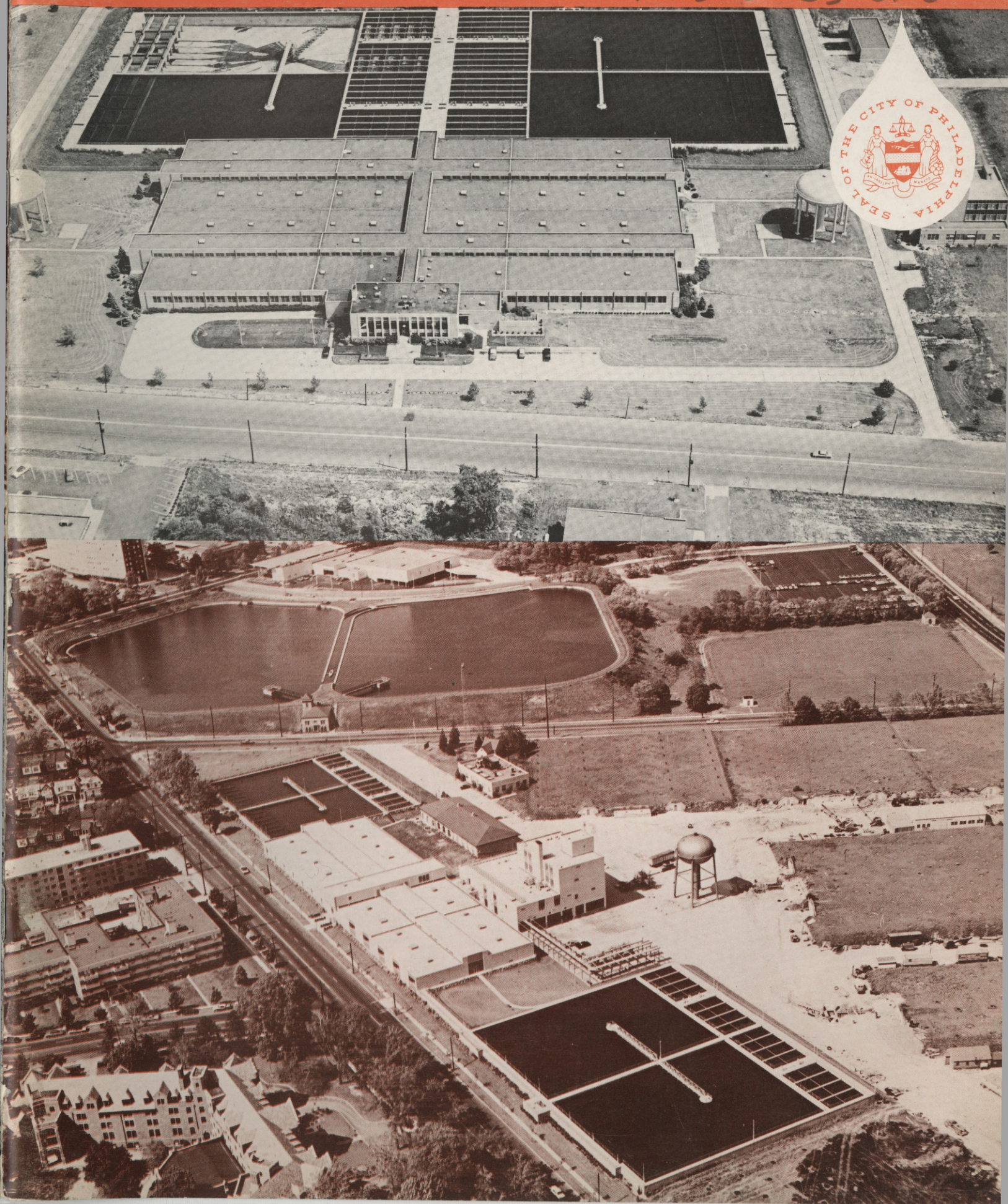
City of Philadelphia · Water Department · Annual Report 1966



Front Cover: Water Treatment Plants — Torresdale at top, Belmont at bottom.
Back Cover: Water Pollution Control Plants — Northeast at top, Southwest at bottom.

CITY OF PHILADELPHIA
WATER DEPARTMENT
ANNUAL REPORT
1966

JAMES H. J. TATE, Mayor FRED T. CORLETO, Managing Director SAMUEL S. BAXTER, Commissioner

PUBLISHED BY THE PHILADELPHIA WATER DEPARTMENT

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† Sub Chiefs: John Dillener, Delaware Filters, resigned March 31, 1967 and replaced by Sylvester J. Campbell; William Thompson, Schuylkill Filters; Charles Pierce; Quality Control, Schuylkill; and Edwin F. Shervin, Quality Control, Delaware.

†† Died April 18, 1967; succeeded by George Carpenter.

††† Retired July 7, 1966; succeeded by Faulkner Edmunds.

* Transferred to Managing Director's Office February 26, 1967.

** Transferred to Commissioner's staff July 24, 1967; succeeded by Kenneth Zitomer.

*** Appointed chief of Design Branch July 24, 1967; succeeded by Walter Clark as chief of Construction.

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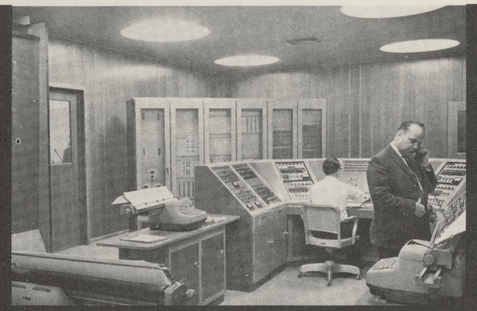
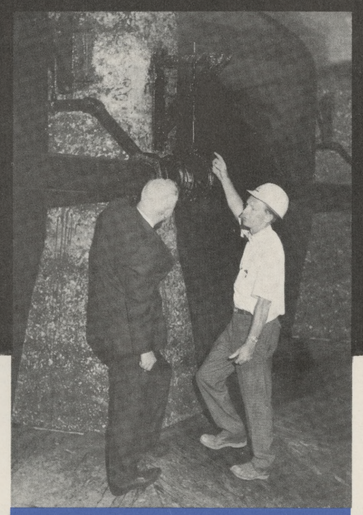
HIGHLIGHTS OF 1966





Despite a sixth year of drought, Philadelphia met all its water needs in 1966. Its sources of supply — the Delaware and Schuylkill Rivers — remained unfailing, and its new water plants efficiently purified and upgraded the river water.

In its thinking about water, however, Philadelphia was still looking to the future.

Though the city had completed the major elements of an improved water supply, its master water plan was still growing to keep pace with the growing needs of the city. This master plan, which now amounted to $530 million (1946-72), had given Philadelphia one of the strongest and best balanced water supplies in America.

With $413 million of construction already completed, the city had built modern water and wastewater systems that were intimately linked and administered by one utility, the Water Department.

The network of automated and semi-automated facilities (plants, pumping stations, storage basins, and mains) that now formed the water system had done much to assure a reliable water supply. At the same time, new water pollution control plants, wastewater pumping stations, and an expanded sewer system were protecting the local streams from pollution.

Much remained, however, to be done.

Hundreds of miles of old water mains and sewers were yet to be replaced, and some additional storage basins for purified water were still to be built. It was likely too that, in a year or two, federal and interstate* authorities would require a higher degree of wastewater treatment to protect more fully the Delaware and Schuylkill Rivers. If so, the city's water pollution control plants would have to be further expanded.

To meet these and other needs, the city's master water plan had been extended far into the future.

Already the Water Department was experimenting with devices to automate its water pollution control plants, studying possible covers for its open reservoirs, developing programs for computers, collecting massive data on the rivers, and considering how it might bring fuller automation to its "push-button" water treatment plants.

If these and other plans were to be realized, many more millions of dollars would have to be invested in the city's water supply.

Happily, the Philadelphia public was also thinking about the future. In 1966, Philadelphians quietly reaffirmed the generous support which they had given for many years. With little public opposition, they accepted a necessary increase of 26% in water and sewer rates, effective January 1, 1967.

The first such increase in five years, the new rates were intended to keep the water and wastewater systems self-sustaining, as required by law, and to pay for continued modernization.

*Federal Water Pollution Control Administration and Delaware River Basin Commission (see page 7).

The Water Department further improved the water and wastewater systems in 1966. Among the major improvements were the following:

1. In the Northeast, a $2.3 million intake facility began supplying Delaware River water to the Torresdale Treatment Plant. Water for more than half of the city flowed through the new, automated intake.

2. The big raw water pumping station which links the new intake to the Torresdale Plant had been completely modernized by early summer, at a cost of $953,000. Six new pumps raised pumping capacity.

3. As part of a water storage program, an underground reservoir went into service at Upper Roxborough. Holding 17.6 million gallons, the $660,000 reservoir will supply portions of the Northwest. Work also started on a 21.4-million gallon, underground reservoir in West Philadelphia. Cost of the latter, $932,000.

4. An additional water pumping station was linked to microwave control from the microwave center, thus bringing to 13 the number of such unmanned stations. More space and equipment were added to the center itself.

5. Treatment of all the city's sewer-borne wastes was finally attained, when a new intercepting sewer picked up the last untreated wastewater still entering a stream. The untreated wastewater represented 1% of total city waste flow.

6. To further stream clean-up, more facilities were being installed at water pollution control plants. These included new pumps, air blowers, and sludge heaters. Two new sludge concentration tanks were finished at the Southwest Plant and a general services building began to rise at the Northeast Plant. Barging of digested sludge to sea was extended to all the plants.

7. Two huge conduits for storm flood relief were completed—one a $2,830,000 replacement for part of the Mill Creek Sewer in West Philadelphia, the other a $915,000 extension of the Main Relief Sewer in the north central area.

8. More than 33 miles of water mains and about 25 miles of sewers were constructed.

Water mains and sewers formed almost 80% of the value of actual construction in 1966. This fact reflected the completion in preceding years of all the planned new plants and pumping stations, as well as other sizable projects.

The value of actual construction, as measured by partial and final estimates in the field, was $14.7 million, compared with $18.5 million the year before. In accounting terms, however, the Water Department encumbered $17.9 million for new capital works, and actually paid out $17.6 million. At the end of the year, encumbrances on the department's books amounted to $15.6 million. During the year, 169 new contracts, with a combined limit of $17.2 million, were awarded.

While steadily expanding its facilities, the Water Department was looking ahead in other ways in 1966. To the many management improvements made in past years, it added others, hoping to achieve additional economies and to make more efficient use of the new facilities. Thus in 1966 it —

- Increased the technical training of its employees, providing more courses for more persons in the use and maintenance of the new equipment as well as in improved operating methods,
- Put into service an Engineering Computer Center to provide fast operating data and to help plan new construction,
- Carried out or evaluated several management surveys,
- Reduced its disabling accident frequency rate (through safety education) to the lowest level in its history,
- Increased its special services for water customers.

As a result, Consumer Service personnel responded to 126,000 telephone calls and made 83,000 field inspections to overcome water and sewer emergencies.

For property owners there was another item of good news. A new municipal ordinance made it easier to collect from the City Government for property damage resulting from broken water mains and sewers. It also expedited the handling of such claims by giving the Water Commissioner jurisdiction over sums up to $2,000.

If there was one thread running through these and other advances in 1966, it was simply the desire of a water utility to serve its customers. The water and wastewater systems were being increasingly adjusted to the needs of two million Philadelphians.

How far the Water Department had gone in achieving this was eloquently underlined by the American Water Works Association. That organization bestowed on the department two awards (Pennsylvania and national) for the best "advancement" effort of 1966.

the RIVERS

Future Clean-up of The Delaware Estuary

For many Delaware Valley communities, the biggest river news in 1966 was a preliminary report released by the Federal Water Pollution Control Administration. This report called for a further massive clean-up of the Delaware River estuary—that portion of the river extending from Delaware Bay northward to Trenton.

Based on five years of study by 100 public and private groups (including the Philadelphia Water Department*), the report cited a need for raising water quality throughout the estuary, in accordance with carefully chosen standards.

Predicting increasing pollution in future years, the report outlined four alternative plans for upgrading the river from Trenton southward. These plans carried price tags ranging from $70 million to $460 million. A fifth plan would simply maintain the stream in its present condition at a cost of $30 million.

Need for Clean-up: The need for greater protection of the estuary (the report noted) was becoming increasingly pressing. Though communities and industries as a group were removing roughly half of their waste loads (as measured by carbonaceous oxygen demand), the remaining half was still entering the estuary in the form of waste-bearing "effluent."

At this "half-removal" rate, the estuary will become more polluted in future years, because growing population and industrial activity will increase the size of the waste load that communities and industries must treat.

Thus total waste loads, which now have a carbonaceous oxygen demand of 1.9 million pounds per day, will have a demand of four million pounds daily in 1975 and 10.7 million pounds in the year 2010 (the report estimated). At half-removal rate, the wastes entering the estuary in 1975 will have a daily carbonaceous oxygen demand of two million pounds, compared with less than one million today. In later years this pollution will mount.**

These predictions of accelerating estuary pollution have not been accepted by all groups familiar with that stream. Though the Philadelphia Water Department has agreed that there will be some growth of pollution, it has questioned the high growth rates listed by the F.W.P.C.A. report.

Public Debate: Released in mid-summer, the F.W.P.C.A. report stirred up lively public debate. Many conservation groups urged maximum clean-up of the estuary in the interest of esthetics, sports, and better environment. Other groups — including the Water Department and many local industries — asked for a substantial but less costly clean-up . . . a clean-up that would be justified by economic benefits and other public needs for tax dollars.

For Philadelphia, the type of plan adopted was of much interest. Depending on the estuary for public water supply, shipping, and industrial water uses, the city had already invested $89.3 million in new water pollution control facilities. It might now have to spend up to $64 million more to expand these facilities.

*Through its continuing estuary research, dating from 1949, and its electronic monitoring stations established along the Delaware in 1960, the department contributed much to the study. Its personnel also headed or served on F.W.P.C.A. study committees.

**Other forms of river pollution (as acid-laden industrial discharges, oxygen-demanding sludge deposits on the estuary bottom, and nitrogenous material) would also presumably grow.

By the end of 1966, the Delaware River Basin Commission (which exercises wide control over Delaware Valley streams) was moving toward a decision on which program would be recommended to the Federal Government. The Commission called for public testimony by local groups, and it planned to submit to Washington a set of proposed water quality standards for the estuary.

By the end of 1966 too, public opinion was beginning to crystallize. Of the five plans or "objective sets" proposed by the F.W.P.C.A. report, two were winning most attention. These were Objective Sets II and III.

Two Regional Plans for the Estuary

In the spring of 1967, after extensive public hearings, the Delaware River Basin Commission decided to recommend for the estuary a *modified form* of Objective Set II. The final details, however, are still so fluid that it is worth recording here the main features of Objective Sets II and III, as developed in the F.W.P.C.A. report.

Setting standards for the river water in 30 different portions of the estuary, the two plans would improve the stream for a variety of uses.

Costs: The cost of Objective Set II (modified or unmodified) by 1975-80 would range roughly from $230 million to $330 million, according to F.W.P.C.A. report estimates; that for Objective Set III, from $130 million to $180 million. Over and above these official price tags, the Delaware Valley will have to spend $5 million to $7.5 million a year up to 1975 to handle additional wastes stemming from population and industrial growth.

Actual costs to clean up the estuary, however, may run even higher than those stated in the F.W.P.C.A. report. Thus the Philadelphia Water Department has argued that the cost estimates for Objective Set II are too low, and the Delaware River Basin Commission is currently restudying these.

Carbonaceous Oxygen Demand: Either plan will reduce drastically the carbonaceous oxygen demand of wastes entering the estuary. Under Objective Set II, which prescribes higher standards, the allowable oxygen demand of such wastes would be only 200,000 pounds per day in 1975-80; under Objective Set III, only 500,000 pounds.

To attain these goals, however, communities and industries will have to increase greatly their treatment of wastes. Thus under unmodified Set II, they will have to provide for 90% removal of carbonaceous oxygen demand from the present waste load and at least 93% from the anticipated 1975-80 load; under Set III, these removal rates would be 75% of the present load and 90% of the 1975-80 load.

Modified Set II—the plan adopted by the Delaware River Basin Commission—calls for 85% removal of carbonaceous oxygen demand from the present waste load by 1975-80.

After 1975-80, it is expected that even higher removals and improved technology will be necessary to keep pace with the wastes from a burgeoning area.

Dissolved Oxygen: Under Objective Set II, dissolved oxygen will be maintained at minimum levels of four milligrams per liter in critical sections of the estuary in the summer; under Objective Set III, this will be three milligrams per liter, compared with frequently lower levels today. Eleven other chemical characteristics of the river water will also be influenced by prescribed standards.*

Recreational Benefits: Both plans (the report noted) will bring a number of key improvements to the estuary. These will include the upgrading of water sports, such as swimming, boating, and sport fishing at the upper and lower extremities of the estuary.

Indicative of the improved water quality will be the increased survival rate for migratory fish. Dissolved oxygen will be kept sufficiently high in the summer to permit shad an 80% to 90% chance of survival in drought years, as against 20% at present. In normal years, the rate would rise from the present 60% to 85% or 95%, according to cost of plan.

Economic Benefits: The two plans will produce a number of measurable economic benefits, related mainly to business generated by water sports. Under Objective Set II, these benefits will range between $140 million and $320 million. They will be almost the same under Objective Set III, although the latter program would cost at least $100 million less.

A Year of Better River Flow

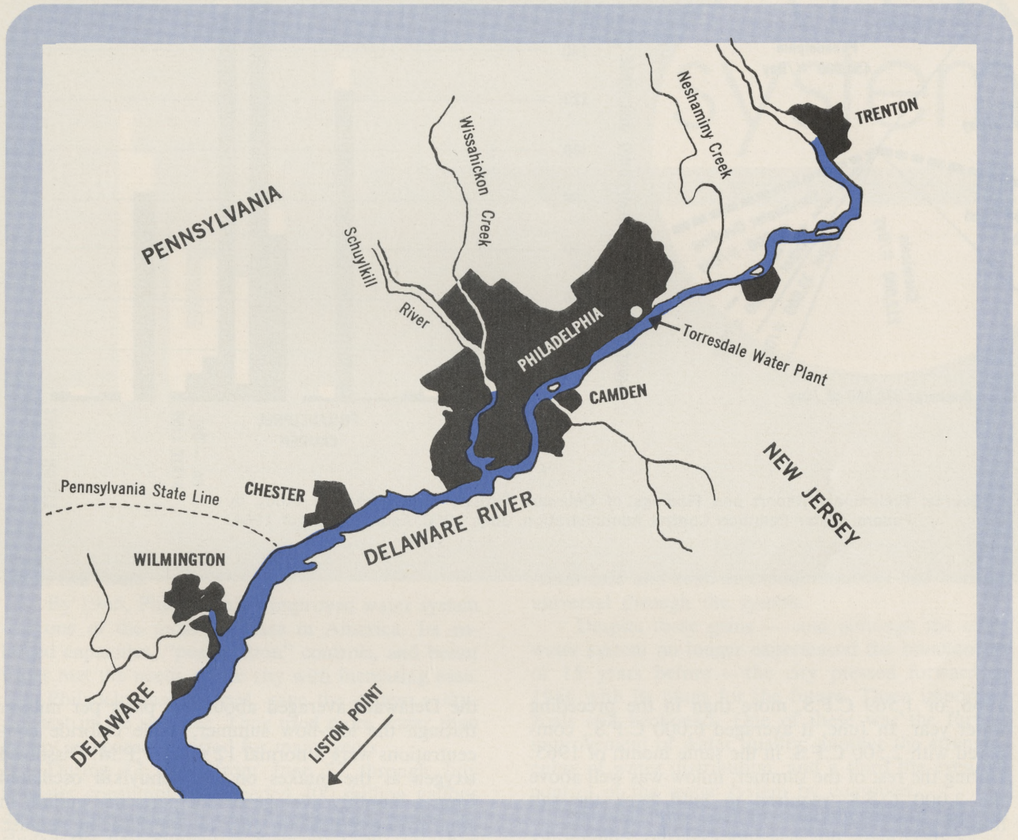
Despite concern about the future of the Delaware estuary, the condition of the local streams was better in 1966. Viewed in the light of the 1940's when pollution was heavy, the Delaware and Schuylkill Rivers had been greatly improved. Because of past clean-up, fewer untreated wastes were entering them.

As a result, the river water in 1966 was usable and plentiful, notwithstanding a sixth year of drought.

Happily, the rivers also flowed more abundantly. This was because of greater rainfall than in 1965 and regular upstream releases of fresh water from dams.

*Chlorides, coliform bacteria, turbidity, pH, alkalinity, phenols, synthetic detergents, hardness, temperature, toxic chemicals, and floating debris, oils, and grease.

THE DELAWARE ESTUARY



The more copious flow improved water quality in both rivers, and in the Delaware it banished the threat of tidal salt water intrusion into the city's drinking supply.

Because of low fresh water flow in the Delaware during 1965, the crucial tidal "salt line"* had advanced within 10 miles of Philadelphia's water intake. In 1966, it did not approach closer than 17 miles and generally hovered much farther away.

