

# Philadelphia Water Department



People Serving People

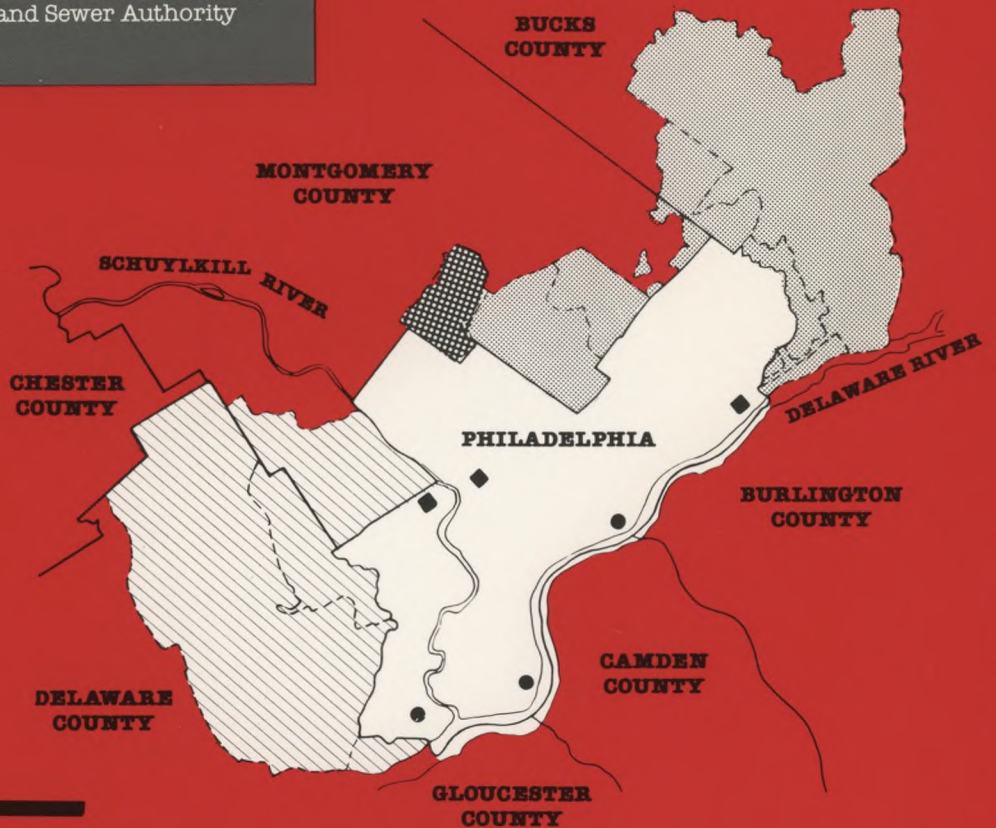
Annual Report Fiscal 1983

# PHILADELPHIA WATER DEPARTMENT

## A Regional Utility

### SERVING THE RESIDENTS OF PHILADELPHIA AND WHOLESALE AGREEMENTS WITH:

- Bensalem
- Lower Southampton
- Lower Moreland
- Abington
- Cheltenham
- Springfield
- Lower Merion
- DELCORA
- Upper Darby
- Bucks County Water and Sewer Authority



### LEGEND

- CITY/COUNTY BOUNDARY
- - AGREEMENT AREA BOUNDARY
- WATER TREATMENT PLANT
- WATER POLLUTION CONTROL PLANT
- ▨ NORTHEAST TREATMENT AREA
- ▩ SOUTHEAST TREATMENT AREA
- ▧ SOUTHWEST TREATMENT AREA

FRONT COVER: Symbolic of the fact that the Water Department serves people of many ethnic backgrounds, this photo shows a fire hydrant being repaired by Lawrence G. Robinson (left) and Carl C. Faulkner at 10th and Arch Streets. The elaborate "China Gate" commemorates Philadelphia's friendship agreement with the Chinese city of Tianjin.

### Contents

- 1 Introduction
- 2 American Red Cross
- 3 United Way
- 4 Highlights
- 6 Water System
- 10 Water Pollution Control
- 15 Engineering Services
- 19 Financial and Management
- 20 Financial Statements

# Philadelphia Water Department

## People Serving People — 24 Hours a Day

The water supply business is capital-intensive. The total assets of the Philadelphia Water Department at the end of Fiscal 1983, including property, plants and equipment were about 1.3 billion dollars. It also is people-intensive because we provide a service that requires around-the-clock attention to product quality and reliability of supply every day of the week.

Equipment alone cannot assure that service. It takes people: skilled, responsible, energetic people. Plant Operators, maintenance crews, engineers, chemists, accountants and secretaries . . . the more than 1,800 employees who repair pipe, maintain pumps, monitor quality, control pressure, keep records and manage the department's resources.

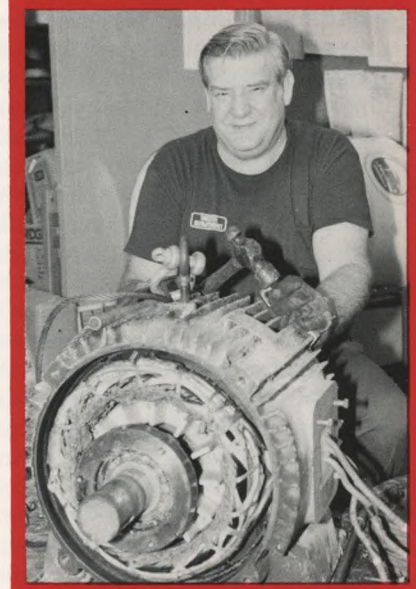
In this publication, you will meet some of these employees during their workday and afterwards as they make their contribution to the community. They are people serving people in the finest tradition of public service.

We dedicate this annual report to them.

W. Wilson Goode  
Mayor

Leo A. Brooks  
Managing Director

William J. Marrazzo  
Water Commissioner



**Responding to the Needs of the Community —  
Employees Have Donated Their Blood**



For many years now, the Water Department has supported the American Red Cross by sponsoring blood drives. In the most recent campaign held during February and March of 1984, employees showed once more how much they demonstrated their concern for the needs of the community. Over 150 employees, 20 of them first-time donors, volunteered to give blood.

The American Red Cross believes that blood should be available to all who need it regardless of race, economic status, ability to donate, place of residence, or membership in a specific group.

The need for blood never ends. The demand is continuous, and no substitute exists for human blood. Therefore, a major focus of the American Red Cross is its blood services program, which supplies half the whole blood and blood products used in the United States.

The Red Cross asks all healthy individuals in the community to join together as good neighbors in regular voluntary blood donation. This joining of individual action in the interest of maintaining a reliable community blood supply is what the Red Cross means by community responsibility in blood service.

*Frank Fie (left) from the Southwest Water Pollution Control Plant is the leading donor in the Water Department with 43 separate donations for a total of more than five gallons. George Holmes (center), a four gallon-plus donor from the Samuel Baxter Water Treatment Plant and Calvin Summers, a two gallon-plus donor from the Belmont Water Plant, show how easy it is to give blood.*

## **Employees Respond**

During 1983, over 300 Water Department employees volunteered to give blood. The Department also had a record number of what the Red Cross calls "extraordinary donors". These are the 32 people who have given a total of a gallon or more of blood, or who have participated in the pheresis program. Under the pheresis program, donors make two-and-one-half hour donations that provide platelets and white cells to cancer and leukemia patients.

## A History of Generous Giving To United Way



Under the leadership of the 1950's of its first Water Commissioner, Samuel S. Baxter, the Water Department began a long tradition of generous giving to the United Way. Not only in those early years but in most years since then, the Water Department has usually led all other City departments in both per capita and total contributions.

Far surpassing its goals for contributions to United Way from 1965 to 1972, the Department won the Torchlighter Award each year. In the seven years from 1978 to 1984, departmental employees contributed over \$500,000. The Water Department was one of 18 organizations chosen in 1982 as "Pacesetters," companies that set challenging goals and ran early campaigns to generate the momentum United Way needed to reach its goal. That year, the Department raised \$75,241, a 22.6% increase over the previous year.

The origins of the United Way movement date back to 1887 when two ministers and a rabbi from the Charity Organization Society coordinated their efforts to form the first United Way organization. The first community planning organization, called Associated Charities, was formed in Pittsburgh, Pennsylvania in 1908. Since then, these charitable drives have been known as Community Chest, Red Feather, and United Fund.

United Way of Southeastern Pennsylvania is a non-profit organization which raises and allocates funds for the support of 250 health and community agencies and services in the four-county Philadelphia area. Over one million people, regardless of race, faith or income, are served.

Some 36,000 volunteers give their time and talents to raise and allocate money in the once-a-year campaign. A citizen review process consists of over 300 volunteers from all walks of life who work year round to determine how much money each United Way agency should receive. They meet throughout the year with each agency to:

- review agency objectives, programs and budgets to see that expenses are justified;
- review the required annual financial audits;
- examine the agency's performance as compared to the agency's stated plans; and
- assess an agency's plans for continuing to serve the public.

*Customer Service field representative Michael Leibowitz (right), seen here at a Family Service Review Committee meeting, helps to determine how much money each United Way agency should receive.*



# Highlights of Fiscal 1983

## Rate Increase

If one fact could summarize all of the Water Department accomplishments in Fiscal 1983, it would be that the new water and sewer rates implemented on schedule on July 1, 1983, represented only a 14 percent increase to the average customer. In the fall of 1981, an increase of approximately 35 percent had been projected, to meet new revenue requirements of \$54 million. By mid-1983, however, the various management initiatives taken by the Water Department under its 1981 Financial Management Plan had reduced the need for additional revenue to \$16.7 million. The most significant accomplishments of 1983 which contributed to the department's success in controlling water and sewer rates are summarized below. One common characteristic of all of them that should be noted beforehand is that in no case was there any curtailment in the level of service.

