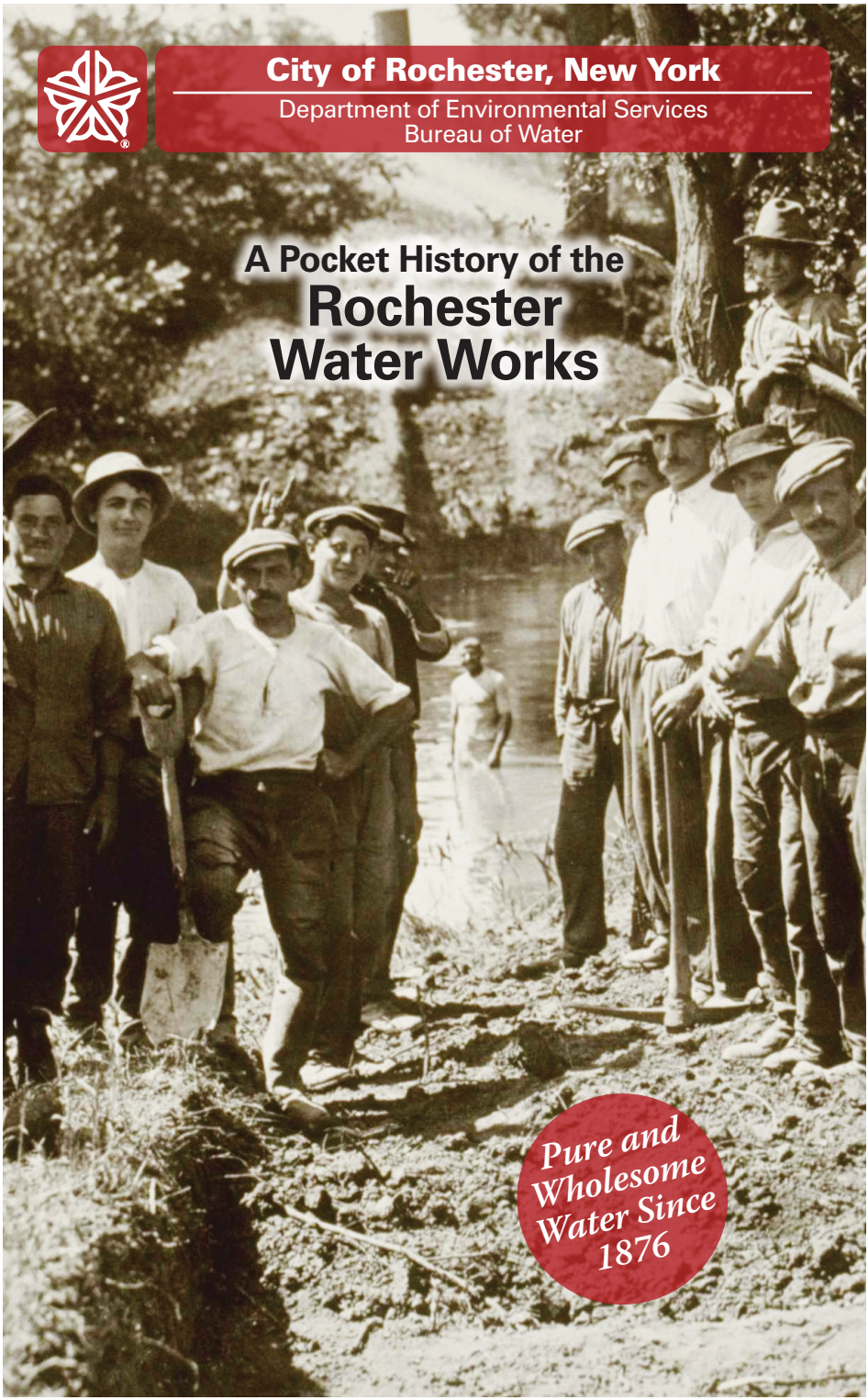
