City of Philadelphia

WATER DEPARTMENT

BIENNIAL REPORT

July 1, 1969 to June 30, 1971

Terms Ended Jan. 3, 1972

JAMES H. J. TATE
Mayor

FRED T. CORLETO
Managing Director

SAMUEL S. BAXTER
Commissioner

Terms Began Jan. 3, 1972

FRANK L. RIZZO
Mayor

HILLEL LEVINSON
Managing Director

CARMEN F. GUARINO
Commissioner

City of Philadelphia

WATER DEPARTMENT

BIENNIAL REPORT

For the Two Fiscal Years from

July 1, 1969 to June 30, 1971

WATER DEPARTMENT

SAMUEL S. BAXTER (Ret. 1/3/72)
Commissioner and Chief Engineer

CARMEN F. GUARINO (Apptd. 1/3/72)
Commissioner

WATER OPERATIONS

CHARLES E. VICKERMAN
Deputy Commissioner
Water Operations

Multi-Division Chiefs

ELWOOD L. BEAN (Ret. 3/31/71)
Water Treatment

*ALAN HESS
Water Treatment

**AZAD ATTARIAN
Water Operations Services Manager

Division Chiefs

ELMER GOEBEL (Ret. 1/26/71)
Distribution

RICHARD SUPPLEE
Distribution

VICTOR A. PAGNOTTO
Load Control Center

HENRY F. KALINOSKI
Pumping

JAMES A. KENNY
Customer Service

GEORGE X. BEY
Water Main Records

WILLIAM SNYDER
Automotive Maintenance

ADMINISTRATIVE SERVICES

***B. BARNEY PALMER
Administrative Services Director

Assistants

FLOYD PLATTON
Personnel Officer

JACOB BALK
Meter Shop

FISCAL SERVICES

LEIGH B. HEBB
Chief, Fiscal Division

WATER POLLUTION CONTROL

CARMEN F. GUARINO (Until 1/3/72)
Deputy Commissioner
Water Pollution Control

Multi-Division Chiefs

†GEORGE W. CARPENTER
Wastewater Treatment

††RICHARD S. STARR
Sewer Collector System

Division Chiefs

WALTER YOKA
Sewer Maintenance

FAULKNER EDMONDS
Drainage Information

ENGINEERING

COMMISSIONER BAXTER (Ret. 1/3/72)
Chief Engineer

†††JOHN BRIGGS
Assistant Chief Engineer

Division Chiefs

KENNETH J. ZITOMER
Design

WALTER H. CLARK
Construction

KUMAR KISCHINSCHAND
Materials Testing Laboratory

JOSEPH RADZIUL
Research and Development

COMMISSIONER'S STAFF

SAMUEL J. SCHWARTZ
Assistant

RAYMOND J. HARRIS
Administrative Assistant

ROBERT F. WALKER
Executive Assistant

* Sub Chiefs: Edward Shervin, Delaware Filters; Hugh Hanson, Schuylkill Filters; and Water Quality Control, Charles Pierce (Schuylkill), and Gerald Creighton (Delaware).

** Coordinates Water Operations office, Water Main Records, Customer Service, Automotive Maintenance, and Building Maintenance.

*** Other Assistants: Joseph A. Duffy, Management Studies; John T. Cappio, Safety Officer.

† Sub Chiefs: William Wankoff, Northeast Plant; Charles Grandy, Southeast Plant; Robert Sharpe, Southwest Plant; Stanley Cywinski, Maintenance; William Barnes, Interceptors; and Ralph Bruno, Electrical Services.

†† Coordinates Sewer Maintenance, Drainage Information, and Sewer Inlet Cleaning.

††† Sub Chiefs: Julian Richter, Projects Control; Thomas Smith, Water and Sewer Systems Planning.

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PLEASE NOTE

The calendric abbreviation "1969-71" will be used throughout this report to denote the two fiscal years from July 1, 1969 to June 30, 1971.

BY SAMUEL S. BAXTER, *Commissioner and Chief Engineer*

The View from 1971

20 YEARS BEFORE AND 20

MOST recent annual reports of this department have not contained signed articles. As twenty years of experience as the "Water Department" (under the Home Rule Charter) come to an end, a short look backward, and a longer look ahead would seem desirable from one who has managed the department during this twenty-year period.

In the long continuous history of water service, dating back to 1799, – in the history of sewer service beginning in the middle of the 19th century, and in the history of sewage treatment beginning about 60 years ago – one continual thread runs. It is the story of outstanding accomplishments, followed by periods of deterioration or inaction, repeated in cycles of varying lengths of time.

In nearly all cases, the deterioration or inaction was not caused by lack of technical competence or willingness to produce by the engineers charged with the work. It was caused in these cases by a lack of funds to provide for new facilities and methods, and for the renewal of worn out equipment and structures. Available funds were used for other projects which seemed to be at the time more needed or more glamorous.

At the very beginning of its history, water service was faced with problems because the initial bond issue was not fully subscribed. Joints in wooden water pipes swelled because water was not available, and this problem plagued the distribution system for 30 or more years until wooden pipes were replaced with iron.

In the 1890's a water system which had been reasonably good for its times was allowed to deteriorate to such a degree that even dirty water was scarce, and the manager pleaded without success for funds to keep his pumps in operation.

When the first filter plants were built in the early 1900's, they were hailed as the engineering marvels which they were. Philadelphia had the largest filter plants in the U. S. and was the first large city to chlorinate water. But only 10 years later, after he had resigned, the Chief Engineer wrote bitterly of his experience in failing to obtain enough money to properly maintain and operate these fine facilities.

In the field of sewage treatment, the city's research and engineering report completed in 1914 heralded a fine start in the program to remove pollution from our rivers. But the fine report was not matched by adequate provision of funds, and three decades passed

YEARS AFTER

before any real progress was made on this program.

In recent years, the self-sustaining features of the Home Rule Charter have made it possible to provide funds from service charges to press ahead on a program to make up for lost time. In these twenty years, new water treatment plants have been built, treatment plants to handle all sewage have been built, other facilities have been modernized, and a start has been made on the huge program of renewing old water and sewer lines.

All of this has happened because of a combination of favorable circumstances — sufficient appropriations by the Council—and a willingness of citizens to pay the service charges for the work.

If the progress of the past 20 years is to continue, there must not be a repetition of what has happened many times in the past. Continual maintenance and upkeep of existing facilities are needed. Old structures and equipment must be replaced, and there will be the everlasting need to provide new and modern facilities to meet the requirements of the future.

In the near future, there is the need to upgrade sewage treatment plants as required by state, regional, and federal regulatory agencies. The date for completion of this work as fixed by these agencies is October 1977, and the present estimate of cost is $235 million. Some of this capital money will come from Federal and State grants, but the cost of amortizing the city's share and the increased operating costs will at least double the present sewer rents.

Beyond the present requirements for sewage treatment, the environmental trends and demands of the future will probably call for such procedures as tertiary treatment, recycling, and removal of heavy metals, phosphorous, nitrogen and other materials. The cost of these items cannot be accurately estimated at this time, but it will be interesting to see if citizens are willing to pay the additional costs for these environmental improvements which they have presumably demanded.

The new water treatment plants built in recent years should provide adequate water of high quality for at least the next 20 years. This will only be possible, however, if adequate funds are made available for replacement of equipment, adequate maintenance,

and the installation of new methods which may be developed within the remaining years of this century.

Bacterial contamination of water has been eliminated. There will be a continued demand to improve quality in many parameters, and especially those which are included in the terms taste and odor. Research is under way to determine if viruses are present in water in forms which may cause disease. If this is determined affirmatively, many new facilities will be needed.

Water pipes are in service which were installed as far back as 1825, and many miles of sewer are more than 100 years old. In the decade of the 1880's, 176 miles of sewer were built, and these will be 100 years old in the next 10 to 20 years. Some work on the replacement of these lines has been done in recent years, but the program must be accelerated to keep pace with deterioration. Coupled with the replacement program of water lines is the need to continue the cement lining of many existing water lines.

High on the list of new programs which should come into being in the near future is the transfer of responsibility of water service lines and sewer laterals from the individual property owner to the Water Department. This has been discussed for over 50 years. There are practical and financial reasons for this change. It will permit orderly replacement of worn out facilities, and will eliminate the substantial charges which customers must pay when lines need renewal. It will replace these charges with a small annual charge in the water and sewer rents of all customers.

Illegal use of hydrants is a nuisance problem, but one of real importance. Future years will require a change in the attitude of citizens towards this improper practice, or substantial funds to provide equipment to prevent this type of use.

In addition to replacement of old sewers because of structural reasons and age, the sewer program which uses the term "flood relief" needs early attention. Many large sewers built 50 or more years ago were designed with the thought that large areas in the drainage basin would stay open and unimproved. Instead some areas are almost 100% impervious, and the main sewers become overcharged during intense storms, and cause flooding and damage to property. The cost of enlarging existing sewers, or building parallel relief sewers is tremendous. Although $30 million has been spent in the past 25 years for this work, the additional work which is required is estimated at close to $100 million.

The Water Department should continue to stress efficiency. The department has been among the leaders in studying, designing and installing automatic and computerized operations of all kinds. These operations are being used more and more in the water and sewer utility field. Continued emphasis on this type of work will be needed in the immediate future years.

While every employee, from the laborer to the chief engineer, plays a necessary part in the work of the department, the increased technology in all fields of operations will require from employees more training and more education. Some of this will come during school and college years, and more of it will be needed during working years. For some specialties, it may mean sending employees to training courses and to colleges for extended periods of time, with the employer paying expenses and salaries.

Efficiency, however, depends on more than computers and trained employees. It also depends on sound organization.

The Philadelphia Water Department is a large public utility. It is important that it be allowed to operate with the freedom required to meet the demands, and give the service, of such a utility. Under the Home Rule Charter for the past 20 years, the relation between the Manager of the Water Department, and the City Council, Chief Executive Officer of the City, and other department heads has been generally excellent. Where differences have occurred, they have been settled without serious effect on the operation of the Water Department.

The abuses which existed in some municipal governments many years ago caused restrictions to be placed on departmental operations. These applied particularly to personnel, contract procedures, and finance. While desirable and necessary at the time, the restrictions have led to procedures and methods which are not compatible with the modern tempo of life. This is particularly so in the case of service utilities, such as the Water Department, where speed and flexibility of operation are necessary to meet the needs and demands of customers. Changes in these restrictive procedures would seem to be desirable in the future operations of the Water Department. Some of these changes have already been made effective by administrative understandings, but more formal action is desirable.

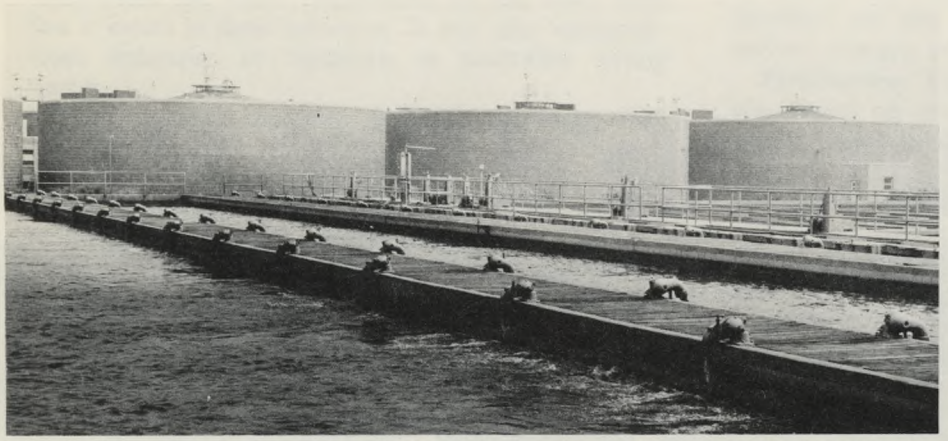
The Water Department is both public utility and City Government department. Because it is more than a department, suggestions have been made, from time to time, than an authority be created to operate the water and sewer functions. In fact, the Home Rule Charter contains a specific provision that permits and governs the creation of an authority.

The opinion of the present management is that the Water Department can continue its operations satisfactorily as a regular city department, provided that the administrative and legal requirements are suitable. This means that the department should be able to operate with the freedom needed to meet its own requirements and those of its customers.

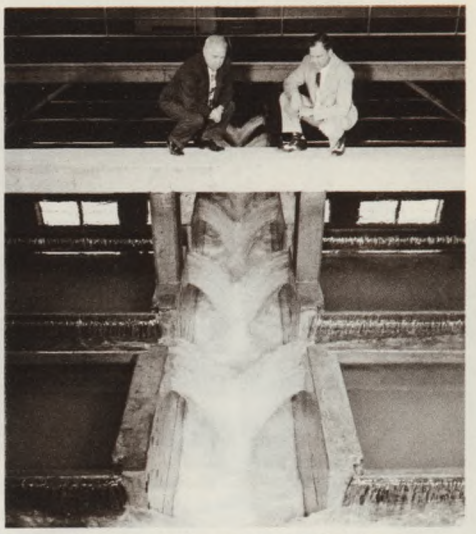
In the end, it is the customer we must satisfy. Customers of all public utilities demand more than ever a high degree of service and reliability. One of the most important problems of the future for the Water Department is how to continue to provide and improve this service, and, at the same time, function within the governmental structure of the city.

The answer to this is clear. If Philadelphia does not repeat the neglect of the past—if public interest remains strong—if the water and wastewater systems are supported with adequate funds—our citizens will enjoy even better water and sewer service in the future. The *next* 20 years will test our endurance as well as our vision.

In Coming Years Our City Should . . .

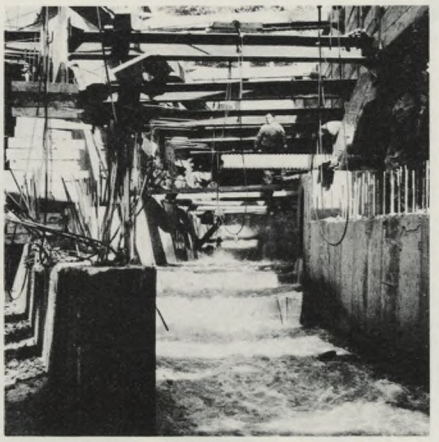


. . . Expand Its Wastewater Plants to Protect Streams

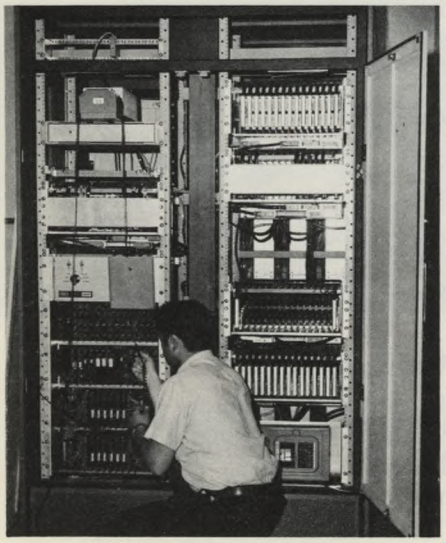


. . . Further Improve Its Drinking Water

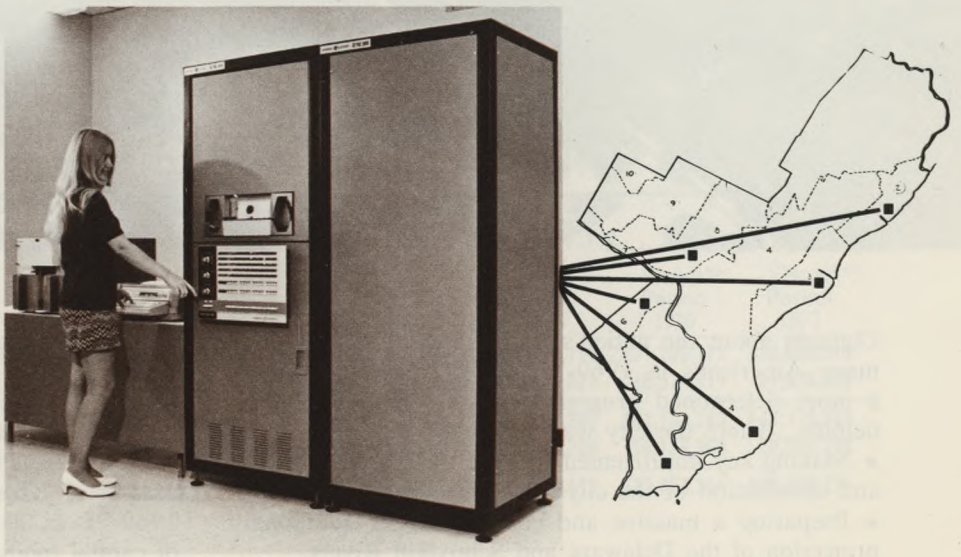
. . . Replace Hundreds of Miles of Old Deteriorating Water Mains and Sewers



. . . Provide More Relief from Storm Flooding

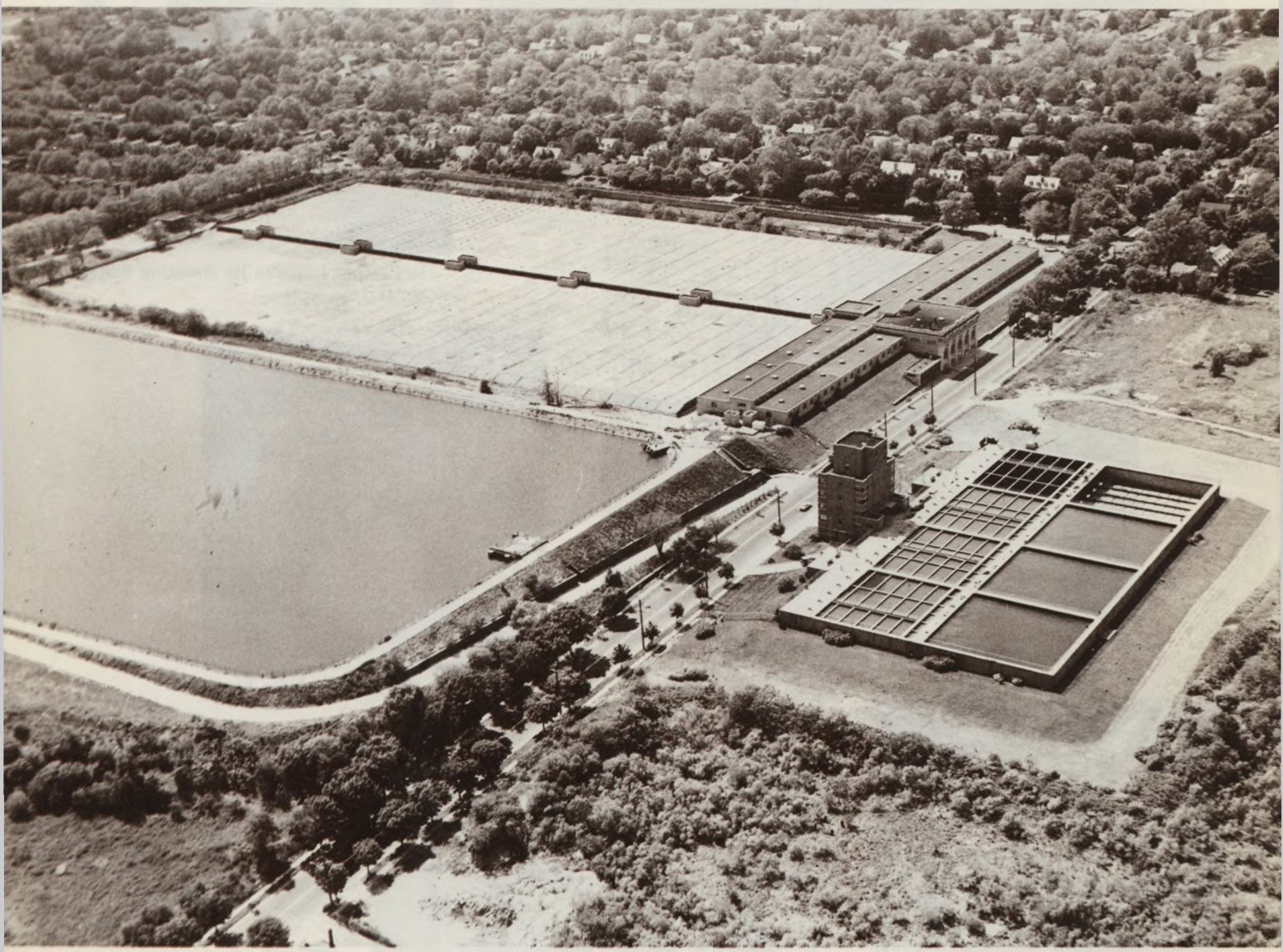


. . . Help Professional Personnel Keep Abreast of New Technologies



. . . Bring Its Water and Wastewater Systems under Computer Control

Highlights of 1969-1971



Concern about the nation's water supplies was felt by many Americans in 1969-71, but nowhere was there a more determined program of action than in Philadelphia. There the city water planners were—

- Making key improvements to the treatment, storage, and distribution of the city's drinking water,
- Preparing a massive and costly plan for additional protection of the Delaware and Schuylkill Rivers.