## New Rate Structure

In response to many requests from individuals and community groups, the Water Department eliminated the system of charging each customer for a minimum allowance of water, whether or not it was used.

Effective July 1, 1983, under the new rate design, each customer started paying only for the actual amount of water used or estimated to have been used.

The new bill includes:

- A quarterly service charge to recover items of expense unrelated to the quantity of water used.
- A quantity charge for usage to recover all other items of expense, such as electricity and water treatment costs.

### COMPONENTS OF 5/8 INCH METER QUARTERLY SERVICE CHARGE

|                           |         |
|---------------------------|---------|
| Metering Costs            | \$ 3.14 |
| Billing Costs             | 6.11    |
| Stormwater Costs          | 14.06   |
| Infiltration/Inflow Costs | 9.70    |
| Industrial Waste Unit     | .04     |
|                           | <hr/>   |
|                           | \$33.05 |

The service charge is not a new charge in the sense that all of the costs included in this charge were included in the former quarterly minimum charge of \$47.00 which was in effect prior to the July 1, 1983 rate change. That former minimum charge also included a charge for a minimum allowance of water which, for most residential customers, was 1,500 cubic feet quarterly. That system of charging for an allowance of water whether or not it was used was understandably criticized in water rate hearings and before City Council by customers who used less than that quantity of water. The new service charge was adopted in light of unanimous testimony offered by senior citizens and consumer groups in opposition to the former allowance system. The service charge was therefore developed by separating from the old minimum charge those costs associated with the above-mentioned services.

This reform will provide, for the first time, an economic incentive to conserve water for those customers who are using less than the former minimum allowance of water.

## Organizational Changes

The newly-created Finance Division continued its reorganization. With several new upper management levels filled, the Division was able to expedite processing of personnel actions, finish the fixed assets accounting system and complete the first full year of operation of the new Computerized Budgetary Accounting System. A former management group with loosely-defined general administrative functions was reconstituted into an Audits and Special Studies Unit, which developed an employee suggestion program, computerized staffing status reports, audited the Meter Shop incentive program, and negotiated agreements with most other City departments on interfund charges. The water and sewer funds were combined for greater accounting efficiency, and the annual financial reports were prepared in-house for the first time. The net result is more effective financial management, reduced dependence on outside consultants, and administrative cost savings.

This year also saw the first steps in the planned implementation of a centralized plant and building maintenance concept for the department. The plan was the result of a detailed study of Water Department maintenance needs, facilities, and current organization. It is intended to improve efficiency and reliability of maintenance efforts, assuring protection of the City's large investment in water and wastewater conveyance and treatment facilities in the future. It will eventually yield annual savings in maintenance costs exceeding \$2 million.

## Conservation

The Water Department continued its aggressive energy conservation program, installing additional equipment to monitor energy usage, maximizing use of off-peak rates, modifying heating systems for greater efficiency, and managing demand to remain within established peak demand rates. Reductions in water usage described below also contributed to success in exceeding energy conservation goals. Energy expenditures for the fiscal year ending June 30, 1983, were 3 percent lower than in the preceding fiscal year. The first several months of Fiscal Year 1984 show a 9 percent decrease in cost compared to the same months in Fiscal Year 1983.

Through water conservation efforts, including leak detection and abatement, control of hydrant abuse, and water meter replacement, the daily average of total water distributed continued to decline, from 329 million gallons per day in 1982 to 324 in 1983. The metered ratio, on the other hand, rose from 0.66 to 0.68. This ratio is a measure of the fraction of total water distributed which is actually billed to customers. The department is one year ahead in its progress toward a ratio of 0.70 in 1985.

## Financial Management

In April, the Seventh Series Water and Sewer Revenue Bonds were successfully advance refunded by the Ninth Series, at a much more favorable interest rate. The resulting reduction in debt service expense is approximately \$22 million. In addition, the Tenth Series bonds, to be sold in 1983 to continue the water pollution control plant expansion and other capital projects, will be an issue of approximately \$124 million, rather than \$195 million as projected two years ago. Design review and cost benefit analysis led to this reduction in capital requirements.

All twelve suburban customer contracts have now been renegotiated to full cost to service rates. In addition, several major, chronic delinquent accounts were collected and prompt payment plans were put into effect to prevent recurring problems. Lawsuits have been instituted in cases as part of an aggressive collection program. The combined result of these efforts is an increase in annual revenues exceeding \$11.0 million.

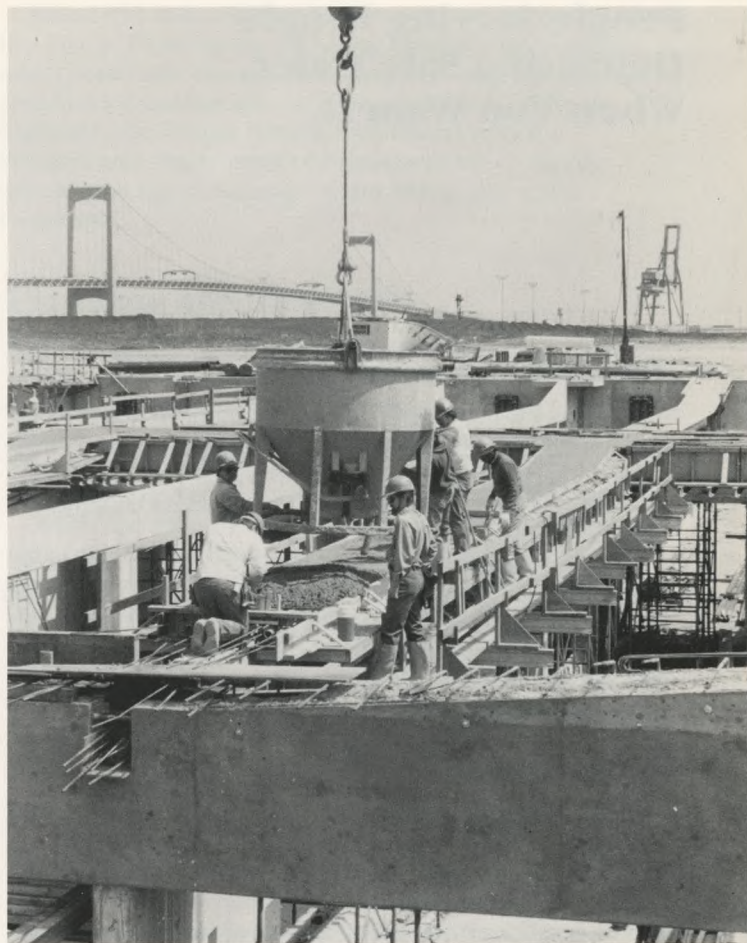
At the time the new water and sewer rates went into effect for Fiscal Year 1984, the Water Department completed its reform of senior citizen discount rates, setting all discounts at a uniform 25 percent and instituting an income test to insure that discounts would only be given to truly needy senior citizens. With the average age of Philadelphia's population increasing, this achievement was welcomed by the bond rating agencies as an important step to protect the financial integrity of the department.

## Other Accomplishments

The department completed a three-year toxic substances monitoring program at the three water pollution control plants and the Baxter Water Treatment Plant. This was an obligation of the City under a Federal Consent Decree which has, in addition, produced a great deal of useful information for use in managing water quality in Philadelphia.

At all three water treatment plants, the department continues to be able to keep trihalomethane concentrations well below the federally-mandated levels. These are presently the only trace organic substances for which regulatory limits have been set, and Philadelphia has been able to meet them through low-cost techniques, thereby avoiding expenditures on costly carbon filtration equipment.

In addition to these major accomplishments, our sick leave control program, instituted in 1981, continues to produce a decline in average annual sick leave usage per employee, from 12.9 in Fiscal Year 1982 to 10.2 in Fiscal Year 1983. We believe further gains are possible in this area, but the improvements in 1983 alone resulted in savings of \$340,000.



*Expansion of the \$182 million Southeast Water Pollution Control Plant (above) required many planning and coordination meetings between design and construction engineers (below). The department maintains a staff of 250 engineers, scientists, planners, and technicians capable of providing all the services necessary to carry out system-wide improvements.*



# The Water System

## People Serving People Delivering Safe Water, When You Want It.

### Treatment and Pumping

The three water treatment plants produced and distributed an average of 311.6 million gallons daily (MGD) to customers in Philadelphia during Fiscal 1983. Another 12.8 MGD was pumped and sold to the Bucks County Water and Sewer Authority.

Both the number of customers and the water produced in Philadelphia has declined considerably since 1965 when we pumped 326 MGD to 526,632 accounts. As of June 30, 1983, the distribution system served 503,291 customers through 3,274 miles of water mains and provided fire protection through 26,777 fire hydrants.

### Water Quality

Water Quality was generally good with the exception of taste and odor problems at the Samuel S. Baxter Plant during a brief period in March and May. In addition, in March there was a spill of 15,000 gallons of a mixture of naphtha and fish oil and 1,500 gallons of sulfuric acid into the Schuylkill River due to a train derailment at the Flat Rock Tunnel. This spill necessitated the closing of the raw water intakes at the Queen Lane and Belmont Plants for approximately 8 hours and the use of activated carbon in each plant for twenty-four hours.

The water furnished to customers continued to meet all of the national quality standards set by the Environmental Protection Agency (EPA). Average trihalomethane (THM) concentrations for the fiscal year were maintained well below the EPA's maximum concentration limit (MCL) of 100 parts per billion (ppb). Through the combination of tighter control of the chlorination process, increased use of chlorine dioxide for algae control at the Samuel S. Baxter Plant, and perhaps favorable raw water conditions, the average for THM's were 42, 52, and 52 ppb for the Belmont, Queen Lane and Samuel S. Baxter Plants respectively. These averages compare to 47, 56 and 72 ppb for fiscal 1982.

