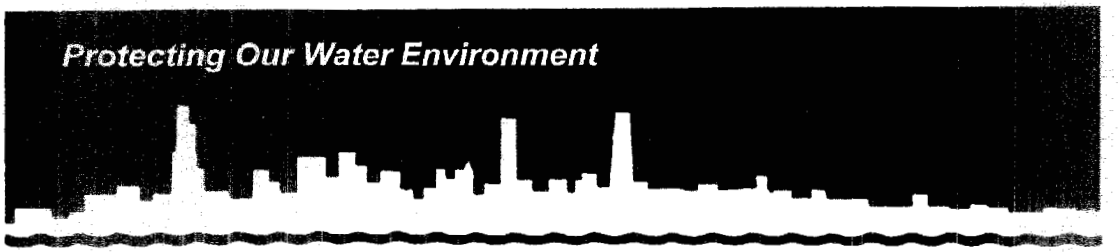

Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

REPORT NO. 04-5

RESEARCH AND DEVELOPMENT

2003

ANNUAL REPORT

March 2004

Metropolitan Water Reclamation District of Greater Chicago
100 East Erie Street Chicago, IL 60611-2803 (312) 751-5600

RESEARCH AND DEVELOPMENT
2003
ANNUAL REPORT

Research and Development Department
Richard Lanyon, Director

March 2004

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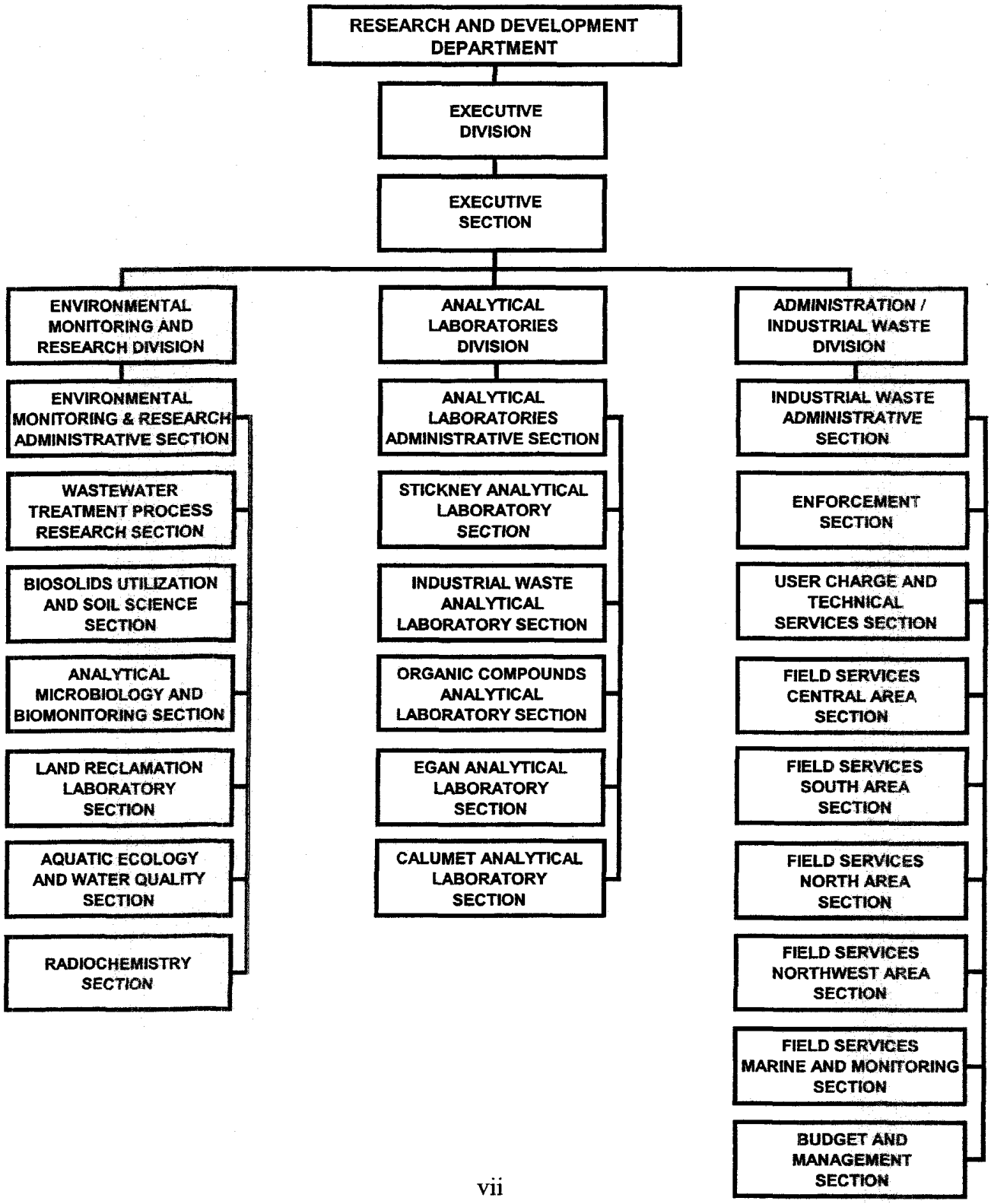
DISCLAIMER

The mention of trade names of specific products does not constitute endorsement of them by the Metropolitan Water Reclamation District of Greater Chicago.

RESEARCH AND DEVELOPMENT DEPARTMENT ORGANIZATION CHART FOR 2003



ADMINISTRATION DIVISION

The Administration Division is responsible for the coordination of all departmental services pertaining to personnel administration, purchasing, computer systems, and administrative assistance to the Director. Primary functions of the Division include: coordination and preparation of budget documents; preparation and administration of contract documents; preparation and administration of consultant agreements; administration of requisitions and purchase orders; administration of departmental personnel actions; planning and coordination of departmental computer systems, training, and security requirements; liaison with other departments; and preparation of Board letters, correspondence, and reports, required by the Director.

Personnel Administration

The Department had 337 budgeted positions during 2003 with a total salary and wage appropriation of $21,263,300. All personnel transactions, including merit wage increases, personnel requisitions, service rating forms, personnel vacancy reports, overtime records, personnel transfers, appointments, resignations, leaves of absence, payroll changes, and disciplinary actions for the Department were either originated or coordinated by this Division. During 2003, the Department reviewed personnel actions relative to 19 retirements. In addition, as part of adopting the 2003 Budget and the District's attrition program, six existing positions were eliminated when vacated during 2003. By year-end, actual positions eliminated upon vacancy by incumbents totaled eight. In addition, effective January 1, 2004, three Management Analyst positions in the Administration Division were reassigned to General Administration. This decrease in positions led to an average expenditure to appropriation ratio of over 96 percent.

Greater Chicago Pollution Prevention Program

In January 1994, the Greater Chicago Pollution Prevention Program (GCP3) was initiated as a cooperative project between the Metropolitan Water Reclamation District of Greater Chicago (District) and the Illinois Waste Management and Research Center (Center).

Technical assistance is provided directly to companies requesting such assistance by a member of the Center's staff. During 2003, the Center provided onsite technical assistance to 39 companies, primarily metal finishers (CFR 413 and 433). In 2003, based on a 2002 Center recommendation, a food processor installed a microfiltration unit to be used to recover product from a waste stream. The new microfiltration unit is expected to substantially reduce the company's BOD loading and save the company money on raw material costs.

Most of the assistance provided has been for industry, but others, such as citizens community groups, schools, government, and trade associations have also benefited. Technical assistance includes pollution prevention, regulatory compliance, regulatory information, and guidance material.

The District and the Center are participating in the United States Environmental Protection Agency's (USEPA's) Common Sense Initiative - Strategic Goals Program for Metal Finishers. This program includes commitments by industry to go beyond compliance, substantially reducing pollution from their

operations. The Center, working with other local stakeholders, has developed a proposal for providing technical assistance to achieve these reductions to the participating metal finishers.

Computer Systems Administration

In 2003, with the assistance of the Information Technology Department (IT), the Administration Division continued its review of all departmental computer systems, local and wide area networks, software utilization, compliance with District security and access procedures, training requirements, etc.

In April 2001, the District implemented the use of an IT-designed program for budget preparation. This Budget Preparation Tool (BPT) was used to prepare the 2003 line item and position budgets. The Enterprise System, which was implemented in 2000, proved inadequate for preparing the District's budget and BPT was developed to assist in this area. The Administration Division prepared the 2003 budget using this new system. Enhancements were made to this budgeting tool for preparation of the 2004 budget.

Budget Administration

A comparison of appropriations to expenditures for 2003 shows the following:

Purchasing Administration

During 2003, more than 422 requisitions were reviewed and processed by the Administration Division, prior to being forwarded to the Purchasing Department. This review verified the availability and proper use of department funds for all requisitioned items. The Division will ensure that all departmental purchase orders are properly closed out at year's end and will process purchase order decreases or increases as appropriate.

Contract Administration

During 2003, the Division was involved in the preparation and administration of 15 contracts for a total cost of approximately $1,126,684, including multiyear contracts. This involved the preparation of detail specifications, Board letters, advertisements, coordination of the receipt and review of bids, recommendations to award, management of fund reservations (used to ensure availability of funds for items costing $10,000 or more), processing of purchase requisitions, change orders, payment of invoices, and release of bid deposits.

The Division administered 15 consulting services agreements with individual values of $9,000 or more and having a total value of

	Appropriation	Expenditure
Personnel (Line Item 101,) (Adjusted)	$21,263,300	$20,425,089
Other Line Items	4,206,400	3,188,168
Total	$25,469,700	$23,613,257

approximately $1,873,423 during 2003. The Division also administered 15 maintenance agreements with individual values of $10,000 or more and a total value of $760,148. This involved preparation and processing of purchase requisitions, change orders, Board letters, and management of fund reservations, preparation and execution of consultant agreements, preparation of requests for proposals, and coordination of the receipt and review of proposals.

Laboratory Accreditation

In 2003, the seven R&D laboratories previously accredited or certified with the State of Illinois maintained their status. The participation of our laboratories in these programs helps to ensure that the laboratories are operated in a manner that meets or exceeds the standards established by the applicable accreditation or certification program. Some benefits of maintaining the high standards required by these programs are better documentation of procedures, increased quality control and quality assessment, improved analyst training, and increased accuracy of test results.

The five laboratories of the Analytical Laboratories Division have been accredited under the National Environmental Laboratory Accreditation Program (NELAP) since 2001. The Illinois Environmental Protection Agency (IEPA) Division of Laboratories is the NELAP accrediting authority for the State of Illinois. The Calumet, Egan, Stickney and Industrial Waste Analytical Laboratories are accredited for inorganic analysis of wastewater. The Organic Compounds Analytical Laboratory is accredited for organic analysis of wastewater and solid waste.

In 2002, the State of Illinois created an advisory committee to review and evaluate the IEPA management of the NELAP accreditation program. Under the enabling Public Act, the District maintains a permanent member on the nine-person committee. The fee schedule for accredited laboratories established in 2002 remained unchanged in 2003. Fees for the five accredited District laboratories range from $3,400 to $4,400.

Since 1979, the Analytical Microbiology Laboratory has been certified for microbiological analysis of drinking water and public water supplies by the Illinois Department of Public Health (IDPH).

In June 2001, the Radiochemistry Laboratory was certified by the Illinois Department of Nuclear Safety (IDNS) for the radiochemical analysis of potable water.

The certification programs administered by the IDPH and the IDNS follow guidelines contained in the USEPA *Manual for the Certification of Laboratories Analyzing Drinking Water*. These guidelines are compliant with regulations issued pursuant to the Safe Drinking Water Act. Currently, no fees are charged for certifications of the Analytical Microbiology Laboratory and the Radiochemistry Laboratory.