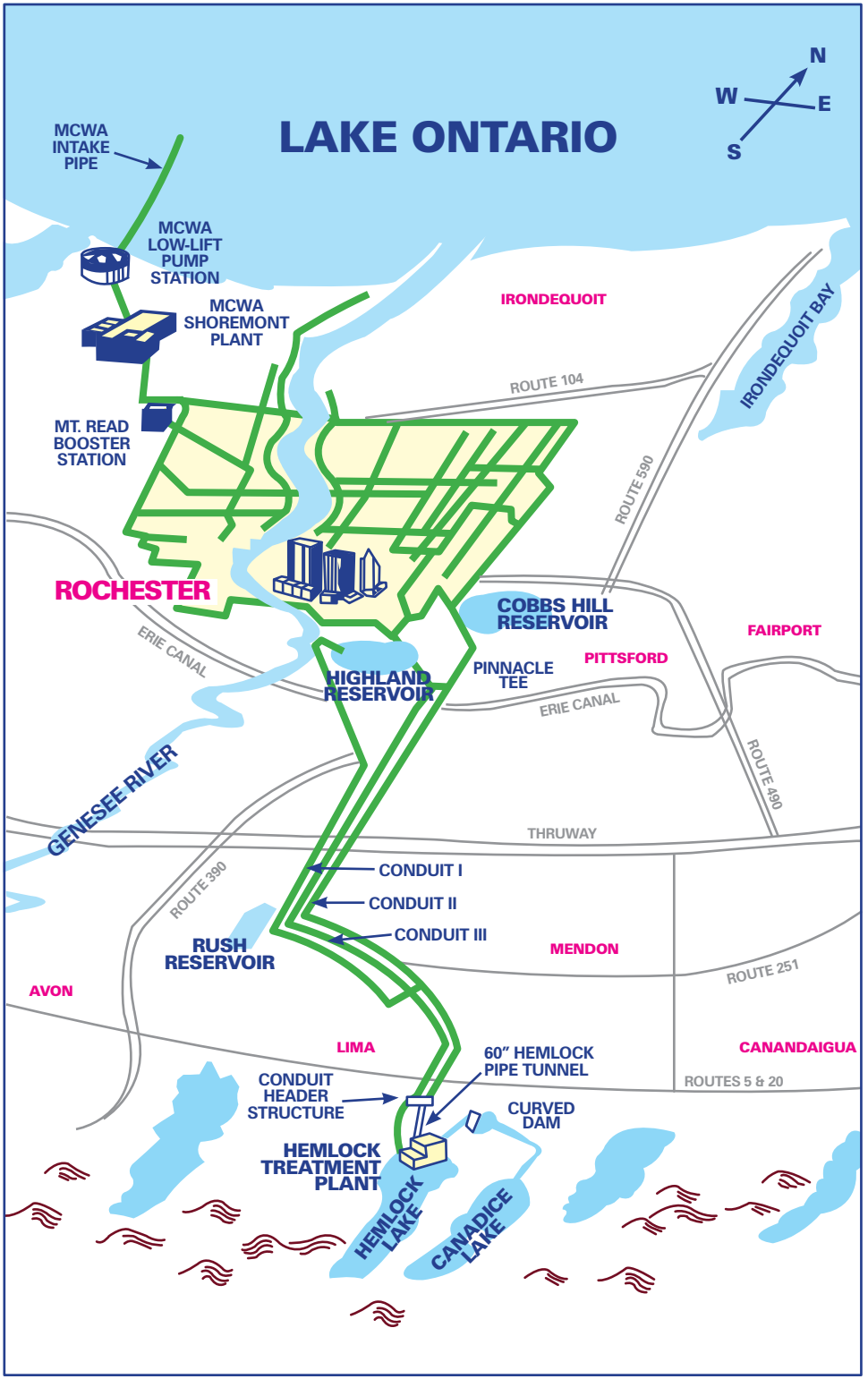

