North Bay Water Treatment Facility and Distribution System Report Covering the Period between July 1 and September 30, 2000

Prepared by
City of North Bay Engineering and Environmental Services Department with data from the Ontario Clean Water Agency

This report is prepared in compliance with Section 12, Ontario Regulation 459 - Drinking Water Protection, as approved under the Ontario Water Resource Act (R.S.O. 2000).

North Bay's Water System:

The City of North Bay obtains its municipal water supply from Trout Lake, a high quality surface water source. The North Bay Water Treatment Plant, rated as a level 2 facility, is located at 280 Lakeside Drive, North Bay. Water is drawn from Delaney Bay at a depth of 21.5 m through a 1200 mm upright intake structure approximately 300 meters from shore through a polyethylene intake pipe. Water treatment at the North Bay Water Treatment Plant consists of coarse screening, disinfection through the continuous feed of sodium hypochlorite (chlorine), fluoridation and pH adjustments using soda ash occurs prior to distribution. The plant is owned by the City of North Bay and is operated by the Ontario Clean Water Agency (OCWA) under a long term contract. OCWA's operational staff certification exceeds operating requirements for the North Bay facility.

The North Bay Water Treatment Plant has been fully automated and can be run remotely through a Supervisory Control and Data Acquisition (SCADA) system by the Ontario Clean Water Agency. All key processes are fully alarmed. Raw water turbidity, free chlorine residual, treated water pH, fluoride and flow are continuously monitored and recorded. Post Chlorination also occurs within the distribution system at the Ellendale Highlift Reservoir, the Judge Avenue Valve Chamber and the Birches Road Standpipe. Continuous alarmed chlorine residual monitoring is carried out at these locations as well. The distribution system is operated by OCWA under a long term contract and is maintained by City forces (North Bay Public Works).

The City of North Bay water distribution system has 5 pressure zones. Zone 1, below the North Bay escarpment, is pressurized from the Ellendale Highlift Reservoir (4.0 Million Imperial Gallon (MIG) capacity) located at the top of Ellendale Road, North Bay. Pressure in Zone 1A, south of the Judge Avenue Valve Chamber can be controlled from the Ellendale Highlift Reservoir but is usually maintained from the Birches Road Standpipe (1.5 MIG capacity) located on Birches Road. Zone 2 (Canadore College area) and Zone 3 (Airport Hill) are pressurized by pumping stations located on Gormanville Road and at the Ellendale Highlift Reservoir. Zone 4 is pressurized by a small reservoir at CFB North Bay(0.4 MIG capacity) and by residual pressure from Zone 3. The system is fully monitored and controlled by OCWA through the SCADA system. The City of North Bay's distribution system is rated as a level 4 system.

North Bay's water system serves a population of 52,500 and the Trout Lake Treatment Plant has a total capacity of 115,900 m^3/day with a rated head of 83.8 m. The firm capacity of the Trout Lake pumping system is 79,500 m^3/day with pump 3 out of service. In a power failure this pumping rate is reduced to 17,500 m^3/day through emergency pump 5. The City has a water taking permit which permits a maximum withdrawal rate of 79,500 m^3/day from Trout Lake.

Summary of Chemical and Physical Characteristics[a] of Treated Water entering the North Bay Distribution System July 1 to Sept 30, 2000:

Month/ 2000	Total Flow (m^3)	Ave/Day Flow (m^3)	Max/Day Flow (m^3)	Ave Turbidity (NTU)	Max Turbidity[b] (NTU)	Ave Free Chlorine Residual (mg/L)	Ave Total Chlorine Residual (mg/L)	THM[c] (ug/L)	Max Fluoride (mg/L)	pH	Ave Temp ^{o} C
JAN	835,604	26,955	29,300	0.44	0.46	0.85	1.06		1.07	7.25	3.1
FEB	771,875	26,616	30,410	0.43	0.56	0.85	1.05		1.01	7.19	3.0
MAR	821,497	26,500	30,073	0.56	1.60	0.86	1.06	24.50	0.96	7.23	3.2
APR	819,945	27,332	32,607	0.56	0.69	0.83	1.03		0.83	7.20	4.5
MAY	924,432	29,724	38,170	0.61	0.82	0.81	1.01		0.90	7.20	5.9
JUN	947,460	31,582	40,610	0.80	1.50	0.81	0.98		0.95	7.15	6.8
JUL	**1,057,228**	**34,104**	**50,213**	**0.74**	**0.91**	**0.91**	**1.13**	**33.00**	**1.01**	**7.10**	**7.2**
AUG	**957,888**	**30,900**	**35,719**	**0.74**	**0.91**	**0.93**	**1.03**		**0.92**	**7.00**	**7.3**
SEP	**822,122**	**27,403**	**39,190**	**0.59**	**0.66**	**1.01**	**1.15**		**0.96**	**6.90**	**7.3**
OCT											
NOV											
DEC											
Total											
AVG:											
MAX:											
PDWS[d]:					1.00/5.00			100.0	1.5		

a) Data for Inorganics, Nitrate/Nitrites as well as Pesticide and PCB have not been provided. The City has never experienced an exceedance in any of these parameters.

b) Turbidity: A measure of water clarity. The maximum acceptable concentration is 1.0 Nephelometric Turbidity Unit (NTU) for water entering the distribution system. An appearance related aesthetic objective of 5 NTU has been set for water taken at consumers' taps.

c) Trihalomethanes: Chlorine can react with natural organics in water to create byproducts generally known as trihalomethanes. The maximum acceptable concentration is 100.0 ug/L based on four quarterly moving annual average test results.

d) Provincial Drinking Water Standards: Updated standards came into effect on August 8, 2000.

Microbiological Characteristics of North Bay's Treated Water:

Microbiological surveillance, or the monitoring for bacterial life in the water distribution system has been an ongoing program for the City of North Bay for many decades. Ontario Regulation 459 has established standardized protocols and has made it mandatory that data be publicly distributed. North Bay has adjusted its sampling program where required to comply with the new regulation which requires a minimum of 60 samples from the distribution system each month (8 +52). Microbiological monitoring consists of sampling for Total Coliforms (TC), *Escherichia Coli (E. Coli)* bacteria (EC) and General Background Populations (GBP). Data (below) is reported as pass or fail. A water sample would fail if a sample taken from within the distribution system obtained a reading greater than zero Colony Forming Units (CFU)/100 ml of either Total Coliform or *E. Coli* bacteria or if General Background Populations exceed 200 CFU/100 ml. If the City encounters a sample that fails the microbiological testing program, the location where the failing sample was obtained is immediately retested. If unacceptable growth in the City's system is found, the rate of chlorination is increased and water mains in the affected area are flushed to ensure that chlorine residuals reach the affected area. Testing and flushing continues until readings consistently meet applicable standards.

Microbiological Test Results for City of North Bay Water Distribution System:

	Total Coliforms			*E. Coli*			General Background		
Month	No. Taken	Pass	Fail	No. Taken	Pass	Fail	No. Taken	Pass	Fail
JAN	54	54	0	54	54	0	46	46	0
~~FEB~~	~~59~~	~~59~~	~~0~~	~~59~~	~~59~~	~~0~~	~~51~~	~~51~~	~~0~~
MAR	67	66	1	67	67	0	59	58	1
APR	60	60	0	60	60	0	52	52	0
MAY	74	74	0	74	74	0	74	74	0
JUN	69	69	0	69	69	0	61	61	0
JUL	**68**	**67**	**1**	**68**	**68**	**0**	**69**	**65**	**4[a]**
AUG	**85**	**85**	**0**	**85**	**85**	**0**	**85**	**81**	**4[a]**
SEP	**56**	**56**	**0**	**56**	**56**	**0**	**56**	**56**	**0**
OCT									
NOV									
DEC									
TOTAL	592	590	2	592	592	0	553	544	9

[a] data represents a single event in which there were multiple sample failures.