Use Attainability Analysis Study

The IEPA began the Chicago Area Waterways Use Attainability Analysis (UAA) Study in 2002 to determine if these waterways can support a higher use designation and meet the goals of the Clean Water Act. Most of these waterways are designated as Secondary Contact and Indigenous Aquatic Life Use and an examination of this use designation has been urged for several years by

the USEPA. The District is committed in its National Pollutant Discharge Elimination System (NPDES) permits to participate in and support the UAA Study. The District is carrying out this commitment by making available all of the water quality and related data from its monitoring activities and is developing an unsteady-state hydraulic and water quality model of the waterway system. In addition, the District will by supplying technical support through review of study reports and proposals for water quality improvement projects.

Bubbly Creek Water Quality Improvement Demonstration Project

With the approval of the IEPA and the cooperation of the Maintenance and Operations (M&O) Department, the R&D Department conducted monitoring of Bubbly Creek during the summers of 2002 and 2003. This was performed to demonstrate if artificially creating flow in the creek during dry weather periods and following the pumping of combined sewer overflow at the Racine Avenue Pumping Station would improve dissolved oxygen conditions. The result of the project in 2002 showed a beneficial effect, and similar work was performed in 2003 to gain more information on the water quality dynamics of Bubbly Creek.

Departmental Reports

During 2003, the Department published 51 formal reports dealing with various aspects of the District's operations. A list of these reports is given in Tables 1 and 2.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1

RESEARCH AND DEVELOPMENT NUMBERED REPORTS PUBLISHED DURING 2003

	Report Title	Author (s)	Date	Organization or Conference Which Presented
2003-1	Bubbly Creek Water Quality Improvement	Lanyon, R.	January-03	Internal District Report
2003-2	Radiological Monitoring of the Raw Sewage, Final Effluent, Sludges, and Biosolids of the MWRDGC 2001 Annual Report	Kawalko, S., A. Khalique, R. Pietz, B. Sawyer, P. Tata	January-03	Internal District Report
2003-3-A	Sensitive Area Considerations for Outfalls Designated in NPDES Permits for the Calumet, North Side and Stickney WRPs - Volume 1	Lanyon, R., I. Polls, J. Wasik	February-03	Internal District Report
2003-3-B	Volume 2 - Appendices	Lanyon, R., I. Polls, J. Wasik	February-03	Internal District Report
2003-4	Annual Biosolids Management Report for 2002	Granato, T.G., P. Grunwald, R.I. Pietz, B. Sawyer	February-03	Internal District Report
2003-5	Calculation of User Charge Rates and Administrative Costs - 2003	R&D Department	February-03	Internal District Report
2003-6	Fish Community in Salt Creek During 1998 and 1999	Dennison, S.G., I. Polls	February-03	Internal District Report
2003-7	O'Hare Cup Reservoir Fill Event Experiment Conducted from 8-13-02 through 9-3-02	Jain, J.S., D. MacDonald, B. Sawyer	March-03	Internal District Report
2003-8	Geotechnical Characterization of Biosolids	Prepared by Great Lakes Soil and Environmental Consultants, Inc.	March-03	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1 (Continued)

RESEARCH AND DEVELOPMENT NUMBERED REPORTS PUBLISHED DURING 2003

	Report Title	Author (s)	Date	Organization or Conference Which Presented
2003-9	Research and Development 2002 Annual Report	R&D Department	March-03	Internal District Report
2003-10	Physical and Moisture Retention Characteristics of Biosolids and Soil-Biosolids Mixtures	F. William Simmons, PhD; Department of Natural Resources and Environmental Sciences University of IL Urbana-Champaign	April-03	
2003-11	Re-evaluation of Local Pretreatment Limits	Bernstein, D., G. Kalinowski J.S. Jain, B. Sawyer, R. Sustich	April-03	Internal District Report
2003-12	Protecting Lake Michigan Water Quality: Addressing Beach Issues in 2003 Volume 1: Reports Volume 2: Appendices	Zmuda, J.T., Z. Abedin, B. Sawyer	June-03	Internal District Report
2003-13	Sedimentation Management in Combined Sewer Overflow Storage Reservoirs using Water Jets - Progress Report	Ven Te Chow Hydrosystems Laboratory; Department of Civil and Environmental Engineering University of IL Urbana-Champaign	July-03	
2003-14	2002 Annual Summary Report Water Quality within the Waterways System of the MWRDGC	Abedin, Z., D. Emery, R.I. Pietz	July-03	Internal District Report
2003-15	Odor Monitoring Program at District Facilities During 2001	Lordi, D.T., B. Sawyer	August-03	Internal District Report
2003-16	O'Hare Cup Reservoir Fill Event Experiment Conducted from 5-1-03 through 5-21-03	Jain, J.S., D. MacDonald, B. Sawyer	September-03	Internal District Report

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1 (Continued)

RESEARCH AND DEVELOPMENT NUMBERED REPORTS PUBLISHED DURING 2003

	Report Title	Author (s)	Date	Organization or Conference Which Presented
2003-17	Water and Sediment Quality Along the Illinois Waterway from the Lockport Lock to the Peoria Lock During 2002	Wasik, J.L., I. Polls	September-03	Internal District Report
2003-18	Hydraulic Calibration of an Unsteady Flow Model for the Chicago Waterway System	Shrestha, R.L.,M.S. C.S. Melching, Ph.D, P.E.	September-03	Institute for Urban Environmental Risk Management Marquette University, Milwaukee WI
2003-19	A Survey of Characteristics of Topsoils Marketed in the Chicago Metropolitan Area	Cox, A.L., G. Tian, T.C. Granato	October-03	Internal District Report
2003-20	Comparison of Fecal Coliform Concentrations and Trends in Two Urban Rivers: The Chicago Sanitary and Ship Canal and the Des Plaines River	Rijal, G.K., Z. Abedin, J. Zmuda B. Sawyer	October-03	Internal District Report
2003-21	Trace Element Concentrations in Street Dust and Surface Soils in the Drainage Basins of the Stickney and Calumet WRPs	Granato, T.C., Z. Abedin, O. Dennison, S. Zumpano, R.I. Pietz, P. Tata, C. Lue-Hing	October-03	Internal District Report
2003-22	EM&R Division 2002 Annual Report	Sawyer, B.	November-03	Internal District Report
2003-23	Thornton Transitional Flood Control Reservoir Pre-Operational Background Groundwater Quality Report 2002-2003	Jain, J.S., D. MacDonald, B. Sawyer	December-03	Internal District Report

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1 (Continued)

RESEARCH AND DEVELOPMENT NUMBERED REPORTS PUBLISHED DURING 2003

	Report Title	Author (s)	Date	Organization or Conference Which Presented
2003-24	Odor Monitoring Program at District Facilities	Lordi, D.T., B. Sawyer	December-03	Internal District Report
2003-25	Characteristics of Stormwater Runoff Sampled at Two Storm Sewers in Evanston and Crest-wood, Illinois	Zhang, H., J.S. Jain, Z. Abedin, B. Sawyer	December-03	Internal District Report
2003-26	Hydraulic Model Study of Chicago River Density Currents	Ven Te Chow Hydrosystems Laboratory; Department of Civil and Environmental Engineering University of IL Urbana-Champaign	December-03	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2003

Report Title	Author (s)	Date	Organization or Conference Which Presented
Fulton County IEPA October 2002	R&D Department Granato, T.C., P. Lindo	January-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA November 2002	R&D Department Granato, T.C., P. Lindo	January-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA December 2002	R&D Department Granato, T.C., P. Lindo	March-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA January 2003	R&D Department Granato, T.C., P. Lindo	March-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA February 2003	R&D Department Granato, T.C., P. Lindo	April-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA March 2003	R&D Department Granato, T.C., P. Lindo	May-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA May 2002 - **REVISION**	R&D Department Granato, T.C., P. Lindo	May-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA April 2003	R&D Department Granato, T.C., P. Lindo	July-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2 (Continued)

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2003

Report Title	Author (s)	Date	Organization or Conference Which Presented
Fulton County IEPA June 2002 - **REVISION**	R&D Department Granato, T.C., P. Lindo	June-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA July 2002 - **REVISION**	R&D Department Granato, T.C., P. Lindo	June-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA May 2003	R&D Department Granato, T.C., P. Lindo	July-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency mental Protection Agency
Fulton County IEPA June 2003	R&D Department Granato, T.C., P. Lindo	September-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA July 2003	R&D Department Granato, T.C., P. Lindo	October-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA August 2003	R&D Department Granato, T.C., P. Lindo	October-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County IEPA September 2003	R&D Department Granato, T.C., P. Lindo	December-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2 (Continued)

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2003

Report Title	Author (s)	Date	Organization or Conference Which Presented
Hanover Park Water Reclamation Plant Fischer Farm Report for 4th Quarter of 2002	R&D Department Granato, T.C., P. Lindo	February-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Hanover Park Water Reclamation Plant Fischer Farm Report for 1st Quarter of 2003	R&D Department Granato, T.C., P. Lindo	May-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Hanover Park Water Reclamation Plant Fischer Farm Report for 2nd Quarter of 2003	R&D Department Granato, T.C., P. Lindo	August-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Hanover Park Water Reclamation Plant Fischer Farm Report for 3rd Quarter of 2003	R&D Department P. Lindo, T.C. Granato	December-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Biomonitoring Report 2003 James C. Kirie WRP NPDES Permit IL0047741 - Results of Whole Effluent Toxicity (WET) Tests Conducted on Effluent Samples	Zmuda, J.T.	June-03	IEPA Bureau of Water Agency, United States Environmental Protection Agency

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

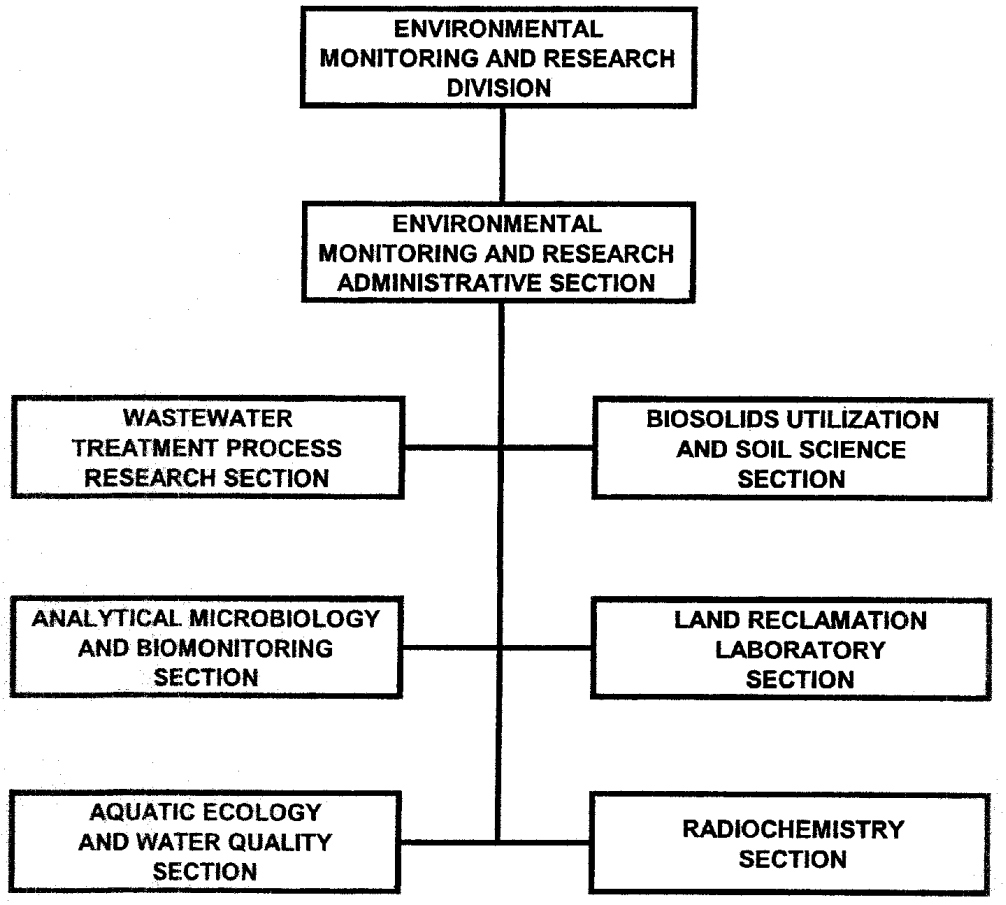
TABLE 2 (Continued)