City of Rochester, New York
Department of Environmental Services
Bureau of Water
A Pocket History of the
Rochester
Water Works
Pure and
Wholesome
Water Since
1876


LAKE ONTARIO
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MCWA SHOREMONT PLANT
MT. READ BOOSTER STATION
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IRONDEQUOIT BAY
ROUTE 104
ROUTE 590
ROCHESTER
COBBS HILL RESERVOIR
FAIRPORT
PITTSFORD
PINNACLE TEE
ERIE CANAL
HIGHLAND RESERVOIR
ERIE CANAL
ROUTE 490
GENESEE RIVER
THRUWAY
ROUTE 390
CONDUIT I
CONDUIT II
CONDUIT III
RUSH RESERVOIR
MENDON
ROUTE 251
AVON
LIMA
60" HEMLOCK PIPE TUNNEL
CANANDAIGUA
ROUTES 5 & 20
CONDUIT HEADER STRUCTURE
CURVED DAM
HEMLOCK TREATMENT PLANT
HEMLOCK LAKE
CANADICE LAKE

Hemlock Lake Auxiliary Spillway

A Snapshot of Rochester's Water System Today

The "Upland" Sources

The primary sources of the City's water supply are Hemlock and Canadice Lakes, located about 30 miles south of Rochester.

Hemlock Lake is about seven miles long, a little more than a half-mile wide, and up to 90 feet deep. Canadice Lake, lying parallel and to the east of Hemlock Lake, is about three miles long, one-third mile wide and up to 95 feet deep. In 2010, the City sold 7000 acres of watershed property surrounding these lakes to New York State. Protection of the watershed property is in accord with the New York State Open Space Conservation Plan. Access to the property is strictly regulated by New York State Department of Environmental Conservation.

The Plant & the Process

The Hemlock Lake Water Filtration Plant, in service since 1993, filters and treats the water from the two lakes. Water from Hemlock Lake is drawn in through an intake pipe to the low-lift pump station where it is pumped to the filtration plant.

Water from Canadice Lake flows by gravity down the Canadice Lake Outlet to the Curved Dam located near Route 15A. There, it enters a concrete conduit and flows by gravity either into the treatment plant or Hemlock Lake.

At the treatment plant, the water treatment process involves coagulation, filtration and disinfection. During coagulation, chemicals are added to untreated water, causing the natural particles to clump together into larger particles called floc. Floc is removed by filtration and the water is then disinfected through addition of chlorine. Fluoride is added to the water as a public health measure, and small amounts of other chemicals may be added to aid in the filtration and disinfection process.

Flowing Home, Downhill

Water from the filtration plant flows through a two-mile tunnel to the Conduit Header Structure, where it enters a system of iron and steel conduits which convey the water to the city. With the exception of the treatment plant, the entire water system stretching from Hemlock Lake to the city is gravity-fed, requiring no costly pumping operations. This design is attributed to the original designers (circa 1873.)

Water passes through Rush Reservoir—a transmission reservoir located in the Town of Rush as it continues its trip northward to either Highland or Cobbs Hill Reservoir. From there it flows by gravity through almost 600 miles of distribution mains to reach homes and businesses in the city.

Great Lake Water, Too!

In addition to its own Upland Lake supply, the City purchases Lake Ontario water from the Monroe County Water Authority (MCWA). Water is drawn from Lake Ontario through an intake pipe and pumped to the MCWA's Shoremont Plant where it is treated and disinfected. Lake Ontario water is pumped into the city distribution system primarily in the area of Mt. Read Boulevard and West Ridge Road. The volume of purchase varies from 2 to 26 million gallons per day, depending on the season.

Evolution of the Rochester Water System

Test of Holly System, 1874

Residents and businesses in Rochester, along with many of their suburban neighbors, are fortunate to be served by a reliable, historic, gravity-fed water system that was built to last. Many of its original reservoirs, mains and structures have passed the test of time and still serve their intended purposes (thanks to visionary planners and designers over a century ago).

The following timeline is an overview of how the system works, and illustrates how Rochester's water supply, conduit, storage and distribution systems evolved from the frontier "boom town" days to state-of-the-art facilities which support, supply and protect a modern community.

Water Transmission Conduit Installation

Responding to the Need

1820s-1840s

Drinking water for the citizens of Rochester (incorporated in 1834) was obtained either from private or public wells or from cisterns, which collected rain water. During this period, the primary concern of community leaders was maintaining an ample supply of water for firefighting purposes. The purity of the water was a low priority, comparatively.

1835

New York State Legislature granted a charter to develop Rochester's first private water company. Unable to agree on a plan to supply water and other urgent demands, the Common Council instead authorized construction of additional wells and cisterns.

1852

A cholera epidemic swept through the city, dramatically demonstrating the need for a pure, safe water supply.

A group of concerned citizens moved to secure a charter from the NY State Legislature for a second Rochester water company, but due to debates over public financing, no work was accomplished before the effort was interrupted by the Civil War. Following the Civil War, the company began construction in 1867, only to go bankrupt later that year. The City acquired the assets of the company in 1882.

1872

A Board of Water Commissioners was formed by an act of the NY State Legislature. The Board appointed J. Nelson Tubbs as Chief Engineer, J. L. Nichols and Emil Kuichling as Assistant Engineers to design the City's water systems. Design of two water systems commenced. The Holly Fire Protection System would use river water pumped from the Genesee River. A second system for potable purposes would be designed using a gravity-fed system from Hemlock Lake.