*The "salt line" is 250 parts of chloride per million parts of water. When salt content exceeds this, the U. S. Public Health Service recommends an alternate source of water supply.

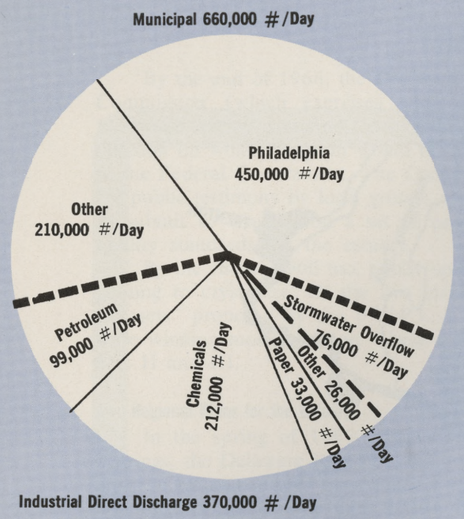
Adequate upstream releases, required in both years by the Delaware River Basin Commission, did much to stem the tidal advance. To this was added 40 inches of rain† in 1966, closely approaching the 1931-60 norm of 42.48 inches. Rainfall in the three years preceding 1966 had been 10 to 12 inches below normal each year.

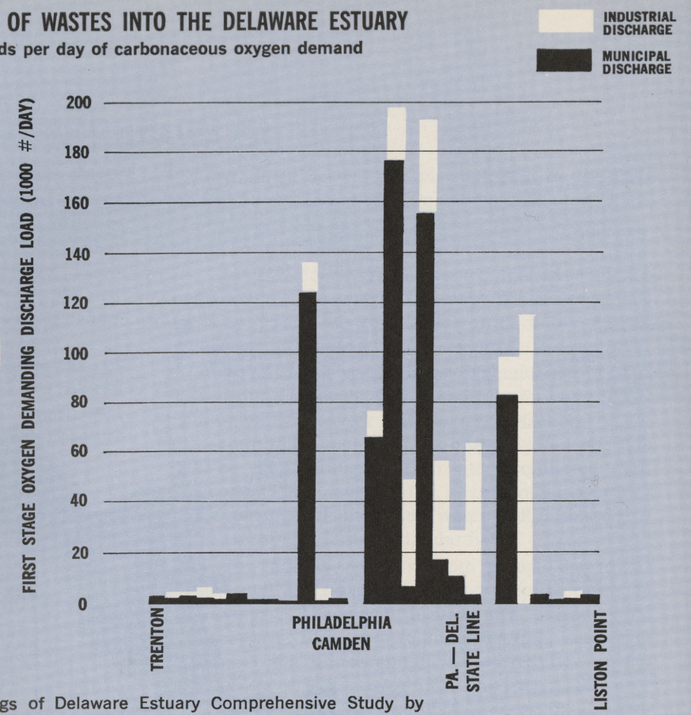
As a result of these favorable influences, the inflow of fresh water into the Delaware estuary (as measured at Trenton) averaged 6,277 cubic feet per second from October 1, 1965 to September 30,

†At Philadelphia International Airport.

PRESENT DISCHARGE OF WASTES INTO THE DELAWARE ESTUARY

Measured in pounds per day of carbonaceous oxygen demand





Source: Preliminary Report and Findings of Delaware Estuary Comprehensive Study by Federal Water Pollution Control Administration, July, 1966. Estimates as of 1964.

1966, or 1,569 C.F.S. more than in the preceding water year. In June, it averaged 6,000 C.F.S., compared with 2,500 C.F.S. in the same month of 1965. During the rest of the summer, inflow was well above the 2,000 C.F.S. required to hold back the salt line.*

In the Schuylkill River, rainfall increased the flow of fresh water over Fairmount Dam to an average of 1,425 cubic feet per second for the water year, compared with 992 C.F.S. in 1964-65.*

Although flows in both rivers were larger than the year before, they were still only half of normal.

The improved flow, however, caused greater dilution of wastes emptied into the streams. Consequently, in most parts of the rivers, the wastes did not critically reduce the dissolved oxygen so vital to water quality and fish. This was evident in the Delaware River, where most shad returned safely to the ocean in mid-summer after spawning.

Dissolved oxygen at the city's water intake on the Delaware averaged about five parts per million through the low-flow summer, while chloride concentrations were a normal 12 to 15 P.P.M. Dissolved oxygen at the intakes on the Schuylkill oscillated from a monthly average of 5.4 parts per million in June to 9.6 P.P.M. in July to 7 P.P.M. in August. Upstream dams and rocks kept Schuylkill water better aerated than that of the Delaware. At the same time, Fairmount Dam excluded the tide.

Detectible spills of industrial or untreated domestic wastes into the rivers were few and had little effect on the quality of water drawn by Philadelphia. Sources of spills were traced by departmental personnel and, in mose cases, correction was obtained. Turbidity in both rivers was low through most of the year.

Hardness of the river water decreased very slightly from the year before. The normally soft Delaware water had a hardness range of 2.9 to 4.6 grains per gallon (monthly average), with an annual average of 3.7 grains. Schuylkill water, which is moderately hard, ranged from 7 to 12.2 grains. Its yearly average was 9.4 grains.

There were no significant changes in other chemical characteristics of the streams.

*Figures unadjusted for upstream diversions. When adjusted for such diversions, the average inflow at Trenton in the 1965-66 water year was 7,448 C.F.S, or 2,048 C.F.S. more than the adjusted flow for the preceding water year.

the WATER system

Toward New Visions

By 1966, Philadelphia's improved water system was one of the most adequate in America. Its enlarged capacities, "push-button" controls, and better water met the needs of the city with increasing ease.

Philadelphians, indeed, gave the system a crucial test in the summer. They used more water than in any comparable period for many years.

During 13 days, from June 27 through July 9, water consumption exceeded 400 million gallons daily — thus setting a new record. This period included the first Sunday in memory (July 3) when water use rose above that level. The summer peak was reached on July 13 when consumption amounted to 471 million gallons.*

Although these figures had been exceeded on single days in other years, never before had the test of the city's new water facilities been so continuous.

Built into the new treatment plants and pumping stations were capacities that comfortably exceeded the summer highs in water consumption as well as the yearly daily averages. At the same time, the new facilities were purifying, pumping, storing, and distributing water with increased efficiency. Automatic and semi-automatic controls had become universal through the system.

Despite these gains — and although the city's water system no longer experienced the breakdowns of 15 years before — the city pressed forward in 1966 with its plans for the future. Three important goals still beckoned: One of these was the further improvement of water quality; another the strengthening of water distribution, and a third the eventual control of the water system by computer.

Though the goal of computerization, or full automation, of operations was still some years away, the Water Department continued to expand the automatic and semi-automatic controls which will form its groundwork. Even larger strides were taken in 1966 toward the other goals.

Toward these visions, the department added about $5.5 million† in new facilities during the year. By the end of the year, its total investment in water system improvements was close to $155.5 million, under the $203.3 million 1946-72 program for the system.

*Average daily water consumption in 1966 was 338.7 million gallons, compared with 326 M.G.D. the year before. High summer temperatures, resulting in increased use of water cooled air conditioners, contributed to the rise—a rise that would have been greater if new steel locking devices had not curbed some illegal openings of fire hydrants.

†This figure (based on partial and final estimates) is approximate only. It includes $1.7 million for water treatment plants and pumping stations, $2.8 million for water mains, and an undetermined amount for other water mains built as part of sewer contracts. Work was completed under 90 water system contracts with a combined limit of $5.4 million, while 73 contracts with a limit of $7.5 million were awarded during the year. On December 31, the value of water system contracts in force was $8.5 million

Along the Delaware: An Automated Intake

Just in time for the high summer demand was the city's new intake on the Delaware River. Built on the margin of that stream, the $2.3 million intake went officially into service on June 15.

Gathered for the brief dedicatory ceremony were more than 100 local officials and civic leaders, headed by the Mayor. As the Mayor pressed a button to open a valve, river water flowed through an underwater sluice gate set in a dike at the river's edge. Above the dike rose a new, light-brick control building.

For much of Philadelphia, the new intake meant a more reliable water supply. Linked to the Torresdale Water Treatment Plant, the intake will provide water for all of the city east of Broad Street as well as portions of the Northwest. In this area live over one million water customers.

Equipped with automatic controls and other advanced features, the new intake replaces an old chlorine building and leaky flap gates located at the head of a small inlet. It will offer a number of advantages —

1. Because of large capacity, it will readily provide the increased water that Philadelphians will need in future years.

2. Its location on the river, rather than at the head of an inlet, will allow efficient inflow of water all the year around, regardless of river conditions. The importance of this was underlined on January 31, 1966 (as on some past occasions) when high winds, compounded by icing. seriously reduced river flow into the old inlet and through the old intake. Winds will have no effect on the new intake, icing will be less, and automatic ice cutters will remove the ice that does form.

3. During severe drought, the new intake will give the city an extra margin of safety against the intrusion of tidal salt water into its drinking supply. Although equipped to draw water at different tide levels, the new intake will be able to draw water in an emergency solely at low tide, when salt in the water is least.

For Philadelphia, this advantage is important. Tidal salt water tends to move further up the Delaware estuary when fresh water flows are low in that stream.

4. Automatic and semi-automatic controls will reduce both employees and operating costs at the new intake. Such controls will sample the river water, record water pressures and levels, and, by signal to the main plant, apply chlorine to the incoming water. Bar screens, rakes, and traveling screens will remove debris automatically from the water.

Two years in the building, the intake includes 16 sluice gates (4 ft. x 7 ft. each) and an equal number of measuring tubes with 42-inch butterfly shut-off valves. The control house, 120 feet long and 69 feet wide, consists of reinforced concrete and brick, with aluminum framed windows, topped by glass blocks.

Completion work valued at $395,000 was done in 1966. The two Schuylkill River intakes, through which the other half of the city's water supply passes, were improved in past years.

At the Plants:
New Steps to Better Water

The water flowing from the treatment plants was of good quality in 1966, but the department hoped to improve it further. For this purpose, some operating changes were made at the plants. Treatment processes were further refined and more "push-button" controls added.

The three plants — all newly opened since 1959 — required no major physical changes in 1966.

Thanks in part to the plants, the tastes and odors of two decades before had largely vanished from the city's water. Bacteria and viruses did not get past the pre-treatment stage, and the purity of the finished water was one of the highest in the country.*

As in past years, the plants ran the river water through a number of treatment steps. These included (1) free residual chlorination, (2) coagulation, (3) settling, (4) filtration, and (5) post chemical treatment.

More Use of Chemicals: To improve the water from rivers stricken by drought, the plants used more chemicals than at any time in their history. Total consumption by the plants and the two open reservoirs was almost 65 million pounds—up 12 million pounds from the year before. Consumption in the period 1960-65 had averaged only 45.8 million pounds yearly.

Alum, which is used for coagulating impurities, accounted for the biggest part of the increase. More lime was also used, mainly at the Torresdale Plant, for stabilizing the "pH" (or ratio of acidity to alkalinity) in the finished water.

Because of the importance of a stable "pH" to industry, there were plans to install "pH" monitoring equipment at Torresdale and possibly to switch from lime to non-deposit forming ferric chloride. The high cost of ferric chloride delayed the latter plan.

Chlorine usage, which rose markedly in 1965, remained at the same high level in 1966.

Total chemical costs were $1,535,000, a jump of $367,000 in two years. Both increased chemical usage and price rises accounted for the change.

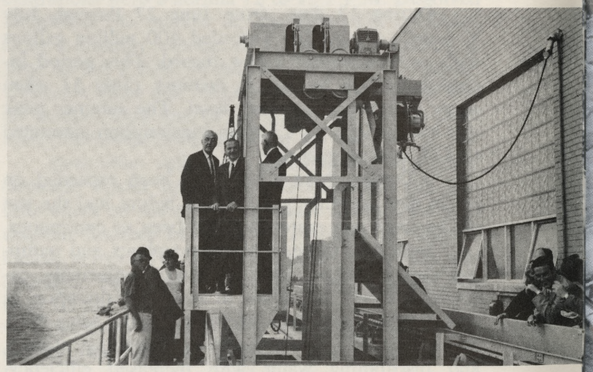
Tastes and Odors: Despite the exhaustive treatment given the city's water, some water quality problems lingered.

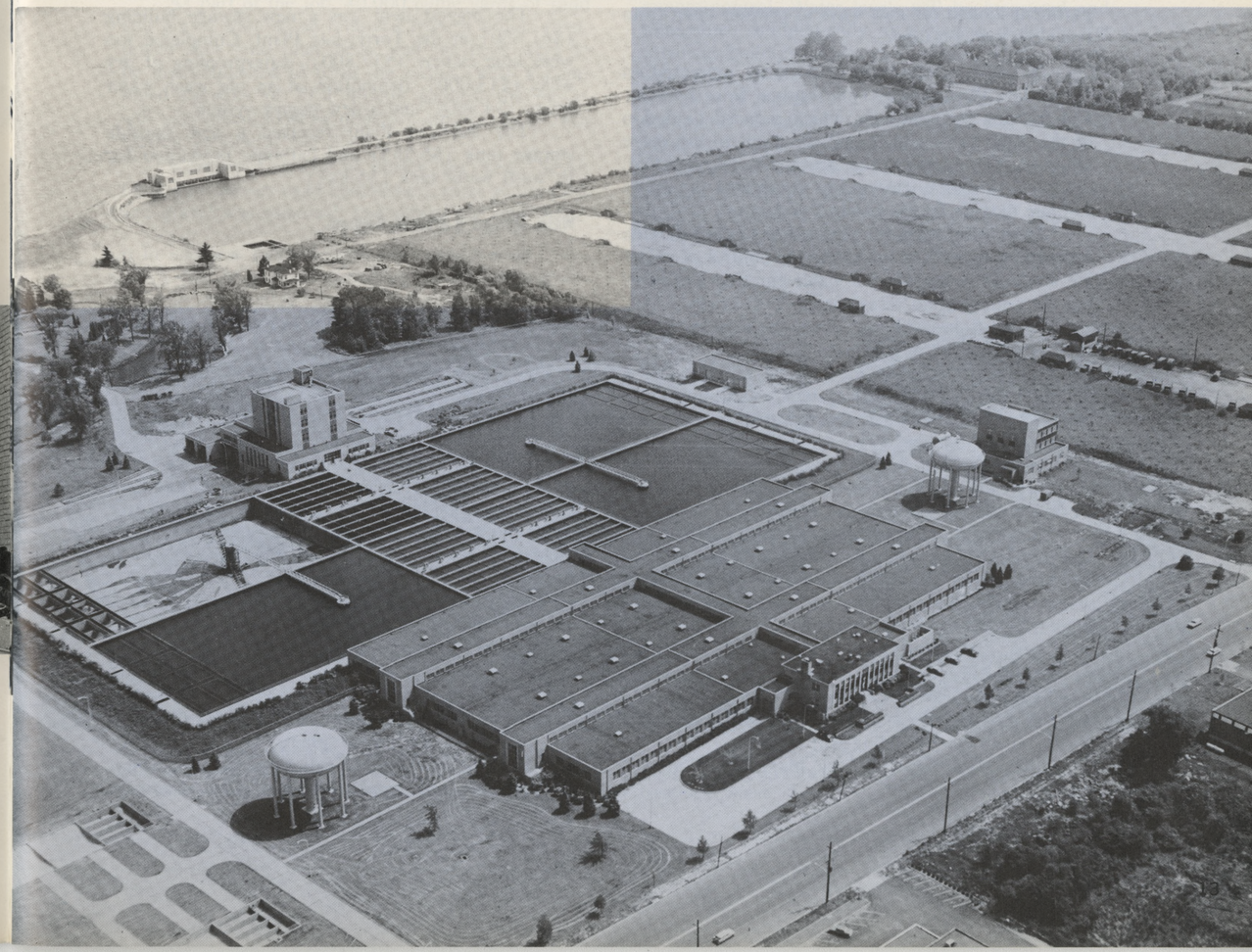
1. Though Philadelphans were enjoying a more palatable water than in the past, the Water Department wrestled in 1966 (as in past years) with a persisting "woody mustiness" in Delaware River water. To locate its cause, the Torresdale Plant laboratory did much research. Although the plant used carbon and potassium permanganate with some success, the laboratory sought a more effective (and less expensive) means for eliminating the odor.

On the Schuylkill River, "musty" and "earthy-musty-bitter" tastes and odors occurred in the winter-spring. Low river flows, cold weather, and probably pollution in the tributary Wissahickon Creek contributed to these. Carbon was used with some effect on these tastes and odors.

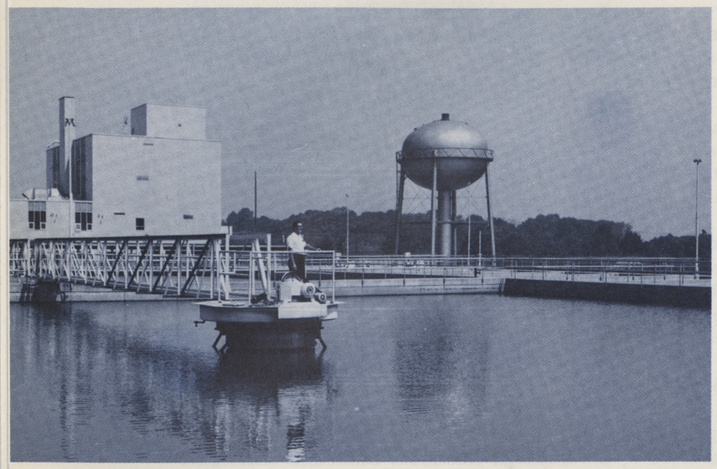
2. Although chlorinous tastes and odors have been generally negligible in recent years, the de-

*In 1966, the coliform organism count of Philadelphia's finished water was only 2.8% of what is allowed under the drinking water standards of the U. S. Public Health Service for interstate carriers.





New River Intake: Supplying half the city, a new intake for Delaware River water went into service on June 15. Located on the dike (inset) of a riverside sedimentation basin, the automated intake will pass water into the basin for the Torresdale Water Treatment Plant (right). Gantry crane (above) removes debris from water flowing under intake building.



Belmont Water Plant: Operating for its first full year in 1966, the new semi-automatic plant purified Schuylkill River water with electronic efficiency. Replacing a 62-year old water works, it is the third of the new water treatment plants built in recent years.

partment looked for new ways to prevent them from reaching the consumer.

In 1966, such tastes and odors increased in Torresdale Plant water. This resulted from river ice and freezing temperatures, which reduced oxidation of the river water and forced the plant to use more chlorine. To neutralize the heavy chlorine residual, the plant installed emergency equipment to apply sulphur dioxide to the finished water.

There were plans for permanent sulphur dioxide equipment, as well as for automatic control of chlorine residuals in the filtered water entering and leaving the underground reservoirs at Torresdale.

At the Belmont Plant, there was another promising development. A new ammonia feed system was almost completed. Scheduled to go into operation in mid-1967, the $28,000 system will improve the carry of chlorine residuals through distribution pipelines, reduce pipeline corrosion, and remove chlorinous tastes and odors from glasses containing traces of detergents. Similar systems are planned for the Torresdale and Queen Lane Plants.

Other Plant Improvements: Planned for the Queen Lane Plant was a $1.3 million chemical storage building, which will greatly improve control of water quality. The building will house feeding systems that will apply ammonia, metaphosphates, carbon, alum, and lime to the river water. In contrast to the manually corrected controls that now govern water pre-treatment at Queen Lane, the new systems will be completely automatic and self-correcting. Work on the new building will begin in 1967.

Most construction at the plants in 1966 was minor.

The biggest item was a new storage building ($61,650) at the Torresdale Plant. Completed too were lime slakers ($37,800), waterproofing of dry wells ($13,000), demolition of an old wash water tower ($4,440), and a new paging system.

The Belmont Plant received a new fluoride storage tank ($5,755) and cathodic protection for its wash water tank ($5,842).

Water Storage: A Growing Program

New storage for purified water was one of the largest unfinished programs. Aiming at 447 million gallons of protected storage within the next few years, the Water Department pressed an ambitious plan to convert abandoned filter beds into underground basins and to cover part of its open reservoirs.

The purpose of the program was to provide more water reserves for emergencies, increase the flexibility of the distribution system, improve water pressures, and guard against algae growths, contamination, and nuclear fallout. Thus while strengthening distribution, the department will preserve the improved quality of the water issuing from the treatment plants.

To attain these goals, the following steps were taken in 1966:

Upper Roxborough Reservoir: A new underground reservoir emerged on the site of the old Upper Roxborough water works. The reservoir grew from eight slow-sand filter beds that once formed the nucleus of the closed plant.

Holding 17.6 million gallons of purified water, the reservoir will supplement two older reservoirs

(at Upper and Lower Roxborough) that hold 11 million gallons. Water will be pumped to the reservoir from the Queen Lane Treatment Plant and then will be redistributed to the Roxborough, Manayunk, and Chestnut Hill areas. Built at a cost of $668,000, the new facility is expected to improve service throughout the upper northwest.