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2003

Report Title	Author (s)	Date	Organization or Conference Which Presented
Groundwater Monitoring Report, Tunnel and Reservoir Plan Calumet Tunnel System 2002 Annual Report	R&D Department	July-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Groundwater Monitoring Report, Tunnel and Reservoir Plan Des Plaines Tunnel System 2002 Annual Report	R&D Department	July-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Groundwater Monitoring Report, Tunnel and Reservoir Plan Mainstream Tunnel System 2002 Annual Report	R&D Department	July-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Groundwater Monitoring Report, Tunnel and Reservoir Plan O'Hare Cup Reservoir Water Quality Monitoring Wells 2002 Annual Report	R&D Department	July-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Groundwater Monitoring Report, Tunnel and Reservoir Plan Upper Des Plaines Tunnel System 2002 Annual Report	R&D Department	July-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency

Figure 1

ENVIRONMENTAL MONITORING AND RESEARCH DIVISION ORGANIZATION CHART



ENVIRONMENTAL MONITORING AND RESEARCH DIVISION

The Environmental Monitoring and Research (EM&R) Division has 70 employees, and is comprised of seven Sections, viz.,

1. Administrative
2. Wastewater Treatment Process Research
3. Biosolids Utilization and Soil Science - Stickney
4. Land Reclamation Laboratory - Fulton County
5. Analytical Microbiology and Biomonitoring
6. Aquatic Ecology and Water Quality
7. Radiochemistry

The major areas of focus of the Division were as follows:

- Monitoring the environmental quality of Lake Michigan, area rivers and canals, and the Illinois River to document the effectiveness of the District's wastewater treatment program.
- Assisting in the resolution of sewage treatment and solids disposal operation problems.
- Providing technical assistance to other departments and agencies with respect to issues related to wastewater treatment; combined sewer overflow management; waterways management; and solids processing, utilization, and marketing.
- Conducting applied and operations research to achieve improvement and cost reductions in District wastewater treatment, waterways management, and solids processing and biosolids utilization activities.
- Assessing the impacts of new or proposed regulations on District activities.

Administrative

In 2003, the EM&R Division was reorganized, with the Toxic Substances Section transferred to the Analytical Laboratories Division and the Experimental Design and Statistical Evaluation Section merged with the EM&R Division Administrative Section.

In addition to the overall administrative and supervisory functions performed by the Administrative Section, the Experimental Design and Statistical Evaluation Group, which is part of the Administrative Section, provided the following support to the rest of the EM&R Division.

STATISTICAL AND COMPUTING SUPPORT

During 2003, the Biostatistician and an Associate Statistician provided statistical and computing support to various projects. The following is a description of some of the activities.

1. Statistical support was provided to a joint Water Environment Federation (WEF) and USEPA, Region 5, biosolids survey to assess the accuracy of Publicly Owned Treatment Works (POTWs) in self reporting the 40 CFR Part 503 Regulated Metals. The project was completed in August 2003.

2. Statistical support was provided to the Analytical Microbiology & Biomonitoring Section to study the trend and average fecal coliform concentrations in the Des Plaines River and the Chicago Sanitary and Ship Canal at Lockport for the 2000-2001 period. The project was completed in September 2003.

3. Statistical support was provided to the Biosolids Utilization and Soil Science Section on the concentrations of metals in street dust collected from the drainage basins of the Stickney and Calumet WRPs. The project was completed in September 2003.

4. Statistical support was provided to the Wastewater Treatment Process Research Section to study the characteristics of stormwater runoff at storm sewers in Evanston and Crestwood, Illinois. The project was completed in November 2003.

5. Statistical support was also provided to the Wastewater Treatment Process Research Section on centrifuge analyses to study the effects of polymer dose (lbs/DT), feed sludge characteristics, and cake solids on sludge throughput (dry tons/day) by the centrifuges. The project is still in progress.

WATER QUALITY DATA

Each year, the Group prepares an annual report describing the water quality of the streams and channels within the District's jurisdiction for the preceding year. Surface water quality data for 2003 were evaluated regarding compliance with water quality standards set by the Illinois Pollution Control Board (IPCB). In 2003, 64 water quality parameters were assayed. Twenty-eight water quality parameters had IPCB General Use Standards. Seventeen parameters (temperature; ammonium nitrogen; un-ionized ammonia; phenols; weak acid dissociable [WAD] cyanide; gross beta activity; total arsenic; total barium; total boron; total cadmium; total chromium [trivalent and hexavalent]; soluble iron; total lead; total nickel; total mercury; total zinc; and total selenium) were in total compliance in General Use Waters of all river systems.

Twenty-three water quality parameters were covered by the IPCB Water Quality Standards for samples taken in the Secondary Contact Waters. Twenty parameters (temperature; pH; total dissolved solids; phenols; fats, oils, and greases; total cyanide; fluoride; total silver; total arsenic; total barium; total cadmium; total copper; total chromium; soluble iron; total lead; total nickel; total manganese; total mercury; total zinc; and total selenium) were in complete compliance in all river systems.

Wastewater Treatment Process Research Section

The Wastewater Treatment Process Research (WTPR) Section is responsible for conducting basic, applied, and problem solving research on various wastewater and sludge treatment processes currently utilized by the District. Technical assistance is provided to the M&O Department for solving water reclamation plant (WRP) operating problems. This Section also investigates innovative treatment processes for future use. The investigation of current operations may originate as the result of a WRP problem, or interest in arriving at new knowledge concerning certain aspects of a wastewater treatment process.

Studies of future operations are concerned with maximizing the efficiency of an existing process at the lowest cost or the development of new processes. Investigations may take the form of surveys, literature reviews, laboratory bench testing, pilot plant studies, full-scale testing, special analyses, or a combination or progression of any or all of the above. Plans and specifications are also reviewed at the request of the Engineering Department for the purpose of optimizing process design criteria.

The major areas of study in 2003 included the following.

POLYMER TESTING

Full-scale polymer tests for the selection and purchase of polymers used at various District facilities were carried out in 2003. These tests included winter and summer polymer tests for the Stickney WRP Postdigestion Centrifuges, polymer tests at the Calumet WRP Centrifuges and the Sludge Gravity Concentration Tanks. The test procedures are described in R&D Department Report No. 01-13.

Polymer testing was also carried out in 2003 at the Hanover Park WRP for the selection and purchase of polymers used in the gravity belt thickening of primary and waste activated sludge.

POLYMER ENHANCED LAGOON DEWATERING

The M&O Department requested that a pilot study be undertaken to evaluate the use of polymers to enhance the lagoon dewatering of anaerobically digested sludge. The experimental studies were carried out during 2002 and a report was prepared in the beginning of 2003. Based upon these studies it was concluded that the addition of a cationic emulsion polymer would appreciably improve the dewatering of digested sludge and thereby increase emergency lagoon storage capacity. Although polymer addition gave faster water separation, it caused the solids to float over the separated water in the pilot-scale studies. Assistance was given to the M&O Department in developing criteria for a contract to provide the necessary equipment to conduct full-scale tests.

SOURCES OF POLYCHLORINATED BIPHENYLS (PCBs) TO THE ATMOSPHERE

The R&D Department is cooperating with Dr. Thomas M. Holsen of Clarkson University in a study to evaluate potential emissions of PCBs from sludge drying areas. Four air samplers were set up around the perimeter of selected drying cells at the Calumet WRP. Air samples were collected using a HiVol sampler with a fiberglass filter followed by

polyurethane foam filter (PUF) every 12 days over the summer period of 2002. The samples were sent to Clarkson University for analysis. Clarkson University is doing the analysis for PCBs and the R&D Department's Toxic Substances Laboratory will also analyze a portion of the samples. During 2003 the analytical methods were verified and a round robin was conducted between the laboratories. It is anticipated that the analyses will be completed during 2004.

ODOR CONTROL TECHNOLOGY

During 2003, an inventory of the odor control technologies in use at the various District WRPs was developed in conjunction with M&O Department staff at the various WRPs. The main odor control processes involve the use of ozone, activated carbon, and hydrogen peroxide. An evaluation of the effectiveness of these systems will be undertaken in 2004.

EMISSION OF HAZARDOUS AIR POLLUTANTS (HAPs) FROM DISTRICT WRPs

As part of the NPDES permits and regulations under the Clean Air Act, an estimate of the emission of HAPs from the wastewater treatment processes was made. Raw sewage samples were collected twice during the year at each of the District's seven WRPs and analyzed by the Toxic Substances Section for 87 compounds which are HAPs of concern for POTWs. Using the BASTE fate model and the raw sewage concentrations, the emissions of HAPs from the wastewater treatment processes were determined. HAP emissions at all of the WRPs were below the 25 tons/year total HAP criterion and 10 tons/year for individual HAPs and, thus, not considered a major source.

In addition, as part of the Stickney WRP Title V permit, the HAPs emission for the Stickney WRP during the summer period was calculated as part of the Emissions Reduction Marketing Systems reporting requirement.

ASSOCIATION OF METROPOLITAN SEWERAGE AGENCIES (AMSA) AIR QUALITY COMMITTEE

The WTPR Section staff also served on AMSA's Air Quality Committee. This committee addresses various issues regarding the Clean Air Act regulations which are pertinent to POTWs. During 2003, areas of work included the initiation of an evaluation of USEPA's WATER9 model for estimating emissions from POTW treatment processes which now includes a section for estimating volatile organic compounds (VOCs) and HAP emissions from wastewater collection systems. After discussions with USEPA, AMSA has initiated studies to review and evaluate the modeling methodology used in WATER9 and compare it to other POTW collection system models. Future work will also include development of field data from interceptor sewers for use in the models.

CHLORINE DISSIPATION STUDY

At the request of the M&O Department, a laboratory study was carried out to determine whether the use of sodium bisulfite for dechlorination at the John E. Egan WRP could be eliminated by using the existing outfall conduit to naturally dissipate the residual chlorine in the final effluent. The study indicated that it may be possible to reduce the dosage of sodium bisulfite but not eliminate it totally.

O'HARE CUP RESERVOIR FILL EVENT EXPERIMENTS

Two full-scale experiments were conducted in 2002-2003 to study the potential for odor formation during storage of combined sewer overflows (CSOs) without mechanical aeration. The objective of this experiment was to use the information collected in this full-scale experiment at the existing O'Hare CUP Reservoir in the evaluation of aeration systems of the future McCook and Thornton Reservoirs.

The first experiment was conducted during a fill event, which took place during August 13, 2002, through September 3, 2002. CSOs were stored without aeration for three weeks without noticeable odor formation. The final R&D Department Report No. 03-7 on this fill event was published in March 2003.

The second experiment was conducted during a fill event, which occurred during May 1, 2003, through May 21, 2003. CSOs were stored without aeration for three weeks without noticeable odor formation. The final R&D Department Report No. 03-16 on this fill event was published in September 2003.

The results of these experiments are being provided to the ACOE to aid in their design process.

