Metropolitan Waste Control Commission

TREATING THE MISSISSIPPI RIGHT

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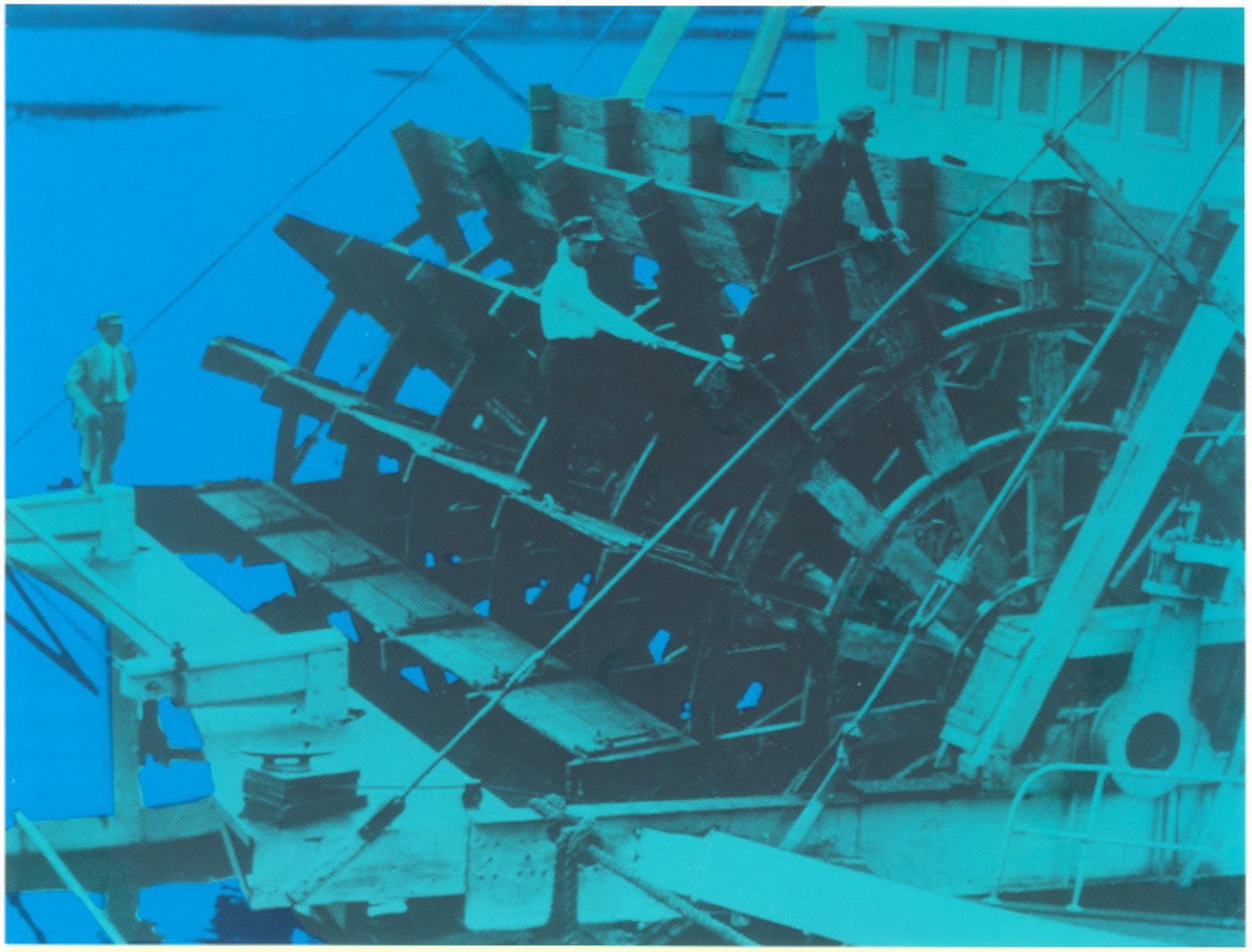

FOREWORD

Imagine for a moment what the Twin Cities would be like if the Metropolitan Wastewater Treatment Plant had never been built. If every time we washed the dishes, took a shower, or flushed the toilet, we just sent wastewater into the nearest pond or river. Fifty years ago, that's exactly what happened.

The Metro Plant, located on Pig's Eye Island, changed all of that. It was the first wastewater treatment facility to be built along the entire 2,348-mile Mississippi River. We're proud of that first. We're also proud of the many technical advances we have made in the field of wastewater management.

The Metro Plant—how it came to be, how it grew, and the challenges it faced and continues to face—it's an exciting story waiting to be told.

As a part of the Metro Plant's 50th Anniversary celebration, we have compiled a full-length narrative of the plant's rich history, interwoven with personal recollections and anecdotes of MWCC employees and retirees.

This historical record affords us the opportunity to look into our past, to put change in perspective, and to consider the significance of the decisions we are making today.

I'd like to dedicate this book to MWCC employees, past and present. Without your dedication and hard work, none of this would have been possible.

Peter E. Meintsma

Peter E. Meintsma

Chair
Metropolitan Waste Control Commission

THE MWCC AND THE MISSISSIPPI: 50 YEARS OF STEWARDSHIP

A RIVER TO SAVE

The Mississippi River. You misspelled it in grade school. Once you learned where to place all the letters, you spelled it just to hear the sound it made, flowing along: M-I-S-S-I-S-S-I-P-P-I. Like its sound, the Mississippi flows along—2300 miles to the Gulf of Mexico.

Rising near Lake Itasca in Northern Minnesota, the Mississippi has been the lifeblood of the Twin Cities area for hundreds of years. Long before anyone dreamed the area would one day be home to two million people, the Mississippi, with tributaries that include great river systems themselves—the Ohio, Arkansas, and Missouri—was a bountiful natural resource. For the people who lived along its banks, the Mississippi provided fresh water, fish, game, fur-bearing animals, and, below the falls, a smooth avenue of transportation.

In 1838, when the area was officially opened to settlement, the river's vast bounty attracted homesteaders. Its importance as a transportation route brought military and trading posts. The Falls of St. Anthony powered lumber and grist mills, and the fertile soil and unspoiled scenic beauty of the surrounding countryside beckoned to people who believed that a new life could be built in Minnesota. The Mississippi River was central to their hopes and dreams.

Even before it began treating sewage, the plant was hailed as both a modern engineering wonder and a savior of the dying river.

Unfortunately, when people lay claim to an extraordinary natural resource, they often overestimate the capacity of that resource to withstand the onslaught of their growing numbers and their dreams. Among the many demands placed on the Mississippi was the disposal of the cities' human and industrial wastes. At first the river was able to keep up with this demand. City sewers, first built in 1871, drained directly into the river, and for many years the river's natural biological processes handled enormous amounts of sewage and other waste with little known effect. Ultimately, however, the demands of burgeoning industries and an ever-growing population were too great.

By the turn of the century, within 30 years, the Mississippi River was unable to process its sewage and wastes. It was a dirty river by today's standards. Yet people in the region in the early 1900s could ignore the

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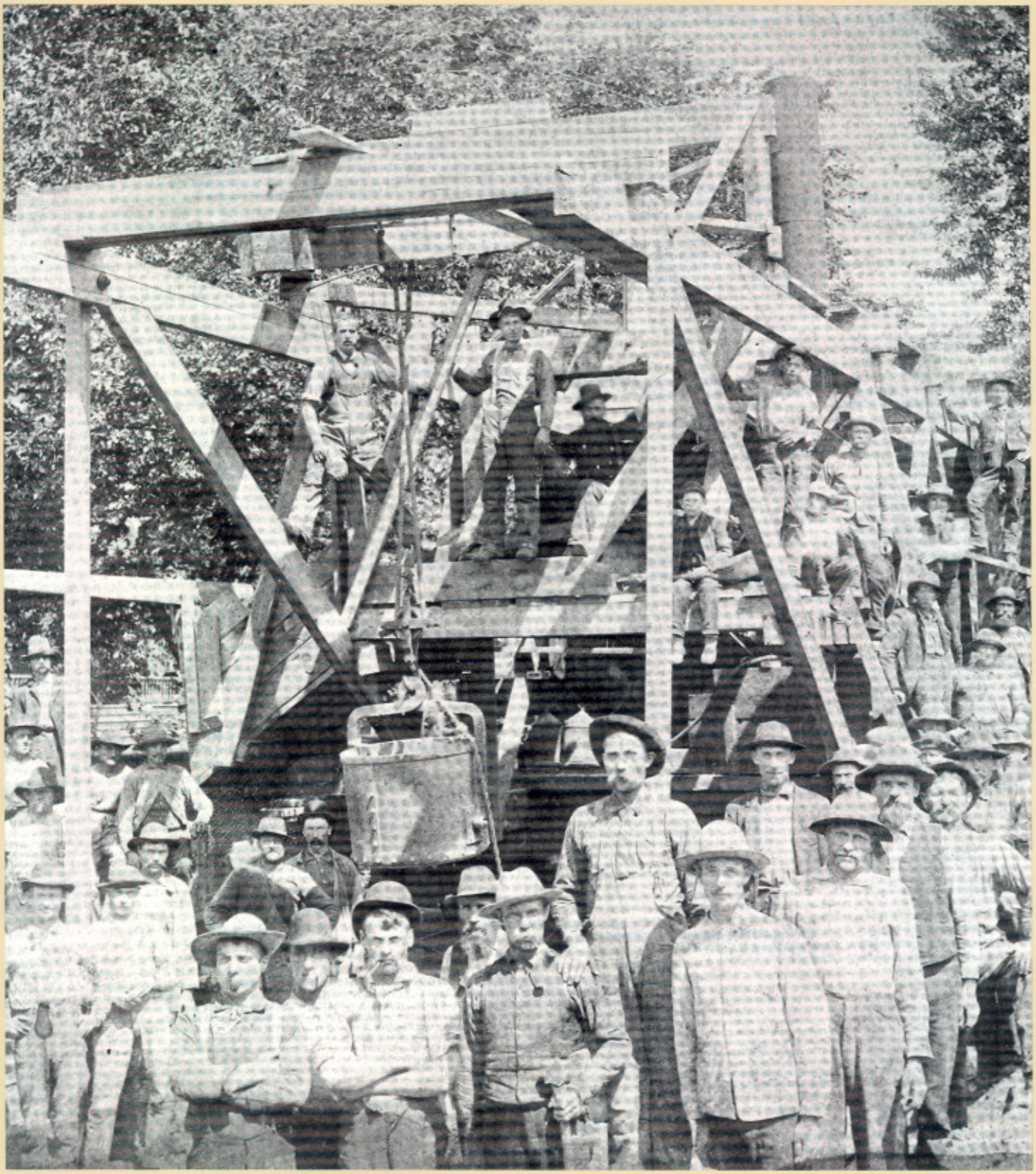
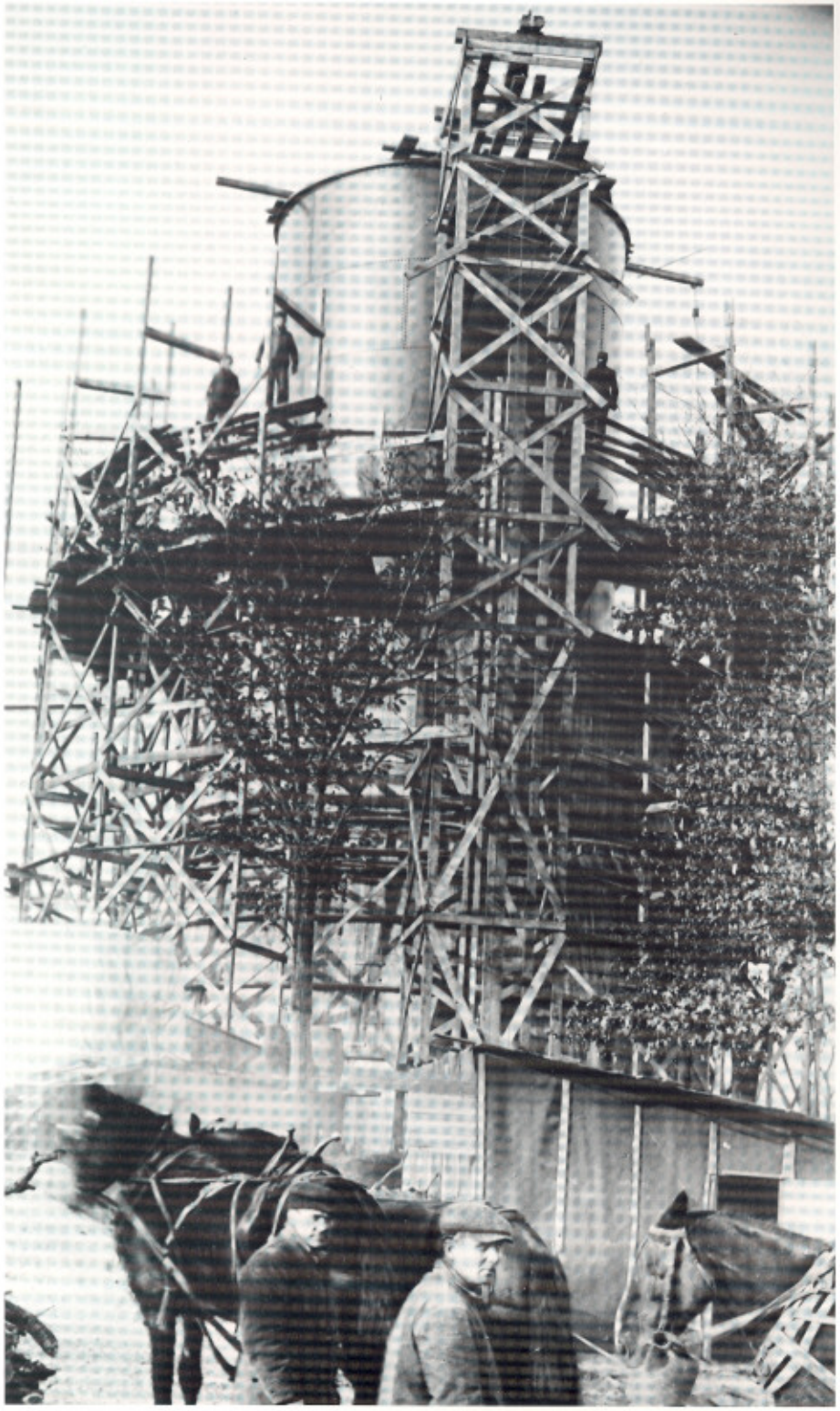
Construction in the 1890s was labor intensive, to say the least. Here the construction gang that helped build the Minneapolis sewer system poses proudly for posterity.