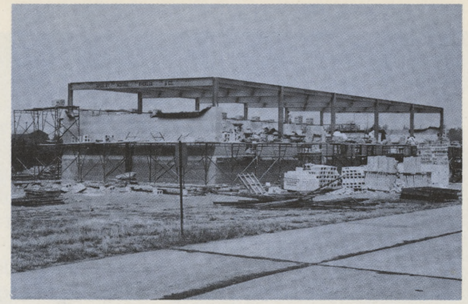
Chlorination of reservoir water will be automatic — regulated by chlorinators, a booster pump, and electronic controls. At the same time, data on water levels and flow rates will be transmitted continuously by microwave to the department's microwave center. The latter will be able to control the water levels in the reservoir (actually three basins) by remote signal that will open or close a large valve.

Although some construction was performed on the new reservoir in 1965, almost two-thirds ($409,000) was done in 1966. The reservoir went into service in September.

Belmont Reservoir: To strengthen water supply in West Philadelphia, three more underground basins were planned for the new Belmont Treatment Plant. Construction started in June.

As part of the job, 40,000 cubic yards of sand and gravel were to be removed from a dozen abandoned slow-sand filter beds, and the beds were to be interconnected to form the basins. With a combined capacity of 21.4 million gallons, the basins will supplement existing underground storage of 18.6 million gallons at the plant.

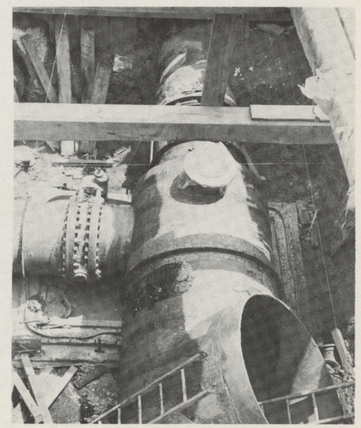
Work moved swiftly during the year. Seven brick gate houses were demolished, most of the sand and gravel was removed, and piping for roof drainage was installed. Plans included the cleaning and repair of the old filter grottoes, erection of baffle walls in them to control the surge of water, and installation of 18 butterfly valves, ranging in size from one to six feet. About 3,200 feet of existing cast iron pipe will be cleaned, cement lined, and put back into use. New piping will total 1,300 feet.



Torresdale Improvement: An added touch to the big Torresdale Water Treatment Plant was a new building to house maintenance equipment. Major features of the plant were completed in earlier years.

While most of the valves in the new reservoir will be manually operated, two key valves will be electrically regulated and adaptable to operation by remote control. Water levels will be measured and transmitted automatically to a control panel in the chemical building of the main plant. There alarms will sound to warn of possible reservoir overflow, and control signals will be transmitted to electro-pneumatic transducers which regulate the output of water to the reservoir from the plant's filter building.

The new reservoir is being built under contracts totaling $932,000. About $400,000 of work was done in 1966.



For Water Supply: More than 33 miles of new water mains were constructed in 1966 to serve new homes and industries as well as to replace old mains. Some of the biggest pipelines, ranging up to four feet in diameter (photos), were laid to supply new underground basins at the Belmont Water Treatment Plant.

Other Underground Storage: The creation of a reservoir at the Queen Lane Treatment Plant will be the last step in the underground storage program. Work on the reservoir, which will hold 50 million gallons, is scheduled to start in 1968, although some technical questions remain to be solved.

Created from 22 old slow-sand filter beds, the reservoir will supplement 40 million gallons of existing filtered water storage at Queen Lane.

Four underground basins, with a capacity of 143 million gallons, went into service at the Torresdale Treatment Plant in 1965.

Covering of Open Reservoirs: Summertime algae in the city's two open reservoirs for filtered water have been a recurring nuisance. Under the influence of bright sunshine, the algae flourish in the clear water, causing tastes, odors, and greenish coloring. To control them, the Water Department spent $32,000 on chlorine, and sodium chlorite in 1966, and often spends more.

To eliminate the algae, the department plans to cover portions of the two reservoirs. The covered portions will include a 35-million gallon basin at the Oak Lane Reservoir and a 60-million gallon basin at the East Park Reservoir. Oak Lane's other basin (35 million gallons) may be converted to other uses, while East Park's other two basins (617 million gallons) will be held in reserve for emergencies.

Pending such future covering, the department took other measures in 1966 to preserve water quality. As a result, the water leaving the East Park Reservoir was the best in years. This was because of more effective control of water in the south basin, which directly supplies consumers.

In mid-summer, two new chlorinators went into service at East Park. These, in combination with sodium chlorite equipment, manufactured chlorine dioxide for dosing the water as it entered the south basin. The chlorine dioxide destroyed algae and helped to clarify the water.

In Water Pumping: More Capacity and Lower Costs

Because of past improvements, the water pumping stations reached new peaks of efficiency. Power costs were lower than they had been in a generation; pumping capacities rose, and the thirteenth pumping station was brought under microwave control.

Of the 15 stations, 14 had been newly built or extensively modernized under a $13.7 million program — 75% finished by the end of 1966.

WATER TREATMENT PLANTS: OPERATING DATA

	Filtered Water Output (in millions of gallons daily)		Electric Power Consumption (in millions of kilowatt hours)	
	1965	1966	1965	1966
Torresdale	167.0	177.0	5.71	5.44
Queen Lane	108.4	108.1	2.07	2.19
Belmont	60.0	61.3	2.87	2.93

	Chemical Costs for Treatment (per million gallons)		Electric Power Costs (per million gallons)	
	1965	1966*	1965	1966
Torresdale	$10.14	$10.63	$0.870	$0.880
Queen Lane	11.06	13.53	0.489	0.494
Belmont	11.15	12.24	1.213	1.178

**Price of chemicals rose slightly and drought required use of more chemicals.*

Amount of Chemicals Used In Treatment
(in millions of pounds — includes reservoirs)

	1965	1966
Alum	21.41	27.80
Chlorine	14.52	14.63
Lime	11.63	14.60
Sodium Hexametaphosphate	.91	.81
Fluoride	.65	.74
Carbon	2.14	1.22
Sulphur Dioxide	.05	.07
Sodium Chlorite	.08	.05
Caustic Soda	1.14	4.60
Experimental Chemicals (including sink-floc clay)	.67	.32
	53.20	64.84

As a result, Philadelphians were receiving water at better pressures, where and when they needed it, and the Water Department itself was saving money.

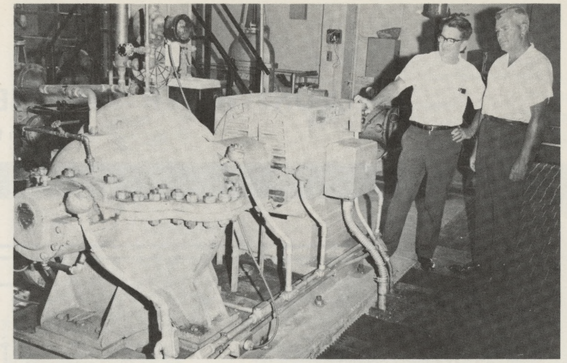
Lower Power Costs: The cost of electric power for pumping each million gallons of water to consumers was only $10.54. This was the tag end of a steady four-year decline, from the $12.32 per million gallons of 1962.

Not only had power costs fallen since 1962, but they had moved generally downward since the early 1950's. In 1950, at a time when the department was still using some steam pumps, the combined cost of steam and electric power was $13.79 per million gallons.

New electric pumps in nearly all the stations had contributed to this decline. At the same time, the department was making more efficient use of pumps through improved controls and sensing devices.

The cost of electric power for pumping in 1966 was 31 cents per million gallons below that for 1965. The drop resulted largely from the completion of modernization at the big station which pumps Delaware River water to the Torresdale Treatment Plant.

At the station (Torresdale Raw Water Station) five new electric pumps had gone into service late in 1965, and a sixth was operative by the following spring. As a result, pumping costs at the station fell from an average of $1.91 per million gallons to $1.51. The 40 cents decline was partially offset by slight fluctuations at other stations.

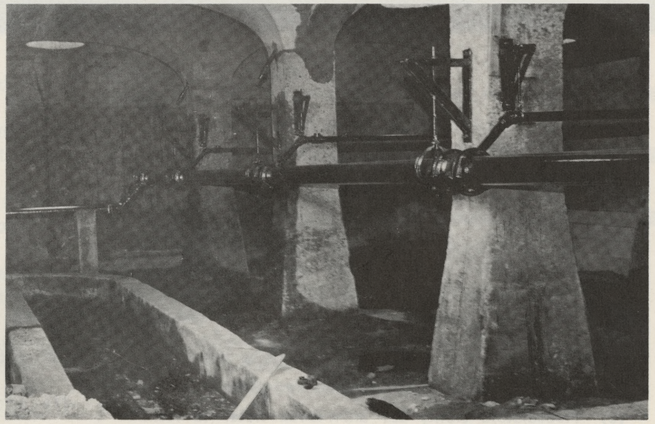


For Better Service: With more than $10 million of improvements already made in its 15 water pumping stations, the Water Department added two new pumps at its Belmont "high service" station. One of these (above) was in operation at year's end.

Pumping Capacities: In 1966, the three stations which deliver river water to the treatment plants had the highest combined capacity in their history—700 million gallons daily. This included an additional 60 million gallons at the Torresdale Raw Water Station, where pumping capacity rose to 360 M.G.D.

At the Torresdale Station, final work valued at $59,000 was done on pumps and related equipment as part of the $932,000 modernization. The latter had also included extensive piping and interior renovations.

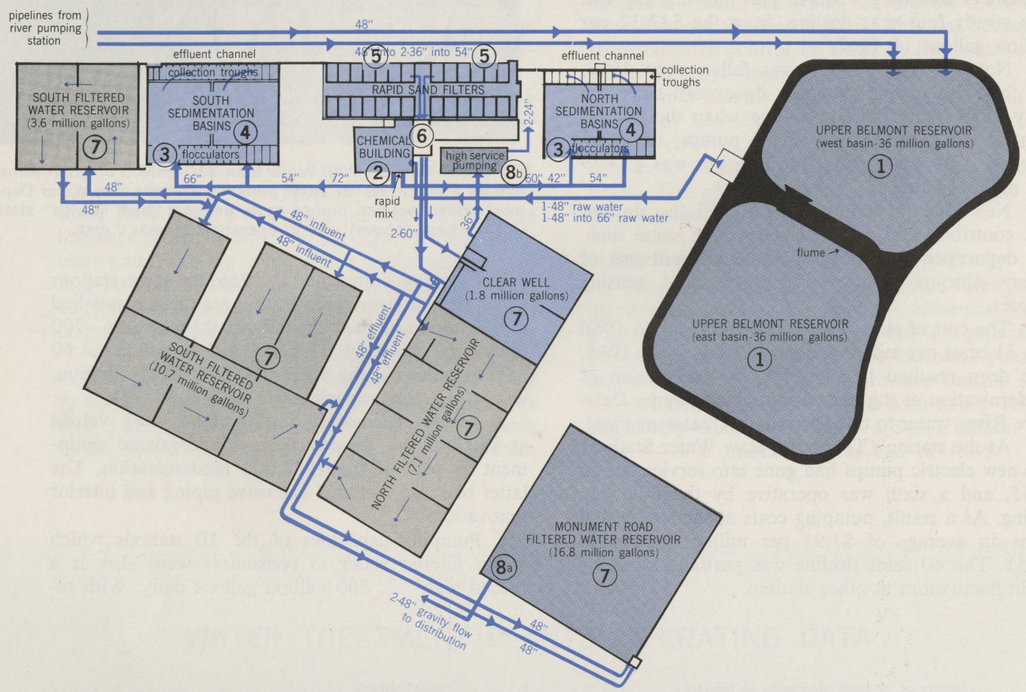
Pumping capacities of the 10 stations which pump filtered water to consumers were also at a record high . . . 800 million gallons daily. With re-



Underground Reservoir. As part of a plan to increase underground storage for purified water at all the water treatment plants, three basins began to take shape at the Belmont Plant. Piping (above) will carry off the rain water from the roof, protecting the stored water.

BELMONT WATER TREATMENT PLANT FLOW CHART

(not drawn to scale)



New treatment plant—put into service in 1965

New underground reservoirs for filtered water—to be put into service in 1967

Pre-existing facilities

54" ← Diameter size of pipeline and direction of water flow

2-24" ← Two pipelines . . . each 24 inches in diameter

1-48" into 66" ← One 48-inch pipeline that expands to 66 inches

Steps in Water Treatment

(1) River water enters open reservoir and is chlorinated

(2) Water is rapidly mixed with alum and other chemicals

(3) Flocculators slowly stir alum-laden water to form "floc"

(4) Impurities in water settle to bottom of open basins

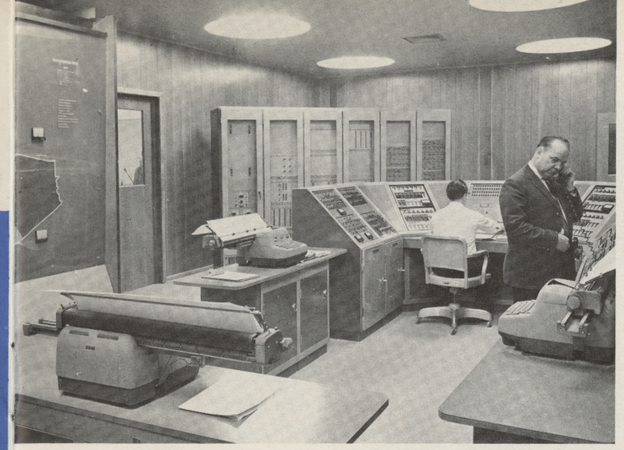
(5) Remaining impurities are filtered out in sand and gravel beds

(6) Filtered water receives most post-treatment chemicals here

(7) Filtered water is temporarily stored in underground basins

(8-A) Filtered water (finally chlorinated at this point) flows to most consumers by gravity

(8-B) Filtered water (after chlorination at clear well) is pumped to some consumers living on high ground



Microwave Center: So many pumping stations, reservoirs and mains were being monitored by microwave in 1966, that the control center was pressed for space. New rooms were being constructed and the old quarters (above) got new lighting and paneling.

placement of two old pumps at the Belmont High Service Station, this figure will rise slightly.

One of the 8-M.G.D. pumps at Belmont was replaced with a new 7.5-M.G.D. pump during the year, but the other was being replaced with an 11-M.G.D. pump, to be ready in 1967. The $39,600 contract was 80% completed.

Extended Microwave Controls: The automating of the pumping stations has done much to lower costs and to increase efficiency. Since 1960, the Water Department has gradually extended microwave controls to nearly all its water pumping stations. Under this system, each station is operated by microwave from a single center, located at 29th and Cambria Streets.

In 1966, the Torresdale Raw Water Station was linked to the center by microwave, under a $22,760 contract. It was the thirteenth station to be so controlled. Only two high-pressure stations for fire service remained outside the system, but there were plans for automating these also.

As each station has become automated and unmanned, labor costs have fallen. Operators have been transferred to other jobs in the department. Four more such positions were abolished at the Torresdale Raw Water Station in 1966.

Not only did the microwave center regulate most of the stations in 1966, but into the center poured a stream of data on water pressures, elevations, flow rates, and other conditions. This data was flashed from pumping stations, reservoirs, treatment plants, storage tanks, and key water mains.

Because of the great growth of the microwave network, the department began to build more efficient quarters for the microwave center. Construction of such quarters under five small contracts totaling $161,000 was a little over half finished.

Besides new lighting and paneling for the control room, the contracts included a workshop for maintenance technicians, new offices, a locker room and lavatories. The expanded center would occupy over 1,900 square feet of space by the spring of 1967.

There were also plans for fully transistorizing the now partially transistorized microwave system. Vacuum tubes will give way to solid state equipment, requiring less space and more easy to maintain. A $295,000 contract was let for this purpose during the year.

Other Improvements: Because of extensive past work, changes at most water pumping stations in 1966 were minor. Such changes included the waterproofing of foundation walls ($15,235) at the Oak Lane Booster Station; new aluminum windows and a new entrance ($2,977) at the Queen Lane Filtered Water Station; and a new aluminum insulated ceiling, new lighting and other electrical work ($44,250) at the Race Street High Pressure Pumping Station.

The Spreading Water Mains: 33 More Miles

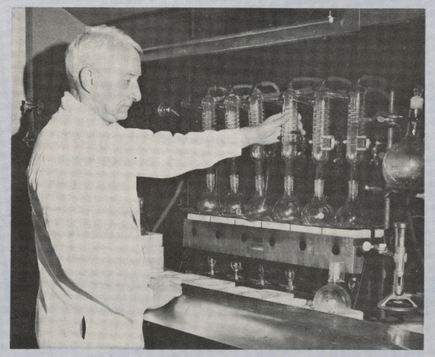
To meet the future needs of Philadelphians, the Water Department built 33.5 miles of new water mains in 1966. While several other forms of construction were tapering off, there was no slackening in the pipeline program.

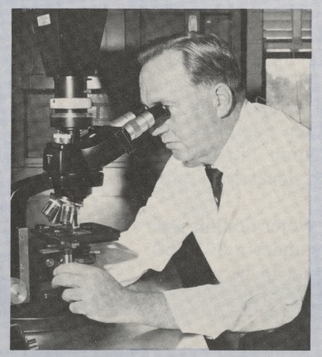
New mains, indeed, were the biggest need still facing the water system. The growth of new housing in many parts of the city, the development of industrial parks, and, above all, the existence of more than 600 miles of deteriorating mains built before the turn of the century—all of these needs promised to keep water main construction brisk for many years.

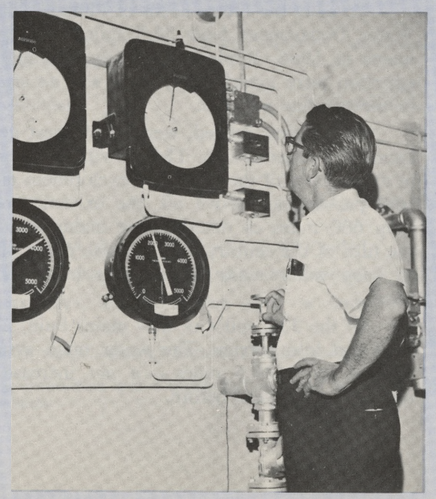
Of the 33.5 miles of new mains built, 27 miles were put into service. The water main system expanded to 3,189.5 miles — a *net* increase of 13 miles over the year before.

TOWARD EVEN BETTER WATER

Water Purity: Always very pure, Philadelphia's finished water was purer than ever in 1966. New water plants, new chlorinators at East Park Reservoir (middle right photo), and 1.5 million laboratory tests reduced the coliform organism count in the water to an even more negligible level than in past years.







For Taste and Odor Control: West Philadelphians were due to receive even better water in mid-1967 as the result of a new ammonia feed system, almost completed at the Belmont Water Treatment Plant. By treating the water with carefully controlled doses of ammonia, the system will eliminate some tastes and odors. Photos: System control panel at left; ammonia pumps and piping above.

Replacement: The replacement of 15 miles of *old* mains formed a major part of construction. This included the relaying of two miles of pipeline in the historic area east of Independence Hall. There several cast iron mains, dating back to the 1824-34 decade, were replaced with new ductile iron mains under a $900,000 contract. The work in 2nd, 3rd, and 4th Streets also included the replacement of 40-year old high-pressure mains with new steel pipelines.

Relaying of old mains occurred throughout the city, wherever advancing age and the jarring of overhead traffic made such work essential.

While replacing some mains, the department cleaned and cement lined 18.5 miles of old pipelines that were still usable. The value of such work was $1.1 million under seven contracts with a limit of $2.5 million.

The cleaning included over seven miles in Manayunk and 1.2 miles on and around West Allegheny Avenue. Both of these areas have been affected by discolored water in the past because of intricate grids of old and small pipelines.

Cleaning and lining reduce such discoloration, improve water pressures, and extend the useful life of old mains. Because they are less costly than pipeline replacement, cleaning and lining will be increased in future years.

New Areas: Fourteen miles of mains were laid for new homes in Eastwick and in Northeast and Northwest Philadelphia. This was in line with the high rate of construction for "new services" in past years.

One of the longest mains for an industrial park was built in several streets of the northeast. These included Comly Road from Roosevelt Boulevard to a point 250 feet northwest of Norcom Road and in Clark Street from Foster Street to Jamison Avenue. The 7,500 feet of pipeline cost $58,807.

In all, about 1.7 miles of mains were laid for industrial parks. Another 1.2 miles were constructed to reinforce water pressures, thus bringing better service to homes in some areas.

New Materials for Pipelines: Philadelphia has used cast iron mains since 1817, and by 1966 it had 3,100 miles of such mains. During the year, the Water Department began a switch from cast iron of the "grey" type to cast iron of the "ductile" type. A number of ductile iron pipelines were ordered or put into service.

Ductile iron, it was believed, would offer several advantages. Strongly resistant to shattering,*

*Carbon is scattered through ductile iron as single molecule points, while in the grey iron it is arranged in straight lines. Thus the ductile iron is less susceptible to shattering.