THORNTON TRANSITIONAL FLOOD CONTROL PRE-OPERATIONAL BACKGROUND GROUNDWATER QUALITY REPORT

The purpose of this report was to meet the reporting requirements of the IEPA relative to pre-operational background groundwater quality in the four groundwater monitoring wells associated with the Thornton Transitional Control Reservoir (Reservoir). The specific informational requirements are described in the June 26, 2001 scope of work for Groundwater Quality Monitoring for the Reservoir in a letter from the IEPA dated August 6, 2001. The pre-operational background study was conducted on the four water quality monitoring wells QT-1 through QT-4 surrounding the reservoir during October 2002 through May 2003. The final R&D Department Report No. 03-23 was published on this project in December 2003 and submitted to the IEPA.

GROUNDWATER MONITORING OF THE TUNNEL AND RESERVOIR PLAN (TARP) SYSTEMS

Groundwater monitoring reports for the year 2002 were prepared for the five TARP systems which included the Mainstream Tunnel System, the Calumet Tunnel System, the Des Plaines Tunnel System, the Upper Des Plaines Tunnel System and the O'Hare CUP Reservoir. These reports were submitted to the IEPA as well as to the USEPA.

TECHNICAL ASSISTANCE TO THE UNITED STATES ARMY CORPS OF ENGINEERS

Under contract with the U.S. Army Corps of Engineers (ACOE), the R&D Department is providing technical assistance to support the design of the aeration and washdown systems of the McCook Reservoir. Regular monthly meetings between ACOE and District personnel are being held to review progress on the design. Alternative design criteria and technologies are being investigated to lessen the District's eventual operating and maintenance costs for this facility as well as the Thornton Reservoir.

ENHANCED PRIMARY SETTLING STUDY

This was a continuation of the study conducted in March-April 2002, in response to a request by the M&O Department to the R&D Department.

This experiment was conducted during May through June 2003 using the same format as the 2002 study. The objective was to determine the effectiveness of polymer and ferric chloride in enhancing settling in the primary settling tanks, and to determine an optimum dosage of polymer and ferric chloride in order to optimize the removal of suspended solids, BOD_5, Total-P, ammonia and TKN during enhanced primary settling.

The 2003 study yielded similar results to that of the 2002 study.

CHARACTERISTICS OF STORMWATER RUNOFF

Stormwater runoff at two storm sewers in Evanston and Crestwood, Illinois, and three Illinois Department of Transportation (IDOT) pumping stations were sampled during several storm events between August 2002 and July 2003 by the Industrial Waste Division (IWD). The purpose of this project was to collect sampling and storm data, perform data analysis, and prepare reports describing the characteristics of stormwater runoff sampled at these locations. One report, containing the results of stormwater runoff sampled at two storm sewers in Evanston and Crestwood, Illinois, was completed in 2003, and published as R&D Department Report No. 03-25. Data collection and analysis on stormwater runoff from IDOT pumping stations were also started in 2003, and report preparation will be completed in 2004.

ADDITIONAL DIGESTION TESTS FOR CALUMET WRP

This project was to monitor whether the requirements for vector attraction reduction could be met through anaerobic digestion at the Calumet WRP, using Option 2 of Section 503.33(b) of the 40 CFR Part 503 Regulations, as volatile solids reduction of 38 percent is not consistently achieved there through its two-step anaerobic digestion process. Option 2 states that vector attraction reduction is demonstrated if after anaerobic digestion of the biosolids, the volatile solids in the biosolids are reduced by less than 17 percent in an additional 40 days bench-scale anaerobic digestion at a temperature between 30° and 37°C. Additional digestion tests for the digester draw from the Calumet WRP started in March 2003, and were conducted in the R&D Department Wastewater Research Laboratory once or twice a month. The test procedure proposed by the USEPA was followed in each test. In all, twelve tests were conducted in 2003. The volatile solids reduction in all tests was less than 17 percent, which indicated that the requirement for vector attraction reduction for the biosolids produced at the Calumet WRP can consistently be met using Option 2 of the 503 Regulation. The test results will be included in the annual Part 503 report to the USEPA.

LOCAL LIMIT REEVALUATION

The EM&R Division, working with the IWD, is evaluating the current Pretreatment Program local limits based upon new USEPA methodologies. Local limits are intended to prevent site-specific plant passthrough and interference from various industrial pollutants. This new method requires a detailed analysis of the fate and transport of each regulated pollutant through the treatment

process in order to determine the limiting criteria controlling its allowable concentration. A mass balance approach is used to convert criteria into allowable headwork loadings. This approach traces the routes of each pollutant through the treatment process, taking into account pollutant removals in upstream processes. The final report was completed and published in April 2003 as R&D Department Report No. 03-11.

CONTINUOUS HYDROGEN SULFIDE ODOR MONITORING STATIONS

Two continuous odor monitoring stations have been located at the Calumet WRP. The stations will monitor and record hydrogen sulfide concentrations that may be emitted to the surrounding areas. One station is located south of the plant area on 130th Street. Another station is located north of the plant area inside the fence line. Each station is furnished with two types of hydrogen sulfide analyzers in a temperature-controlled shelter. The performance of both types of analyzers will be studied and compared to measure hydrogen sulfide in the very low part per billion range.

The continuous hydrogen sulfide analyzers were fully operational in 2003. The hydrogen sulfide concentration data from each analyzer was recorded and compared to determine reliability of each in detecting hydrogen sulfide in the low part per billion range. The lead acetate technology proved to have more desirable operational properties.

ODOR STUDIES FOR THE UPPER DES PLAINES 14 INTERCEPTOR SEWER

An evaluation of the Upper Des Plaines collection sewer 14 (UDP14) was conducted to determine the source of odor problems in the vicinity of Drop Shaft 5 (DS5) near the James C. Kirie WRP. The parameters evaluated were pH, temperature, ORP, BOD, FOG, suspended solids, conductivity, sulfides, and sulfates. The results showed a high component of food industry type waste. The food industry waste has increased BOD_5, FOG and sulfides.

The M&O Department installed a chemical dosing station upstream of DS5. Ferric chloride and Bioxide® were dosed into UDP14 to reduce the concentration of sulfides in the sewer system. The sewer and manhole airspace were monitored to determine the effectiveness of the dosing.

Biosolids Utilization and Soil Science Section

The Biosolids Utilization and Soil Science Section is responsible for determining, through monitoring and research activities, the environmental impact of the District's biosolids applications on agricultural fields, disturbed and urban lands, and landfill sites. The Section is also responsible for providing technical support for biosolids marketing, and oversight of technical aspects of biosolids land application contracts.

The environmental monitoring component of the program includes the sampling and analyses of waters, soils, plants, and biosolids at land application sites, landfills, and solids drying facilities receiving biosolids. The results of this monitoring program are reported to the IEPA and the USEPA. In 2003, the Section submitted 56 permit required reports to the IEPA, one report to the USEPA, 12 reports to the M&O Department for reporting to the IEPA, and 12 reports to the IEPA and the USX Corporation on

monitoring at the USX biosolids demonstration project.

The research component consists of studies to support the local marketing of biosolids, such as: establishing demonstration plots for reclamation of slag deposits, designing a test site for demonstrating the use of biosolids in the final cover of landfill side slopes, establishing cooperative research with consulting soil scientists to study availability of biosolids phosphorus to plants and its environmental impacts, studying the beneficial effects of biosolids use on golf course turf, and studying soluble salts in biosolids and their effect on plant growth. The research component also consists of studies to demonstrate the protection afforded to human health and the environment by the USEPA's Part 503 biosolids regulations, such as: studying the toxicity of trace elements to plants, and studying changes over time in the bioavailability of trace elements to plants in biosolids-amended soils.

The Section also conducts applied research to support land reclamation activities at the District's 15,003 acre site in Fulton County, including maintaining experimental corn plots which have received cumulative applications of 893 tons of biosolids per acre (maximum amended plots) from 1973 through 2003. These plots are utilized to study changes in the fertility of mine soil, the uptake of trace elements into corn, and the fate of nutrients from continuous annual applications of biosolids.

The Section also provides technical support for biosolids marketing by maintaining continuous demonstrations of turfgrasses, prairie grasses, forage grasses, and wild flowers in a greenhouse at the Lue-Hing R&D Complex.

Analytical Microbiology and Biomonitoring Section

In 2003, the Analytical Microbiology and Biomonitoring Section was composed of 4 professional and 12 technical personnel. The Section was comprised of the following subgroups which performed specific monitoring or research activities: Virology, Parasitology, Analytical Microbiology, and Biomonitoring. The activities of the Microbiology Section in 2003 are summarized below.

VIROLOGY SUB-GROUP

Air-dried biosolids (final product) were analyzed for enteric viruses for compliance with the Part 503 *Standards for the Use or Disposal of Sewage Sludge* (Standards). No enteric viruses were found in any of the final product samples. A research study was begun to measure the concentrations of male-specific RNA (FRNA) coliphages in raw wastewater, digester feed, digester draw, and in final product. Preliminary results indicated that FRNA coliphages are a possible alternate indicator for assessing the efficiency of wastewater sludge treatment.

PARASITOLOGY SUB-GROUP

Air-dried biosolids (final product) were analyzed for viable *Ascaris* ova for compliance with the Part 503 Standards. All biosolids produced from the District's codified process were determined to be Class A biosolids with respect to pathogens (less than 1 viable *Ascaris* ovum per four grams) as defined by the Part 503 Standards. Research to investigate the use of microscopic image analysis to routinely analyze biosolids for viable *Ascaris* ova was continued in 2003.

ANALYTICAL MICROBIOLOGY SUB-GROUP

Fecal coliform and other microbiological analyses were conducted in support of the following monitoring studies: Illinois Waterway; Chicago Area Waterways; Lake Michigan beaches; offshore waters of Lake Michigan; biosolids monitoring for Part 503 compliance; solids drying areas monitoring wells; and TARP groundwater monitoring wells. Potable water at District facilities was monitored for total coliforms, FC, and total heterotrophic bacteria. A research study begun in 2000 to find the *Escherichia coli* (EC) to fecal coliform (FC) ratio in the District's WRP effluents and ambient waters was completed.

BIOMONITORING SUB-GROUP

Acute whole effluent toxicity (WET) tests with fish *(Pimephales promelas)* and daphnids *(Ceriodaphnia dubia)* were conducted on an effluent sample from the James C. Kirie WRP. Chronic toxicity tests with these same organisms were conducted on effluent samples from the Hanover Park, Stickney, Calumet, and North Side WRPs. Biomonitoring reports for the Hanover Park and Kirie WRPs were submitted to the IEPA in compliance with the respective NPDES permits. Results of chronic tests conducted on the Stickney, Calumet, and North Side WRPs, which were conducted as part of a cooperative study with the USEPA and IEPA, were submitted to the USEPA and IEPA.

Aquatic Ecology and Water Quality Section

The Aquatic Ecology and Water Quality Section is responsible for monitoring and assessing the water and sediment quality in Chicago area waterways. An additional responsibility is to review and participate in regional work groups that formulate emerging federal and state water quality rules and regulations that directly relate to District NPDES permits and to water quality in Chicago area waterways. These regulations include 305(b) assessment reporting, 303(d) listing of impaired waters, lower Des Plaines River UAA, Chicago River UAA, total maximum daily loads for Salt Creek and the West Branch of the DuPage River, and development of nutrient standards.

Field monitoring activities conducted during 2003 by the Aquatic Ecology and Water Quality Section include the following.

BENTHIC INVERTEBRATE MONITORING

During the period of June through September 2003, benthic invertebrates were assessed at 25 monitoring stations in the Calumet, Chicago, and the Des Plaines River Systems. Twelve stations were located on the deep-draft waterways and thirteen stations were on wadeable streams. Benthic invertebrates were collected using a 6 X 6 Ponar Grab sampler and a 3 X 3 Hester-Dendy artificial substrate. In the laboratory, the sediment samples were washed, screened, and the benthic organisms counted and identified. The benthic invertebrate data will be provided to the IEPA for their use in preparing the Illinois 305(b) assessment report.