In spite of the increased use of chlorine dioxide at the Samuel S. Baxter Plant as part of increased efforts to further reduce THM's, the chemical costs per million gallons of water treated were lower at each plant during Fiscal 1983 in comparison with Fiscal 1982. The flow weighted average chemical treatment cost in Fiscal 1983 was \$21.14 as compared to \$25.05 per million gallons in Fiscal 1982.

## Where the Money Goes:



39¢ EMPLOYEES

6¢ PURCHASE  
of SERVICES

6¢ INTERFUND  
SERV. CHARGES

9¢ ELECTRICITY

11¢ MATERIALS,  
SUPPLIES, EQUIP.

29¢ DEBT SERVICE

## Samuel S. Baxter Water Treatment Plant

Samuel S. Baxter, who passed away on February 7, 1982, was the Philadelphia Water Department's first Water Commissioner and Chief Engineer from 1952 to 1972. He had previously been employed in the Philadelphia Department of Public Works from 1923 to 1951.

His innovative engineering and sound management principles were the driving forces behind a four hundred million dollar program to modernize and upgrade the City's water and sewer system facilities. The Torresdale Treatment Plant was opened in 1959 as part of this program of modernization under the leadership of Samuel S. Baxter.

He had an international reputation as an outstanding engineer, and served as President of the American Water Works Association, the American Public Works Association, and the American Society of Civil Engineers.

In the Fall of 1982, in recognition of his 49 years of outstanding public service to Philadelphia, City Council passed an ordinance designating the "Torresdale Water Treatment Plant" as the "Samuel S. Baxter Water Treatment Plant."



## Water System Maintenance

To understand the magnitude of maintaining our water distribution system, imagine all of Philadelphia's water mains stretched out, at a depth of four feet, beneath the highways for 3,274 miles from Miami, Florida to Seattle, Washington.

To further exemplify our complicated maintenance problems, imagine that within these 3,274 miles of pipe there are 80,878 valves, 26,777 fire hydrants and that periodically throughout the year, there are going to be 888 water main breaks.

Fortunately, the water mains, valves, and hydrants are actually laid out in a grid-like design over the 130 square miles of Philadelphia rather than from coast to coast. However, the task of maintaining the huge water system in summer heat and sub-freezing winter temperatures is still tremendous.

## Improving The Water Distribution Organization

To improve productivity and management controls the Water Distribution Unit was reorganized in April of 1983 into an Emergency Support Services Unit, a Water Distribution Unit, and a Water Conveyance Headquarters Unit. Included in the new Emergency Support Unit are crews for delinquent bill shut-offs, valve maintenance, cement work, ferrule installations, hydrant repairs, and emergency response. Since the reorganization of the cement crew, the backlog of paving work has been reduced by one-half.

## Leak Detection

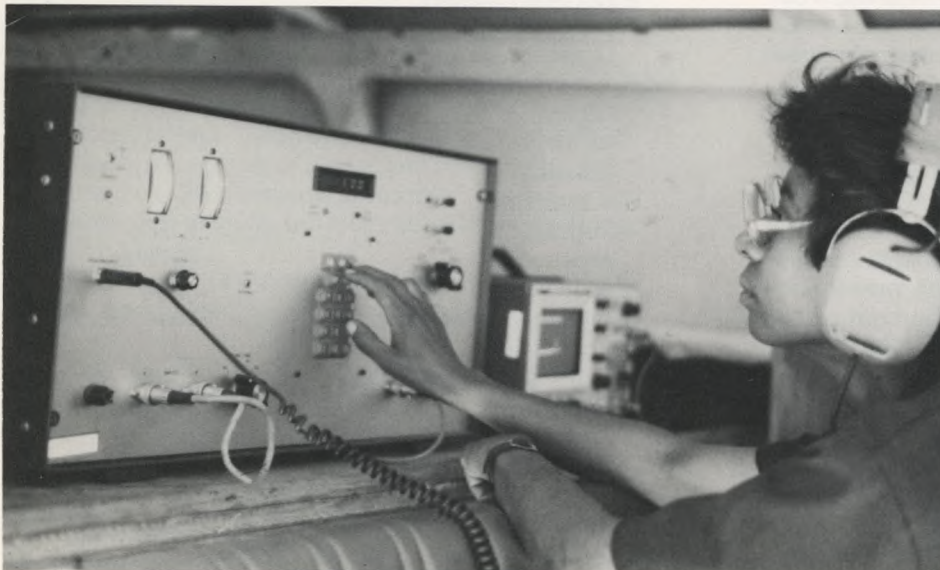
One important goal of the department's long range financial management plan was the reduction of unaccounted for water through a vigorous leak detection program. Early in Fiscal 1983, in accordance with this goal,

## Our 3,274 Miles of Water Mains Would Stretch From Coast to Coast

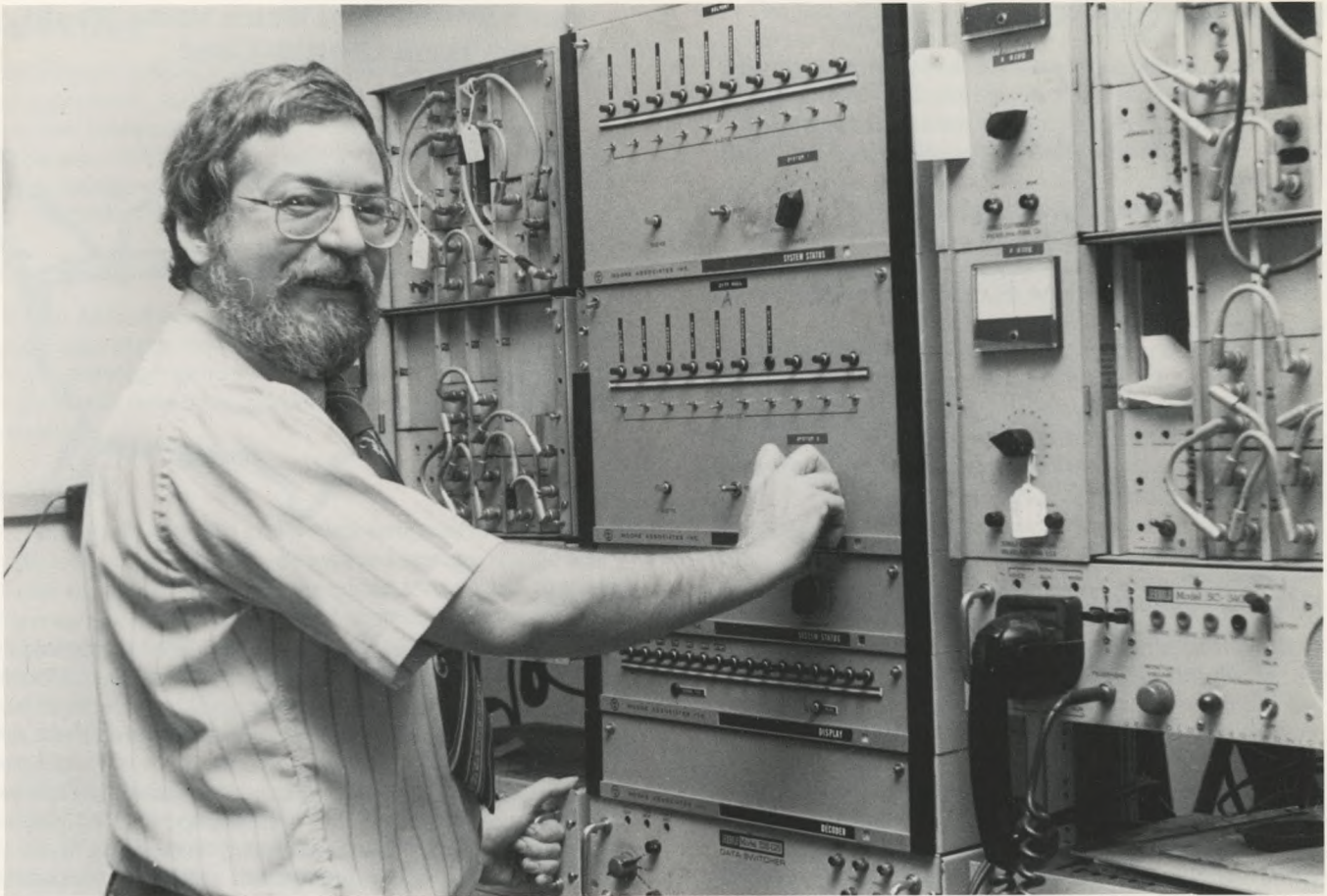


the department purchased a sophisticated electronic system to pinpoint underground leaks. Once the general location of an underground leak is determined, a transducer or sound sensor is attached to the water main on both sides of the suspected leak at a valve, hydrant or water curb stop. These transducers are connected by a cable to a microprocessor (computer) and oscilloscope located inside the leak detection van. Water escaping through the leak opening sets up acoustic impulses which are transmitted along the main to each of the sensors. Knowing that these sound impulses travel in each direction along the main at the same speed, the microprocessor is able to calculate the exact distance from one of the sensors to the leak.

Total leakage abated during Fiscal 1983 by our water waste consultant and the leak detection crew was 19.5 million gallons per day, which represents a savings to the City of \$670,500 annually. Approximately 60% of this leakage was found in South Philadelphia.