Notices Given within the Third Quarter of 2000

Notices of Adverse Water Quality were filed with the Medical Officer of Health and the Ministry of the Environment within the period July 1, 2000 to September 30, 2000 for three discrete events. Failed general background counts and a positive Total Coliform reading were recorded for City Fire Hall No. 3 on Marshall Park in mid July. The problem was isolated to a contaminated tap at the Fire Hall. A reported event, late in July, resulted from two general background sample failures at the end of Premier Road near Champlain Park. A third reportable event occurred in August of 2000 when a low chlorine residual was measured at the end of Pinewood Park Drive. Both of these later problems were caused by low chlorine residuals at the end of lines which were restored through increased chlorination and flushing. The City will systematically test all end of lines in the City over an 18 month period and will manually flush or install automatic flushing devices at key locations.

Steps Taken within the Quarter to comply with Provincial Water Quality Standards

The City has been very active in the 3rd quarter of 2000 assessing the impact of Ontario Regulation 459 and making modifications to plans and programs to respond to the new regulation. Ontario Regulation 459 which includes updated Provincial Water Quality Standards became effective on August 26th, 2000.

The largest impact of the updated regulation to North Bay is the upgrading of the minimum level of treatment from a guideline to legislation. The minimum level of treatment for a surface water source, which must be in place by the end of 2002, is chemically assisted filtration and disinfection or other treatment that the Ministry of Environment agrees is equal to or better than this standard. The new regulation also establishes a standard of 1.0 NTU as the maximum acceptable concentration of turbidity that can enter the City's distribution system. This will have implications on the City as it proceeds to add filtration or an equivalent process.

North Bay experiences periodic episodes where raw water turbidity spikes above 1.0 NTU for several hours at a time. This turbidity standard may affect the City's ability to meet the new filtration standard with an alternative (equivalent to) technology. North Bay is currently pilot testing emerging ultra violet irradiation as a means to protect consumers from chlorine resistant parasites that could enter Trout Lake. UV irradiation was recommended for further investigation in the Trout Lake Parasite Risk Study completed earlier this year. While UV irradiation may technically be equivalent to or better than filtration to treat North Bay's water, it is difficult to predict how the quality of the source may change overtime. Trout Lake is currently one of the best municipal water sources in Ontario and despite having a watershed protection strategy in place, these characteristics could change unpredictably. A trend through the 1990's of improving turbidity of raw water has abruptly ended in 2000 with turbidity returning to levels not seen for a decade and with several spikes that have exceeded 1.0 NTU. Historically spikes above 1.0 NTU have been encountered, on average, once every three years for a duration of several hours. No exceedance of this standard was experienced between July 1 and September 30, 2000.

The attractiveness of ultra violet irradiation is its adaptability to the City's current infrastructure. UV alone could simply be installed on the discharge line at the Trout Lake Water Treatment plant and it would in no way impede flows or restrict pumping rates. The intensity of the light increases or decreases to match the pumping rate. It would supplement current disinfection practices to ensure that anything that enters the distribution grid would be non viable. It would also have no effect on turbidity and technically its performance to inactivate any target life forms at turbidity levels equal to or higher than maximums experienced in North Bay should soon be known. Higher turbidity levels, however, could affect the City's ability to carry a chlorine residual in the distribution system, causing microbiological failures to become more common. This again could be remedied by intensifying distribution monitoring and by maximizing use of post chlorination systems. Results from the UV pilot study will be known by the end of 2000.

Other measures that the City of North Bay and the Ontario Clean Water Agency have taken to comply with the new regulation include reviewing sampling and analysis protocols and making adjustments were necessary. Protocols for reporting indicators of adverse water quality, making data and reports publically available have been established and are being followed. The City is in the process of hiring a consulting firm to complete the "Engineers Report" required by Regulation 459. The City has supplemented the Terms of Reference to provide direction on complying with filtration by the end of 2002. The City has also prepared its first Quarterly Report.