)			Conger, C. S.	"
Statistical Clerk	GS-5	1531	RO-550	Johnson, A. T.	"
Mathematics Technician	GS-5	1512	RO-43641A	Hickey, J. B.	"
Cartographic Draftsman	GS-5	816	BSS-40251A	Dennis, J.	"
Statistical Clerk	GS-4	1531	RO-4351A	Motley, K. L.	"
Statistical Clerk	GS-4	1531	RO-435	Johnson, W.	"
Statistical Clerk	GS-4	1530	RO-4351A	McDonald, Newman	"
<u>LABORATORY BRANCH</u>					
Director, Laboratories	GS-14	1320		Risley, C. (Actg.)	"
Secretary (Steno)	GS-5	318	RO-384	Gordon, I. C.	"
Clerk-Typist	GS-4	322	RO-407	Dyer, I. C.	"
Clerk-Typist	GS-4	322	RO-4071A	Booker, M. A.	"
<u>Chemical Laboratory</u>					
Supvry. Chemist (Analytic)	GS-13	1320	BSS-3879	Fuller, F. D.	"
Chemist	SR SAN			Calbert, C. E.	"
Chemist (Analytical)	GS-11	1320	BSS-3876	Johnson, W. D.	"
"	"	"	BSS-38761A	Kelley, P. W.	"
"	"	"	"	Whitworth, R. S.	"
"	GS-9	"	BSS-41211A	Vacant 2/	"
"	"	"	BSS-4121	Doolas, G.	"
"	"	"	BSS-41211A	Hall, R. H.	"
"	"	"	"	King, E. T.	"
Chemist	AHSO(R)(T)			Hawley, J. E.	"
"	"			Meiggs, T. O.	"
"	GS-5	1320	BSS-50571A	Vacant 2/	"
"	GS-5	1320	"	Putnam, I. B.	"

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL
 TECHNICAL SERVICES BRANCH
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Title	Grade	Series	Pos. No.	Name	Duty Station
<u>LABORATORY BRANCH (Cont'd)</u>					
<u>Chemical Laboratory (Cont'd)</u>					
Physical Science Tech (Chem)	GS-5	1311	BSS-4235	Frye, G.	Chicago, Illinois
" " "	GS-5	1311	BSS-42351A	Allen, O. E.	"
Laboratory Helper	GS-3	1398	BSS-5346	Troupe, L. A.	"
<u>Microbiological Laboratory</u>					
Supvry. Bacteriologist (Gen)	GS-13	420	BSS-3877	Scarce, L.E.	"
Bacteriologist	SAHSO(R)(T)			Rubenstein, S.	"
Bacteriologist	SAHSO(R)(T)			Bond, H. A.	"
Biological Aide	GS-4	402	BSS-6173	Dixon, M. L.	"
<u>Radiological Laboratory</u>					
Supvry. Chemist (Analytical)	GS-13	1320	BSS-5518	Risley, C., Jr.	"
Chemist	AHSO(R)(T)			Abbott, W. L.	"
Physical Science Tech.	GS-5	1311	BSS-42351A	Cornier, R. F.	"
<u>Biological Laboratory</u>					
Supvry. Biologist	GS-13	401	BSS-4096	Cook, G. W.	"
Biologist	SAHSO(R)(T)			Fox, J. L.	"
Biologist (Water Poll.)	GS-9	401	BSS-4425	Schuytema, G. J.	"
Biological Lab. Tech. (Gen)	GS-7	404	BSS-5614	Vacant 1/	"
Biologist (Water Poll.)	GS-7	401	BSS-4426	Marciniak, P.	"
Biologist (Water Poll.)	GS-7	401	BSS-44261A	Powers, R. E.	"
Biologist (Water Poll.)	GS-7	401	BSS-44261A	Rummel, L. H.	"
Laboratory Helper	GS-2	1398	BSS-4705	Townsend, J. L.	X/ "
<u>PLANNING AND REPORTS BRANCH</u>					
Supvry. Sanitary Engineer	GS-14	819	BSS-4445	Ownbey, C. R.	"
Soil Conservationist (Staff)	GS-12	457	BSS-6737	Vacant 3/	"
Secretary (Typing)	GS-5	318	RO-411	Fischbach, T. G.	"
Clerk-Typist	GS-4	322	RO-484	Hawkins, D. A.	"
<u>Engineering Section</u>					
Supvry. Sanitary Engineer	GS-13	819	BSS-5371	Townsend, L. E.	"
Secretary (Steno)	GS-5	318	RO-383	Ehlert, L. S.	"
<u>Basic Data Unit</u>					
Sanitary Engineer	SR SANE			Minkin, J. L.	"
Sanitary Engineer	SA SANE			Start, G. P.	"
Sanitary Engineer	ASANE			Vacant 2/	"
Statistical Clerk	GS-4	1531	RO-4351A	Crawford, J. M.	"
Clerk-Typist	GS-4	322	RO-408	Morwitz, D.	"

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL
 TECHNICAL SERVICES BRANCH
 GREAT LAKES-ILLINOIS RIVER BASINS PROJECT
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 January 1, 1964

Title	Grade	Series	Pos. No.	Name	Duty Station
<u>PLANNING AND REPORTS BRANCH (Cont'd)</u>					
<u>Environment Analysis Unit</u>					
Sanitary Engineer	GS-12	819		Vacant <u>2/</u>	Chicago, Illinois
Sanitary Engineer	ASE(R)(T)			Ross, J. M.	"
Sanitary Engineer	GS-9	819	BSS-5292	Pinkstaff, E.	"
Mathematics Technician	GS-5	1521	BSS-4364	Elder, J. W.	"
Sanitary Engineer	ASE(R)(T)			Chaussee, D. R.	"
<u>Industrial Wastes Unit</u>					
Sanitary Engineer	SRSANE(R)(T)			Eklund, H.	"
Sanitary Engineer	ASE(R)(T)			Dunne, W. M.	"
<u>Hydrology Unit</u>					
Hydraulic Engineer	GS-12	813	BSS-6212	Willeke, G. E.	"
<u>Cooperative Studies Section</u>					
Sanitary Engineer (Chief)	SANE(R)(T)			Johnson, R. E.	"
Sanitary Engineer	ASE(R)(T)			Hopkins, D. R.	"
Sanitary Engineer	GS-12	819		Vacant <u>2/</u>	"
<u>Economics Section</u>					
Economist General	GS-13	110	BSS-4926	Schuck, W. J.	"
Regional Economist	GS-5	110	EH-63-432	Kee, D.	"
Statistical Clerk	GS-5	1531	RO-520	Vacant <u>1/</u>	"
<u>Report Preparation Section</u>					
Tech. Publ. Writer Engr.	GS-12	1083	BSS-4174	Buchanan, H. A.	"
Cartographic Draftsman	GS-5	816	BSS-4025	Buckhauler, A.	"
Cartographic Draftsman	GS-4	816	BSS-4110	Johnson, L. A., Jr.	A/ "
Technical Writer	GS-9	1083		Vacant <u>4/</u>	"

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL
TECHNICAL SERVICES BRANCH
GREAT LAKES-ILLINOIS RIVER BASINS PROJECT
LAKE ERIE FIELD STATION
January 1, 1964

Title	Grade	Series	Pos. No.	Name	Duty Station
<u>ADMINISTRATIVE BRANCH</u>					
Project Director	SR SANE			Northington, C.W.	Cleveland, Ohio
Deputy Director	SE DIR			Hubbs, G. L.	"
Public Health Analyst	GS-5	685	EH-63-439	Vacant	"
Administrative Aide	GS-6	301	RO-320	Vacant	"
Secretary (Steno)	GS-5	318	RO-162	Cline, C.	"
Secretary (Typing)	GS-4	318	RO-605	Pastva, J. D.	"
<u>FIELD OPERATIONS BRANCH</u>					
Chief, Sanitary Engineer	SAN(R)(T)			McElwee, W. C.	"
Secretary (Steno)	GS-4	318	RO-554	Eggleston, B. C.	"
General Mechanic	WB-11	4740		Vacant 4/	"
Sanitary Engineer	SANE			Vacant 4/	"
Sanitary Engineer	SANE			Vacant 4/	"
<u>Field Measurements Section</u>					
Supvy. Sanitary Engineer	SA SANE(T)			Marceleno, T.	"
Sanitary Engineer	A SANE(R)(T)			Warren J.	"
Boat Operator	WB-8	5903	BSS-5687	Jones, W. L.	"
Boat Operator	WB-8	5903	BSS-56871A	Frye, W.	"
Aquatic Sample Collector	WB-4	3501	BSS-42371A	Fuller, F. D., Jr.	"
"	"	"	"	Bacher, J.	"
"	"	"	"	Good, J. S.	"
"	"	"	"	McGuinness, J.	"
"	"	"	"	Sprenger, R.	"
"	"	"	"	Ziats, R. J.	"
"	"	"	"	Chrencik, C. F.	"
"	"	"	"	White, W. H.	"
"	"	"	"	Peterson, T. W.	"
"	"	"	"	Robinson, C. W.	"
Sanitary Engineer	ASANE			Vacant 4/	"
Sanitary Engineer	ASANE			Vacant 4/	"
<u>Hydraulics Section</u>					
Supvy. Sanitary Engineer	SA SANE(R)(T)			Oster, C. C.	"
Sanitary Engineer	A SANE(R)(T)			Carrara, R. S.	"
<u>LABORATORY BRANCH</u>					
Director, Laboratories	SCI DIR			Frohne, W. C.	"
Secretary (Steno)	GS-4	318	RO-549	Wagner, A. R.	"
<u>Chemical Laboratory</u>					
Chemist Analytical	GS-11	1320	BSS-3876	Fisher, W. C.	"
"	GS-7	"	BSS-4164	Schroeder, V. C.	"
"	"	"	"	Ross, C.	"
Chemist	GS-5	"	BSS-5057	Osterland, C.	"
"	"	"	"	Tedde, F. A.	"

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL
 TECHNICAL SERVICES BRANCH
 GREAT LAKES-ILLINOIS RIVER BASINS PROJECT
 LAKE ERIE FIELD STATION
 January 1, 1964

Title	Grade	Series	Pos. No.	Name	Duty Station
<u>LABORATORY BRANCH (Cont'd)</u>					
<u>Chemical Laboratory (Cont'd)</u>					
Chemist	GS-9	1320		Vacant 4/	Cleveland, Ohio
"	"	"		Vacant 4/	"
"	GS-7	"	BSS-41641A	Vacant 4/	"
"	GS-5	"		Vacant 4/	"
<u>Biological Laboratory</u>					
Biologist	SAHSO(R)(T)			Casper, V. L.	"
Biologist	SAHSO(R)(T)			Kleveno, C. C.	"
Biologist	GS-5	401		Vacant 2/	"
<u>Microbiological Laboratory</u>					
Bacteriologist (Gen.)	GS-11	420	BSS-4122	Peterson, M.	"
Bacteriologist	GS-9	420		Vacant 4/	"
Biological Aide	GS-5	404		Vacant 4/	"
Biological Aide	GS-5	404		Vacant 4/	"
<u>PLANNING AND REPORTS BRANCH</u>					
Supvy. Sanitary Engineer	GS-13	819	EH-63-43	Day, R. V.	"
Secretary (Steno)	GS-4	318	RO-546	Oliver, J.	"
Cartographic Draftsman	GS-5	816	BSS-40251A	Alexander, D.	"
<u>Basic Data Section</u>					
Sanitary Engineer	ASANE(R)(T)			Fazzino, S. C.	"
Sanitary Engineer	SANE			Vacant 2/	"
<u>Data Processing Section</u>					
Sanitary Engineer	ASANE(R)(T)			Witte, R. D.	"
Clerk-Typist	GS-4	322		Vacant 1/	"
<u>Engineering Section</u>					
Sanitary Engineer	SANE			Vacant 2/	"
Sanitary Engineer	SASANE(R)(T)			Martinez, W. W.	"
Sanitary Engineer	ASANE			Vacant 4/	"
Reports Preparation Engr.	SANE			Vacant 3/	"

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL
 TECHNICAL SERVICES BRANCH
 GREAT LAKES-ILLINOIS RIVER BASINS PROJECT
 LAKE ONTARIO FIELD STATION
 January 1, 1964

Title	Grade	Series	Pos. No.	Name	Duty Station
Acting Project Director	SR	SANE		Vacant 4/	Rochester, New Yo.
Administrative Assistant	GS-7	301		Vacant 4/	"
Secretary	GS-5	318		Vacant 4/	"
Sanitary Engineer	ASE(R)(T)			Vacant 6/	"
Aquatic Sample Collector	WB-4	3501	BSS-4237	Vacant 6/	"

1/ EOD 1-64
 2/ EOD 2-64
 3/ EOD 3-64
 4/ EOD 4-64
 5/ EOD 5-64
 6/ EOD 6-64

A/ Term. 1-10-64
 B/ Term 4-64
 C/ Transfer to Cleveland 4-64
 D/ Transfer to Rochester N.Y. 6-64

X/ Temporary limited appointment.