Water Service

Much had already been done to improve the city's water service. Since the 1950's, Philadelphia had created a network of modern treatment plants, pumping stations, reservoirs and mains, and these were supplying finer water in abundant flows and at adequate pressures. This work continued during the biennium 1969-71, as the Water Department invested $12 million of capital funds in the water system.

Thus at the Queen Lane Water Treatment Plant, the department—

- Put into service a new building, with automated equipment, for the storage and application of chemicals as part of water purification,
- Built several new basins as part of a covered reservoir for the storage of 50 million gallons of purified water,
- Bored two-thirds of a 6,000-ft. water tunnel to supply the plant with river water.

Taken together, the new Queen Lane facilities will upgrade the quality and enlarge the quantity of water available to Philadelphians living between Broad Street and the Schuylkill River. Their combined cost will be $7 million.

In addition, the department—

- Began to operate a new computer at its Microwave Center to monitor distant water pumping stations and reservoirs,
- Built 38 miles of water mains to supply homes and businesses in all parts of the city,
- Inaugurated water service to Bucks County, with the completion of a $1 million water main in State Road.

The new service to Bucks County represented the first sizable sale of Philadelphia water outside the city limits and a new step towards regional cooperation.

Stream Protection

Of all the urgent concerns, the need for future stream protection was greatest. To meet this need, the Water Department was readying its biggest program to date.

Costing up to $235 million, the plan calls for the expansion of the three plants that treat the city's sewer-borne wastes. To these plants will be added new aeration and settling tanks and other modern equipment.

Built under a pressing timetable, the new facilities are scheduled to be completed by late 1977 and they will provide fuller treatment of wastewater. As a result, the city's pollution removals (as measured by biochemical oxygen demand) will jump from the present 54% to 85% or 90%.

In January, 1971, the Water Department took its first formal step towards such expansion. It submitted a preliminary engineering plan to the Delaware River Basin Commission, the main regulatory body for the local streams. The plan, covering expansion of the Northeast Plant, will be followed by preliminary and final plans for all the plants.

These plans form another stage in Philadelphia's continuing drive to improve its rivers. Today its "water pollution control" plants, which were completed in the 1950's, treat *all* of its wastewater. Linked to them is an updated network of pumping stations and sewers.

While planning expansion, the Water Department made a number of lesser improvements to its wastewater system in 1969-71. It—

- Built several new facilities for wastewater treatment, including a centrifuge building for sludge dewatering at its Southwest Plant and an incinerator for wastewater skimmings at its Northeast Plant,
- Modernized a building at the Northeast Plant to create a new center for laboratories, offices, and future plant automation,
- Put into service two miles of large tunnel sewers to relieve storm flooding in North Central and Northeast Philadelphia,
- Constructed 25 miles of sanitary and small storm sewers to serve neighborhoods throughout the city.

The value of improvements to the wastewater system was $17.3 million during the biennium, with sewers accounting for most of this.

Other Developments

Vital as were these physical improvements, the Water Department did not rely on them alone. It also looked for other ways to serve its customers and to increase the efficiency of its operations.

One of its most successful efforts was a continuing study of manpower use. Up to June 30, 1971, the department had saved $1.2 million as a result of this study. Sixty-one positions were abolished among maintenance crews and clerical personnel, without a reduction in performance.

During the biennium, the department also—

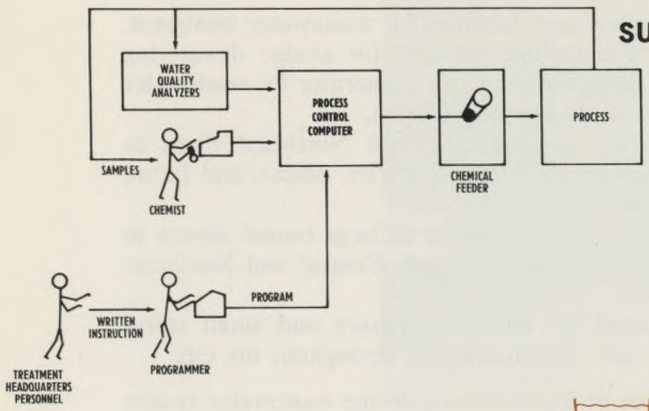
- Completed studies for the automation of two water treatment plants,
- Experimented with new chemicals to improve water treatment,
- Studied the ecological effects of ocean disposal of digested wastewater sludge,
- Made sanitary surveys of rivers and creeks, as a basis for future stream clean-up,
- Cleaned 135,000 sewer inlets throughout the city, thus removing a source of odors, rats, insects, and flooding,
- Tested new devices to prevent the illegal opening of fire hydrants,
- Provided training courses for its employees, and conducted a regional "pilot" course for sewage plant operators at the request of the Federal Government.

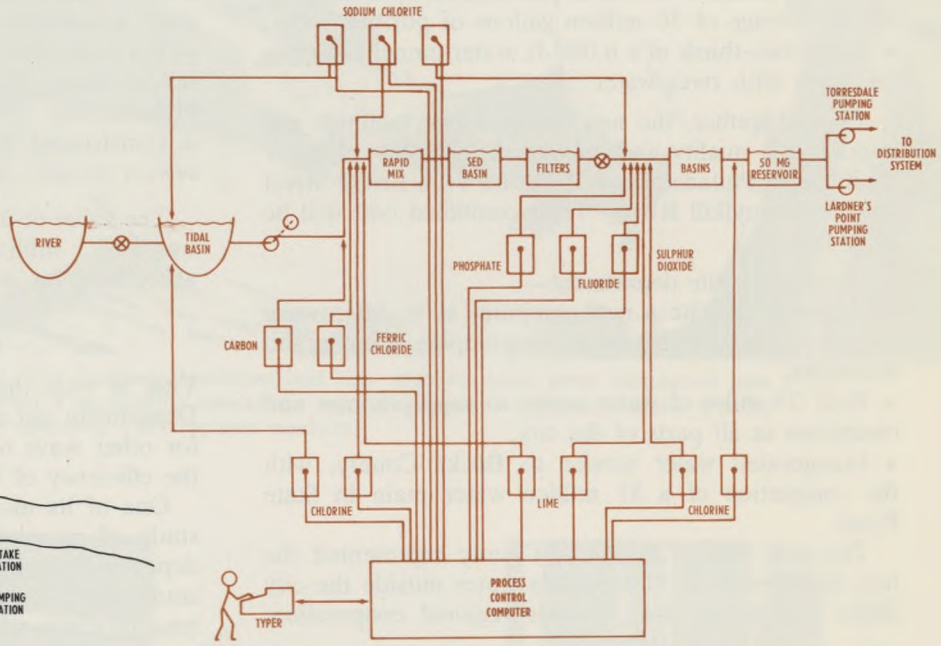
Thanks to the many past improvements, customers were willing to pay for the rising cost of service. Growing debt service and operating costs forced the Water Department to raise its water and sewer rates on July 1, 1970. Water rates rose by 25% and sewer rates by 47%. A new surcharge was also imposed on certain industrial wastes. For the most part, the public quietly accepted the increase.

Once more the American Water Works Association recognized the success of the department in improving its physical facilities, customer services, and public relations. It gave national and state awards to the city.

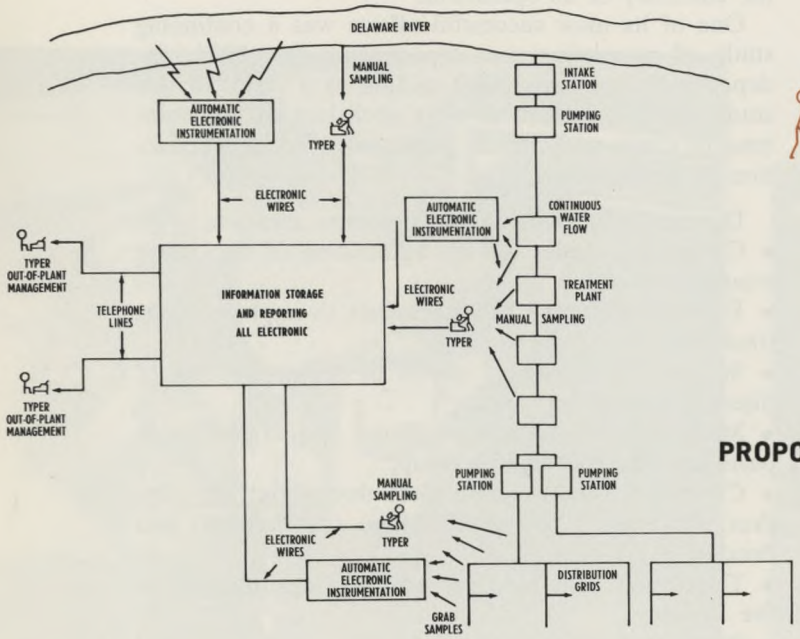
*Future Automation of Torresdale Water Plant

SUGGESTED FUTURE ROUTINE FOR PLANT DOSAGE CONTROL

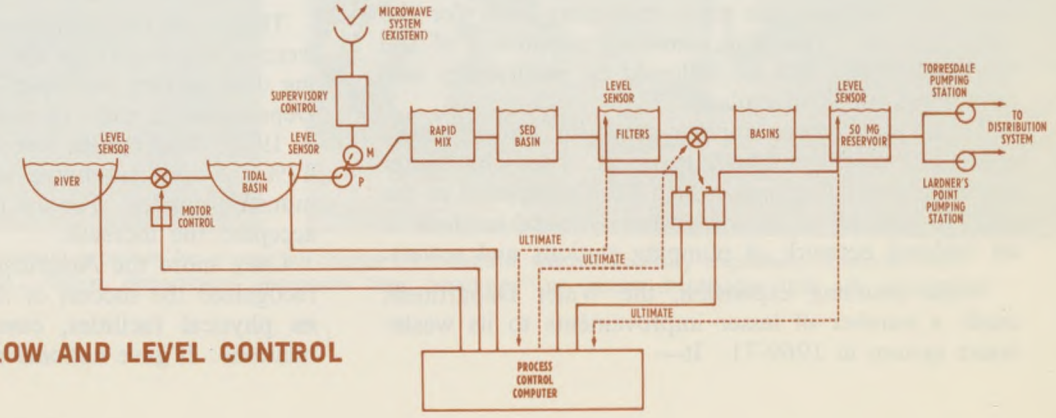




FUTURE CHEMICAL FEED CONTROL



PROPOSED METHOD OF ANALYZING WATER QUALITY, DATA GATHERING AND REPORTING



FUTURE FLOW AND LEVEL CONTROL

*As proposed by the consultants. See page 11.

THE WATER SYSTEM

A PROGRESSIVE WATER SYSTEM

Philadelphia's water system was largely modern in 1969-71. As a result, it offered plenty of water to everyone, and the quality of this water was the best in nearly a century. Water pressures were adequate and delivery was reliable.

As if in response to what was offered them, Philadelphians used more water than at any time in 15 years. They consumed a daily average of 364.3 million gallons.

Fortunately, the water treatment plants had no difficulty in meeting this increased demand. Their rated capacity (480 million gallons daily) was well in excess of public requirements, and their total peak capacity (681 M.G.D.) easily met high hourly and summertime rates.

There were also other factors that enabled the plants to perform well. Constructed in the 1950's and 1960's, they were still comparatively new. Semi-automatic in operation, they provided a variety of treatment steps.

From the plants, the water flowed to consumers via new reservoirs and pumping stations and through a pipeline network which had been extensively improved. Much of this system was operated by "push-button" or microwave controls.

To modernize its water system, the city had spent $181 million of capital funds from January 1, 1946 to June 30, 1969, and, in 1969-71, it did additional construction valued at $12 million.* Other large improvements, costing $42.7 million, were planned to the end of 1977.

*Based on partial and final estimates in the field. The $12 million included $2.7 million for plants and reservoirs, and $7.3 million for mains. In addition, an undetermined amount (close to $2 million) was spent for water mains under sewer contracts. Other water system statistics for the 24 months: 155 contracts, with a limit of $7.6 million, were completed; 209 contracts, with a limit of $14.3 million, were awarded; 58 contracts, with a limit of $10.9 million, were in force on June 30, 1971.

STEPS TOWARDS AUTOMATION

In line with a trend in American industry, the Water Department was moving gradually towards automation. It planned to control, within a few years, the treatment and distribution of water by computer.

1. In the water treatment plants, automation was still being studied. These studies moved rapidly ahead in 1969-71, as a private consultant** examined operations at the Queen Lane and Torresdale Plants, and outlined plans for future automation. By mid-1971, a final report on the Torresdale Plant had been completed and the final report on Queen Lane was being drafted.

Typical of future plans for all the plants, the Torresdale study recommends the use of a "process control" computer. Among other things, this computer would (1) regulate water flows and levels throughout the plant, (2) monitor the functions of valves, chemical applicators, and other automatic equipment, (3) adjust the dosages of chemicals applied to water, (4) start the washing of filter beds, (5) receive and use water quality analyses transmitted by monitoring instruments situated along the river, (6) maintain a preventive maintenance file for plant equipment, and (7) do reports.

Automation, it is believed, will make possible precise regulation of water quality, as well as savings in chemicals and manpower.

2. The department began to computerize water distribution. After more than a year of testing, a new digital computer went into service at the Microwave Center in June, 1970.

The computer immediately monitored more than 100 field points, located at water pumping stations, reser-

**General Electric Company, Re-entry and Environmental Systems Division. This firm also completed an automation study of the Belmont Water Plant in 1967.

voirs, and large mains. Receiving a steady flow of data by microwave, it recorded and digested the information for center operators. This data included water flow rates, pressures, and elevations, as well as the "status" of equipment.

A solid-state complex, the computer is capable of monitoring up to 200 field points. Eventually, it will also perform a function now performed by Microwave Center operators—the remote control of pumps and valves at distant pumping stations and reservoirs. It will also speed up the department's response to emergencies.

To prepare for such computer control, the department eliminated the remaining vacuum-tube devices throughout the microwave system in 1968 and 1969. It replaced them with new multiplexing equipment, transmitters and receivers of the solid-state type. Situated at the Microwave Center and eight transmitting towers, the new solid-state devices make maintenance easier and increase operating efficiency.

The combined cost of the computer and solid-state equipment was $465,000.

THE QUEEN LANE PLANT: $7 MILLION OF IMPROVEMENTS

Modern in equipment and structure, the water treatment plants required few physical additions. Nevertheless, some changes were being made at the Queen Lane Plant to assure better service for several hundred thousand customers. The Queen Lane improvements will cost more than $7 million.

New Chemical Building: Completed just in time to meet a serious winter problem was a new chemical treatment building. Put into service in February, 1971, the building, with its advanced equipment, quickly overcame the tastes and odors produced in the Schuylkill River water by a winter thaw.

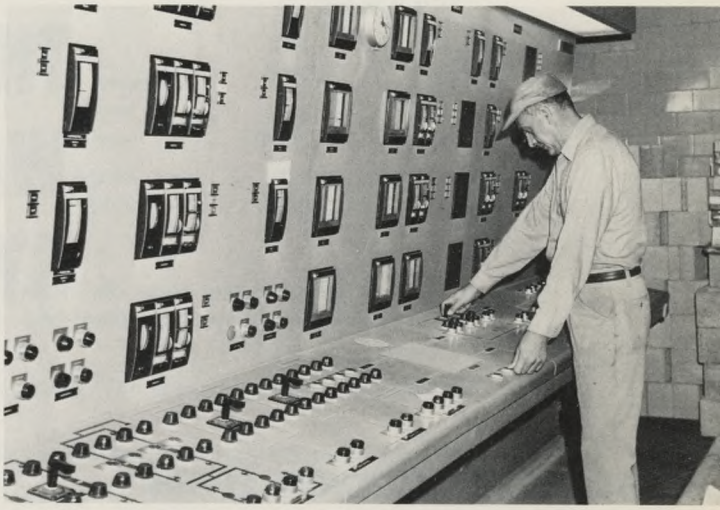
The value of the building, however, was more than seasonal. Erected at a cost of $1.3 million, it will assure a permanent improvement in Queen Lane water.

The new building holds a variety of tanks and pumps for the storage, weighing, measuring and application of five chemicals* as part of water treatment. Controlled from a central panel, the chemical systems are automatic and self-correcting. They will increase the precision and flexibility of chemical treatment both before and after water filtration.

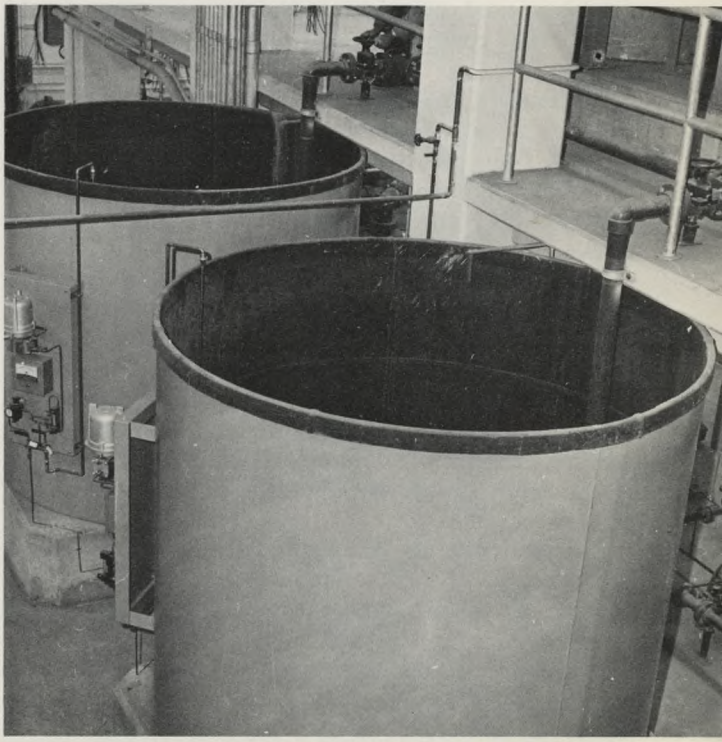
Of special importance to water customers is the ammonia feed system. Although this will not go into operation until a similar system is installed at the Torresdale Plant, it will eventually eliminate chlorinous tastes and odors from the finished water.

The new building is a one-story, light-brick structure, with most of its chemical equipment located in a deep basement. Operated initially by manual controls, the building was switched over to automatic controls in July, 1971.

*Carbon, alum, lime, hexametaphosphate, and ammonia.



Electronic Overseer: This 18-ft. panel made most chemical treatment fully automatic and self-correcting at the Queen Lane Plant in 1971. The panel improves water treatment by regulating chemical storing and feeding devices in a new $1.3 million building.



New Chemical Building: These phosphate storage tanks are monitored by the panel shown in the top photograph. Holding 2,000 gallons each, they form part of the extensive new equipment for holding and applying five chemicals at Queen Lane.

Covered Reservoir: Along with improved chemical treatment, new water storage was being added at the Queen Lane Plant. In May, 1971, the first half of a covered reservoir was put into service.

The reservoir is being formed from 22 abandoned filter beds under contracts totaling $3.5 million. Holding 50 million gallons of purified water, it will provide a protected reserve to meet high summertime and hourly demand of water customers.

Eleven slow-sand beds on the north side were converted to form the first half of the new reservoir. As part of this work, the contractor removed 43,000 cubic yards of sand and gravel, grouted walls and ceilings, cut interconnecting apertures, installed drainage pipes, and built pillars to reinforce the roofing. Sensing devices to measure water level and outflow, and to control by remote signal the rate of filtration in part of the filter building, were also installed.

Conversion of the 11 abandoned beds on the south side was started late in 1970, and will be completed in the autumn of 1972. This conversion will be similar to that on the north side.

The Queen Lane reservoir will be the last in a series of covered reservoirs formed from obsolete filter beds. Within the last nine years, covered basins built at other plants have added 199 million gallons to retention capacity for purified water.

The Federal Government will pay 40% of the cost of the new reservoir at Queen Lane.

Water Tunnel: To meet future needs, a new water tunnel was being bored from the Schuylkill River to the Queen Lane Plant. By mid-1971, about 4,000 feet of the 6,000-ft. tube had been excavated.