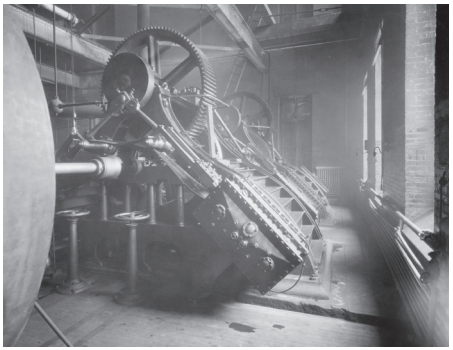
1873

Land for reservoirs in Rush and at Highland Park was purchased by the City.

Building an Infrastructure

1873-74

The Holly Fire Protection System was constructed so that steam-driven pumps could bring Genesee River water up to high pressure for fire protection in the City's downtown commercial and industrial areas. The pumping station was located on Brown's Race. A test of the Holly system on Feb. 18, 1874, at Main and State Streets shot a 4-inch stream of water 294 feet into the air.



Holly Pump Station

1873-76

The domestic water system was constructed to supply the city with drinking water from Hemlock Lake. The project included running a transmission conduit (Conduit I) from the north end of the Lake to reservoirs located at Rush and what is now Highland Park, and developing a distribution system of water pipes within the city. The work force used to build the water system consisted of 700 to 900 men.

Hemlock Lake water entered the distribution system for the first time on Jan. 23, 1876, and was being delivered to customers throughout the city by September. The original distribution system consisted of 58 miles of pipe, 521 hydrants and 27 water troughs and supplied 2,700 customers. By 1880, the Rochester Water Works was supplying an average of 4.5 million gallons of water to the people of Rochester everyday.

Keeping Pace with Progress

1877

A telegraph line was strung between Hemlock Lake and the city in support of water system operations. It was later converted to a telephone line, which, at the time, was the longest in the world.

1893-94

Because of the City's fast growing population and increasing demand for water, a second transmission conduit (Conduit II) was added between Hemlock Lake and Rochester, which included a 6 foot-high, 2 mile-long, horseshoe-shaped tunnel, a 1,550 foot-long steel intake pipe and two structures called "overflows." These overflows were designed as safety valves to prevent water pressure from rupturing the tunnel and to discharge water from the conduits in emergencies.

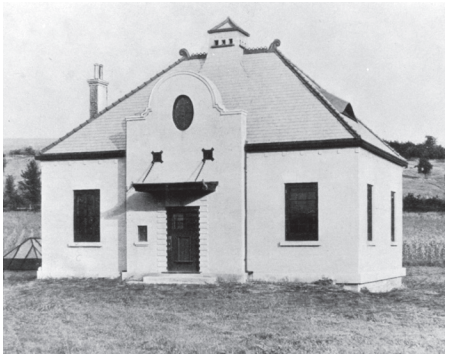
Overflow 1, 1894

1901

A gatehouse was constructed over the gates at Hemlock that regulated the flow of water from the intake into the tunnel.

1904

The Upper Gatehouse at Highland Reservoir was constructed, replacing a temporary wooden building over the stop-gates which had been erected in 1894.



Hemlock Gatehouse, 1901

Satisfying a Growing Thirst

1904

Land on Cobbs Hill was purchased for construction of a third City reservoir.

1905-08

Cobbs Hill Reservoir was constructed with a capacity of 144 million gallons.

Two new gatehouses and a new transmission conduit were built from Cobbs Hill down Highland Avenue to Clinton Avenue, which then connected to an existing conduit on Clinton Avenue just north of Elmwood Avenue. This connection became known as the Pinnacle Tee.

Highland Upper Gatehouse

1914-18

Due to increasing population and demand, another conduit (Conduit III) was laid between Overflow 1 (at the north end of the Hemlock Tunnel) and the Pinnacle Tee. Eight truss bridges were built along this route over Honeoye Creek to carry an access road for conduit maintenance.

1917-19

The "Curved Dam" was constructed on Canadice Lake Outlet, which diverted Canadice Lake water through a 5-foot diameter concrete pipeline into Hemlock Lake, providing a new water source and enhancing the total supply by 25 percent.

1925

A chlorinator was installed on the outlet from Rush Reservoir.