PERSONNEL NEEDS
FY 1964

Project: Great Lakes-Illinois River Basins

y - yes
n - no

Title	Grade	Series	Job Descr.		Status	Position		Duty Station	EOD
			Prep.	App.		Auth.	Funded		
Public Information Officer	GS-12	1081			y	y	y	Chicago	3/64
Soil Conservationist	GS-12	457			y	y	y	"	2/64
Sanitary Engineer	GS-12	819	n			y	y	"	2/64
Sanitary Engineer	GS-12	819			y	y	y	"	2/64
Statistical Clerk	GS-5	1531			y	y	y	"	1/64
Chemist	GS-7	1320			y	y	y	Clev. Ohio	4/64
Chemist	GS-9	1320	n			y	y	"	4/64
Chemist	GS-9	1320	n			y	y	"	4/64
Biologist	GS-5	401		y		y	y	"	2/64
Bacteriologist	GS-9	420		y		y	y	"	4/64
Sanitary Engineer	SANE					y	y	"	4/64
Sanitary Engineer	SANE					y	y	"	4/64
Sanitary Engineer	ASANE					y	y	"	4/64
Sanitary Engineer	ASANE					y	y	"	6/64
Sanitary Engineer	SANE					y	y	"	4/64
Reports Preparation Engineer	SRSANE					y	y	"	3/64
Project Director						y	y	Rochester, N.Y.	4/64
Administrative Assistant	GS-7	301	n			y	y	"	4/64
Secretary	GS-5	318	n			y	y	"	4/64

PERSONNEL NEEDS
FY 1964

y - yes
n - no

Project: Great Lakes-Illinois River Basins

Title	Grade	Series	Job Descr.		Status	Position		Duty Station	EOD
			Prep.	App.		Auth.	Funded		
Public Information Officer	GS-12	1081			y	y	y	Chicago, Ill	3/64
Soil Conservationist	GS-12	457			y	y	y	"	2/64
Sanitary Engineer	ASANE					y	y	"	2/64
Sanitary Engineer	GS-12	819		n		y	y	"	2/64
Sanitary Engineer	GS-12	819			y	y	y	"	2/64
Statistical Clerk	GS-5	1531			y	y	y	"	1/64
Technical Writer	GS-9	1083		n		y	y	"	4/64
Hydrographer	GS-12	1360			y	y	y	"	5/64
Hydrographer (Phys)	GS-9	1360			y	y	y	"	5/64
Chemist (Analytical)	GS-9	1320			y	y	y	"	2/64
Chemist	GS-5	1320			y	y	y	"	2/64
Biological Lab. Tech.	GS-7	404			y	y	y	"	1/64
Chemist	GS-5	1320		n		y	y	Cleveland, Ohio	4/64
Chemist	GS-7	1320			y	y	y	"	4/64
Chemist	GS-9	1320				y	y	"	4/64
Chemist	GS-9	1320		n		y	y	"	4/64
Biologist	GS-5	401			y	y	y	"	2/64
Bacteriologist	GS-9	420			y	y	y	"	4/64
Biological Aide	GS-5	404			y	y	y	"	4/64
Biological Aide	GS-5	404			y	y	y	"	4/64
General Mechanic	WB-11	4740		n		y	y	"	4/64
Sanitary Engineer	SANE					y	y	"	4/64
Sanitary Engineer	SANE					y	y	"	4/64
Sanitary Engineer	ASANE					y	y	"	6/64
Sanitary Engineer	SANE					y	y	"	2/64
Sanitary Engineer	ASANE					y	y	"	6/64
Clerk-Typist	GS-4	322		n		y	y	"	1/64
Sanitary Engineer	SANE					y	y	"	2/64
Sanitary Engineer	ASANE					y	y	"	4/64
Sanitary Engineer	SANE					y	y	"	3/64
Reports Preparation Engineer	SANE					y	y	"	4/64
Project Director	SRSANE					y	y	Rochester, N.Y.	4/64
Administrative Assistant	GS-7	301		n		y	y	"	4/64
Secretary	GS-5	318				y	y	"	4/64
Sanitary Engineer	ASE					y	y	"	6/64
Aquatic Sample Collector	WB-4	3501			y	y	y	"	2/64

SPACE

Project: Great Lakes-Illinois River Basins Project
 FY : 1964
 Date : December, 1963

Location	Use	Area (sq. ft.)	Cost
1819 W. Pershing Rd. Chicago, Illinois	Office, Laboratory, and Storage	29,337	\$ 23,500 (1)
7298 York Road Cleveland, Ohio	Office, Laboratory, and Storage	15,000	1,500 (1)
Rochester, New York	Office, Laboratory, and Storage	7,000	500 (1) 10,000 (2)
(1) Utilities			
(2) Rent			

SPACE

Project: Great Lakes-Illinois River Basins Project

FY : 1965

Date : December, 1963

Location	Use	Area (sq. ft.)	Cost
1819 W. Pershing Rd. Chicago, Illinois	Office, Laboratory, and Storage	29,337	\$ 23,500 (1)
7298 York Road. Cleveland, Ohio	Office, Laboratory, and Storage	15,000	1,500 (1)
Rochester, New York	Office, Laboratory, and Storage	7,000	21,000 (2) 1,000 (1)
Naval Air Station Grosse Ile, Michigan	Office, Laboratory, and Storage	5,200	800 (1)

(1) Utilities
(2) Rent

ESTIMATED WORKING BUDGET PLAN

88

Fiscal Year 1964

Program/Project No. 207/645
Region and Location Region V, Chicago, Ill. and Title Great Lakes-Illinois River
Basins Project

1964 Allowance No. 4-31551964 Estimate

11 Personnel Compensation	\$ 951,000
Summer employment	5,000
Consultants' fees	2,000
12 Personnel benefits	144,000
21 Travel	
Temporary duty travel	160,000
Change of station including dependents and dislocation allowance	10,000
Car rental	30,000
22 Transportation of things	
Change of station	24,000
Other	1,000
23 Rents, communications & utilities	44,000
24 Printing and reproduction	2,000
25 Other services	
Contracts	524,500
Other	21,900
26 Supplies and materials	66,000
31 Equipment	<u>180,000</u>
Total	\$2,165,400

ESTIMATED WORKING BUDGET PLAN BY QUARTER

89

Fiscal Year 1964

Region and Location Region V, Chicago, Illinois Program/Project No. 207/64.
 and Title Great Lakes-Illin
River Basins Project
 1964 Allowance No. 4-3155

	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>	<u>Total</u>
Personnel Compensation and benefits	\$ 262,000	\$ 271,000	\$ 282,000	\$ 285,000	\$ 1,100,000
Travel	49,000	48,000	41,000	62,000	200,000
Contracts*	115,000	255,000	148,000	6,500	524,500
Other	66,800	81,500	124,100	68,500	340,900
Total	\$ 492,800	\$ 655,500	\$ 595,100	\$ 422,000	\$ 2,165,400

*1st Quarter includes:

Weather Bureau	\$ 18,000
Communicable Disease Center	15,000
Bureau of Commercial Fisheries	9,000
Geological Survey	6,800
Corps of Engineers Boats	50,000
Renovation	8,100
Bureau of Outdoor Recreation	10,000

*3rd Quarter includes:

Information International	\$ 41,000
Corps of Engineers	55,000
Battelle Institute	50,000
Laboratory Services	2,000

*2nd Quarter includes:

New York University	52,000
Chesapeake Bay Institute	5,000
Bureau of Outdoor Recreation	30,000
Fish and Wildlife Service	38,000
Private Boat	105,000

PERSONNEL ON PAY AND ON LEAVE
and
Personal Services Request for FY 1964

Region and Location Region V, Chicago, Illinois
Program/Project No. 219/606
and Title Great Lakes-Illinois River Basins Project

1963 Allotment No.	Position Title	Encumbent (as of 7/1/63)	Grade	Current Annual Rate	1964 Request		Remarks
					Compensation	Benefits	
3-7075	Project Director	Kehr, Wm. Q.	SEDIR+16	\$ 12,216	\$ 9,600	\$ 2,790	
	Deputy Director	Megregian, S.	SANDIR+20	12,936	10,320	2,790	
	Sanitary Engineer	Preissner, E. D.	ASANE(R)(T)+3	6,299	4,464	1,996	
	Secretary	Kristalyn, Agnes	GS-6	6,055	6,188	472	
	Clerk-Typist	Metker, B.	GS-4	4,810	4,877	367	
	Clerk-Stenographer	Cappos, Joan	GS-3	4,135	4,170	335	
	Administrative Officer	Banish, C. E.	GS-12	9,790	10,057	767	
	Administrative Aide	Scelsi, M.	GS-6	6,055	6,188	459	
	Secretary	Donatello, S. R.	GS-5	5,045	5,117	366	
	Personnel Clerk	Karthan, C.	GS-5	4,725	4,841	369	
	Procurement Clerk	Krajicek, L.	GS-4	4,950	5,060	363	
	Stock Control Clerk	Russo, C. N.	GS-4	5,090	5,148	354	
	Clerk-Stenographer	Morgan, A.	GS-4	4,110	4,170	321	
	Storekeeping Clerk	Griffin, C. S.	GS-4	4,950	5,060	426	
	Storekeeping Clerk	McGeahan, P. G.	GS-4	4,950	5,060	426	
	Storekeeping Clerk	Cravens, J. C.	GS-3	4,580	4,628	398	
	Chf. of Fld. Operations	Vacant	GS-14				C. Pemberton Actg. (Dual Occupancy)
	Secretary	Gose, R.	GS-5	5,685	5,762	408	
	Chf. of Fld. Meas.	Libby, R.	GS-13	13,340	13,697	1,017	
	Sanitary Engineer	Schieble, W. H.	ASANE(R)(T)-2	4,828	3,112	1,829	
	Sanitary Engineer	Carrara, R. S.	ASANE(R)(T)-2	4,828	3,112	1,829	
	General Mechanic	Witt, S. A.	WB-11	7,051	7,051	566	
	Engineering Tech	Summey, R. D.	GS-7	5,540	5,678	470	
	Secretary	Kwiat, L. C.	GS-5	4,565	4,638	352	
	Aquatic Sample Coll.	Box, A.	WB-4	5,262	5,262	443	

Personnel on Duty as of July 1, 1963
and
Personal Services Request for FY 1964 - Continuation Sheet

Region and Location		Region V, Chicago, Illinois		Program/Project No. 219/606 and Title Great Lakes-Illinois River Basins		
1963 Allotment No.		3-7075				
Position Title	Encumbent (as of 7/1/63)	Grade	Current Annual Rate	1964 Request		Remarks
				Compensation	Benefits	
Aquatic Sample Coll.	Degutis, W. J.	WB-4	\$ 5,262	\$ 5,262	\$ 443	
"	Demske, E. P.	WB-4	5,013	5,013	275	
"	Edwards, P. I.	WB-4	5,262	5,262	275	
"	Harrison, Z. D., Jr.	WB-4	5,013	5,013	423	
"	Hutchinson, C.	WB-4	5,262	5,262	443	
"	Kamppinen, T. L.	WB-4	5,013	5,013	275	
"	Kash, A. A.	WB-4	5,013	5,013	275	
"	O'Connell, E. M.	WB-4	5,013	5,013	194	
"	Slovick, J. V.	WB-4	5,013	5,013	427	
"	Winslow, P. P.	WB-4	5,013	5,013	227	
Hydraulic Engineer	Pemberton C.	GS-13	11,880	*12,199	916	
Sanitary Engineer	Tellekson, M.	GS-12	9,790	10,057	767	
Hydraulic Eng. Tech.	Callier, J. E.	GS-5	5,365	5,429	453	
"	Robinson, H. B., Jr.	GS-5	5,365	5,429	387	
Hydrographer	Verber, J. L.	HSO(R)(T)+14	9,155	6,840	2,489	
"	Farlow, J. S.	HSO(R)(T)+6	7,895	5,580	2,489	
"	Reilly, B. J.	GS-7	6,650	6-812	547	
Sanitary Engineer	Rasmussen, J. H.	ASANE(R)(T)-2	4,828	3,302	1,717	
Sanitary Engineer	Kuhn, R. M.	ASANE(R)(T)+2	5,208	3,492	1,842	
Secretary	Bryant, C. J.	GS-5	4,885	4,950	375	
Cartographic Draftsman	Martin, M. J.	GS-4	4,110	4,243	292	
Supv, Digital Computer	Zink, C.	GS-12	9,475	8,166	644	WAE
Digital Computer Prog.	Conger, C. S.	ASANE(R)(T)-2	4,828	3,302	1,835	
Mathematics Technician	Hickey, J. B.	GS-5	4,565	4,722	357	
Cartographic Draftsman	Dennis, J.	GS-5	4,725	4,805	329	