Eleven feet in diameter, the tunnel will carry an 8-ft. diameter concrete conduit. Through it will flow up to 150 million gallons of river water daily, pumped by a station at Ridge Avenue and Schoolhouse Lane.

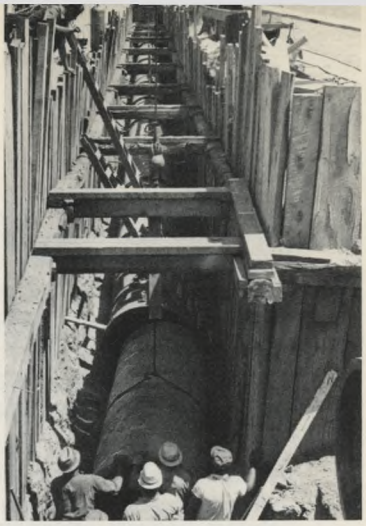
Although the tunnel will be capable of meeting all the water demands of the plant, two existing supply mains will be retained in order to assure extra reserve capacity and to satisfy future growth in demand.

Set at depths of 50 to 100 feet, the tunnel was being cut by a special boring machine. The machine greatly sped up the rate of cutting, eliminated blasting, and provided a smoother bore than would have been possible by conventional methods.

In June, 1971, a contract was awarded for construction of a pipeline loop around the pumping station at the river. The tunnel will be linked to this loop, which will include 1,160 feet of 5-ft. steel pipe. Two 48-inch magnetic flowmeters will measure water flow rates through the loop and transmit them to a panel in the station.

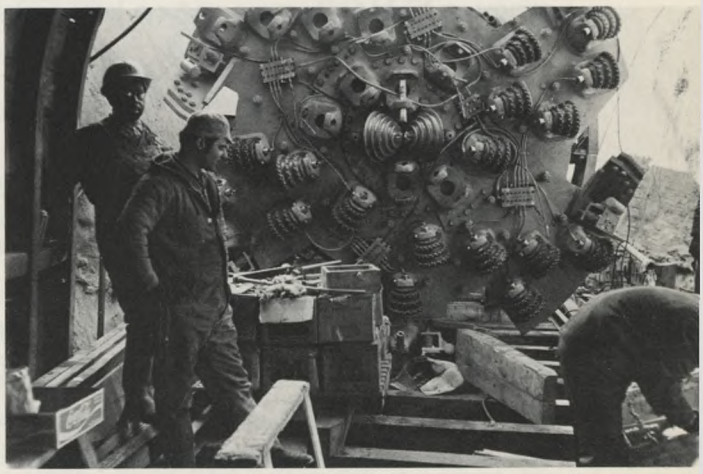
The combined cost of the tunnel and the loop will be $3.4 million, with the Federal Government paying 44% of the cost.

All Plants: Except for the items discussed above, there were no major changes at the water treatment plants. There was much routine replacement of operat-

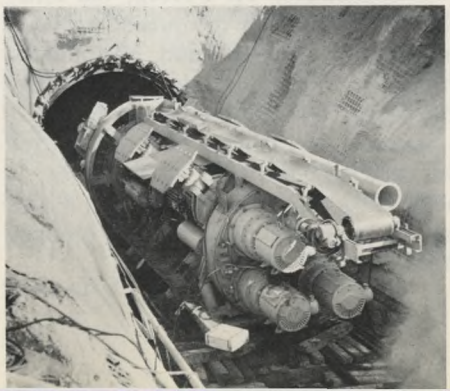


Cleaning: Workmen clean a 4-ft. diameter distribution main outside the filter building of the Queen Lane Plant. The main was afterwards linked to a new covered reservoir.

Covered Reservoir: The photograph shows one of the 22 old filter basins which are being converted into a covered reservoir for purified water at the Queen Lane Plant. The first half of the 50-million gallon reservoir was put into service in May, 1971.



For Faster Tunneling: A rotating cutter head (above) is being set with roller bits of high carbon steel. The cutting machine (shown below) was rapidly boring a 6,000-ft. tunnel to bring river water to the Queen Lane Plant.



ing equipment, however, and plans were being made for future improvements.

Plans included (1) automatic triggering of filter washing by "head loss" (already achieved for some filters), (2) central control of pre-treatment and filtration, even in advance of automation, (3) closed-circuit television systems for observation of critical plant areas, (4) construction of additional supply mains (both raw and filtered water) linked to the plants, (5) installation of additional automatic equipment for control of chemical application, and (6) establishment of river monitoring stations that will report to the plants by automatic signal.

Dry sodium chlorite caused a friction fire at the Belmont chemical building in February, 1971. Damage estimated at $50,000, was largely repaired by the end of June.

PUMPS TO MEET ENLARGED DEMAND

Modernized or newly built in the past two decades, the water pumping stations were able to meet all the demand of consumers. Yet this demand was often so high in the summer, that several stations had little reserve capacity. To meet the problem, the department planned to install larger pumps.

One such pump was installed at the Torresdale Filtered Water Station. With a capacity of 27 million gallons daily, it replaced a small 6 M.G.D. pump under a $282,000 contract. The department planned to remove a 10 M.G.D. pump under a later contract and install a second 27 M.G.D. pump.

Supplying the far northeast of the city, these pumps will raise the total *high-service* capacity of the station from 42 million gallons daily to 80 million.

Contracts were awarded for the replacement of two pumps at the Lardner's Point Filtered Water Station. This station supplies much of North and South Philadelphia east of Broad Street with water from the Torresdale Plant.

The old pumps, of 25 M.G.D. capacity each, will be replaced with two new pumps of 40 M.G.D. each. As a result, total station capacity will climb from 210 million gallons daily to 240 million.

By mid-1971, electrical work had been started for the Lardner's Point pumps under pump contracts totaling $418,000.

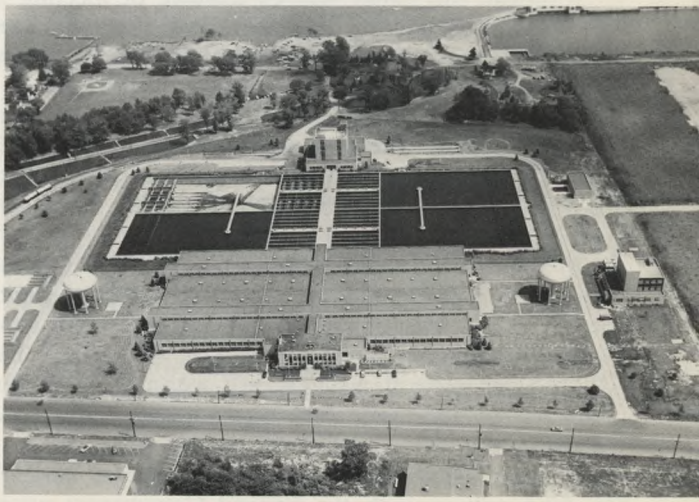
Partly because of the high demand, the total electric power bill for pumping rose in 1969-70. Along with it rose the *average* power cost for pumping a million gallons of water to consumers. At $11.42, the latter was about a dollar higher than in the preceding year. These trends continued in 1970-71, and, accentuated by an increase in electric rates, they raised the average power cost to $13.78 per million gallons pumped.

High Pressure Stations: No major changes occurred at the two stations which pump water to fight fires in the central business district and the north central part of the city. During the biennium, these stations pumped 121,825,000 gallons of water for 89 fires.

Among minor improvements, the department installed new air conditioning and ventilation systems, as well as 53 aluminum windows, at the Fairhill Station, under contracts totaling $80,000.

PHILADELPHIA WATER FOR BUCKS COUNTY

So abundant was the city's water that plans were made for sharing it with the city's neighbors. A new main was laid to carry up to 25 million gallons of Philadelphia water daily to water-short areas of Bucks County.



Water Supply to Bucks County: The big Torresdale Water Treatment Plant in Northeast Philadelphia will supply up to 25 million gallons of city water daily to Bucks County. Use of movable steel shoring (top photograph) sped construction of a $1 million pipeline from the plant's pumping station.

City Water Flows to Bucks County

Regional Cooperation: To carry Philadelphia water for the first time to water-short areas of Bucks County, a new steel main was laid for 1.7 mile in State Road. The water is being supplied under an agreement between the City Government and the Bucks County Water and Sewer Authority.

Inauguration Day: Officials of the City Water Department and the Bucks County Water and Sewer Authority open a valve of the new main to start the water flow. While some turn a key, others listen with an electronic device for the water sound.

The new main went officially into service in August, 1970, when officials from the city and county opened a large valve to start the water flow. By mid-1971, the main was carrying an average of 4 million gallons daily, with peak hourly loads at the rate of 12 M.G.D.

Four feet in diameter, the steel main runs for 1.7 mile north on State Road, from the Torresdale Filtered Water Pumping Station to the Bucks County line. There it ties into new distribution pipelines built by Bucks County.

The new service, which is provided under an agreement between the City Government and the Bucks County Water and Sewer Authority, is an important step towards regional cooperation in water supply. Up to now Philadelphia has supplied only two small areas outside its boundaries.

Of the $1 million cost of the new main, the U.S. Department of Housing and Urban Development paid 45%, while the Bucks County authority will pay the carrying charges on that portion of the capital cost borne by the city. The authority will also pay for the water which it receives.

H.U.D. also financed in part the $2.8 million cost of the distribution mains built by Bucks County.

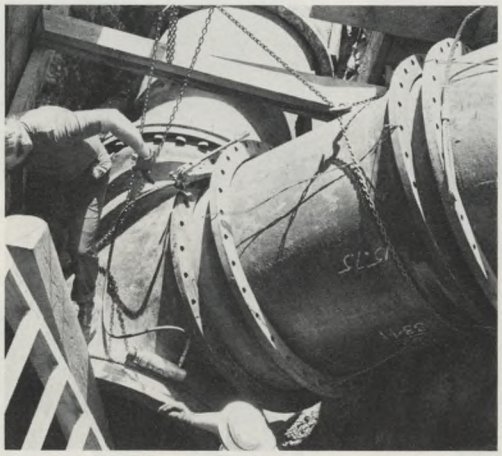
NEW WATER MAINS FOR IMPROVED SUPPLY

While extending its water service to Bucks County, the Water Department built 38 miles of mains to improve distribution within the city. The 38 miles were laid for a variety of purposes—to replace old pipelines, supply new homes, and reinforce water pressures.

For Replacement: The most urgent pipeline need was that for replacement. Eaten by rust or shaken by overhead traffic, many old mains were steadily deteriorating. During the biennium, there were 1,173 breaks in pipelines which had been laid between the years 1819 and 1900. That this high breakage will continue there is little doubt, for the city has 750 miles of mains that antedate the turn of the century.

To meet this perennial challenge, the Water Department has replaced over 200 miles of mains in the past decade. In 1969-71, it replaced an additional 20 miles. The latter mileage included two large center-city jobs:

1. Steel pipe, four feet in diameter and 1,156 feet long, was laid around the north, east, and south sides of City Hall to form a new link in the Broad Street



Broad Street Link: Remarkable for its bends and curves, a new steel water main was laid around the east side of City Hall to serve as a link in the huge Broad Street supply line. Workmen make a cross-tie at right and seal the main below.

Historic Find: An old wooden water main, dating from the early years of the 19th century, turns up during digging on the east side of City Hall. Such mains, consisting of logs with bored centers, were abandoned by Philadelphia before 1850.

Polyethylene Protection: To protect new water mains against electrolysis, or deterioration from stray electrical currents, the Water Department began to wrap some of its mains in polyethylene before placing them in the ground. The main above was among several miles of new mains laid in Eastwick.

supply main. It replaced an old pipe segment that formerly swung around the west side of City Hall, but was removed to facilitate the creation of a new plaza. Costing $503,000, the new main is remarkable for the number of its bends and curves.

2. Distribution and high pressure mains were being replaced in an area bounded by Market Street and Susquehanna Avenue, Front and 12th Streets. The job, valued at $1,961,000, was half finished. It includes some sewer work.

Many old mains were saved rather than replaced. Thus 34 miles of mains were cleaned and cement-mortar lined under contracts totaling $1.6 million. This improved carrying capacity, increased water pressures, reduced water discoloration, and extended pipeline life.

For New Homes: Almost 13 miles of mains were laid to meet the needs of new homes and industries. Much of this mileage was built in newly developed neighborhoods, such as Eastwick and parts of Northeast Philadelphia, but some was also placed in redeveloped older parts of the city. One of the largest jobs ($607,000) was performed in a number of streets centering on 52nd Street and Woodland Avenue.

For Reinforcement: To improve water pressures in parts of the northeast, 1.6 mile of pipe was laid under three contracts totaling $266,000. The pipe was placed in portions of Verree Road, Bloomfield Avenue, Pine Road and Rhawn Street.

Cleaning Equipment: The city cleaned and cement lined 34 miles of old water mains during the biennium. Cleaning scrapers, which are pulled through mains by cable, together with flushing line and cable truck are shown above.

Locking Nut: Faced with the illegal opening of hundreds of fire hydrants on hot summer days, the distribution crews began to test a new type of locking nut on the top of some hydrants. The locking nut showed great promise in reducing water wastage.

Locking Bonnet: In addition to the locking nut, the Water Department experimented with a special security bonnet (above). Removable only with a special tool (below right), the bonnet may prevent illegal hydrant openings.

WATER SYSTEM MAINTENANCE

New controls made it possible to reduce distribution crews by 40 men during the biennium (see page 39), but the crews did as much work as ever. Performing tens of thousands of jobs yearly, they kept 3,200 miles of water mains, and thousands of valves, fire hydrants, ferrules, and other connections, in operating order.

Among the jobs which they performed were:

	1969-70	1970-71
Water Mains Repaired	1,043	838
Ferrules:		
Installed	3,752	4,305
Drawn or Shut off	2,011	2,557
Pipeline Valves:		
Inspected	38,020	34,822
Repaired	3,741	3,969
Installed	633	511
Fire Hydrants:		
Inspected	39,964	32,113
Repaired	11,497	7,813
Renewed	459	379
Installed First Time	10	13
Painted	11,267	16,468
Valve Chambers Built or Rebuilt	17	16
Fire and Supply Connections Installed	151	154
Joint Leaks Repaired	153	189
Complaints Investigated	15,913	14,231
Water Services:		
Shut off for Delinquency	13,926	12,401
Restored	7,539	1,817
Reinspected	8,639	11,471

A troublesome problem was the illegal use of fire hydrants. Hundreds of fire hydrants were opened on hot summer days, and water pressures tumbled to dangerous lows. Much manpower was needed to turn off the hydrants.

Unhappily, the locking "harnesses" which the department had applied to the plugs a few years earlier had been gradually decimated by ingenious residents. By the summer of 1971, however, the department was testing two new devices on a modest scale, and these held great promise. One of these was a new type of security bonnet for the hydrant top; the other was a lock for the nut.

Shining Meters: The Meter Shop overhauled and repainted nearly 100,000 water meters during 1969-71. Because of such regular maintenance, the number of malfunctioning meters in the city's water system averaged little more than 1% of the 526,000 meters in the system.

Building Maintenance: The Building Maintenance Unit performed 3,900 jobs of various types. Notable was the installation of bar screens and chlorine diffusers at the Torresdale Water Plant, sodium chlorite tanks at the East Park Reservoir, and a heating boiler at the Materials Testing Laboratory.

Many repairs were made to fences, barbed wire, and windows damaged by vandals. The unit's security force was effective, wherever used, but was too small to protect all outlying installations. The force was given firearms training by Philadelphia police, and it was equipped with a mobile radio.

Completed by outside contractors were a new roof for the Torresdale Filtered Water Pumping Station and outdoor lighting for the Distribution Headquarters.

Hundreds of jobs were also performed by Plant Maintenance personnel.

Logan Garage: The Logan Garage performed 55,000 job operations. These included preventive maintenance, state inspections and repairs, and other services to vehicles.

526,000 EFFICIENT METERS

The city's water meters were in such good condition that the Meter Shop did only routine work. Keeping close to the job rate of 1968-69, the shop handled nearly 50,000 meters yearly. These meters, which were tested, repaired, repainted, or newly installed, represented about 9% of those in the system.

Of the 526,000 meters in homes and businesses, nearly all were new or improved. Several statistics underlined this fact:

1. As a result of vast improvements, non-registering meters averaged only 7,500 yearly, or little more than 1% of all meters. This was the lowest number in the Meter Shop's history. All were quickly repaired or replaced.

2. Meter improvement made it possible to decelerate further the rate of *periodic* meter overhaul (or "rotation"). In 1969-71, it was necessary to "rotate" only 23,000 small meters yearly, compared with annual rotations of 40,000 or 50,000 a few years before.

Because large meters (one inch or more in size) produce 56% of all water-sewer revenues attributable to *measured* water use, there was no deceleration in the periodic overhaul and replacement of such meters. During the biennium, the department rotated 2,500 yearly, or 15% of all large meters.

Other statistics:

	1969-70	1970-71
Meters repaired in shop	37,139	38,708
Large meters repaired in field (major repairs)	213	149
Small meters repaired in field (minor repairs	7,175	6,183
Meters installed on new "services"	1,908	1,751

WATER TREATMENT PLANTS: OPERATING DATA

Note: Hyphenated years are fiscal; the others are calendar. Fiscal 1969-70 overlaps with calendar 1969.

1. FILTERED WATER OUTPUT (in millions of gallons daily)

	1967	1968	1969	1969-70	1970-71
TORRESDALE	186.7	203.0	215.4	223.7	213.9
QUEEN LANE	106.6	110.2	94.2	93.4	94.6
BELMONT	61.3	63.1	62.1	63.7	65.9
TOTAL	**354.6**	**376.3**	**371.7**	**380.8**	**374.4**

Note: Water use in fiscal 1969-70 averaged 365.5 million gallons daily, and in fiscal 1970-71 it averaged 363 M.G.D. The difference between these figures and total plant output is represented by evaporation and by water used for washing filters.

2. CHEMICAL COSTS FOR TREATMENT (per million gallons)

	1967	1968	1969	1969-70	1970-71
TORRESDALE	$10.43	$10.15	$ 9.94	$ 9.38	$ 9.20
QUEEN LANE	13.88	14.24	14.87	14.08	14.15
BELMONT	10.20	11.96	13.12	12.00	11.96

Note: The total cost of chemicals used in the water treatment plants and reservoirs was $1,545,000 in fiscal 1969-70 and $1,506,000 in fiscal 1970-71.

3. ELECTRIC POWER CONSUMPTION FOR TREATMENT (in millions of kilowatt hours)

	1967	1968	1969	1969-70	1970-71
TORRESDALE	5.68	5.80	5.36	6.11	6.35
QUEEN LANE	2.01	1.96	2.92	2.21	2.11
BELMONT	2.71	2.75	2.21	2.89	1.91

4. ELECTRIC POWER COSTS FOR TREATMENT (per million gallons)

	1967	1968	1969	1969-70	1970-71
TORRESDALE	$0.82	$0.73	$0.73	$0.82	$0.92
QUEEN LANE	0.52	0.46	0.59	0.63	0.82
BELMONT	1.14	1.07	1.20	1.21	0.88

WATER QUALITY AND THE RIVERS

ONE OF AMERICA'S BEST WATERS

Measured in terms of wet chemical tests, the city's water was tested once or twice every minute in 1969-71. Yet the total number of such tests had been cut in half in recent years—from 1.5 million to 750,000 annually.*

This cut was made possible by the introduction of new techniques and much automatic equipment. Thanks to these, the laboratories were performing more complicated tests, analyzing greater volumes of water, and testing water continuously at the river and through every stage of treatment at the plant. Thus, measured by results, the Water Department was doing better and more extensive testing than ever before.

Because of the improved testing and the scientific treatment, Philadelphia's water was of good quality. One of America's purest treated waters, it was clear and palatable. Vanished (except in rare circumstances) were the tastes, odors and discoloration of the early 1950's. By any laboratory test, the city's water was equal to or better than most of the quality standards of the U.S. Public Health Service and the goals of the American Water Works Association.

Settled in large basins, filtered through sand and gravel beds, and refined with chemicals, Philadelphia water was thoroughly treated. To improve this treatment further, the Water Department continued to experiment with new methods.

*The 750,000 tests were made on 90,000 water samples from the plants, 11,000 from the distribution system, and many thousands from the rivers.