Backing Up the System

1934

A pump station and chlorinator were built on Dewey Avenue, just south of Ridge Road, that could draw up to 4 million gallons of water per day from Eastman Kodak's water mains to provide an alternate source of water during emergencies and potentially satisfy an increasing demand.

A 24-inch crossover pipe was constructed near the Lima-West Bloomfield town line, linking all three conduits.

1936

The dike at the north end of Hemlock Lake was raised and a new spillway was built to increase storage capacity.

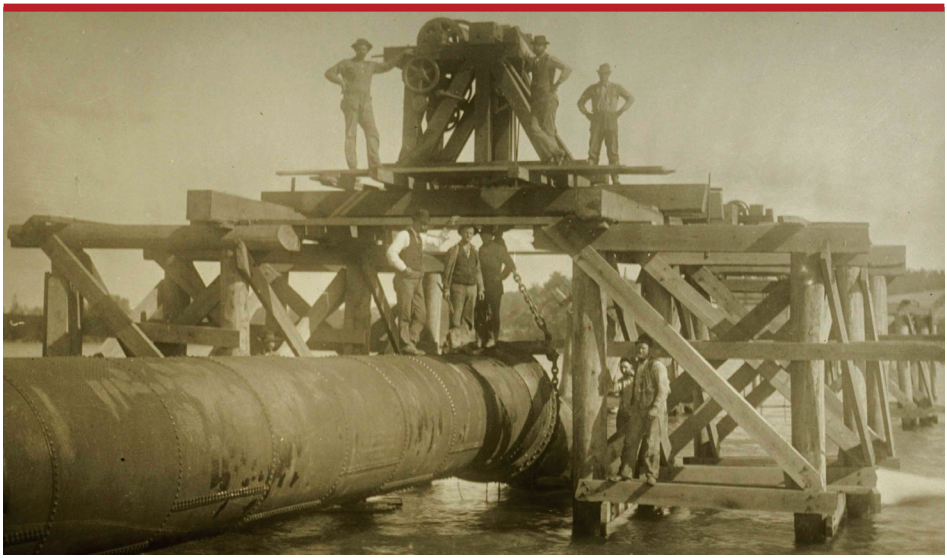
1937

A dam was built at the north end of Canadice Lake to increase storage capacity.

Maintaining & Expanding (Again!)

1943

A program of restoring water mains to "like-new" condition by cleaning out deposits and lining them with cement mortar began when Conduit I (the original line from Hemlock Lake) was cleaned and lined.



Hemlock Lake Intake Pipe Installation

1944-45

Land in the Town of Wayland was purchased in order to divert a creek into the Hemlock Watershed to increase its yield (the amount of water it can deliver to the system).

1944-46

Conduits II and III from Hemlock Lake to the city were lined with cement in an effort to reduce or eliminate leakage and to improve hydraulic characteristics of the conduits.

1947

The dike at the north end of Canadice Lake was raised to provide greater storage capacity.

1948

A pump house was built at Canadice Lake so that water could be drawn from below the level where it could be moved using gravity.

Wayland Dam and Spillway were constructed.

Adding Another Source

1953-55

A new water treatment plant which drew water from Lake Ontario was built on Dewey Avenue in the Town of Greece, northwest of the City. The new plant, along with a 48-inch diameter prestressed concrete water main and booster pump station on Mt. Read Boulevard at Ridge Road, gave the City an alternate source of water, ending complete dependence on Hemlock and Canadice Lakes. Water was initially drawn from Lake Ontario through two pumps set in Kodak's intake well.

1963

The City contributed to the cost of an intake pipe into Lake Ontario constructed by the Monroe County Water Authority (MCWA), securing the right to withdraw 40 million gallons per day.

1964-65

The Lake Ontario low-lift pump station was constructed. The Dewey Avenue Treatment Plant suction line was disconnected from the Kodak intake and attached to the joint City-MCWA intake pipe.

Updates, Repairs & Improvements

1964-65

A pump station and 36-inch diameter pipeline was built at Hemlock Lake, enabling the City to draw water from below Hemlock Lake's gravity feed level. The pipeline also served as a bypass when needed for maintenance of the brick tunnel between the Hemlock Gatehouse and Overflow 1.

1972

Hurricane Agnes, the most destructive natural disaster to the system ever experienced, washed out the "Curved Dam," preventing Canadice Lake water from reaching Hemlock Lake until the dam was rebuilt in 1973. The storm also undermined Conduits II and III at Frost Hollow and damaged a right-of-way bridge at Factory Hollow. These were repaired or replaced by the Water Bureau.