and
Personal Services Request for FY 1964 - Continuation Sheet

Program/Project No. 219/606

and Title Great Lakes-Illinois River Basins Project

Region and Location Region V, Chicago, Illinois

1963 Allotment No.

3-7075

Position Title	Encumbent (as of 7/1/63)	Grade	Current Annual Rate	1964 Request		Remarks
				Compensation	Benefits	
Statistical Clerk	Johnson, W.	GS-4	\$ 4,950	\$ 5,013	\$ 426	
Statistical Clerk	Motley, K. L.	GS-4	4,810	4,878	367	
Chf. of Labs.	Vacant	GS-14				
Secretary	Gordon, I. C.	GS-5	5,045	5,117	399	
Clerk-Typist	Dyer, I. C.	GS-4	5,090	5,148	388	
Clerk-Typist	Booker, M.A.	GS-4	4,950	5,013	345	
Supv. Chemist	Fuller, F. D.	GS-13	11,150	11,280	847	
Chemist	Johnson, W. D.	GS-11	9,105	9,329	720	
Chemist	Lurie, B. L.	GS-11	9,105	9,329	720	
Chemist	Kelley, P. W.	GS-11	9,105	9,329	720	
Chemist	Whitworth, R. S.	GS-11	8,840	9,048	700	
Chemist	Doolas, George S.	GS-9	8,250	8,455	613	
Chemist	Hall, R. H.	GS-9	7,575	7,779	613	
Chemist	King, E.	GS-9	7,125	7,474	546	
Chemist	Kennedy, D. D.	SAHSO(R)(T)	5,747	4,140	1,985	
Chemist	Hawley, J. E.	JAHSQ(R)-2	4,265	3,038	1,797	
Chemist	Putnam, I. B.	GS-5	5,525	5,595	383	
Chemist	Frye, G.	GS-5	4,885	4,950	372	
Phys. Sci. Tech.	Allen, O. E.	GS-5	4,565	4,770	360	
" "	Cornier, R. F.	GS-5	4,565	4,770	360	
Supv. Biologist	Cook, G. W.	GS-13	11,150	11,852	891	
Biologist	Schuytema, G. J.	GS-9	6,675	7,062	493	
Biologist	Rummel, L. H.	GS-5	4,565	4,806	362	
Biologist	Marciniak, P. L.	GS-7	5,540	5,678	422	
Biologist	Fox, J. L.	SAHSO(R)(T)	5,747	4,140	1,985	

Personnel on Duty as of July 1, 1963
and

Personal Services Request for FY 1964 - Continuation Sheet
P

Region and Location Region V, Chicago, Illinois
1963 Allotment No. 3-7075

Program/Project No. 219/606
And Title Great Lakes-Illinois River Basins Project

Position Title	Encumbent (as of 7/1/63)	Grade	Current Annual Rate		1964 Request		Remarks
					Compensation	Benefits	
Supv. Bacteriologist	Scarce, L. E.	GS-13	\$ 11,880	\$	12,199	\$ 867	
Bacteriologist	Rubenstein, S.	SAHSO(R)(T)-2	6,048		4,012	2,281	
Bacteriologist	Donohue J. E.	GS-7	5,725		5,888	399	
Biological Aide	Dixon, M. L.	GS-4	5,090		5,148	335	
Supv. Chemist	Risley C.	GS-13	11,515		11,854	891	
Chemist	Calbert C.	SRSAN+10	9,185		6,870	2,639	
Chemist	Abbott, W. L.	AHSO(R)(T)-2	4,828		3,112	1,829	
Chf. Plang. & Reps.	Vacant	GS-14					
Asst. Chief	Ownbey, C. R.	GS-14	13,695		14,113	1,046	
Secretary	Fischbach, T. G.	GS-5	5,685		5,762	441	
Clerk-Typist	Hawkins, D. A.	GS-4	4,810		4,878	364	
Supv. Sanitary Eng.	Townsend, L. E.	GS-13	11,150		11,825	889	
Secretary	Ehlert L. S.	GS-5	5,525		5,595	417	
Sanitary Engineer	Minkin, J. L.	SRSANE+18	11,105		8,790	2,639	
Statistical Clerk	Crawford, J. M.	GS-4	4,110		4,202	337	
Statistical Clerk	McDonald, N.	GS-4	4,110		4,217	290	
Clerk-Typist	Morwitz, David	GS-3	4,030		4,089	266	
Sanitary Engineer	Howe, R. S.	SASANE(R)(T)-2	5,747		4,152	1,985	
Sanitary Engineer	Pinkstaff, E.	GS-9	7,800		7,998	580	
Sanitary Engineer	Ross, J. S.	ASANE(R)(T)-2	4,828		3,112	1,829	
Mathematics Tech.	Elder, J. W.	GS-5	4,565		4,798	362	
Sanitary Engineer	Eklund, H.	SRSANE(R)(T)+10	9,185		6,520	2,633	
Sanitary Engineer	Rosenberg, E. I.	GS-11	9,105		9,635	740	

Personnel on Duty as of July 1, 1963

and

Personal Services Request for FY 1964 - Continuation Sheet

Program/Project No. 219/606
and Title Great Lakes-Illinois River Basins Project

Region and Location Region V, Chicago, Illinois

1963 Allotment No. 3-7075

Position Title	Encumbent (as of 7/1/63)	Grade	Current Annual Rate	1964 Request		Remarks
				Compensation	Benefits	
Hydraulic Eng.	Willeke, G. E.	GS-12	\$ 9,475	\$ 10,054	\$ 769	
Sanitary Engineer	Rouse, J. V.	SRSANE(R)(T)-2	6,048	4,072	2,282	
Sanitary Engineer	Johnson R. E.	SANE(R)+14	9,155	6,840	2,489	
Sanitary Engineer	Hopkins, D. R.	ASANE(R)(T)-2	4,828	3,286	1,829	
Sanitary Engineer	Chausse, D. R.	ASANE(R)(T)-2	4,828	3,112	1,855	
Chief Economist	Schuck, W. J.	GS-13	12,610	12,794	874	
Statistical Clerk	Lafayette, D.	GS-5	4,725	4,865	414	
Tech. Publ. Writer	Buchanan, H. A.	GS-12	9,475	9,846	754	
Cartographic Draftsman	Buckhault, A.	GS-5	5,205	5,283	444	
Cartographic Draftsman	Johnson, L. A.	GS-4	4,110	4,243	373	

Personnel on Duty as of July 1, 1963

Personal Services Request for FY 1964 - Continuation Sheet

Program/Project No. 219/606
and Title Great Lakes-Illinois River Basins Project

Region and Location Region V, Chicago, Illinois

1963 Allotment No. 3-7075

Position Title	Encumbent (as of 7/1/63)	Grade	Current Annual Rate	1964 Request		Remarks
				Compensation	Benefits	
<u>Temporary Employment:</u>						
Scientist	Siverly, R. E.	SCIENT(INACT)+8	\$ 8,135	\$ 291	\$ 126	EOD 7/7/
Biological Aide	Kliese, K.	GS-5	4,565	1,126	41	EOD 7/7/
Biological Aide	Rdylewicz, J.	GS-5	4,565	1,126	41	EOD 7/7/
Laboratory Helper	Millette, J.	GS-3	3,820	881	32	EOD 7/7/
Laboratory Helper	Owbey, A. C.	GS-2	3,560	757	27	
Laboratory Helper	Townsend, J.	GS-2	3,560	1,170	42	EOD 7/21/
Laboratory Helper	Brown, C. A.	GS-2	3,560	1,170	42	EOD 7/21/
Laboratory Helper	Pettengill, S.	GS-2	3,560	688	25	EOD 7/1/
Aquatic Sample Coll.	Baldwin, F. J.	WB-4	4,763	1,099	40	
Aquatic Sample Coll.	Plummer, R.	WB-4	4,763	1,172	42	EOD 7/7/
Aquatic Sample Coll.	Maurer, J.	WB-4	4,763	1,630	59	
Aquatic Sample Coll.	Stockdale, B. E.	WB-3	4,472	4,472	162	
Aquatic Sample Coll.	Chorowicki, D.	WB-3	4,472	1,531	55	
Aquatic Sample Coll.	Keil, R. L.	WB-3	4,472	1,152	42	EOD 7/21/
Aquatic Sample Coll.	Ream, R. C.	WB-3	4,472	1,531	55	
Sanitary Engineer	Demeo, P. J.	JAHSO(COSTEP)-2	4,265	526	334	EOD 7/7/

New Positions:

Chemist	Meiggs, T.	HSO(R)(T)+8	8,135	5,529	2,373	EOD 7/19/63
Mycologist	Bond, H. A.	HSO(R)(T)-2	6,816	3,601	1,641	EOD 9/1/63
Sanitary Engineer	Alessi, C. F.	ASANE(R)(T)-2	4,828	3,052	1,793	EOD 7/8/63
Public Information Ofcr.		GS-12	9,475	7,400	567	10/63
Sanitary Engineer		GS-12	9,475	4,992	380	1/64
Sanitary Engineer		GS-12	9,475	4,992	380	1/64
Economist		GS-12	9,475	4,992	380	1/64

Personnel on Duty as of July 1, 1963

and
Personal Services Request for FY 1964 - Continuation Sheet

Program/Project No. 219/606

and Title Great Lakes-Illinois River Basins Proj.

Region and Location Region V, Chicago, Illinois

1963 Allotment No. 3-7075

Encumbent

(as of 7/1/63)

Position Title

New Positions:

Administrative Trainee
Economist
Purchasing Agent
Sanitary Engineer
Sanitary Engineer
Sanitary Engineer
Accounting Clerk
Laboratory Helper
Secretary

Grade

GS-9
GS-9
GS-5
GS-5
GS-5
GS-5
GS-4
GS-3
GS-5

Current
Annual
Rate

\$ 6,675
6,675
5,205
5,525
5,525
5,525
4,110
3,820
5,525

\$ 6,314
5,749
4,420
4,233
4,233
4,233
3,489
1,945
5,531

1964 Request

Compensation Benefits

\$ 462
423
332
315
315
315
269
150
413

Remarks

8/63
9/63
9/63
10/63
10/63
10/63
9/63
1/64
EOD 7/8/63

Butgereit, J.

Personnel on Duty as of July 1, 1963
and
Personal Services Request for FY 1964

Region and Location	Region V, Cleveland, Ohio	Program/Project No. 219/606
1963 Allotment No.	3-7075	and Title Lake Erie Field Station

Position Title	Encumbent (as of 7/1/63)	Grade	Current Annual Rate	1964 Request		Remarks
				Compensation	Benefits	
Sanitary Engineer	Northington, C.W.	SRSANE(R)(T)+12	\$ 9,545	\$ 7,080	\$2,639	
Secretary	Cline, C. L.	GS-4	4,110	4,307	344	
Secretary (549)	Oliver, J. E.	GS-4	4,110	4,307	323	
Secretary (546)	Wagner, A.	GS-4	4,110	4,170	321	
Secretary	Eggleston, B.	GS-4	4,110	4,170	321	
Cartographic Draftsman	Alexander, D.	GS-5	4,565	4,638	352	
Sanitary Engineer	Day, R. V.	GS-13	11,150	11,866	891	
Sanitary Engineer	McElwee, W. C.	SAN(R)(T)+6	7,595	5,580	2,189	
Sanitary Engineer	Oster, C.	ASANE(R)(T)-2	5,127	3,302	2,248	
Sanitary Engineer	Kirkwood, D.	SASANE(R)(T)-2	6,048	3,912	2,277	
Sanitary Engineer	Fazzino, S.	ASANE(R)(T)-2	5,127	3,112	2,127	
Sanitary Engineer	Witte, R. D.	ASANE(R)(T)-2	4,828	3,112	1,829	
Sanitary Engineer	McGowan, F. M.	SASANE(R)(T)+2	6,287	4,152	2,286	
Boat Operator	Jones, W. L.	WB-8	5,720	5,985	275	
Aquatic Sample Coll.	Fuller, F.	WB-4	4,930	4,930	224	
"	Peterson, W.	WB-4	4,930	4,930	190	
"	Robinson, C.	WB-4	4,930	4,930	224	
"	Ziats, R. J.	WB-4	4,930	4,930	271	
"	Bacher, J.	WB-4	4,680	4,944	224	
Chemist	Fisher, W. C.	GS-11	9,105	9,440	727	
Chemist	Schroeder, V. C.	GS-7	6,835	7,197	527	
Chemist	Ross, C.	GS-5	5,845	5,928	439	
Chemist	Tedde, F. A.	GS-5	5,525	5,745	427	
Biologist	Casper, V. L.	SAHSO(R)(T)+2	5,987	4,152	1,985	
Biologist	Kleveno, C.	AHSO (R)(T)+8	6,575	4,560	2,180	
Bacteriologist	Peterson, M.	GS-11	8,310	8,473	627	

