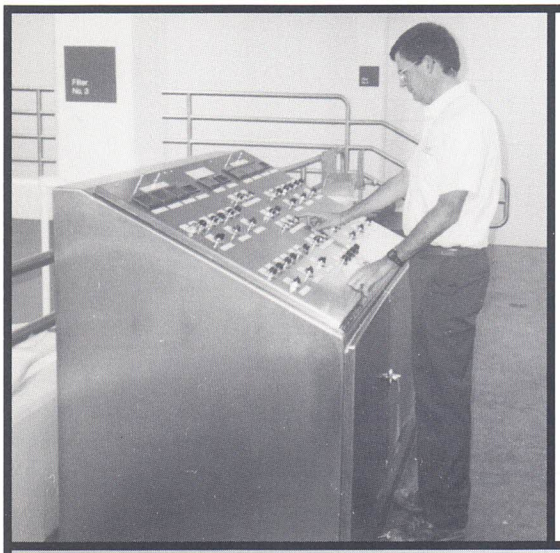
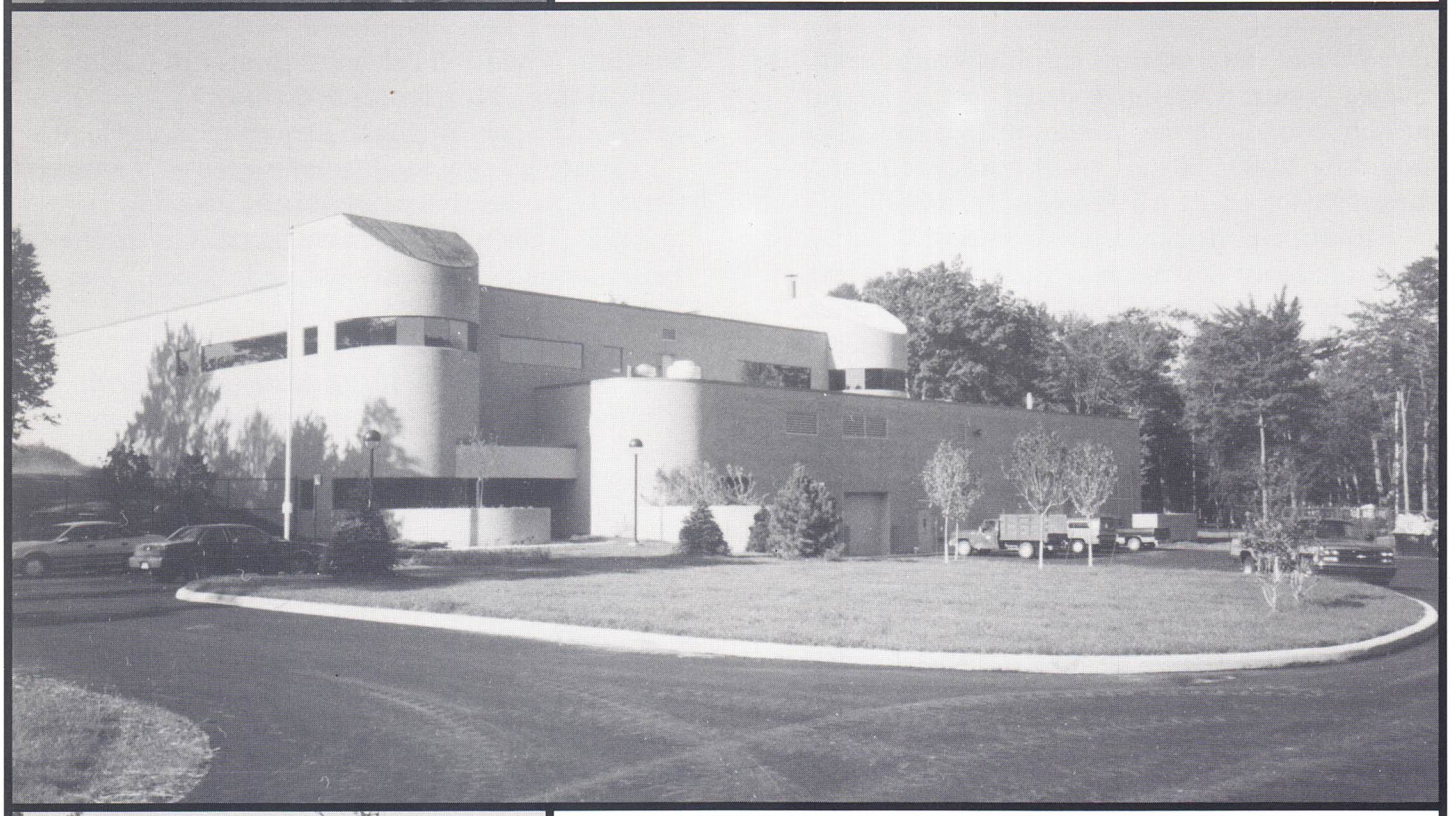