Genuine, not mechanical, horsepower and manpower helped construct this water tank for the Minneapolis Waterworks.

growing dangers of pollution thanks to the natural phenomenon of spring flooding. Each year the rising waters of the Mississippi scoured the banks and removed the year's deposits of sludge and other pollutants. This annual flushing provided just enough cleansing action to keep the river from becoming a huge open sewer.

In 1917, construction of the Twin Cities lock and dam, downstream from the present-day Ford Bridge, slowed the river's current through the Twin Cities and diminished its purging effect during spring floods. Without the annual spring cleaning, sludge deposits began to build quickly. In the three years following the dam's completion, an estimated 3 million cubic yards of sewage sludge settled in the pool above the lock and dam. The pollution became so concentrated that during the summer months the river became a septic tank. Bacterial action and gasification in the decomposing pollutants lifted large mats of sludge to the surface, creating an almost unbearable stench along the river. The Mississippi's most offensive stretch ran from St. Anthony Falls to the St. Croix River, 30 miles.

Concern for the public's health—not for the river or the environment—eventually brought action. In 1923, the Minnesota State Board of Health wrote letters to the Minneapolis and

St. Paul city councils urging them to deal with the problem. A statement from the Board of Health indicated that the river was a public health nuisance; river water was unsafe for humans or livestock to touch, let alone drink.

In spite of the peril, the city councils were slow to respond. Two years later, in 1925, the Board of Health pressed the matter again. But it took 13 more years, plus the intervention of the state legislature, and some outspoken encouragement from people living downstream, before anything was done. Three interim organizations (the Minneapolis Sanitary Commission, the Twin City Sanitary Commission, and the Metropolitan Drainage Commission) preceded the Minneapolis-St. Paul Sanitary District, formed in 1933. Five years later, the Minneapolis-St. Paul Sanitary District completed construction and began operation of the Twin Cities' first sewage treatment plant.

The plant was located along the Mississippi on Pig's Eye Island, south of St. Paul. The island was named for Pierre "Pig's Eye" Parrant, a fur trader and bootlegger who in 1832 became one of the first settlers of St. Paul. Even before it began treating sewage, the plant was hailed as both a modern engineering wonder and a savior of the dying river. Typical of the media coverage at the time, a headline in the November 21, 1938,

Pierre "Pig's Eye" Parrant (Art courtesy of Minnesota Historical Society.)

Minneapolis Evening Tribune proclaimed great expectations for the Twin Cities: "Old Man River to Find Fountain of Youth in New Sewage Plant."

These great expectations were not unfounded. With the opening of the Pig's Eye Plant, Minneapolis and St. Paul became the only major metropolitan area on the Mississippi to treat its sewage before dumping it into the river. (Nationwide, only about 25 cities of comparable size had sewage treatment facilities.) In addition, the Pig's Eye Plant, which is called the Metro Plant today, had a significant impact on the river during its first four months of operation. The floating rafts of stinking scum and sludge, covering as much as 50 percent of the river's surface, virtually disappeared. Within a couple of years, fish returned and anglers reported catching walleyes in waters that, before the plant opened, could not support carp and other rough fish.

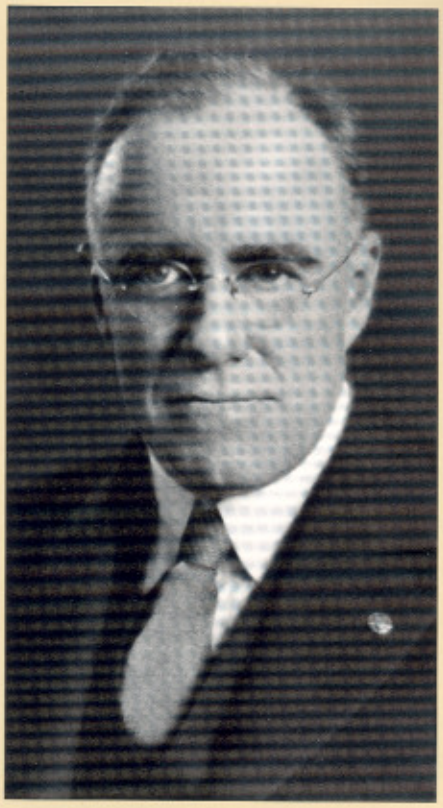
In the early years, board members and employees of the Sanitary District considered the new treatment system a complete success. Residents of the Twin Cities and visitors from around the world concurred. Thousands of people toured the plant, many of them engineers planning treatment facilities for their own cities. Over the years, the Sanitary District maintained the river at acceptable levels and developed a

proprietary interest in the well-being of the Mississippi. The Sanitary District's job was to dispose of sewage; its mission was to save the river. Early Sanitary District progress reports echoed the enthusiasm of the newspaper headlines, and the District began aggressively urging institutions and neighboring communities that were not treating sewage to join in the fight to clean up the river. In a real way, the Sanitary District appointed itself the steward of the Mississippi River, adopting the causes of conservation and environmental protection long before those concerns became a part of the public conscience.

CHANGING PERSPECTIVES

As the population of the metropolitan area grew, the Sanitary District began planning for expansion of the Metro Plant. Many of the surrounding suburbs, such as Richfield, St. Louis Park, and Lauderdale, were connected to the system by 1954. At that time, the Metro Plant was treating more than 140 million gallons of sewage a day, which pushed the physical plant to its limit. For the first time since the plant's inception in 1938, the water quality of the Mississippi began to deteriorate.

At about the same time, a significant shift in the public conscience was beginning to take place. Twin



JAMES A. CHILDS

The road leading to the Metro Plant is named Childs Road. To the casual observer, the road signs seem to be the slim legacy left behind by James A. Childs, the first chief engineer and secretary of the Metropolitan Drainage Commission. In truth, the impact of Childs' work in planning the Twin Cities' first sewage disposal system continues today.

James A. Childs was the driving force, the "brains," behind a planning and selection process that, after considering 16 different locations and numerous plans, chose the Pig's Eye site and the design for a treatment plant that ranked among the best in the world. He also shaped the early river sampling program that was crucial to reclaiming the pollution-ravaged Mississippi.

In addition, Childs was protective of his employees, according to former MWCC deputy administrator, Maurice Robins, who worked under Childs in 1934 and 1935. Robins recalls Childs scolding him after a wild night of river sampling with temperatures at 40 below.

"He said to us, 'Don't ever go out in weather like that again,'" Robins says. "Childs was very much a humanitarian."

Unfortunately, James A. Childs never saw how much his work contributed to cleaning up the Mississippi. He died of heart disease in April 1935, three years before the plant opened.

Citians began to view sewage treatment not as a means of protecting the public from a health threat but rather as an obligation to protect the environment. They wanted the Mississippi returned to a more natural state for fishing and other recreational activities. As public standards for water quality became more stringent, it became apparent that the original plant and the supporting sewer system were inadequate.

The original plant provided primary treatment of sewage, a process that removed roughly 50 percent of the pollutants. In primary treatment, screens, settling tanks, and skimming devices remove sand, grit, and larger solids.

By the mid-1960s, plant expansions had increased overall capacity and added secondary treatment facilities. In secondary treatment, naturally occurring micro-organisms—stimulated by the addition of air—consume most of the waste material. The wastewater is then separated from the organisms and solids, disinfected chemically, and returned to the river. The addition of secondary treatment facilities boosted the plant's performance, eliminating 85 to 90 percent of the pollutants.

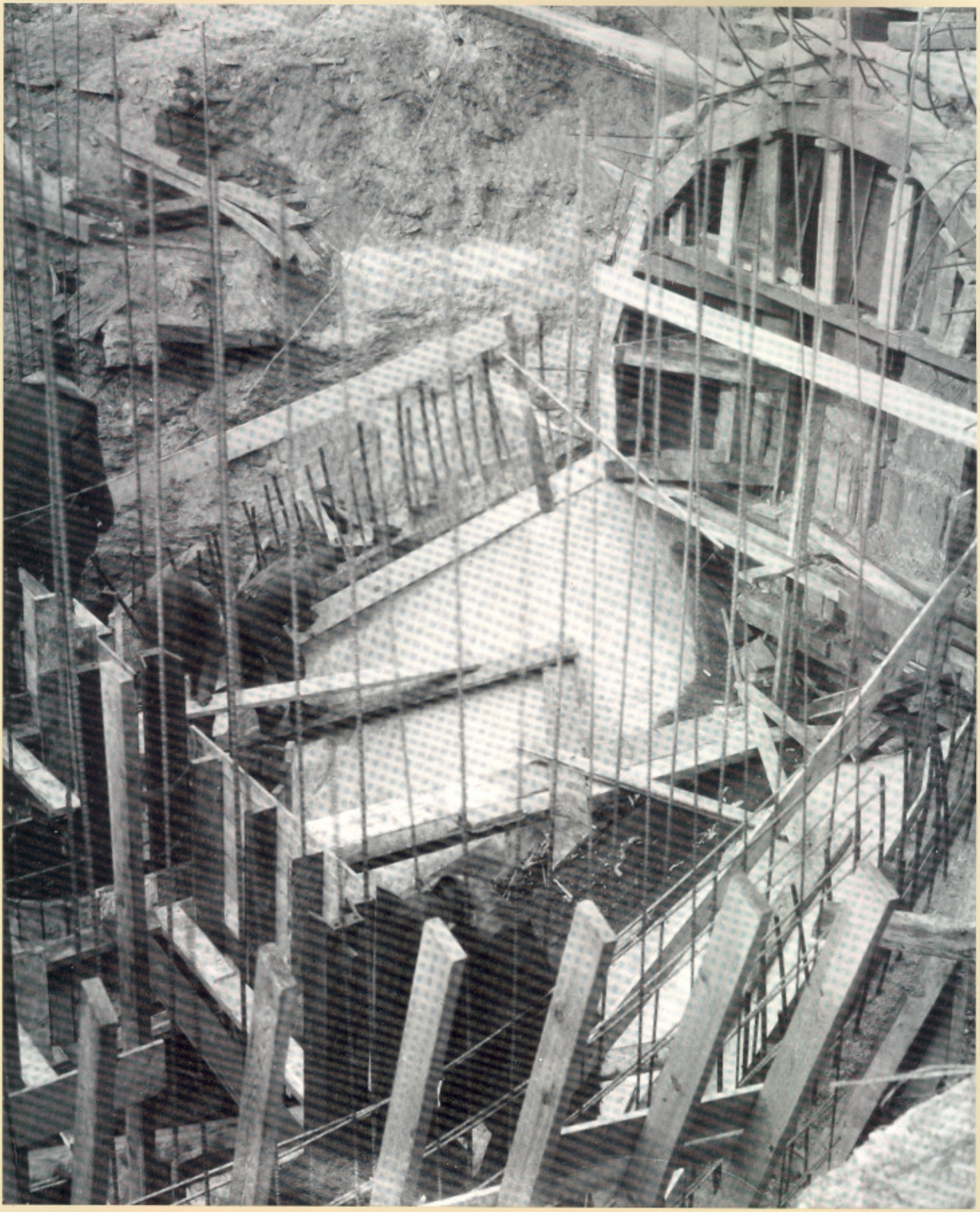
Once again, water quality improved, but the treatment level failed to keep pace with the public's rapidly changing values. In addition, the growing suburban population placed an increased load on the river, negating many of the Metro Plant's gains. New state and federal laws set stricter standards in the late 1960s and the Sanitary District scrambled to keep up.

In 1969, the Metropolitan Council established the Metropolitan Sewer Board (later renamed the Metropolitan Waste Control Commission), incorporating the Minneapolis-St. Paul Sanitary District and 33 treatment plants of the suburban communities into one organization responsible for the entire region's sewage treatment.

The evolving values and standards for environmental protection fostered a change in the public's

KSTP Broadcasts From 200 Feet Underground

AN UNUSUAL RADIO BROADCAST conducted by KSTP originated 200 feet below the streets of St. Paul in the new Minneapolis-St. Paul sewage disposal tunnel. Announcers John Wald and Abbott Tessman handled the broadcast. Mr. Wald is pictured above as he interviewed O. S. McCormick, general superintendent of construction, a feature of the program.



MAURICE ROBINS: FROM THE BEGINNING

By the time the Metro Plant opened its gates and first began treating sewage in 1938, Maurice Robins had already logged four years working for the Minneapolis-St. Paul Sanitary District. Robins signed on as a river sampler in August of 1934, never dreaming he would spend the next half century helping to clean up and protect the Mississippi River.

"We had three crews, and we sampled the river 24 hours a day, five days a week," Robins says. "The samples helped the Sanitary District determine the level of treatment needed and the size of the plant."

After a year of river sampling, Robins received a temporary appointment as an assistant chemist in the laboratory. His appointment became permanent a year later, and by 1942 he had worked his way up to chief chemist. Robins took charge of the routine testing, which kept the treatment process running smoothly, but he also got involved in some interesting detective work. One day in the early 1940s, large amounts of wood chips started showing up in the untreated sewage flowing into the plant, clogging some of the machinery and disrupting the treatment process. Plant operators asked Robins to play detective. Acting on a tip from a St. Paul sewer cleaning crew member, Robins traced the chips back to a paper products manufacturer.