*Water Distribution Repairman Gloria Hayes operates the van-mounted computer that helps to locate leaks with pinpoint accuracy.*



*Norman Weintraub, Chief, Conveyance, checks some of the microwave equipment needed to operate the Load Control Center. Sensors throughout the system constantly monitor water pressures, rates of flow and water elevations of reservoirs allowing one operator at the center to control all 15 water pumping stations.*

Despite some procurement problems in obtaining needed supplies, maintenance crews kept the water flowing to homes and industries while grappling with broken water mains and damaged fire hydrants in winter's cold and summer's heat.

To combat the problem of large numbers of fire hydrants being illegally opened on hot summer days, 7,303 locking devices were installed compared to 2,670 in Fiscal 1982.

Critical for an effective water and sewer accounts receivables program is a procedure for the shut-off of delinquent properties. Since 1961, when the Water Department began shutting off delinquent properties at the direction of the Department of Revenue, almost \$12 million has been collected on site. During Fiscal 1983, over 29,600 delinquent accounts were serviced, 13,854 shut offs made, and \$1,542,139 was collected.

A new device, developed by the Emergency and Support Service Unit, has proven to be very successful in eliminating illegal turn-ons by unauthorized persons after the department has turned off the water curb stop for a delinquent bill. The 300 devices installed thus far have proved to be over 90% effective.

Among the jobs performed daily by the Distribution Unit were:

|                          | FY 83 | FY 82 |
|--------------------------|-------|-------|
| Water Main Repairs       | 888   | 1053  |
| Ferrules Installed       | 3347  | 3510  |
| Drawn or Shut Off        | 2460  | 2931  |
| Pipeline Valves          |       |       |
| Inspected                | 4602  | 4704  |
| Repaired                 | 1232  | 1583  |
| Installed                | 358   | 273   |
| Fire Hydrants            |       |       |
| Inspected                | 17273 | 23701 |
| Repaired                 | 10769 | 11231 |
| Renewed                  | 183   | 215   |
| Complaints Investigated  | 19447 | 20822 |
| Water Services           |       |       |
| Shut Off for Delinquency | 13854 | 6778  |
| Restored                 | 4944  | 3333  |
| Excavated                | 2477  | 3004  |

## 100,000 Calls For Assistance

Handling over 100,000 telephone calls annually from Philadelphians requires a lot of knowledge, patience and courtesy, and the department continually strives to respond to its customers in this manner.

The calls concern many urgent problems such as broken water mains, open fire hydrants, leaking meters, low water pressure and clogged inlets. In response to these calls, Customer Services radioed over 10,800 requests for service to mobile field representatives.

During Fiscal 1983, inspectors made 72,562 investigations regarding permits, billing inquiries, leaks, missing meters and plumber's work. Almost 4,000 plumbing violation notices were served.

Many property owners on welfare, however, were unable to pay for plumbers. In 381 such cases, the repairs were made for \$248,964 and the costs billed to the owners.

Under a small claims ordinance administered by the Water Department, 162 claims against the City for damages from broken water mains and sewers were voluntarily settled for \$85,957.

## Maintenance Meter Shop

They are called the "cash registers" of the department and at the present time, there are 503,556 water meters in the system varying in size from 5/8 to 10 inches. As part of the department's 10 year program to replace 400,000 5/8 inch mechanical meters, 41,687 new magnetic meters of the 5/8 inch type were installed during Fiscal 1983. These new meters are more accurate, easier to read, less costly to repair, and are hermetically sealed so they do not leak from the register.

## Automotive

Keeping the department's 534 trucks and other vehicles rolling requires a tremendous amount of preventative maintenance and repair. During the year, the Automotive Maintenance Unit performed 21,234 job operations including repairs to off-the road equipment and vehicles, state inspections, and preventative maintenance checks. In addition, they dispensed over 500,000 gallons of gasoline and diesel fuel.

## Building and Plant

Employees of Building Maintenance performed 1,636 jobs at the treatment plants, pumping stations, and headquarters building. Major repairs included repairing both the North and South eleven foot diameter conduits at Queen Lane Filters and renovation to the Torresdale Filters laboratory.

Machine Shop employees including five machinists, one blacksmith and one welder, continued repairing, rebuilding, or modifying all water processing equipment. Salvaging of parts and hydrants resulted in a savings of \$86,488.



*On one of the 72,562 investigations made annually by Customer Service, field representative Michael Leibowitz reports to the radio dispatcher.*

*Calvin Summers, a mechanic at the Belmont Water Treatment Plant, works on one of the many maintenance jobs needed to keep the plant operating.*



# The Water Pollution Control System

## People Serving People Working 24 Hours a Day To Protect the Environment

### Southeast Water Pollution Control Plant

During Fiscal 1983, the expansion program at the Southeast Plant was winding down in the primary end and gearing up in the new secondary end. With only two of the four primary tanks in service for a couple of months and three for the remainder of the year, the plant was still able to exceed the consent decree requirements with a suspended solids reduction of 61% and a BOD reduction of 46%. The average flow treated each day at the plant dropped to 88 MGD from 109 MGD, probably due to reduced leakage in the water distribution system, a decrease in industrial water consumption, and diversion of flows to the Northeast Drainage District from the Southeast District.

Energy Management at the Southeast Plant and the Central Schuylkill Pumping Station resulted in savings of \$67,410 compared to the previous fiscal year.

### Southwest Plant

The Southwest Plant met effluent quality limitations for biochemical oxygen demand (BOD) on the average throughout the fiscal year and just missed the suspended solids (SS) limitation of 30 milligrams per liter (mg/l) with a reported average of 31 mg/l.

During Fiscal 1983, the original Southwest Sewage Plant built in 1925 was retired. After 58 years of service, the pumping station was demolished and the five centrifugal pumps were replaced with three new self-regulating helix screw pumps. Each two-stage screw lift pump has a capacity of 32 MGD of wastewater and is powered by a 150 horsepower motor.

For 29 years, the pumping station was the only building at the Southwest site. The preliminary primary treatment facilities were not added until 1954. Six of the original floating cover anaerobic digesters were also demolished and replaced during the year. With these two facilities gone, the dewatering stations were the only buildings which are still in operation from the old plant.

Only two new processes remain to be placed in service under the plant expansion program. These facilities, the Grit and Screening Incinerators and the Gas Handling Building, should begin service during the summer of 1984. The anticipated completion of the expansion project at Southwest has shifted emphasis from equipment start-up to control of process, budget and organizational problems.

## Where the Money Goes:



43¢ DEBT SERVICE

5¢ ELECTRICITY

6¢ MATERIALS,  
SUPPLIES, EQUIP.

11¢ INTERFUND  
SERV. CHARGES

18¢ PURCHASE  
of SERVICES

17¢ EMPLOYEES

Installation and testing of the plant's Computer Monitoring and Control System (CMCS) by Leeds and Northrup, the prime contractor, continued during Fiscal Year 1983. In May of 1983, they replaced the originally installed CP400 computers with new CP800 computers which are five times faster than the old models. Installation and wiring of the system's thirteen remote multiplexers (MUS) was completed in June of 1983. Southwest Plant personnel undertook the major task of verifying that field signal wiring was properly connected to the multiplexers. Of the 5,340 points monitored or controlled by the computer, 2,403 had been checked by the end of the fiscal year.

### Inlet Cleaning

The Philadelphia stormwater drainage system includes approximately 75,000 inlets which convey stormwater from the street surface into the underground storm sewer system. The Department has 103 men in 35 work crews who are responsible for inspecting and cleaning these inlets. Inlets are cleaned on both a complaint and scheduled basis, with complaints causing about 55% of the inlet cleanings.

During Fiscal 1983, crews cleaned 59,711 inlets mechanically and 6,700 manually, removing 1.5 million cubic feet of debris. Inlet Cleaning also replaced 3,920 missing covers, installed 1,054 locking covers and adjusted 467 inlet frames.

To improve our service, an evening shift was activated in May of 1982 which consisted of 5 combination unit crews. "Combo" units, first purchased in 1975, are actually a combination of a hydraulic crane and a dump truck body. These crews are assigned to congested areas, particularly in Center City, when day crews are unable to serve because of pedestrian and traffic problems.

## Northeast Plant

The largest of the three Wastewater Treatment plants, the Northeast Water Pollution Control Plant treated an average of 176 MGD of wastewater in Fiscal 1983. The plant met the interim National Pollutant Discharge Elimination System permit regulations for suspended solids and biochemical oxygen demand percent removal at 73% and 66%, respectively. The 77,000 pounds of BOD lbs. sent to the river was a significant decrease of 21% over 1982.

Although the plant experienced some operating problems because of continuing construction and greater flows and grit quantities from the Delaware Low Level sewer, the progress of the Aeration Tank modification work was a promising development. This enabled 160 rotating biological contactors (RBCs) to start operation along with four new blowers. This new mode of secondary treatment resulted in a better quality effluent despite limiting hydraulic conditions.

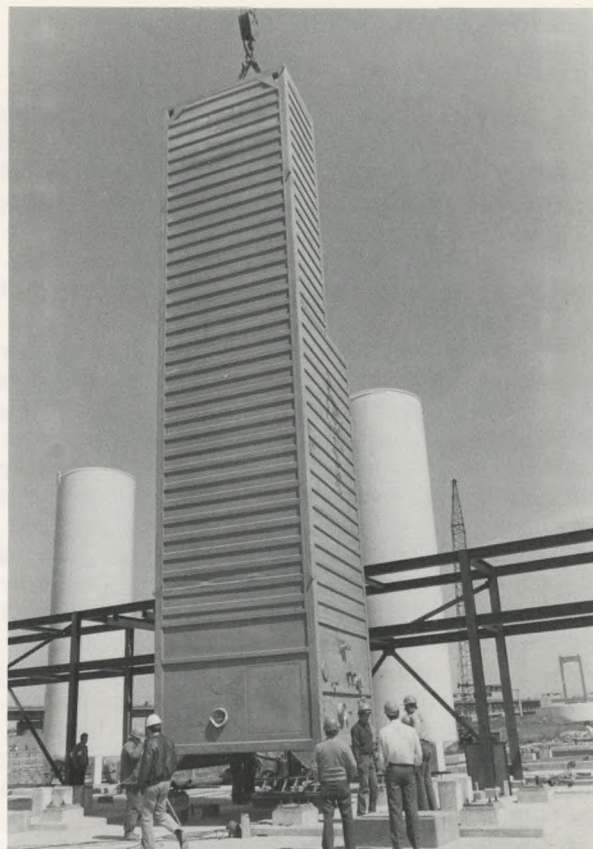
Because the latest 1980 Census figures show a decrease in the City's population, the design flow figure for the expanded Northeast Plant has been revised to 210 MGD from the original 250 MGD. This revision will result in a savings of millions of dollars in the remaining capital improvements projects.