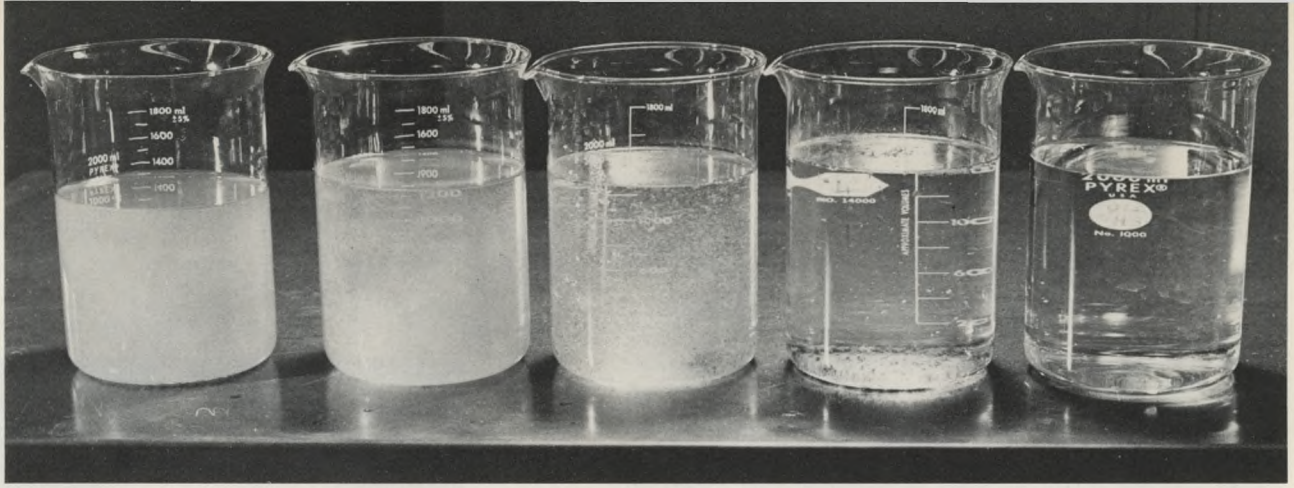
Thus in 1969-71, turbidimeters were installed at the Torresdale Plant to monitor the water passing beneath the pre-treatment building and entering the filter building. The devices transmitted a signal to the plant laboratory, enabling chemists to adjust coagulation in the settling basins more quickly. To improve coagulation further, equipment was acquired to monitor the river water for "pH" (or relative degree of acidity and alkalinity) in the future.

At the Torresdale Plant, too, ferrous chloride was tried for the first time in half of the settling basins. Residual chlorine in the water converted the ferrous to ferric chloride, and the resulting coagulation and settlement of impurities were very good. This experiment, which saved $30,000 in chemical costs in 1970-71, will be continued. There were experiments with ferric (but not ferrous) chloride as a coagulant at the Belmont Plant, and it is possible that alum, the normal coagulant at all the plants in the past, will be partly displaced in the future.

Although a new chemical building was put into service at the Queen Lane Plant (see page 12), there were no other radical changes in treatment of a permanent nature.

In 1971, a winter thaw washed vegetation and wastes into the Schuylkill River, filling the river water with tastes and odors. To remove these, the Queen Lane and Belmont Plants used large amounts of carbon, sodium chlorite, and chlorine.

Despite such episodes, the cost for chemical treatment was satisfactory at all the plants. At the Torres-



Water Treatment: More than $3 million was spent during 1969-71 for chemicals to treat the city's drinking water. Beakers above show one reason why. Starting with murky river water in the beaker at extreme left, the beakers show (left to right) successive stages in water clarification when alum and lime are added.

Testing for Quality: Chemists perform 750,000 wet chemical tests annually to ensure that Philadelphians will receive pure and palatable water. At the Belmont Water Quality Laboratory (above), a chemist checks distillation apparatus.

Automatic Testing Equipment: Acquired in 1970-71, this gas chromatograph is among many new automatic instruments introduced into Water Department laboratories. Such instruments eliminate many tedious wet chemical tests, while assuring faster and more continuous testing of the city's water.

dale Plant, indeed, the chemical cost for treating one million gallons of water reached its lowest point in a steady six-year decline. The cost in 1970-71 was only $9.18—a drop of 96 cents since 1965. At the Queen Lane and Belmont Plants, improved controls kept the costs in line with those of the immediate past (see table on page 20).

Algae, which often bloom in the summer in open basins, were well controlled at the Oak Lane and East Park Reservoirs. Improved facilities, indeed, for applying chemicals preserved a crystal-clear, algae-free water at Oak Lane. To the chemical "feed" equipment already there, the department added equipment for liquid sodium chlorite at both reservoirs, and for sulphur dioxide at Oak Lane.

THE CONDITION OF THE RIVERS

Abundant rainfall improved the condition of the Delaware and Schuylkill Rivers in the fiscal year from July 1, 1969 to June 30, 1970. The local precipitation, as measured at Philadelphia International Airport, was 45.64 inches for the year, or several inches above the long-term averages.* It was at least 10 inches above the abnormally dry, preceding year.

Precipitation dropped sharply, however, from July 1, 1970 to June 30, 1971, when it amounted to only 36.49 inches locally. This did not affect the quality of the river water appreciably, since upstate rains maintained a large river volume.

The fresh water flow in the two rivers was more than satisfactory. The annual average flows, in cubic feet per second, as recorded at Trenton on the Delaware and at Fairmount Dam in the Schuylkill were:

	Water Year Oct., 1968-Sept., 1969	Water Year Oct., 1969-Sept., 1970	Water Year Oct., 1970-Sept., 1971
Delaware River**	9,785 C.F.S.	10,413 C.F.S.	11,764 C.F.S.
Schuylkill River**	1,790 C.F.S.	2,587 C.F.S.	3,278 C.F.S.

*Long-term averages: 40.91 inches for the period 1872-1966; 42.48 inches for 1931-60; and 39 inches for 1958-67.

**All flow figures for the Delaware River at Trenton are unadjusted for upstream diversions. Flow figures for the Schuylkill River at Fairmount Dam have been adjusted to reflect withdrawals of water from the river by Philadelphia.

Pollution Detectives: Spills of wastes into streams are traced to their source by the Water Department. To speed up this detective work, the department purchased new portable equipment of an automatic type in 1970-71, allowing its sanitary engineers to make tests of stream samples right on river banks (photos at right and below).

In terms of the fiscal years, the annual average flows were also good. At Trenton, they reached 11,942 C.F.S. in 1969-70 and 11,152 C.F.S. the following year; at Fairmount Dam, they were 3,008 C.F.S. and 2,943 C.F.S. respectively. These figures were close to the 30-year averages for the two streams.

The sizable flows created a variety of favorable stream conditions. Thus dissolved oxygen averaged eight parts per million at the Delaware intake, and eight to 12 P.P.M. at the Schuylkill plant intakes. Chloride concentrations in the Delaware River estuary were very low.

Thanks to the large river volume, the normally soft Delaware water continued soft, and the hardness of the moderately hard Schuylkill water was kept to an acceptable level. Measured in grains per gallon, the average annual hardness of the two streams was:

	1969-70	1970-71
Delaware River	4.2	3.9
Schuylkill River	9.8	8.5

Monthly hardness averages over the two-year period fluctuated from 2.8 to 5.2 grains per gallon in the Delaware, and from 6 to 14.6 grains in the Schuylkill. Other chemical characteristics of both rivers were good.

Several industrial oil spills occurred along the Schuylkill River northwest of the city. The worst of these happened in November, 1970, when a lagoon dike broke and spilled 3,000,000 gallons of crankcase oil into the river. Closing its river intakes for many hours, the Water Department allowed the oil to pass. There was no effect on water service or on the quality of the city's finished water.

No major fish kills or chemical spills occurred in the Delaware.

STREAM STUDIES

Sanitary engineers kept close watch on the condition of the rivers. Aided by seven automatic monitoring stations, they collected data daily on a variety of stream characteristics. Numerous water samples were also taken directly from the streams.

The Water Department's motor launch plied the

Delaware estuary weekly, collecting water samples from Trenton to Marcus Hook. At other times it made runs across the stream, taking cross-sectional samples. These samples were tested in an onboard laboratory.

There was, of course, little that was new in all of this. The Water Department, in cooperation with the U.S. Geological Survey, had sampled the rivers since the 1940's, and since 1962 its monitoring had been *around the clock*. So voluminous had its stock of stream data become, that it planned to analyze this data with a computer in fiscal 1971-72. Thus it would achieve an old goal—to build up a long-term picture of the rivers.

This monitoring program was supported by a number of special studies in 1969-71. These included (1) the monthly analysis of water quality in 11 creeks on both sides of the Delaware River, (2) a coliform study of the Delaware between the Northeast Water Pollution Control Plant and the Torresdale Water Treatment Plant, and (3) sanitary surveys of the Schuylkill River at various points, above the Wissahickon Creek, above Reading, and below Fairmount Dam. The sanitary surveys (made by motor boat and canoe) were intended to locate waste discharges and to classify watershed development.

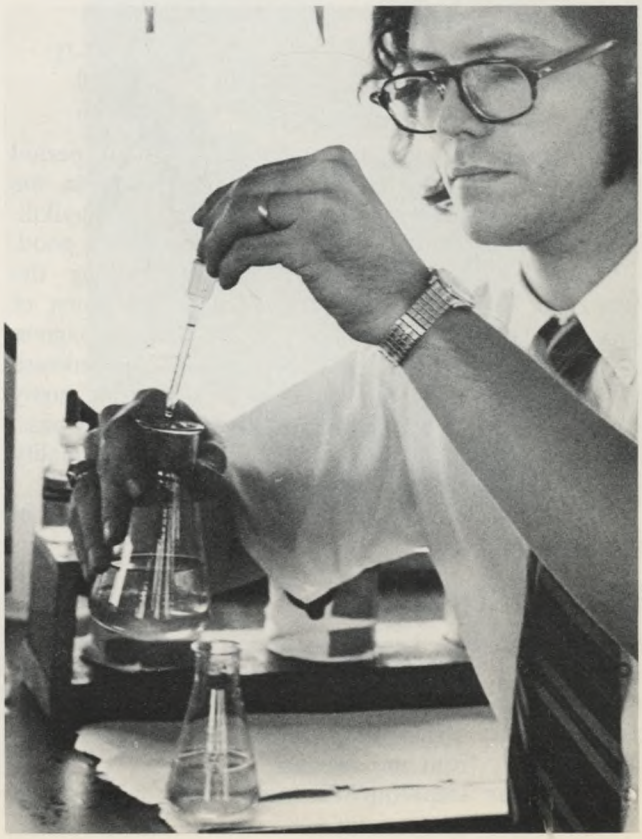
Several studies were being made for the Water Department by Drexel University. These included studies of (1) oleiocheate worms in the bed of the Delaware River to determine their effect on stream oxygen, and (2) incinerator wastes to learn their effect, if any, when used as landfill along streams. Drexel will do a study in 1971-72 on certain compounds that cause tastes and odors in water supplies.

Anxious for genuine stream clean-up, the Water Department turned an analytical eye on a "mathematical model" of the Delaware River estuary. The model had been used by the Delaware River Basin Commission to set new standards for estuary improvements. Aided by a private consulting firm, the department discovered serious defects in the mathematical model, and it requested the Commission for a hearing on these findings.

The department also looked for ways to control the discharge of storm water overflow from "combined sewers"* into local streams. For this purpose, it planned to (1) resume, with federal funding, a study of the effect of microstraining on storm water, (2) test the application of a new principle—fluidic pressure—in intercepting chambers, to regulate storm water discharge, and (3) develop new instrumentation for a comprehensive study of discharges.

*About half of Philadelphia's sewer mileage consists of combined sewers, which carry both storm water and sanitary sewage in the same pipe. During dry weather, their flow is carried to wastewater plants for treatment, but in time of storm part of the flow may be discharged to streams to avoid swamping the plants. Intercepting chambers regulate the discharges.

Stream Monitoring: The "Aquadelphia", the Water Department's fast motor launch, cruised the Delaware River estuary weekly, collecting water samples along a 60-mile stretch. The samples were tested in an on-board laboratory, giving the department rapid knowledge of river conditions.




AQUADELPHIA II
CITY OF PHILADELPHIA

FACTS IN BRIEF

	Fiscal 1970-71	Fiscal 1969-70	Calendar 1960
POPULATION	1,948,609(a)	1,948,609(a)	2,002,512(b)
WATER SYSTEM:			
Meters in system	523,052	523,731	519,644
Unmetered accounts	1,904	1,880	8,350
Total services	524,956	525,611	527,994
Consumption of filtered water			
• Per person on average day (gals.)	186.3	187.6	165
• Average day (million gals.)	363	365.5	329.7
• Maximum day (million gals.)	498.6(c)	496.4(d)	435.1
• Total annual (billion gals.)	132.5(e)	133.4	120.7
Total annual raw water pumped (billion gals.)	141.7	139.8	128.1
Pipelines (miles)	3,230	3,219.4	3,041
Valves	76,609	76,027	66,789
Fire hydrants	25,472	25,435	24,815
WASTEWATER SYSTEM:			
Wastewater treated on average day (million gals.)	431.3	425.4	355.1
Total wastewater treated in year (billion gals.)	157.4	155.3	129.9
Sewers (miles)	2,532.6	2,523.4	2,352.3
HIGH PRESSURE FIRE SYSTEM:			
Pipelines (miles)	63.5	63.2	63.3
Valves	1,888	1,882	1,874
Fire hydrants	1,050	1,050	1,070

NOTE: (a) U.S. Census figure for 1970
(b) U.S. Census figure for 1960
(c) Friday, June 25, 1971—temperature 92° F.
(d) Thursday, July 17, 1969—temperature 91° F.
(e) This figure does not include 496.1 million gallons of water delivered to Bucks County.

THE WASTEWATER SYSTEM

PLANS FOR CLEANER STREAMS

How far the city had gone in reducing stream pollution was underlined by a simple statistic in 1969-71. Philadelphia's water pollution control plants treated an average of 428.4 million gallons of wastewater daily, the greatest flow in their history. The flow had jumped by 75 million gallons daily in 10 years.

Not only was the city treating all of its own wastewater, but it was treating the flows of many outlying communities. The latter provided about 8% of the wastes reaching the city's plants.

From these flows the plants removed a combined average of 54% of biochemical oxygen demand (B.O.D), and thus cut in half the polluting effect of effluents reaching the streams. For the biennium as a whole, they removed 218,000 tons of suspended solids.

Despite this substantial protection for the Delaware and Schuylkill Rivers, the Water Department was laying plans for fuller treatment. Thus, early in 1970, it reached an agreement with the Delaware River Basin Commission and the Pennsylvania Sanitary Water Board* for the expansion of its plants. Under this agreement, Philadelphia will be permitted to build "activated sludge" plants that will be large enough initially to limit the city's wastewater effluent to 131,500 pounds of carbonaceous oxygen demand daily. This will be equivalent to removal of 85% or 90% of biochemical oxygen demand, and will meet new stream protection standards set by the two regulatory agencies.

The Water Department lost no time in carrying out the new agreement. On January 2, 1971, it met the first deadline imposed by the Basin Commission. It filed with the commission a preliminary engineering plan for the expansion of the Northeast Plant. Preliminary and final plans for all the plants will be filed at regular intervals.

Costing up to $235 million** at predicted 1972 prices, the expansion will add new settling and aeration tanks to all the plants. The two primary treatment plants, Southeast and Southwest, and the existing intermediate plant at Northeast, will be upgraded to provide full secondary treatment.

By 1975 (according to the preliminary plan), the Northeast Plant will be able to treat 250 million gallons of wastewater daily—an increase of 75 M.G.D. To make this possible, the Water Department will add these cubic foot volumes to the tank capacity at the plant:

	Present Tanks Total Volume	Additional Tanks Total Volume
Primary Settling	1,250,000 C.F.	1,250,000 C.F.
Aeration	2,829,000 C.F.	4,600,000 C.F.
Final Settling	2,400,000 C.F.	2,060,000 C.F.

Supporting the new aeration tanks and reinforcing the old will be new air blowers with a capacity of 282,500 cubic feet per minute—more than three times the existing capacity. Total digester tank capacity will rise from the present 19.3 million gallon sto 24.5 million. These new capacities will enable the Northeast Plant to treat wastes longer and more efficiently.

*The Sanitary Water Board has since been absorbed by the new Pennsylvania Department of Environmental Resources.

**From an original estimate of $80-$100 million for expansion, the possible cost rose to $193 million in 1971 and $235 million for 1972. Inflation, engineering revisions, and public pressures push the costs up. Thus public interest in odor control alone will add $50 million to the cost. It is expected that most of these costs will be shared between the federal and local governments, with the state contributing something.

Although plans for the Southwest Plant are still to be developed, its treatment capacity will rise from 136 million gallons daily to 210 M.G.D. by 1976. At the Southeast Plant, however, there will be a slight decline (by 1977) from 136 M.G.D. to 125 M.G.D., even though wastes will be treated to a higher degree. This is because of a stable population area.

When the expansion is completed, Philadelphia will be able to accept more wastewater from outlying communities, and more communities, it is believed, will send their flows to the city plants for treatment. This will increase the protection of the rivers, spare small communities the heavy expense of building small treatment plants, and provide more revenues for the Water Department.

IMPROVING THE WASTEWATER PLANTS

Although plant expansion was still a few years away, the Water Department had made many recent improvements in wastewater treatment. In fact, its plants removed 15% more biochemical oxygen demand in 1969-71 than the State required.

Pending expansion, the Sanitary Water Board required the city to limit its wastewater effluent, entering streams, to 332,000 pounds of B.O.D. daily. In 1969-71, the city actually emptied only 282,000 pounds daily.

This achievement was made possible, in part, by the many physical changes carried out in the plants in the 1960's. From January 1, 1960 through June 30, 1969, the Water Department spent $8.7 million on new tanks, pumps, controls and other equipment.* In fiscal 1969-71, another $2.3 million was invested.**

One result of the new equipment was that the primary treatment plants continued to outperform their design levels. Intended to remove only 35% of B.O.D., the two plants removed 41% to 50% in 1969-71. At the same time, their removal of suspended solids ranged from 57% to 63%, compared with a 50% design level.

The Northeast Plant kept close to its 75% design level for the removal of suspended solids, but difficult industrial flows held its B.O.D. removal to an average 64%, or 11 percentage points below its design goal.

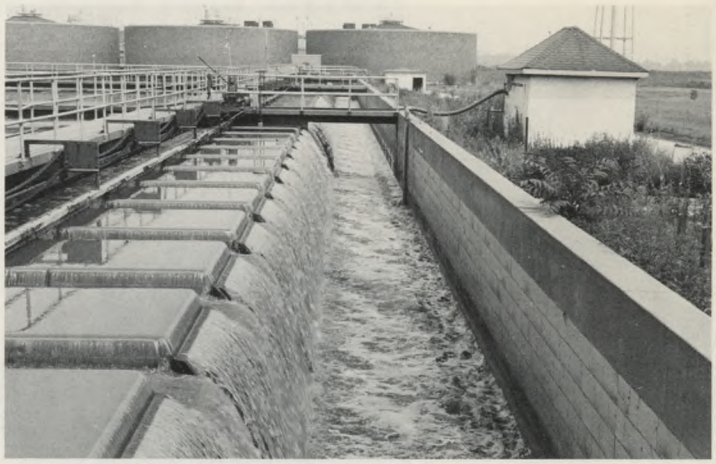
To improve the performance of all the plants, several new facilities were built during the biennium. By mid-1971, most of these were ready to go into service.

For Grease Incineration: In June, 1971, a small incinerator went into operation at the Northeast Plant: Its purpose to burn grease, oil, and other skimmings from wastewater.

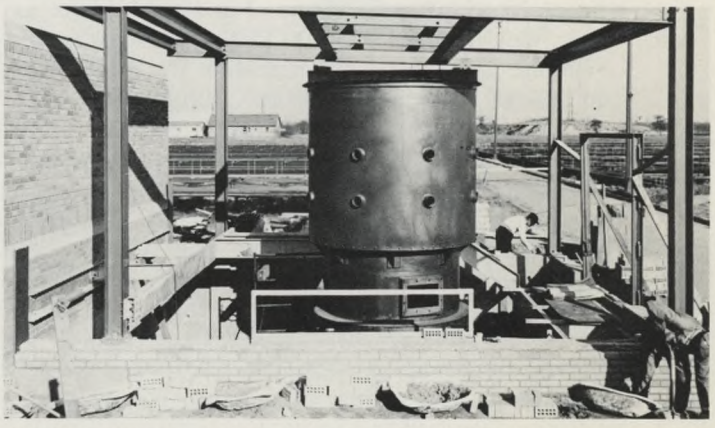
Of the water hearth type, the incinerator will be able to burn up to 600 lbs. of grease and oil per hour. This

*Total new capital funds invested in the wastewater system from January 1, 1946 to June 30, 1969 was $294 million.