"I went to the man in charge and showed him a jar of the chips," Robins remembers. "He said, 'Where'd you get those? Our stockpile?' I said, 'No. They're plugging up our screens down at the treatment plant and I'm sure they're worth more to you than they are to us.'"

The company traced the problem to a manager who cleaned the conveyor belts at the end of his shift by simply hosing the wood chips down the drain. The shift manager lost his job—much to Robins' chagrin—but the wood chips stopped showing up at the treatment plant.

In 1968, Robins became chief engineer and executive director of the Metro Plant. He was promoted to deputy administrator of MWCC in 1971. Even after he retired in 1975, Robins couldn't keep away from his life's work. For the next eight years, he worked as a part-time consultant on various Metro Waste Control Commission projects. Finally, in 1983, Maurice Robins hung up his hat for good.

"I decided," Robins recounts, "that 50 years was long enough for what started out as a temporary job."

perception of its sewage treatment organization. The earlier organizations had been perceived as heroes (albeit not without flaws). Now people began to perceive the MWCC as a villain. In the public's eye, the MWCC was a polluter, not a steward, of the river.

Part of the MWCC's problem derived from pre-existing conditions. Originally designed to limit pollution so as to reduce its public health threat, the MWCC facilities were now called upon to eliminate pollution. But the Metro Plant had been built as a gravity-fed treatment system. Wastewater entering the plant passed through a series of bar screens and settling and aeration tanks, each slightly lower in elevation than the one before. After exiting the last set of tanks, the wastewater flowed back into the river, without the aid of pumps. Therefore the plant was inoperable in the spring when the river rose above the level of the treatment tanks. To make matters worse, only a handful of the 33 treatment plants inherited by the Commission provided adequate sewage treatment. Each year, the release of millions of gallons of untreated sewage brought banner headlines of a far different nature from those printed in November 1938.

An equally persistent problem occurred because the city sewers

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Workers building part of the Metro Plant sewer on Pig's Eye Island, circa 1937. (Photo courtesy of Minnesota Historical Society.)

were originally designed (in the late 1800s) to carry both storm water and sewage to the river. When the old Sanitary District built its interceptor sewers (sewers that intercepted the flow of the original city sewers, carrying it to the Metro Plant for treatment), they were designed to handle normal sewage flows. Whenever rainwater or other runoff increased the flow, much of the sewage bypassed the interceptor sewers and flowed directly into the river. This wasn't a problem at first. The higher water volume in the river diluted the pollution to acceptable levels. In time, however, increased industrial wastes—many of them toxic and resistant to standard sewage treatment—added to the Commission's problems.

During the 1970s and 1980s, the MWCC struggled to correct these problems and to keep up with the stricter water quality standards. More than $350 million—much of it in the form of federal and state grants—was spent on construction projects to upgrade the treatment levels, eliminate outdated treatment plants, and build new interceptor sewer lines and regional plants. Administrative problems cropped up as a result of the MWCC's growth and expenditures. One construction project produced widely publicized cost overruns, while inflation and the expansion necessitated substantial rate increases for sewer system users. It was a troubling time for the Commission.

Louis J. Breimhurst

In spite of the economic problems, the substantial and rapid growth, and the negative publicity, the MWCC made significant gains in water quality as new treatment facilities were brought on line. Stewardship of the Mississippi remained a driving force behind the Commission. Today the MWCC's treatment facilities remove over 90 percent of the pollutants in wastewater regionwide. In the 1980s, the Metro Plant, flagship of the Commission, met or exceeded all state and federal requirements for effluent standards for four consecutive years.

Today the MWCC serves 105 metropolitan area communities, from Hastings to Forest Lake, from west of Lake Minnetonka to Stillwater.

"When we do our job well, nobody hears about us," says Lou Breimhurst, current administrator of the MWCC. "People flush their toilets, the problem's gone. It's not their problem anymore. It's our problem. Now we can take care of it.

"We are an environmental protection agency for the local area. Our purpose is to protect the environment and improve the quality of living. Think what the environment would be like if we didn't exist: We'd have a fouled-up river, a poor, sluggish economy, and a low quality of life."

Where once the Commission struggled to keep up with a growing

As proof of the Mississippi's purity, mayflies spawned in record numbers in June 1987. (Photo courtesy of Star Tribune, Minneapolis.)

population that threatened to reduce the gains made in the early years of sewage treatment, the Commission now waits for public awareness to catch up with the Mississippi's ever-improving water quality.

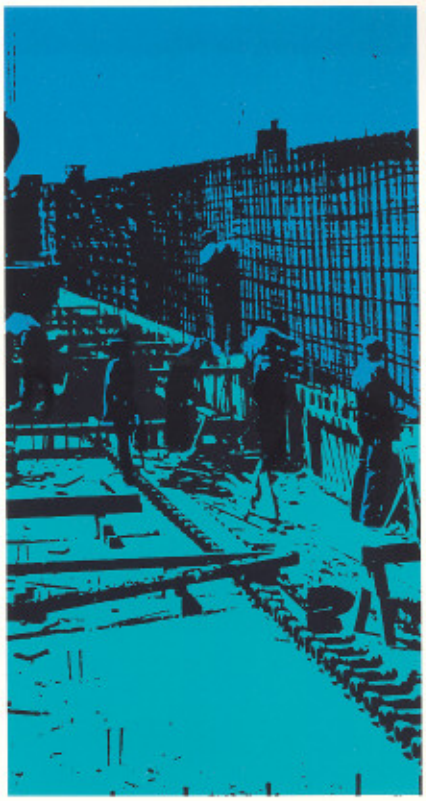
In 1987 the public became more aware of river water quality thanks to a natural phenomenon that brought out the snowplows on a warm summer day. Mayflies are extremely short-lived insects that hatch in the river. The *Hexagenia* mayfly had been absent from the Mississippi for nearly a decade. But in June, a bumper crop of mayflies hatched and were attracted to the lights on the I-494 bridge over the Mississippi. Dead and dying insects filled the interstate a foot deep, creating a slippery goo that led to two accidents. The State Patrol closed the highway until the snowplows cleared the road.

Mayflies are harbingers of cleaner water, but the Mississippi has not yet regained the pristine quality of the past. But with 50 years of careful stewardship by the MWCC and its predecessors, the Mississippi is closer to that goal than it has been for more than a century.

MWCC Construction: Continuous and Gargantuan

We've all acted as sidewalk superintendents—necks bent, mouths agape—at the building site of a new skyscraper, following the careful movements of workers hundreds of feet above the ground. Through the ages, large-scale engineering and construction feats have captivated the public imagination. Yet one of the metropolitan area's most amazing and monumental engineering and construction projects—the MWCC sewage treatment system—has gone largely unnoticed.

"The construction at the MWCC ought to have captured everyone's attention," says MWCC Chair Peter Meintsma. "Every year we build the equivalent of the Metrodome—in terms of cost and size. The projects demand great sophistication of our engineers and, because of the money involved, tremendous economic management. Since construction began in 1934, the MWCC (and its predecessor organizations) have built roughly half a billion dollars' worth of settling tanks, sludge incinerators, and other equipment at the Metro Plant alone. Today, the sewage treatment system for the metropolitan area includes 12 separate treatment plants and over 500 miles of interceptor sewer lines, serving an area that's twice the size of Rhode Island. Yet for all the construction and the money spent, few people notice what we're doing out here."



The First Treatment Plant

On July 13, 1934, six months after the Public Works Administration agreed to provide $16 million in grants and loans, the ceremonial first shovel of dirt was moved and construction was begun on the network of large interceptor sewers. The first chief engineer of the Minneapolis-St. Paul Sanitary District was C.C. Wilbur, who was later replaced by George Schroepfer. In 1945, Schroepfer became a professor at the University of Minnesota, and in the following years earned an international reputation for his work in civil and sanitary engineering.

It took three years to complete the interceptors (see sidebar: "Sandhogs"), including a double-barreled sewer, capable of delivering 610 million gallons of sewage a day, which ran the final nine miles to the plant.

Plant construction was begun in September 1935, and the administration and laboratory building was

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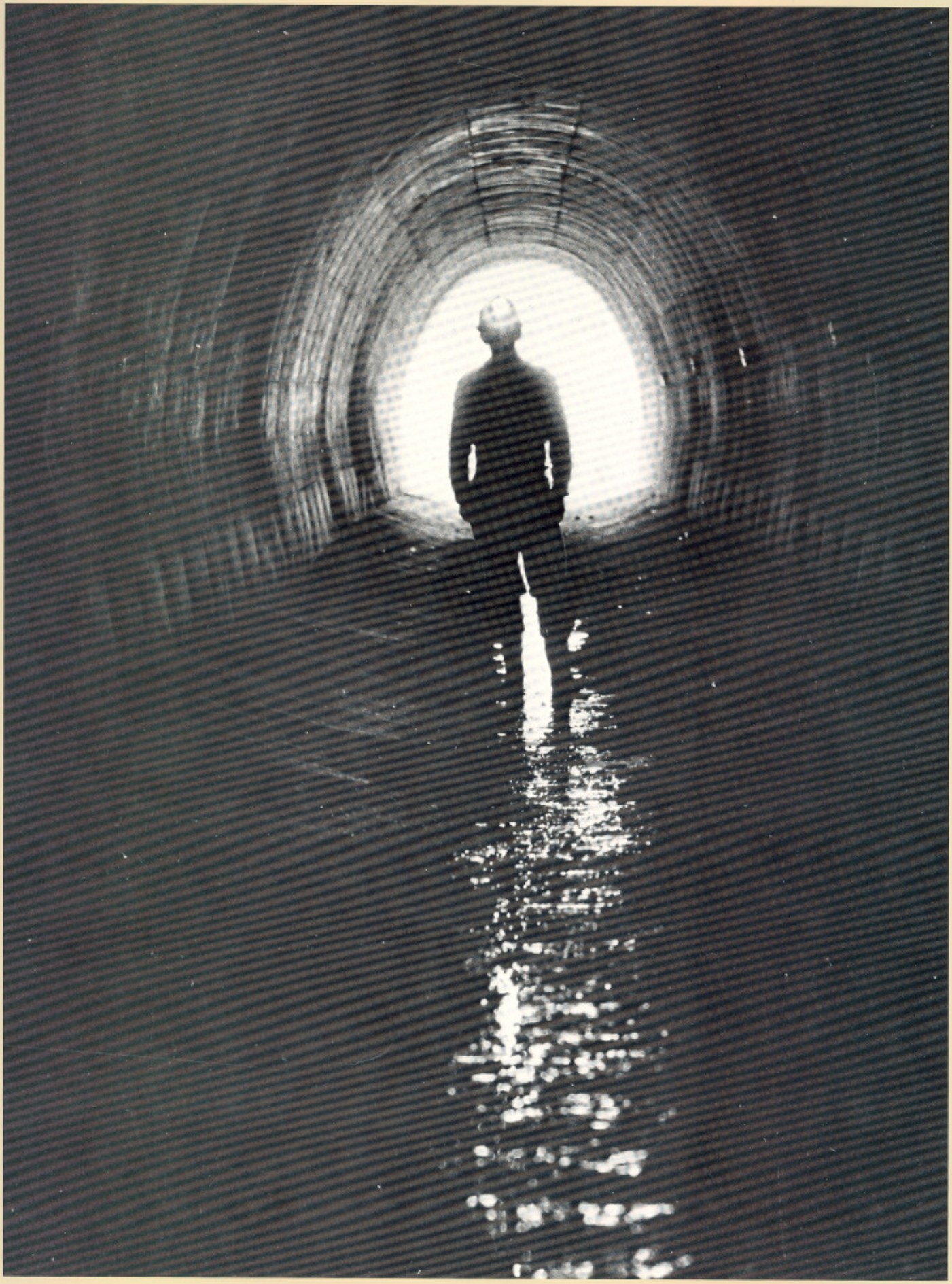
(Photo courtesy of Star Tribune, Minneapolis.)



completed February 1, 1937; approximately a year later, the plant was completed and dedication ceremonies were held on May 16, 1938.

During those four years, the local media kept the public well informed about the project's progress. When the plant opened, thousands of visitors from around the world—as many as 2,000 during a single weekend—toured the buildings and the grounds to get a firsthand look at the construction and its impressive statistics: Working six million hours, as many as 1,500 workers at a time installed 30 million pounds of reinforcing and structural steel and laid nine miles of pipe inside the plant proper.

The new plant was designed to treat an average flow of 134 million gallons a day. In addition to the Administration Building, the plant featured a large pretreatment building, housing the screen and grit chambers, and a filtration and incineration building for processing sludge. These buildings were located at the north end of the plant where the sewage entered from the main interceptor. Past the buildings to the south were two sets of 15-foot deep settling tanks, each set covering an area roughly the size of a football field, and two banks of effluent filters composed of fine-grained sand.

For the next 22 years, the Sanitary

Lucky and Company

Shortly after the Metro Plant opened in 1938, a mongrel dog wandered in looking for handouts. According to plant manager Louie Bartscher, one of the plant workers made the mistake of feeding the dog. "Lucky," as the dog was named, presumably for his recent good fortune, became the plant mascot and lived there until he died sometime around 1944.

Lucky wasn't the only stray who showed up at the Metro Plant. When it was first built, Metro was an outpost in the wilderness and visits from local animals, including deer, raccoons, and skunks, were frequent. Today, even though the city has grown up around the Metro Plant, wildlife is still plentiful in the area. A great blue heron rookery, south of the plant, is among the largest in the state. In 1981, a deer strayed into one of the aeration tanks. Plant worker Bernhard Borg lassoed the frightened animal and secured it to the side of the tank. A conservation officer arrived later, tranquilized the deer, then completed the rescue. Unlike Lucky, the deer did not become a plant mascot.