Welcome to the City of Sault Ste. Marie's

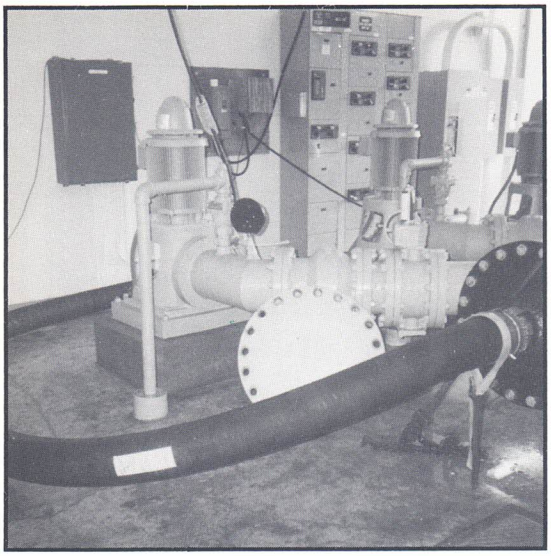
WATER FILTRATION FACILITY

Dedication Saturday, October 23, 1993

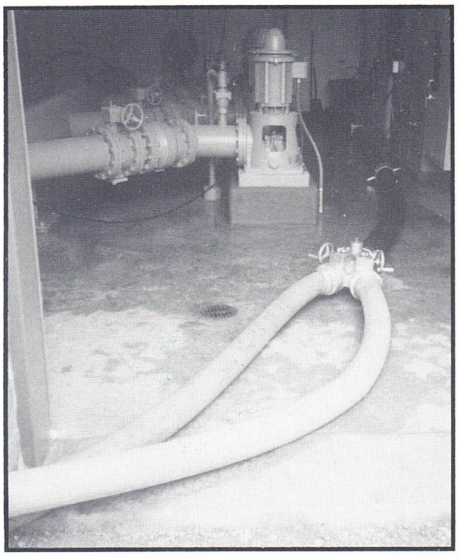


Our tour will take you through the process of water filtration from where river water receives its initial treatment to the delivery of finished water to the storage tanks.

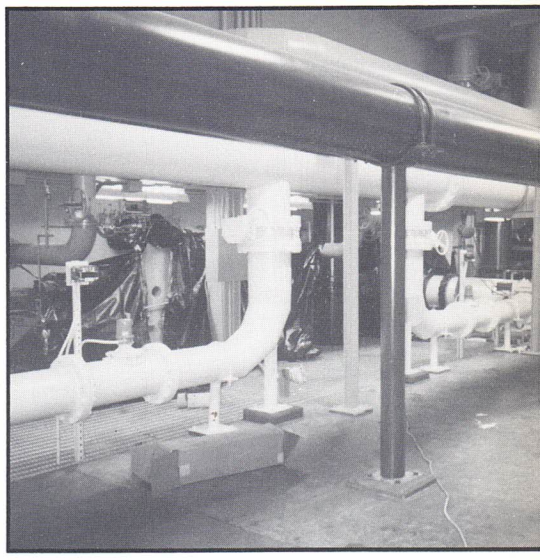
Thank you for attending our open house and seeing your new Direct Filtration Water Facility.