**Based on partial and final estimates in the field. Sewers accounted for nearly $15 million additional. Other wastewater system statistics for the 24 months: 219 contracts, with a limit of $17.3 million (including some water mains), were completed; 157 contracts, with a limit of $15.8 million, were awarded; 81 contracts, with a limit of $17.7 million, were in force on June 30, 1971.



Plant Expansion: Ever increasing flows of wastewater to the water pollution control plants underline the need for future plant expansion. Annual flows averaged 428.4 million gallons daily in 1969-71—a jump of 75 million gallons daily in 10 years. Southwest Plant above.



New Incinerator: To burn grease, oil and other skimmings from wastewater, a small incinerator was built at the Northeast Water Pollution Control Plant. Burner and stack (shown above) are part of equipment, which will reduce plant odors and pipeline clogging.

will reduce the clogging of plant pipelines, improve the operation of sludge digester tanks, and eliminate some lagoon odors.

Operating at temperatures exceeding 2,000 degrees F., the incinerator is odorless and particulate matter emitted by it is negligible. Of a type permitted by the city's air management code, it is fueled in part by natural or sewage gas, low in pollutants.

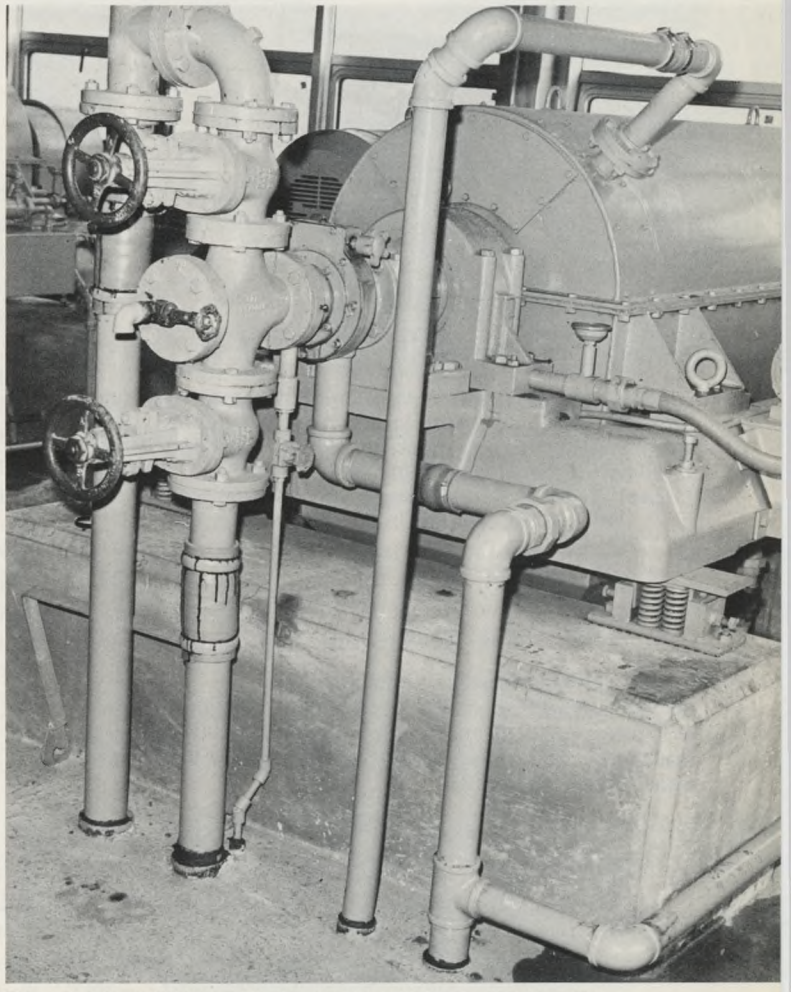
The cost of the incinerator (including the new one-story brick building in which it is located) was $203,000. There are plans for similar incinerators at the other two plants.

For Gas Recirculation: New piping and compressor systems were improving the turnover of sludge in digester tanks. Forcing bacteria-produced gas to the bottom of the tanks, the compressors caused the sludge to become turbulent. As a result, surface scum was broken up and the build-up of hardened deposits was prevented. The improved turnover increased tank capacity and reduced maintenance costs.

Because "digestion", or the decomposition of sludge by anaerobic bacteria, is the final step in wastewater treatment, the new systems will have a marked effect on plant performance.

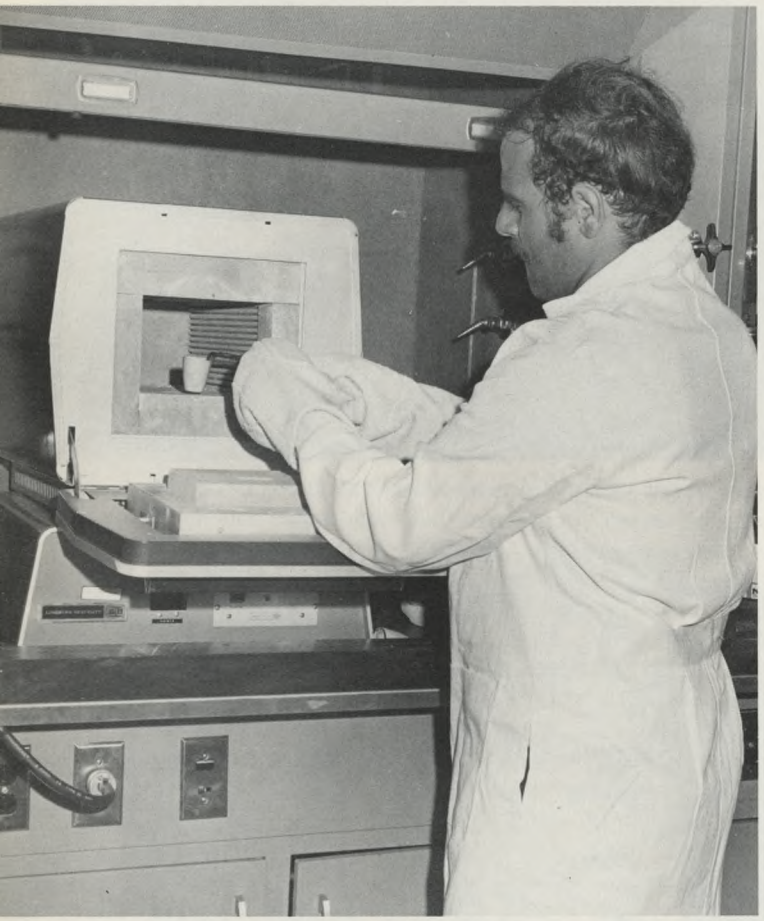
By mid-1971, eight digester tanks had been adapted at the Northeast Plant, and four at the Southwest Plant, under the current contracts. The cost was $624,000. Of the remaining four tanks at Southwest, one was converted in an earlier year, and the other three will be adapted under a future contract.

For Sludge Dewatering: Almost ready was a centrifuge building at the Southwest Plant. This $804,000 station will remove some of the water from digested sludge. Whirling the sludge at speeds up to 2,400 R.P.M., five steel centrifuges will separate water from solids. A polyelectrolyte chemical will condition the sludge.



For Dewatering Sludge: Because digested sludge (the end-product of wastewater treatment) must be barged to sea, an $804,000 building (top photograph) was constructed at the Southwest Plant to remove some of the water from the sludge. By mid-1971, final tests were being run on five steel centrifuges that whirl the sludge to separate water from it. Photograph above, one of the centrifuges.

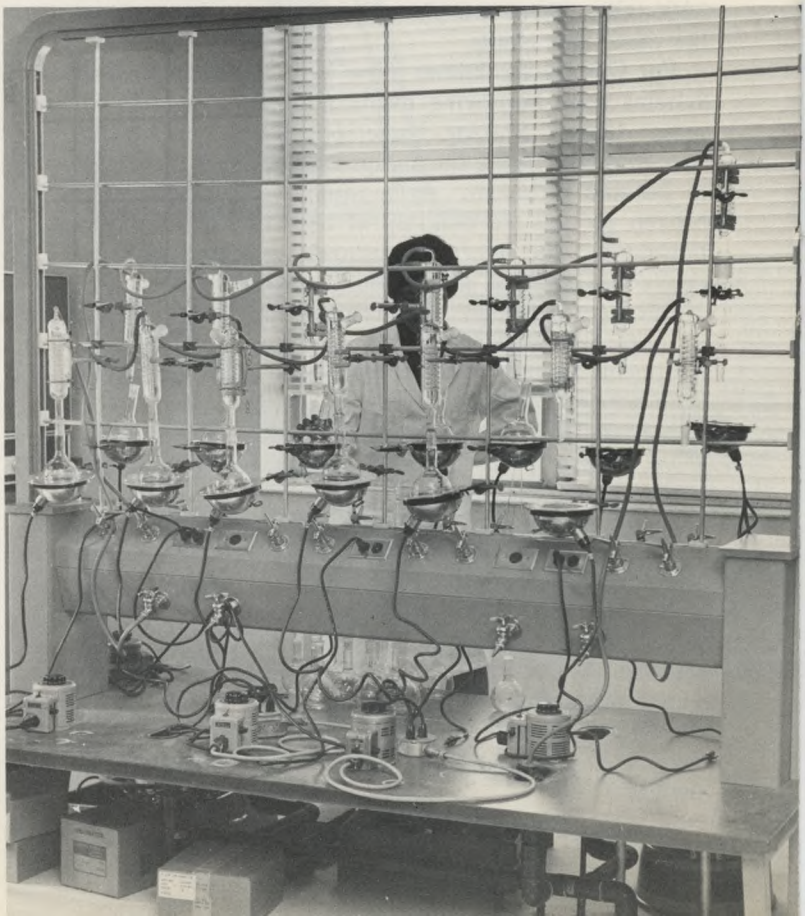
New Offices and Laboratories Open



Laboratories: Changes in the old administration building have provided more space for the plant laboratories. Formerly crowded on one floor, these now have two floors, with improved equipment, lighting and ventilation. Chemist (above) places a sludge sample into an oven to dry.

Improved Headquarters: A new wrap-around wing was added to the old administration building at the Northeast Plant, and the old building was renovated inside. The $520,000 job added 4,500 square feet to the previous 6,000 square feet of space.

New Equipment: The distillation apparatus is among new equipment that will enable the expanded laboratories at Northeast to control wastewater treatment more effectively. Here chemists and sanitary engineers watch over treatment 24 hours daily.



Offices: Space for offices and a future computer center was provided in the new wrap-around wing. Offices are manned by plant management and the chief of the wastewater treatment division.

Such dewatering will raise the solid content of the sludge from 6% to 10%, and this will net monetary savings for the city, since the sludge is barged to sea by a private contractor who charges on gallonage.

An airy, brick edifice with wide expanses of glass, the station measures 74 ft. x 32 ft. Within it are 10 sludge pumps, as well as pumps, tanks and mixers for chemicals. With the structure largely finished in the previous year, mostly electrical work was done in 1969-71. Because of technical difficulties, several modifications were being made in equipment and much testing was being done.

For Supervision: The old administration building at the Northeast Plant was given a complete face lifting. Renovated and expanded, it was reoccupied in July, 1971, by supervisory and laboratory personnel.

Of special note was a new wrap-around wing, which added 4,500 square feet to the previous 6,000 square feet of space. The wing, a one-story concrete block structure with brick facing, houses offices for management, lecture rooms and other facilities. It also includes space for a future computer center, to be used when the plant is brought under automation.

Six laboratories were established in the renovated main building, and these are housed on two floors—double the space they had before. The basement contains heater and locker rooms, a library, and a storage room for glassware.

Cost of the renovation and expansion: $520,000

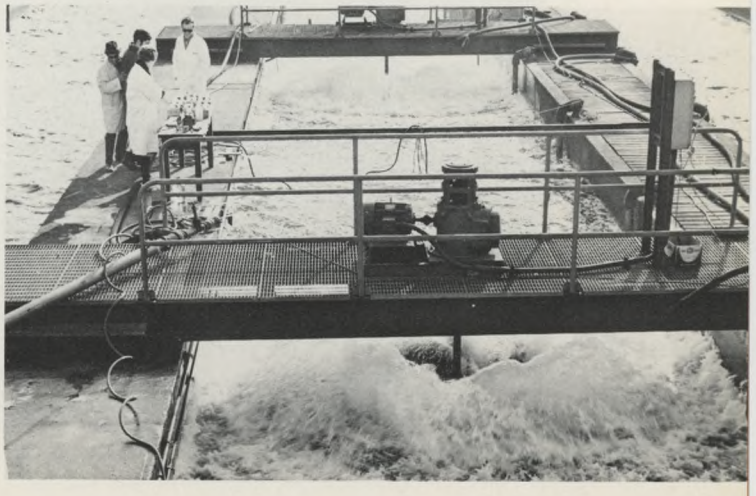
For Other Purposes: Other work completed included a small building for storage and repair of equipment ($180,000) at the Southeast Plant; new indoor switchgear ($316,000) and two electric sluice gate "operators" ($9,500) at the Northeast Plant; screening shredders and sorting tables ($44,000) and two cold sludge pumps ($39,250) at the Southwest Plant. A sewage pump of 10 M.G.D. capacity ($54,000) was installed and nearly ready at Southwest.

THE BARGING OF DIGESTED SLUDGE TO SEA

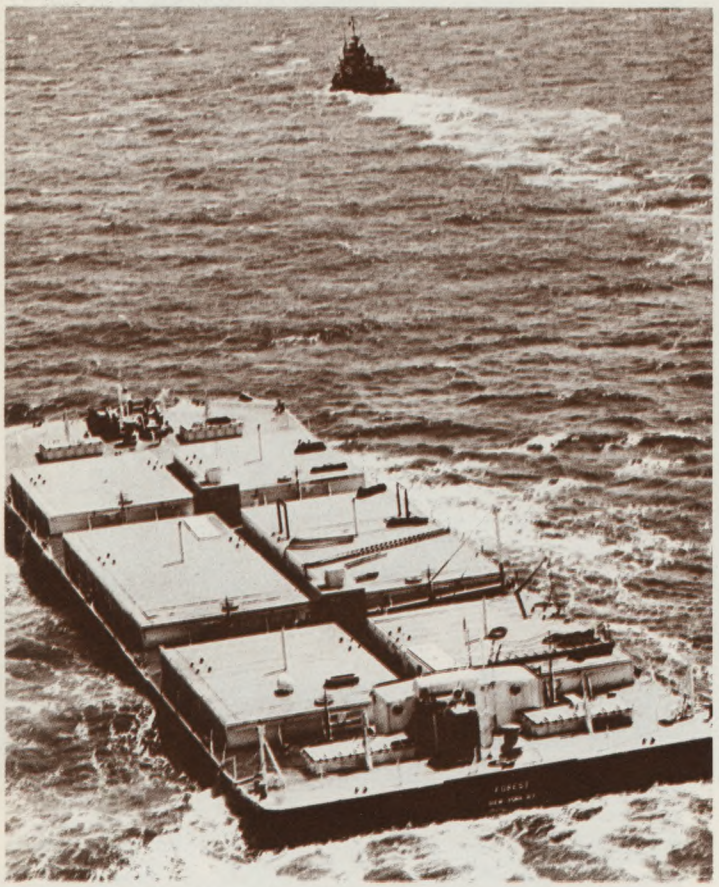
Because disposal lagoons were nearly full at its water pollution control plants, the Water Department continued to barge much of its digested sludge to sea. The sludge was placed in an area of the Atlantic Ocean, about 11½ miles from Cape May. It is an area where currents would not carry the sludge shoreward.

In 1969-71, barges carried 215 million gallons of sludge to the ocean, but fewer trips were needed in the second year. The drop in trips resulted from the production of a less watery sludge at the Northeast Plant, where solids content rose to 14%. The cost of barging averaged $3.50 per thousand gallons.

For More Efficient Treatment: Two new mechanical aerators went into service (below) at the Northeast Plant, supplementing the air supplied by blowers to the aeration tanks. Chemists (above) check effect of additional aeration on the wastewater being treated. Air is needed by aerobic bacteria to break down wastes in the tanks.



Courtesy of the Evening Bulletin



Barging to Sea: Philadelphia continued to barge much of its digested sludge to the Atlantic Ocean because of inadequate disposal space on land. Preliminary study showed that the city's digested sludge—the end product of comprehensive wastewater treatment—has little, if any, effect on ocean life.

Because of protests from some citizens' groups, Philadelphia's barging program was much in the news. There were claims that the deposit of digested sludge was harming the ecological chain of the ocean.

To ascertain whether this was true, the Water Department hired the Franklin Institute and Thomas Jefferson University to make a complete study of the disposal area. The study started in January, 1971, and will take one year.

In a preliminary report in the spring of 1971, Franklin Institute reported no evidence of harmful effects on ocean life. Its tentative explanation for this was that "with the carefully controlled Philadelphia digested sludge procedure, the ocean is able to recycle and reuse these materials as fast as they are added."

The institute noted that Philadelphia's digested sludge is a relatively inert material that has been thoroughly processed. It includes 86% to 90% water, 5% earth and sand, and a small percentage of organic matter that has been fully stabilized by anaerobic bacteria in tanks at the plants. It differs greatly from the *raw* (untreated or partially treated) wastewater sludge emptied by other communities into the ocean.

NEW SEWERS FOR WASTE COLLECTION

To collect wastewater and convey it to the plants efficiently, the city had improved a number of facilities. By mid-1969, it had 14 modern stations to pump its sanitary flow, and these required little except maintenance. Much remained to be done, however, on sewers.

To meet this need, the Water Departent built more than 25 miles of sanitary and small storm sewers in 1969-71. For this purpose, it spent nearly $12 million.

Treatment Experiment: Looking for new ways to improve plant efficiency, the Water Department injected pure oxygen (instead of air) into an aeration tank at the Northeast Plant. The experiment, conducted from the trailer, indicated a marked improvement in the destruction of wastes by aerobic bacteria.

Old Sewers: Replacement of a 140-year old brick sewer in Pine Street was one of the largest sewer jobs. The line was being replaced for several blocks with a new reinforced concrete conduit, as part of a continuing program to remove deteriorating sewers. Pine Street job, above and below.

Replacement: One of the most pressing needs was that for replacement. Although Philadelphia had constructed 640 miles of new sewers since 1953, it still had 1,000 miles that antedated the year 1910. Set at shallow depths and vibrated by overhead traffic, many old sewers were steadily disintegrating.

To keep up with this problem, the Water Department replaced 100 miles of old sewers in the 1960's, and in 1969-71 it replaced an additional 13.5 miles.

One of the most impressive jobs was in center city. There a contractor ripped out a big brick sewer in Pine Street between 19th and 25th Streets and replaced it with a new reinforced concrete line. Two blocks in Pine Street, between 17th and 19th Streets, and several blocks in 23rd Street, between Pine and South Streets, were still to be done under the $1,575,000 contract. The 140-year old brick line, eight feet in diameter, is being replaced with a 6 ft. x 7 ft. box. Of the cost, the Federal Government will pay half.

Other Purposes: To service newly developed or redeveloped neighborhoods, the Water Department built nine miles of sewers. These included 3.3 miles of large conduits in Eastwick and two miles in Northeast Philadelphia. Finished in Eastwick was a large concrete box sewer, ranging up to 7 ft. x 12 ft. in size and resting on piles. This $785,000 line will carry storm water along Scholl Street to the Schuylkill River.

In the Northeast: To meet the needs of new homes, a sewer is laid (left), while workmen build a related manhole (below). Nine miles of sewers were built in all parts of the city during the biennium to service newly developed or redeveloped neighborhoods.