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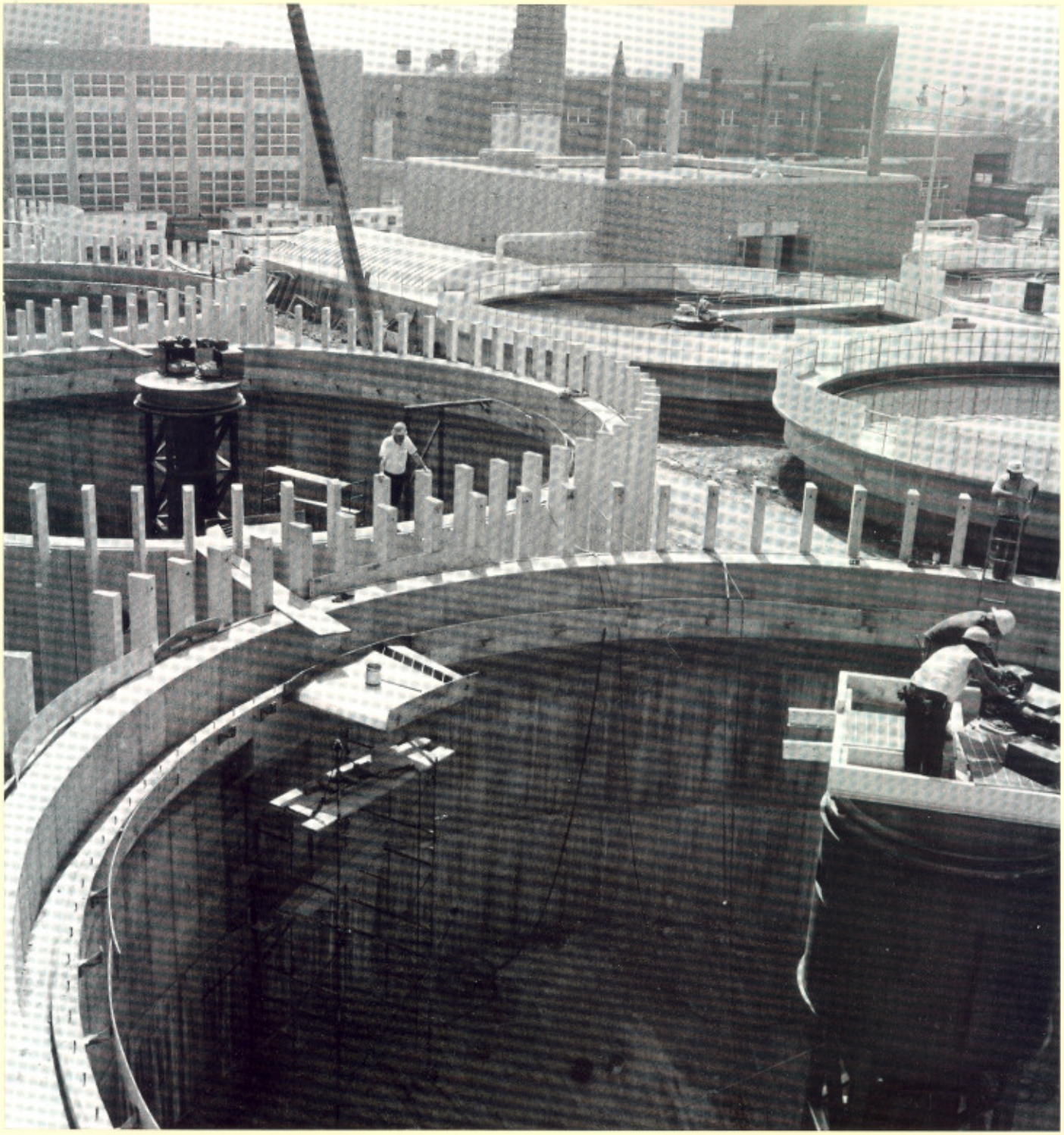
Digging and hauling to make room for interceptor lines (1936). The process continues today at the Metro Waste Control Commission. (Photo courtesy of Minnesota Historical Society.)

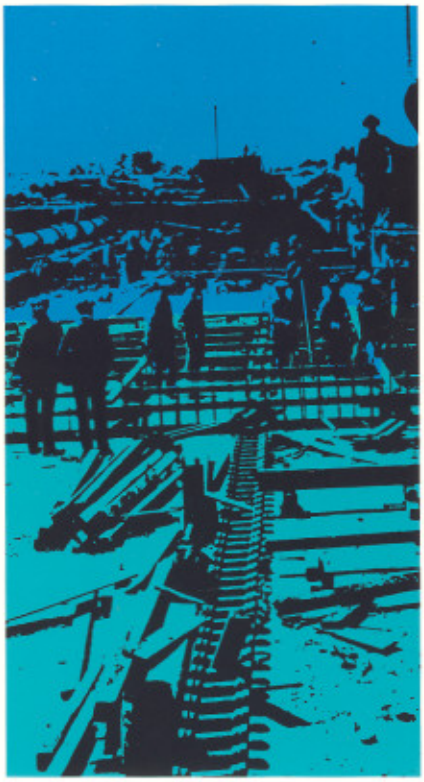
WEST



District undertook countless other building projects. Although many of the projects were minor in comparison to the original construction, the cumulative effect over the years was impressive.

"There were few periods of time we weren't building something," says Maurice Robins, a former deputy administrator of the MWCC who began working for the Sanitary District in 1934.

To expand service, the District first built interceptor lines to institutions that weren't connected to the city lines, notably the State Soldier's Home. Later, the District built lines to the nearby suburbs. During other construction projects, the Sanitary District replaced or modified worn or outmoded equipment. "A lot of those modifications came from suggestions by employees," Robins recalls. "Like the automatic washing of the filters that de-watered the sludge. Initially, the filters had to be taken down and cleaned. That cost us time and money. When some employees suggested an automatic washer, our engineers expanded on the idea and developed a system that was later adopted by other treatment plants. Our employees were always looking for ways to make things run better and to save the District money."



Every year we build the equivalent of the Metrodome—in terms of cost and size.

In the early 1960s, after years of moderate, even-paced growth, the Sanitary District embarked on a building cycle at the Metro Plant that spanned the next twenty years. During that time, the District raced to expand service for a growing population and to meet increasingly stringent standards for sewage treatment.

"Before the expansion, Metro was a small, concentrated plant," says Ray Payne, MWCC assistant director of engineering. "Through nearly 100 construction projects, we expanded to one of the largest treatment facilities in the country. People should go down there and see. They'd be amazed by the size of the Metro Plant today."

The first phase of this expansion cycle, completed in 1966 at a cost of $10 million, added secondary treatment facilities—aeration and settling tanks. The District also completed a number of associated projects in 1966, including aeration compressors, flood control dikes, sludge tanks, and more buildings, at a cost of $20 million. By 1969, when the Metropolitan Council formed the Metropolitan Waste Control Commission at the request of the state legislature, the plant needed additional secondary treatment facilities—sludge incinerators and aeration compressors. They were completed by 1972.

Within a few years, however, the ever-increasing flow of sewage and

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In this August 1978 photo, workers install the rake mechanism for the decant tanks at the Metro Plant.

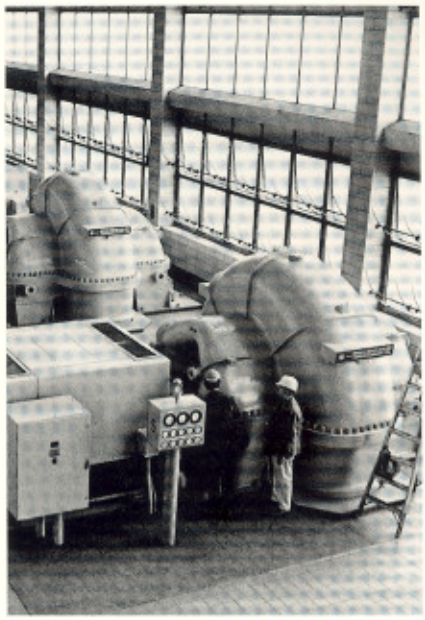
All That Smells Is Not Sewage

Make no mistake, the aroma in the pretreatment building is not likely to be mistaken for fine French perfume. Most of what shows up at your local treatment plant is...well, you know... sewage. But through the years a remarkable array of objects have shown up where their owners least expected.

Shortly after the Metro Plant opened, the phone began ringing with calls from unlucky residents who hoped their loss had been the Metro Plant's gain. The most common calls were from people who had lost diamond rings and other jewelry. Because of their size, these items are generally irretrievable. But thousands of other items—some of which obviously didn't wash down the kitchen sink—have been recovered at MWCC plants. A short list includes:

- countless children's toys, especially dolls and rubber balls
- false teeth (by the dozens)
- license plates (two from the same car)
- tires, hubcaps, and other automobile parts
- a bowling ball (must have been a rough game)

In the early years, one lucky man had an uncashed check for $80 returned to him. People who lost paper currency were never lucky. When a bill occasionally showed up on the vacuum filters that de-watered the sludge, the workers considered it a bonus for whoever spotted it first.



In secondary treatment, air compressors aerate the wastewater.

the demand for more thorough treatment outstripped the plant's capacity. To meet the challenge, the MWCC nearly doubled the size of the plant, building what amounted to another entire treatment plant with pretreatment, primary, and secondary treatment facilities. These new facilities, built along the east side of the existing plant, were completed in 1978 at a cost of approximately $90 million.

State-of-the-Art Engineering

The most recent major expansion at the Metro Plant was the construction, completed in 1983, of $220 million worth of sludge handling facilities. This new system includes thermal conditioning units that enhance the de-watering process, storage tanks, roll presses and other de-watering equipment, incinerators, and air pollution control equipment. The sophisticated sludge handling system is only one example of the innovative engineering the MWCC has incorporated into its facilities. Says Ray Payne, "It's the first of its kind in the country."

At the heart of this new construction is a unique energy-recovery system that enables the MWCC to save more than $3 million a year in fuel costs. These savings are possible because of the specially designed incinerators that burn sludge without

the continual need for costly fossil fuels. Oil or gas fires the sludge only at start-up. Once the incinerators reach optimum operating temperature, the sludge generates enough heat to maintain combustion.

But that's not all. A complex mechanical system captures the excess heat generated by the incinerators and recycles it throughout the plant, where it is used to condition the sludge and to heat some of the buildings. For the new system, the MWCC received an Energy Saver's Award of Excellence from the Minnesota Department of Energy and Economic Development, and a Special Recognition National Award for Energy Innovation from the U.S. Department of Energy.

Regional Plants

When the responsibility for sewage disposal for the entire metropolitan area was consolidated and assigned to the MWCC in 1969, 33 treatment plants were handling the area's sewage. But only four of those plants were capable of providing adequate treatment. While it was feasible to upgrade some of the plants, many had to be phased out and, in some cases, replaced with new, efficient, and more centrally located facilities.

"Some of the old plants were so outdated and inefficient that they practically ran untreated sewage into the river," says Louie Bartscher,

Metro Plant workers who posed for a photo in February 1965 are (left to right) Fremont Brown, S. Iverson, Paul Jacobson, Horace Wiley, Tom Kissell, Walt Rosa, Leroy Neal, Charles Sullivan, and Mike Leuken.

Metro Plant manager. "Many of them were nothing more than settling lagoons. Others were so undersized they flooded out at least once a month."

From its inception, it has been MWCC's philosophy to treat more sewage in fewer facilities. By 1979, the MWCC had closed 21 plants and had built four new ones: the Seneca Plant in Eagan in 1971; the Blue Lake Plant in Shakopee in 1973; the Rosemount Plant in 1973; and the Empire Plant, serving the Farmington-Lakeville area, in 1979.

In the intervening years, four more plants were closed and only 12 remain today. In addition to the Metro Plant and the four plants mentioned above, the MWCC maintains and operates plants in Anoka,

Bayport, Chaska, Cottage Grove, Hastings, Savage, and Stillwater. The Anoka, Bayport and Savage plants will be phased out over the next four years. The sewage they currently treat will be routed to existing plants.

Tuning the System

Currently the MWCC is fine-tuning its technology. The hard work and capital investment of the past several years have brought performance close to 100 percent compliance with state and federal regulations. Ongoing construction projects are aimed at improving efficiency and economy and replacing existing facilities as needed so that the MWCC can continue to safeguard the environment of the people it serves.

"Many of our older interceptor lines are deteriorating badly," says Peter Meintsma. "If one of them collapsed, we'd have a major crisis on our hands. Currently, as part of our fine-tuning process, we're replacing the Minneapolis East Interceptor, one of the largest sewers in the system. We're working hard every day to make sure our plants stay in good condition and can meet the growing needs of our area."

The Sandhogs tunnelling on Pig's Eye Island, 1937. This was no job for the timid, or those with weak backs or lungs. (Photo courtesy of Minnesota Historical Society.)