Temporary Water Supply Intake



Temporary Water Supply to Old Pumphouse



Pipe Gallery

We have four vertical turbine pumps at the raw water pump station, located east of the old pumphouse. Each raw water pump is capable of providing 2,000,000 gallons of water each day to the Filtration Plant.

Raw water (untreated river water) is monitored for how much turbidity it contains. Turbidity is a measurement of cloudiness in the water. It is expressed in Nephelometric Turbidity Units or NTUs. Our raw water ranges from 0.5 NTUs to 20 NTUs.

After turbidity monitoring, chlorine is added to the raw water. The chlorine is necessary to kill any bacteria the raw water contains. The chlorine in the finished water is kept at one part per million, or one gallon of chlorine to 1,000,000 gallons of water.

Alum (aluminum sulfate) is then added to coagulate the turbidity into bigger particles. The water then passes through a rapid mixer which mixes the chlorine and alum together.

After the rapid mixer, the water goes to the flocculators. A flocculator is essentially a large tank with a mixing impeller in it. It slowly mixes the water, allowing the alum to coagulate the turbidity. In the flocculators, dirt particles bump into each other and stick together to form larger particles. These larger particles are called "floc". It takes 32 minutes for water to pass through the four flocculators.

Once the water passes through the flocculators, it goes to the splitter boxes. Here the water is divided evenly four ways to go to the filters.

The filter bed media is made up of 12 inches (12") of sand, topped by 18 inches (18") of anthracite charcoal. Each filter is capable of cleaning water at a rate of 1450 gallon per minute. The filters clean the water to 0.03 to 0.05 NTUs. This is over 100 times cleaner than required by the Michigan Department of Health.

After leaving the filters, it goes over a filtered water weir. At this point lime is added to raise the pH. This will eliminate corrosivity in the water, which can cause rusting in pipes. Our desired pH range is 7.9 to 8.3.

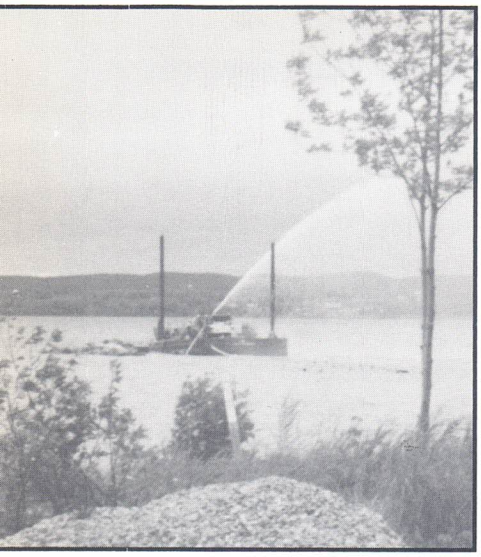
Fluoride is added to the water at a concentration of 1.0 to 1.1 parts per million. Fluoride in water supplies have been proven to reduce dental cavities.

Filtered water is stored in a 1.5 million gallon clear well. The water is stored here until it is needed in other areas of our transmission system or elevated storage tanks.

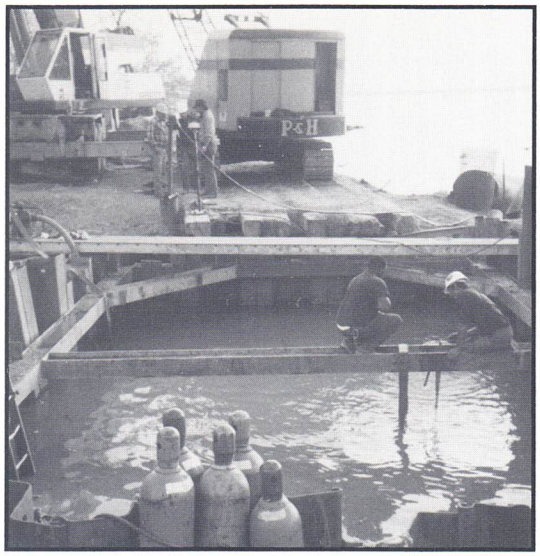
Water is pumped from the clear well into the water transmission system with four high-service pumps. Two large pumps are capable of pumping 3,000,000 gallons each per day and two smaller pumps can each pump 1.5 million gallons per day.