## Frozen Cofferdams Allow Complicated Sewer Hookup

Imagine for a moment, you are trying to change a washer in your faucet with the water running full force. Difficult — well, that's analagous to the job the Water Department faced when they wanted to change the flow of two major sewers from the existing Grit Chamber at the Northeast Plant to the new Pretreatment Building.

To complicate the problem further, the department's contractor had to construct the diversion chamber, a junction box and a huge meter vault around the two major sewers while they were carrying close to 130 million gallons daily of raw sewage. How do you ensure the stability of soils beneath the two conducts while excavation proceeded around them? The contractor chose a unique \$1.5 million system of nine elliptical cofferdams ringed with brine filled refrigeration pipes to freeze dense soil during this excavation. In all, 320 freeze pipes were installed some 60 feet deep to ensure a water tight material.

To permit the installation of a temporary 8 feet diameter steel flume in the existing 12 feet, 3 inch diameter Upper Delaware Low Level Interceptor, it was necessary to divert 54 MGD of untreated sewage from the Northeast Drainage District to the Delaware River for five days in January of 1983. The installation of the temporary flume was required for the construction of the junction chamber around the existing Upper Delaware sewer. It was necessary to repeat this diversion to the river in January of 1984 when the temporary flume was removed with the aid of welder's cutting torches (see back cover photo). Both diversions has a relatively small impact upon the river and were approved by the Delaware River Basin Commission.



*One of two cryogenic oxygen production units is lowered into place at the Southeast Plant. White towers in background are storage tanks for oxygen.*

*Champion blood donor Frank Fie works on one of the hundreds of motors at the Southwest Plant.*



## Collector System Interceptor Services

Combined-flow sewers carry both sanitary wastes and storm water in the same pipelines. In past years, the City's combined flow sewers poured heavy wastes into local streams. To correct this situation, Philadelphia built special conduits to intercept these wastes and divert them to the plants. Linked to over 150 miles of such interceptors, the combined sewers now empty into the rivers only during heavy storms.

This outflow to the rivers is controlled by regulator units in intercepting chambers. In dry weather, all the sewage in the combined sewer normally passes through a regulator gate and then to a plant for treatment. During storms, however, the rain swollen flow causes a float to rise, partly closing a gate which diverts a portion of the flow to the river.

There are 14 major collector systems and 174 regulators in the 2,933 miles of Philadelphia's sewers. The interceptor services made 7,523 inspections of these facilities in Fiscal 1983, an 18.7% increase over the previous year.

Fiscal 1983 marked the first time that large or complex maintenance work on the intercepting chambers was performed under a requirements contract. This work involved the rehabilitation of 62 mechanical regulators, 19 tide gates and 7 manually operated valves at a total cost of \$198,000.

To ensure full coverage throughout the city and at the same time, keep crew travel time to a minimum, Sewer Maintenance operates from three maintenance yards located at 28th and Clearfield Streets, 50th Street and Paschall Avenue, and Milnor and Robbins Streets.

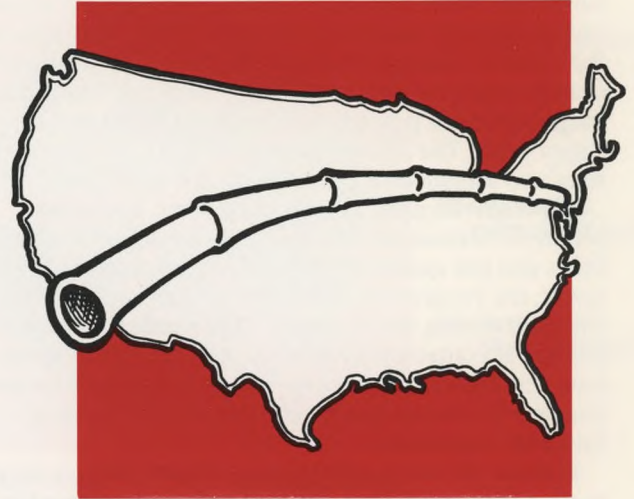
Daily maintenance jobs performed by these crews including inspection repairs, cleanings or reconstructions were:

| Jobs                   | Fiscal 1983 |
|------------------------|-------------|
| Sewers                 | 9,811       |
| Inlets                 | 10,992      |
| Manholes               | 835         |
| Laterals               | 24          |
| Drainage Right-of-Ways | 273         |

Crews also cleaned 44 miles of sewers by high pressure flusher and almost 2 miles by the mechanical bucket method. They rodded 3 miles of choked sewers and cleaned 78 acres of streams and their banks. Sewer inspectors walked or crawled through 168 miles of sewers and viewed another 8 miles by television camera to check the structural integrity of the City's sewers.

Entering confined spaces such as sewers and associated manholes can be hazardous unless the proper precautions are taken. Recognizing this fact, all sewer maintenance employees have been trained in confined space entry procedures. One of the first steps in this procedure is to test the atmosphere under the sewer manhole cover by using a Dynamation Meter to check for oxygen deficiencies, hydrogen sulfide and explosive gases. The department has purchased 150 of these new "state-of-the-art" gas detectors at a cost of \$135,000.

## 2,933 Miles of Sewers To Maintain



*Sewer Maintenance crew replaces damaged slab at one of the 75,000 inlets in the City.*



## Sludge Disposal: A Major Challenge

Since the cessation of ocean disposal of sludge in November of 1980, the management of sludge disposal has become one of the most pressing issues faced by the Water Department.

In fiscal 1983, over 36,000 dry tons of sludge was generated by the three sewage treatment plants. By early 1986, this output will increase to an estimated 110,000 dry tons annually.

## Dewatering Digested Sludge

Digested sludge is the final, innocuous product of wastewater treatment. Before composting this sludge, some of the water is removed by using centrifuges or belt filters. The separation of the water from the sludge is aided by the addition of polymers.

## Composting

The dewatered sludge is trucked from the Northeast and Southwest Water Pollution Control Plants to the Southwest Composting Pad. Here, the sludge is mixed with wood chips and aerobically composted for 21 days. The operation is very similar to the backyard compost pile but on a much larger scale, using blowers to make the piles "breathe." Since the pile temperatures exceed 140° during composting, the sludge is further stabilized and the bacteria level is reduced. Finally, the compost is screened to recover as much of the wood chips as possible and to produce a higher quality product.

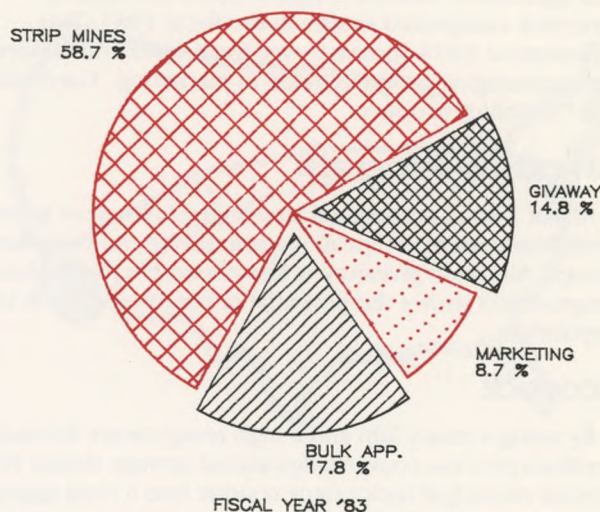
Several products are generated from composting:

- Gardenlife — A screened, composted material sold in forty-pound bags and in bulk quantities as Earthlife.
- Dry Philorganic — An unscreened composted material which is either sold or freely distributed to the public.
- Mine Mix — Digested sludgecake mixed with unscreened composted material in a one to one ratio.

Extensive renovation began at the Southwest Composting Pad this year including:

- Construction of a vehicle wash facility which will save over \$150,000 annually in maintenance and manual washing costs.
- Grading and paving of a twenty acre site for the mixing and composting operation. The concrete pads provide better drainage, eliminate muddy conditions which hamper the mixing of sludge and woodchips, and produce a drier compost material.
- Installation of a fifty-ton truck scale to weigh sludge and compost.
- Construction of a storm sewer to return used water and storm runoff to the treatment plant.

COMPOST UTILIZATION



## Stripmine Reclamation: An Environmentally Safe Program

Of all the composted sludge utilization techniques, stripmine reclamation continues to be the largest program with about 60% of the total sludge used to revegetate areas that have been scarred by coal stripmines.

Unfortunately, the quantity of mine mix used in program declined in fiscal 1983 due to continued public opposition in Western Pennsylvania and problems with the new bids for performing the application of composted sludge material.

From the inception of this program, the department has followed the guidelines established by the Pennsylvania Department of Environmental Resources (PA DER) for the application of sludge to reclaim stripmined lands. The PA DER established their guidelines based on studies performed by the U.S. EPA, the U.S. Department of Agriculture, the Food and Drug Administration and various institutions of higher learning. These studies show that under correct application procedures, composted sludge application to strip mined areas could not only be beneficial but safe to the environment.