SANDHOGS

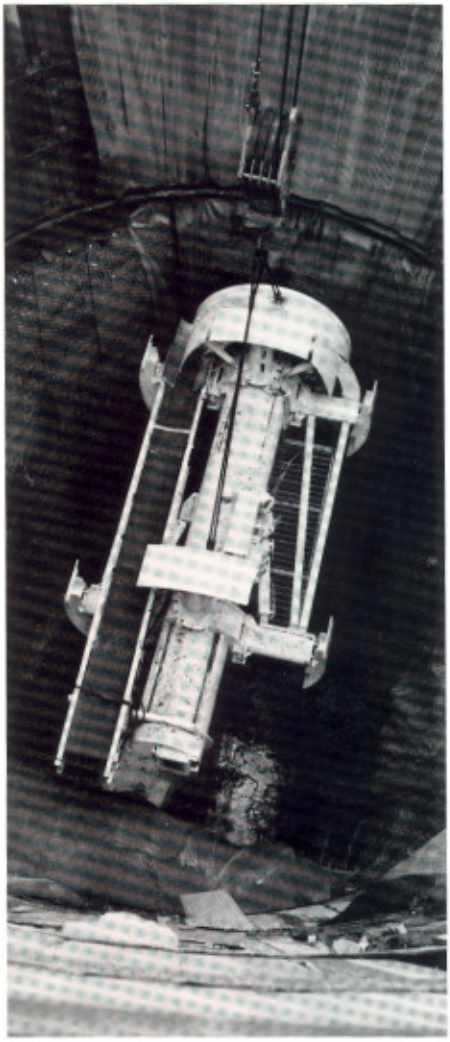
They were the glamour boys of the construction crews and the darlings of the news media. The "sandhogs"—some 600 men—were named for the millions of tons of sand and rock they removed from deep beneath the streets of the Twin Cities. They had the unenviable task of digging miles and miles of tunnels to make way for the large interceptor sewers needed to convey wastewater to the Metro Plant. The original city sewers flowed directly into the Mississippi, requiring the Minneapolis-St. Paul Sanitary District to construct 52 miles of interceptor sewer lines between 1934 and 1937, mostly in tunnels dug by the sandhogs.

The work was hard, dirty, and dangerous—four sandhogs were killed in cave-ins. But it was also adventurous—the notion of hundreds of people working as much as 200 feet below the surface of the city captivated local residents. Dozens of newspaper stories, and at least one radio program broadcast live from a tunnel, chronicled the efforts of the sandhogs.

Using pneumatic drills and streams of water under 350 pounds of pressure, the sandhogs chiseled a tunnel through the St. Peter sandstone that underlies most of the Twin Cities. The water used for drilling and the groundwater that oozed continuously through the porous sandstone covered the tunnel floor with a foot or more of slurry. Knee-high rubber boots were standard sandhog apparel. Pumps pushed the slurry into giant hoppers at the surface, where the water was allowed to drain before the sand was hauled away.

Workers at the face of the tunnel were protected by an overhead shield. In particularly unstable sections, the workers installed airlocks to fill the tunnels with as much as 32 pounds of air pressure per square inch. The sandhogs who worked in pressurized sections of tunnel remained at the job site for an hour after exiting the tunnel to make sure they didn't suffer the bends from rapid decompression. When the sandhogs finished tunneling, other workers built forms and pumped in concrete to finish the job.

Today the MWCC maintains more than 500 miles of interceptor sewers ranging in size from a few inches to more than 10 feet in diameter. The building of new interceptors is a continuous process, both to replace worn lines and to expand service. One of the largest current projects is the Minneapolis East Interceptor, a six-mile sewer line scheduled for completion in 1990. It is being built in a tunnel, but the dirty work is now done by tunnel boring machines that can be driven through the earth by a lone operator. The bright, heady days of the sandhogs have come and gone.



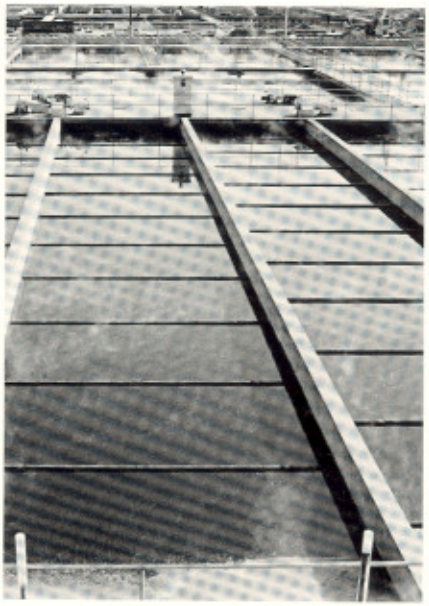
The Sandhogs who helped build the MWCC system have been replaced today by this safer and more efficient tunnel boring machine, shown here being lowered into the shaft. (Photo courtesy of Steven Berperson.)

A Sewage Treatment Treatise

Rivers, lakes, and oceans were the world's original sewage treatment plants. To a point, these bodies of water were extraordinarily proficient waste purifiers. First, the large quantity of clean water diluted the sewage, rendering it less offensive. Second, the natural movement of the water—the ocean tide stream flow—carried the sewage away from the cities. Third, naturally occurring microorganisms in the water "fed" on organic human and industrial wastes, breaking them down and neutralizing them.

Prior to the 1800s, many cities had not outgrown the capacity of nearby bodies of water to purify their sewage, yet sewage still posed a serious health threat. City dwellers commonly dumped wastes into the street, where they stayed until rain or snowmelt carried them into streams. In the early 1800s, many large cities—London, New York, Boston—began building sewer lines to carry wastes away from homes and factories and into rivers—the Thames, the Hudson, the Charles—and eventually into the ocean.

Although these sewer lines made life in the city more bearable, they provided only a partial solution to the problem of sewage disposal. By the time sewer lines were installed in many cities, the demands placed on the receiving waters already exceeded their natural ability to handle the wastes.



The settling tanks at the Metro Plant, the primary phase of the wastewater treatment process.

What happens when a stream, river or lake can no longer handle its waste? As the biological and chemical processes that break down sewage consume more and more oxygen, the level of dissolved oxygen in the water gets too low, and fish and plant life begins to die. Then, once the available oxygen is depleted, the decaying sewage takes its oxygen from sulfur compounds, which releases noxious hydrogen sulfide gas. This is what occurred in England in 1858. The pollution of the Thames engulfed London in an unbearable odor and thousands of people fled the city. London redesigned its sewers during the next several years so that sewage was released at high tide to ensure better disposal. Thirty-three years later, in 1891, London actually began treating its sewage before dumping it into the Thames.

Minneapolis and St. Paul were no different from other cities when it came to disposing of wastes. But the citizens of the area were quicker than residents elsewhere to move toward new solutions. In the Twin

opposite page:

South St. Paul interceptor sewer line being installed under the Mississippi River.

BURNING IT

Research prior to building the Metro Plant indicated that incineration would be the most economical way to get rid of sludge, saving as much as $10 a ton over other disposal methods. Incineration remains the primary method of sludge disposal today.

In the first incinerators, fossil fuels were needed to burn the sludge completely because the sludge had a high moisture content even after being concentrated and de-watered. The incinerators also created an air pollution problem, releasing fly ash and certain noxious gases.

In the 1960s and 1970s, the Sanitary District installed pollution control devices to reduce air pollution. But as fossil fuel prices skyrocketed in the early 1970s, Sewer Board engineers began investigating new methods of incineration. The result was the award-winning sludge disposal/energy recovery system completed in 1983. This system uses multiple hearth incinerators that burn sludge as fuel, reduce the consumption of oil and gas, and produce heat for the plant.

BARTSCHER & BARTSCHER

Louis Bartscher, Sr. and Louie Bartscher, Jr., 1980

Like father like son?

You could say sewage runs in the Bartscher family, and Louie Bartscher (the younger) would be the first to laugh, though he's heard every sewer joke a dozen times over. Louie Bartscher virtually grew up at the Metro Plant on Pig's Eye Island. Today Bartscher is plant manager at Metro, the MWCC's largest treatment facility. But if Louis Bartscher (the elder) had had his way, his son would never have lifted a finger in the sewage treatment business.

"I used to get mad at my father," Bartscher recalls. "He wouldn't pull any strings to get me a job here. He wanted me to go to college."

The senior Bartscher began working at the Metro Plant in 1936. His official title was purchasing agent, but his duties ran the gamut from clerical to supervisory. Through the years he worked his way up to executive secretary of the Minneapolis-St. Paul Sanitary District, and then retired in 1964. Though his own appointment came through the old political patronage system (an uncle was a St. Paul City Councilman), Bartscher had no intention of using his influence for his son.

"I found out years later that even after his retirement he tried to block me from getting a permanent position here," the junior Bartscher says. Bartscher had worked a couple of summers at the plant during 1962 and 1963 while he was attending college. When his father retired, Bartscher landed a temporary job as a laborer and eventually achieved permanent status.

Like his father before him, Bartscher worked his way up through a variety of jobs at the Metro Plant. He also continued his education at night, completing college in 1973. But the degree his father encouraged him to pursue did not convince him to look for a job elsewhere. The sewage business fascinated him, and he stayed with it, becoming plant manager in 1980.

"This is a great place to work," Bartscher says. "Most people have no idea of what goes on here." He points out that the plant has never been the sort of noxious, objectionable workplace most people imagine it to be. "When I came down here as a kid, I didn't think of it as a sewage treatment plant," he recalls. "It was like a park—a beautiful place, surrounded by lilac bushes.

"I learned to drive in a 1939 Buick on some of the roads behind the plant. When I got my driver's license, I brought my sisters down here and taught them how to drive. The plant was in the middle of nowhere in those days, and a farm sat right next to it."

There are no farms nearby anymore, and plant expansions have taken over much of the wide open space in which the Bartschers learned to drive, yet it's obvious from the way Bartscher talks that his father, who died in 1987, was never able to erase the younger Bartscher's fascination with the plant. However, the seeds his father planted on the importance of education have continued to grow. Bartscher has been attending school at night to earn a law degree. The Bartscher family has definitely entered a new era. You see, Bartscher's daughter is already practicing law.

Like daughter like father?

Cities area, pollution of the Mississippi never reached the odoriferous proportions of the Thames in the 1850s. However, by the early 1920s, the river had obviously reached its limit as a sewage disposal. During the summer months, certain stretches of the Mississippi exuded the same rotten egg odor that had plagued London. Fish disappeared from the worst stretches of the river and the State Board of Health declared the water a public health nuisance.

In 1927, the state legislature established the first of the MWCC's predecessor organizations to address the problem of sewage treatment. By 1938 construction had been completed on a sewage treatment plant on Pig's Eye Island. When the plant, known today as the Metro Plant, went into operation in June of that year, the Twin Cities became the first major community on the Mississippi to treat its sewage. Nationwide, only 25 other cities of comparable size had sewage treatment facilities.

At that time, in the late 1930s, efforts to treat sewage were motivated primarily by health concerns rather than by concerns for the environment. The Metro Plant, following the designs of similar facilities, provided only primary treatment of sewage.

Primary treatment at the Metro Plant removed roughly 50 percent

When the Metro Plant began operation in June 1938, the Twin Cities became the first major community on the Mississippi to treat its sewage.

of the pollutants. The main steps in the process were relatively simple: Raw sewage entering the plant passed through one-inch bar screens designed to remove the larger particles. The sewage then passed through a grit chamber, which slowed the water flow sufficiently to allow particles of sand and grit, entering the system through storm sewers, to settle out. From there the sewage flowed to large settling tanks, which slowed the current sufficiently to allow the bulk of the suspended solids to settle out of the water. After traveling through the settling tanks, the processed water returned to the river proper. At times when the river level was exceptionally low, workers at the plant chlorinated the effluent, to kill bacteria, before returning it to the river. The solids that settled out of the sewage were removed from the bottom of the settling tanks, concentrated, de-watered, and incinerated. During 1941, the Metro Plant treated more than 39 billion gallons of sewage, removing nearly 109,000 wet tons of partially de-watered sludge.

For the next 15 years, primary treatment of sewage in the Mississippi satisfied the needs of the metropolitan area. As the population grew and public values changed, primary treatment of sewage could no longer preserve an acceptable level of water quality in the Mississippi.

The Metro Plant needed secondary treatment facilities, and these were added when the plant underwent its first major expansion in the early 1960s. The main feature of secondary waste treatment, which at the Metro Plant began operation in 1966, is an activated sludge process. After the primary treatment phase, wastewater flows into tanks containing heavy concentrations of bacteria that feed on the remaining solid wastes. The bacteria need oxygen, which is why they deplete it from rivers and lakes; aerators pump a continuous supply of oxygen through the mixture to expedite the process. The bacteria help concentrate the remaining solids into particles that will readily settle out of the wastewater. After leaving the aeration tanks, the wastewater flows through another set of tanks, where the particles settle to the bottom.

In the process of purifying water, the Metro Plant annually removes more than 250,000 tons of sludge.

Since the original expansion of the Metro Plant in the 1960s, the MWCC has refined the treatment process even further. Today, the effluent is chlorinated to kill pathogens and then dechlorinated to prevent chemical pollution before being released in the river. During the summer months when dissolved oxygen levels in the river are lower, the Metro Plant provides limited tertiary treatment. In this phase, another class of naturally occuring bacteria is added to the wastewater to change ammonia into nitrates.

The MWCC's 11 regional plants all provide secondary treatment. With the exception of the Rosemount Plant, which uses a physical-chemical treatment process, the plants all use some variation of the activated sludge process in use at the Metro Plant. To meet state and federal regulations, the Empire Plant provides tertiary treatment to reduce the nutrients in the effluent.

While some of America's coastal cities have yet to go beyond the primary treatment of sewage, the MWCC plants remove over 90 percent of the pollutants in wastewater, using a refined and sophisticated process that attracts state and federal awards, and mayflies.

THE SLUDGE FACTOR

Sludge—the solids taken out of treated water—is one of the most persistent problems confronting sewage treatment plant operators. During its first full year of operation in 1939, the Metro Plant removed about 100,000 wet tons of sludge from the sewage it treated. Today, the Metro Plant annually removes more than 250,000 tons of sludge before releasing the effluent into the river. Throughout its 50-year history, the MWCC and its predecessors have continuously searched for safe, innovative ways of handling this voluminous by-product.