When a filter becomes dirty, it is back washed. This process starts by air scouring the media for two to four minutes. Water is then pumped backwards from the clear well at a rate of 7200 gallons per minute until the filter becomes clear. The backwash process may take up to 100,000 gallons of treated water and 20 minutes to perform.

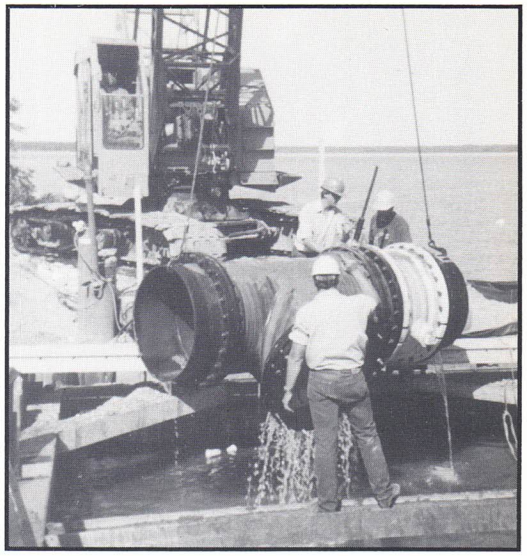
Water filtration of all surface water is required by the Safe Water Drinking Act (Public Act 399 of 1976). The Sault Ste. Marie water intake is located 1600 feet out in the St. Mary's River. The intake is in 40 feet of water, the water inlet 10 feet off the bottom. The structure is set in a cribbing filled with rip rap and covered by steel grating.



Testing Pressure with Fire Truck on Barge



Raw Water Tie-in



Pipe Assembly-Raw Water Tie -in

1. RAW WATER PUMP STATION

There are four vertical turbine-style pumps, capable of pumping 2,000,000 gallons of raw water each, per day, to the Water Filtration Plant.

2. RAPID MIXER

There are two 20-inch inline mixers to mix chlorine and alum and one 39-inch basin mixer to blend polymer if needed.

3. FLOCCULATION

Our four 33,000-gallon concrete tanks are in series. The flocculators are equipped with four variable-speed mixers with a 76-inch impeller. Flocculation detention time at maximum flow is 32 minutes.

4. SPLITTER BOX

This evenly divides the flow of water to each filter cell.

5. FILTRATION

The water is filtered through four filter cells with an area of 361 ft^2 each. Each filter is capable of filtering water at 1450 gallons per minute. Each filter cell has 30 inches of media, 12 inches of sand covered by 18 inches of anthracite charcoal.

6. DISINFECTION

Four solution-feed chlorinators are capable of feeding up to 250 pounds of chlorine per day.

7. CLEAR WELL

There is one 1.5-million gallon buried concrete tank with a six-hour detention time. Dimensions of clear well are 163 x 98 x 14ft.

8. FILTER BACKWASH

Filter backwash water is supplied with two 7200 gallons per minute vertical turbine-style pumps. The waste backwash water is conveyed to a 200,000 gallon storage tank, then pumped to the Wastewater Treatment Plant with three pumps capable of 230,000 gallons per day combined.

9. CHEMICAL SUPPLY

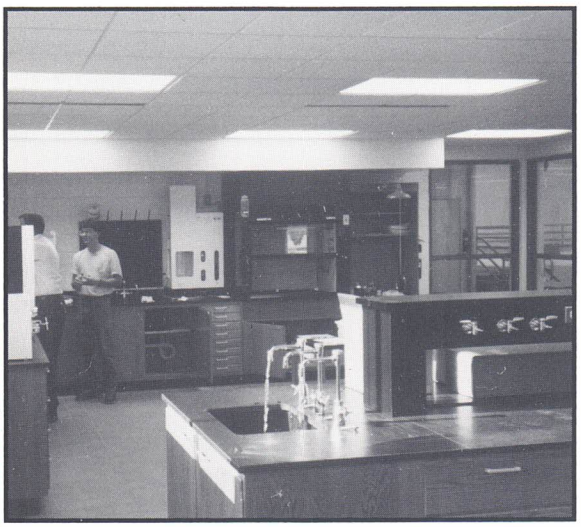
A. Fluoride: We have one storage tank with a capacity of 6,000 gallons of hydrofluosilicic acid. Two chemical feed metering pumps supply fluoride to the water at a concentration of 1.0 to 1.1 parts per million.