New Sewers Are Built In Many Neighborhoods

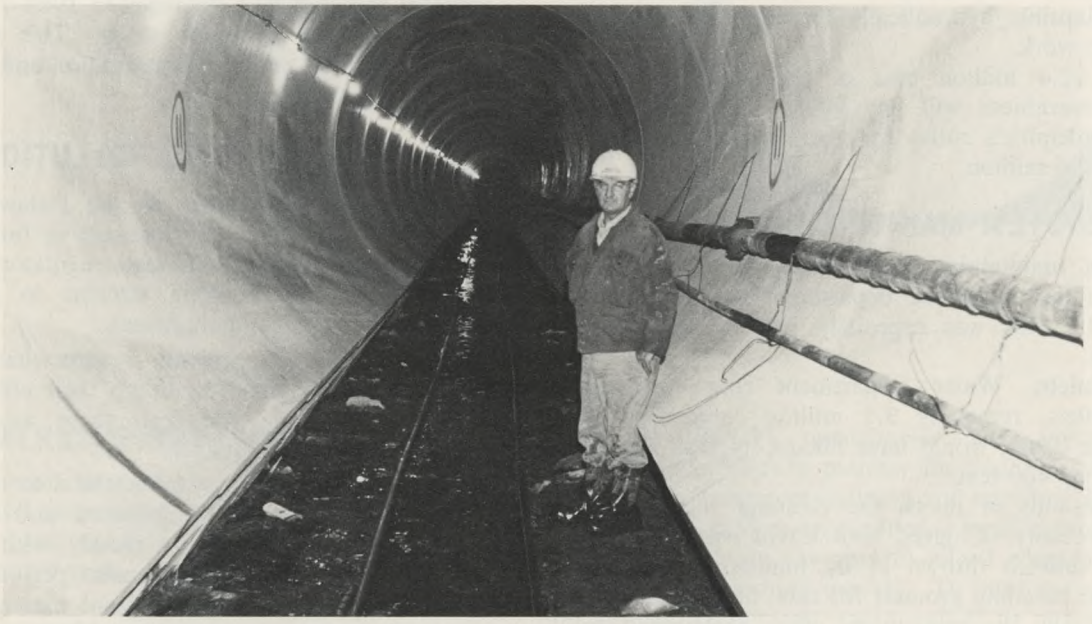
In Eastwick: Finished in Eastwick was a large concrete box sewer, ranging up to 7 ft. x 12 ft. in size. The line, part of many miles of sewers built for fast growing Eastwick, will carry storm water to the Schuylkill River.

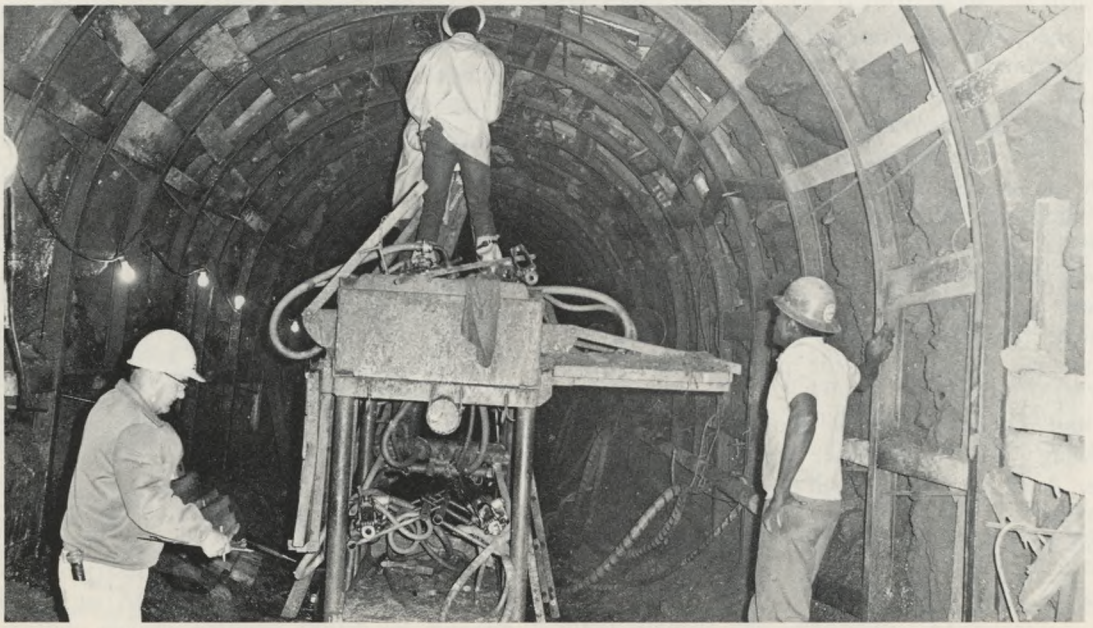
Almost three miles of sewers were laid to provide older homes with city sewer service for the first time, or to relieve other unsanitary conditions. The construction included a reinforced concrete line in Convent Avenue, to convey storm water from the eastern portion of Torresdale to the Delaware River. The cost of the 6 ft. x 8 ft. box was $342,000.

TUNNEL SEWERS TO RELIEVE FLOODING

As part of its effort to reduce storm flooding, the Water Department continued to build giant concrete tubes in tunnel. These tunnel sewers were intended to drain off heavy storm waters that often overburdened older sewers.

1. Thus a welcome addition in North Central Philadelphia west of Broad Street was another extension to the Main Relief Sewer. Ten feet in diameter, the tube was built under Sedgley Avenue between Margie and 16th Streets, and northward under 16th Street to Clearfield Street. Put into service in November, 1969, it picks up storm water from the north central city and carries the flow to a main trunk that empties into the Schuylkill River. The cost of the extension was $1.7 million.





For Storm Flood Relief: The big Wakeling Street Relief Sewer was extended for another mile through Northeast Philadelphia. By September, 1971, it was diverting up to 2,000 cubic feet of storm water per second from overloaded sewers. Steel ribs are checked above, while top photograph shows finished concrete tube.

2. In Northeast Philadelphia, the Wakeling Street Relief Sewer was extended for another mile, and the new tube began to pick up flow in September, 1971,

Varying in diameter from 8½ to 10¼ feet, the extension runs under Levick Street from Cranford Street to Bustleton Avenue, and in Bustleton Avenue between Levick and Benner Streets. It includes two large junction chambers.

To several northeast neighborhoods, the extension will bring vital relief. It will divert up to 2,000 cubic feet of storm water per second from overloaded sewers.

Dug in 15 months, the tunnel was concreted between April and July, 1971. A new method of concreting, which included the pouring of the arch first and the use of a collapsible, hydraulically-operated form, greatly sped up the work.

Of the $2.4 million cost of the extension, the Federal Government will pay 40%. The new tube brings Philadelphia's outlay for storm flood relief since 1946 to $30.6 million.

SEWER SYSTEM MAINTENANCE

The job of maintaining 2,500 miles of sewers and related facilities taxed the department to the utmost in 1969-71. This was especially true of the city's sewer inlets.

Sewer Inlets: Water Department crews cleaned 135,000 inlets, removing 3.1 million cubic feet of debris. The debris would have filled City Hall Tower to a height of 400 feet.

For thousands of inlets, the cleaning was a long deferred necessity. Clogged with leaves washed in by rains and rubbish thrown in by humans, the inlets had become breeding grounds for rats, flies and odors. Unable to take the rains, they often contributed to flooding.

Although the job of cleaning inlets was transferred from the Department of Streets to the Water Department on April 1, 1968, a lack of public funds (both before and after the transfer) had delayed much of the urgent work. Fortunately, such funds became available in the second half of 1969, and the known backlog of uncleaned inlets was reduced to the vanishing point by the spring of 1970.

With much new equipment and a three-fold increase in permanent cleaning positions by June 30, 1971, the department planned to continue systematic cleaning. The cost of such cleaning for the previous two-year period was $2.9 million.

Sewers and Other Facilities: To keep the city sewers flowing, the maintenance crews performed 39,000 jobs. As in past years, much of this maintenance was preventive.

Inspecting more mileage than ever before, the crews walked or crawled through 266 miles of old sewers and checked another six miles by television camera. They also examined 11 miles of newly constructed lines prior to acceptance by the department. Modifications were suggested for some of the new lines, and nine miles of old sewers were reported for replacement.

Cleaning too was at an all-time high. Workmen cleaned 170 miles of pipe sewers by high-pressure water jet and dredged eight miles of brick sewers with the mechanical bucket. In addition, six miles of sewers were rodded.

Because of numerous sewer breaks, over 800 feet of sewer was replaced as part of major repairs, and crews removed debris from many acres of streams and bordering lands. They also repaired sewer inlets, reconstructed sewer laterals, and checked for insanitary conditions.

Some of the increased efficiency in 1969-71 resulted from a manpower utilization study. This study, described on page 39, led to reorganization and improved scheduling of crews.

REDUCING INDUSTRIAL POLLUTION

With the growth of industry in the Delaware River Basin, stream pollution may increase in future years. For this reason, state and interstate regulatory agencies will require industries along streams to give their wastes a higher degree of treatment.

In Philadelphia, the problem is somewhat different. Most Philadelphia industries dump their effluents into city sewers, and the city treats these wastes at its water pollution control plants.

Because such wastes may be harmful to city sewers or may make treatment complicated and expensive, the Water Department works closely with local industry. Its sanitary engineers make periodic rounds of industrial plants and advise plant management on how to recapture or neutralize deleterious wastes. More than 1,000 plants—the major producers of local industrial wastes—have been visited and revisited in the past 20 years.

In 1969-71, engineers inspected over 500 local industries to check out methods of treating wastes. In addition, they reviewed 3,000 plumbing plans, often recommending the installation of waste treatment equipment. There were frequent conferences with industry representatives on new treatment devices.

The department continued to investigate another source of stream pollution—the illegal cross connection of sanitary and storm water sewers. During the biennium, engineers examined 259,000 feet of storm sewers, raising the total to 696,000 since 1967. Numerous cross connections were discovered, and these were being corrected.

To encourage some industries to treat or bottle up their wastes more effectively, the Water Department adopted a new surcharge on industrial wastes entering the city sewers (see page 47). A survey of waste oil disposal by 1,000 gasoline service stations was also begun.

WATER DEPARTMENT MODERNIZATION 1946-1977

WATER SYSTEM	Encumbered-Expended Jan. 1, 1946-June 30, 1971	Scheduled July 1, 1971-Dec. 31, 1977
Load Control Center	$ 1,284,081	$ 248,222
Torresdale Plant	25,967,660	1,161,999
Queen Lane Plant	12,988,709	3,025,627
Belmont Plant	12,042,730	2,293,998
Water Pumping Stations	14,300,676	2,692,331
Water Mains — Built, Replaced, Cleaned, Lined	93,249,461	28,271,494
Filtered Water Storage	12,773,292	3,815,293
Universal Metering	4,788,064	—0—
High Pressure Fire System	5,159,773	1,209,036
Miscellaneous	7,293,962†	—0—
Total Water System Capital Improvements	**$189,848,408**	**$42,718,000**

WASTEWATER SYSTEM	Encumbered-Expended Jan. 1, 1946-June 30, 1971	Scheduled July 1, 1971-Dec. 31, 1977
Northeast Water Pollution Control Plant	$ 17,883,770	$ 92,935,256*
Southeast Water Pollution Control Plant	6,727,889	43,658,891*
Southwest Water Pollution Control Plant	11,027,510	60,215,658*
Water Pollution Abatement—Engineering and Related	404,000	6,120,211*
Wastewater Pumping Stations	2,615,594	509,974
Interceptors	54,770,460	6,408,688
Sewers — Built, Replaced	187,754,689	53,971,348
Storm Flood Relief	28,236,318	—0—
Miscellaneous	7,467,386†	475,974
Total Wastewater System Capital Improvements	**$316,887,616**	**$264,296,000**

*Chiefly for expansion of water pollution control plants to increase capacity and upgrade wastewater treatment.
†To be distributed under other listed categories.

WATER POLLUTION CONTROL PLANTS: OPERATING DATA

	1969-70				1970-71			
	Northeast	Southeast	Southwest	Total	Northeast	Southeast	Southwest	Total
POPULATION EQUIVALENT*	1,795,800	1,015,700	804,400	3,615,900	1,859,820	1,071,915	803,000	3,734,735
Watewater Flow (in millions of gallons daily)								
Rated plant capacity	175	136	136	447	175	136	136	447
Total flow treated	165.56	125.72	134.15	425.43	170.01	125.52	135.78	431.31
Flow from other communities	12.18	1.99	23.79	37.96	11.32	2.23	17.68	31.23
Solids in Wastewater (in parts per million)				**Weighted Average**				**Weighted Average**
Raw suspended solids	308	178	245	249	306	184	270	259
Final suspended solids	79	76	94	83	93	79	100	91
Total solids removed	229	102	151	166	213	105	170	168
% of solids removed	74.4	57.3	61.6	66.7	69.6%	51.1%	62.9%	64.9%
Tons of solids removed daily	158.1	53.5	84.5	296.1	151.1	55	96.4	302.5
Biochemical Oxygen Demand in Wastewater (in parts per million)				**Weighted Average**				**Weighted Average**
Raw water	209	162	121	168	223	172	123	177
Final effluent	72	96	63	77	85	98	62	82
Total B.O.D. removed	137	66	58	91	138	74	61	95
% of B.O.D. removed	65.6	40.7	47.9	54.2	61.9%	43%	49.6%	53.7%
Gas Production								
Millions of cubic feet daily	1.1720	—	1.1390	2.3110	1.125	—	1.098	
Cubic feet per lb. volatile	7.1	—	6.6		7.7	—	7	
Digested Sludge								
Gallons barged to sea	68,067,956	—	38,361,398		64,565,642		45,114,000	
Average % of solids	12.1%		6.6%		14%		6.4%	

*"Population equivalent is not actual population. It is a technical measure of wastewater strength. It is figured as 0.167 lb. per person daily. This measure is needed because industrial wastes are stronger then domestic wastes. Because the Northeast Plant receives most of the city's industrial wastes, its population equivalent is higher than that of either of the other two plants.

MANAGEMENT AND ENGINEERING SERVICES

SAVINGS THROUGH IMPROVED USE OF MANPOWER

After four years of intensive effort, a manpower consulting firm was still hard at work in the Water Department. Moving from division, the firm was studying procedures and manpower utilization.

This study had already produced impressive savings. As rapidly as new systems could be developed, Water Department managers were putting them into effect.

Nowhere was the impact so great as in the Water Distribution Section. There 40 field positions had been abolished.

The new controls made it possible to reduce the number and size of work crews, improve the scheduling of assignments, lessen travel time through better routing, promote flexibility and streamline work methods. Much scheduling and recording was being done by I.B.M. machine, and it was planned to use a computer eventually for such control.

Similar controls had been largely implemented among Sewer Maintenance crews, and 21 clerical positions had been abolished in various offices as a result of improved time standards and utilization.

On June 30, 1971, the department paused to tote up its savings. The accumulated savings for the preceding three years amounted to $1,204,335. The savings included—

Water Distribution Crews	$669,892
Sewer Maintenance Crews	219,614
Office Clerical Personnel	226,494
Water Meter Shop Supervisors*	88,335

*Savings obtained through an incentive program for Meter Shop supervisors.

In these areas, the current annual rate of savings had risen to $557,000, but the potential annual rate was over $1 million. The full impact of savings had not yet been achieved in all units, since the new systems and procedures had been instituted gradually over the preceding three years and not in all units simultaneously.

Studies by the consultant, H. B. Maynard and Co., Inc. (under contract to the Water Department) have now begun in the Water Treatment and Design Divisions. Other units to be covered in the future include Customer Service, Water Pumping, and Survey.

NEW STEPS TOWARDS EMPLOYEE QUALITY

While seeking to improve the use of its manpower, the Water Department continued to stress employee *quality*. Such quality has become increasingly important in recent years as the department has turned to automated plants and sophisticated equipment. Only intelligent, well trained employees can use these facilities efficiently.

Recruitment: Selective hiring was still an important source of employee quality. To find bright young engineers, department recruiters made 32 trips to universities and colleges in 1969-70, traveling as far west as Minnesota. Of 239 engineering students interviewed, 20 received expense-paid tours of Water Department facilities and seven were hired. Attractive starting salaries and a tight labor market helped to fill the openings.

Seven more students were hired in 1970-71 as a result of recruitment in local colleges.

Because of the need to clean thousands of clogged sewer inlets, there was a sharp increase in the number

of permanent full-time employees in 1969-70. As of June 30, 1970, the department had 1,626, compared with 1,597 one year before. A job freeze slashed this number, however, to 1,584 by June 30, 1971. The turnover of permanent employees during the two years was as follows:

	1969-70	1970-71
Hired	224	85
Separated	190	186
Promoted	125	89
Turnover Rate	18.3%	8.3%

Training: To upgrade the skills of its employees, the department intensified its training programs.

1. Of national significance was a special course for sewage plant operators. This course, financed by the Federal Water Pollution Control Administration and the U.S. Department of Labor, was begun at the Northeast Plant in September, 1969 and ran for 44 weeks. It drew 25 operators from Philadelphia and 15 from outlying communities.

Planning to use it as a "pilot" for similar courses across the nation, F.W.P.C.A. hoped to relieve a national shortage of operators. The local course was developed and conducted by the Water Department.

2. To encourage its engineers in further study, the department provided "tuition reimbursement" for engineering courses. As a result, up to 17 engineers took courses at local universities in each of the two years. Most of these employees were young.

3. Thirty-five employees also attended brief technical courses offered by private institutions and industries, as well as by Federal Government agencies. The courses ranged from management and secretarial work to water quality and biological waste treatment. Special courses were also conducted within the department to improve employee skills.

4. Orientation sessions were held for new employees and pre-retirement conferences for older employees. Women employees attended a cancer detection seminar.

Other Personnel Programs: Sick leave usage rose to 14.7 days per employee in 1969-70, but dropped to 13 days in the following year. New controls were imposed on sick leave use, and field investigations were frequent.

In November, 1970, the Water Department won "Torchlighter" status when its employees contributed over $67,000 to the United Fund. This was $12,000 in excess of its quota.

SAFETY EDUCATION

Driver safety was an important goal. That this goal was being achieved in part was evidenced by the bestowal of 234 "safe driver" awards on Water Department employees in 1969 and 252 in 1970. The awards were given by the National Safety Council to employees who drove department vehicles for an entire year without a preventable accident.

Preventable accidents totaled 209 in the two-year period, and non-preventable 118.

The department's safety program covered many areas of activity. No effort, indeed, was spared to impress safety rules on employees and supervisors. This was done in many different ways—through lectures, posters, films and conferences—through safety equipment, awards, and driver training.

Despite this program, some types of accidents were

Management Study: Manpower consultants (seated) discuss manpower utilization with Design Branch officials. This is part of a continuing departmental study, which has netted the Water Department $1.2 million in savings to date.

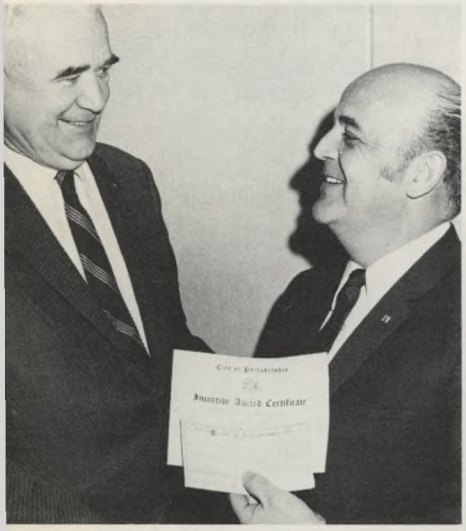
Torchlighter Award: Water Department employees gave $67,000 to the United Fund in 1970, far exceeding their quota. As a result, the department won "torchlighter" status.

Retirement: Elwood L. Bean (right), chief of water treatment, receives a Mayor's Citation from the Water Commissioner. Bean, a nationally recognized expert on water quality, did much to improve the city's water.

Heroism Award: William L. Greene (right) receives the "Award for Heroism" of the American Water Works Association from an AWWA representative. Greene rescued a child from drowning.

For Coolness: Robert McDermott (right), operator at the Belmont Water Plant, receives a commendatory letter from the Water Commissioner for cool action in the aftermath of a sodium chlorite explosion at the plant.

Recreation Activities: Billiards champions Earl Banton (left) and Joseph Pitts (right) receive trophies from the Water Commissioner. The Water Department Employees' Recreation Association sponsors softball, basketball, bowling, billiards and many other sports contests against outside teams.



Incentive Award: Some employees offered new ideas for saving money or improving efficiency. Salvatore Di Vincenzo (right) receives a $25 city check for suggesting safety slogans for elevators.

Department Employee of Year: George Bucher, chairman of Civil Service Commission (left), presents a citation to Ronald Muheim, who was named the Water Department's Employee of the Year for 1971. Muheim tried to save a drowning child.

City Employee of the Year: Herbert Smothers (center) rescued two fellow employees from a sewer when they were overcome. Smothers receives a citation as "City Employee of the Year for 1970" from city officials.

Awards for Safety: Employee, above left, was one of 34 employees to receive special awards from the National Safety Council for driving city vehicles 10 or 11 years without a preventable accident. For the department itself, there was an Achievement Award (upper right) for reducing its injury frequency rate during 1969.

ENGINEERS ARE DOERS

Engineers are the vital core of the Water Department, planning, guiding, supervising a variety of operations. In 1969-71, they – (photographs) (1) used the engineering computer to solve many complex problems, (2) drew up plans and models for construction of new buildings, (3) restudied the layout of pipelines in city streets, (4) drew up blueprints of new facilities, (5) kept an eye on materials used by contractors, and performed many other services.