SPREADING IT

By the time sludge is removed from the sewage and de-watered, and before incineration, it's less offensive than you might imagine. The treatment processes break down the solids, eliminating much of the odor and rendering the material relatively innocuous. The end product is a crumbly, gray, clay-like material that is rich in humus and other soil nutrients and conditioners.

Because of the large quantities of sludge generated, spreading sludge on land (called land-spreading) was impractical as a sole means of disposal in the early years. But interest in using sludge as a fertilizer grew rapidly, and land-spreading increased from just 21 tons in 1939 to 26,000 tons in 1944. In 1946, however, the State Board of Health prohibited further land-spreading of sludge because of widespread fears that sludge might serve as a vector for polio and other infectious diseases.

Modern sludge treatment processes eliminate the danger of spreading infectious diseases. Limited land-spreading of sludge was begun in 1978, and between 1981 and 1983, while the MWCC was building the new sludge treatment and incineration facilities, all the sludge was disposed of by spreading it on the land.

Today, the MWCC incinerates the bulk of the sludge and only spreads a small amount on land, but may do more land-spreading in the future. Currently, the Minnesota Pollution Control Agency (MPCA) requires permits for land-spreading. The MWCC is conducting research in conjunction with the University of Minnesota to determine how to continue land-spreading of sludge without harming the environment. They are also investigating various methods of composting and co-composting (mixing sludge with other solid wastes) to find better uses for sludge.

Landspreading begins with de-watered sludge at this Metro Plant conveyor belt.

TESTING THE WATERS: THE ROLE OF THE LABORATORIES

Chemists Bert Clark (left) and Orville Bruss test raw sludge in the Hood Room at the Sewage District lab, 1964-65. (Photo courtesy of Maury Robins.)

During its first year of operation in 1927, fourteen and a half employees (including a part-time clerk/stenographer) comprised the original staff of the Metropolitan Drainage Commission (MDC). Among them were one chemist/bacteriologist, one laboratory helper, and six gaugers and samplers. Working out of a rudimentary laboratory in MDC's headquarters at 2694 University Avenue in Minneapolis, those eight workers began what was to evolve into the longest continuous scientific study of a body of water in Minnesota history. It was no accident that more than half of the original employees of the MDC were hired to study the Mississippi, for the river's deterioration had brought the MDC into existence.

To survey the extent of the damage to the river, the staff members operated from boats, bridges, and, in the winter, from the surface of the ice. They collected and analyzed samples from a network of sites stretching from the Camden area north of Minneapolis to Wabasha, nearly 100 miles downstream.

The early testing program developed a profile of the Mississippi in terms of water quality, flow patterns, sources of pollution, and the presence of various kinds of aquatic life—fish, plant, and insect.

"The engineers had to know the volumes of sewage so they could make accurate estimates," recalls Maurice Robins. Robins, former deputy administrator of MWCC, worked as a river sampler in the mid-1930s. "They created a profile of the river that shaped the original treatment system. Using this profile, the engineers planned an interceptor sewer system that would capture the outfall from all the major sources of pollution, and a treatment plant that would restore the health of the Mississippi."

In 1934, the river sampling program was stepped up. The MDC hired three more samplers; collection took place 24 hours a day, five days a week. "Year-round sampling meant we were on the river when it

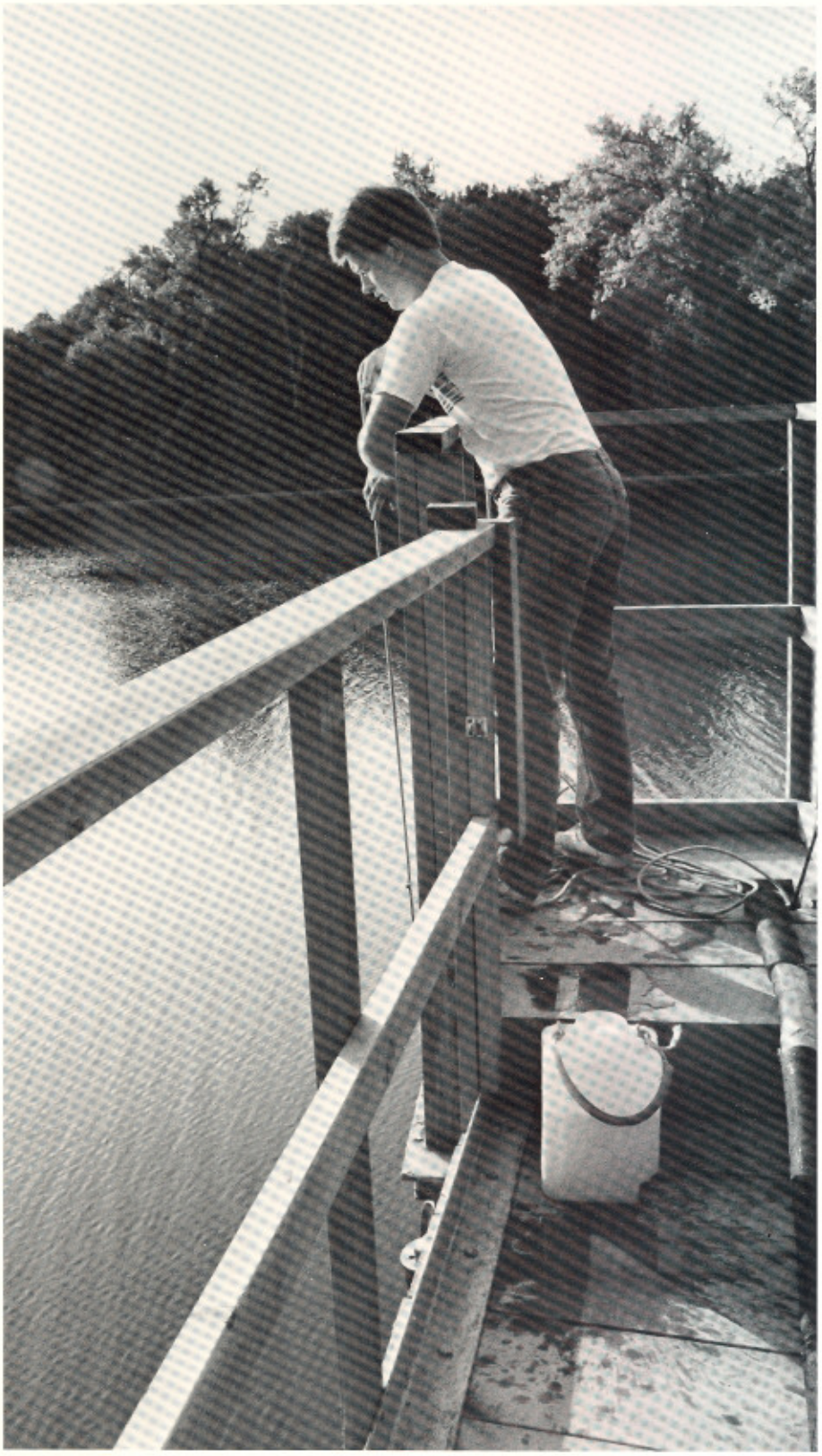
was 90 above and 40 below," Robins recalls. "Sometimes the samples would freeze before we got them back to the car, and we had to run back and do it again."

When the builders completed the Administration Building at the Pig's Eye site in 1937, the MDC moved the laboratory from University Avenue to quarters on the second floor.

With the opening of the plant, the MDC greatly expanded the role of the laboratory staff. They continued their river sampling program, but they also had to monitor the treatment process from beginning to end. Automatic samplers collected water at regular intervals along the system, and the staff analyzed these samples to ensure that the process was operating properly.

Occasionally the staff members became detectives to solve problems that arose. In the early 1940s, for instance, plant workers regularly smelled benzene in the influent to the plant. Because benzene is flammable and explosive, it posed a number of safety threats. Robins, who by that time had been promoted to the Metro Plant laboratory staff, explains how they tracked down the source of the benzene:

"Two of us went out and started sniffing manholes. We walked down the middle of the street, tracing the odor all the way up to Northeast Minneapolis. When we got to a paint manufacturer, the odor was very



Jim Rowenhorst, a water quality technician at the Metro Plant, takes a water sample from the Minnesota River, 1987. (Photo by Kerri Ryan.)

strong. Beyond it, no benzene smell."

As it turned out, a storage tank had developed a leaky valve, allowing the benzene to drain into the sewer lines unbeknownst to the manufacturer. They fixed the leaky valve and benzene stopped showing up at the Metro Plant.

On other occasions, the laboratory staff went into action when unusual substances clogged or eroded the pumps or other plant equipment.

After the addition of secondary treatment facilities in 1966, laboratory duties increased once again because there were new processes to monitor. This jump in lab activity in the 1960s, however, was nothing compared to what lay in store in the next decade.

In the 1970s, three factors combined to overwhelm the laboratory staff. First, the newly formed MWCC was responsible not only for the Metro Plant but also for the 32 other treatment plants in the system. The MWCC soon closed some of these plants because they were inefficient, but almost overnight the laboratory staff faced hundreds of more tests. "We had to monitor the entire treatment process, from influent to effluent, in each plant," recalls Jim Corcoran, former head of the laboratory. "Even with the plant closings, our workload expanded tremendously."

The laboratory at the Metro Plant became the central laboratory for all the plants. Continued expansion at the Metro Plant, however, increased process control analyses four-fold, and by 1975, the laboratory had outgrown its space in the Metro Plant's Administration Building. To solve this problem, the MWCC established smaller laboratories at some of the regional plants to do routine process control analyses.

In the Sewage District lab, Anton (Dutch) Mollenkamp, left, and Maury Robins with water samples, August 1945. (Photo courtesy of Maury Robins.)

Second, in 1972, the Federal Clean Water Act established much more stringent standards for sewage treatment. The Environmental Protection Agency developed a permit system that set separate standards for the effluent of each plant and required regular monitoring to verify compliance. "With the advent of the permit system," says John Hubbling, MWCC air quality manager, "there came a fixed list of analyses that had to be done on every plant, every month." Also, newly established standards for air pollution created another set of tests for laboratory workers as they assumed responsibility for monitoring incinerator emissions and odor control.

Third, the emergence in the 1970s of toxic industrial wastes as a growing source of pollution required new, more sophisticated tests and careful monitoring of industrial wastes

before they were emptied into the sewer system.

"There are relatively few inorganic toxic materials of major concern," says Hubbling. "But the possible number of organic pollutants? Pesticides and PCBs are the ones you hear about. The analysis for any one of these chemicals is time-consuming, complex, and expensive. And there are almost an infinite number of them."

The explosive growth of demands on the MWCC laboratories dictated an expansion of both staff and facilities. The MWCC made additional space available in the Administration Building at the Metro Plant, and reverted to a single, central laboratory to avoid duplication of expensive equipment.

Today, some 40 employees work in the laboratory that has taken over the entire second floor, half of the first floor, and most of the basement of the Administration Building (which nearly doubled in size during the 1966 plant expansion). The laboratory staff performs almost 200,000 analyses annually. Samples are logged on a computer, which tracks their progress and stores the results.

The laboratory has kept up with increased demands and new standards by switching to highly automated analysis equipment. Noses

Fahima Gabrawy conducts nitrate/nitrite analysis on the Technicon, March 1985.

The laboratory staff performs over 200,000 analyses each year.

sniffing out benzene are not enough today, for the Environmental Protection Agency (EPA) has identified over 100 toxic organic compounds. Computerized mass spectrometers, gas chromatographs, and other sensitive equipment help the MWCC's staff members monitor wastewater for the presence of these pollutants.

"This equipment is expensive and very powerful," says Hubbling. "Today we can do more tests in a few hours than we could in a few days 15 years ago."

Despite the changes in the laboratory's equipment, you can still find MWCC employees on the river almost any day of the year. They monitor some 27 sites along 160 miles of river, including the Mississippi, Minnesota, St. Croix, Vermillion, and Rum Rivers. The staff is making sure the treatment plants are doing their job, maintaining river water quality. Today, the staff uses faster boats and more sophisticated equipment, but much of their work is the same as the work done by the "6 gaugers and samplers" who signed on with the MDC 61 years ago. That's as it should be. After all, it all began with the river. And that's where it all ends.

FLOODS

The topography of the Twin Cities area made Pig's Eye Island an ideal site for a sewage treatment plant, at least in most respects. Because the cities were spread out atop the bluffs and hills flanking the Mississippi, the treatment system could be built without expensive pumping stations. Gravity supplied the power needed to bring the sewage to the plant.

Pig's Eye Island, at 698 feet above sea level, had one major drawback. It was only about 12 feet above the normal level of the river and therefore susceptible to flooding. In most years, the annual spring floods interrupted service for a short period when the river rose above the effluent outfall, making sewage treatment impossible. A dike constructed along with the plant protected it against the highest water mark on record, the flood of 1881, when the Mississippi crested at about 702 feet above sea level. Over the years, however, the river has cared little for the old record. In 1952, 1965, and 1969, the river rose above the 702-foot level, flooding the grounds and threatening to destroy or seriously damage millions of dollars' worth of equipment inside the plant.

The flood of 1965 was the worst of all. On April 8, with the river rising three feet a day, the plant was shut down and workers began preparing for the flood. The office staff moved to temporary quarters at the St. Paul City Hall. Workers sandbagged building entrances, brought in cots and blankets, and set up a commissary in the laboratory on the second floor of the Administration Building.

On April 11, a crew of 41 men assembled at the plant. That night, the river inundated Childs and Warner Roads, isolating the plant and crew. Although the MWCC had borrowed six boats from the Minneapolis Park Board and had rented an Army duck boat, the strong current of the swelling river and the continuous barrage of floating debris and chunks of ice made it too dangerous to transport the workers in and out of the plant. They were stranded for the next 12 days.