Personnel on Duty as of July 1, 1963
and
Personal Services Request for FY 1964 - Continuation Sheet

Region and Location	Region V, Cleveland, Ohio	Program/Project No. 219/606
1963 Allotment No.	3-7075	and Title Lake Erie Field Station

Position Title	Encumbent (as of 7/1/63)	Grade	Current Annual Rate	1964 Request		Remarks
				Compensation	Benefits	
<u>Temporary Employment:</u>						
Aquatic Sample Coll.	Moorehead, R. D.	WB-4	\$ 4,680	\$ 1,152	\$ 42	EOD 7/21/63
"	Sewall, R.	WB-4	4,680	1,152	42	EOD 7/7/63
"	Good, J.	WB-4	4,680	1,620	59	EOD 7/21/63
"	Jones, D. W.	WB-4	4,680	1,602	58	
Biological Aide	Lentzen, D.	GS-5	4,565	1,126	41	EOD 7/7/63
<u>New Positions:</u>						
Scientist	Frohne, Wm. C.	SCIENDIR-14	10,896	8,280	2,790	EOD 7/1/63
Sanitary Engineer	Martin, R. W.	ASANE(R)(T)-2	4,828	3,052	1,793	EOD 7/8/63
Biologist	Nolfe, J. R.	HSO (R)(T)+8	8,135	5,709	2,444	EOD 7/8/63
Chemist	Sckay, D. C.	AHSO(R)(T)-2	4,828	3,052	1,793	EOD 7/8/63
Chemist	Wright, G. L.	AHSO (R)(T)-2	4,828	3,052	1,793	EOD 7/8/63
<u>TOTAL</u>						
Great Lakes-Illinois River Basins Project			755,078.00	103,644.00		
Lake Erie Field Station			169,649.00	37,322.00		
<u>GRAND TOTAL</u>			<u>\$924,727.00</u>	<u>\$140,966.00</u>		

Request for Funds, Fiscal Year 1965

Region and Location	<u>Region V, Chicago,</u>	Program/Project No. 207/645
	<u>Illinois</u>	and Title <u>Great Lakes-Illinois River</u>
1964 Allowance No.	<u>4-3155</u>	<u>Basins Project</u>

	<u>1965 Request</u>
11 Personnel Compensation	\$ 1,281,000
Consultants's fees	3,000
12 Personnel benefits	172,000.
21 Travel	
Change of station including dependents and dislocation allowance	150,000
Car rental	40,000
22 Transportation of things	
Change of station	20,000
Other	4,000.
23 Rents, communications & utilities	46,000
24 Printing and reproduction	25,000
25 Other services	
Contracts	612,000
Other (Lake Ontario)	21,000
26 Supplies	50,000.
31 Equipment	76,000
	<hr/>
Total	\$ 2,500,000

Program/Project No. 207/645

and Title Great Lakes-Illinois River Basins Project

Region and Location Region V, Chicago, Illinois

1964 Allowance No. 4-3155

Position Title	Incumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
OFFICE OF THE PROJECT DIRECTOR						
Project Director	Kehr, W. Q.	SE DIR	\$ 10,560	\$ 10,560	\$ 3,047	
Deputy Director	Megregian, S.	SAN DIR(R)(T)	11,340	11,340	3,047	
Public Inf. Ofcr.		GS-1081-12	9,980	9,980	750	
Secretary	Kristalyn, A.	GS-318-6	6,285	6,285	464	X/
Secretary (Steno)	Butgereit, J. E.	GS-318-5	5,650	5,650	379	
Clerk-Typist	Metker, B.	GS-322-4	4,915	4,915	363	
ADMINISTRATIVE BRANCH						
Administrative Ofcr.	Banish, C. E.	GS-341-12	10,310	10,310	750	
Ass't Adm. Ofcr.	Thorsteinsson, P. J.	GS-341-9	7,490	7,490	570	
Administrative Aide	Scelsi, M.	GS-301-6	6,285	6,285	451	
Personnel Clerk (Typ)	Ammos, C.	GS-203-5	4,850	4,850	372	
Secretary (Steno)	Morgan, A. F.	GS-318-5	4,690	4,690	313	
Procurement Clerk	Krajicek, L.	GS-2020-4	5,055	5,055	355	
Stock Control Clerk	Russo, C. M.	GS-2040-4	5,195	5,195	350	
Storekeeping Clerk	Griffin, C. S.	GS-2033-4	5,055	5,055	419	
Storekeeping Clerk	McGeehan, P. G.	GS-2033-4	5,055	5,055	419	
Storekeeping Clerk	Cravens, J. C.	GS-2033-3	4,650	4,650	570	
FIELD OPERATIONS BRANCH						
Suprvy. San. Engr.	Pemberton, C.	GS-819-14	13,615	13,615	893	
Secretary	Gose, R.	GS-318-5	5,810	5,810	404	
Field Measurements Section						
Suprvy. San. Engr.	Libby, R. W.	GS-819-13	14,035	14,035	994	
Sanitary Engineer	Scheible, W.	ASE(R)(T)	3,912	3,912	2,277	4T/
Sanitary Engineer	Alessi, C. F.	ASE(R)(T)	3,112	3,112	1,828	4T/
General Mechanic	Witt, S. A.	WB-4740-11	7,051	7,051	595	4T/
Suprvy. Engr. Tech.	Summey, R. D.	GS-802-7	5,795	5,795	461	4T/
Secretary (Steno)	KWILATT, L.	GS-318-5	4,690	4,690	337	4T/

Personnel Services Request for FY 1965

Region and Location Region V, Chicago, Illinois Program/Project No. 207/645
 and Title: Great Lakes-Illinois River Basins Project

1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
FIELD OPERATIONS BRANCH cont'd						
Field Measurements Section cont'd						
Aquatic Sample Coll.	Box, A., Jr.	WB-3501-4	\$ 5,262	\$ 5,262	\$ 442	
"	Degutis, W. J.	"	5,262	5,262	442	
"	Winslow, P. P.	"	5,262	5,262	230	
"	Slovick, J.	"	5,262	5,262	442	
Hydraulics Section						
Sanitary Engineer	Tellekson, M. W.	GS-819-12	10,310	10,310	750	
Oceanography Section						
Hydrographer	Verber, J. L.	HSO(R)	8,280	8,280	2,705	X/
Hydrographer	Farlow, J. S.	HSO(R)(T)	6,720	6,720	2,597	
Sanitary Engineer	Rasmussen, J. H.	ASE(R)(T)	3,112	3,112	1,828	
Sanitary Engineer	Farmer, V. H.	ASE(R)(T)	3,112	3,112	1,828	
Hydrographer	Hutchinson, C.	GS-1360-12	9,980	9,980	750	
Engineering Tech.	Bryant, C. J.	GS-802-5	5,490	5,490	449	
Secretary (Steno)	Martin, M. J.	GS-318-5	5,170	5,170	381	
Cartographic Drftsm.	Reilly, B. J.	GS-816-4	4,215	4,215	284	
Hydrographer (Phys)		GS-1360-9	7,030	7,030	527	X/
Hydrographer (Phys)		GS-1360-7	6,925	6,925	536	
Data Processing Section						
Suprvy. Dig. Comp. Prog.	Zink, K. W.	GS-331-12	9,980	9,980	750	X/
Digital Comp. Prog.		ASE(R)(T)	3,112	3,112	2,020	
Statistical Clerk	Johnson, A. T.	GS-1531-5	5,490	5,490	449	
Mathematics Tech.	Hickey, J. B.	GS-1512-5	4,690	4,690	347	
Cartographic Drftsm.	Dennis, J.	GS-816-5	4,850	4,850	324	
Statistical Clerk	Motley, K. L.	GS-1531-4	4,915	4,915	363	
"	Johnson, W.	GS-1531-4	5,055	5,055	449	

Program/ Project No. 207/645
and Title: Great Lakes-Illinois River Basins Project

Region and Location Region V, Chicago, Illinois

1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
LABORATORY BRANCH						
Director, Laboratories	Risley, C.	GS-1320-14	\$ 13,615	\$	1,021	
Secretary, (Steno)	Gordon, I. C.	GS-318-5	5,170	5,170	335	
Clerk-Typist	Dyer, I. C.	GS-322-4	5,195	5,195	334	
Clerk-Typist	Booker, M. A.	GS-322-4	5,195	5,195	338	
Chemical Laboratory						
Suprvy. Chem. (Analy.)	Fuller, F. D.	GS-1320-13	11,725	11,725	846	2T/
Chemist	Calbert, C. E.	SR SAN	7,800	650	237	
Chemist (Analytical)	Johnson, W. D.	GS-1320-11	9,810	9,810	723	
"	Kelley, P. W.	GS-1320-11	9,530	9,530	705	
"	Whitworth, R. S.	GS-1320-11	9,530	9,530	705	
"		GS-1320-9	7,030	7,030	527	X/
"	Doolas, G.	GS-1320-9	8,540	8,540	276	
"	Hall, R. H.	GS-1320-9	8,180	8,180	614	
"	King, E. T.	GS-1320-9	7,720	7,720	538	
Chemist	Hawley, J. E.	AHSO(R)(T)	3,112	3,112	1,828	
"	Meiggs, T. O.	AHSO(R)(T)	3,112	3,112	1,828	
"		GS-1320-5	4,690	4,690	352	X/
"	Putnam, I. B.	GS-1320-5	5,810	5,810	423	
Phys. Sci. Tech. (Chem)	Frye, G.	GS-1311-5	5,010	5,010	415	
"	Allen, O. E.	GS-1311-5	4,850	4,850	358	
Laboratory Helper	Troupe, L. A.	GS-1398-3	3,880	3,880	291	
Microbiological Laboratory						
Suprvy. Bacteriologist	Scarce, L. E.	GS-420-13	12,495	12,495	845	
Bacteriologist	Rubenstein, S.	SAHSO(R)(T)	3,912	326	189	
Bacteriologist	Bond, H. A.	SAHSO(R)(T)	6,780	6,780	2,380	
Biological Aide	Dixon, M. L.	GS-402-4	5,195	5,195	331	2T/

Personnel Services Request for FY 1965

Program/Project No. 207/645
and Title: Great Lakes-Illinois River Basins Project

Region and Location Region V, Chicago, Illinois

1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request Compensation Benefits		Remarks
LABORATORY BRANCH cont'd						
Radiological Laboratory						
Chemist	Abbott, W. L.	AHSO(R)(T)	\$ 3,112	\$ 3,112	\$ 3,961	
Phy. Sci. Tech.	Cornier, R. G.	GS-1311-5	4,850	4,850	358	
Biological Laboratory						
Suprvy. Biologist	Cook, G. W.	GS-401-13	12,110	12,110	869	
Biologist	Fox, J. L.	SAHSO(R)(T)	3,912	3,912	1,976	
Biologist (Wat. Poll.)	Schuytema, G. J.	GS-401-9	7,030	7,030	490	
Biologist (Wat. Poll.)	Marciniak, P.	GS-401-7	5,795	5,795	414	
Biologist (Wat. Poll.)	Powers, R. E.	GS-401-7	5,795	5,795	201	4T/
Biologist (Wat. Poll.)	Rummel, L. H.	GS-401-7	5,795	5,795	414	
Biol. Lab. Tech. (Gen)		GS-401-7	5,795	5,795	635	4T/
PLANNING AND REPORTS BRANCH						
Suprvy. San. Eng.	Ownbey, C. R.	GS-819-14	14,515	14,515	1,017	
Soil Conservationist		GS-457-12	9,980	9,980	750	
Secretary (Typing)	Fischbach, T.	GS-318-5	5,810	5,810	437	X/
Clerk-Typist	Hawkins, D. A.	GS-322-4	4,915	4,915	360	
Engineering Section						
Suprvy. San. Eng.	Townsend, L. E.	GS-819-13	11,725	11,725	846	
Secretary (Steno)	Ehlert, L. S.	GS-318-5	5,650	5,650	412	
Basic Data Unit						
Sanitary Engineer	Minkin, J. L.	SR SANE	8,640	3,600	1,250	6T/
Sanitary Engineer	Start, G. P.	SA SANE	3,912	1,630	970	6T/
Sanitary Engineer		ASANE	3,112	1,295	760	X/
Statistical Clerk	Crawford, J. M.	GS-1531-4	4,355	1,810	140	6T/
Clerk-Typist	Morwitz, D.	GS-322-4	4,355	4,355	277	