B. Alum: There are two storage tanks with a combined volume of 7,000 gallons. Three chemical feed metering pumps supply alum to our rapid mixer at a rate of 0.9 to 2.0 parts per million.

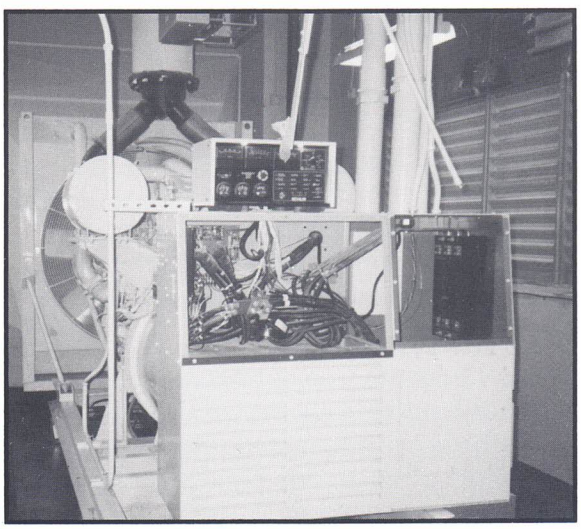
C. Polymer: It is used for additional coagulation if needed. It is applied at our #3 rapid mixer.

D. Lime: This is added to the water at a concentration of four to six parts per million. Used to eliminate corrosivity in treated water

First Load of Alum



Bacteriological Lab



Diesel Generator

Placing Filter Media

After the treatment process, the water travels through a new 24-inch transmission line that services customers before the elevated storage tanks. Whatever water is not used by customers goes into a 200,000 gallon elevated tank located on the Radar site, plus a 750,000 gallon elevated tank located at 4th Avenue and Meridian Street. Another elevated tank is located on 25th Avenue, which stores up to 250,000 gallons of water. During the summer, the City also uses the standpipe located at the corner of Ryan and Easterday. It holds 374,000 gallons. With all tanks full, the City has 3,100,000 gallons of water in storage. The City's normal use per day is 2,000,000 gallons.

If a power outage occurs for more than 15 seconds, our 600KVA diesel generator takes over. The generator is capable of supplying power to the entire Water Filtration Plant.

This Water Filtration Facility will serve the City of Sault Ste. Marie for many decades. Our old pumphouse was built in 1900 and served the community until the present Water Filtration Plant was put on-line on August 18, 1993.

Water Treatment Facility Construction Timetable

April 1988: The City of Sault Ste. Marie, received statements and interviewed several consulting firms. At this time, the City was uncertain if groundwater or surface water would be used to supply potable water.

May 1989: The City contracted with Fishbeck, Thompson, Carr & Huber (FTCH) for design development of a water treatment plant.

February 5, 1990: The City contracted with FTCH for final design phase for a direct filtration water treatment plant.

September 4, 1990: The City contracted for the Water Plant sitework and extension of lakeshore transmission main.

May 9, 1991: The City contracted out for construction engineering for the Water Plant.

May 1991: The construction bids were awarded.

May 1991: The City contracted with an underwater construction team to complete all necessary improvements to the intake. East of the old pumphouse is the new Raw Water Pump Station. Its purpose is to pump raw water to the Water Treatment Facility through a 20-inch-diameter pipe.

July 1991: Construction started on the Water Treatment Plant, at a cost of $6,247,000.00.

October 1991: The City awarded bids to DeVere Construction to install a second transmission line from the Water Treatment Plant to the 750,000 gallon elevated storage tank located at 4th Avenue and Meridian Street at the cost of $1,365,663.00.

August 16, 1993: Substantial completion of the Water Treatment Plant occurred when the plant was able to produce potable water.

August 18, 1993: At 2:30 p.m., the new Water Treatment Facility started producing treated water for the City of Sault Ste. Marie.