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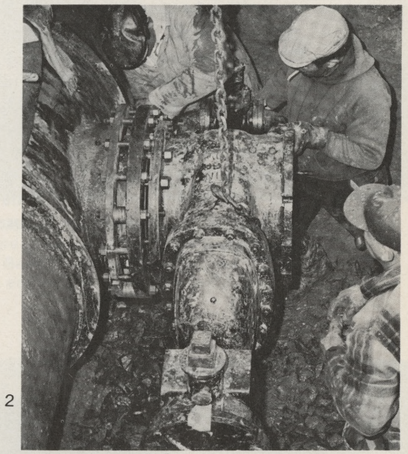

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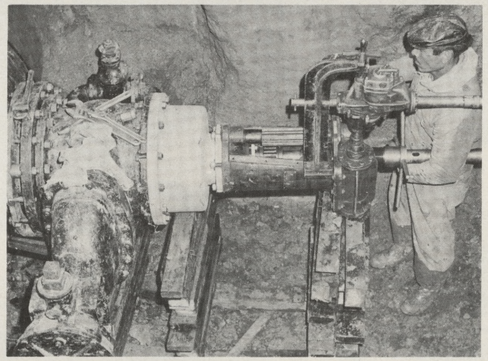


Valves: Hundreds of new valves must be inserted into water mains with scientific precision each year. To permit future connection of a branch pipeline to this big concrete supply main, workmen are inserting a tapping valve. Photos— (1) At top, a steel cylinder is put around the main, (2) in middle, the tapping valve is bolted to the steel cylinder, and (3) at bottom, a coring machine cuts a circular piece from the main and pulls the piece into the white drumhead, from which it will be removed after a gate in the valve is closed.

it withstands water pressures up to 400 pounds per square inch. This makes it more durable than the grey iron and will permit its use even for high pressure mains, for which only steel is now used.

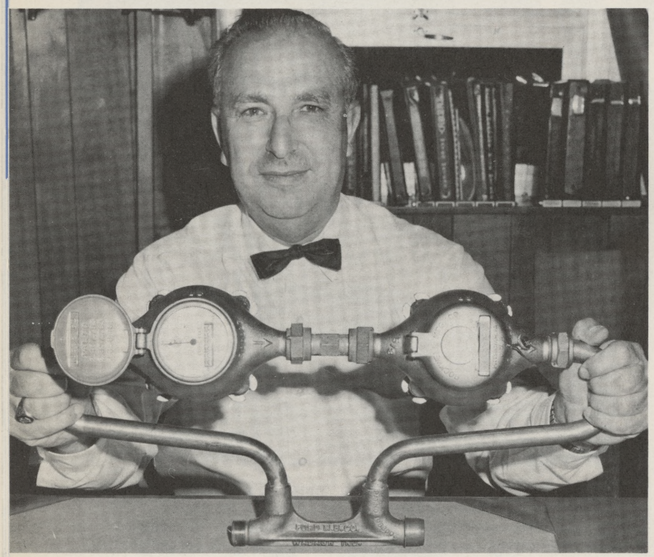
Ductile iron is also flexible enough to be bent to conform to odd terrain. It can be bent over, under or around other pipes. This cannot be done with the grey iron or with steel.

In recent years, the department has also experimented with other materials. It has built some of the largest concrete conduits in the country to supply its underground reservoirs and to meet other special needs. Steel pipe has been substituted for a number of very large cast iron feeder mains.

Main Breaks: Because of a colder winter, water main breaks numbered 847, compared with 718 the year before. The statistical pattern of such breaks varied little, however, from that of preceding years.

Breaks averaged one and one-half a day during warmer months and from four to seven a day in the winter. About two-thirds of the breaks were in mains laid before 1900, and 83% of them were in small pipelines of six inches or less in diameter. Among the burst mains were 14 that dated back to the period 1819-30. There were no breaks in mains larger than three feet in diameter.

For Big Savings: A new type of valve box, made of plastic, was used by the Water Department for the first time. Saving the department over $100,000 a year, the valve box weighs only two pounds, eliminates injuries, and is adjustable in length.



Water Meter Study: To learn more about the corrosive effects of water on water meters, the Meter Shop placed 15 double sets of meters in strategically located homes. After one year, one meter will be removed from each home for examination.

The Water Meter Shop: A Record Output

One of two cities in America with a half-million water meters, Philadelphia measures almost all the water it sells. Nearly every property in the city has a water meter, and nearly every meter is new or reconditioned.

Reducing water waste and improving the fairness of water charges, this happy state of affairs is largely the work of the past dozen years.

By 1966, the city had attained still another goal: Its Water Meter Repair Shop was operating at a higher level of efficiency than most other shops of the kind. The Meter Repair Shop was overhauling at least 30 meters per man each day. This was more than twice the 12 to 13 meters per man day normally overhauled by shops in other cities.

This high degree of efficiency had been attained with a steadily diminishing work force. In 1966, the shop's personnel numbered only 67—a drop of 25 from 1962 and less than half the force of a decade before. Careful reorganization and an incentive pay plan had accomplished this result.

This efficiency was manifested in various ways in 1966:

1. Because of much replacement or overhaul of water meters in recent years, the number of non-registering or otherwise malfunctioning meters was only 8,685. This was about 1.6% of the 529,000 meters in the system. Since 1958, when malfunctioning meters numbered 21,000, there have been fewer such meters each year.

2. The great improvement in the city's water meters enabled the Water Department to move toward a 15-year "rotation" plan for all its small meters (⅝-inch and ¾-inch). Such "rotation," which involves the complete reconditioning of each meter, had been completed for the first time in 1964 as the result of a 10-year program. In 1966, the Meter Shop "rotated" nearly 33,000 small meters as part of the removal and resetting of 51,000 meters in all. Newly built homes received 2,530 meters.

3. Because of the large revenues that they produce, large meters (one inch to 12 inches) have received more frequent attention than small meters. The 16,675 large meters have been fully overhauled (or "rotated") each three or four years. In 1966, over 3,200 such meters were repaired and reset, and these included 2,400 rotations.

Representing about 3% of all water meters in Philadelphia, large meters produce 56% of all water-sewer revenue from *measured* consumption and 38% of all revenue.

4. Total jobs performed by the Meter Shop numbered 83,000, about 5,000 less than the year before. There were over 27,000 inspections of meters in the field.

5. To learn more about water meter corrosion, the shop installed 15 sets of double meters in various homes. One meter will remain permanently, while the other will be removed after a year to determine the amount, and possibly the causes, of corrosion. Effects of Delaware and Schuylkill water will be compared.

Vehicle Maintenance: Almost 18,000 repairs, inspections and other services were performed on Water Department vehicles at the Logan Garage. The garage kept over 1,100 pieces of automotive equipment running.

Water System Maintenance

Among maintenance activities were the following:

Distribution Network: Distribution crews gave the 73,000 valves in city water mains increasing attention. This was because many of these valves had become old and corroded, making it difficult to regulate efficiently the flow of water to consumers.

To meet this condition, the crews replaced 1,455 valves, the greatest number to date. They also inspected 54,000 valves, compared with 30,000 to 40,000 in preceding years. Valve repairs rose to 3,900, about 900 more than in 1965.

One of the biggest advances, however, was in the use for the first time of a new type of valve box.

For many years, the Water Department had built 125-pound concrete boxes to house its valves. These boxes were expensive to build, and the advent of leak-proof valves eventually made them obsolete.

In 1965, therefore, the department adopted a cast iron box, which weighed only 25 pounds, had a diameter of a few inches, and was adjustable in length. The new box could also be stored more easily, saved space in streets crowded by utility lines, and had a smaller lid. Use of the new box in 1965 saved nearly $95,000 that year, or $60 a box.

In 1966, the department substituted an unbreakable plastic for the cast iron. Weighing only two pounds, the plastic box eliminated injuries to hands and feet. While retaining all the advantages of cast iron boxes, plastic boxes were even cheaper. Future annual departmental savings will far exceed the $95,000 realized on cast iron boxes.

Crews also gave more attention to the 26,000 fire hydrants. To protect the hydrants from illegal opening in the warm summer, the crews installed 2,833 locking devices on them—or three times the number installed in 1965 when the program began.

Because the locks were put on hydrants that have been most abused, there was a marked improvement of water pressures in some neighborhoods. Dollar savings on water (formerly wasted) and manpower (normally used to turn off hydrants) was considerable.

Almost 18,000 fire hydrants were repaired, while 79,000 hydrant inspections were made. Both figures were higher than those of the year before.

Other maintenance by distribution crews varied little from that of past years. The crews pumped out flooded cellars, regulated water flow, flushed out pipelines, made new service connections, and performed a variety of inspections. They laid over 8,300 feet of water mains independently of work done by contractors.

Building Maintenance: Over 1,800 building maintenance jobs were done by department personnel. These jobs included the erection of a chlorine equipment building at the East Park Reservoir, installation of new heating boilers at two water plants, changes in flumes and conduits, and construction of a roof walkway for visitors at the Belmont Treatment Plant.

Contractors installed new aluminum doors and did cleaning and pointing of brick work at the Distribution Headquarters, under contracts totaling $15,300.

Logan Garage: At the big Logan Garage, almost 18,000 repairs, inspections and other services were performed on the automotive fleet. The latter consisted of 117 passenger vehicles, 213 trucks, and 800 pieces of "off-the-road" equipment. Some vehicles of the City Department of Public Property were also repaired.

The Machine Shop performed 1,100 jobs. One of the principal activities was the overhaul and repair of pumps for the water pumping stations.

The Instrumentation Unit checked on 270 instruments and gauges that are electrically, electronically, pneumatically, or hydraulically operated. These devices are located in the water pumping stations. New sensing lines were installed at the Queen Lane screen house and pneumatic valve controls were improved at the Fairhill High Pressure Station.

WATER DEPARTMENT MODERNIZATION 1946-1972

WATER SYSTEM	Encumbered-Expended 1946-1966	Scheduled 1967-1972
Load Control Center	$ 1,051,415	$ 306,000
Torresdale Plant	25,957,155	476,000
Queen Lane Plant	11,475,524	915,000
Belmont Plant	11,987,099	1,972,000
Water Pumping Stations	10,328,915	3,424,000
Water Mains—Built, Replaced, Cleaned, Lined	73,502,590	33,835,000
Filtered Water Storage	9,038,014	3,569,000
Universal Metering	4,788,064	0
Miscellaneous	3,955,332	0
High Pressure Fire System	3,363,856	3,336,000
Water System Capital Improvements	**$155,447,964**	**$47,833,000**

WASTEWATER SYSTEM	Encumbered-Expended 1946-1966	Scheduled 1967-1972
Northeast Water Pollution Control Plant	$16,026,241	$ 3,929,000
Southeast Water Pollution Control Plant	6,607,215	468,000
Southwest Water Pollution Control Plant	9,567,022	406,000
Wastewater Pumping Stations	2,615,594	61,000
Interceptors	54,522,744	2,623,000
Sewers—Built, Replaced	137,958,133	58,699,700
Miscellaneous	3,319,722	185,000
Storm Flood Relief	26,766,718	3,622,000
Water Pollution Control Capital Improvements	**$257,383,389**	**$69,993,700**

the WASTE water system

New City Plans for Cleaner Streams

In stream protection, as in water supply, Philadelphia was looking ahead in 1966. The city was studying a number of plans for reducing the burden of wastes on the Delaware River estuary.

These plans were another stage in the city's long continuing efforts to clean up the local streams.

Treating only 21% of its wastewater in 1951, the city through steady improvements had raised this proportion to 97% a decade later. In January, 1966, it diverted its last untreated wastewater (about 1% of total flow) to a water pollution control plant. For the first time, it was treating *all* its wastewater, plus large quantities from other communities.

In 1966, the three water pollution control plants treated an average of 383 million gallons of wastewater daily—the second highest flow in their history. From the 140 billion gallons treated during the year, the plants removed 111,000 tons of suspended solids and 67,000 tons of biochemical oxygen demand (B.O.D.*).

Though the wastewater flow was slightly less than it was the year before, the tonnage of solids and B.O.D. removed was much greater. At the same time, the prorated removals of the three plants — 67% of solids and 58% of B.O.D. — were somewhat higher than the treatment given by most municipalities and most industries along the Delaware estuary.**

Despite this important protection for the estuary, the Water Department moved in 1966 to do even more. Anticipating that higher stream standards would be required by federal and interstate authorities, the department planned to expand and automate its water pollution control plants, as well as to improve further its treatment methods. To the $247 million† already invested by it in stream clean-up, it added $10.2 million†† of new capital facilities in 1966.

Expansion of the Water Pollution Control Plants

Notwithstanding past clean-up, the flow of wastes into the Delaware estuary in 1966 was heavy.

Most wastewater plants in estuary communities (including two of the three plants in Philadelphia) provided only "primary," or moderate, treat-

*Biochemical oxygen demand is a measure of pollution.

**A half-dozen municipalities (or municipal sources) account for 95% of the municipal waste load entering the Delaware estuary, according to the preliminary report of the Federal Water Pollution Control Administration. Four of these sources (other than Philadelphia) remove 30% to 35% of biochemical oxygen demand on the average. Industries show a wide range.

†Includes both water pollution control facilities and all sewers.

††This figure (based on partial and final estimates) includes $1.2 million for water pollution control plants and $9 million for sewers. Work was completed under 146 sewer system contracts with a combined limit of nearly $11.6 million, while 96 contracts with a limit of $9.7 million were awarded during the year. On December 31, the value of sewer system contracts in force was $13.5 million.

ment of wastes. Communities and industries as a group removed only 50% of the biochemical oxygen demand from waste-bearing flows.

Because of this, it seemed increasingly likely that the Delaware River Basin Commission would require "secondary" treatment by estuary communities. Under such treatment, the removal of biochemical oxygen demand would rise to 85% for the estuary as a whole (see page 8).

Foreseeing this change, the Water Department actively laid its plans. In 1966, it began preliminary cost studies for the addition of secondary treatment tanks (for aeration and final settling) at its Southeast and Southwest Plants. Expansion of these plants, which now provide only primary treatment, may cost $54 million.

As part of this study, the department was also considering more facilities for the Northeast Plant, where secondary treatment is in effect. Such facilities might cost $10 million, and would raise removal of B.O.D. to the 85% level envisioned for the other two plants. The Northeast Plant, when originally built, was designed for 75% removal of B.O.D.; the other two plants for 35%.

Construction in 1966: With large scale expansion still a few years away, the Water Department continued to add to its water pollution control plants. In 1966, it did work valued at a half-million dollars to improve specific operations.

Much of this included maintenance or replacement of existing facilities. Among major construction projects, however, were the following:

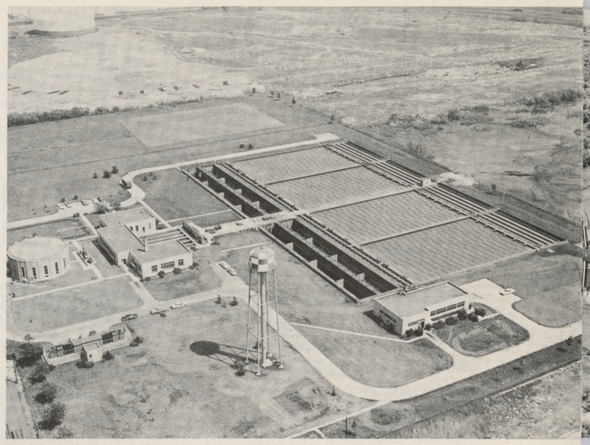
1. To improve the heating of wastewater sludge, new heaters were being installed at both the Northeast and Southwest Plants.

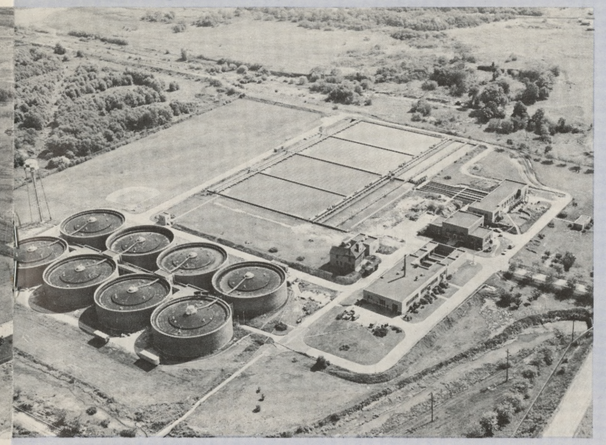
At Northeast, five new heaters were put into service and two more were to be installed under a $121,000 contract. Largest of their type in the world, the seven heaters will have a capacity of 4.2 million B.T.U.'s per hour — nearly double the capacity of the old heaters they replace.

By heating sludge more efficiently, the new equipment will strengthen the growth of billions of tiny anaerobic bacteria which decompose the sludge in digestion tanks.

For the anaerobic bacteria, the news was also good at the Southwest Plant. There the department was adding a wing to the sludge heater building under contracts totaling $171,250. The wing, one-quarter finished, will contain new type heaters of 10 million B.T.U.'s capacity, and these will supplement a dozen existing heaters of 27.6 million B.T.U.'s.

Of a "heat exchange" type, the new heaters (unlike the present ones) will not emit gases and odors to the atmosphere. Largely supplanting existing heaters in the summer, they will reduce neigh-



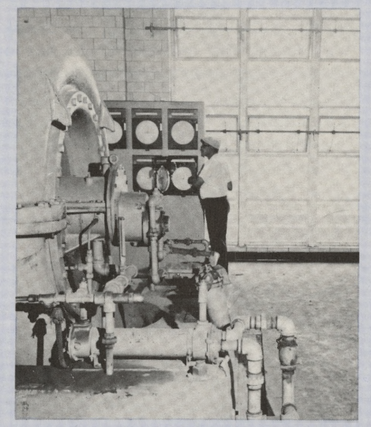


Future Expansion: To meet rising federal and interstate standards for protection of streams, the Water Department studied plans for a $54 million expansion of two water pollution control plants. At the Southeast Plant (above) and the Southwest Plant (above right), more tanks will be built to assure fuller treatment of wastes. Removal of biochemical oxygen demand from wastewater will double.

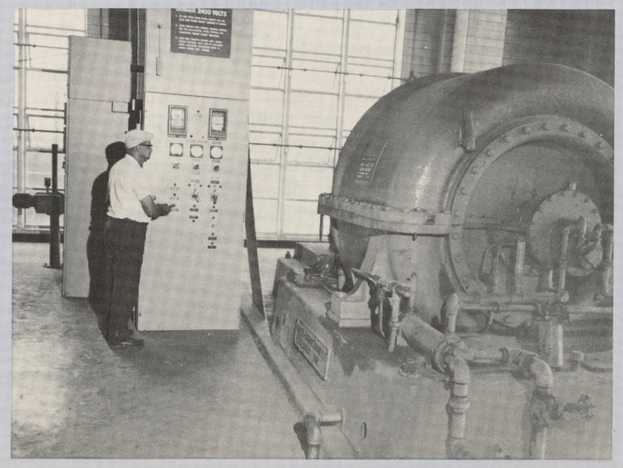
Toward Automation: To reduce costs and increase efficiency, the department was studying future automation of its water pollution control plants. Among experimental steps were an instrument to record dissolved oxygen in an aeration tank at the Northeast Plant (above) and an automatic gauge to regulate sludge thickness in a settling tank at the Southwest Plant. Control panel (left) monitors distantly located gauge.

EXPANSION AND AUTOMATION:

STEPS TO CLEANER STREAMS



Recent Expansion: New air blowers and panels, located in a new wing of the blower building, completed a $5.3 million expansion at the Northeast Water Pollution Control Plant. The blowers will supply air to a new aeration tank. There were plans, however, for a future $10 million expansion of the plant to increase the degree of wastewater treatment.



borhood nuisances, while in the winter they will help to boost the heating of sludge.

The new heaters will be made automatic in future years and will raise heat in digestion tanks on automatic signal.

2. To house its scattered maintenance shops, the Northeast Plant was erecting a general services building. Rising over old sand-drying beds and tanks long abandoned, the brick structure itself was largely finished by the end of the year. Much of the plumbing, heating and electrical work, however, was still to be done. The new building (166 ft. x 83 ft.) will cost $453,000.

3. Because of materials shortages caused by the Viet Nam War, several old projects were not quite completed. The most important of these was a new wing for the air blower building at the Northeast Plant. Although the wing (including air blowers) was ready, the blowers could not operate until a new electrical substation was finished. Lack of cable and other materials delayed the station. The blowers will supply air to a new aeration tank.

Costing $1,080,000, the blower building wing is the last item in a $5.3 million improvement program carried out at the plant in the last few years. As part of this program, five new tanks went into service in 1965.

4. Last touches were put to two concentration tanks for sludge at the Southwest Plant, and the tanks went into service early in the year. Removing some of the water from raw sludge, the tanks made it easier for subsequent digestion of the sludge.

Several pumps—four of them for primary-tank sludge and one for final-tank effluent—were being installed at the Northeast Plant.

Wastewater Treatment: Toward Automation and New Methods

The Water Department sought new ways to improve the efficiency of its water pollution control plants. By improving efficiency, it hoped to reduce or partially offset the heavy costs of future expansion.

Automation: Few things seemed as promising as plant automation. Not only could automation lower operating costs and upgrade the treatment process, but it would also permit more efficient use of personnel. Like wastewater plants everywhere, Philadelphia's plants in 1966 suffered from a labor market shortage of sophisticated engineering and laboratory skills.