1978

The new, automated Holly Pump Station was constructed on Brown's Race to replace deteriorating mechanical systems and eliminate the need for an on-site staff "operator."

Highland Lower Gatehouse as it appeared in 1974

Sharing Resources

1978

An agreement was signed with the Monroe County Water Authority giving the City ownership of all distribution mains within city limits (some which had been leased) and turning over the Dewey Avenue Treatment Plant and Mt. Read Boulevard Pump Station to MCWA. It also provided for exchange of water between the City's water system and the County's, allowing each agency's facilities to function at maximum efficiency.

1981

The Wilson Boulevard Pump Station was constructed, assuring an ample and back-up water supply for Strong Memorial Hospital and the University of Rochester, in the event of a disruption in the conduit system south of the City.

Continuous Improvement

1983

Extensive structural rehabilitation of Cobbs Hill Reservoir was performed including shotcrete rehab of the concrete walls and extensive cleaning.

1985

New chlorine stations were built at all three City reservoirs.

The Highland Reservoir was drained so the fountain could be rebuilt and the stonework could be rehabilitated.

1986

An Elmwood Avenue river crossing was installed (the first to use welded plastic pipe), which allowed delivery of water to the City's southwest sector directly from the upland lakes without being diverted into reservoirs.

1991

Structural rehabilitation was performed on Rush Reservoir's Weir Building and Inlet Structure #1. In addition, sediment

was cleaned from the reservoir and the reservoir embankment was strengthened by the addition of an earthen buttress embankment along the southeast side. Control valves used to manage flows from the Hemlock Lake Water Filtration Plant were installed.

Hemlock's brick tunnel was slip-lined with 60-inch diameter fiberglass pipe.

A New Plant & Better Processes

1993

Though the quality of Hemlock and Canadice Lake water was very good, new Federal regulations required that all water drawn from surface sources (including Hemlock and Canadice Lakes) be filtered to remove the tiny suspended particles which can cause cloudiness in the water and prevent proper disinfection. Construction of a new filter plant at Hemlock Lake with a capacity of filtering 48 million gallons per day began in 1991 and was completed in 1993.

1998

The first of three new sodium hypochlorite chlorination stations opened at Cobbs Hill Reservoir. The use of sodium hypochlorite is much safer than the chlorine gas previously used, with a much lower health risk from exposure to the hypchlorite solution.

2006

The Water Bureau moved into a new, state-of-the-art 84,000-square-foot Operations Center, replacing the old facility which dated back to 1915. The new facility was awarded a LEED Gold rating by the US Green Building Council, the first municipally-owned facility in New York State to receive the LEED Gold rating.

2005-13

The City implemented several large diameter conduit replacement projects that amount to over 5 miles of new (36 to 42 inch) water main conduits to replace several aging sections of the conduit system between Hemlock Lake and the City.

2010

After leaks were discovered in Highland Reservoir, the City installed a synthetic rubber liner in the Reservoir. Other improvements to Highland Reservoir included replacing or structurally lining the intake and outlet lines feeding the

Canadice Lake

Hemlock Lake Water Filtration Plant

reservoir fountain, and adding a new inlet structure, and valves to control flow into and out of the reservoir.

2011

After several years of negotiations, the City and MCWA entered into a new water sharing agreement to replace the former agreement that expired in 2008.

2011-12

In an effort to bring the water storage reservoirs up to new regulations set by the U.S. Environmental Protection Agency for drinking water, the City installed a synthetic liner and floating cover system on Rush Reservoir. This project included a myriad of other site and reservoir improvements such as structurally lining the inlet and outlet lines that serve Rush Reservoir, and installing new reservoir bypass valves.