A number of steps are being considered to help ensure public acceptance of this important program including the hiring of a Government Agency Liaison employee and a Community Affairs Coordinator. A full-time employee in Western Pennsylvania has been hired to supervise all stripmine reclamation contract work.

## Bulk and Liquid Application

The bulk application program uses a mixture of compost and screened mine mix for agricultural utilization and landfill revegetation. Bulk application is more economical and efficient than liquid application due to easier handling and fewer permitting problems. For these reasons, the Liquid Application Program was terminated in December of 1982.

## Marketing

Delchem Services, currently in the second year of a five year agreement, marketed almost 3,000 dry tons of screened, composted sludge in the fiscal 1983. This represents a 500% increase over fiscal 1982 and confirms the encouraging progress made in marketing "Gardenlife" and "Earthlife" products.

## Giveaway Program

About 14% of composted sludge products were given to small home users, nonprofit organizations and community groups. Although giveaway is less expensive the marketing program still shows the potential of reaching a much large population.

## Ecorock

By using a rotary kiln and a high temperature furnace, the EcoRock process converts dewatered sewage sludge and ground municipal incinerator residue into a road aggregate which can be used to repair and replace old pavement.

The demonstration plant, located at the Northeast Water Pollution Control Plant, has completed its start-up period. Modifications are being made to optimize its operation and then to determine whether the process will operate as designed.

After fifteen trial runs, EcoRock product samples were analyzed and show no significant levels of leachable heavy metals or pesticides. Waste process gasses were tested and conform to air quality standards for hydrogen sulfide, carbon dioxide and particulates.

## Industrial Waste Control

The Water Department Wastewater Control Regulations were finalized and passed in January, 1977 in response to a consent decree signed with the U.S. Environmental Protection Agency (EPA) which ended ocean dumping of sewage sludge by 1981. The regulations impose strict limits on the discharge of heavy metals, oils, greases, and other substances by Philadelphia industries to help the City meet the federal standards for wastewater effluents, improve sludge quality for land disposal and protect the department's plants from treatment upsets.

The Industrial Waste Unit has the responsibility to enforce not only the Water Department's regulations for industrial wastewater discharges but those of the EPA.

Current federal policy mandates technology based regulations for the management of industry's pretreatment of wastewater. In 1982, EPA began publishing generally stricter categorical regulations which took precedence over any local regulations. There are over 20 categories of industries such as pharmaceutical, textile, electroplating, smelting, organic chemical, for which specific regulations will gradually be established by EPA.

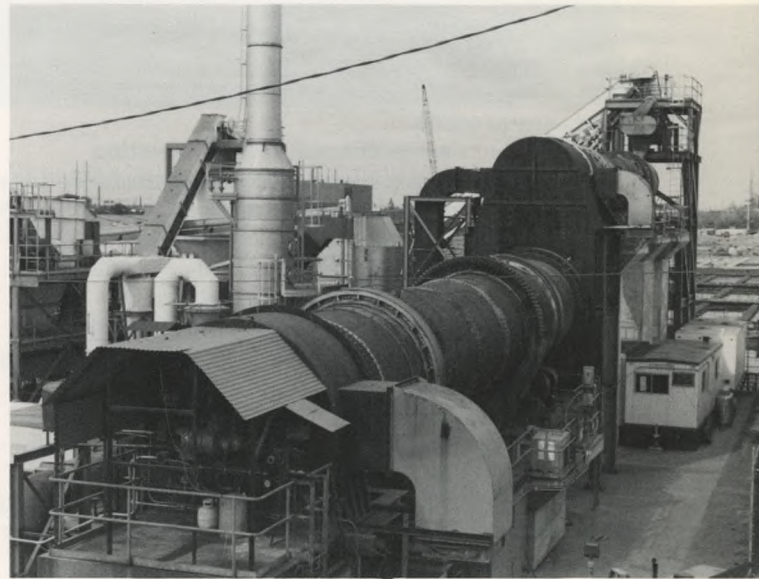
Companies in Philadelphia that discharge wastes above a certain strength to City sewers must pay an Industrial Waste Surcharge. EPA's "User Charge" Guidelines pertaining to the 1977 Clean Water Act make this surcharge mandatory to be eligible for receipt of federal grant money for the construction of wastewater plants.

The industrial categories represented in the surcharge program include cooperages, cheese manufacturers, bakeries, paper manufacturers, renderers, breweries, sugar refiners, tanners, laundries and laundromats.

Each industry subject to the surcharge which does not provide its own data or does not have a standard value developed, is sampled at least twice each billing quarter. As a result, 947 samples were collected during fiscal 1983.

Normally, the amount of water metered for an account equals the amount of wastewater discharged to the City sewer. However, some customers experience water losses from boiler operations, cooling water evaporations, or water used in their products. When such losses exist in commercial or industrial establishments and the metering of sewage flow is not feasible, a sewer rental factor must be calculated. In fiscal 1983, 32 sewer rental factors were developed or reviewed.

To prevent stream pollution, industrial waste engineers investigated over 200 public complaints. These included odors from sewers, oil and chemical spills, abandoned containers of waste chemicals and contaminated storm sewers. Once a source was found, the discharger was compelled to properly dispose of the waste and pay for any sizeable expenses the department may have incurred.



*Ecorock pilot plant burns sewage sludge and municipal incinerator residue in a rotary kiln and fuses it in a furnace at 2000° F into a hard rock.*



# Engineering Services

---

## People Serving People Planning For Your Future

### Planning and Engineering

The Planning and Engineering Division was created in 1982 from the department's previous Engineering Division and the Planning and Technical Services Division. The division retains all responsibilities of its predecessors including: (1) engineering support for the entire Water Department, including project planning, surveying, design, cost estimating, and construction management; (2) the management of the Capital Improvement Program and the administration of the program to reconstruct and expand the three wastewater treatment plant facilities; (3) strategic planning associated with long term operation of the department; and (4) the responsibility of providing all of the department's laboratory and computer services.

### Construction

During Fiscal 1983, Construction Branch engineers and inspectors supervised 210 contracts with a combined value of \$124.7 million. Of these, 65 projects totaling \$39.2 million were completed and 145 jobs totaling \$84.5 million were still active on June 30, 1983.

Approximately 6.6 miles of water mains, 396 valves, 62 fire hydrants and 7.7 miles of sewer lines were constructed in Fiscal 1983. The sewers ranged in size from 10-inch sanitary lines to 15 by 20 foot, box sewers.

Work continued on the \$4.2 million contract to install a lining and floating cover on the two north basins of the East Park Reservoir. Scheduled to be completed in the Spring of 1984, the floating nylon cover will prevent the growth of taste and odor causing algae in the summertime and protect the purity of drinking water.

The department's storm flood relief sewer program progressed with completion of a \$2.2 million job in Allegheny Avenue from Glenwood to Sedgley, a \$3.5 million project in Dauphin Street from 22nd Street to Sedgley and two contracts totaling \$18 million in Belfield Avenue.

### Design

Design engineers and technicians prepared plans, specifications, and estimates for a wide spectrum of future construction. The 109 contracts, on which in-house work was done, had an estimated value of \$58 million. They also coordinated 37 additional contracts worth \$23 million that were completed by our consultants.

The major design projects included:

- New Automotive Maintenance Garage
- Maintenance Facilities for the Northeast and Southeast Water Pollution Control Plants
- New Central Laboratory Facilities
- Sewer and Inlet Cleaning Headquarters Building and Storage Yard
- Water and Sewer Reconstruction Program

About 350 miles of State Highway routes are now within the City of Philadelphia, including complex interchanges, underpasses and bridges. In connection with the expansion program for maintenance and improvements to these highways, the Design Branch cooperated with the Pennsylvania Department of Transportation to supply information about drainage, water mains, and sewer locations.

### Planning and Research

#### Maintaining Our Infrastructure

The public infrastructure — the intricate system of highways, bridges, airports, railways, ports, water and sewer systems, city streets — has been the underpinning of our national growth. It is essential to the functioning of our economy. And yet, as a nation, we have let it deteriorate.

Why? The primary reason is long-term underinvestment; tight budgets, inflation and higher costs for social services have consistently reduced public works investments since the 1950's. In 1965, we invested 4.1 percent of our Gross National Product in public capital projects but by 1980, the figure was down to 1.8 percent. The Congressional Budget Office estimated in 1983 that the nation needed to spend \$53.4 billion a year on repairs and construction of all public works over the next eight years.

Fortunately, since 1946, Philadelphia has spent over a billion dollars to maintain and improve its water and sewer systems. In the period from 1979 to 1983, the Water Department budgeted an average of over \$5 million annually to rehabilitate its aging water mains. More recently, as a first step in developing a long-range accelerated program for the replacement and rehabilitation of the water distribution system, the City of Philadelphia Water Supply Infrastructure Study was initiated in 1980 through the assistance of the Army Corps of Engineers and the State of Pennsylvania. The first phase of this study was to determine the major factors involved in water main breaks. A computerized inventory of the 14,964 water main breaks occurring in Philadelphia from 1964 through 1980 was prepared to determine the effects of pipe diameter, age, geographic location, type of break, corrosion, month during the year, etc. In Fiscal 1983, 37 pipe and soil samples from selected main breaks were sent to the Materials Testing Laboratory (MTL) for physical and chemical tests to determine the remaining strength of the main, the degree and type of corrosion and the type of soil environment around the pipe.

The second phase of the study was to develop and integrated water main information system with water main inventory, water main break, MTL data, leak, and discontinuance permit computer files linked by a geography file for each street segment. By the end of Fiscal 1983, the Water and Sewer Systems Planning Unit of the Design Branch was starting to use some of the computer programs to develop the water main replacement capital program.