1

2

3

4

5

overly frequent. The number of disabling injuries per million man hours worked was 43.27 in fiscal 1969-70, and 40.1 in the following year. These rates (kept on a fiscal year basis for the first time) were only slightly below the rates for the calendar years 1968 and 1969. Medical treatment cases, representing non-disabling injuries, totaled 149 in 1969-70 and 164 in 1970-71.

ENGINEERING DEVELOPMENTS

The work of the engineering units was being transformed by a digital computer. The computer, an I.B.M. 1130, replaced a slower model on January 1, 1968, and it quickly sped up the solution, and extended the range of solution, of engineering problems. Increasingly, the engineering units were resorting to it.

In 1969-71, it was used by—

- the Water and Sewer Systems Planning Unit to study pipeline hydraulics and streams,
- the Design Branch to prepare monthly progress reports, contract specifications, and hydraulic designs; to solve structural problems; and to do survey calculations,
- the Construction Branch to solve problems in coordinate geometry, aid field surveys, calculate pipe quantities, print efficiency statistics, and do other reports,
- the engineers of Water Pollution Control to prepare various reports on plant operation, clogged sewer inlets, industrial waste surcharges, and special matters.

New computer programs were written, and old programs revised, by the Computer Unit during the biennium. These affected not only the Water Department but also other city agencies which used the services of the unit. The computer was in use 95% of possible time.

Water and Sewer Systems Planning: Because pipelines are constantly affected by urban changes, the computer was of special value to the small Water and Sewer Systems Planning Unit. Through numerous studies, the unit sought to anticipate the effects of shifting population and of new homes and highways.

Hydraulic reviews and related planning played an important part in such studies. During the biennium, these studies covered 21 miles of future sewers at 254 locations, with a cost tag of $15.5 million; and many miles of future water mains at 276 points in the water distribution grid, valued at $3.9 million. Other mains were studied to support city applications for federal funding, or to service new developments such as the Tioga Marine Terminal or planned center city buildings.

To meet future needs, the unit also studied (1) drainage plans for Eastwick and International Airport, (2) sewer relocation for the Broad Street subway extension, (3) the Sandy Run sewer system in the northeast, (4) the capacity of present interceptors to accept additional wastes from suburbs and oil refineries, and (5) the ability of certain storm sewers to prevent flooding.

Design: "Plans, specifications and estimates" for 375 projects, valued at nearly $30 million, were prepared by the Design Branch. The projects included large supply mains for two water plants, new water pumps, and many miles of distribution mains and sewers. Sludge pumps, grease burning facilities, screening shredders, and other improvements were planned for the water pollution control plants.

Because of limited personnel, some of the work was let to private consultants.

As in past years, Design employees worked closely with the State Department of Transportation in planning piping and drainage for the Delaware Expressway, which is still under construction. Many reports were also prepared on drainage for private buildings.

Construction: Of the Construction Branch, there is little to note here, for much of this report describes the large building program which has been supervised by that branch. Construction engineers checked on the work performed by contractors under 250 to 300 contracts annually, representing a value of $30-$38 million. The unit's surveyors worked on more than 100 field projects each year.

Materials Testing: Honest value from contractors for each municipal dollar spent was still the goal of the Materials Testing Laboratory. Although this laboratory is operated by the Water Department, it serves all city departments, analyzing their purchases for conformance to specifications.

Modern and well equipped, the laboratory made more tests on more samples in 1969-70 and 1970-71 than it had for many years. Tests rose in each of the two years.

	1969-70	1970-71
Samples Tested	6,600	10,800
Physical Tests	45,000	80,000
Chemical Tests	25,000	43,000

Some of the increase resulted from the construction of a multi-purpose stadium in South Philadelphia. Because of this, about half of the samples were submitted by the Department of Public Property, which supervised construction of the stadium. The Water Department submitted one-third.

Other Units: Some "brainstorming" was done by other units.

Thus the engineering staff of Water Pollution Control studied the (1) feasibility of a fourth water pollution control plant, (2) economics of using certain chemicals in wastewater treatment, (3) practicability of using digester gas from water pollution control plants to power vehicles, (4) nature of wastes from various industries, and (5) preliminary designs for wastewater "pilot" facilities.

The Research and Development Unit made many studies along the rivers. These have been described elsewhere.

The Water Main Records Unit made hundreds of revisions to block plans and plates. It also continued

the microfilming of many records, and processed nearly 7,300 permits for use of fire hydrants or making of service connections.

The Projects Control Unit processed 273 contracts and provided contractors with information. It also acted as liaison between the Water Department and the City Council on legislative matters.

SERVING THE CUSTOMER

In 1969-70, water customers asked for more service than ever before. The number of telephone calls received by the Customer Service Unit totaled 180,000. This was 20,000 more than the annual average for the preceding three years.

A mild winter and mild spring showers, however, dropped the total to 142,000 in 1970-71.

Following up on many of these calls, field inspectors checked on leaking meters, broken mains, clogged sewer inlets, discolored water, flooded cellars, and many other matters that affected customers. When investigation justified action, department crews were quickly dispatched to correct the reported conditions.

During the biennium, inspectors made 171,000 inspections covering permits, billing, missing meters, charity applications, fire service connections, and construction. Many customers were required to correct insanitary or other private conditions, and the department issued 21,000 "violation" notices for this purpose. Only 103 such cases had to be taken to court. In an increasing number of instances (mainly welfare cases), the department corrected the insanitary condition and billed the customer in installments. The number of such "City Fund" jobs totaled 291 and cost $85,600.

Under a small claims ordinance administered by the Water Department, 177 private claims against the municipality (for damage from broken water mains, sewers, etc.) were settled. Five claims were rejected, and five were referred to the Law Department. The total value of the settlements was $25,288.

A NATIONAL AWARD FOR COMMUNITY RELATIONS

Keeping the public informed is a basic part of Water Department policy. In 1969-71, the department issued periodic news releases, distributed thousands of brochures, encouraged visits to its plants, set up a variety of exhibits, delivered explanatory letters about new construction to home owners, sent out speakers, and held a number of public ceremonies.

Among new developments were—

- Issuance of a two-color, illustrated, 36-page brochure entitled "Clean Streams for Philadelphia"—one of the most comprehensive booklets ever prepared on water pollution control for the average citizen in any municipality,
- Publication of other brochures on plant visits, water treatment, and water quality analyses,
- Installation of exhibits at the Greater Philadelphia Health Fair, the City Employees' Week Fair, several local colleges, and other places,
- Visits to the water treatment plants by 19,000 Philadelphians and foreign tourists,
- A comprehensive effort, including news releases, leaflets, interviews and speeches to explain an increase in water and sewer rates that became effective on July 1, 1970.

These and other efforts of the department were recognized for the fourth and fifth times in five years by the American Water Works Association. In June, 1970, the department received its second national "Community Relations Award" from A.W.W.A., and in June, 1971, it received its third "Advancement Award" from the Pennsylvania Section of A.W.W.A.

The department was cited for its physical improvements, customer services, and public relations.

PERSONNEL CHANGES

The most significant changes were as follows:

Promotions

In fiscal 1969-70: Kumar Kischinschand, from Assistant Chief to Chief of the Materials Testing Laboratory; Walter Yoka, from Assistant Superintendent to Superintendent of the Sewer Maintenance Section; Azad Attarian, from Administrative Assistant III to Water Operations Services Director.

In fiscal 1970-71: Richard A. Supplee, from Assistant Superintendent to Superintendent of the Water Distribution Section; Robert Walker, from Chief of Customer Service to Administrative Assistant III (Executive Assistant to the Commissioner); and Rinaldo Luciani, from Engineering Supervisor I to II.

New Appointments

Giovanni Petri, as Architect IV in the Design Branch, on April 20, 1970.

Retirements

James A. Brady, Jr., Engineering Supervisor I (Chief of the Projects Control Unit), on February 11, 1970; and Jacob Reich, Sanitary Engineer III (Chief of the Industrial Wastes Control Section), on September 15, 1970.

William Thompson, Sanitary Engineer III (Superintendent of Water Filtration, Schuylkill Division), on January 5, 1971; Edward Witkowski, Water Treatment Laboratory Supervisor, on January 8, 1971; Elmer Goebel, Water Distribution Superintendent, on January 26, 1971; and Elwood L. Bean, Sanitary Engineer V (Chief of the Water Treatment Division), on March 31, 1971.

Other

Robert Wenzinger, Staff Engineer I, resigned on February 6, 1970, and Nicholas Bubernak, Engineering Supervisor I, transferred to the Department of Public Property on May 31, 1970.

Exhibits Inform the Public

Better Water for Americans Week: The Water Department joined other water utilities in celebrating "Better Water for Americans Week" in August, 1970. The Mayor's proclamation of the event was read by Councilman William Cibotti (left).

Clean-up Parades: Floats (above and below) were used in Clean-up, paint-up, Fix-up Parades during the biennium. Simple themes conveyed department messages.

City Employees' Fair: Typical of exhibits placed by the Water Department at shows, meetings and colleges were the displays at the City Employees' Fair (above and below) in 1970 and 1971. Exhibits presented facts about department operations.

NEW WATER AND SEWER RATES EFFECTIVE JULY 1, 1970

*TABLE OF HALF-YEAR RATES FOR SMALL METERS

	WATER				SEWER**	
	—Old Rates—		—New Rates—		Old Rates	New Rates
Meter Size	Minimum Allowance (Cubic Feet)	Minimum Water Rate	Minimum Allowance (Cubic Feet)	Minimum Water Rate	% of Water Bill	% of Water Bill
5/8"	3,000	$10.00	3,000	$12.50	98%	115%
3/4"	3,000	15.00	3,000	19.00	93%	109%

OLD ABOVE MINIMUM CHARGE: $1.32
NEW ABOVE MINIMUM CHARGE: $1.65
For each 1,000 cubic feet of water beyond the 3,000 cubic feet minimum allowance.

*Most small-meter bills are mailed out every six months. A few go out quarterly. The rates and allowances for the latter can be determined by splitting the half-year figures in the table.

**The sewer bill is figured at a certain percentage of the water bill. This percentage varies with the size of the water meter.

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*TABLE OF QUARTER-YEAR RATES FOR ALL METERS

	WATER			SEWER**	
Meter Size	Minimum Allowance (Cubic Feet)	Old Rate Minimum Charge	New Rate Minimum Charge	Old Rate % of Water Bill	New Rate % of Water Bill
5/8"	1,500	$ 5.00	$ 6.25	98%	115%
3/4"	1,500	7.50	9.50	93%	109%
1"	2,000	11.00	13.75	88%	103%
1¼"	4,000	20.00	25.00	83%	98%
1½"	6,000	30.00	37.50	78%	92%
2"	16,000	80.00	100.00	73%	86%
3"	36,000	175.00	220.00	68%	80%
4"	64,000	317.50	400.00	62%	73%
6"	144,000	700.00	875.00	57%	67%
8"	288,000	1,400.00	1,750.00	51%	60%
10"	400,000	1,975.00	2,450.00	51%	60%
12"	575,000	2,800.00	3,500.00	51%	60%

OLD "ABOVE MINIMUM" CHARGE: $1.32
NEW "ABOVE MINIMUM" CHARGE: $1.65
For each 1,000 cubic feet of water beyond the "minimum" allowance.

*Customers with water meters one inch or larger in size are billed every three months. Most customers with meters smaller than one inch are billed every six months. To determine allowances and rates for half-year periods, double the figures in the table above.

**The sewer bill is figured at a certain percentage of the water bill. This percentage varies with the size of the water meter.

FINANCIAL DEVELOPMENTS

THE NEW WATER AND SEWER RATES

To maintain its modern service, the Water Department took an urgent step in 1970. It revised its water and sewer rates to meet rising costs. Water rates rose by 25% and sewer rates by 47%.

For the average Philadelphia family, the combined 36% increase amounted to four cents a day. It added $8 or less to the regular *half-year* bill of most families, and in the case of one-quarter of all families the extra charge was about $7.

Taking effect on July 1, 1970, the new rates were to run for three years. They were planned to produce revenue surpluses initially and to meet all the department's operating and debt service costs. Towards the end of the three-year period, the surpluses will decline, offering only an emergency cushion. This fiscal plan was in accordance with the City Charter, which requires the Water Department to be self-supporting.

The new rates were urgently needed, for, by 1970, water and sewer revenues were lagging behind expenditures. If the old rates continued, the climbing costs would wipe out an accumulated surplus in fiscal 1970-71, and there would be an operating deficit of $40 million by 1973.

In Philadelphia, as in other cities, a number of cost factors were at work:

1. Inflation was pushing up construction costs by 9% to 11%† a year. This was having a heavy impact on the $15 million to $25 million annual construction program of the Water Department.

2. Despite many economies, operating costs of the Water Department had climbed from $23.5 million in 1967 to $28.5 million in fiscal 1969-70, and were expected to reach $39 million by fiscal 1972-73.

3. Debt service—or the total dollars repaid on those municipal bonds which finance water and sewer construction—had risen by 4% a year since 1967, and it was expected to ascend by 11% annually in the next three years. Thus the Water Department paid out $22.5 million for principal and interest in 1967, but these payments will increase by $6.1 million a year by fiscal 1972-73.

The new rates were quietly accepted by the Philadelphia public. This acceptance stemmed in part from a recognition of the many benefits that improved service had brought to the community.

Thanks to the new rates,* the Water Department is improving this service further.

A SURCHARGE ON INDUSTRIAL WASTES

Because of the heavy cost of treating industrial wastes, the Water Department adopted a new surcharge** for the first time. The surcharge, which took effect on July 1, 1970, produced $1.2 million in the ensuing year.

Under the new plan, some industries and commercial establishments are required to pay a surcharge based on the *strength* of the wastes which they empty into city sewers. This surcharge is in addition to the ordinary municipal rates for sewer service.

Unfortunately, the wastes from certain industries

†The rate was 14% in 1971.

*The new rates are embodied in Water Regulation No. 34 and Sewer Regulation No. 6.

**The surcharge is covered by Sewer Regulation No. 6.

Fiscal Operations: New business machines and new methods have been introduced into the Water Department's accounting operations over the years. Accountant above checks cost ledgers while operating cash register machine.

New Surcharge: As part of an enforcement program for a new surcharge on industrial wastes, sanitary engineers monitored the wastes of many industries in 1970-71. Above, department engineers take "readings" on waste discharges into city sewers by two industries.

create special problems for the municipal plants that treat them. The new surcharge, it is anticipated, will compensate the Water Department for the extra costs that it incurs in these instances. It may also encourage some industries to recapture or neutralize strong wastes.

The regulation provides that the surcharge shall be imposed when an industry contributes pollutants that are in excess of 350 milligrams per liter of biochemical oxygen demand and/or in excess of 400 milligrams per liter of suspended solids.

The actual charge to each firm is based on samples taken of its wastewater, or on samples taken from industries or establishments so similar as to create a norm for that firm's industrial category. Samples are collected periodically by Water Department engineers.

The surcharge amounts to one and one-half cents for each pound of pollutants exceeding the limits noted above. It applies to all wastewater discharged into the municipal sewer system on or after July 1, 1970. Hardly more than 60 large industries (out of 5,000 in the city) are expected to produce most of the revenue from the new surcharge. Besides some small industries, the surcharge affects 450 laundries and laundromats and several hundred restaurants.

OTHER NEW CHARGES FOR SERVICES

To defray the rising cost of service, the Water Department put into effect several other new charges, or revised charges, on July 1, 1970.

Fire-Service: For the first time, a fire-service charge was levied on private fire-protection systems located *within* Philadelphia. The charge will be made yearly and will cover all systems that are supplied by Water Department pipelines.

Hitherto only private systems located outside the city (but connected to its pipelines) paid a fire-service charge, and they will continue to do so. The new charges on *Philadelphia* systems will help to meet the sizable costs that the Water Department must bear in order to provide stand-by service.

Various: Other regulations that took effect included (1) Regulation No. 36, revising charges for ferrule and valve connections. (2) Regulation No. 37, revising charges for restoring water service after it has been shut off, (3) Regulation No. 38, imposing a $30 service charge for shutting down a water main to permit a plumber to repair a broken water pipe, and (4) Regulation No. 39, revising charges for installation of water meters.

CAPITAL ACTIVITY

Fiscal Year July 1, 1969 to June 30, 1970	Water System Projects	Wastewater System Projects	Total
Capital contracts encumbered July 1, 1969	**$15,726,804**	**$15,482,368**	**$31,209,172**
Add: Capital work initiated July 1, 1969 to June 30, 1970	**4,657,414**	**5,916,697**	**10,574,111**
Total: Net capital activity in Fiscal 1970	**$20,384,218**	**$21,399,065**	**$41,783,283**
Less: Capital expenditures in Fiscal 1970	**7,445,633**	**8,683,336**	**16,128,969**
Capital contracts still encumbered June 30, 1970	**$12,938,585**	**$12,715,729**	**$25,654,314**
Fiscal Year July 1, 1970 to June 30, 1971			
Capital contracts encumbered July 1, 1970	**$12,938,585**	**$12,715,729**	**$25,654,314**
Add: Capital work initiated July 1, 1970 to June 30, 1971	**4,324,302**	**17,196,626**	**21,520,928**
Total: Net capital activity in Fiscal 1971	**$17,262,887**	**$29,912,355**	**$47,175,242**
Less: Capital expenditures in Fiscal 1971	**8,622,328**	**11,947,440**	**20,569,768**
Capital contracts still encumbered June 30, 1971	**$ 8,640,559**	**$17,964,915**	**$26,605,474**

SUMMARY OF CAPITAL ACTIVITY—1966 to 1971

	1966	1967	1968	Fiscal* Period 1968	Fiscal** Period 1970	Fiscal*** Period 1971
Capital contracts encumbered, beginning of period	**$15,290,618**	**$15,641,384**	**$19,720,719**	**$19,720,719**	**$31,209,172**	**$25,654,314**
Add: Capital work initiated	**17,929,890**	**23,094,060**	**19,386,518**	**38,720,673**	**10,574,111**	**21,520,928**
Total: Net capital activity	**$33,220,508**	**$38,735,444**	**$39,107,237**	**$58,441,392**	**$41,783,283**	**$47,175,242**
Less: Capital expenditures	**17,579,124**	**19,014,725**	**18,526,916**	**27,232,220**	**16,128,969**	**20,569,768**
Capital contracts encumbered, end of period	**$15,641,384**	**$19,720,719**	**$20,580,321**	**$31,209,172**	**$25,654,314**	**$26,605,474**

* 18-months transition period, ended June 30, 1969
** 12 months ended June 30, 1970
*** 12 months ended June 30, 1971

WATER FUND - brief financial statement

BALANCE SHEET

ASSETS AND OTHER DEBITS

	June 30 1971	June 30 1970
Utility Plant		
Utility Plant in Service	$300,553,047	$293,728,970
Construction Work in Progress	7,424,651	4,879,861
Unexpended Construction Authorizations	16,224,799	18,199,625
	$324,202,497	**$316,799,456**
Current Assets		
Cash	$ 3,206,328	$ 4,486,121
Accounts Receivable:		
Customers, for Utility Service	7,430,480	5,947,454
Other	323,173	225,148
Estimated Uncollectible Receivables	(1,360,531)	(1,234,464)
Materials and Supplies at Standard Cost	1,975,390	1,829,727
Advances to Other Municipal Funds	3,141,420	612,271
Prepaid Expenses	—	777
	$ 14,716,260	**$ 11,867,034**
	$338,918,757	$328,666,490

LIABILITIES AND OTHER CREDITS

Long Term Debt and Other Credits		
Bonds Payable	$119,971,614	$119,025,079
Sinking Fund Assets	(2,889,779)	(2,790,442)
Bond Authorizations Unissued	6,000,000	6,900,000
	$123,081,835	**$123,134,637**
Excess of Utility Plant and Fund Accounts over Long Term Bond Commitments	201,120,662	193,664,819
	$324,202,497	**$316,799,456**
Current Liabilities		
Accounts Payable	$ 730,273	$ 786,611
Accrued Payroll	473,307	384,452
Advances from Other Municipal Funds	33,650	12,223
	$ 1,237,230	**$ 1,183,286**
Surplus and Surplus Reserves		
Reserves for Commitments	$ 1,754,602	$ 1,473,537
Surplus:		
Invested in Materials and Supplies	1,975,390	1,829,727
Estimated Collectible Receivables	6,393,122	4,938,138
Available for Appropriation	3,355,916	2,442,346
	$ 11,724,428	**$ 9,210,211**
Total Surplus and Surplus Reserves	**$ 13,479,030**	**$ 10,683,748**
	$ 14,716,260	**$ 11,867,034**
	$338,918,757	**$328,666,490**

WATER FUND continued

STATEMENT OF INCOME AND SURPLUS

	For The Fiscal Year Ending June 30	
Operating Revenue:	**1971**	**1970**
Metered Sales	$28,361,483	$23,621,702
Municipal and Other Metered Sales	1,160,296	769,400
Public Fire Protection	1,241,396	1,224,484
Private Fire Connections	378,401(1)	—
Other Operating Revenues	716,548	599,046
Total Operating Revenue	**$31,858,124**	**$26,214,632**
Operating Revenue Deductions:		
Operating Expenses, other than Maintenance	$12,200,384	$10,737,222
Maintenance Expenses	5,424,693	4,742,376
Total Operating Expenses	**$17,625,077**	**$15,479,598**
Charges in Lieu of Depreciation	7,289,782	6,823,133
Total Operating Revenue Deductions	**$24,914,859**	**$22,302,731**
Operating Income	6,943,265	3,911,901
Other Income	664,966	692,870
Gross Income	**$ 7,608,231**	**$ 4,604,771**
Income Deductions:		
Interest on Long Term Debt	$ 4,726,465	$ 4,395,594
Net Income or (Loss)	**$ 2,881,766**	**$ 209,177**
Surplus and Surplus Reserves at the Beginning of the Year	10,683,749	10,912,971
Other Adjustments to Surplus (Net)	(86,485)	(438,399)
Total Surplus and Surplus Reserves at the End of the Year	**$13,479,030**	**$10,683,749**

NOTE: (1) Represents a new source of revenue. On July 1, 1970, a fire-service charge was levied on private fire protection systems within the city. See page 49.