During the year, the department continued its preliminary studies of engineering and cost data for automating its plants. It let a contract to a consulting firm for a final study of such data, with a report to be submitted in 1967.

Three other companies were also at work, making voluntary experiments with instruments that might be adapted to the city's plants. Because of the complex nature of Philadelphia's wastes, much development work will be necessary.

The automating of the plants will probably move through two stages: In the first stage, controls over wastewater treatment will be centralized at one point and will be managed by human operators; in the second stage, computers will take over from the operators and full automation will be achieved.

One concrete step was taken toward these goals in 1966 at the Southwest Plant. There a new automatic gauge went into operation in a primary settling tank. Measuring the thickness of sludge flowing from the tank, the gauge increased or decreased the thickness by sending signals to long collecting arms in the tank. The collectors, synchronized by the signal, swept varying amounts of sludge into a sump (according to command), and this sludge was automatically pumped past the gauge.

Because of the new gauge, plant employees no longer needed to check sludge thickness with long poles or manually synchronize collectors and pumps. Time-consuming laboratory tests to check employee judgment were eliminated. Thus error was reduced and efficiency increased.

The new system was working so well by the end of the year that plans were made to install gauges in primary tanks at all the plants.

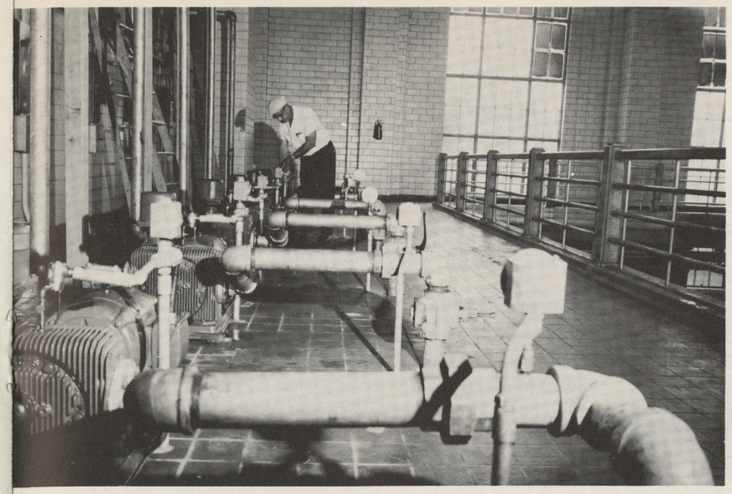
Improved Treatment: Desiring more effective treatment of wastes, the department used chemicals at its Southwest Plant for the second year. Chlorine was applied to the plant "effluent"—the separated water which is emptied into the river after removal of part of the solids.

As a result of such chlorination, the removal of biochemical oxygen demand from Southwest wastes rose to 48% — an increase of 19% in three years. Past operational difficulties have kept B.O.D. removal below the 35% plant design level for several years.

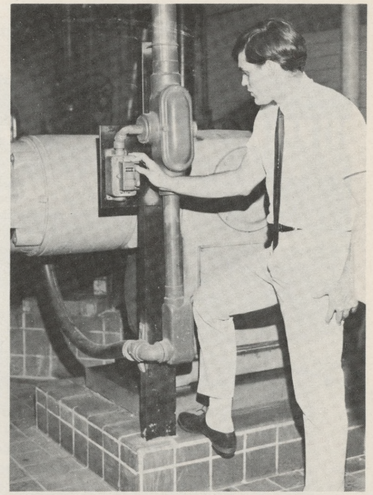
There were also some experiments with activated carbon and polyelectrolytes at Southwest. The latter, used occasionally on a plant scale, improved the removal of suspended solids; the former was still being laboratory tested.

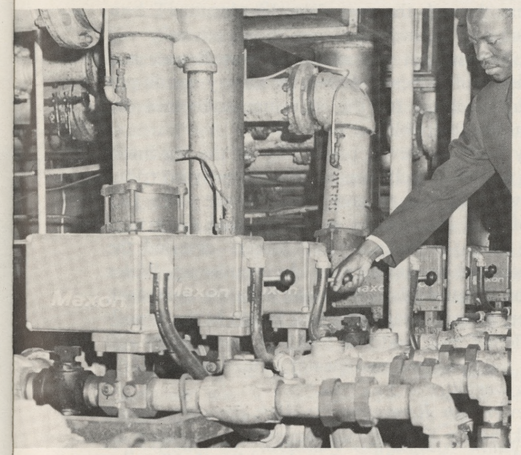
Thanks to new non-clogging pumps and other equipment, the removal of suspended solids jumped to 61%—up 14% in three years and well above the plant's 50% design level for solids.

Tightened operations at Southeast and new facilities at Northeast kept treatment efficiency satisfactory at those plants. Southeast, a primary plant, took out 59% of solids and 46% of B.O.D. (well above design levels), while Northeast removed 76% of solids and 70% of B.O.D.

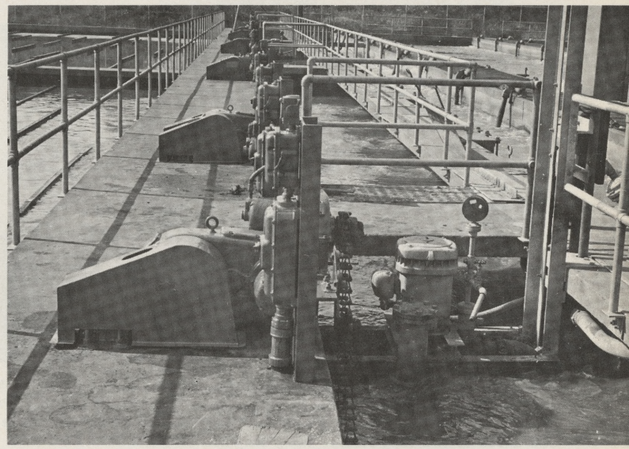


Gas Pumps: To improve heating of sludge (the settled product of the wastewater treatment process), new pumps were installed at the Northeast Water Pollution Control Plant to supply gas to heaters.





New Sludge Heaters: Largest of their type in the world, seven new sludge heaters were being installed at the Northeast Plant. Five of the heaters were in service at the end of the year, and the improved heating helped to multiply the tiny anaerobic bacteria which decompose the sludge in digestion tanks.



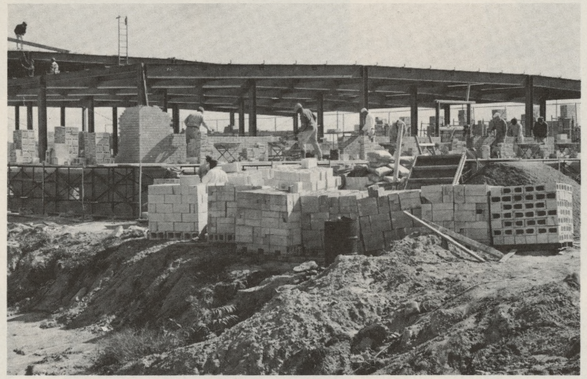
Sludge Pumping: To move sludge more efficiently through the Southwest Water Pollution Control Plant, many new non-clogging pumps have been installed in recent years. The hot sludge pump (top photograph) and the primary tank pump (bottom photograph, foreground) were among those installed in 1966.

Barging of Sludge to Sea: Barges made 92 trips to sea, carrying 62 million gallons of digested sludge.

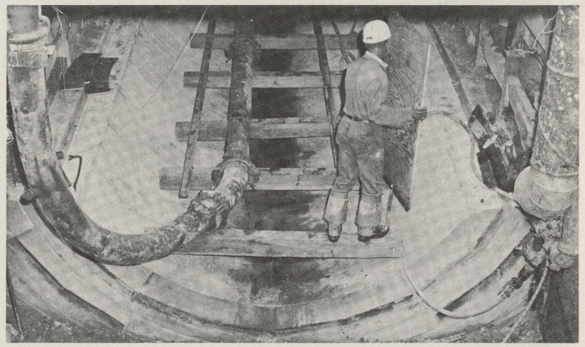
The harmless end-product of wastewater treatment, digested sludge has been barged to sea from the Northeast Plant for several years. In 1966, it was barged for the first time from the other two plants.

Barging from the Southwest and Southeast Plants began in January from a newly completed pier on the Schuylkill River. From this pier, the barges carried 33.5 million gallons of digested sludge to the Atlantic Ocean. This was a little more than half of all the sludge from the two plants, and the department planned to barge even more in 1967.

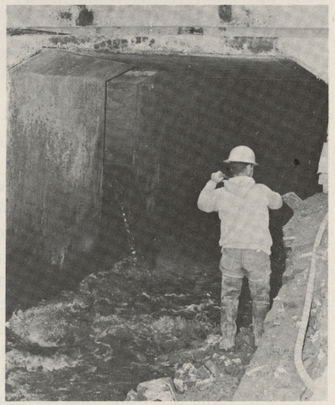
At the Southwest Plant (which receives Southeast Plant sludge for digestion and disposal), barging will make unnecessary the costly construction of more lagoons for sludge disposal and it will free valuable land for other public purposes.



For Efficiency: A new general services building rises at the Northeast Water Pollution Control Plant. The $435,000 building will house various maintenance shops, as well as offices, locker rooms and related facilities.



Gunner's Run Sewer: A huge brick sewer, which collects sanitary and storm flow from North Philadelphia, was replaced for 3,000 feet with a new reinforced concrete pipeline. Photo shows concrete cradle of new sewer.



Gunner's Run Sewer: Built partly in open cut and partly in tunnel, the $2.1 million sewer was almost finished. In photo, concrete section of new line and some 70-year old bricks of old sewer.

In 1967, the Water Department will install centrifuge machines at the Southwest Plant to remove more water from the sludge before it goes to sea.* Thus more solids will be carried on each trip and the city will save money. Under the private $883,000 contract, costs for barging from all the plants currently average $3.73 per thousand gallons.

Wastewater Collection: The Growing Sewer Network

The far-flung network which collects wastes from all parts of the city has been steadily improved. By the beginning of 1966, the Water Department had seven modern, wastewater pumping stations and 2,463 miles of sewers. Of the latter, 21% had been built since 1953.

To handle increasing wastewater flow as well as storm runoff, the department built nearly 25 miles of tributary (or branch) sewers in 1966. This was only a little less than the average mileage laid each year through the preceding decade.

Some of the new sewers replaced very old sewers. Others met the needs of new homes and industries. Still others relieved insanitary conditions or brought service for the first time to homes dependent on cesspools.

By 1966, however, practically all the big intercepting sewers, which receive wastewater from tributary sewers, had been completed. There were 141 miles of such interceptors in service, and the last of the big lines—a sewer in 26th Street—diverted the last untreated wastewater to the Scuthwest Water Pollution Control Plant in January. In the northeast, however, a small interceptor was begun in the Woodhaven Road area under a $56,000 contract. It will receive (and meter) wastewater from Lower Moreland Township.

Sewers for Replacement: With the intercepting network nearly finished, the department stepped up the replacement of *old* sewers. It replaced 12 miles of such sewers, compared with nine miles the year before.

The need to replace old sewers will become more acute in future years, for the city has at least 800 miles of sewers that date back to the late 19th century. Growing age and the vibrations of overhead traffic will push more and more of these to the breaking point.

One such sewer, which channels old Gunner's Run, was replaced for more than 3,000 feet in 1966. The huge brick line gave way to a new reinforced concrete line, extending from 5th and Clearfield Streets to "A" and American Streets.

*Digested sludge is mostly water. Solids in digested sludge from the Southwest Plant in 1966 averaged 6.6%. Centrifuge machines could raise this to 12% or 13%. Because of some lagoon dewatering, digested sludge from the Northeast Plant is 11% solids.

Collecting both sanitary flow and storm water from North Philadelphia, the old brick sewer was no longer able to withstand the stresses of heavy flow and overhead traffic. More than 70 years old, its bricks were deteriorating.

The new pipeline was of greater capacity. Built partly in tunnel and partly in open cut, it consisted of an 11-ft. diameter tube and a box ranging up to 11½ ft. x 12½ ft. in size. Costing $2.1 million, it was 80% finished by the end of the year, and it was scheduled to go into service in March, 1967. The old sewer, running somewhat north of the new line, will be salvaged for limited use.

Many other old lines were replaced under 80 contracts. The largest of these jobs centered on Delancey Place between 19th and 21st Streets ($675,000) and on Vine Street between 3rd and Lawrence Streets ($185,000), with both contracts including additional streets. Barely started was a $675,000 project in 52nd Street between Wyalusing and Thompson Streets.

Sewers for New Development: For fast increasing homes and industries in new areas, the department built 10.5 miles of small sanitary and storm water sewers. As in past years, the heaviest construction was in Northeast Philadelphia and in Eastwick.

To provide storm water drainage for Eastwick, large box sewers were started in Holstein, Mingo and Essington Avenues under contracts totaling $2,530,000. The contracts also included small sanitary lines to carry wastes to the Southwest Water Pollution Control Plant. Finished was a $380,000 sewer in 74th Street from Eastwick Avenue to Drainage Street.

Among the many sewers for new housing in the northeast was a one-mile line centering on Clark and neighboring streets. Cost: $163,555.

Relief of Insanitary Conditions: Many homes received city sewer service for the first time, with 2.3 miles of sanitary and storm lines being built for this purpose. The homes included sixty along Bustleton Avenue, from Poquessing Avenue to Woodhaven Road. Abut 3,200 feet of pipelines were laid in Bustleton Avenue at a cost of $166,750.

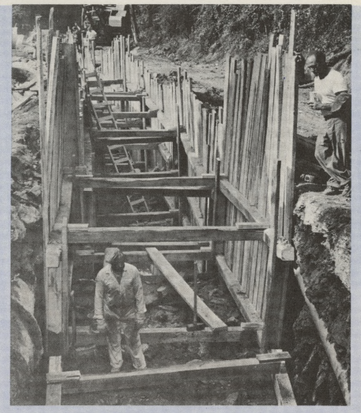
Work also began on 3,600 feet of pipelines to serve more than 100 homes in Rex Avenue, from Germantown Avenue to the Wissahickon Creek. The $340,000 job will be finished in 1967.

In the Manayunk area, the city laid 1.3 miles of collecting sewers along and under the Schuylkill Canal. Collecting flow from the surrounding neighborhood, the sewers will carry storm water into the canal and wastes to an intercepting sewer on the west side of the canal. Although the $465,000 contract was finished, many tributary sewers (including sewers for some Roxborough homes that have no sewer service) were yet to be built under future contracts.

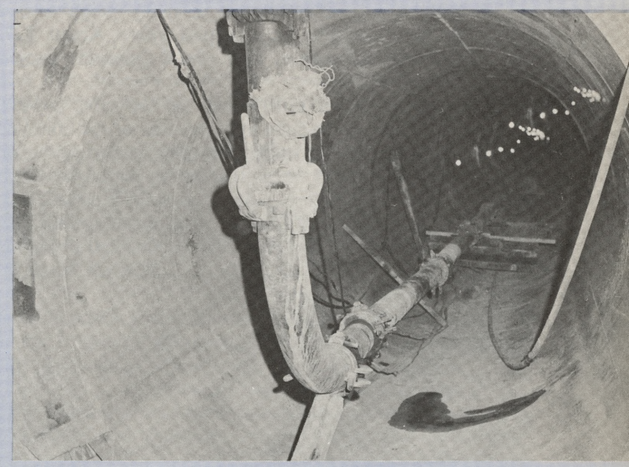
Wastewater Pumping Stations: With one billion gallons a day capacity, the pumping stations efficiently moved the wastewater to or into the plants for treatment.

For the most part, only normal maintenance was done at the stations. At the Central Schuylkill Station, however, three small contracts ($68,-700) for electrical work, drainage, and a screenings grinder and shredder, were completed.

At the Frankford Grit Chamber, which is not a pumping station, interior renovations were made at a cost of $31,000.



Toward Improved Sanitation: About 2.3 miles of sewers were built in 1966 to provide City sewer service for some homes for the first time. Above, workmen place wooden sheathing and shoring for a sewer in Rex Avenue, while below a pipeline is run beneath the Schuylkill Canal to carry wastewater from Roxborough-Manayunk to an interceptor.



Drainage: A large sewer is laid in a Northeast Philadelphia drainage right-of-way to assure better storm water run-off to neighboring streams. Water Department crews inspected 148 drainage right-of-way locations in 1966 and cleaned over half of them.

Relief from Storm Flooding In the West and North

The program for storm flood control carried no new projects in 1966. This was because flooding had been greatly reduced in many neighborhoods by huge conduits built in past years. About $27.3 million had gone into flood control projects (1946-66).

The storm relief needs of the city, however, had not yet been fully met. Because of the continued spread of streets, roofs, and other impermeable surfaces, it seemed likely that storm runoff would increase in the future, placing an even heavier burden on old sewers and making more relief conduits necessary, For this reason, the department's planning engineers studied a number of old storm water systems in 1966.

Partly financed from the city's General Fund, the big conduits form a program separate from the many miles of small storm water sewers built each year to serve homes and industries.

Though no new projects were started, two sizable jobs for storm flood relief were finished in 1966.

1. After four years, the old Mill Creek was finally chained in West Philadelphia. The brick sewer, through which Mill Creek has flowed since the 1880's, was replaced for more than a mile with a new reinforced concrete pipeline of greater capacity.

In the past, the flood waters of Mill Creek had often burst through the crumbling bricks and flooded surrounding streets.

The new sewer segment—a rectangular box ranging from 11 ft. x 12 ft. up to 16 ft. x 18 ft. in size—extended from 55th and Master Streets southeastward to 50th and Brown Streets. There it joined portions of the sewer which had been replaced in earlier years.

Costing $2.8 million, the new segment is part of $7.4 million of Mill Creek reconstruction since 1953.

2. Elsewhere, a 1,600-ft. concrete tube was added to the big Main Relief Sewer, which collects storm water from North Philadelphia west of Broad Street. The tube, built in tunnel 55 feet below the surface, reached along Sedgley Avenue from Margie Street to 22nd Street and southward on 22nd to link up with the sewer at Dauphin Street.

Eleven feet in diameter, the tube was constructed at a cost of $865,000. It will go into service after a further extension is built in Sedgley Avenue and 16th Street in 1967-68.

3. Almost finished was a surge basin, formed by widening and deepening Mingo Creek. The basin, running for a mile, will collect storm water from Eastwick and convey this to the new Mingo Creek Storm Water Pumping Station on the Schuylkill River. The job was done under a $454,000 contract.

Sewer Maintenance

Spurred by growing wastes and the steady aging of many sewers, the Water Department has given increasing attention to sewer maintenance. In 1966, the 15 maintenance crews performed 18,855 jobs—about 6,000 more than in 1962 and 10,000 more than a decade before.

Although the number of jobs performed had risen by 50% in five years, the 101 sewer maintenance employees were barely 15% more.

The employees worked nearly 28,000 man-days in 1966, cleaning, inspecting and repairing sewers, inlets, laterals and drainage rights-of-way.

To aid this accelerated work, the department experimented with, or adopted, some new labor-saving equipment.

Among the items was a high pressure cleaner for sewers. The new cleaner, equipped with a tank and high pressure hose, shot jets of water through the sewers with great force. Cutting through solid grease and easily moving heavy objects, the cleaner took on tasks that were too difficult for bucket machines and sewer rodders.

Purchased by the department for $12,352, the new machine cleaned five miles of choked sewers after its arrival in August. About two miles of sewers were rodded and flushed by other means.

The department also tested a closed-circuit television camera and decided to acquire one permanently in 1967. The new camera will make it easier to inspect small sewers and deteriorating old sewers.

While waiting for the camera, maintenance crews sharply accelerated the inspection of old sewers. They inspected 139 miles—the greatest mileage to date—and suggested that 10 miles be replaced. Such inspection and replacement, it is believed, will help to prevent some sewer breaks in the future.

Hiring bulldozers, the department also increased the cleaning of drainage rights-of-way. Crews inspected 148 such locations and cleaned over half of them—thus unclogging many drainage rights-of-way which have been filled up in recent years by builders of new homes.

Crews also repaired 300 feet of sewers at 22 locations (as a result of sewer breaks) and inspected 200 newly built sewers before the department's construction engineers accepted them.

Control of Industrial Wastes

Although many Philadelphia industries were treating or bottling up their wastes, there was need to reduce further the industrial pollution of local streams.

Because of this, the Water Department accelerated its inspection of industrial plants. Its small force of inspectors visited 369 manufacturing and processing industries. This was more than twice the 156 of 1965 and three or four times the number covered annually in previous years. There were plans for further tripling such inspections in 1967.

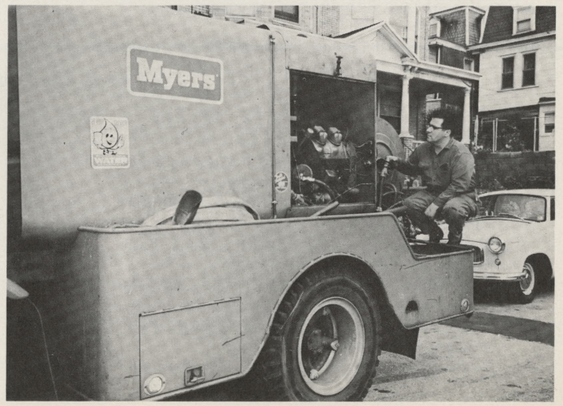
Checking plant facilities, the inspectors offered free technical advice on wastes control or suggested the installation of treatment units where necessary. As a result, Philadelphia sewers were protected from some chemically harmful wastes, and the future dumping of some untreated wastes into the rivers was averted.