*After Pennsylvania Governor Dick Thornburg (second from right) and Philadelphia Mayor W. Wilson Goode (right) signed agreements for a new \$2.41 million Superfund grant to cleanup the Enterprise Avenue site, Water Commissioner Marrazzo used the special occasion to present the Governor and State Environmental Resources (DER) Secretary Nicholas DeBenedictis with bags of "Philorganic," the department's composted sludge product.*

### **Cleaning Up the Enterprise Avenue Landfill**

During the 1970's, several waste hauling firms illegally disposed over 11,600 drums of toxic wastes on sections of 40 acres of land leased for the disposal of incinerator residue. This land, known as the "Enterprise Avenue site," is located adjacent to the Southwest Water Pollution Control Plant.

After a preliminary investigation and exploratory excavation by the Water Department in 1979 and 1980, it was established that between 5,000 and 15,000 drums had been buried at the site. These drums contained paint sludges, solvents, oils, resins, metal finishing, solid inorganic and laboratory wastes. Based on this information, a study was conducted developing the most environmentally sound and cost effective remedial action program. Location, excavation and disposal of all drums and contaminant soil at a federally approved hazardous waste landfill site was the alternative chosen to rectify the situation.

During Fiscal 1982 and 1983, the Water Department spent over \$8 million to remove all the drums, 21,000 tons of contaminated soil and 200,000 gallons of water from the site and to establish and monitor 68 groundwater wells. After discovery of the dump site, a criminal investigation ensued. Admission by bribed City employees, hauling records of the transporting firms, records of generators and testimony by deponents and witnesses aided the City in identification of approximately seventy-three (73) firms responsible for producing the wastes buried at Enterprise Avenue. After vigorous litigation by the Law Department, the City recovered \$6.3 million from 56 of the generators, and the City is presently prosecuting the remaining generators.

Because of funding limitations, two piles of contaminated soil covered with clay and graded to reduce erosion problems remain on site. A new contract will be issued early in Fiscal 1985 to remove the soil and close the site by placing a cover of clay followed by the top soil and seeding for erosion control.

## Bureau of Laboratory Service (BLS)

The four major branches of BLS are the Water and Wastewater Laboratories, Projects Section, Materials Testing Laboratory and the Quality Assurance Section.

### Waters and Wastewater Laboratories

The Water and Wastewater Laboratories are composed of four analytical chemistry laboratories and one aquatic biology laboratory. The laboratories are engaged in surveillance of water supplies and in determining the quality of drinking water (Water Analysis Lab), analyzing industrial wastes, wastewater, and sludge (Wastewater Analysis Lab), analyzing and characterizing organic compounds in water and wastewater (Organics Lab), monitoring the processes of the Water Pollution Control Plants (two Water Pollution Control Plant Labs) and the monitoring of phytoplankton and zooplankton in water supplies, drinking water and wastewater (Aquatic Biology Lab). The laboratories are also engaged in studies to improve the quality of drinking water, and in researching new and improved water treatment processes.

### Water Quality

During Fiscal 1983, Philadelphia water met or exceeded all physical, chemical, radiological and bacteriological water quality standards established by the United States Environmental Protection Agency (USEPA) under the Safe Drinking Water Act (SDWA).

Drinking water is monitored in order to insure the highest quality water every day of the week. Samples are collected from over seventy (70) fixed sampling points throughout the City, from the Samuel S. Baxter, Queen Lane, and Belmont Water Treatment Plants, from Roxborough, East Park, and Oak Lane reservoirs, and from the Somerton, Fox Chase, and Roxborough supply tanks. Selected samples are tested for over 60 parameters, which include taste and odor, chlorine, pH, hardness, clarity, nutrients, metals, radioactivity, organics, and microbiological activity. Over 20,000 samples are collected over the course of the year resulting in over 100,000 analytical results.

Reductions in pH and chlorine concentration, changing the points of chlorination and ammoniation, and the use of alternative disinfectants such as chlorine dioxide have been effective in reducing trihalomethanes. In Fiscal 1983, trihalomethane levels were reduced 9% at Belmont WTP, 13% at Queen Lane WTP and 32% at Torresdale WTP compared to Fiscal 1982.

## Projects Section

The Projects Section is charged with conducting research and planning activities related to water and wastewater quality, developing programs for orderly dissemination of information developed in the laboratories, working with Water and Wastewater Laboratories in responding to water quality complaints from customers and other related issues.

A major emphasis of this Section in Fiscal 1983 was the initiation of the Taste and Odor project to assess the nature and extent of taste and odor problems in Philadelphia drinking water and to recommend strategies for improvement.

In cooperation with Torresdale Water Treatment Plant personnel, two pilot filters were set up at the plant with dual filtering media. The purpose of this project is to determine whether it is to the Department's financial benefit to replace convention sand media with a dual sand, anthracite media. Results indicated that filter runs for dual media averaged from 1.3 to 4 times as long as conventional sand media.

## Quality Assurance Section

The Quality Assurance Section develops programs for quality assurance procedures for use in all our laboratories, provides technical supervision for drinking water treatment plant laboratories, assesses the technical performance of these laboratories and monitors the safety procedures in the laboratories and field sites.

## Materials Testing Laboratory

During Fiscal 1983, the Materials Testing Laboratory tested 11,818 samples, requiring a total of 181,503 tests. The Water Department, by submitting 9,659 samples requiring 148,829 tests accounted for 82% of the laboratory's workload. The departments of Streets, Public Property, Commerce, Procurement and Recreation submitted 2,159 samples, accounting for the remaining 18% of the output.

Approximately 76% of the Laboratory's total output was performed by the Physical Testing Section of the Materials Testing Laboratory, which is responsible for the physical and mechanical testing of concrete, soil, metals and other materials submitted generally from construction projects throughout the City.

Of the 150 concrete cylinders processed each day, 75 to 100 were tested in compression. Field testing requests increased not only because the lab procured additional nuclear density and paint thickness gauges but also because the Physical Testing Section attempted to decrease response time for appointments from 1 day to 3 hours.



*View of Fairmount Water Works in foreground and Philadelphia Museum of Art as seen from west bank of Schuylkill River.*

### **Restoring the Fairmount Waterworks**

The Fairmount Waterworks, as it exists today, reflects the evolution of this major Philadelphia landmark over a period of 165 years. The facility, which provided a municipal water supply for a young and growing city, was constructed in the early 1800s and is a classic example of the Greek Revival style architecture of the period. The purpose of the Waterworks was to house pumps which would draw water from the Schuylkill River and raise it to reservoirs located on "Faire Mount," now the location of the Philadelphia Museum of Art. From there the water could flow by gravity to the residents of the city. In its totality, the Waterworks was steeped with architectural richness and technical vitality which enjoyed international acclaim.

The Waterworks went through several technical renovations in its nearly 100 years of operation. Originally utilizing steam engines to pump the water, the Waterworks ran its technical course by changing to water wheels and finally to turbines to supply the power needed to elevate the water to the reservoirs. When the Waterworks ceased operation in 1909, the buildings were subsequently modified to incorporate a variety of uses unrelated to their original function, including an aquarium and swimming pool.

It wasn't until September 1979 that the City started seriously examining ways of restoring the Waterworks. The Water Department took the leading role with this endeavor and contracted with an architectural and planning firm to do an Adaptive Reuse Feasibility Study. This study was completed by September 1981, and one of the more interesting concepts was the installation of hydropower units throughout the below-grade area. This type of reuse was attractive since it would generate revenues that could possibly fund the restoration of the buildings above grade. Other suggested reuses were a restaurant, a catering service, a health club, museum, and a chapel. Although these ideas were all acceptable, they could hardly provide the estimated 10 million dollars in revenues to cover the

total restoration costs. Therefore, hydropower became the focus of the Water Department's efforts.

On May 1, 1981 the City of Philadelphia was issued a preliminary permit by the Federal Energy Regulatory Commission (FERC) to study the feasibility of the site. The permit was given to the City under municipal preference since there were competing applications for this site.

By February 1982, the Department had entered into an agreement with a consulting engineer to provide engineering services in the performance of an economic feasibility and preliminary design study for the hydroelectric potential at Fairmount Dam. Of the various turbine locations examined, the New Mill House area was chosen in the final report issued in September of 1982. The location, which originally housed turbines from 1861-1909, was the most economical to utilize. The new turbines could be retrofitted easily within the original structure. The existing tail races could be again utilized and the original forebay re-excavated. After examining various turbine scenarios, a two turbine design was suggested that would have an installed capacity of 2000 kilowatts. Fish ladders and downstream fish passages were also included in the engineering design. From a design standpoint, the project would be feasible as well as compatible with the overall restoration effort.

One of the more difficult and uncertain parameters needed for this type of evaluation was the selling price of the energy produced. The energy could be sold either to the Philadelphia Electric Company or directly to the Art Museum at an estimated price of from 5 to 7¢ per kilowatt hour. At these prices, the estimated \$8 million in capital investment is attractive only with the numerous tax incentives available specifically to the private sector. Because the low-head hydropower project appeared to be feasible with these tax incentives, the City applied for a license to develop the site from the FERC on July 31, 1983. Shortly thereafter, the Water Department began drafting a formal "Request for Proposal" which will be used as a basis for eventually awarding the hydropower site to a developer.

# Financial and Management Services

## Finance

The Finance Division was created in April 1982 by joining the Fiscal and Management Units which previously came under the Administrative Division. The division is responsible for the development of water and wastewater revenue requirements and rates, the preparation and control of the capital and operating budgets, the management of capital financing programs, the conduct of internal audits and management productivity studies, the administration of customer revenue and conservation oriented rate programs, the general accounting of operating and capital funds, and the maintenance of the inventory control, functionalized cost and fixed asset accounting systems.