FISH MONITORING

Fish were collected during June through September 2003, at 25 stations in the Calumet, Chicago, and Des Plaines River Systems. Twelve stations were located on the deep-draft waterways and thirteen stations

were on wadeable streams. On the deep-draft waterways, fish were collected using an electrofishing boat. A backpack electrofisher or a small electrofishing boat and bag seine were used to assess the fish population on wadeable steams. Fish were identified, weighed, measured for length, and examined for parasites and disease. The fish data will be provided to the IEPA for their use in preparing the Illinois 305(b) assessment report.

Monitoring for Asian carp was also performed during April and October 2003, at three sample sites in the Brandon Road Pool and one in the Lockport Pool. Trammel and fyke nets were used, but no Asian Carp were found within this study reach.

HABITAT AND SEDIMENT QUALITY MONITORING

During June through September 2003, a physical habitat assessment was conducted at 25 monitoring stations in the Chicago, Calumet, and Des Plaines River Systems. In order to assess sediment chemistry and sediment toxicity, sediment samples were collected at 13 monitoring stations in the Calumet System. The results of the habitat assessments, chemical analyses of sediments, and sediment toxicity testing will be provided to the IEPA for their use in preparing the Illinois 305(b) assessment report.

CHLOROPHYLL MONITORING

During 2003, chlorophyll in phytoplankton was monitored monthly at 59 stations in the Calumet, Chicago, and Des Plaines River Systems. Surface water samples were collected using a stainless steel bucket. In the laboratory, samples were analyzed for chlorophyll *a*, *b*, and *c*, and pheophyton *a*. The concentration of chlorophyll *a* will be used to estimate the phytoplankton biomass and productivity, and to determine the trophic status of surface waters.

CONTINUOUS DISSOLVED OXYGEN (DO) MONITORING

Continuous DO monitoring continued during 2003 at 34 stations in the Calumet and Chicago River Systems. Monitoring stations extended from the Wilmette Pumping Station on the North Shore Channel, the Chicago River Lock on the Chicago River, and the O'Brien Lock on the Calumet River, to Jefferson Street on the Des Plaines River below the Lockport Lock. Water quality monitors were retrieved and deployed weekly at the 34 stations. Annual summary reports will be prepared for DO data monitored in the Calumet and Chicago River Systems.

ILLINOIS WATERWAY MONITORING

During May, August, and October 2003, water samples were collected from 49 stations in six navigational pools along 133 miles of the Illinois Waterway System from the Lockport Lock to the Peoria Lock. The primary objective of the monitoring is to determine water quality and sediment trends along the waterway system from Chicago to Peoria. In order to characterize the chemical quality of the sediments, sediment samples were collected during October at 14 selected monitoring stations.

BUBBLY CREEK DEMONSTRATION PROJECT

The water quality in Bubbly Creek was monitored to assess the impact of opening a gate at the Racine Avenue Pumping Station to allow water from the creek to discharge into the intercepting sewer system, thereby

establishing a flow in the creek when otherwise it would be stagnant. The hypothesis for this demonstration project was that Bubbly Creek needs a continuous flow to allow the natural processes of self-purification to occur. During 2003, four pump-back flow conditions were monitored, 38 mgd and 75 mgd during dry weather and 38 mgd and 75 mgd during wet weather. Hourly dissolved oxygen was measured at Loomis Street on the South Branch of the Chicago River and at I-55 and 36th Street on Bubbly Creek. Chlorophyll was used as a measure of photosynthetic activity in Bubbly Creek.

Radiochemistry Section

The Radiochemistry Section is responsible for the radiological monitoring of waters, wastewaters, and biosolids, and the maintenance of radiation safety at the District. It also performs any special tasks involving the use of ionizing radiation and radioisotopes. The Section performed 5,044 tests in 2003.

RADIOLOGICAL MONITORING OF WATERWAYS

The radiological monitoring of the area's waterways under the jurisdiction of the District includes the Calumet, Chicago, and Des Plaines River Systems. The concentration of radioactivity in water samples analyzed from all three river systems were within the USEPA Drinking Water Standards for gross alpha and gross beta radioactivity.

RADIOLOGICAL MONITORING OF WASTEWATERS AND BIOSOLIDS

The radiological monitoring of raw and treated wastewaters from the District's WRPs was initiated in 1967 and continues to date. During the year, the radioactivity in the final effluent of all the WRPs was generally lower than the corresponding raw sewage of the WRP, indicating that the wastewater treatment process is removing radioactivity from the raw sewage. The amount of gross alpha and gross beta radioactivity in the final effluent is also less than the USEPA standards for gross alpha and gross beta radioactivity contaminant levels in the community water system. This shows that the discharge of final effluent from the District's WRPs is not likely to have an adverse effect on the radiological quality of the Chicago River Systems.

The Section also performs radiological monitoring of biosolids from the seven WRPs, Hanover Park WRP lagoons, and from the eight solids drying sites of the District. The monitoring data serves as a measure of present-day radioactivity levels in comparison to levels in the past years for gross alpha, gross beta, and gamma-emitting radionuclides in biosolids.

RADIATION SAFETY PROGRAM ACTIVITIES

The Section maintains the radioactive material license issued to the District by the Illinois Emergency Management Agency, Division of Nuclear Safety (DNS), assuring that activities are conducted according to the license conditions and regulations. These activities include radiological monitoring of personnel and work areas in the Radiochemistry Laboratory, leak testing of nickel-63 detectors in gas chromatographs at the R&D laboratories, leak testing of nuclear gauges used by the Engineering Department, leak testing of an X-ray fluorescent paint analyzer, and leak testing of an APD2000 CW detector owned by the Safety Section of the General Administration Department.

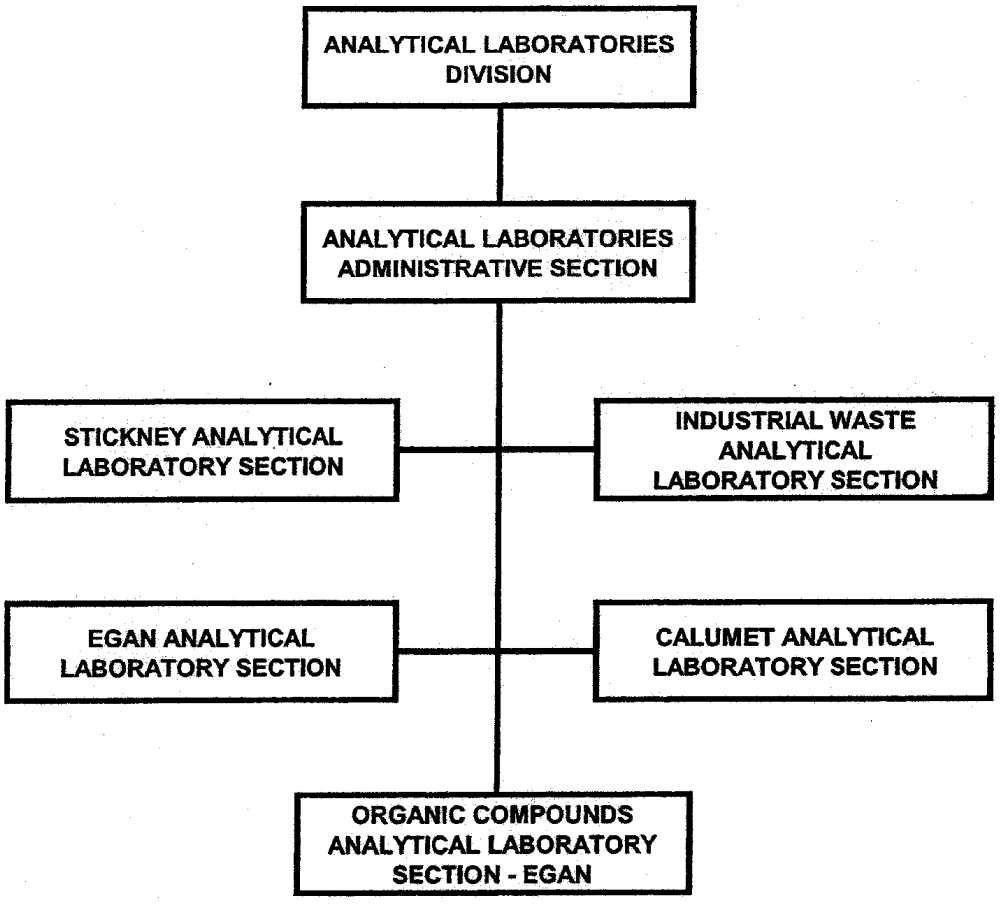
LABORATORY QUALITY ASSESSMENT PROGRAM ACTIVITY

The Section continued to participate in the U.S. Department of Energy, Environmental Measurements Laboratory's Quality Assessment Program. Water samples were analyzed for gross alpha, gross beta, tritium, cobalt-60, and cesium-137 activity; and soil samples were analyzed for potassium-40, cesium-137, bismuth-212, lead-212, bismuth-214, lead-214, and actinium-228 radioactivity.

The Section also participates in the Environmental Resource Associate RadChem proficiency testing program for gross alpha, gross beta, tritium, cesium-134, cesium-137, and cobalt-60 in water as required by the DNS as a part of the Radiochemistry Laboratory certification.

Figure 2

ANALYTICAL LABORATORIES DIVISION ORGANIZATION CHART



ANALYTICAL LABORATORIES DIVISION

The Analytical Laboratories Division (ALD) provides daily analytical services to the District as follows:

- To the M&O Department for monitoring treatment process operations and NPDES permit compliance for the seven WRPs, for monitoring Biosolids processing activities, and the operation of the TARP project.

- To the EM&R Division for various applied and operations research to achieve improvements and cost reductions in District treatment process operations, and to assist in monitoring Chicagoland waterways.

- To assist the IWD as it routinely regulates categorical industrial discharges to the sewer system and waterways to determine compliance with the Sewage and Waste Control Ordinance and the USEPA-approved Pretreatment Program.

A centralized laboratory and two regional laboratories (a total of one organic and four inorganic analytical laboratory sections) are maintained in order to consistently provide the needed analytical services in a timely manner.

The large number of analyses performed by the ALD, as shown in Table 3 on page 28, could not be accomplished without automation and instrumentation. To improve automated data acquisition, storage and reporting from these instruments, the Laboratory Information Management System (LIMS) upgrade to Windows continued in 2003. This migration to the Batches and Windows environment will increase processing and reporting speed, take advantage of new functionality, and ensure continued technical and software support for a less customized system. Through its LIMS team, the ALD provided ongoing support during 2003 to the EM&R Division, the IWD, and M&O Department personnel.

During 2003, data for the Ambient Water Quality Monitoring Network Program were transferred each quarter to the national STORET to facilitate access by the IEPA and others.

The five analytical laboratories renewed laboratory accreditation by the IEPA during 2003 in accordance with National Environmental Laboratory Accreditation Conference standards.