To reduce the dumping of grease into sewers, inspectors visited 600 restaurants and cafeterias during the year. They also reviewed plumbing plans for commercial wastes and approved the issuance of more than 600 permits for waste interception devices. The latter were followed up with 981 field inspections.

In Northeast Philadelphia, 65 miles of creeks and Delaware River estuary were surveyed for pollution, and several pollution sources were pinpointed.

Industrial wastes regulations in 22 other cities were studied as a preliminary to revising and codifying such regulations in Philadelphia.

For Sewer Cleaning: A new type of machine, using a water jet under high pressure, made sewer cleaning more effective. The powerful water jet easily cut through solid grease and swept away heavy debris.



Water Pollution Control: The treatment of wastewater is constantly watched by laboratory personnel equipped with a variety of instruments. Portable recorder (photo) is used to check dissolved oxygen in plant aeration tanks.

WATER POLLUTION CONTROL PLANTS: OPERATING DATA

Summary for 1966

	Northeast	Southeast	Southwest	Total
Population Equivalent	**1,833,800**	**973,392**	**970,832**	**3,778,024**
Wastewater Flow (in millions of gallons daily)				
Rated Plant Capacity	175	136	136	447
Total Flow Treated	152.79	110.12	120.01	382.92
Flow from Other Communities	10.34	2.38	19.64	32.36
Solids in Wastewater (in parts per million)				**Weighted Average**
Raw Suspended Solids	338	211	274	281
Final Suspended Solids	82	87	108	92
Total Solids Removed	256	124	166	189
% Solids Removed	75.7%	58.8%	60.6%	67.3%
Tons of Solids Removed Daily	163.1	56.9	83.1	303.1 Tons
Biochemical Oxygen Demand in Wastewater (in parts per million)				**Weighted Average**
Raw Wastewater	240	177	162	198
Final Effluent	72	95	84	83
Total B. O. D. Removed	168	82	78	115
% of B. O. D. Removed	70%	46.3%	48.1%	58.1%
Gas Production				
Millions of Cubic Feet Daily	1.05	—	1.365	—
Cubic Feet Per Lb. Volatile	6.04	—	7.55	—
Plant Treatment Costs (per million gallons treated)				
Electric Power Only	$3.35	$1.63	$1.01	—
All Treatment Costs (including electric power)	**$25.20**	**$8.22**	**$15.12**	—

Four Year Summary

	1963	1964	1965	1966
NORTHEAST:				
Wastewater Flow—Millions of Gallons Daily	137	141	149	153
Suspended Solids—% Removed	76	71	78	76
Biochemical Oxygen Demand—% Removed	70	68	74	70
SOUTHEAST:				
Wastewater Flow—Millions of Gallons Daily	100	101	107	110
Suspended Solids—% Removed	50	55	56	59
Biochemical Oxygen Demand—%' Removed	44	44	45	46
SOUTHWEST:				
Wastewater Flow—Millions of Gallons Daily	117	123	129	120
Suspended Solids—% Removed	47	54	55	61
Biochemical Oxygen Demand—% Removed	29	31	39	48

MANAGEMENT & ENGINEERING services

The Improvement of Management

The Water Department continued to simplify and tighten its management. Many of the steps taken were intended to hold down operating costs, improve procedures, and do things faster. Others were to meet the needs of the public more fully.

Engineering Computer Center: Perhaps the biggest stride toward efficiency was a new Engineering Computer Center, which opened in January. The center was equipped with a digital computer, capable of 100,000 calculations a minute.

Managed by the Water Department but also serving other municipal agencies, the new center began to solve in minutes troublous engineering problems that formerly required weeks or months.

Much of the year was given to developing new programs and new applications for the computer. A daily and monthly reporting system was also set up.

The computer was expected to solve many complex problems in pipeline design, land survey, water and wastewater treatment. Typical was a plan for processing operational reports for the water pollution control plants. Man hours needed to prepare such reports will be reduced from 60 to 25.

New Claims Ordinance: There was also another step toward administrative simplification—a step which had special meaning for many Philadelphians. This was a new claims ordinance passed by the City Council on recommendation of the Mayor.

Under this law, the owners of property damaged by the breaking or overflow of water mains and sewers will be able to collect more easily from the City Government. The ordinance permits owners to collect even when it is proved that the municipality was not at fault. Hitherto, owners have had to prove municipal negligence.

The new law will also expedite the handling of claims up to $2,000. This it does by permitting the Water Commissioner (1) to appraise each claim and make an award in favor of the claimant without a hearing, or (2) to order a departmental hearing to adjudicate the claim. Hearings will be informal, and no longer will court proceedings be necessary. The claimant may still appeal to the courts, however, if he decides not to accept the Commissioner's award. In 1966, awards totaling $5,569 were made.

Management Studies: There were several management studies during the year. At the Water Meter Repair Shop, the department brought in a management consultant firm for a periodic audit. The department also reviewed recommendations contained in a survey of municipal agencies by a group of consulting firms engaged by the City Council.

Water Department analysts made some studies. As a result of these, the microfilming of vital sewer return plans was scheduled for 1967, weekly report forms were designed for the Central Stores Unit, and new training manuals were prepared for the Meter Shop.

Fiscal Operations: Although some significant studies were under way, there were no marked changes in accounting or budgeting procedures.

The Fiscal Division processed 281 contracts valued at $19.3 million. The contracts included 234

for public works and 47 for professional services and other purposes. The division also handled the paper work for capital budget payments totaling $17.6 million.

Personnel Programs

Along with the search for simpler and faster methods of doing things, the Water Department has upgraded the quality and efficiency of its personnel. This it has done with a variety of programs, intended to train, guide, and stimulate its employees.

In 1966, there were several indications that these programs had been successful. Though the water and wastewater systems had become more complex, the department was operating them with 1,555 employees—one of the smallest enrollments in many years. At the same time, the personnel turnover rate was only 8.67%—a rate that compared favorably with that of private industry.

Improved training, better working conditions, a strong civil service, and good employee morale accounted in part for these achievements.

Training: Of all the programs, training loomed largest. This was because new operating methods, sophisticated research, "push-button" plants, and advanced equipment have made well trained employees essential.

To provide such training in 1966, the department arranged in-plant courses for 86 employees, while it sent 95 other employees to technical schools or industries. The courses ranged from instrumentation and operation of water and wastewater plants to industrial hydraulics and electrical maintenance.

Training was also provided in other areas: Seventy-nine new employees attended orientation sessions; eight employees completed high school; 13 studied courses in the Philadelphia Governmental Training Institute; and seven studied administration at the University of Pennsylvania Fels Institute.

Recruitment: Continuing an annual campaign to attract young engineers, recruiters visited Eastern, Midwestern and Southern colleges. As a result, nine graduate engineers were hired.

In all, 193 new employees entered the department, while 190 old employees resigned or transferred, or, in a few cases, were dismissed. In addition, 86 employees were promoted.

The sick leave rate—11.86 days per employee—was practically the same as the year before.

Other Programs: Water Department employees aided the community and one another in various ways. Thus they contributed $49,345 to the United Fund Campaign, exceeding the department's quota by 15% and winning torchlighter status for the department. They also formed an intradepartmental blood bank, with 226 members.

Recreational programs, sponsored by the Water Department Employees' Recreational Association, attracted many employees after work hours. The association fielded teams in bowling, basketball, tennis, and other sports. Its softball team won the championship of the City Employees' Softball League. Some functions of the association were taken over by the Municipal Employees' Recreational Council, which represents all municipal departments.

On special leave, John Dillener, superintendent of the Torresdale Water Treatment Plant, headed a team of American engineers who put into service a new water treatment plant in Saigon, Viet Nam.

PERSONNEL CHANGES

The most important personnel changes in 1966 included the following:

Promotions

Joseph Duffy, from Water Customer Services Supervisor I to Administrative Analyst III; and John LaRosa, from Accountant III to Accounting Officer.

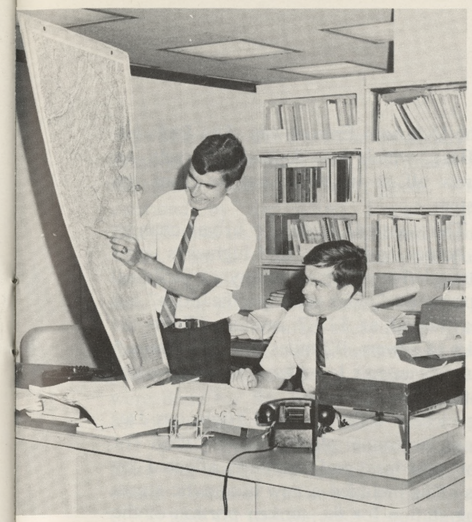
Separations

Edward Goebel, Water Distribution Supervisor, resigned November 14; Eugene V. Bonner, Chief of Sewer Records and Information, retired July 7.

Deceased

Robert J. Waters, Sanitary Engineer III (Superintendent of Queen Lane and Belmont Water Treatment Plants), on June 7; and Richard S. Boggs, Civil Engineer III (Construction), on December 20.

Management Aid: To its many items of modern business equipment, the Water Department added a machine for "reading" microfilmed records of engineering plans and reprinting copies of such plans from the microfilm. One result was the elimination of many filing cabinets for storage of cumbersome blueprints.



Engineering: Looking ahead to the future needs of the city is the daily task of Water Department engineers. From studies of the Delaware River by Research and Development engineers (left) to examination of long range plans by departmental Planning Unit members (right), this work goes on.

The Best Safety Record to Date

The 12-year old safety education program set a new mark in 1966. It pushed the disabling accident frequency rate down to the lowest level in the history of the department.

The number of disabling injuries per million man hours worked was only 10.9, compared with 16.3 in 1965 and 68.4 when the program started. The department's rate was far below the national average for water utilities.

The actual count of disabling injuries was 38, or 20 fewer than the year before, while working days lost because of such injuries dropped from 909 to 859. Medical treatment cases rose, however, from 159 in 1965 to 194 in 1966.

Behind the reduction in disabling injuries was a growing safety awareness by employees, encouraged by new safety equipment, supervisory checks on safety practices, and periodic lectures and conferences. Nevertheless, unsafe acts by employees were still the leading cause of the disabling injuries that did occur.

Continuing driver education reduced motor vehicle accidents to 172—four less than in 1965 and 38 below 1964. Of these accidents, 87 were considered preventable.

Several awards were won by the department. Of the employees who operate departmental vehicles, 237 drove throughout the year without a preventable accident. They received "safe driver awards" from the National Safety Council—many of them for the eighth, ninth or tenth time.

The low disabling accident frequency rate was recognized with an award* from the Safety Council of the Chamber of Commerce of Greater Philadelphia and the American Society of Safety Engineers, Philadelphia Chapter. The American Water Works Association bestowed an "Award of Progress."

Engineering Activities

Long hours at the drawing board or sloshing through muddy sewer trenches were often the lot of staff engineers. Planning, designing, or constructing new facilities, they moved from one unglamorous job to another.

Yet their role in 1966 (as in other years) was vital, for to their hands were entrusted hundreds of projects valued at many millions of dollars.

There was little change in the nature of their work in 1966, although the new Engineering Computer Center will speed up and simplify some of their efforts in coming years. To programs for the Computer Center, the various engineering units gave much study.

Among major engineering activities were the following:

Planning: Looking to the future, the small Water and Sewer Systems Planning Unit studied several large drainage systems and made preliminary or final designs for the reconstruction of more than 200 old sewers.

It also did much planning of water supply for 10 redevelopment areas, including Eastwick and the

*Safety award actually received in 1967, but covered 1966.

Big Suggestion, Big Check: For suggesting a new type of valve box that is saving the Water Department over $100,000 a year (see page 22), George W. Gilbert, left, a water distribution supervisor, was awarded the largest check ever bestowed by the City Government for an idea. The award before deductions was $940.

Christmas Caroling: As in past years, Water Department employees sang Christmas carols in City Hall courtyard just before the holiday. Many citizens stopped to listen.

environs of the Delaware Expressway. The Philadelphia Naval Base, which has depended largely on wells, will draw all of its water supply from the municipal system.

Design: The constant bustle of urban change, bringing new homes, industries, and highways, kept the Design Branch busy with a variety of facilities. The branch prepared "plans and specifications" for 292 contracts valued at $16.7 million. These included 13 miles of sewers, 92 miles of water mains,* and various improvements to water works and water pollution control plants.

Working closely with the State Highways Department, design personnel planned the location (or relocation) of pipelines and drainage affected by new highways. This included a new automatic storm water pumping station for the sunken portion of the Delaware Expressway in Society Hill.

The branch also prepared 168 reports on drainage and other matters for various public and private agencies. Limited personnel required the farming out of some planning to private consultants.

Construction: Engineers and inspectors of the Construction Branch supervised 346 projects with a contract limit of $36 million. Constantly in the field, construction personnel brought many of these projects to completion. At the same time, they performed 198 field surveys and drew up 172 "return" plans.

Research and Development: The brainstorming unit — Research and Development—pursued several long range studies related to stream quality, rainfall, storm flow, and sewer inlet design.

Continuing the work of past years, research engineers roamed the Delaware estuary in a laboratory-equipped cabin cruiser. They collected water samples, studied sludge deposits on the river bottom, and checked sewer outfalls for waste discharges. To build up a long-term picture of water quality, they also amassed data from electronic monitoring stations along the stream.

With a Federal Government grant, the Water Department and Drexel Institute of Technology studied the effects of incinerator residues on the quality of the river water. The study was to determine whether such residues might be safely used to build up park land along the Delaware.

Periodic flooding of sewer inlets in some parts of the city led to creation of a joint study committee by the Water and Streets Departments. Clogging, cleaning, design, and many other problems related to inlets will be studied. In Philadelphia, the Water Department designs and constructs inlets; the Streets Department cleans them.

*Includes old mains scheduled for cleaning and lining.

Materials Testing: The Materials Testing Laboratory assured the City Government full value for the dollars which the latter spent. The laboratory, operated by the Water Department, performed 31,000 tests on 2,800 physical and chemical samples taken from a variety of municipal purchases. The laboratory also checked materials used by contractors doing jobs for the city.

The tests covered everything, from paints and metals to asphalt and concrete, and from coal and gasoline to ink and food. About 58% of the tests were done for the Water Department, and the rest for other municipal agencies.

While physical and chemical tests continued, there was increasing use of infra-red equipment to obtain "profiles" of new organic compounds. The 6,700 tests for this purpose were double the number performed the year before. Resulting profiles greatly increased the speed with which complex new materials could be identified.

Customer Service 24 Hours Daily

Together with water supply and wastes collection, the Water Department provided many special services for its customers. Of these services, water customers were becoming increasingly conscious.

Thus 126,000 telephone calls (9,000 more than the year before) poured into the Customer Service Section in 1966. The calls concerned leaking water

Fond Farewell: Retiring employees got warm send-offs during the year. Typical was this party for a Meter Shop man, who received a watch and savings bond from fellow employees.

Quarter Centenarians: It was a gay evening for 20 employees who were inducted into the Water Department's Quarter Century Club. With 25 years of service behind them, the new members were wined and dined by the club's older members.

Training: Employees sought or were given training in many different fields. One employee (photo) receives from the Water Commissioner a high school equivalency diploma under a program sponsored by the School Board and the City Government.

A Year of Awards: For the Water Department, the awards came thick and fast in 1966. There were awards won by the department's basketball, softball and bowling teams; there were awards for United Fund giving, and even some public relations honors.

meters, flooded cellars, broken water mains, open fire hydrants, clogged sewer inlets, and many other problems troubling home owners. In response to these calls (and 10,000 car radio appeals), the unit despatched field representatives or emergency crews to provide quick assistance.

On duty 24 hours daily, Customer Service personnel made 83,000 field inspections, or 12,000 more than the year before. These included a jump of 1,000 in the rereading of water meters (usually at the request of customers), and about 7,000 more area surveys for leaks.

While meeting the needs of customers, mobile inspectors followed up on other matters for the municipality. They served 4,270 notices of plumbing violations and secured correction by the property owner in all but 31 cases, which were referred to magistrates. Nearly 4,600 inspections were made to clear up billing problems.

The Winning of A National Award for Advancement

In June, 1967, the American Water Works Association presented its highest national award to the Philadelphia Water Department. This award was for the "best community relations effort" by any large water utility in 1966.

The national award was a follow-up to A.W.W.A.'s Pennsylvania award won by the department in June of 1966.

These awards were based on the concept of "advancement," the guiding ideal of the 4,500 water utilities represented in the American Water Works Association. The awards recognized that the Philadelphia Water Department had achieved substantial advancement in physical facilities, service, and public relations.

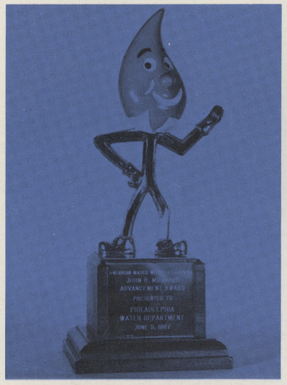
The national award—the John H. Murdoch Advancement Award—singled out Philadelphia as the winner among all water utilities in the United States and Canada with 25,000 or more paying customers.

Back of the award were the many improvements in plants, pipelines, and customer services described in this report. Back of it also, however, was the fact that the Water Department has tried to keep its customers informed.

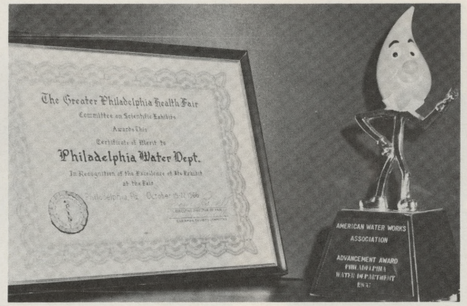
Thus A.W.W.A. cited the department for "a large-scale continuing public information program begun in 1959."

As part of this program in 1966, the department issued news releases, distributed 40,000 colorful brochures about water supply, guided 9,500 visitors through its water plants, placed displays in shows and exhibitions attended by several hundred thousand Philadelphians, distributed thousands of explanatory letters to home owners concerning impending water main and sewer construction, continued a series of high-quality printed annual reports, and did many other things to tell its story to the community.

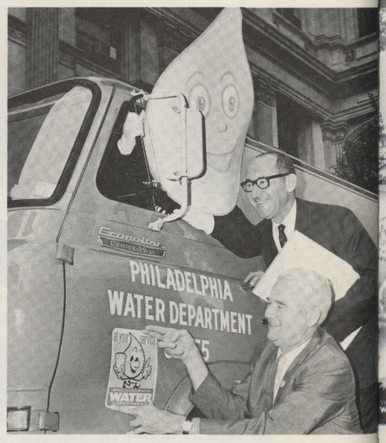
A.W.W.A. commended the department for making a "comprehensive effort" in 1966 to explain fully to its customers a proposed increase in water and sewer rates (see page 42).