Program/Project No. 207/645

and Title: Great Lakes-Illinois River Basins Project

Region and Location Region V, Chicago, Illinois

1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
<u>PLANNING AND REPORTS BRANCH cont'd</u>						
<u>Environment Analysis Unit</u>						
Sanitary Engineer	Ross, J. M.	GS-819-12	\$ 9,980	\$ 9,980	\$ 750	6T/
Sanitary Engineer	Pinkstaff, E.	ASE(R)(T)	3,112	1,295	760	
Sanitary Engineer	Elder, J. W.	GS-819-9	8,180	8,180	566	6T/
Mathematics Tech.	Chaussee, D. R.	GS-1521-5	4,690	4,690	347	
Sanitary Engineer		ASE(R)(T)	3,112	1,295	760	
<u>Industrial Wastes Unit</u>						
Sanitary Engineer	Eklund, H.	SRSANE(R)(T)	8,220	8,220	2,854	
Sanitary Engineer	Dunne, W. M.	ASE(R)(T)	3,112	3,112	1,828	
<u>Hydrology Unit</u>						
Hydraulic Engineer	Willeke, G. E.	GS-813-12	10,310	10,310	750	
<u>Cooperative Studies Section</u>						
Sanitary Engineer	Johnson, R. E.	SANE(R)(T)	8,280	8,280	2,489	X/
Sanitary Engineer	Hopkins, D. R.	ASE(R)(T)	3,112	3,112	1,828	
Sanitary Engineer		GS-819-12	9,980	9,980	750	
<u>Economics Section</u>						
Economist (General)	Schuck, W. J.	GS-110-13	13,650	13,650	886	X/
Regional Economist	Kee, D.	GS-110-5	4,690	4,690	352	
Statistical Clerk		GS-1531-5	4,690	4,690	352	
<u>Report Preparation Section</u>						
Tech. Publ. Wrtr. Engr.	Buchanan, H. A.	GS-1083-12	9,980	9,980	730	X/
Cartographic Drftsm.	Buckhaultner, A.	GS-816-5	5,330	5,330	440	
Cartographic Drftsm.	Johnson L. A.	GS-816-4	4,215	4,215	5	
Technical Writer		GS-1083-9	7,000	7,000	5	

Personnel Services Request for FY 1965

Program/Project No. 207/645
and Title: Great Lakes-Illinois River Basins Project
Lake Erie Field Station

Region and Location Region V, Cleveland, Ohio

1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
<u>ADMINISTRATIVE BRANCH</u>						
Project Director	Northington, C. W.	SR SANE	\$ 8,220	\$ 8,220	\$ 2,788	6T/ <

Program/Project No. 207/645
 and Title: Great Lakes-Illinois River Basins Project
 Lake Erie Field Station

Region and Location Region V, Cleveland, Ohio

1964 Allowance No. 4-3155

1964 Allowance No. 4-3122

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
<u>FIELD OPERATIONS BRANCH cont'd</u>						
<u>Hydraulics Section</u>						
Suprvy. San. Eng.	Oster, C. C.	SASANE(R)(T)	\$ 3,912	\$ 3,912	\$ 2,277	
Sanitary Engineer	Carrara, R. C.	ASANE(R)(T)	3,112	3,112	1,828	
<u>LABORATORY BRANCH</u>						
Director, Laboratories	Frohne, W. C.	SCI DIR	11,340	11,340	3,032	
Secretary (Steno)	Wagner, A. R.	GS-318-4	4,215	2,107	158	TT/
<u>Chemical Laboratory</u>						
Chemist (Analytical)	Fisher, W. C.	GS-1320-11	9,530	4,765	352	TT/
"	Schroeder, V. C.	GS-1320-7	7,355	3,677	258	TT/
"	Ross, C.	GS-1320-7	6,965	3,482	245	TT/
Chemist	Osterland, C.	GS-1320-5	5,650	2,825	213	TT/
Chemist	Tedde, F. A.	GS-1320-5	5,810	2,905	212	TT/
"		GS-1320-9	7,030	3,515	264	TT/
"		GS-1320-9	7,030	3,515	264	TT/
"		GS-1320-7	5,795	2,897	217	TT/
"		GS-1320-5	4,690	2,345	176	TT/
<u>Biological Laboratory</u>						
Biologist	Casper, V. L.	SAHSO(R)(T)	5,280	2,640	1,012	TT/
Biologist	Kleveno, C.	SAHSO(R)(T)	6,780	3,390	1,190	TT/
Biologist		GS-401-5	4,690	2,345	176	TT/
<u>Microbiological Laboratory</u>						
Bacteriologist	Peterson, M.	GS-420-11	8,698	4,359	309	TT/
Bacteriologist		GS-420-9	7,020	3,515	251	TT/

Personnel Services Request for FY 1965

Region and Location Region V, Cleveland, Ohio Program/Project No. 207/645
 and Title: Great Lakes-Illinois River Basins Project
Lake Erie Field Station

1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
<u>LABORATORY BRANCH cont'd</u>						
<u>Microbiological Laboratory cont'd</u>						
Biological Aide		GS-404-5	\$ 4,690	\$ 2,345	176	X/ 7T/
Biological Aide		GS-404-5	4,690	2,345	176	X/ 7T/
<u>PLANNING AND REPORTS BRANCH</u>						
Suprvy. San. Eng.	Day. R. V.	GS-819-13	12,110	12,110	869	
Secretary (Steno)	Oliver, J.	GS-318-4	4,215	4,215	317	
Cartographic Drftsm.	Alexander, D.	GS-816-5	4,690	4,690	395	
<u>Basic Data Section</u>						
Sanitary Engineer	Fazzino, S. C.	ASANE(R)(T)	3,112	3,112	2,127	
Sanitary Engineer		SANE	8,250	3,150	1,035	X/ 6T/
<u>Data Processing Section</u>						
Sanitary Engineer	Witte, R. D.	ASANE(R)(T)	3,112	3,112	1,828	
Clerk-Typist		GS-322-4	4,215	2,107	158	X/ 6T/
<u>Engineering Section</u>						
Sanitary Engineer		SANE	8,280	8,280	2,489	X/
Sanitary Engineer	Martinez, W. W.	SASANE(R)(T)	3,912	3,912	2,277	X/
Sanitary Engineer		ASANE	3,112	3,112	1,828	X/
Reports Prep. Eng.		SANE	8,280	8,280	2,489	X/

Program/Project No. 207/645
and Title Great Lakes-Illinois River Basins Project
Lake Ontario Field Station

Region and Location Region V, Rochester, New York
1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
<u>ADMINISTRATIVE BRANCH</u>						
Project Director		SR SANE	\$ 8,640	\$ 8,640	2,990	X/
Deputy Director		SR SANE	8,640	5,040	1,743	6/
Administrative Aide		GS-301-7	5,795	5,795	435	X/
Secretary (Steno)		GS-318-5	4,690	4,690	352	X/
Secretary		GS-318-4	4,215	2,457	182	6/
<u>FIELD OPERATIONS BRANCH</u>						
Supvry. San. Eng.		SAN(R)(T)	6,720	3,920	1,512	6/
Secretary (Steno)		GS-318-4	4,215	2,457	182	6/
General Mechanic		WB-4740-11	6,697	3,906	287	6/
Sanitary Engineer		SANE	8,280	4,830	1,449	6/
Sanitary Engineer		SANE	8,280	4,830	1,449	6/
Sanitary Engineer		SASANE(T)	6,540	3,815	1,379	6/
Sanitary Engineer		ASANE(R)(T)	5,400	3,150	1,113	6/
Sanitary Engineer		ASE(R)(T)	3,112	1,813	1,064	6/
Boat Operator		WB-5903-8	5,844	3,409	252	6/
Boat Operator		WB-5903-8	5,844	3,409	252	6/
Aquatic Samp. Coll.		WB-3501-4	4,763	2,772	203	X
"	"	"	4,763	2,772	203	6/
"	"	"	4,763	2,772	203	6/
"	"	"	4,763	2,772	203	6/
"	"	"	4,763	2,772	203	6/
"	"	"	4,763	2,772	203	6/
<u>LABORATORY BRANCH</u>						
Director, Laboratories		SR SANE	8,640	8,640	2,990	X/
Secretary (Steno)		GS-318-4	4,215	2,108	158	7/
Chemist (Analytical)		GS-1320-11	9,530	4,765	353	7/

Personnel Services Request for FY 1965

Program/Project No. 207/645
and Title Great Lakes-Illinois River Basins Project
Lake Ontario Field Station

Region and Location Region V, Rochester, New York
1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
<u>LABORATORY BRANCH cont'd</u>						
Chemist (Analytical)		GS-1320-7	\$ 7,355	\$ 3,670	\$ 258	7/
Chemist (Analytical)		GS-1320-7	6,965	3,500	250	7/
Chemist		GS-1320-5	5,650	2,825	213	7/
Chemist		GS-1320-5	5,810	2,905	211	7/
Chemist		GS-1320-9	7,030	3,515	264	7/
Biologist		SAHSO(R)(T)	3,912	1,944	1,134	7/
Biologist		SAHSO(R)(T)	3,912	1,944	1,134	7/
Bacteriologist (Gen)		GS-420-11	8,698	4,349	308	7/
Bacteriologist		GS-420-9	7,030	3,515	264	7/
Biological Aide		GS-404-5	4,690	2,345	176	7/
Biological Aide		GS-404-5	4,690	2,345	176	7/
<u>PLANNING AND REPORTS BRANCH</u>						
Supv. San. Eng.		GS-819-13	11,725	6,839	511	6/
Secretary (Steno)		GS-318-4	4,215	2,457	182	6/
Cartographic Draftsm.		GS-816-5	4,690	2,730	203	6/
Sanitary Engineer		ASANE(R)(T)	3,112	1,813	1,064	5/
Sanitary Engineer		SANE	3,282	8,282	2,489	X/
Sanitary Engineer		ASANE(R)(T)	3,112	1,813	1,064	5/
Sanitary Engineer		SANE	8,280	4,830	1,449	5/
Sanitary Engineer		SASANE(R)(T)	3,912	2,282	1,323	5/
Sanitary Engineer		ASANE	3,112	1,813	1,064	5/

Program/Project No. 207/645
 and Title Great Lakes-Illinois River Basins Project
 Lake Huron Field Station

Region and Location Region V, Grosse Ile, Michigan

1964 Allowance No. 4-3155

Position Title	Encumbent	Grade	Current Annual Rate	1965 Request		Remarks
				Compensation	Benefits	
<u>OFFICE OF THE FIELD STATION DIRECTOR</u>						
Field Station Director		GS-819-14	\$ 13,615	\$ 10,211	\$ 765	4/
Administrative Aide		GS-301-7	5,795	4,346	324	4/
Secretary		GS-318-5	5,010	3,757	279	4/
<u>FIELD OPERATIONS SECTION</u>						
Chief		GS-819-13	12,110	9,082	675	4/
Aquatic Biologist		GS-401-12	9,980	7,485	558	4/
Sanitary Engineer		GS-819-11	8,690	6,517	486	4/
Sanitary Engineer		GS-819-11	8,690	6,517	486	4/
Aquatic Biologist	V	GS-401-9	7,030	7,030	527	4/
Boat Operator		WB-5903-8	6,740	6,740	505	1/
Boat Operator		WB-5903-8	6,740	6,740	505	1/
Aquatic Sample Collector		WB-3501-4	5,575	5,575	418	1/
"		WB-3501-4	5,575	5,575	418	1/
"	V	WB-3501-4	5,035	5,035	377	1/
"	V	WB-3501-4	5,035	5,035	377	1/
Clerk-Typist		GS-322-4	4,495	3,371	252	4/
<u>LABORATORY SECTION</u>						
Laboratory Director		GS-1320-13	12,110	9,082	675	4/
Chief Bacteriologist		GS-420-12	9,980	9,980	558	1/
Chief Chemist		GS-1320-9	7,030	7,030	527	1/
Bacteriologist	V	GS-420-9	7,030	7,030	527	1/
Chemist	V	GS-1320-5	4,690	4,690	351	1/
Clerk-Typist	V	GS-322-4	4,215	4,215	316	1/
Laboratory Aide	V	GS-1398-2	3,620	3,620	271	1/
Laboratory Aide	V	GS-1398-2	3,620	3,620	271	1/

Program/Project No. 207/645
and Title Great Lakes-Illinois River Basins Project
Lake Huron Field Station

Region and Location	Region V, Grosse Ile, Michigan
1964 Allowance No.	4-3155

Position Title	Incumbent	Grade	Current Annual Rate		1965 Request		Remarks
					Compensation	Benefits	
<u>ENGINEERING EVALUATION SECTION</u>							
Chief		GS-819-13	\$ 12,110	\$ 9,082	\$ 675	4/	
Statistical Clerk V		GS-1531-5	4,690	4,690	351	1/	
Clerk-Typist		GS-322-4	4,495	3,371	252	4/	

Verdict

X - Incumbent unknown. Will have been hired in FY 1964.