Stickney Analytical Laboratory (SAL)

This laboratory is located at the Lue-Hing R&D Complex and performed 621,515 analyses for solids, nutrients, and metals on 51,338 samples in providing analytical services for the following:

M&O DEPARTMENT

1. Process Control, Operations Monitoring, and NPDES Compliance Monitoring for the Stickney WRP.

2. Solids Management Areas at Harlem Avenue, Lawndale Lagoons, Ridgeland Avenue, Stony Island, and Calumet.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 3

TOTAL NUMBER OF ANALYSES PERFORMED IN 2003

Program		Nutrients	Oxygen Demands	Metals	Solids	Organic Compounds	Others	Total Program
4652	Liquid Monitoring	109,536	89,832	217,276	65,692	0	59,043	541,379
	TARP	3,869	1,233	1,821	1,005	0	3,546	11,474
	Treatment Facilities	105,667	88,599	215,456	64,687	42,513	55,497	572,418
4653	Solids Monitoring	18,881	1,433	76,902	111,335	7,057	37,719	253,326
4666	Sewage & Waste Control	1,271	232	256,077	1,417	31,086	17,370	307,453
4663	User Charge	0	52,684	0	16,625	0	28,912	98,221
4671	Lake Michigan	762	328	0	344	3,960	429	5,822
4672	Waterways	10,811	4,875	84,900	3,209	43,837	19,386	167,019
4673	Inspection Events	0	0	0	0	0	0	0
4674	IPCB Water Quality	0	0	0	0	0	0	0
4681	Assistance to M&O	3,250	141	4,729	1,234	5,494	9,528	24,376
4682	Assistance to Others	1,117	2,936	156	1,395	0	2,702	8,306
4690	Operations & Research	19,452	3,435	65,395	2,022	13,164	4,377	107,844
Totals		165,080	155,896	705,435	203,273	147,109	179,465	1,556,258

3. Calumet, Stickney, and Egan WRPs Biosolids Centrifuge Cake Application to Agricultural Lands.

4. USEPA and IEPA Split Sampling Program.

5. TARP Groundwater Monitoring Program.

6. Stickney Master Plan Study.

EM&R DIVISION

1. Environmental and Permit Compliance Monitoring for the Prairie Plan Project in Fulton County involving biosolids quality, test well water quality, surface water quality, and plant tissues.

2. USX South Works Reclamation Demonstration and Slag Leachate Study.

3. Solids Management Areas at LASMA, Marathon, Vulcan, Egan, HASMA, and RASMA.

4. NANI analysis for Biosolids samples from LASMA, Marathon, Vulcan, HASMA, RASMA, SWRP Lagoons, and Stony Island Avenue.

5. Analytical Support for Biosolids Marketing.

6. TARP Monitoring Wells (for Thornton and Calumet).

7. Additional Digestion Test for 503 Reporting.

8. Polymer Evaluation of Centrifuge Dewatering.

9. McCook Reservoir Study.

10. Ambient Water Quality Monitoring Program.

11. Illinois Waterways Monitoring Program.

12. Enhanced Primary Settling Study.

13. Biosolids Salinity Study.

IWD

Metals analyses are conducted on regulated categorical industrial discharges to determine compliance with the Sewage and Waste Control Ordinance. The following 13 metals are regulated: arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc.

OTHER SERVICES

In addition to typical water, wastewater, and biosolids analyses, this laboratory also performs analyses on materials purchased by the District (such as lubricants, sodium hypochlorite, and ferric chloride) for verification of contract requirements.

Analytical services for certain essential processes at the Stickney WRP are provided seven days a week. The following critical areas are supported: (1) monitoring of mixed liquor and return sludge concentrations, (2)

the raw sludge thickening process, and (3) the biosolids dewatering operation.

Industrial Waste Analytical Laboratory (IWAL)

This laboratory is located at the Lue-Hing R&D Complex and performed 200,011 analyses on 24,336 samples. The laboratory performs analyses for fats, oils and greases (collectively, FOG); several methods for cyanide and phenols; total organic carbon (TOC); biochemical oxygen demand; chemical oxygen demand (implemented in May); total and suspended solids; pH; and dissolved oxygen in support of the following:

M&O DEPARTMENT

Process Control, Operations Monitoring, and NPDES Permit Compliance Monitoring for the District's seven WRPs.

EM&R DIVISION

Various environmental monitoring and research programs, such as: (1) Ambient Water Quality Monitoring Network Program, (2) Illinois Waterways Monitoring Program, (3) Stickney and Calumet Master Plan Studies, and (4) the Wetlands Initiative. The latter involved analysis of samples collected from 40 sampling points within the seven District WRPs for TOC analysis over a two-week period.

IWD

Analytical assistance for administration of the Sewage and Waste Control Ordinance and the User Charge Ordinance. This includes: (1) maintaining evidentiary laboratory chain of custody for all samples obtained from various industrial dischargers; and (2) providing records as required for various legal proceedings, hearings and/or Freedom of Information Act requests.

In 2003, the laboratory upgraded several major pieces of equipment and purchased other equipment to facilitate the analytical work of the laboratory:

1. A 25-year old automated cyanide system was replaced with a newer system that also performs the phenol analysis.

2. A second mididistallation system was purchased and put into operation to increase the laboratory's capacity for phenol determinations.

3. A robotic BOD system that was purchased and received in mid-December will be used to determine the final dissolved oxygen content of samples analyzed for BOD. This robotic system is the first step towards semi-automation of the BOD procedure.

4. Equipment was purchased to upgrade the existing 20-year old weak acid dissociable cyanide analyzer.

The IWAL continued a study initiated in 2002 to evaluate the effect of sample storage time on the BOD of various types of high strength industrial discharges. Also, the laboratory began an assessment of the use of a synthetic BOD seed material.

Organic Compounds Analytical Laboratory (OCAL)

The OCAL is located at the John E. Egan WRP and is responsible for the analysis of samples for organic priority pollutants (including more than one hundred organic compounds listed by the USEPA) and many non-listed organic compounds, such as endocrine disruptors and polychlorinated biphenyl (PCB) congeners.

During 2003, the OCAL performed 147,109 analyses on 603 samples in providing analytical support services to the following:

M&O DEPARTMENT

1. Analyzed for organic compounds in raw sewage, sludge, and final effluent from the seven District WRPs semiannually for monitoring NPDES compliance.

2. Analyzed for organic compounds in WRP samples as requested to assist in problem solving associated with plant operations.

EM&R DIVISION

1. Conducted analysis for emission of volatile organic compounds in District raw sewage samples from the seven District WRPs semiannually.

2. Conducted analysis for alkylphenol compounds in raw sewage and sludge samples from the seven District WRPs semiannually.

3. Analyzed Chicagoland and Illinois waterway samples, including aqueous and sediment samples.

4. Analyzed Lake Michigan Diversion samples following storm-related events.

5. Analyzed well samples from the USX sites.

6. Analyzed O'Hare CUP Reservoir water samples that were discharges of diverted river waters.

7. Conducted analysis for volatile organics, base neutral and acid organic compounds, pesticides/PCBs and herbicides in Thornton Reservoir samples.

8. Analyzed culture or millipore water samples.

9. Various land reclamation projects.

IWD

1. Analyzed for organic priority pollutants in discharges from industrial users as part of the District's Pretreatment Program to ensure compliance with Discharge Authorizations and USEPA categorical standards. Types of wastes included: electroplating, organic chemicals and plastics, cold forming, metal finishing, metal molding and casting, and aluminum forming.

John E. Egan Analytical Laboratory (EAL)

This laboratory is located at the Egan WRP and performed 266,176 analyses on 27,104 samples in providing analytical services for the following:

M&O DEPARTMENT

1. Process Control Analyses and NPDES Compliance Monitoring for Egan, Kirie, Hanover Park and North Side WRPs.

2. Process Stream Evaluations of Suspected Incidents of Toxic Interferences or Pass-Through Events.

3. Soluble Phosphorus Study at the Four North Area WRPs.

4. Polymer Testing for Raw Sludge Dewatering at the Egan and Hanover Park WRPs.

5. Materials and Boiler Water Testing Programs.

6. USEPA and IEPA Split Sampling Program.

EM&R DIVISION

1. Soluble Copper Study of Kirie and Hanover Park WRPs.

2. Egan WRP Centrifuge Cake Testing for Application of Sludge to Land, Part 503 Reporting Requirements.

3. Hanover Park WRP Lagoon Sludge Testing for Application of Sludge to Land, Part 503 Reporting Requirements.

IWD

1. Determination of pH of Grab Samples Collected by IWD Personnel in the North Area.

2. Preservation of Cyanide Grab Samples before Holding Time is Exceeded.

Calumet Analytical Laboratory

This laboratory is located at the Calumet WRP and performed 321,447 analyses on 31,769 samples in 2003 by providing analytical services for the following:

M&O DEPARTMENT

1. Process Control and Operations Monitoring and NPDES Compliance Monitoring for the Calumet and Lemont WRPs.

2. Analytical Support for the Calumet Master Plan.

3. Monitoring of diurnal fluctuations to the Calumet raw influent on a monthly basis.

4. Ongoing Assistance to Investigate Increased Zinc Loadings to the Calumet WRP.

5. USEPA and IEPA Split Sampling Program.

6. Monitoring of Hydrogen Sulfide Concentrations at the Kirie WRP.

EM&R DIVISION

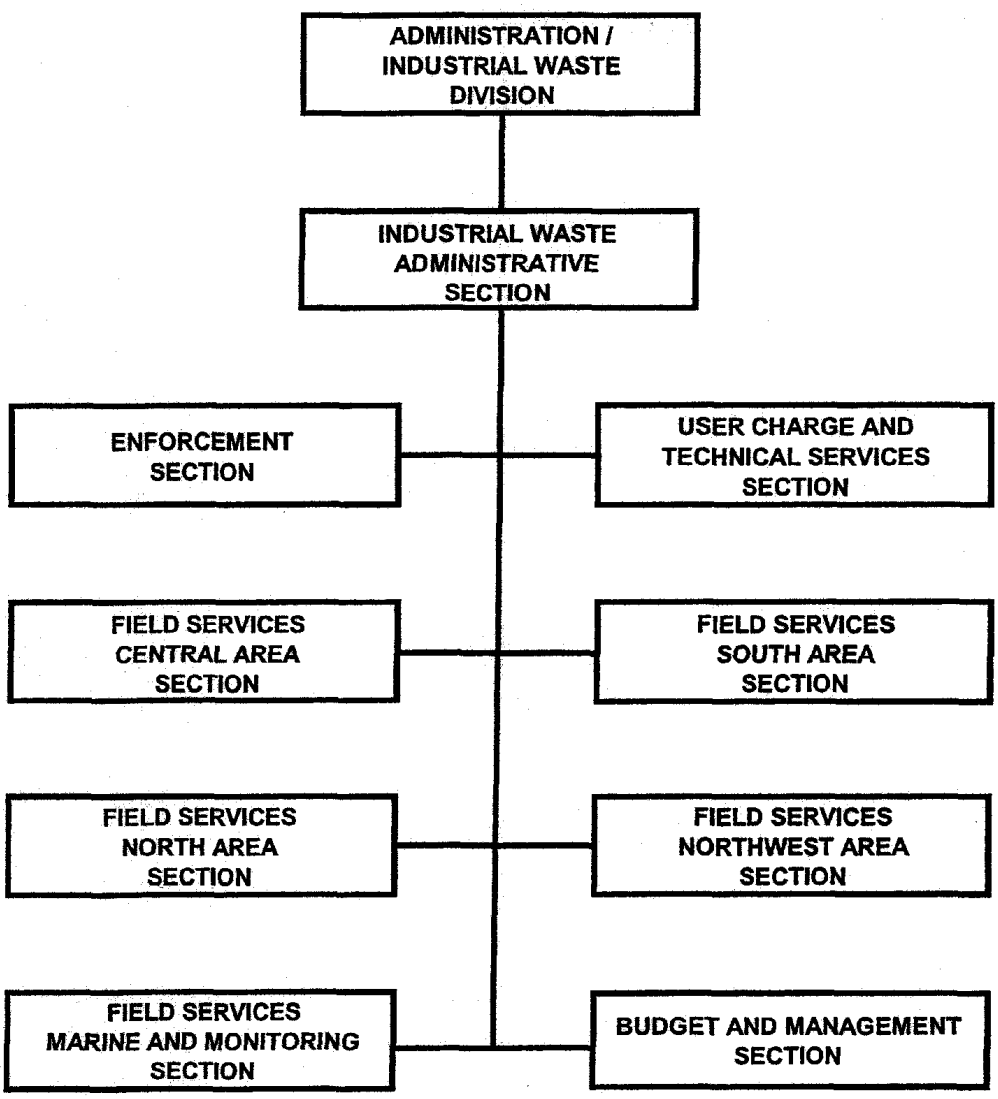
1. Analytical Support for Calumet Biosolids Processing Operations and the Fulton County Prairie Plan Project.