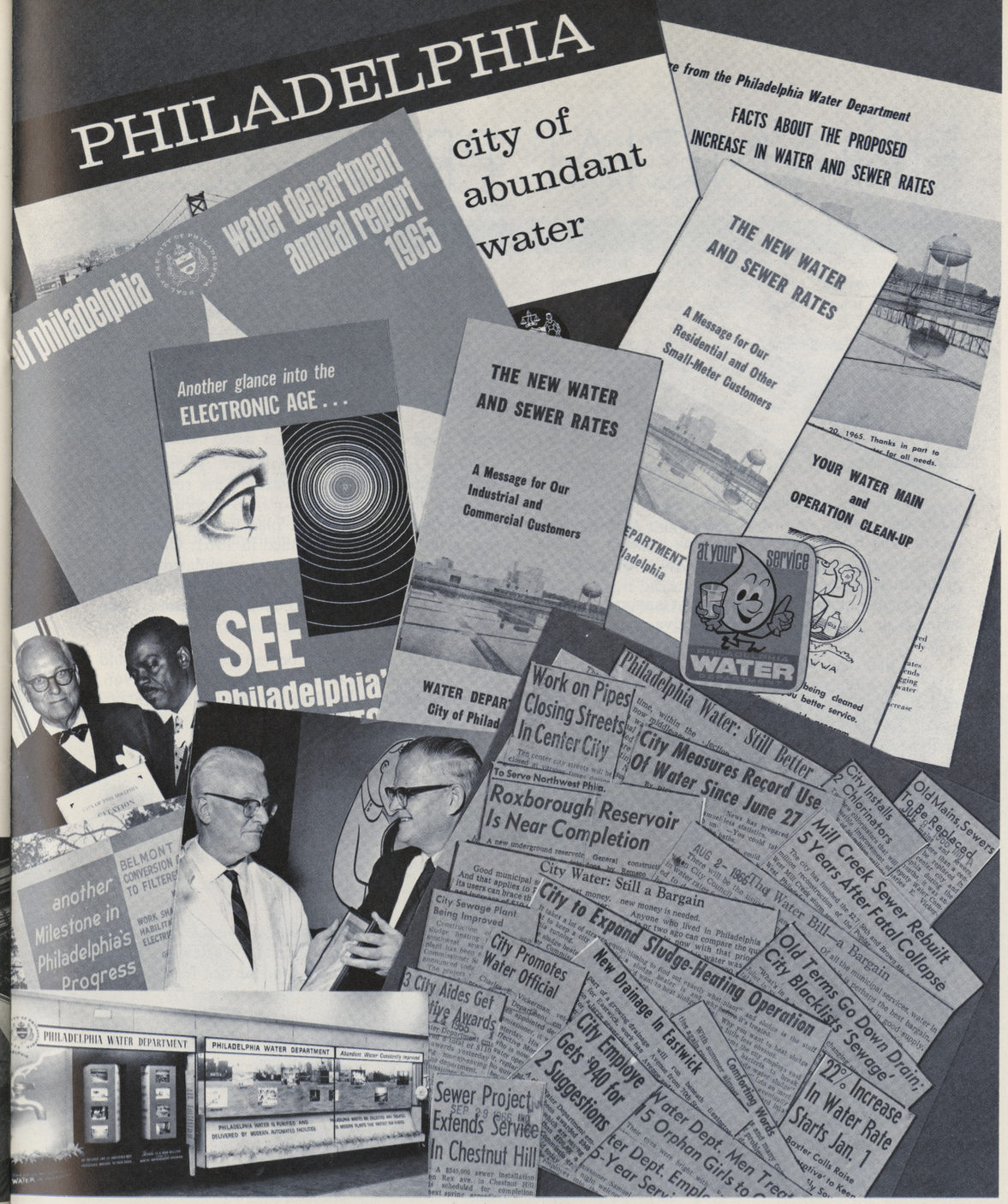
A National Award: The American Water Works Association conferred on the Water Department its highest national award for the "best community relations effort" by any large water utility in 1966. The award (a Willing Water statuette) represented "advancement" in physical facilities, customer services and public relations.



Other Honors: Another Willing Water statuette for community and public relations was won from the Pennsylvania branch of the American Water Works Association, while the Greater Philadelphia Health Fair bestowed a plaque for the "excellence" of the department's exhibits at the fair.



Willing Water Week: A special week in honor of "Willing Water", the water-drop symbol of American water utilities, drew new public attention to the importance of good water service. The Water Commissioner affixes an "At Your Service" decal to a truck as the City Representative looks on.



Community Relations: Desirous of keeping its customers informed, the Water Department told the story of its operations through press releases, colorful brochures, mail stuffers, and award-winning exhibits. One employee, Cosby O. Fennell (left inset, with polkadot tie), was named "City Employee of the Year" for heroism.

FINANCIAL PROGRESS

A Change in Water and Sewer Rates

By the mid-summer of 1966, an increase in water and sewer rates was becoming increasingly urgent. The rising costs of providing a sound, modern water supply were fast outstripping Water Department revenues.

Because of this, the department announced an increase in rates, to become effective on January 1, 1967.

On that date, water rates rose by approximately 22% and sewer rates by 31%, making a combined increase of 26%. For most families, this meant a rise of 2¼ to 3 cents a day for water and sewerage combined.

The new increase—the first in five years—was planned to keep the Water Department self-supporting (as required by law) for an additional four years. Back of the increase were a number of pressing developments:

1. The most important of these was a steady rise in the debt service on the city's water and sewer bonds. This debt service (consisting of principal and interest payments combined) had been rising at the rate of 6% a year, and it was expected to continue to mount in the future by at least 3% a year. In the five years, 1961-66, the demands of debt service on the Water Department's budget had climbed by one-third.

2. Construction costs had been going up both nationally and locally about 4% per year since 1961. Since the Water Department invests from $15 million to $25 million a year in new capital facilities, the inflation was having a marked effect on departmental costs.

3. Although the department had achieved many economies (through new, push-button plants and modern, labor-saving equipment, etc.), its operating costs were also rising. Labor costs, in particular, had increased, even though the department had no more employees than were on its rolls five years before.

4. In 1966, Water Department revenues were less than necessary expenditures. This revenue lag —the first in several years—was in accordance with the department's long range plan for the water and sewer rates which it established in 1961. Under this plan, revenue surpluses were accumulated in the first few years to meet later, inevitably rising costs, which in the final year exceeded (as planned) the expected revenues.

This lag of revenues behind rising costs could not be allowed to continue, however, beyond 1966. If it continued, the department would have an operating deficit of $6.9 million in 1967, and by the end of 1970 its cumulative deficit would total more than $30 million.

The new water and sewer rates, it is expected, will effectively prevent this deficit. They will provide an accumulated revenue surplus over the four-year period 1967-70. The surplus will decline, however, toward the end of the period, because of the continued rise of costs.

This long range planning will enable the city to continue to improve its water and wastewater facilities, as well as to provide good service for its water customers.

Announced on July 29, 1966, the new rates were extensively publicized by the Water Department . . . through press releases, brochures, television, and radio interviews, and talks with business and civic groups.

As a result of this—and a growing public awareness of the importance of efficient water and sewer service—Philadelphians quietly accepted the increase.*

*There was little public opposition One large daily newspaper (the Evening Bulletin) supported the increase in three editorials. The Philadelphia Board of Realtors also issued a statement of support.

Current Finance

Although the new water and sewer rates were not to become effective until 1967, the Water Department maintained a solid financial position throughout 1966. High revenues combined with surpluses from preceding years enabled the department to meet all its rising expenses.

The past surpluses, however, were essential to keeping the department "in the black." Built up by the self-supporting Water and Sewer Funds, the surpluses stemmed from (1) long range planning of revenues and expenditures, (2) institution (in 1962) of water shut-offs for persistent non-payment of bills, and (3) strict economy.

Whittled down in 1966, the combined water-sewer surplus totaled only $4,052,000 at the end of the year. This was less than half the 1965 surplus, and even this balance (it was anticipated) would be completely wiped out in 1967 if the old water and sewer rates remained in effect.

Water Fund: Revenues of the Water Fund—$22,661,000—were at an all-time high in 1966. They exceeded those of 1965 by $424,000, and they were $24,000 above the record set in 1964.

Most types of Water Fund revenues, indeed, showed some improvement. Thus current water sales totaled $17,096,000, a jump of $101,000 over the previous year. Delinquent collections also rose by $154,000 to $1,979,000. Other revenues—$3,587,000—were up $268,000 from 1965, despite some falling off in meter installation income and interest earnings. These "other revenues" represented about 16% of all income and current water sales about 75%.

While revenues rose, Water Fund outgo climbed even faster. Thus total obligations in 1966 were $24,647,000, or $1,412,000 more than in 1965.

The largest increase in expenditures was for personal services, which cost $6,536,000 or $616,000 more than the year before. This 10% jump stemmed from a comprehensive revision of the City Pay Plan, resulting in salary increases for most municipal employees. There was scarcely any change, however, in the number of employees paid from the Water Fund.

Next to personal services, debt service showed the biggest increase. The $8,984,000 outlay for debt service—representing 36% of all Water Fund obligations—was $606,000 greater than in 1965.

TABLE OF NEW WATER AND SEWER RATES

Effective January 1, 1967

	WATER				SEWER*
	Semi-Annual Bills		Quarterly Bills		
Meter Size	Minimum Allowance (Cubic Feet)	Minimum Water Rate	Minimum Allowance (Cubic Feet)	Minimum Water Rate	Rate % of Water Bill
5/8″	3,000	$ 10.00	1,500	$ 5.00	98%
3/4″	3,000	15.00	1,500	7.50	93%
1″	4,000	22.00	2,000	11.00	88%
1¼″	8,000	40.00	4,000	20.00	83%
1½″	12,000	60.00	6,000	30.00	78%
2″	32,000	160.00	16,000	80.00	73%
3″	72,000	350.00	36,000	175.00	68%
4″	128,000	635.00	64,000	317.50	62%
6″	288,000	1,400.00	144,000	700.00	57%
8″	576,000	2,800.00	288,000	1,400.00	51%
10″	800,000	3,950.00	400,000	1,975.00	51%
12″	1,150,000	5,600.00	575,000	2,800.00	51%

Rate per 1000 cubic feet for water used in addition to the minimum allowance $1.32

*The Sewer Bill is figured at a certain percentage of the Water Bill. This percentage varies with the size of water meter.

CAPITAL ACTIVITY—1966

	Water Works	Water Pollution Works	Storm Flood Works	Total
Capital contracts encumbered January 1, 1966	**$ 7,569,036**	**$ 6,996,454**	**$725,128**	**$15,290,618**
Add: Capital work put under way in 1966	**7,312,089**	**10,701,382**	**(83,581)***	**17,929,890**
Total: Net capital activity in 1966	**$14,881,125**	**$17,697,836**	**$641,547**	**$33,220,508**
Less: Capital expenditures in 1966	**7,287,527**	**9,739,474**	**552,123**	**17,579,124**
Capital contracts still encumbered December 31, 1966	**$ 7,593,598**	**$ 7,958,362**	**$ 89,424**	**$15,641,384**

*The liquidating of outstanding encumbrances and the lapsing of balances give a negative value to storm and flood activity "put under way" in the table.

Pensions increased by $111,600, and payments to the General Fund by $92,900. There were also smaller increases in other categories, which were more than offset by drops in refunds and in the purchase of services, materials, supplies, and equipment. The department continued its annual contribution of $500,000 from the operating budget as "pay-as-you-go" financing for the capital budget.

As a result of the increases in obligations (both in 1965 and in 1966), obligations for 1966 exceeded current revenues by $1,986,000. This was the second operating deficit under the old water-sewer rates, and it was even greater than the first deficiency —$1,097,000 in 1965.

From the budgetary standpoint, however, the year's operations continued to reflect conservative fiscal planning. Water Fund income totaled 104% of 1966 budgetary estimates; every individual item of income indeed (except one), exceeded 100%, with miscellaneous revenues reaching 162.5% as the result of a "windfall." Thus water sales were $440,000 greater than estimates, miscellaneous income $187,000 more, and payments by the General Fund for water services $155,000 more and for fire protection $116,000 greater. Only payments from the Sewer Fund to the Water Fund dropped—by $56,000.

Total Water Fund obligations ran $32,000 above the available appropriations (post-year closings from surplus permit this), despite substantial lapses in appropriations. Such lapses included $89,000 for personal services, $44,000 in claims and awards, $40,000 in refunds, and $31,000 for purchase of services and for miscellaneous items. At the same time, payments to the General Fund jumped $162,000 above appropriations, while those to the Municipal Pension Fund were $100,900 (or 20%) higher than appropriations. The increased payments to the General Fund reflected in part the revision of the City Pay Plan, while those to the Pension Fund reflected actuarial changes during the year.

Operations were aided by the addition of $378,000 to surplus, through the merger of encumbrances from prior years. As a result, the Water Fund closed 1966 with a cumulative cash surplus of $1,551,000. This represented a drop of $1,607,000 from the previous year.

Sewer Fund: Despite fiscal ties between them, the Water and Sewer Funds did not follow the same fiscal patterns in 1966.

Total income of the Sewer Fund—$17,426,000 —was only slightly ($91,000) above that of 1965, while it was $244,000 below the high mark set in 1964.

Charges to general users, representing 85% of all Sewer Fund income, totaled $14,857,000, or $233,000 more than in 1965. Both current and delinquent collections continued to be strong.

State aid, accounting for 8% of Fund income, continued to rise—jumping from $1,245,000 in 1965 to $1,327,000 in 1966. This rise was based on physical additions which the Water Department had made to its water pollution control plants. Under existing law, the Commonwealth may reimburse local communities in an annual sum ranging up to 2% of the approved capital value of local water pollution control facilities. The purpose of the law is to encourage communities to build facilities that will protect streams and lakes.

FACTS IN BRIEF

	1966	1965	1956
Population	**2,002,512(a)**	**2,002,512(a)**	**2,170,000(b)**
WATER SYSTEM:			
Meters in system: Dec. 31	527,052	526,632	485,000
Unmetered accounts: Dec. 31	1,804(c)	1,741	34,000
Total services: Dec. 31	**528,856**	**528,373**	**519,000**
Consumption of filtered water			
• Per person on average day (gals.)	169.2	162.8	162
• Average day (million gals.)	338.7	326	351.7
• Maximum day (million gals.)	471(d)	455.2	423.2
• Total annual (billion gals.)	123.6	118.9	128.7
Total annual raw water pumped (billion gals.)	**129.6**	**125.3**	**137.5**
Pipelines (miles)	3,189.5	3,176.2	2,907.1
Valves	72,923	72,850	61,982
Fire hydrants	24,973	24,740	23,773
WASTEWATER SYSTEM:			
Wastewater treated on average day (million gals.)	382.9	386.3	198.7
Total wastewater treated in year (billion gals.)	**139.7**	**141**	**72.7**
Pipelines (miles)	2,476.8	2,463.4	2,211.3
HIGH PRESSURE FIRE SYSTEM:			
Pipelines (miles)	63.3	63.3	63.3
Valves	1,868	1,868	1,868
Fire hydrants	1,050	1,050	1,060

Note: (a) U. S. Census, 1960
(b) Estimate by Chamber of Commerce of Greater Philadelphia
(c) Includes some properties from which meters were temporarily removed
(d) Wednesday, July 13, 1966 — temperature 97 degrees F.

Other Sewer Fund revenues were down $225,000, partly because a neighboring community paid a 1966 bill (for wastewater treatment) in 1967 and partly because 1965 revenues had been exceptionally high.

As with the Water Fund, obligations of the Sewer Fund jumped in 1966. They rose by $1,578,000 to $19,871,000.

Sixty per cent of the increase was in debt service, which went up by $992,000 to $13,030,000. Debt service, indeed, accounted for 68% of all Sewer Fund spending and was 2% higher than the year before.

The $2,148,000 spent for personnel services was $281,000 more than in 1965. This reflected not only revisions in the City Pay Plan but also the hiring of more employees to staff the expanded Northeast Water Pollution Control Plant and sewer maintenance.

Purchase of services rose by $147,000, materials, supplies and equipment by $113,000, and employee welfare payments by $7,000, as a result of expanded activities.

Because of changes in the City Pay Plan, payments to the General and Water Funds increased by $100,000. At the same time, actuarial revisions produced an increase of $34,800 (or 10%) in payments to the Municipal Pension Fund. As with the Water Fund, "pay-as-you-go" financing for the Sewer Fund capital budget totaled $500,000.

Taken together, Sewer Fund obligations exceeded revenues in 1966 by $2,446,000. This was the second operating deficit in the Fund under the existing water-sewer rates.

In budgetary terms, the Fund operated conservatively. Total income ran to 101.7% of budgetary estimates, with every item of revenue except two exceeding 100%. In fact, one item produced 133.6% of estimates. Current sewer charges, however, were slightly below the budgetary prediction and sewer charges to other municipalities (as already noted) were down.

Total obligations ran $142,000 under appropriations, with the substantial lapses in payments to the Water Fund ($55,900), in salaries and wages ($55,200), in materials, supplies and equipment ($29,600), and in refunds ($27,000), more than offsetting excesses in payments to the General Fund ($34,600) and to the Municipal Pension Fund ($15,400). Operations were aided by the addition of $65,300 to surplus, through the merger of encumbrances from prior years.

As a result, the Sewer Fund closed 1966 with a cumulative surplus of $3,302,000. This was $2,380,000 less than the $5,682,000 surplus with which the year opened.

Capital Finance

Because of the past completion of many large projects, the department's "capital activity" in 1966 declined to one of the lowest points in several years. This capital activity (which includes expenditures and new commitments) showed a net value of $33.2 million, compared with $37.8 million in 1965 and $55.7 million in 1964.

During the year, the department paid out about $17.6 million. This was $4.9 million less than in 1965 and $15.5 million below 1964.

New commitments—or capital work "put under way" in 1966 totaled $17.9 million. Although such commitments were $2.7 million higher than in 1965, they were $5.1 million under the level reached two years before.

The new commitments included $7.3 million for the water system and $10.7 million for the wastewater system. Although hardly any new commitments were made for storm flood control, expenditures for this purpose on older contracts totaled $552,000.

Water system commitments included $1,020,000 for additional water storage, $185,000 for expansion of the microwave network, and $550,000 for rehabilitation of high pressure mains. Much work on low pressure mains was also included.

Provision was made for new sewers in Eastwick ($2,878,000) and elsewhere, as well as for improvements at two water pollution control plants. Thus $458,000 of commitments were entered into for the Northeast Plant and $410,000 for the Southwest Plant.

CAPITAL PROJECTS 1966

WATER PLANTS AND DISTRIBUTION SYSTEM

Major Projects Completed During 1966

			Cost
1.	W-1091	Upper Roxborough Water storage: General construction for the conversion of abandoned slow-sand filter beds into underground storage basins for filtered water.	$ 614,759
2.	W-988 W-1059 W-1139	Torresdale Raw Water Pumping Station: Final work on installation of new pumps and general renovation, including plumbing and electrical improvements.	925,936
3.	W-1200 W-1201	Torresdale Raw Water Intake: General construction together with electrical work for a new raw water intake on the Delaware River to supply the Torresdale Water Treatment Plant.	2,253,505
4.	W-1040-D	Relay of 16-inch cast iron main in Chestnut Street between 3rd and 6th Streets; also relay of 12-inch cast iron main in Chestnut Street between 6th and 8th Streets.	$ 182,309
5.	W-1301-H	Laying of 16-inch steel high pressure main in Market Street between 10th and 12th Streets.	149,982
6.	W-1379-D W-1392-D W-1424-D	Cleaning and cement lining of cast iron water mains ranging from six inches to 20 inches in diameter; also replacement of line valves.	1,228,252

Some of the Larger Projects Under Construction at Year's End

			Limit of Contract
1.	W-1461 W-1462	Belmont Water Storage: General construction, including piping replacement, sand and gravel removal, drainage improvement, etc., together with electrical work, for the conversion of abandoned slow-sand filter beds into underground basins for storage of filtered water. 40% completed	$ 932,000
2.	W-1377 W-1378 W-1372	Belmont Water Treatment Plan: Installation of cathodic protection for the wash water tank; an ammonia feed system to upgrade the quality of water for consumers; and two new high service pumps. Pumps 80%; rest 99% completed.	75,600
3.	W-1474 W-1475 W-1499 W-1503 W-1504	Load Control Center: Expansion, including general construction, electrical, air conditioning, plumbing and heating work. 50% completed	$ 160,750
4.	W-1327-D W-1484-D W-1485-D W-1486-D W-1378-DM	Cleaning and cement lining of cast iron water mains ranging from six inches to five feet in diameter; also replacement of line valves.	1,705,000
5.	W-1419-DH	Relay of water mains in various portions of 2nd Street (between Cuthbert and Arch Streets, Elfreth's Alley and Race Streets, etc.) 2% completed	900,000
6.	W-1508-E	Laying of water mains in Essington Avenue in the Eastwick area. 50% completed	305,000

STORM FLOOD RELIEF

Major Projects Completed During 1966

			Cost
1.	S-2956-R	Mill Creek Sewer: Reconstructed from 50th and Brown Streets to 53rd and Poplar Streets.	$1,615,472
2.	S-2922-F	Main Relief Sewer: Extended in 22nd Street from Dauphin Street to Sedgley Avenue and over Sedgely Avenue to Margie Street.	$ 865,279

Some of the Larger Projects Under Construction at Year's End

			Limit of Contract
1.	S-3419-E	Mingo Creek: Excavation of Mingo Creek from Mingo Creek Storm Water Pumping Station to 77th Street and Ashwood Avenue to create a surge basin. 91% completed	$ 454,000

WATER POLLUTION CONTROL PLANTS AND SEWERS

Major Projects Completed During 1966

			Cost
1.	SD-341-NE SD-366-NE SD-369-NE SD-374-NE-O SD-380-NE-O SD-382-NE-O SD-387-NE-O SD-395-NE SD-397-NE-O	Northeast Water Pollution Control Plant: Various improvements, including replacement of hanger pipes in aeration tanks; installation of gas-fired heaters, chain link fences, a grit and screen pipeline to lagoons, and a drainage line; electrical work; and installation of eight flow tubes and four dual pen motors for sludge digestion tanks.	$ 327,776
2.	SD-303-SW	Southwest Water Pollution Control Plant: Two sludge concentration tanks.	248,034
3.	SD-312-SW SD-319-SW SD-321-SW SD-326-SW SD-327-SW SD-332-SW-O SD-336-SW-O SD-337-SW-O	Southwest Water Pollution Control Plant: For various electrical work; replacement of sprockets on collectors in primary tanks; installation of an automatic gauge for measuring sludge density in primary tanks; roof exhaust fans, etc.	244,016
4.	S-3414-E	Sewer in 74th Street from Eastwick Avenue to Drainage Street.	$ 380,389
5.	S-3434-RD	Sewers in Poplar Street between 15th and 17th Streets, and in various other locations in North Philadelphia.	379,434
6.	S-3326-RDH	Sewers in 10th Street between Market and Filbert Streets and between Arch and Vine Streets, including relay of water main.	315,243