<u>EOD</u>	<u>Date</u>	<u>Terminations</u>
1	July 1964	1T
2	August	2T
3	September	3T
4	October	4T
5	November	5T
6	December	6T
7	January 1965	7T
8	February	8T
9	March	9T
10	April	10T
11	May	11T
12	June	12T

LONG RANGE ESTIMATES

Fiscal Years 1967, 1968, & 1969

<u>Fiscal Year</u>	<u>Positions</u>	<u>Amount</u>
1967	86	\$1,200,000
1968	43	600,000
1969	36	500,000

EXTERNAL EXPENDITURES
(thousands of dollars)

Project: Great Lakes-Illinois River Basins Project
 FY : 1964
 Date : December, 1963

Amount	Method*	Recipient	Description of Work
\$ 15,000	R	Communicable Disease Center	Virus Study
49,500	C	New York University	Refining data, computer programming, current meters, etc.
2,500	P	Cine Service	Development and indexing of film from meters.
9,000	R	Bureau of Commercial Fisheries	Boat services.
40,000	R	Bureau of Outdoor Recreation	Recreational studies of Lakes Michigan & Erie watersheds.
38,000	R	Bureau of Fish & Wildlife	Studies of Lakes Michigan & Erie watersheds.
18,000	R	Weather Bureau	Meteorological support.
155,000	R	Corps of Engineers	Large boat support.
104,000	P	Great Lakes Survey Corporation	Setting and retrieving current stations.
5,000	R	Corps of Engineers	Instrument tower.
5,000	R	Sanitary Engineering Center	Data processing.
2,000	R	Sanitary Engineering Center	Laboratory services.
2,000	P	Central Michigan University	Laboratory services.
41,000	C	Information International	Data conversion.
50,000	C	Battelle Institute	Economic Base Study
6,800	R	Geological Survey	Stream gaging information

* C - Contract
 R - Reimbursement to other Fed. Agency
 P - Purchase order
 O - Other, specify

EXTERNAL EXPENDITURES
(thousands of dollars)

Project: Great Lakes-Illinois River Basins Project
 FY : 1965
 Date : December, 1963

Amount	Method*	Recipient	Description of Work
\$ 50,000	C	New York University	Refining data, computer programming, current meters, etc.
5,000	P	Cine Service	Development and indexing of film from meters.
40,000	R	Bureau of Outdoor Recreation	Recreational studies of Lakes Michigan and Erie watersheds.
40,000	R	Bureau of Fish & Wildlife	Studies of Lakes Michigan and Erie watersheds.
18,000	R	Weather Bureau	Meteorological support.
130,000	R	Corps of Engineers	Large boat support.
150,000	P	Great Lakes Survey Corporation	Setting and retrieving current stations.
5,000	R	Corps of Engineers	Instrument tower.
5,000		Sanitary Engineering Center	Data processing.
2,000	R	Sanitary Engineering Center	Laboratory services.
2,000	P	Central Michigan University	Laboratory services.
50,000	C	Information International	Data conversion.
125,000	C	Battelle Institute	Economic Base Study.
10,000	R	Geological Survey	Stream gaging information.
5,000	C	University of Wisconsin	Legal, administrative, and regulatory matters.

* C - Contract

R - Reimbursement to other Fed. Agency

P - Purchase order

O - Other, specify

BUDGET BY ACTIVITIES
(thousands of dollars)

115

Project: Great Lakes-Illinois River Basins Project
FY : 1964
Date : December, 1963

Activity	Fiscal Year 1964
*Headquarters and administration:	
Rent, office and lab.	232
Social sciences:	
Projections	77
Benefit analysis	6
Physical sciences:	
Inventory	94
Field instrumentation	116
Measurements and sampling	670
Laboratory equipment	58
Laboratory services	419
Machine data processing	145
Data analysis and evaluation	120
Reports:	
Preparation	27
Printing	10
Comprehensive Planning	
Engineer evaluation	71
Flow regulation	33
Land use	9
Recreation (Bureau of Outdoor Recreation)	40
Aquatic Life (Fish and Wildlife Service)	<u>38</u>
Total	2,165

*Includes all overhead items (administrative services, motor pool, communications, utilities, etc.).

BUDGET BY ACTIVITIES
(thousands of dollars)

116

Subject: Great Lakes-Illinois River Basins Project
 : 1965
 Date: December, 1963

Activity	Fiscal Year 1965
Headquarters and administration:	
Rent, office and lab.	380
Physical sciences:	
Projections	147
Benefit analysis	10
Physical sciences:	
Inventory	65
Field instrumentation	94
Measurements and sampling	653
Laboratory equipment	52
Laboratory services	520
Machine data processing	152
Data analysis and evaluation	150
Reports:	
Preparation	55
Printing	8
Comprehensive planning:	
Engineering evaluation	74
Flow regulation	46
Land use	14
Recreation (Bureau of Outdoor Recreation)	40
Aquatic Life (Fish and Wildlife Service)	40
Total	2,500

Includes overhead items for entire project (administrative services, motor pool, communications, utilities, etc.)

2,500 - 116

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL

Summary of Changes

Project: Great Lakes-Illinois River Basins Project

	<u>Pos.</u>	<u>Amount</u>
		\$
1965 Estimated Working Budget		
A. "Built-in" changes		
1. <u>Decreases</u>		
(a) Nonrecurring program costs.....		15,000
(b) Nonrecurring equipment.....		180,000
(c) One less day of pay (262 days in 1964; 261 in 1965).....		3,000
2. <u>Increases</u>		
(a) Annualization of new positions authorized in 1964	31	167,000
(b) Increased pay costs:		
(1) Civilians.....	20	3,200
(2) Commissioned Officers.....	15	7,500
B. <u>New Program Items</u>		
1965 Estimated Requirements		
1. *New Positions		
Lake Huron ----- (Compensation and Benefits).....	11	75,500
Difference between annualization and full year cost.....	31	187,000
2. <u>Equipment</u>		
Chicago.....		21,000
Cleveland.....		5,000
Detroit.....		10,000
Lake Ontario.....		40,000
3. Net increase of other program expenditures.....		16,800

*100 % used since 11 people will be picked up from Enforcement on July 1, 1964.

APPENDIX

LAKE HURON WATERSHED

GENERAL STUDY PLAN

PRELIMINARY

December 1963

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Water Supply and Pollution Control
Great Lakes-Illinois River Basins Project

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I - INTRODUCTION

Background

The Great Lakes-Illinois River Basins Project, in cooperation with State agencies and others, is engaged in a comprehensive study of water quality on a broad scale. This study, one of several being undertaken in the nation's major drainage basins under provisions of the Federal Water Pollution Control Act, is a part of the program of the Division of Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare.

The Project's study area, as shown on Figure 1, comprises the Illinois River Basin, and the United States portion of the Great Lakes, their tributaries and contributing watersheds.

For study and reporting purposes, the area has been divided into six major parts, consisting of the Illinois River Basin and each of the five Great Lakes basins. Each major part is further subdivided into subdrainage basins for water resource and water quality considerations, and into subregions - generally along county lines - for economic base studies. Boundary lines of the six major parts are outlined on Figure 1. Additional details for the Lake Huron Study Area are shown on Figure 2.

The general objectives of the Project have been described as follows:

- 1) A determination of the causes of water pollution and the effects of such pollution on the quality of water resources and on beneficial uses.
- 2) The development of agreements on the desired beneficial uses and the water quality required to accommodate those uses.
- 3) The development of water quality control measures to achieve the desired objectives, including the establishment of a time table for their accomplishment.

To meet these objectives, the Project has solicited participation, assistance, advice, and cooperation on the part of: other Federal agencies; State agencies concerned with public health, water pollution control, water resource management, and related fields; interstate agencies; municipalities; industry; and many other interested groups, both public and private. Most gratifying, also, has been the coordination of effort with our Canadian counterparts achieved through both official and informal channels of communication. Thus it is proving possible to study each of the international boundary lakes as a physical entity.

At this time (December 1963) the intensive phase of work has been completed in the Illinois River Basin, is approaching completion in the Lake Michigan Basin, and is well under way in the Lake Erie Basin. The Lake Huron and Lake Ontario Basins are next on the schedule for detailed study, and therefore this study plan was prepared. It has two purposes: 1) to serve as a general guide to preparation of detailed plans for study in the Lake Huron area, and 2) to inform interested parties who may not have been already familiar with GLIRB Project.

The Lake Huron Study Area

The study area begins on the west at the Straits of Mackinac, where Lake Michigan joins Lake Huron, and at the outlet of Lake Superior, and terminates at the Lake Huron outlet, just north of the mouth of Black River, where it joins the Lake Erie study area. The choice of terminal boundaries is somewhat arbitrary, but conforms with the rule that, in general, connecting channels between the Great Lakes are treated as tributary to the downstream Lake.

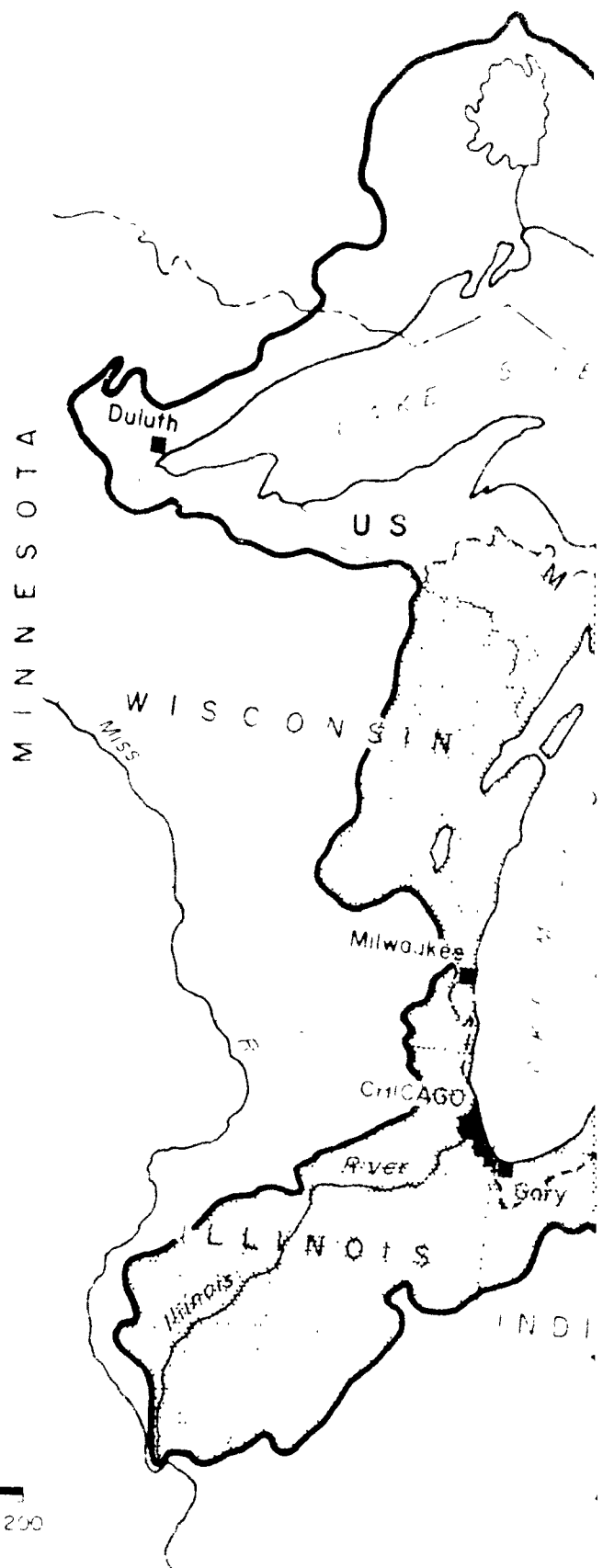
The Lake Huron study area forms a connecting link, between the two headwater basins of Lake Michigan and Lake Superior, and the downstream Lake Erie Basin. With respect to population concentration and industrial development, the Lake Huron area is dwarfed in importance by the two study areas it connects, i.e., Lakes Michigan and Erie. A similar situation applies in regard to the magnitude and gravity of present water quality problems, and that is why the Lake Michigan and Lake Erie Basins received earlier attention.

There are certain aspects that are common to all areas and should not be slighted. These include but are not necessarily limited to: 1) Water Budget Studies, an appraisal of the ground and surface water resources available to the area; 2) Lake Current Studies, to determine both mass movements and local current patterns in selected areas; and 3) A Sampling Program, sufficient in details of coverage and parameters analyzed to provide a base line for future observation of changes in water quality.

Objectives of the Lake Huron Basin Study

Specific objectives of the study are:

1. To determine the present quality of the waters of Lake Huron and its tributaries, by a review of existing records supplemented by a field sampling program.
2. To inventory water uses and trends of usage in the Basin, for municipal and industrial water supply, recreation, aquatic and wildlife, navigation, agriculture, and other purposes.