Just before midnight on April 12, the flood waters burst through and over the dike, and the crew scrambled to save the plant. On April 13, water forced its way through the screen and grit chambers and seeped into the tunnel system. Workers sealed the breach with plywood and sandbags. Later that day, the water pressure from the flood blew out the urinals in the Administration Building basement. Again, the crew managed to seal the leak. On the 14th, at three in the morning, water exploded through an air intake duct in a boiler room. Two scuba divers (employed by a contractor working on a construction project at the plant) stemmed the flow—estimated at 1,000 gallons per minute—by sealing it with a large insulation blanket and assorted boards and timbers.

Although the water kept finding new ways into the buildings, the crew was able to protect most of the equipment by plugging leaks as they sprang and by continuously pumping the water back into the river. On April 16, the river crested at 708.5 feet above sea level; on the 18th, the flood waters began to recede. When the flood subsided, workers discovered that, while the plant had suffered little structural damage, silt had filled the settling tanks and rendered them inoperable. On May 9, after three weeks of clean-up, the plant began operating again.

In 1975, the MWCC completed construction of the final phase of flood protection projects. The plant is now surrounded by an earthen dike and concrete floodwall that rises to 716 feet above sea level—nearly eight feet higher than the high water mark of 1965. An effluent pumping station, finished in 1977, makes it possible for the Metro Plant to treat sewage even during the annual spring flood—unless the mighty Mississippi opts for a new record.

Clean Water and the Law: The MWCC Responds to the Challenge

At the turn of the century, the Mississippi River and other metropolitan area lakes and streams were beginning to show serious effects from pollution. People in the Twin Cities soon became aware that something had to be done about sewage disposal. But government agencies had limited responsibilities for regulating water pollution control activities.

"Although a pollution problem existed, people were less concerned with protecting the environment in those days," says Lou Breimhurst, MWCC administrator. "The focus was on health threats—waterborne diseases."

The State Board of Health became marginally responsible only when pollution endangered public health. By 1907, the Health Board recognized that the continued discharge of untreated sewage posed a serious threat to public health and began requiring municipalities to provide primary sewage treatment.

Dr. A.J. Chesley (Photo courtesy of Minnesota Historical Society.)

"They didn't have any real authority, though," says Louie Bartscher, Metro Plant manager. "They could pressure communities to treat their sewage, but that didn't get the water cleaned up."

Today's strong conservation ethic did not exist in the public conscience and, more often than not, individual communities—Minneapolis and St. Paul included—chose to forego the costly construction of adequate sewer lines and treatment facilities.

As the condition of the Mississippi worsened, the Health Board stepped up its efforts. In 1923, at the instruction of Health Board members, the executive officer of the Board, Dr. A.J. Chesley, wrote letters to the city councils of Minneapolis and St. Paul, urging them to take action. He received no response. In 1925, Chesley wrote to the city councils again. The State Board also engaged the assistance of the U.S. Public Health Service, which conducted a survey of the Mississippi from the Twin Cities to Winona, assessing the impact of sewage disposal.

In the meantime, grass roots support for treatment facilities grew stronger. The Izaak Walton League, the Engineers Society of St. Paul, the Engineering Club of Minneapolis, and other private organizations spoke out in support for immediate action. The state legislatures of Minnesota and Wisconsin formed a

joint interim committee to look into the problem.

In August of 1926, the Minneapolis City Council formed the Minneapolis Sanitary Commission to study "the condition of the river and the problem of sewage disposal." Later that year, the members of the commission invited St. Paul to join and changed the name to the Twin Cities Sanitary Commission. By this time, however, members of the state legislature lost faith in the joint commission. On April 14, 1927, in Chapter 181 of the General Laws of 1927, the legislature established the Metropolitan Drainage Commission (MDC). Made up of two representatives from Minneapolis, two from St. Paul, and one from Winona, the MDC was the first organization to adopt a stewardship role for the Mississippi and its tributaries.

Working with a first year budget of $23,900, the MDC boasted 144 full-time employees, a part-time clerk, a consulting engineer from Chicago, and a professor of civil engineering from the University of Minnesota. Headed by James Childs, formerly of the Health Board, the MDC began the monumental task of cleaning up the untreated sewage discharged directly into the river by some 1,125 miles of sewers through 84 different outlets.

"It could get pretty awful down by the river," recalls Maurice Robins, former MWCC deputy administrator and water sampler. "There were floating feces, dead fish, and a terrible sewer smell."

Twin Citians began to view sewage treatment not as a means of protecting the public from a health threat, but rather as an obligation to protect the environment.

During the next six years, the MDC studied the river, charted the sources of pollution, and designed a treatment plant and a disposal system for the Twin Cities that would stop the deterioration of the Mississippi.

In 1933, when it was time to raise money and begin construction of the Metro Plant, the state legislature formed the Minneapolis-St. Paul Sanitary District to succeed the MDC and make the plan a reality. The cost of building and operating the system was apportioned to the two cities according to the assessed valuation of property, with roughly 66 percent apportioned to Minneapolis and 34 percent to St. Paul.

While the Sanitary District solved the immediate problem of sewage treatment and disposal for the Twin Cities, the state still lacked an official body empowered to regulate water pollution. The State Board of Health maintained its role as part-time watchdog and, as such, set the following standards for the Sanitary District:

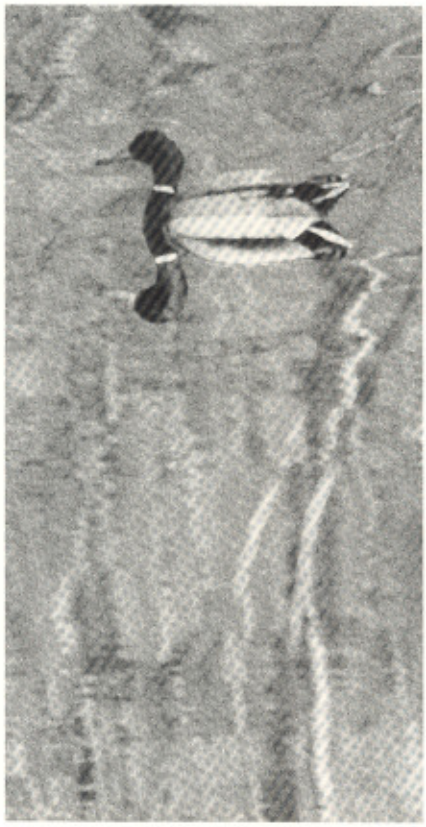
1. The health of livestock should not be materially endangered.
2. The present public nuisance should be eliminated.
3. Fish life in the river, at least below the mouth of the St. Croix, should not be jeopardized.

During the first few years immediately following the opening of the treatment plant, the Sanitary District not only met, but exceeded these standards. Within four months, the District eliminated the health hazards, danger to livestock, and public nuisances. Within two years, fishermen were reporting catches of game fish well above the mouth of the St. Croix.

"The impact on the river was tremendous," recalls Robins. "No more dead fish, no more sewage smell—we even saw people swimming in the river across from the plant."

In 1945, the legislature formed the Water Pollution Control Commission (WPCC), an offshoot of the State Board of Health, to regulate newly emerging water pollution problems. The WPCC's main concern—that communities provide primary treatment of sewage—had little impact on the Sanitary District, which had been providing primary treatment since 1938.

During the 1950s, no outside agency policed the Sanitary District, but the District's own monitoring program showed that treatment facilities needed to be expanded to maintain the river's water quality. Earlier gains began to disappear as population growth and industrial expansion increased the load of pollutants entering the river. The District began planning plant expansions that would increase both the amount and level of treatment. In 1965, the District completed work on secondary treatment and additional primary treatment facilities.



The impact on the river was tremendous. No more dead fish, no more sewage smell.

During the late 1960s, however, three developments evolved that significantly reshaped the approach to sewage treatment in the Twin Cities and exponentially increased the expectations placed on the Sanitary District.

First, sprawling suburban growth made it increasingly difficult for separate governmental agencies to effectively manage burgeoning interdependent services such as transportation, health care, education, police and fire protection—and sewage treatment. In 1967, the state legislature formed the Metropolitan Council as a coordinating agency on a regionwide basis. In 1969, the Metropolitan Sewer Board (later renamed Metropolitan Waste Control Commission), was charged with the responsibility of managing the entire area's sewage treatment system, including nearly 200 political jurisdictions. The Sewer Board was composed of one representative from each of the seven counties in the metropolitan area.

Second, growing public awareness of a need for stricter pollution controls led to the creation of new state and federal government agencies

and higher standards for sewage treatment. In 1967, the Minnesota legislature established the Minnesota Pollution Control Agency (MPCA) to replace the old Water Pollution Control Commission. The MPCA was soon empowered to set effluent standards for treatment plants and to enforce compliance. In 1970, the U.S. Congress formed the Environmental Protection Agency (EPA) and, in 1972, passed the Federal Clean Water Act, which set as its goal "the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters." As an interim goal, the act aspired to make the nation's waters clean enough to support fish and safe enough to permit swimming.

Third, both the MPCA and the EPA established grant programs to fund the expansions and improvements necessitated by the new, stricter standards.

Given these three significant developments, and the expanded responsibility for not one but 33 treatment plants, the Metropolitan Sewer Board found itself saddled with a tremendous administrative and managerial challenge. Twenty-nine of those treatment plants were inadequate by 1969 standards.

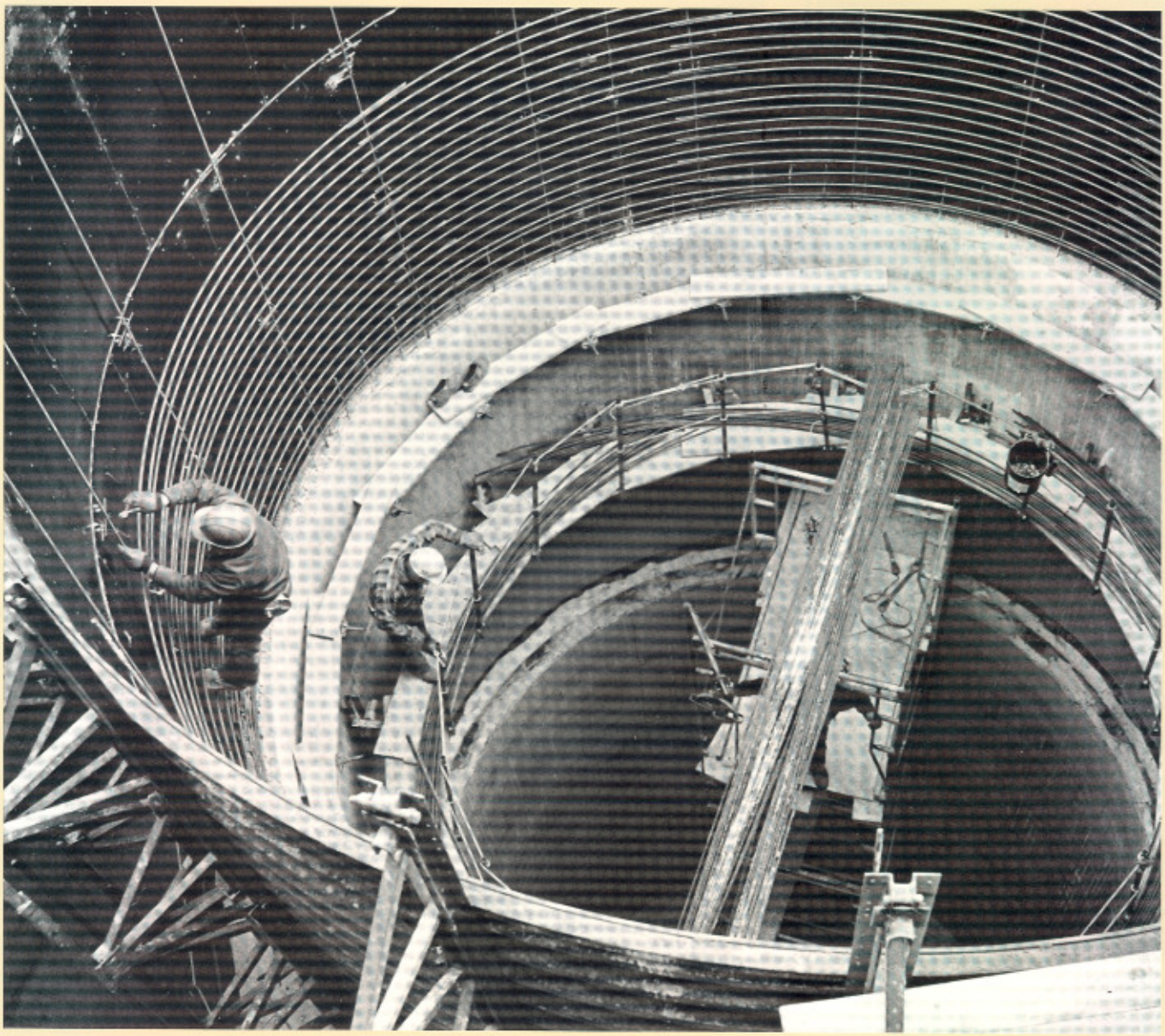
"Some of those plants were so undersized and inefficient they went out of commission every time a local industry discharged a large amount of wastewater," recalls Bartscher. "We had to close those plants almost immediately."

In the early 1970s, the Board completed the construction of two previously approved regional plants to handle wastewater from plants due to close. But before the Sewer Board was renamed the Metropolitan Waste Control Commission in 1974, the state and federal regulatory agencies raised effluent standards even higher. The EPA instituted the National Pollutant Discharge Elimination System, which set specific standards for each of the various kinds of effluent pollutants.

For the next decade, the MWCC struggled to meet the evolving challenge. Existing facilities failed to meet the new standards, and the public harshly criticized the Commission. To meet the demand, over $350 million worth of expansions and improvements (federal grants supplied 75 percent and state grants 15 percent of these funds) were undertaken at the Metro Plant alone.