Some of the Larger Projects under Construction at Year's End

			Limit of Contract
1.	SD-340-NE SD-347-NE SE-348-NE SD-340-SW-O SD-341-SW SD-342-SW SD-343-SW SD-345-SW-O	Northeast Water Pollution Control Plant: Various work on a new wing for the blower building, including general construction, a 5000 KVA outdoor sub-station for the blower building, and other electrical work. Sub-station 39% and rest 95% completed.	$1,080,000
2.	SD-376-NE SD-378-NE SD-385-NE SD-386-NE	Northeast Water Pollution Control Plant: General construction of new general services building, together with electrical work, plumbing, and heating for building, and installation of 3-ton traveling crane. 50% completed	453,500
3.	SD-361-NE SD-367-NE SD-375-NE-O SD-383-NE-O SD-384-NE-O SD-389-NE-O SD-390-NE-O SD-391-NE-O SD-392-NE-O SD-393-NE-O	Northeast Water Pollution Control Plant: Various improvements, including installation of new sludge heaters, replacement of eight primary sludge pumps, replacement of piping and pump to the main influent gates, and various electrical work.	448,050
4.	SD-309-SW-O SD-313-SW-O SD-317-SW-O SD-322-SW-O SD-323-SW-O SD-335-SW-O	Southwest Water Pollution Control Plant: Various improvements including replacement of roller guides on digester tank covers, screen cleaning equipment, and hanger pipes; also installation of a 10 M.G.D. wastewaster pump and other	515,600
5.	SD-152-GO	Northeast and Southwest Water Pollution Control Plants: Barging of digested sludge to sea.	$ 883,000 ($319,000 in 1966)
6.	S-3412-B	Construction of collecting sewers for sanitary and storm water flows in Manayunk along the Schuylkill Canal. 90% completed	465,000
7.	S-3512-B	Sanitary and storm water sewers in Rex Avenue in Chestnut Hill.	340,000
8.	S-3564-E S-3637-E S-3651-E	Sanitary and storm water sewers in various portions of Eastwick, including Holstein, Mingo, and Essington Avenues. 20% to 90% completed	2,582,000
9.	S-3465-RD S-3498-RD	Reconstruction of Gunner's Run sewer in Lippincott Street from "A" and American Streets to 5th and Clearfield Streets. 80% completed	2,100,000
10.	S-3517-RD	Sewer reconstruction in 52nd Street from Wyalusing Avenue to Thompson Street, etc. 10% completed	675,000
11.	S-3457-RDH	Sewers in Delancey Place between 19th and 21st Streets, etc., including water main relay. 68% completed.	675,000

WATER FUND — a brief financial statement

BALANCE SHEET

ASSETS AND OTHER DEBITS

	December 31 1966	1965
Utility Plant		
Utility Plant in Service	$267,598,365	$257,181,152
Construction Work in Progress	4,517,746	7,224,356
Unexpended Construction Authorizations	13,995,258	13,172,316
	$286,111,369	**$277,577,824**
Current Assets		
Cash	$ 2,213,932	$ 4,048,947
Accounts Receivable:		
Customers, for Utility Service	4,809,023	5,209,041
Other	201,435	174,329
Estimated Uncollectible Receivables	(1,497,653)	(1,724,799)
Materials and Supplies at Standard Cost	1,781,104	1,742,710
Advances to Other Municipal Funds	1,576,226	1,341,313
Prepaid Expenses	1,729	3,935
	$ 9,085,796	$ 10,795,476
	$295,197,165	**$288,373,300**

LIABILITIES AND OTHER CREDITS

Long Term Debt and Other Credits		
Bonds Payable	$114,719,411	$111,583,427
Sinking Fund Assets	(2,540,825)	(2,230,197)
Bond Authorizations Unissued	7,500,000	8,250,000
	$119,678,586	**$117,603,230**
Excess of Utility Plant and Fund Accounts over Long Term Bond Commitments	166,432,783	159,974,594
	$286,111,369	**$277,577,824**
Current Liabilities		
Accounts Payable	$ 540,968	$ 435,250
Payroll Accrued	252,027	212,168
Overpayment of Revenues	13,646	29,910
Advances from Other Municipal Funds	320,556	405,132
	$ 1,127,197	**$ 1,082,460**
Surplus and Surplus Reserves		
Reserves for Commitments	$ 1,039,110	$ 1,108,789
Surplus:		
Invested in Materials and Supplies	1,781,104	1,742,710
Estimated Collectible Receivables	3,512,805	3,658,572
Available for Appropriation	1,625,580	3,202,945
	$ 6,919,489	$ 8,604,227
Total Surplus and Surplus Reserves	$ 7,958,599	$ 9,713,016
	$ 9,085,796	**$ 10,795,476**
	$295,197,165	**$288,373,300**

STATEMENT OF INCOME AND SURPLUS

	For the Year Ending December 31 1966	1965
Operating Revenue:		
Metered Sales	$18,708,128	$18,484,301
Municipal and Other Metered Sales	703,992	706,729
Public Fire Protection	1,140,847	1,062,395
Other Operating Revenues	526,822	522,614
Total Operating Revenue	**$21,079,789**	**$20,776,039**
Operating Revenue Deductions:		
Operating Expenses, other than Maintenance	$ 8,684,308	$ 8,006,448
Maintenance Expenses	3,883,837	3,926,721
Total Operating Expenses	$12,568,145	$11,933,169
Charges in Lieu of Depreciation	6,795,208	6,318,732
Total Operating Revenue Deductions	**$19,363,353**	**$18,251,901**
Operating Income	1,716,436	2,524,138
Other Income	416,257	394,579
Gross Income	**$ 2,132,693**	**$ 2,918,717**
Income Deductions:		
Interest on Long Term Debt	$ 3,664,774	$ 3,453,836
Net Income or (Loss)	**$ (1,532,081)**	**$ (535,119)**
Surplus and Surplus Reserves at the Beginning of the Year	$ 9,713,016	$10,646,477
Other Adjustments to Surplus (Net)	(222,337)	(398,342)
Total Surplus and Surplus Reserves at the End of the Year	**$ 7,958,598**	**$ 9,713,016**

NOTES TO FINANCIAL STATEMENTS

1. Charges in Lieu of Depreciation. The City Charter provides that the rates and charges for supplying water and services shall yield at least an amount equal to operating expenses and debt service charges on any debt incurred or about to be incurred for water supply purposes.
2. Utility Plant in Service. Real property was valued herein at actual cost or engineering estimates where actual cost was not ascertainable. Equipment was valued at cost or replacement value.
3. Unexpended Construction Authorizations. This represents unexpended authorizations to complete projects in progress and projects not commenced, as well as unused financing, reimbursements, grants-in-aid, etc.
4. Bonds Payable. The bonds of the City of Philadelphia are all general obligations and, therefore, no bonds are issued by the water system per se. Similarly, a consolidated sinking fund is maintained for the retirement of such bonds. The amounts herein shown represent an apportionment of bonded indebtedness based on bonds issued for water system improvements.
5. Bond Authorizations Unissued. Commitments for capital projects authorized in the City's Capital Budget are made against available sources of financing, which include bond authorizations approved by the electorate or City Council and declared self-supporting by a Court of Common Pleas, and Water Fund operating pay-as-you-go appropriations. This item represents the amount of unissued bonds authorized for water system capital improvements.
6. Reserve for Commitments. Represents contractual obligations of the Fund for the future deliveries of services.
7. NOTE: The Statements are on the accrual basis as distinguished from the city budgetary basis of accounting.

WATER FUND — ANALYSIS OF 1966 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)
Water Sales:					
Collections on Current Billings (with penalties)	$16,850,000	$17,096,161	$ 246,161	101.5%	$18,708,128
Collections on Past Billings (with penalties and interest)	1,785,000	1,978,668	193,668	110.8	364,292(2)
Total Water Sales	**$18,635,000**	**$19,074,829**	**$ 439,829**	**102.4%**	**$19,072,420**
Meter Installations (Water Fund share—60%)	136,100	137,485	1,385	101.0	130,993
Miscellaneous Income	298,900	485,847	186,947	162.5	462,827
Interest Earnings	201,000	223,772	22,772	111.3	232,605
Payments from Other City Funds:					
General Fund:					
Water Sales to City Agencies	644,000	798,527	154,527	124.0	703,992(3)
Fire Protection Services	1,025,000	1,140,847	115,847	111.3	1,140,847(3)
Sewer Fund:					
Joint Fund Expenses	856,000	800,085	(55,915)	93.5	793,701(3)
TOTAL INCOME	**$21,796,000**	**$22,661,392**	**$ 865,392**	**104.0%**	**$22,537,385**

OUTGO (by major object of expenditure)		Final Obligations				Accrual Basis Expenses
Operations	Final Appropriations	Amount	% of Total	Lapses Amount	%	
Water Operations:						
Salaries and Wages	$ 6,625,000	$ 6,536,403	26.5%	$ 88,597	1.3%	$ 6,268,631
Purchases of Services by Contract	2,226,000	2,194,736	8.9	31,264	1.4	1,906,198
Materials and Supplies	3,222,000	3,219,379	13.1	2,621	.1	2,690,674
Equipment	244,000	242,331	1.0	1,669	.7	977,221
Miscellaneous	1,000	142	.0	858	85.8	140
Payments to General Fund:						
Financial services; reading meters, billing, etc.	1,082,659	1,141,041	4.6	(58,382)	—	1,141,041(3)
Other services rendered	824,341	928,189	3.8	(103,848)	—	928,189(3)
Contributions to Bond Fund	60,000	60,000	.2	0	.0	60,000
Total Water Operations	**$14,285,000**	**$14,322,221**	**58.1%**	**$ (37,221)**	**—%**	**$13,972,094**
Employees' Welfare Plan Payments	170,000	168,529	.7	1,471	.9	168,529
Claims and Awards	90,000	45,552	.2	44,448	49.4	55,155
Employees' Pension Fund Payments	508,000	608,900	2.5	(100,900)	—	608,900(3)
Refunds	50,000	9,603	.0	40,397	80.8	0(3)
Workmen's Compensation	15,000	8,317	.0	6,683	44.6	8,317
Provisions for Estimated Uncollectible Receivables	—	—	—	—	—	(227,146) (5)
Total Operations	**$15,118,000**	**$15,163,122**	**61.5%**	**$ (45,122)**	**—%**	**$14,585,849**
Capital Payments						
Debt Service:						
Amortization of Principal	$ 5,319,000	$ 5,318,843	21.6%	$ 157	.0%	$ 5,318,843
Interest	3,678,000	3,664,774	14.9	13,226	.4	3,664,774(3)
Capital Budget Financing	500,000	500,000	2.0	0	.0	500,000
Total Capital Payments	**$ 9,497,000**	**$ 9,483,617**	**38.5%**	**$ 13,383**	**.1%**	**$ 9,483,617**
TOTAL OUTGO	**$24,615,000**	**$24,646,739**	**100.0%**	**$ (31,739)**	**—%**	**$24,069,466**

SUMMARY COMPARISON OF 1966 BUDGETARY OPERATIONS
(Original and Actual Budgets)

	Encumbrance Basis			Accrual Basis(6)
	Budget Estimate(1)	Actual	Change	
Surplus, December 31, 1965	**$ 2,839,000**	**$ 3,157,828**	**$ 318,828**	**$ 9,713,016**
Add or (Subtract): Adjustment of Prior Years' Operations	0	378,469	378,469	(222,337)
Add: 1966 Income	21,796,000	22,661,392	865,392	22,537,385
Total 1966 Resources	$24,635,000	$26,197,689	$1,562,689	$32,028,064
Less: 1966 Outgo	24,615,000	24,646,739	(31,739)	24,069,466
Surplus, December 31, 1966	**$ 20,000**	**$ 1,550,950**	**$1,530,950**	**$ 7,958,598**

NOTES:
(1) Budget as proposed by the Mayor and adopted by Council in November, 1965.
(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

SEWER FUND — a brief financial statement

BALANCE SHEET

ASSETS AND OTHER DEBITS

	December 31 1966	1965
Utility Plant		
Utility Plant in Service	$370,096,576	$360,769,758
Construction Work in Progress	4,657,709	4,999,715
Unexpended Construction Authorizations	20,187,712	15,807,318
	$394,941,997	**$381,576,791**
Current Assets		
Cash	$ 4,457,809	$ 6,567,290
Accounts Receivable:		
Customers, for Utility Service	4,204,779	4,320,788
Other	289,392	49,060
Estimated Uncollectible Receivables	(1,093,550)	(1,129,838)
Materials and Supplies, at Standard Cost	205,716	186,561
Advances to Other Municipal Funds	381,407	456,825
Prepaid Expenses	—	471
	$ 8,445,553	**$ 10,451,157**
	$403,387,550	**$392,027,948**

LIABILITIES AND OTHER CREDITS

Long Term Debt and Other Credits		
Bonds Payable	$181,210,035	$179,877,231
Sinking Fund Assets	(4,555,094)	(3,900,521)
Bond Authorizations Unissued	12,450,000	8,310,000
	$189,104,941	**$184,286,710**
Excess of Utility Plant and Fund Accounts over Long Term Bond Commitments	205,837,056	197,290,081
	$394,941,997	**$381,576,791**
Current Liabilities		
Accounts Payable	$ 143,052	$ 156,782
Payroll Accrued	85,426	68,639
Overpayment of Revenues	10,531	26,111
Advances from Other Municipal Funds	51,437	117,948
	$ 290,446	**$ 369,480**
Surplus and Surplus Reserves		
Reserves for Commitments	$ 1,223,734	$ 946,391
Surplus:		
Invested in Materials and Supplies	205,716	186,561
Estimated Collectible Receivables	3,423,929	3,266,632
Available for Appropriation	3,301,728	5,682,093
	$ 6,931,373	$ 9,135,286
Total Surplus and Surplus Reserves	$ 8,155,107	$ 10,081,677
	$ 8,445,553	**$ 10,451,157**
	$403,387,550	**$392,027,948**

SEWER FUND — a brief financial statement

STATEMENT OF INCOME AND SURPLUS

	For the Year Ending December 31 1966	1965
Operating Revenue:		
Metered Sales	$ 14,613,756	$ 14,465,863
Municipal and Other Metered Sales	920,005	849,048
Other Operating Revenues	292,368	291,111
Total Operating Revenue	**$ 15,826,129**	**$ 15,606,022**
Operating Revenue Deductions:		
Operating Expenses, Other than Maintenance	$ 4,230,834	$ 3,751,385
Maintenance Expenses	1,629,938	1,300,649
Total Operating Expenses	**$ 5,860,772**	**$ 5,052,034**
Charges in Lieu of Depreciation	8,023,016	7,491,037
Total Operating Revenue Deductions	**$ 13,883,788**	**$ 12,543,071**
Operating Income	1,942,341	3,062,951
Other Income	1,869,891	1,774,995
Gross Income	**$ 3,812,232**	**$ 4,837,946**
Income Deductions:		
Interest on Long Term Debt	$ 5,591,858	$ 5,249,472
Net Income or (Loss)	**$ (1,779,626)**	**$ (411,526)**
Surplus and Surplus Reserves at the Beginning of the Year	10,081,678	10,815,260
Other Adjustments (Net)	(146,945)	(322,057)
Total Surplus and Surplus Reserves at the End of the Year	**$ 8,155,107**	**$ 10,081,677**

NOTES TO FINANCIAL STATEMENTS

1. Charges in Lieu of Depreciation. The City Charter provides that the rates and charges for supplying sewer services shall yield at least an amount equal to operating expenses and debt service charges on any debt incurred or about to be incurred for sewer supply purposes.
2. Utility Plant in Service. Real property was valued herein at actual cost or engineering estimates where actual cost was not ascertainable. Equipment was valued at cost or replacement value.
3. Unexpended Construction Authorizations. This represents unexpended authorizations to complete projects in progress and projects not commenced, as well as unused financing, reimbursements, grants-in-aid, etc.
4. Bonds Payable. The bonds of the City of Philadelphia are all general obligations and, therefore, no bonds are issued by the sewer system per se. Similarly, a consolidated sinking fund is maintained for the retirement of such bonds. The amounts herein shown represent an apportionment of bonded indebtedness based on bonds for sewer system improvements.
5. Bond Authorizations Unissued. Commitments for capital projects authorized in the City's Capital Budget are made against available sources of financing, which include bond authorizations approved by the electorate or City Council and declared self-supporting by a Court of Common Pleas, and Sewer Fund operating pay-as-you-go appropriations. This item represents the amount of unissued bonds authorized for sewer system capital improvements.
6. Reserve for Commitments. Represents contractual obligations of the Fund for the future deliveries of services.
7. NOTE: The Statements are on the accrual basis as distinguished from the city budgetary basis of accounting.

SEWER FUND — ANALYSIS OF 1966 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)
Sewer Charges:					
Collections on Current Billings (with penalties)	$13,240,000	$13,152,691	$ (87,309)	99.3%	$14,613,756
Collections on Past Billings (with penalties and interest)	1,415,000	1,703,873	288,873	120.4	287,462(2)
Total Sewer Charges	**$14,655,000**	**$14,856,564**	**$ 201,564**	**101.4%**	**$14,901,218**
Sewer Charges to Other Municipalities	510,000	327,313	(182,687)	64.2	545,235
Meter Installations (Sewer Fund share—40%)	83,000	84,756	1,756	102.1	84,756
Miscellaneous Income	81,000	106,018	25,018	130.9	111,189
Interest Earnings	260,000	347,232	87,232	133.6	366,457
Payments from other City Funds:					
General Fund: Sewer services to City agencies	308,000	376,825	68,825	122.3	374,770(3)
State Reimbursement for Clean Streams Program	1,240,000	1,326,840	86,840	107.0	1,326,840(3)
TOTAL INCOME	**$17,137,000**	**$17,425,548**	**$ 288,548**	**101.7%**	**$17,710,465**

OUTGO (by major object of expenditure)	Final Appropriations	Final Obligations Amount	% of Total	Lapses Amount	%	Accrual Basis Expenses
Operations						
Wastewater Operations:						
Salaries and Wages	$ 2,203,400	$ 2,148,190	10.8%	$ 55,210	2.5%	$ 2,150,625
Purchases of Services by Contract	1,482,000	1,476,275	7.4	5,725	.4	1,268,567
Materials and Supplies	268,200	238,612	1.2	29,588	11.0	174,762
Equipment	154,150	154,122	.8	28	.0	84,791
Miscellaneous	250	48	.0	202	80.8	47
Payments to General Fund:						
Financial services; reading meters, billing, etc.	809,704	850,740	4.3	(41,036)	—	850,740(3)
Other services rendered	262,296	255,812	1.3	6,484	2.5	255,812(3)
Payments to Water Fund:						
Joint Fund Expenses	856,000	800,085	4.0	55,915	6.5	793,702(3)
Contributions to Bond Fund	40,000	40,000	.2	0	.0	40,000
Total Wastewater Operations	**$ 6,076,000**	**$ 5,963,884**	**30.0%**	**$112,116**	**1.8%**	**$ 5,619,046**
Employees' Welfare Plan Payments	76,000	71,862	.4	4,138	5.4	71,862
Claims and Awards	25,000	24,999	.1	1	.0	39,988
Employees' Pension Fund Payments	250,000	265,400	1.3	(15,400)	—	265,400
Refunds	42,000	14,989	.1	27,011	64.3	0
Workmen's Compensation	0	0	.0	0	.0	0
Provision for Estimated Uncollectible Receivables	—	—	—	—	—	(36,288) (4)
Total Operations	**$ 6,469,000**	**$ 6,341,134**	**31.9%**	**$127,866**	**2.0%**	**$ 5,960,008**
Capital Payments						
Debt Service:						
Amortization of Principal	$ 7,439,000	$ 7,438,225	37.4%	$ 775	.0%	$ 7,438,225
Interest	5,605,000	5,591,858	28.2	13,142	.2	5,591,858
Capital Budget Financing	500,000	500,000	2.5	0	.0	500,000
Total Capital Payments	**$13,544,000**	**$13,530,083**	**68.1%**	**$ 13,917**	**.1%**	**$13,530,083**
TOTAL OUTGO	**$20,013,000**	**$19,871,217**	**100.0%**	**$141,783**	**.7%**	**$19,490,091**

SUMMARY COMPARISON OF 1966 BUDGETARY OPERATIONS (Original and Actual Budgets)

	Encumbrance Basis Budget Estimate(1)	Actual	Change	Accrual Basis(5)
Surplus, December 31, 1965	**$ 5,455,000**	**$ 5,682,093**	**$ 227,093**	**$10,081,678**
Add or (Subtract): Adjustment of Prior Years' Operations	0	65,304	65,304	(146,945)
Add: 1966 Income	17,137,000	17,425,548	288,548	17,710,465
Total 1966 Resources	**$22,592,000**	**$23,172,945**	**$ 580,945**	**$27,645,198**
Less: 1966 Outgo	20,013,000	19,871,217	141,783	19,490,091
Surplus, December 31, 1966	**$ 2,579,000**	**$ 3,301,728**	**$ 722,728**	**$ 8,155,107**

NOTES:
(1) Budget as proposed by the Mayor and adopted by Council in November 1965.
(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