0 25 50 100 150 200
MILES

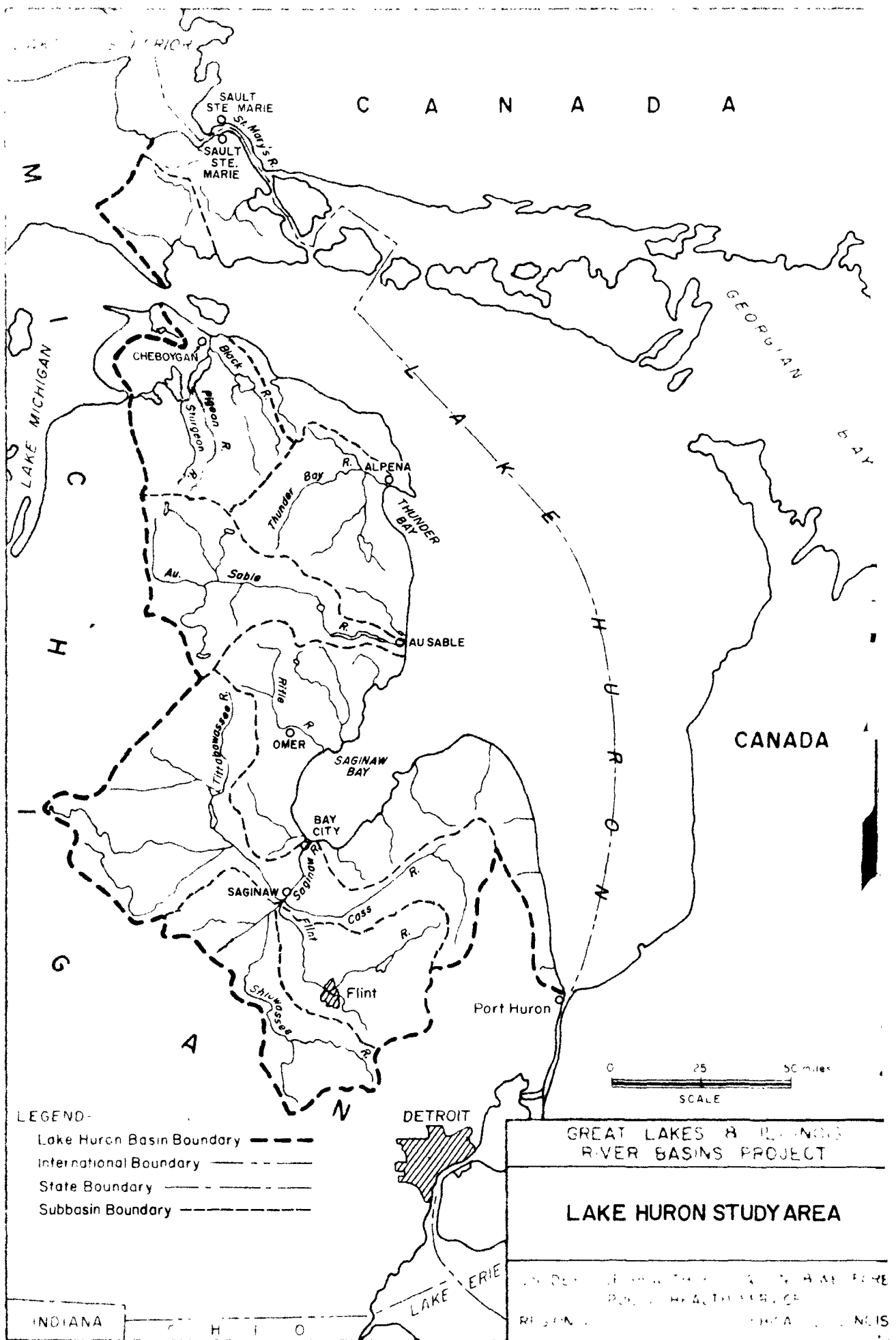


FIGURE 2

3. To identify sources of pollution, and compile data on quantities and characteristics of water-borne wastes, in each sub-drainage basin, catalogued by sources and points of discharge.

4. To appraise the adequacy of present practices in land use, water use, and waste disposal in relation to water quality protection.

5. To measure Lake Huron currents and establish their patterns as an aid to predicting the fate of pollutants discharged into the Lake and resultant effects on the Lake.

6. To make economic and demographic studies leading to projections of future growth, accompanying water demands, and associated water-borne wastes.

7. To determine the existing and potentially developable water resources, ground and surface, within the Basin.

8. To formulate a plan for guidance of a cooperative program aimed at improving and protecting the quality of waters in the Basin. This includes development of agreements on the water quality goals, analysis of measures for achieving these goals, and time tables for their accomplishment.

Organization for the Study

Except as otherwise noted in this report, the intensive phase of the study will be carried out by the Lake Huron Field Station, which will operate as a Branch of the Great Lakes-Illinois River Basins Project. The Field Station Director (to be designated) will be responsible to the GLIRB Project Director, and will be in direct charge of all activities of the station. Tentatively, it is planned that the Lake Huron Field Station will take over the space, facilities, and available manpower, of the Detroit River-Lake Erie Project (an enforcement activity) at Gross Ile, Michigan, when that Project is completed next year.

In addition to the main field station, substations will be needed for certain activities. Two substations will probably be established - one in the Saginaw Bay Area, at or near Bay City, and one at Sault Ste. Marie, Michigan. Substations will be under the main Field Station. Local laboratories of other agencies, and a mobile laboratory, will be utilized as necessary.

Activities to be conducted from GLIRB Project headquarters in Chicago include: economic-demographic studies and contracts therefor; land use management practices in relation to water quality; and Lake current (oceanographic) studies. Contract arrangements have been made through Chicago headquarters for cooperative studies by the Bureau of Outdoor Recreation and by the Bureau of Sport Fisheries and Wildlife,

USDI; these arrangements provide for continuity throughout the GLIRBP study and will continue to be administered from headquarters.

Project headquarters staff will exercise technical supervision and/or render technical assistance to the Lake Huron Field Station as provided herein under subsequent sections dealing with specific activities; and otherwise as directed by the Project Director or requested by the Field Station Director with the Project Director's concurrence.

II - BASIC DATA COLLECTION

Water Uses

The collection of basic data will be one of the first activities started, and will be a continuing activity. Contacts will be established and maintained with persons and agencies in the area having pertinent information and records. First efforts will be directed toward determining what information is available, the gaps in needed information, and how these gaps may be filled, either by Project investigations or cooperative effort by others. Discussion of specific categories of basic data follows:

For the sake of uniformity, water uses will be grouped into the following categories, in conformity with the grouping already established in studies of other parts of the GLIRB Project study area:

1. Municipal Water Source
2. Industrial Process Water
3. Recreation
 - A. Whole-body contact
 - B. Limited bodily contact
4. Irrigation
5. Fish and Aquatic Life
 - A. Tolerant
 - B. Facultative
 - C. Intolerant
6. Wildlife and Livestock Watering
7. Hydroelectric Power
8. Commercial Shipping
9. Cooling
10. Esthetics
11. Waste Water Assimilation

The inventory of municipal and industrial water uses in the Lake Huron Basin will be compiled for each sub-drainage basin. The published data will be updated where needed through state office visits for collecting data from unpublished reports. Results will be

published in the form established by the Basic Data Branch of WS&PC Division, Washington, including the national coordinate system for describing point locations.

For other water uses, the extent of usage will be described in appropriate terms, as quantitatively as possible. Examples are: acreage irrigated and type of irrigation practiced; rated capacity in KW and annual energy generation in KWH for hydroelectric and thermal power plants; annual tonnage (historical and projected) for commercial shipping; and, for recreational boating, number and type of boats registered, berthing capacity of marinas, etc.. Bathing beach areas on Lake Huron will be mapped and described.

Water Borne Wastes

A comprehensive picture of the waste loadings to receiving waters in the basin will be obtained. The state agencies and other agencies will be asked to cooperate in obtaining the data via state records, plant visits and/or plant sampling at selected plant sites, both industrial and municipal. Information will be obtained relative to the loadings contributed by boats, shipboard discharges, and dredging operations in Lake Huron and tributary streams.

Water Quality Appraisal

Existing reports will be used as a source of data for determining the present water quality and as a guide in determining where stream and Lake sampling is needed. Records of water analyses from water intakes, beaches, or other points in Lake Huron will be analyzed for historical trends in water quality at selected points in the Lake.

Water Resource Appraisal

The adequacy of ground and surface water sources to supply present and projected demands will be appraised. This involves a study of the geology and hydrology of the area. From low-flow frequency data on tributary streams, design drouth conditions will be developed so that water quality objectives can be associated with adopted recurrence intervals of extreme conditions.

For projecting long-term trends in overall average water quality in Lake Huron, an estimate of the net annual flow-through of water will be required. Hydraulically, Lakes Michigan and Huron act as a single lake; therefore the water balance study for Lake Huron will have been completed in connection with work on Lake Michigan Basin.

Information will be collected on the effects of fluctuating Lake surface levels on water uses.

Land Use

The quality of water reaching streams and lakes from surface runoff is closely associated with land use. Patterns of existing land use will be determined from Department of Agriculture records and other sources. Representative watersheds will be selected for field studies to determine quality of runoff water and establish factors to be applied to the whole land area. This work will be directed from Project headquarters by a staff specialist, possibly through cooperative arrangement with the Department of Agriculture.

III - FIELD OPERATIONS

Sampling Program

Conduct of the field sampling program will be a major responsibility of the Field Station and its substations. This will include coordinating car routes, boat sampling, processing and delivery of samples to laboratories, and installation, maintenance and operation of automated sampling equipment such as DO (dissolved oxygen) analyzers and carbon filter stations.

Lake Huron-Extended Range Sampling

Sampling in the main body of the Lake will be conducted in boats equipped with laboratory facilities for making certain tests (see LABORATORY PROGRAM) and with quarters for the boat crew and necessary Project personnel. Lake sampling stations will be located at each current meter station (see Lake Current Studies) and at intermediate points.

Cruises will be scheduled to collect samples at least once during each of the three seasons, spring, summer, and fall. One of the cruises should be conducted either in late fall or early spring, as close to winter conditions as ice and weather permit.

At each station call, a temperature sounding shall be taken from top to bottom with the Bathythermograph, and samples collected at three depths: near the surface, near the bottom, and at mid-depth. Data collected on the first cruise shall be processed promptly and examined for both horizontal and vertical variations in quality; spacing of sampling stations and depths on subsequent cruises will then be modified according to the variations thus disclosed.

Lake Huron-Intensive Local Sampling

Sampling activities in Saginaw Bay will be generally the same as described for the main Lake, except that stations will be more closely spaced, and sampling probably will be conducted by fast boats not equipped with quarters or laboratory. Detailed plans for sampling in the Bay will be worked out with regard for areas of concentrated usage, such as bathing beaches, and heavy sources of pollutional input.

In the St. Mary's River - connecting channel between Lakes Superior and Huron - International Joint Commission (IJC) staff will provide much of the needed information. Additional sampling will be designed only to supplement the IJC data.

Sampling at the confluence of major tributaries with Lake Huron will be designed to provide a basis for estimating the annual and seasonal input to the Lake and show the patterns of dispersal of constituents into Lake water. This program will be conducted for the following tributaries:

Cheboygan River
Thunder Bay River
Au Sable River
Rifle River
Saginaw River
St. Marys River
Kawkawlin River

The sampling pattern at a tributary confluence will consist of one or more stations located upstream from Lake backwater effect, and additional stations radiating outward until the water quality merges with that of the main Lake.

Stream Sampling

Sampling of streams on the watershed will include areas of importance to population concentrations, industry and recreation. Existing records, of state and other agencies, will be screened to determine where supplementary sampling may be needed. The field program will probably include these areas:

- 1) Industrial-urban (Saginaw River Valley)
- 2) Agricultural (Cass River)
- 3) Forested (Au Sable River)

Sampling stations will be located above and below major waste-water outfalls, and downstream through the zone of assimilation and recovery for decomposing organic wastes.

Lake Current Studies

Objectives of the Lake current studies are to determine the mass movements of Lake water, the pattern of currents and relationship of currents to wind and other forces, effective mixing volumes, and the mechanics of the mixing process - all for the purpose of predicting the fate of pollutants discharged and their effect on Lake water quality and water uses. A combination of fixed-position recording stations and tracer techniques will be used.

Figure 3 shows tentative locations of current meter stations in the Lake. Stations will be operated continuously for a period of one

year. General procedures will be the same as developed in the earlier studies on Lake Michigan.

Drogue and dye studies will be conducted in selected inshore areas, and especially in Saginaw Bay, where sufficient tracings will be carried out to establish dispersion coefficients and velocity patterns over the range of different wind conditions.