2. Sulfate Analyses of Waterways, TARP, and Lysimeter Samples.

3. Sulfate and Trace Metals Analyses for the USX Project.

Figure 3

ADMINISTRATION / INDUSTRIAL WASTE DIVISION ORGANIZATION CHART



INDUSTRIAL WASTE DIVISION

The Industrial Waste Division consists of four sections: Administrative, Enforcement, User Charge and Technical Services, and Field Surveillance and Studies. The Division's primary responsibilities are the enforcement of the District's Sewage and Waste Control Ordinance (SWCO) and User Charge Ordinance (UCO). It is responsible for the compilation and presentation of data pertaining to industrial user discharges to the District's sewerage system. Finally, the Division executes the District's responsibility as a primary response agency for hazardous materials emergencies in Cook County.

Administrative Section

This Section is responsible for the general administration of the Division and for coordination and direction of the work of the Enforcement, User Charge and Technical Services, and Field Surveillance and Studies Sections. It is responsible for budgetary preparations and control, and prepares and maintains Division procedural manuals. The Section reviews and comments on pretreatment and wastewater regulations proposed by federal and state agencies.

The Administrative Section also coordinates the supply of technical data, technical support activities, and recommendations provided by the Division to other divisions of the R&D Department, and to other departments of the District. It presents data in report form for a variety of purposes and prepares illustrative charts and tables pertinent to those reports.

Enforcement Section

The Enforcement Section is responsible for the routine administration and enforcement of the SWCO, which incorporates the federal pretreatment regulations for certain industrial categories and specifies limits for concentrations of contaminants discharged to the District's sanitary sewerage system and to the waterways within the District's boundaries.

Administrative activities performed by the Enforcement Section during 2003 included the issuance or renewal of 211 Discharge Authorizations; the review of 887 Continued Compliance Reports; and the review of 35 Spill Prevention, Containment and Countermeasure Plans. Enforcement activities for the period from 1999 through 2003 are depicted in the following table.

Year	Cease and Desist Orders/Amendments	Board Orders	Legal Actions/ Amendments
1999	595	6	58
2000	462	2	0
2001	456	1	6
2002	429	0	11
2003	406	1	18

The Enforcement Section also prepares the District's list of significant violators of applicable pretreatment regulations, which is required to be published annually in the newspaper with the largest daily circulation within the jurisdiction of the District. The trend for the period from 1999 through 2003 is depicted in the following table.

Year	Effluent Limitations	Reporting Requirements	Other Requirements[1]	Total Number of Industrial Users Published
1999	30	36	0	66
2000	22	59	1	79
2001	11	61	0	68
2002	15	49	0	62
2003	18	64	2	76

[1] Other violations included dilution, failure to provide access for inspection purposes, failure to install adequate sampling facilities, failure to provide adequate spill containment, failure to install and maintain adequate pretreatment facilities.

Beginning in 2002, industrial users meeting the performance criteria described in Appendix G to the SWCO have been granted regulatory flexibilities concerning self-monitoring. Thirty-four industrial users have been granted status as Non-significant Categorical Industrial Users (NCIU). NCIUs are allowed to forego submittal of one of two biannual Continued Compliance Reports, reducing both the industrial user's compliance demonstration costs and the District's oversight costs.

User Charge and Technical Services Section

The User Charge and Technical Services Section administers the District's federally-approved User Charge system as authorized under the UCO.

In 2003, the Section received and reviewed reports filed by 3,676 users (961 commercial-industrial and 2,715 tax-exempt users) containing calculations of their User Charge liabilities under the UCO and documentation corroborating their data. The Section classified 34 new large commercial-industrial and tax-exempt users and 36 small nonresidential-commercial users in 2003.

The Section requests verification sampling of certain facilities by the Field Surveillance and Studies Section, and determines the acceptability of the user's proposed sampling methodology. In 2003, the Section reviewed 606 District inspection and sampling reports from the Field Surveillance Section; 98 user proposals for sampling, monitoring and/or installations; sealed 108 privately owned water meters used for reporting volume deductions or discharge volumes; and conducted 301 field inspections to verify user data and/or compliance with the UCO. As of the end of 2003, the Section had also identified 98 industrial users who were eligible for reduced reporting and self-monitoring requirements under the UCO. Granting reduced reporting requirements reduces the cost to industrial users for determining their fair share of User Charges and reduces the District's oversight costs related to these industrial users.

Effective January 1, 2001, the UCO was comprehensively amended to provide for the direct recovery of costs for administration of the SWCO and UCO from industrial users, through Minimum Pretreatment Requirements charges, Noncompliance Enforcement charges and User Charge Verification charges.

The following table shows the User Charge revenue, as reported by the District's Finance Department, collected over the period from 1999 through 2003.

Year	User Charge Receipts
1999	$53,354,085
2000	$49,297,496
2001	$50,037,292
2002	$47,061,518
2003	$50,474,317

Field Surveillance and Studies Section

The Field Surveillance and Studies Section investigates and surveys industrial facilities within the jurisdiction of the District, and samples their effluent discharges to determine their compliance with the SWCO and as verification of user data as required by the UCO. During 2003, 2,014 SWCO and 945 UCO inspections and sampling programs were performed.

The Section also performs the collection of samples to monitor the quality of Lake Michigan and District waterways, in order to detect and reduce the incidence of pollution. In 2003, 18,548 water quality samples were collected. Further, all groundwater monitoring wells installed for the District's TARP were routinely sampled. In 2003, 1,423 samples were obtained at 123 TARP groundwater monitoring wells. Chemical toilet service companies who, under District permit, discharge cleanings at the Stickney WRP are also monitored and sampled. During 2003, three chemical toilet service companies made 536 disposals at the Stickney WRP. For these disposal events, 120 samples were randomly obtained.

The Section is also responsible for the investigation of spills and discharges of pollutants and hazardous, toxic or volatile materials to sewer systems and waterways within the District's boundaries, and initiates containment and cleanup activities pertaining to such events. Through such actions, Section personnel execute the District's role as primary response agency for hazardous materials emergencies in suburban Cook County, provide support to the Chicago Fire Department for such emergencies, and provide support to the Cook County Department of Environmental Control for toxic gas release incidents.

In 2003, 247 investigations were conducted in response to requests from federal, state and local agencies, municipalities and private citizens; 36 investigations were conducted in response to self-reported industrial activities; and 50 investigations were conducted in response to requests from the District's M&O Department.

APPENDIX I

MEETING AND SEMINARS 2003

1. Aquatic Nuisance Species Dispersal Barrier Meeting, Chicago, Illinois, January 2003.

2. Illinois Emergency Management Agency, Computer Aided Management of Emergency Operations, Emergency Response Software Training, Chicago, Illinois, January 2003.

3. Illinois Water Environment Association, Government Affairs in Water Pollution Control Seminar, Lisle, Illinois, January 2003.

4. Industrial Water, Waste, and Sewage Group Meeting, Chicago, Illinois, January 2003.

5. Midwest Water Analysts Association, Winter Expo 2003, Kenosha, Wisconsin, January 2003.

6. National Fire Academy Incident Safety Officer Training, Chicago, Illinois, January 2003.

7. United States Department of Agriculture, Cooperative State Research Service Regional Research Committee W-170 Annual Meeting, Las Vegas, Nevada, January 2003.

8. United States Environmental Protection Agency, Workshop to Develop a Protocol for Reliable Genetic Methods for the Detection of Viruses for Use in EPA's Water Programs, Cincinnati, Ohio, January 2003.

9. American Academy of Environmental Engineers, Excellence in Environmental Engineering Awards Competition, Baltimore, Maryland, February 2003.

10. Association of Metropolitan Sewerage Agencies, Winter Conference, Santa Fe, New Mexico, February 2003.

11. Pennsylvania State University, Wastewater Biology Courses, Champaign, Illinois, February 2003.

12. River Development Task Force Meeting, Chicago, Illinois, February 2003.

13. Thermo Elemental Seminar, Chicago, Illinois, February 2003.

14. United States Environmental Protection Agency, Nutrient Standards Workgroup Meeting, Springfield, Illinois, February 2003.

15. United States Environmental Protection Agency, Region V, 2003 Midwest Surface Water Monitoring and Standards Meeting, Chicago, Illinois, February 2003.

16. United States Geological Survey, Office of Employee Development, Aquatic Chemistry, Denver, Colorado, February 2003.

17. Water Environment Federation/American Water Works Association/Chesapeake Water Environment Association, Joint Residuals and Biosolids Management Conference and Exhibition, Baltimore, Maryland, February 2003.

18. Asian Carp Rapid Response Planning Team Meeting, Chicago, Illinois, March 2003.

19. Great Lakes Regional Pollution Prevention Roundtable, Chicago, Illinois, March 2003.

20. Illinois Association of Wastewater Agencies, Mini-Conference, Springfield, Illinois, March 2003.

21. Illinois Chapter of American Fisheries Annual Meeting, Whittington, Illinois, March 2003.

22. Illinois Environmental Protection Agency, Water Quality Standards for Radium Meeting, Springfield, Illinois, March 2003.

23. Illinois Water Environment Association, 24th Annual Conference, Rockford, Illinois, March 2003.

24. Industrial Water, Waste, and Sewage Group Dinner Meeting, Chicago, Illinois, March 2003.

25. Northwestern Indiana Regional Planning Commission, Interagency Task Force on *E. coli*, Portage, Indiana, March 2003.

26. Pittsburg Conference, Orlando, Florida, March 2003.

27. United States Geological Survey, Office of Employee Development, Sediment Data-Collection Techniques, Vancouver, Washington, March 2003.

28. Asian Carp Rapid Response Planning Team Meeting, Chicago, Illinois, April 2003.

29. Central States Water Environment Association, 8th Annual Education Seminar, Madison, Wisconsin, April 2003.

30. Evergreen Park Environmental Fair, Evergreen Park, Illinois, April 2003.

31. Midwest Water Analysts Association and the Northern Illinois Water Analysts Association, Joint Meeting, Chicago, Illinois, April 2003.

32. Perkin Elmer, Open House and ICP Demo, Oak Brook, Illinois, April 2003.

33. United States Environmental Protection Agency, 26th Annual Conference on the Analysis of Pollutants in the Environment, Chicago, Illinois, April 2003.

34. Water Environment Research Foundation, Project Subcommittee Meeting, Lewisburg, Pennsylvania, April 2003.

35. Aquatic Invasive Species Summit, Chicago, Illinois, May 2003.

36. Asian Carp Rapid Response Planning Team Meeting, Chicago, Illinois, May 2003.

37. Association of Metropolitan Sewerage Agencies, 2003 National Environmental Policy Forum and 33rd Annual Meeting, Washington, D.C., May 2003.