During Fiscal 1983, the addition of the Audits and Special Studies Unit led to a comprehensive study of interfund charges, computerization of Authorized Position Lists and Vacancy Reports, and a study of the Meter Shop Incentive Plan. Work also began in 1983 on the consolidation of inventory storerooms and plans were made to combine the Water Fund and Sewer Fund beginning with Fiscal Year 1984.

Because of limited space, the complete 31 page financial report cannot be reproduced here. However, three schedules on the following pages present the reader with an understanding of the magnitude of the Fiscal operation.



*Michael Augustyn, Safety Officer, (left) and Martin Goldberg, Industrial Waste Unit, discuss procedures for operation of meters that measure explosive gases and levels of oxygen and hydrogen sulfide.*

## Personnel Programs

Because of plans for expansion and automation of Water Department plants, the selection and training of its employees assumed an increasing importance to efficient operations.

**New Engineers:** During the Winter-Spring recruiting season of 1982-83, a record number of engineering students indicated interest in being interviewed for employment as Graduate Engineers. From the 561 students who signed up for interviews, 220 with the most related interest and highest grade averages were selected for interviews and testing. As a result, 18 Graduate Engineers were appointed during the fiscal year.

**New Classes:** Seven new professional classes were established during the year; Aquatic Biologist III, Utility Financial Information Officer, Utility Library Technician, Utility Maintenance Operations Manager, Utility Accounting Manager, Revenue Requirements and Rates Manager, Industrial Wastes Control Supervisor and Word Processing Supervisor II.

**Training Programs:** To add specialized knowledge and to widen management's outlook, 70 employees took 17 courses in subjects such as:

|                          |                      |
|--------------------------|----------------------|
| Storm Sewer Design       | Boiler Efficiency    |
| Modern Practice of       | Practical Hydraulics |
| Gas Chromatography       | Workshop             |
| Quality Assurance of     | Budget & Finance     |
| Chemical Measurements    | Public Works         |
| How to Organize and      | Centrifugal Pump     |
| Manage a Preventive      | Maintenance          |
| Maintenance Program      | Auto Temp Control    |
| Secondary, Tertiary, and | Seminar              |
| Toxics Treatment         | Urban Stormwater     |
| Water Loss Reduction     | Seminar              |
| Seminar                  | Centrifugal Pump     |
| Water Loss Reduction     | Seminar              |
| Seminar                  | Hazardous Chemical   |
|                          | Seminar              |

**Sick Leave:** Use of sick leave was reduced to 10.63 days per year per employee, 5.8% below the previous year's rate of 11.29.

**Safety:** The Safety Office provided training for 1,062 employees in eight courses on Solvent Handling, Construction Safety, Confined Space Entry, Eye Protection, Fire Prevention and Suppression, First Aid, Safe Lifting, and Industrial Fire Safety.

The number of disabling injuries per million manhours worked rose to 46.44 from 44.56 and the severity rate, the number of days lost due to these injuries, remained the same. Motor vehicle accidents increased to 185 from 164, despite the fact that the number of miles driven increased by only 1%.

# City of Philadelphia Water Department — Administering The Water and Sewer Funds

CONSOLIDATED SUPPLEMENTAL SCHEDULE OF RATE COVENANT COMPLIANCE  
FOR THE FISCAL YEAR ENDED JUNE 30, 1983 (Amounts in Thousands of Dollars)  
(Legally Enacted Basis)

| LINE NO. |   | 1983             | 1982             |
|----------|---|------------------|------------------|
|          | PROJECT REVENUES:   |                  |                  |
| 1        | Water   | \$ 72,838        | \$ 67,987        |
| 2        | Wastewater  | 130,787          | 98,770           |
| 3        | Total   | <u>203,625</u>   | <u>166,667</u>   |
|          | OPERATING EXPENSES:   |                  |                  |
| 4        | Water   | 55,982           | 47,233           |
| 5        | Wastewater  | 46,035           | 53,304           |
| 6        | Total operation and maintenance expenses                                    | 102,017          | 100,537          |
| 7        | Less — interdepartmental charges  | (8,953)          | (8,622)          |
| 8        | Net operating expenses  | <u>93,064</u>    | <u>91,915</u>    |
| 9        | Net earned project revenues   | 110,561          | 74,752           |
| 10       | Unencumbered funds available for appropriation at beginning of fiscal year  | 7,413            | 216              |
| 11       | Adjusted net project revenues   | <u>\$117,974</u> | <u>\$ 74,968</u> |
|          | DEBT SERVICE:   |                  |                  |
|          | Revenue bonds debt service:   |                  |                  |
| 12       | Principal   | \$ 8,730         | \$ 6,695         |
| 13       | Interest  | 60,431           | 47,520           |
| 14       | Less — interest capitalized   | (22,315)         | (21,569)         |
| 15       | Total revenue bonds debt service  | 46,846           | 32,646           |
|          | General obligation bonds debt service:                                      |                  |                  |
| 16       | Principal   | 14,466           | 14,658           |
| 17       | Interest  | 6,080            | 6,635            |
| 18       | Total general obligation bonds debt service                                 | <u>20,546</u>    | <u>21,293</u>    |
| 19       | Total debt service  | <u>\$ 67,392</u> | <u>\$ 53,939</u> |
|          | OTHER CHARGES:  |                  |                  |
| 20       | Interdepartmental charges   | <u>\$ 8,953</u>  | <u>\$ 8,622</u>  |
| 21       | Total revenues and beginning unencumbered balance (Line 3 + 10)             | <u>\$211,038</u> | <u>\$166,883</u> |
| 22       | Total operating expenses, debt service and other charges (Line 8 + 19 + 20) | <u>169,409</u>   | <u>154,476</u>   |
| 23       | Net unapplied project revenues  | 41,629           | 12,407           |
| 24       | Funds transferred to General Fund   | 4,994            | 4,994            |
| 25       | Unencumbered funds available for appropriation at end of fiscal year        | <u>\$ 36,635</u> | <u>\$ 7,413</u>  |

Editor: Robert F. Walker

Design and Photography:  
Robert F. Walker  
Bernard Rosenberg

BACK COVER: This eight foot diameter diversion flume, installed in January 1983, is shown being removed in January 1984. The flume enabled the contractor to construct a massive junction chamber, forty feet deep around the existing Upper Delaware sewer at the Northeast Plant.

# City of Philadelphia Water Department — Administering The Water and Sewer Funds

CONSOLIDATED SUPPLEMENTAL SCHEDULE OF RATE COVENANT COMPLIANCE  
FOR THE FISCAL YEAR ENDED JUNE 30, 1983 (Amounts in Thousands of Dollars)  
(Legally Enacted Basis)

Pursuant to Section 4.03(b) of the General Water and Sewer Revenue Bond Ordinance of 1974 (Bill No. 1263), the City is required to impose, charge and collect in each Fiscal Year Rates and charges at least sufficient, together with that portion of the unencumbered amount of the operating funds balances available and reserved for appropriation for the payment of Operating Expenses at the commencement of such Fiscal Year, which together with all other project revenues to be received in such Fiscal Year, shall equal not less than the greater of:

- A. The sum of:
  - (i) all Net Operating Expenses payable during such Fiscal Year;
  - (ii) 150% of the amount required to pay the principal of and interest on all Bonds issued and outstanding hereunder which will become due and payable during such Fiscal Year; and
  - (iii) the amount, if any, required to be paid into the Sinking Fund Reserve during such Fiscal Year; or
- B. The sum of:
  - (i) all Operating Expenses payable during such Fiscal Year; and
  - (ii) all Sinking Fund deposits required during such Fiscal Year in respect of all outstanding Bonds and in respect of all outstanding general obligation bonds issued for improvements to the water or sewer systems and all amounts, if any, required during such Fiscal Year to be paid into the Sinking Fund Reserve.

Coverage is computed as follows:

| Coverage A | 1983          | 1982          |
|------------|---------------|---------------|
| Line 3     | \$203,625     | \$166,667     |
| - Line 8   | (93,064)      | (91,915)      |
| + Line 10  | <u>7,413</u>  | <u>216</u>    |
|            | 117,974       | 74,968        |
| ÷ Line 15  | <u>46,846</u> | <u>32,646</u> |
| = Coverage | 2.52x         | 2.29x         |
| <br>       |               |               |
| Coverage B | 1983          | 1982          |
| Line 3     | \$203,625     | 166,667       |
| - Line 6   | (102,017)     | (100,539)     |
| + Line 10  | <u>7,413</u>  | <u>216</u>    |
|            | 109,021       | 66,346        |
| ÷ Line 19  | <u>67,392</u> | <u>53,939</u> |
| = Coverage | 1.62x         | 1.23x         |

## Water and Sewer Funds Assets Fiscal Years Ended June 30, 1983 and 1982

|                                  | (In Thousands)   |                  |
|----------------------------------|------------------|------------------|
|                                  | 1983             | 1982             |
| Current Assets                   | 115,926          | 97,362           |
| Restricted Assets                | 194,020          | 176,004          |
| Property, Plant<br>and Equipment | <u>1,133,403</u> | <u>1,012,797</u> |
|                                  | 1,443,349        | 1,286,163        |

## Water and Sewer Funds Liabilities and Fund Equity Fiscal Years Ended June 30, 1983 and 1982

|                       | (In Thousands) |                |
|-----------------------|----------------|----------------|
|                       | 1983           | 1982           |
| Current Liabilities   | 82,976         | 89,024         |
| Long Term Liabilities | 859,965        | 730,147        |
| Fund Equity           | <u>500,408</u> | <u>466,992</u> |
|                       | 1,443,349      | 1,286,163      |