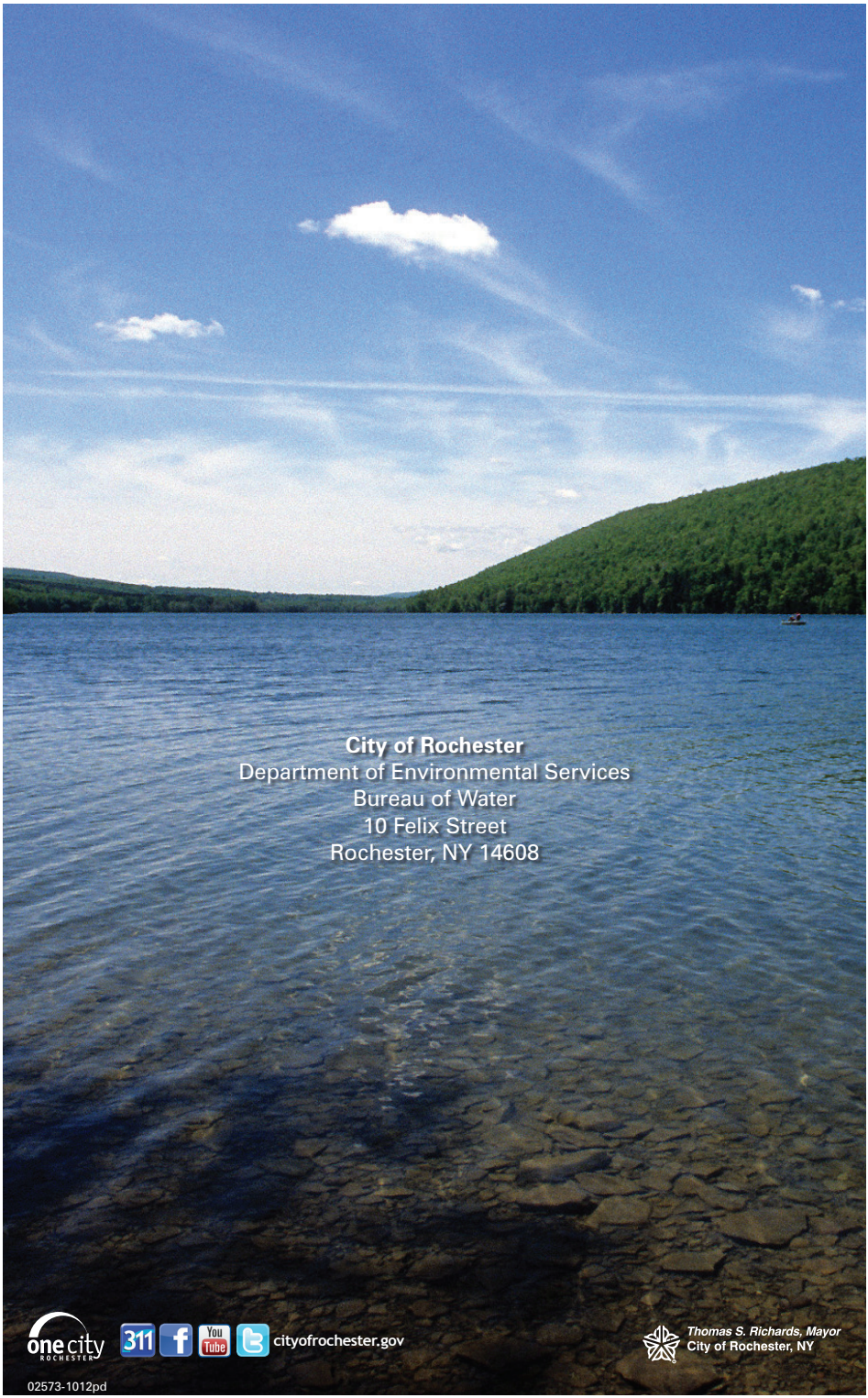
1970s-Present

The Water Bureau has cleaned and installed a lining of cement mortar in over 300 miles of iron pipe water mains throughout the distribution system. Over 70 percent of the water mains in the water system have a lining of cement mortar.

The present City distribution system consists of approximately 600 miles of water mains, 19,000 valves and 7,200 hydrants supplying water to a population of 215,000. The Holly Fire Protection System is still in operation today, offering high-rise buildings a less expensive means of providing fire protection.

Today, the Water Bureau is continuously performing maintenance such as valve and hydrant repairs and replacement, leak investigation, repairs, meter replacement and other tasks that are necessary to maintain a safe, reliable water system. The fact that the entire water system still functions as its designers originally intended is a testament to their foresight 140 years ago, the hard work of the Bureau's maintenance staff and the continual investment in the water system by City administration.

Water Bureau Operations Center



City of Rochester
Department of Environmental Services
Bureau of Water
10 Felix Street
Rochester, NY 14608

one city ROCHESTER

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Thomas S. Richards, Mayor
City of Rochester, NY

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