WATER FUND—ANALYSIS OF FISCAL YEAR 1971
BUDGETARY OPERATIONS AND COMPARISON WITH ACCRUAL BASIS STATEMENTS

INCOME (by major source)	Budget Estimate(1)	Actual Receipts	Receipts Compared with Estimates	% of Estimate Realized	Accrual Basis Income(2)(7)
Water Sales:					
Collections on current billings (with penalties)	$25,709,000	$24,220,755	$(1,488,245)	94.2%	$28,361,483
Collections on past billings (with penalties and interest)	2,442,000	2,826,570	384,570	115.7	516,201(2)
Total Water Sales	**$28,151,000**	**$27,047,325**	**$(1,103,675)**	**96.1%**	**$28,877,684**
Fire Service Connections	250,000	339,829	89,829	135.9	378,401
Meter Installations (Water Fund share—60%)	127,000	118,346	(8,654)	93.2	142,934
Miscellaneous Income	459,000	499,712	40,712	108.9	539,719
Interest Earnings	284,000	311,391	27,391	109.6	316,290
Payments from Other City Funds:					
General Fund:					
Water Sales to City Agencies	976,000	1,160,296	184,296	118.9	1,160,296(3)
Joint Fund Expenses	0	168,108	168,108	—	161,797(3)
Fire Protection Services	1,130,000	1,241,396	111,396	109.9	1,241,396(3)
Sewer Fund: Joint fund expenses	896,000	1,337,302	441,302	149.3	896,000(3)(4)
Total Income	**$32,273,000**	**$32,223,705**	**$ (49,295)**	**99.8%**	**$33,714,517**

OUTGO (by major object of expenditure)		Final Obligations				
Operations	**Final Appropriations**	**Amount**	**% of Total**	**Lapses Amount**	**%**	**Accrual Basis Expenses(7)**
Water Operations:						
Salaries and Wages	$ 9,552,000	$ 9,296,114	29.4%	$255,886	2.7%	$ 9,145,369
Purchases of services by contract	2,460,000	2,448,942	7.8	11,058	.4	2,567,935
Materials and supplies	3,522,000	3,499,031	11.1	22,969	.7	2,721,581
Equipment	405,000	397,003	1.3	7,997	2.0	858,521
Miscellaneous	501,000	500,689(8)	1.6	311	—	689
Payments to General Fund:						
Financial services, reading meters, billing, etc.	1,587,275	1,545,614	4.9	41,661	2.6	1,545,614(3)
Other services rendered	1,079,725	994,429	3.1	85,296	7.9	994,429(3)
Contributions to Bond Fund	60,000	60,000	.2	—	.0	60,000
Total Water Operations	**$19,167,000**	**$18,741,822**	**59.4%**	**$425,178**	**2.2%**	**$17,894,138**
Employees' welfare plan payments	348,000	294,397	.9	53,603	15.4	294,397
Claims and awards	90,000	54,132	.2	35,868	39.9	54,132
Employees' pension fund payments	1,251,000	1,282,900	4.1	(31,900)	—	1,282,900(3)
Refunds	25,000	12,975	—	12,025	48.1	12,975(3)
Workmen's compensation	28,000	9,038	—	18,962	67.7	9,038
Provision for estimated uncollectible receivables						126,067(5)
Total Operations	**$20,909,000**	**$20,395,264**	**64.6%**	**$513,736**	**2.5%**	**$19,673,647**
Capital Payments						
Debt Service:						
Amortization of principal	$ 5,933,000	$ 5,932,639	18.8%	$ 361	—%	$ 5,932,639
Interest	4,764,000	4,726,465	15.0	37,535	.8	4,726,465(3)
Capital Budget Financing	500,000	500,000	1.6	0	—	500,000
Total Capital Payments	**$11,197,000**	**$11,159,104**	**35.4%**	**$ 37,896**	**.3**	**$11,159,104**
TOTAL OUTGO	**$32,106,000**	**$31,554,368**	**100.0%**	**$551,632**	**1.7%**	**$30,832,751**

SUMMARY COMPARISON OF FISCAL YEAR 1971 BUDGETARY OPERATIONS
(Original and Actual Budgets)

	Encumbrance Basis			
	Budget Estimate(1)	**Actual**	**Change**	**Accrual Basis(6)(7)**
Surplus, June 30, 1970	**$ 1,994,000**	**$ 2,189,139**	**$ 195,139**	**$10,683,748**
Add or (Subtract): Adjustment of Prior Years' Operations	0	496,457	496,457	(86,484)
Add: Fiscal Year 1971 Income	32,273,000	32,223,705	(49,295)	33,714,517
Total 1971 Resources	**$34,267,000**	**$34,909,301**	**$ 642,301**	**$44,311,781**
Less: Fiscal Year 1971 Outgo	32,106,000	31,554,368	(551,632)	30,832,751
Surplus, June 30, 1971	**$ 2,161,000**	**$ 3,354,933**	**$ 1,193,933**	**$13,479,030**

NOTES:
(1) Mayor's budget adopted by Council in May 1970.
(2) On the accrual basis, income is considered as earned when billed, whereas the budgetary basis considers income as earned when collected. Thus collection of the prior years is not considered as income on the accrual basis statements.
(3) These figures reflect respective net adjustments to charges in interfund operations.
(4) Payments made by the Sewer Fund to the Water Fund for general management services is not considered as income on the accrual basis, but as a reduction of operating expenses.
(5) The net increase (or decrease) to the estimated uncollectible receivables is considered an expense on the accrual basis.
(6) Surplus on the accrual basis includes the amounts invested in:
Materials and Supplies
Estimated Collectible Receivables
(7) Exigencies precluded the availability of some actual accrual basis data. Therefore, some estimates were used for accruals.
(8) Includes $500,000.00 reserved for the state tax on Water Utilities; that portion of the Act which applied to Municipalities was repealed during August 1971 and this money reverted to surplus.

SEWER FUND - brief financial statement

BALANCE SHEET

ASSETS AND OTHER DEBITS

	June 30 1971	June 30 1970
Utility Plant		
Utility Plant in Service	$411,445,582	$398,206,869
Construction Work in Progress	10,938,473	11,309,497
Unexpended Construction Authorizations	28,968,531	20,186,371
	$451,352,586	**$429,702,737**
Current Assets		
Cash	$ 5,444,697	$ 4,454,611
Accounts Receivable:		
Customers, for Utility Service	7,506,708	5,386,938
Other	179,409	105,421
Estimated Uncollectible Receivables	(1,198,699)	(993,745)
Materials and Supplies at Standard Cost	309,225	255,573
Advances to Other Municipal Funds	789,318	98,858
Prepaid Expenses	—	3,752
	$ 13,030,658	**$ 9,311,408**
	$464,383,244	**$439,014,145**

LIABILITIES AND OTHER CREDITS

Long Term Debt and Other Credits		
Bonds Payable	$192,475,006	$190,155,613
Sinking Fund Assets	(6,732,973)	(6,188,010)
Bond Authorizations Unissued	11,400,000	10,800,000
	$197,142,033	**$194,767,603**
Excess of Utility Plant and Fund Accounts over Long Term Bond Commitments	254,210,533	234,935,134
	$451,352,586	**$429,702,737**
Current Liabilities		
Accounts Payable	$ 374,407	$ 242,223
Payroll Accrued	303,922	160,572
Advances from Other Municipal Funds	723,263	264,516
	$ 1,401,592	**$ 667,311**
Surplus and Surplus Reserves		
Reserves for Commitments	$ 1,404,312	$ 962,081
Surplus:		
Invested in Materials and Supplies	309,225	255,573
Estimated Collectible Receivables	6,487,418	4,498,615
Available for Appropriation	3,428,111	2,927,828
	$ 10,224,754	$ 7,682,016
Total Surplus and Surplus Reserves	$ 11,629,066	$ 8,644,097
	$ 13,030,658	**$ 9,311,408**
	$464,383,244	**$439,014,145**

SEWER FUND continued

STATEMENT OF INCOME AND SURPLUS

	For The Fiscal Year Ending June 30	
Operating Revenue:	**1971**	**1970**
Metered Sales	$26,806,261	$19,190,234
Municipal and Other Metered Sales	1,550,624	1,749,866
Industrial Sewage Surcharge	687,324	—
Other Revenue	570,020	399,869
Total Operating Revenues	**$29,614,229**	**$21,339,969**
Operating Revenue Deductions:		
Operating Expenses, Other than Maintenance	$ 8,274,728	$ 6,535,434
Maintenance Expenses	2,410,452	1,940,126
Total Operating Expenses	**$10,685,180**	**$ 8,475,560**
Charges in Lieu of Depreciation	9,943,662	9,070,939
Total Operating Revenue Deductions	**$20,628,842**	**$17,546,499**
Operating Income	8,985,387	3,793,470
Other Income	1,883,355	2,057,403
Gross Income	**$10,868,742**	**$ 5,850,873**
Income Deductions		
Interest on Long Term Debt	$ 7,240,070	$ 6,467,932
Net Income or (Loss)	**$ 3,628,672**	**$ (617,059)**
Surplus and Surplus Reserves at the Beginning of the Year	8,644,096	9,644,490
Other Adjustments (Net)	(643,702)	(383,335)
Total Surplus and Surplus Reserves at the End of the Year	**$11,629,066**	**$ 8,644,096**

SEWER FUND—ANALYSIS OF FISCAL YEAR 1971
BUDGETARY OPERATIONS AND COMPARISON WITH ACCRUAL BASIS STATEMENTS

INCOME (by major source)	Budget Estimate(1)	Actual Receipts	Receipts Compared with Estimates	% of Estimate Realized	Accrual Basis Income(2)(6)
Sewer Charges:					
Collections on current billings (with penalties)	$23,842,000	$22,186,661	$(1,655,339)	93.1%	$26,806,261
Collection on past billings (with penalties and interest)	2,216,000	2,741,941	525,941	123.7	553,085(2)
Total Sewer Charges	**$26,058,000**	**$24,928,602**	**$(1,129,398)**	**95.7%**	**$27,359,346**
Sewer Charges to Other Municipalities	670,000	797,608	127,608	119.0	764,891
Surcharges (new in Fiscal 1971)	300,000	618,661	318,661	206.2	687,323
Meter Installations	84,000	75,132	(8,868)	89.4	75,132
Miscellaneous Revenues	80,000	94,725	14,725	118.4	103,415
Interest Earnings	282,000	341,977	59,977	121.3	352,124
Payments from Other City Funds:					
General Fund: Sewer service to City agencies	670,000	785,733	115,733	117.3	785,733(3)
Joint fund expenses	0	3,585	3,585		3,585(3)
State Reimbursement for Clean Streams Program	1,400,000	1,390,217	(9,783)	99.3	1,390,217(3)
TOTAL INCOME	**$29,544,000**	**$29,036,240**	**$ (507,760)**	**98.3%**	**$31,521,766**

OUTGO (by major object of expenditure)		Final Obligations		Lapses		Accrual Basis
Operations	Final Appropriations	Amount	% of Total	Amount	%	Expenses(6)
Wastewater Operations:						
Salaries and wages	$ 4,987,000	$ 4,914,623	17.2%	$ 72,377	1.5%	$ 4,914,623
Purchase of service by contract	1,861,000	1,820,166	6.4	40,834	2.2	1,561,247
Materials and supplies	616,000	518,134	1.8	97,866	15.9	286,717
Equipment	798,500	758,228	2.6	40,272	5.0	726,583
Miscellaneous	500	77	—	423	84.6	—
Payments to General Fund:						
Financial services, reading meters, billing, etc.	1,254,112	1,406,895	4.9	(152,783)	—	1,406,895(3)
Other services rendered	324,888	413,439	1.4	(88,551)	—	413,439(3)
Payments to Water Fund:						
Joint fund expenses	896,000	1,337,302	4.7	(441,302)	—	896,000(3)
Contribution to Bond Fund	40,000	40,000	.1	0	0	40,000
Total Wastewater Operations	**$10,778,000**	**$11,208,864**	**39.1%**	**$(430,864)**	**—%**	**$10,245,504**
Employees' welfare plan payments	200,000	147,482	.5	52,518	26.3	147,482
Claims and awards	80,000	79,947	.3	53	.1	80,504
Employees' pension fund payments	721,000	757,500	2.7	(36,500)	—	757,500
Refunds	15,000	10,155	—	4,845	32.3	0
Workmen's compensation	0	0	—	0	.0	0
Provision for estimated uncollectible receivables	—	—	—	—	—	204,954(4)
Total Operations	**$11,794,000**	**$12,203,948**	**42.6%**	**$(409,948)**	**—%**	**$11,435,944**
Capital Payments						
Debt Service:						
Amortization of principal	$ 8,717,200	$ 8,717,080	30.4%	$ 120	—%	$ 8,717,080
Interest	7,285,800	7,240,070	25.3	45,730	.6	7,240,070
Capital Budget Financing	500,000	500,000	1.7	0	.0	500,000
Total Capital Payments	$16,503,000	$16,457,150	57.4%	$ 45,850	.3%	$16,457,150
TOTAL OUTGO	**$28,297,000**	**$28,661,098**	**100.0%**	**$(364,098)**	**—%**	**$27,893,094**

SUMMARY COMPARISON OF 1971 BUDGETARY OPERATIONS

	Encumbrance Basis			
	Budget Estimate(1)	Actual	Change	Accrual Basis(5)(6)
Surplus, June 30, 1970	**$ 1,994,000**	**$ 2,902,119**	**$ 908,119**	**$ 8,644,096**
Add or (Subtract): Adjustment of Prior Years' Operations	0	150,850	150,850	(643,702)
Add: 1970 Income	29,544,000	29,036,240	(507,760)	31,521,766
Total 1971 Resources	**$31,538,000**	**$32,089,209**	**$ 551,209**	**$39,522,160**
Less: 1971 Outgo	28,297,000	28,661,098	364,098	27,893,094
Surplus, June 30, 1971	**$ 3,241,000**	**$ 3,428,111**	**$ 187,111**	**$11,629,066**

NOTES:
(1) Budget as proposed by the Mayor and adopted by Council in May 1970.
(2) On the accrual basis, income is considered as earned when billed, whereas the budgetary basis considers income as earned when collected. Thus collection of the prior years is not considered as income on the accrual basis statements.
(3) These figures reflect respective net adjustments to charges in interfund operations.
(4) The net increase (or decrease) to the estimated uncollectible receivables is considered an expense on the accrual basis.
(5) Surplus on the accrual basis includes the amounts invested in:
Materials and Supplies
Estimated Collectible Receivables
(6) Exigencies precluded the availability of some actual accrual basis data. Therefore, some estimates were used for the accrual basis.

CAPITAL PROJECTS

July 1, 1969 through June 30, 1971

WATER PLANTS AND DISTRIBUTION SYSTEM

Major Projects Completed

			Cost
1.	W-1448 thru W-1450	Queen Lane Chemical Building: General construction, plumbing and electrical work on a new chemical storage and treatment building at the Queen Lane Water Treatment Plant.	$1,311,000
2.	W-1471 W-1523 W-1720	Load Control Center: Installation of solid-state equipment at various microwave towers and at the control center; also installation of a solid-state 200-point capacity data logger at the center, and of control equipment at the Roxborough High-Service Pumping Station.	382,000
3.	W-1575-76	Torresdale Filtered Water Pumping Station: Installation of 27 M.G.D. high-service pump, plus valves and piping.	256,000
4.	W-1464-M	A 48-inch steel main to carry water from the Torresdale Filtered-Water Pumping Station to Bucks County.	1,000,000
5.	W-1678-D	A 48-inch steel main around the east side of City Hall, to form a link in the Broad Street supply main.	503,000
6.	W-1626-28-29-D	Cleaning and cement lining of water mains, ranging from six to 16 inches in diameter, in various parts of the city.	1,555,000

Some of the Larger Projects under Construction on June 30, 1971

			Limit of Contract
1.	W-1500-01	Queen Lane Water Storage: Conversion of 22 slow sand filter beds into an underground reservoir for storage of purified water. 67% completed.	$3,514,000
2.	W-1673	Queen Lane Water Tunnel: Boring of 6,000-ft. long tunnel and construction of 8½-ft. diameter tube inside it, to convey Schuylkill River water to the Queen Lane Water Treatment Plant. 46% completed.	2,340,000

WATER POLLUTION CONTROL PLANTS AND SEWERS

Major Projects Completed

			Cost
1.	SD-402-04-NE SD-350-52-SW	Northeast and Southwest Water Pollution Control Plants: Installation of gas recirculation systems in 12 digester tanks.	$ 624,000
2.	SD-426 to -31-NE	Northeast Plant: Renovation and expansion of the administration building, including general construction, plumbing, heating, electrical work, and air conditioning.	520,000
3.	SD-417-18-NE	Northeast Plant: Construction of an incinerator to burn grease and oil skimmed from wastewater.	203,000
4.	SD-373-NE	Northeast Plant: Installation of a 4.16 KV indoor metal clad switchgear.	300,000
5.	SD-198-99-SE SD-207-11-SEO	Southeast Water Pollution Control Plant: Construction of a new building to store maintenance equipment.	180,000
6.	S-3844-B	A storm water conduit (6 ft. x 8 ft.) in Convent Avenue from State Road to the Delaware River.	342,000
7.	S-3669-E S-3779-E S-3780-E S-3787-E	Construction of various large sewers in the Eastwick section to collect storm water and sanitary sewage.	2,379,000

Some of the Larger Projects under Construction on June 30, 1971

			Limit of Contract
1.	S-3675-RD	Replacement of sewers in Pine Street between 17th and 25th Streets, and in 23rd Street between Pine and South Streets, plus some water main work. 70% completed.	$1,575,000
2.	S-3492-E S-3784-86-E S-3897-E S-3930-E S-4019-E	Construction of various large sewers in the Eastwick section to collect storm water and sanitary sewage.	3,704,000
3.	SD-356-SW SD-360-SW thru SD-362-SW	Southwest Water Pollution Control Plant: Erection of a centrifuge building to separate water from digested sludge. General construction, electrical, heating and plumbing work. 99% completed.	804,000
4.	S-3472-RDH	Replacement of old sewers, plus some water mains, in an area bounded by 7th, Market, Arch and 11th Streets. 35% completed.	1,036,000

STORM FLOOD RELIEF

A Major Project Completed

			Cost
1.	S-3395-FBD	Extension of the Main Relief Sewer along Sedgley Avenue from a point 230 feet west of Margie Street to 16th Street and north on 16th to Clearfield Street.	$1,700,000

A Major Project under Construction on June 30, 1971

			Limit of Contract
1.	S-3899-B	Extension of the Wakeling Street Relief Sewer in Bustleton Avenue from Benner Street to Levick Street and in Levick Street from Bustleton Avenue to Cranford Street. 95% completed.	$2,400,000

PUBLISHED BY THE PHILADELPHIA WATER DEPARTMENT