38. Illinois Emergency Management Agency, Midwest Emergency Management Workshop, Rockford, Illinois, May 2003.

39. Illinois Environmental Protection Agency, Nutrient Criteria Workgroup Meeting, Springfield, Illinois, May 2003.

40. Industrial Water, Waste, and Sewage Group Dinner Meeting, Chicago, Illinois, May 2003.

41. National Advisory Council for Environmental Policy and Technology Meeting, Washington, D.C., May 2003.

42. National Biosolids Appeals Board Meeting, Alexandria, Virginia, May 2003.

43. North American Benthological Society Annual Meeting, Athens, Georgia, May 2003.

44. International Association for Great Lakes Research, Annual Conference, Chicago, Illinois, June 2003.

45. Northwestern Indiana Regional Planning Commission, Interagency Task Force on *E. coli* Portage, Indiana, June 2003.

46. Tekmar Dohrmann Seminar, Schaumburg, Illinois, June 2003.

47. Aquatic Nuisance Species Dispersal Barrier Meeting, Chicago, Illinois, July 2003.

48. Asian Carp Rapid Response Planning Team Meeting, Chicago, Illinois, July 2003.

49. Association of Metropolitan Sewerage Agencies, Summer Conference, Boston, Massachusetts, July 2003.

50. Association of Metropolitan Sewerage Agencies and Environmental Protection Agency, Water9 Model Evaluation Meeting, Research Triangle Park, North Carolina, July 2003.

51. Illinois Water Environment Association, Plant Operations Seminar, Bloomington, Illinois, July 2003.

52. National Environmental Monitoring Conference, 19th Annual, Arlington, Virginia, July 2003.

53. United States Environmental Protection Agency, Water Quality Trading Program Workshop, Chicago, Illinois, July 2003.

54. Water Environment Research Foundation, Biosolids Research Summit, Alexandria, Virginia, July 2003.

55. Citgo Oil Company, Oil Spill Training Drill, Rolling Meadows, Illinois, August 2003.

56. Midwest Water Analysts Association, Steering Committee Meeting, Downers Grove, Illinois, August 2003.

57. United States Geological Survey, Streamgage Cooperators Meeting, Peoria, Illinois, August 2003.

58. Water Environment Research Foundation, Wastewater Security Threat Workshop, Washington, D.C., August 2003.

59. American Society for Microbiology, 43rd Annual Meeting on Infectious Diseases, Chicago, Illinois, September 2003.

60. Asian Carp Rapid Response Planning Team Meeting, Chicago, Illinois, September 2003.

61. BP–Amoco Oil Company, Foam Fighting Seminar, Forest View, Illinois, September 2003.

62. Chicago River Summit, 1st Annual, Chicago, Illinois, September 2003.

63. Illinois Association of Wastewater Agencies, Annual Conference, Utica, Illinois, September 2003.

64. Illinois River Coordinating Council Meeting, Chicago, Illinois, September 2003.

65. Industrial Water, Waste, and Sewage Group Dinner Meeting, Chicago, Illinois, September 2003.

66. International Ion Chromatography Symposium, San Diego, California, September 2003.

67. National Advisory Council for Environmental Policy and Technology, Council Meeting, Washington, D.C., September 2003.

68. Wildlife Habitat Council, Restoring Greenspace 2003 Conference, Merrillville, Indiana, September 2003.

69. Asian Carp Rapid Response Planning Team Meeting, Chicago, Illinois, October 2003.

70. Governor's 2003 Conference on the Management of the Illinois River System, Peoria, Illinois, October 2003.

71. Great Lakes Beach Association, 3rd Annual Meeting, Lake Michigan: State of the Lake '03 Conference, Muskegon, Michigan, October 2003.

72. Midwest Water Analysts Association, 2003 Fall Meeting, Sheboygan, Wisconsin, October 2003.

73. Midwest Water Analysts Association, Steering Committee Meeting, Kenosha, Wisconsin, October 2003.

74. Northern Illinois Pipeline Association, Public Awareness Training, Elmhurst, Illinois, October 2003.

75. Northwestern Indiana Regional Planning Commission, Interagency Task Force on *E. coli*, Portage, Indiana, October 2003.

76. QIAGEN Inc. Gene Expression Seminar, Chicago, Illinois, October 2003.

77. Radiobioassay and Radiochemical Measurement Conference, Jackson Hole, Wyoming, October 2003.

78. Thermo Informatics World 2003, Fort Lauderdale, Florida, October 2003.

79. Water Environmental Federation, 76th Annual Conference, Los Angeles, California, October 2003.

80. American Society of Agronomy Annual Meeting, Denver, Colorado, November 2003.

81. Association of Metropolitan Sewerage Agencies and Environmental Protection Agency, Pretreatment Coordinators' Workshop, Seattle, Washington, November 2003.

82. Illinois Department of Public Health, Annual Environmental Laboratory Seminar, Springfield, Illinois, November 2003.

83. Illinois Scientific Surveys Conference, Chicago, Illinois, November 2003.

84. Illinois Water Environment Association, Hazardous Waste and Industrial Pretreatment Annual Committee Meeting, Lombard, Illinois, November 2003

85. Industrial Water, Waste, and Sewage Group Dinner Meeting, Chicago, Illinois, November 2003.

86. Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, Tenth Meeting, St. Louis, Missouri, November 2003.

87. United States Environmental Protection Agency, Regional Technical Advisory Group Meeting, Chicago, Illinois, November 2003.

88. Water Environment Federation, Total Maximum Daily Load 2003 Specialty Conference, Chicago, Illinois, November 2003.

89. Asian Carp Rapid Response Planning Team Meeting, Chicago, Illinois, December 2003.

90. Association of Metropolitan Sewerage Agencies and United States Environmental Protection Agency, Pretreatment Streamlining Meeting, Washington, D.C., December 2003.

91. Midwest Water Analysts Association, Expo Planning and Steering Committee Meetings, Gurnee, Illinois, December 2003.

92. Water Environment Research Foundation, Workshop on Developing Better Microbial Indicators, San Antonio, Texas, December 2003.

APPENDIX II

PRESENTATIONS 2003

1. "Ambient Hydrogen Sulfide Monitoring." Presented at the Midwest Water Analysts Association, Winter Expo 2003, Kenosha, Wisconsin, by Doris Bernstein, January 2003. PP

2. "Biosolids Source and Processing Effects on Inorganic Forms and Release of Biosolids Phosphorus." Presented at the United States Department of Agriculture, Cooperative State Research Service Regional Research Committee W-170 Annual Meeting, Las Vegas, Nevada, by Albert E. Cox, Thomas C. Granato, and Richard I. Pietz, January 2003. PP

3. "Quality of Runoff Water from Biosolids-Amended Soils: 30 Years of Monitoring at Fulton County." Presented at the Midwest Water Analysts Association, Winter Expo 2003, Kenosha, Wisconsin, by Lakhwinder S. Hundal, Thomas C. Granato, Richard I. Pietz, and Carl R. Carlson, January 2003. PS

4. "The Impact of Zion Nuclear Power Plant Operation on Lake Michigan Water Quality." Presented at the Midwest Water Analysts Association, Winter Expo 2003, Kenosha, Wisconsin, by Abdul Khalique, Richard Pietz, Bernard Sawyer, and Richard Lanyon, January 2003. PP

5. "Update of Biosolids Research Activities at the Metropolitan Water Reclamation District of Greater Chicago." Presented at the United States Department of Agriculture, Cooperative State Research Service Regional Research Committee W-170 Annual Meeting, Las Vegas, Nevada, by Thomas C. Granato, January 2003. PP

6. "Bubbly Creek Water Quality Improvement – A Demonstration Project in 2002." Presented at the River Development Task Force Meeting, Chicago, Illinois, by Richard Lanyon, February 2003. PP

7. "Biosolids Regulations: An Update of Activities by the United States Environmental Protection Agency and the Nuclear Regulatory Commission." Presented at the Illinois Water Environment Association, 24th Annual Conference, Rockford, Illinois, by Thomas C. Granato, March 2003. PP

8. "Comparison of Fecal Coliform Concentrations and Trends in Two Urban Rivers: The Chicago Sanitary and Ship Canal and the Des Plaines River." Presented at the Illinois Water Environment Association, 24th Annual Conference, Rockford, Illinois, by Geeta Rijal, March 2003. PP

9. "History, Hydrologic Conditions, Hydraulic Controls, Wastewater Management, Dry and Wet Weather Operations and Water Quality Conditions." Presented at the Aquatic Invasive Species Summit, Chicago, Illinois, by Richard Lanyon, May 2003. PP

10. "Chicago Area Waterways System." Presented at the Chicago Area Waterways System, Use Attainability Analysis Study Stakeholder Advisory Committee Meeting, Chicago, Illinois, by Richard Lanyon, June 2003. PP

11. "Chicago River and Water Quality." Presented at the Chicago River Summit, 1st Annual, Chicago, Illinois, by Richard Lanyon, September 2003. PP

12. "Impact of Chicago Area Point Sources on Water Quality in the Upper Illinois Waterway." Presented at the Governor's 2003 Conference on the Management of the Illinois River System, Peoria, Illinois, by Richard Lanyon, October 2003. PP

13. "Pilot-Scale Polymer-Enhanced Lagoon Dewatering of Digested Sludge." Presented at the Water Environment Federation, 76th Annual Conference, Los Angeles, California, by Kamlesh Patel, David T. Lordi, Bernard Sawyer, and Richard Lanyon, October 2003. PS

14. "Protecting Lake Michigan Water Quality; Addressing Beach Issues in 2003." Presented at the Great Lakes Beach Association, 3rd Annual Meeting, Lake Michigan: State of the Lake '03 Conference, Muskegon, Michigan, by James Zmuda, October 2003. PS

15. "Radioactivity in Biosolids-Amended Soil and Uptake of Radioactivity by Crops." Presented at the Radiobioassay and Radiochemical Measurement Conference, Jackson Hole, Wyoming, by Abdul Khalique, Albert Cox, Thomas C. Granato, and Richard I. Pietz, October 2003. PP

16. "*E. coli* to Fecal Coliform Ratios in Wastewater, Chicago Area Rivers, and Lake Michigan." Presented at the Illinois Department of Public Health, Annual Environmental Laboratory Seminar, Springfield, Illinois, by Rick Gore, November 2003. PP

17. "Impact of Chicago Area Point Sources on Water Quality in the Upper Illinois Waterway." Presented at the Northwestern University, Environmental Engineering and

Science Graduate Seminar, Evanston, Illinois, by Richard Lanyon, November 2003. PP

18. "Regulatory Update: Pretreatment, User Charge and Water Quality Issues." Presented at the Industrial Water, Waste, and Sewage Group Dinner Meeting, Chicago, Illinois, by Richard Lanyon, November 2003. PP

19. "Soil Phosphorus Status During Thirty Years of Annual Biosolids Application." Presented at the American Society of Agronomy Annual Meeting, Denver, Colorado, by Albert E. Cox, Thomas C. Granato, Richard I. Pietz, and Carl R. Carlson, November 2003. PS

20. "TARP Project Status, Schedule, Benefits, and System Operations." Presented at the Chicago Area Waterways System, Use Attainability Analysis Study Stakeholders Advisory Committee Meeting, Chicago, Illinois, by Richard Lanyon, December 2003. PP

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*P = Available as a paper
B = Available as both a paper and PowerPoint Presentation
PP = Available as PowerPoint Presentation
PS = Poster Presentation

APPENDIX III

PAPERS PUBLISHED 2003

1. Lanyon, R., I. Polls, and M. Sopcak, "Continuous Monitoring Prevents Data Problems." Water Environment Laboratory Solutions, Vol. 10, No. 4, pp. 6-9, 2003.

2. Lanyon, R., "Impacts of Chicago Metropolitan Area Point Sources on Water Quality in the Upper Illinois Waterway." Proceedings of the Governor's 2003 Conference on the Management of the Illinois River System, Peoria, Illinois, 2003.

3. Patel, K., D.T. Lordi, B. Sawyer, and R. Lanyon, "Pilot-Scale Polymer-Enhanced Lagoon Dewatering of Digested Sludge." Proceedings of the Water Environment Federation, 76th Annual Conference, Los Angeles, California, 2003.