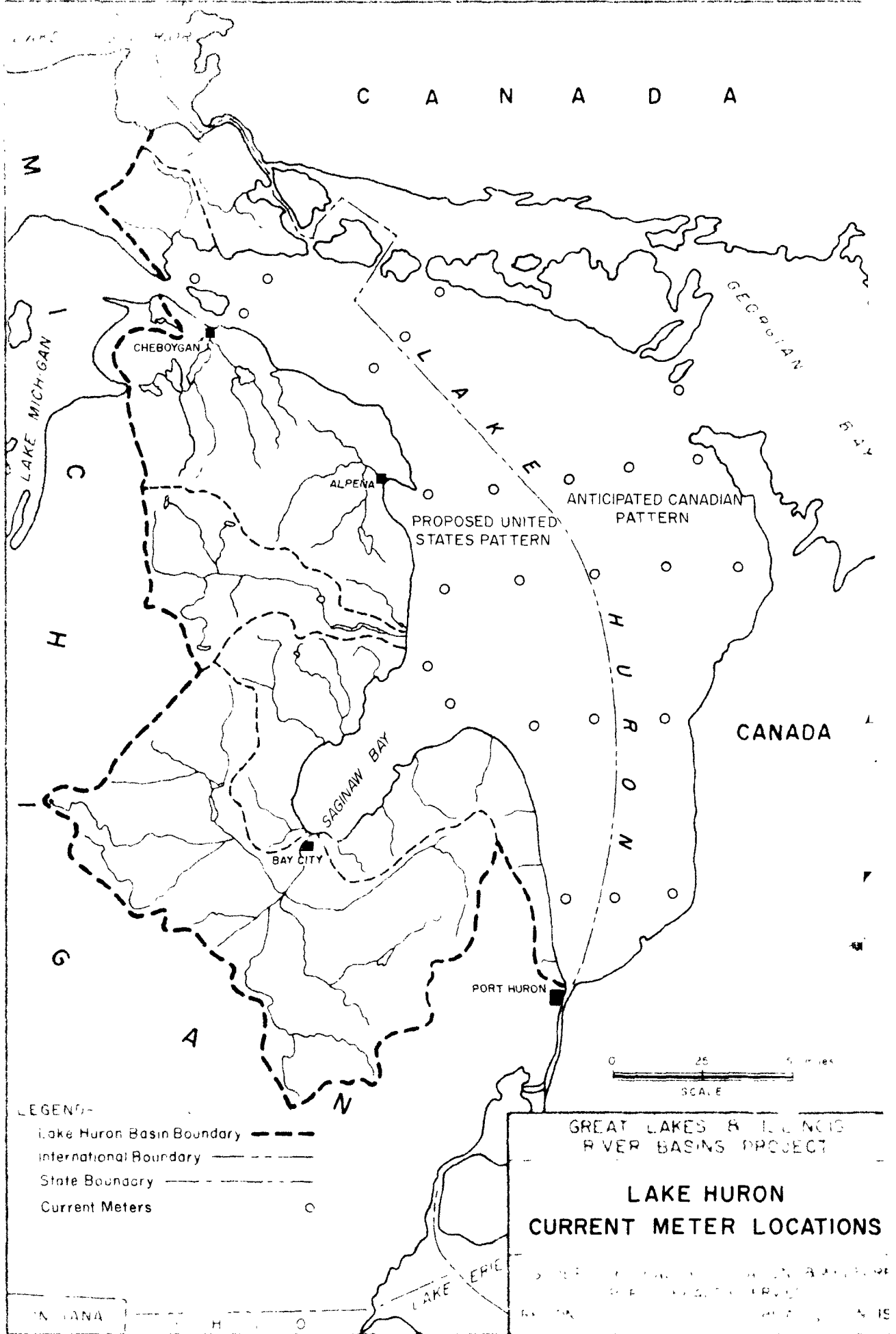
Stream and Waste Water Flows

Flow data will be obtained as needed to translate the concentrations, determined by laboratory analyses of samples, into quantity of material transported. It is expected that much of the required flow information can be obtained by utilizing existing stream gaging programs of USGS and other agencies. Necessary supplemental field measurements will be accomplished by use of conventional current meters, weirs, Parshall flumes or other appropriate equipment.

Special Studies

Special field studies may include surveys of sludge deposits, core sampling of the Lake bottom, and studies of combined sewer operation.

Sampling and flow measurements should be made on a number of representative small drainage areas to obtain factors for estimating the pollutional contributions of natural runoff from urban and rural areas. For the latter, this work should be coordinated with the general study of land use and related water quality (see Land Use).



IV - LABORATORY PROGRAM

Biology

Biological investigations in the Lake Huron area will be undertaken with four ultimate objectives:

- 1) To evaluate the general biological condition of the Lake.
- 2) To define local or zonal effects from tributaries and waste discharges.
- 3) To provide the biological information required for explanation and interpretation of certain chemical, bacterial and physical data.
- 4) To guide the development of water quality control measures that will promote desirable, and inhibit undesirable, aquatic life.

Samples of benthic animals, attached flora, and phytoplankton will be collected at stations selected to coincide with stations where chemical, physical and bacteriological measurements will be made.

A minimum program would involve seasonal studies of the biological parameters as outlined below:

<u>Parameters</u>	<u>Frequency</u>	<u>Collected by</u>	<u>Analyzed by</u>
Phytoplankton	Bi-weekly in streams All samples from Lake	Aquatic Samplers	Chicago Lab.
Benthic fauna	May, Aug., Oct.	Biologists	Field Sta. Lab. (assisted by Chgo.)
Attached algae	May, Aug., Oct.	"	Field Sta. and/or Chicago
Rooted weeds	July or Aug.	"	" "
Net Plankton	Each Lake Station	"	Chicago Lab.

Field Station-based biologists would be responsible for tributary work and some of the lake cruises. Chicago-based biologists would also work some of the lake cruises. Except on deep-water cruises, sampling by biologists will be made independently of chemical and bacteriological sampling.

Laboratory Procedures

Samples collected from the Lake waters would be screened at the Field Station laboratories, preserved and returned to the GLIRBP laboratory in Chicago. Here they would be processed (macro and micro-examination) for enumeration and identification.

The laboratory analyses will consist of:

- 1) Bottom fauna identification and enumeration.
- 2) Attached plant life, including algae and fungi, identification and measure of abundance.
- 3) Phytoplankton identification and enumeration.
- 4) Net plankton, identification and organic content.

Special projects will include studies on the use of artificial substrata for eutrophication evaluation; chlorophyll densities of the subject waters; diurnal fluctuations of dissolved oxygen, and electrofishing and bioassay as needed.

Chemistry

The bulk of this program will consist of routine sampling of the waters under study. Samples will be delivered to the field laboratory for the analyses which are to be made there. The remainder of the samples will be sent to GLIRBP laboratory in Chicago. An outline is presented segregating the analytical tests to be performed at the field laboratory and at GLIRBP into various groups based on the need for repeated determinations for each parameter under study.

Field Station Laboratory Outline

Tests to be run:	Frequency of Test:
pH	All samples
Specific Conductivity	All samples
DO	All samples
Alkalinity	All samples
Chloride	All samples
Turbidity	All samples
BOD	Inshore & Tributary samples
COD	Tributary samples
Solids	Waste samples
(a) Dissolved	All samples
(b) Suspended	Inshore & Tributary samples
Cyanide	Special samples, waste
Phenols	Special samples, waste

GLIRBP Laboratory Program Outline

Tests to be run:	Frequency of Test:
Carbon Chloroform Extracts & Carbon Alcohol Extracts	Special samples at selected stations
Nitrogens (NH_3 , Kjeldahl, NO_3)	All samples collected; 3 depths
Total Phosphates	All samples collected; 3 depths
Oil	Special samples as needed
Toxic Metals (Cu, Pb, Zn, Cd, Ni, Cr)	Once at each station; composited depths
Gross Minerals (Na, K, Ca, Mg, SO_4 , SiO_4)	<u>Lake Samples</u> - once at each station; 3 depths Tributaries - once at each station on composite samples
ABS	All stations collected; 3 depths
Trace Elements	Same as Gross Minerals

Microbiology

The objectives of the microbiological investigation will be to determine the present quality of the waters of each lake and its drainage basin through the use of certain parameters which express the sanitary status of the waters investigated and through the use of other parameters which help to express other qualities of the lake. This information will provide information as to points of influx of domestic sewage and the wastes of certain industries, as well as localizing areas of pollution within the Lake itself. The tests listed below will be the chief items comprising the microbiological survey of the Lake.

Coliform Tests

1. Total coliform via membrane filter (All samples).
2. Coliform differentiation on selected samples by elevated temperature test (gas production from lactose, at $44.5 - 45.0^\circ$ in 24 hours).

Fecal Streptococcus Tests

1. Total fecal streptococci via membrane filter using K.F. Agar plates. - Inshore and Tributary samples as indicated by reconnaissance studies.
2. Streptococcus differentiation on selected samples via special fermentation and metabolic tests.

Total Plate Counts

Total plate counts - All Lake samples plus selected Inshore and Tributary samples. Procedure will be membrane filter or special pour plates.

- a. 20° C.
- b. 35° C.
- c. With further special bacteriological identification tests on selected samples.

Pathogen Detection

- a. Enteroviruses
- b. Salmonella
- c. Other selected tests

Radiochemistry

All samples for radioactivity studies will be sent back to the Great Lakes-Illinois River Basins Project laboratory in Chicago for analysis.

Samples are to be collected at the same stations where chemical, physical and biological tests are to be made. Special samples will be collected when high results are encountered from routine samples. Sewage treatment plant outfalls and waste outfalls will be sampled, particularly where known radioisotope users are involved.

Special biological samples will also be collected for radioactivity determinations. This will include plankton on the lake, bottom samples on the lake and tributaries and filamentous algae on the tributaries.

V - ECONOMIC-DEMOGRAPHIC STUDIES

The Economic and Demographic Study would include the following activities: Population studies and projections for each sub-region or other area deemed of value to the study; an economic study of each of the above areas; and an analysis of the rate and direction of population and industrial growth of selected industries through the year 2010. The following is an outline of the proposed Economic and Demographic Study:

Population 1930-2010

- A. Standard Metropolitan Statistical Areas.
- B. County Data
- C. Community Data. Selected communities or townships.
- D. Service Area. Existing and likely future area.
- E. Density of population (persons per square mile).

Economy of the Area

- A. Standard Metropolitan Statistical Areas.

Employment 1950-1960

Total
Manufacturing-total
Selected Industries

Value Added by Manufacture 1939-1947-1957

Total
Selected Industries

- B. County Data

Employment 1950-1960

Total
Manufacturing-total
Selected Industries

Value Added by Manufacturer 1939-1947-1957

Total
Selected Industries
Other production measures, e.g., units, tons,
When available
Location of Key Plants

C. Major City or Sub-Area

Value Added by Manufacture

Economic Outlook

Analysis of rate and direction of growth, shift in area or sub-area industry patterns and quantity of production; projection of population and levels of selected industries to 2010.

VI - RELATED STUDIES

Cooperative arrangements have been, or will be, made with other Federal agencies to conduct studies and submit reports concerning those facets of water use and water quality management in which the agencies have special responsibility and competence. These include: Water Oriented Recreation, by the Bureau of Outdoor Recreation, U. S. Department of the Interior; Fish and Wildlife Aspects, by Fish and Wildlife Service, USDI; and possibly, Land Use in Relation to Water Quality, by the Soil Conservation Service, U. S. Department of Agriculture.

VII - PLAN FORMULATION

The end product of the Project's endeavors will be a synthesis of all elements of the study into a coordinated plan for the guidance of water quality control programs. The plan will identify existing water pollution problems; spot the locations of problem areas; appraise the nature and gravity of problems, the water uses affected and the extent of detriment to those uses; and recommend steps to be taken for the abatement of pollution. Where alternative plans would accomplish the objectives, these will be thoroughly presented as a guide to decision-making bodies.

Engineering analyses will be made for translating the projections of population growth and industrial activity into accompanying water demands and associated waste loads.

An essential element of the planning function is the statement, in terms as quantitative as possible, of the water quality goals toward which the program should be directed, and against which the forecast water quality can be compared. The establishment of these water quality objectives will be carried out through consultation and coordination with the Project's Technical Advisory Committee, the State of Michigan, other Federal agencies, and Project staff.

The impact of present and future waste loads on receiving waters will be analyzed. Where these receiving waters are tributary streams, this analysis will include identification of waste inputs, the effectiveness of collection and treatment measures, and the stream flows available under adopted drought conditions for assimilation of waste residues after treatment. Generalized estimates will then be made of the amount of regulation needed from tributary storage reservoirs to alter the flow regimen to maintain the quality goals.

With respect to Lake Huron itself, a different set of questions arises in predicting the fate of pollutants and their effects on Lake water quality. Questions include both local and Lake-wide effects and long-term trends. Mathematical models will be set up for estimating these effects. The desired answers include: 1) the steady-state concentrations of persistent constituents corresponding to existing and future rates of gross annual input; 2) the time required for concentrations to reach critical levels under projected input rates, if the steady-state concentration is above the limits set for water quality goals; 3) local dispersion patterns in the vicinity of significant waste input points; and 4) correlation between Lake currents and wind or other causative factors, to aid designers in determining strategic locations to minimize short-circuiting between waste input points and water use points.