"We applied for every nickel of grant money we could to keep up with the more stringent controls," says Bartscher. "In a sense, this created new problems for us because we forced our engineers and consultants to come up with plans and specs in an unrealistic time frame."

Incomplete engineering specifications led to substantial cost overruns on one project. In addition,



THEN AND NOW

When the Minnesota legislature established the Metropolitan Sewer Board in 1969, it "purchased" the 33 existing treatment plants and other incidental property from the individual communities. Payment came in the form of credits against future charges for sewage treatment. Most of the plants have been phased out or replaced as illustrated by the charts below.

Plants in 1969:

Anoka
Apple Valley
Bayport
Burnsville
Chanhassen (two plants)
Chaska
Cottage Grove
Eagan Township
Excelsior
Farmington
Forest Lake Township
Forest Lake Village
Lakeville
Long Lake
Maple Plain
Medina
Metropolitan
Mound
Newport
Oak Park Heights
Orono
Prior Lake
Rosemount
St. Paul Park
Savage
Shakopee
South St. Paul
Hastings
Inver Grove Heights
Stillwater
Victoria
Wayzata

Plants in 1988:

Anoka*
Bayport*
Blue Lake**
Chaska
Cottage Grove
Empire**
Hastings
Metropolitan
Rosemount**
Savage*
Seneca**
Stillwater

*To be phased out over next four years

**New plants under construction or undergoing expansion

there were some administrative problems, and, while the public questioned MWCC hiring practices and methods of awarding consultant contracts, individual communities questioned the apportionment of costs and the overall expense of sewage treatment.

Many of these problems confronting the MWCC during the 1970s and 1980s were highlighted in a series of newspaper articles, published in 1983. After the articles appeared, Governor Rudy Perpich appointed an independent committee to review the MWCC and to recommend solutions. The committee found that some of the accusations were exaggerated, but the MWCC still needed to reform some of its practices.

In response to the newspaper articles and the committee's report, the MWCC hired a consulting firm to review and revamp its management practices. "The consulting firm came up with 72 recommendations," recalls Breimhurst. "We responded to every one of them."

Among the changes adopted were increased administrative staff, internal auditing, a more sophisticated computer system, and an active program of public and community relations.

Despite the problems the MWCC encountered, by the early 1980s the organization had begun regularly to meet the effluent standards set

(Photo courtesy of Minnesota Historical Society.)

by the MPCA and the EPA, even though those standards continued to rise. Today, all MWCC plants achieve nearly 100 percent compliance. Although costs have risen, the cost per user for sewage treatment in the metropolitan area is roughly 70 percent of the national average.

The Metropolitan Waste Control Commission has come a long way since its inception as the Metropolitan Drainage Commission in 1927, working on a $23,900 annual budget. The MWCC's current annual operating budget is $108 million. The MWCC employs 980 people and provides sewage treatment for approximately 1.9 million residents in 105 communities. The combined residential, industrial and commercial population served by the MWCC is 2.8 million people. Nine commissioners oversee the entire operation; eight are appointed to represent the precincts within the metropolitan area, and the chairperson is appointed by the governor. The staff is organized into departments of planning, engineering and construction, facilities operations, quality control, administrative services, and offices of public and community relations, health and safety, legal counsel, and internal auditor.

With current treatment processes meeting and often exceeding government standards, the MWCC is entering an era of fine-tuning—replacing

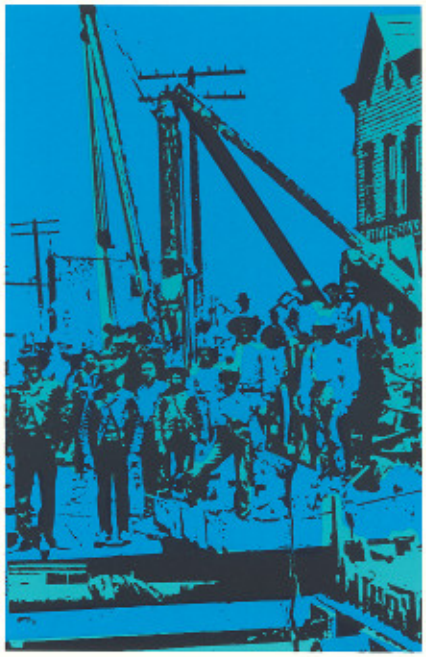
worn or outdated sewer lines and treatment facilities, and streamlining and economizing operations and management. Also the MWCC hasn't stopped building. There's the new Minneapolis East Interceptor sewer, the new Rosemount Plant, and several plant expansions.

"We've made great strides in a lot of areas," says Lou Breimhurst. "The organization is working much better. We've got a good group of people and they're pulling together. Still, we've got to make a concerted effort to continue to improve productivity and performance. This will be an ongoing process. You can't do it piecemeal or overnight."

"The MWCC is one of the most vital organizations in our area," says Commission Chair Peter Meintsma. "We're protecting the environment, the health, and the money of our constituents.

"Keeping a river clean is a tremendously complicated business. The interplay of the scientific, engineering, and management disciplines requires great sophistication and skill on the part of our people."

One example of the MWCC's problem solving technique is their innovative approach to reducing heavy metals in wastewater. Because these pollutants are difficult to remove through standard treatment processes, the MWCC began requiring industries producing these pollutants to remove them before



they entered the system. Some companies, however, failed to comply and incurred heavy fines. Collecting money is seldom a hardship, but the fines did not solve the heavy metals problem in the river. After carefully considering the alternatives, the MWCC decided to allow the offending companies to use the money they owed to finance construction of a central metals recovery plant, which will soon supply pretreatment facilities for a consortium of industries.

Ultimately, the Mississippi will be still cleaner because of the MWCC's ability to create intelligent solutions to sewage treatment problems. The MWCC and its predecessors came into being to reclaim the Father of Waters, the lifeblood of the Twin Cities metropolitan area, and it continues to get the job done, on the Mississippi and on other metro area rivers.

Robins, who worked for the MWCC and its predecessors for nearly 50 years, assessed the impact of a half century of wastewater treatment in the metropolitan area as follows: "I personally feel a great sense of pride in what the Sanitary District, the Sewer Board, and the MWCC have accomplished. You'll get some disgruntled and dissatisfied people, but we've done a world of good for the entire area. All you have to do is take a close look at the Mississippi River today."

This photo was taken outside the administration building at the Metro Plant in the early 1960s. Left to right: S. Sager, Louis Bartscher, Sr., Lowell Marsh, William Trulander, Scott Linsley, G. Stroessenreuther, Frank Hermann, Ed Schwartz, Kerwin Mick, and Maurice Robins.

Stranded at the Metro Plant during the flood of April 1965, (left to right) Bill Svendsen, Bill Valley, Matt McConville, Walter Gersmeyer, Bill Camp, Clayt Hagen, Wally Woytasek, Larry Helms, Lloyd St. Sauver.

Row 1 (left to right) Don Bluhm, Tony Guerre, Tom Creager, Russ Susag, Louie Bartscher, John Sockness, John Almo, Don Madore, Jim Rosenberger. Back Row: George Kaczor, Hal Allen, Tom Lund, Ken Robins, Lonnie Dye, Bill Blain.

GEORGE LATIMER
MAYOR

CITY OF SAINT PAUL
OFFICE OF THE MAYOR

347 CITY HALL
SAINT PAUL, MINNESOTA 55102
(612) 298-4323

May 6, 1988

Mr. Peter Meintsma, Chairman
Metropolitan Waste Control Commission
350 Metro Square Building
Seventh and Robert Streets
Saint Paul, Minnesota 55101

Dear Peter:

Congratulations to all at the Metropolitan Waste Control Commission (MWCC) as you celebrate the 50th anniversary of the Metropolitan Wastewater Treatment Plant (Metro Plant) in Saint Paul.

Our city has a special interest in the Metro Plant, which is located within our city limits. Saint Paul, along with Minneapolis, played a major role in building the Metro Plant and the interceptor sewer system. As the first primary treatment plant along the Mississippi River, the Metro Plant played an important role in improving water quality for our citizens.

Over the past 50 years, the Metro Plant has grown to meet the demands of a developing region. The plant currently serves 1.5 million citizens in 60 communities, including the City of Saint Paul.

We hope to keep working with you over the next 50 years as you face the continual challenge of treating the wastewater in the region in an efficient and environmentally sound manner.

Very truly yours,

George Latimer

George Latimer
Mayor

OFFICE OF THE MAYOR
127 CITY HALL
MINNEAPOLIS, MINNESOTA 55415

PHONE: (612) 348-2100

DONALD M. FRASER
MAYOR

minneapolis
city of lakes

May 2, 1988

Peter E. Meintsma, Chair
Metropolitan Waste Control Commission
350 Metro Square Building
7th & Robert Streets
St. Paul, MN 55101

Dear Peter:

I am pleased to be able to take this opportunity to congratulate the Metropolitan Waste Control Commission on the 50th Anniversary of the Metropolitan Wastewater Treatment Plant.

Twin Citians have traditionally exhibited a strong desire for a government which is close to them personally. The result is that the area contains almost 150 cities spread over seven counties. We even have two central cities. Within this there are a few features such as the highway system and the telephone system which tie us together and allow us to think of ourselves as a unified region. The wastewater treatment system is one of these features which makes a "region" out of this amalgamation of cities and counties.

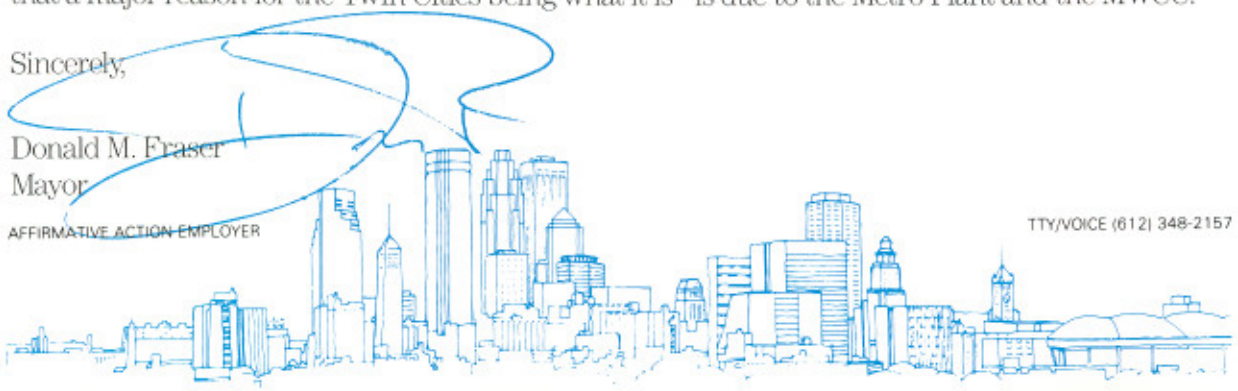
As a unifying element, the wastewater treatment system has several unique features. For example, it is the most hidden of the regional systems. Most people do not think of the system unless something is wrong. To the great credit of the MWCC, most people never have the need to think of the system. But even though the wastewater treatment system is the most hidden, it does have two other features: as evidenced by the 50th Anniversary of the Metro Plant, it is the oldest continuous metropolitan "system" (the original trolley system had the same unifying function). And, as an actual determinate of development patterns for the region, it is definitely the most important system.

As I mentioned, most Twin Citians seldom give any thought to the wastewater treatment system and the role it plays in their individual lives, and the overall life of the region. It is therefore very appropriate for you to use Metro Plant to make us all more aware of its importance, both in the past and the present.

Congratulations on your 50th! As we move towards the 21st Century, you can certainly take pride that a major reason for the Twin Cities being what it is—is due to the Metro Plant and the MWCC.

Sincerely,

Donald M. Fraser
Mayor



AFFIRMATIVE ACTION EMPLOYER

TTY/VOICE (612) 348-2157

GLOSSARY

aeration: to circulate oxygen through a substance, as in wastewater treatment where it aids in purification.

bar screen: in wastewater treatment, a device that removes large solids.

chlorinization: the application of chlorine to drinking water, sewage, or industrial waste to disinfect or to oxidize undesirable compounds.

clarifier: a settling tank where solids are mechanically removed from wastewater.

combined sewers: a system that carries both sewage and storm water runoff.

effluent: treated wastewater which exits the treatment plant.

fossil fuels: combustibles derived from the remains of ancient plants and animals, like coal, oil, and natural gas.

heavy metals: metallic elements like mercury, chromium, cadmium, arsenic, and lead, with high molecular weights.

incinerator: a controlled chamber where waste substances are burned.

influent: wastewater flow entering a treatment plant.

interceptor sewers: the collection system that connects main and trunk sewers with the wastewater treatment plant.

outfall: the place where an effluent (treated wastewater) is discharged into receiving waters.

PCB's (Polychlorinated biphenyls): a group of toxic, persistent chemicals used in transformers and capacitors. Further sale or new use is banned by a 1979 law.

primary treatment: the first stage of wastewater treatment; removal of floating debris and solids by screening and sedimentation.

resource recovery: the process of obtaining matter or energy from materials formerly discarded (e.g. solid waste, wood chips).

secondary treatment: biochemical treatment of wastewater after the primary stage, using bacteria to consume the organic wastes.

settling tank: a holding area for wastewater, where heavier particles sink to the bottom and can be siphoned off.

sludge: the concentration of solids removed from sewage during wastewater treatment.

suspended solids: tiny pieces of pollutants floating in sewage that cloud the water and require special treatment to remove.

tertiary treatment: advanced cleaning of wastewater that goes beyond the secondary or biological stage. It removes nutrients such as phosphorous and nitrogen, and most suspended solids.

wastewater: water carrying dissolved or suspended solids from homes, farms, businesses, and industries.

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