



## North Bay Water Treatment Facility and Distribution System Report for the Period of October 1 and December 31, 2000 (Second Issue)

Prepared by  
City of North Bay Engineering and Environmental Services Department with data supplied by  
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).*

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### **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 polyethylene intake structure approximately 300 meters from shore. The intake is situated 4 meters above the lake bottom. 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 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 operating staff certification exceeds the certification required for the North Bay facility.

The North Bay Water Treatment Plant has been 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, as well as treated water free chlorine residual, pH, fluoride and flow are continuously monitored and recorded. Post chlorination 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 remote locations. Treatment and pumping stations are operated by OCWA, and the distribution system 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 is pressurized 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 a 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<sup>3</sup>/day with a rated head of 83.8 m. The firm capacity of the Trout Lake pumping system is 79,500 m<sup>3</sup>/day with pump 3 out of service. In a power failure this pumping rate is reduced to 17,500 m<sup>3</sup>/day through emergency pump 5. The City has a water taking permit which allows a maximum withdrawal rate of 79,500 m<sup>3</sup>/day from Trout Lake.

**Table 1: Summary of Chemical and Physical Characteristics<sup>a,b</sup> of Raw and Treated Water entering or in the North Bay Distribution System, 2000 with October 1 to December 31 Highlighted**

Month/ 2000	Total Flow (m <sup>3</sup> )	Ave/Day Flow (m <sup>3</sup> )	Max/Day Flow (m <sup>3</sup> )	Ave Turbidity (NTU) (Raw)	Max Turbidity <sup>c</sup> (NTU) (Raw)	Ave Free Chlorine Residual (mg/L)	Ave Total Chlorine Residual (mg/L)	Max Fluoride (mg/L)	pH	Ave Temp °C	Distribution System	
											THM <sup>d</sup> (ug/l)	Lead (ug/l)
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	0.96	7.23	3.2	41.50	0.22
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	1.01	7.10	7.2	42.50	0.56
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		
<b>OCT</b>	<b>879,610</b>	<b>28,375</b>	<b>33,790</b>	<b>0.53</b>	<b>0.63</b>	<b>1.00</b>	<b>1.14</b>	<b>1.14</b>	<b>7.08</b>	<b>8.2</b>	<b>56.00</b>	<b>BDL<sup>e</sup></b>
<b>NOV</b>	<b>813,805</b>	<b>27,127</b>	<b>33,112</b>	<b>0.45</b>	<b>1.20</b>	<b>0.96</b>	<b>1.16</b>	<b>1.00</b>	<b>7.37</b>	<b>7.4</b>		
<b>DEC</b>	<b>924,108</b>	<b>29,810</b>	<b>32,038</b>	<b>0.45</b>	<b>0.59</b>	<b>1.03</b>	<b>1.23</b>	<b>0.92</b>	<b>7.31</b>	<b>3.8</b>		
Total	10,600,231											
AVG:		28,946		0.56		0.90	1.08				46.66	
MAX:			50,213		1.60	1.03	1.23					
PDWS <sup>f</sup> :					1.00/5.00			1.50			100.00	10.0

- a) Chlorine residuals, Fluoride, pH and Average Temperature are reported for water entering the distribution system while trihalomethanes and lead are from distant points within the distribution system.
- b) Data for other 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. Data is available from the Engineering and Environmental Services Department upon request.
- c) 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 5.0 NTU has been set for water taken at consumers' taps." (Quoted directly from the PWQS definition of Turbidity)
- d) 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.

- e) Below Detection Limit
- f) 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 of the City of North Bay for many decades. North Bay has adjusted its sampling program where required to comply with the new regulation. Microbiological monitoring consists of testing for Total Coliforms (TC), *Escherichia Coli* (*E. Coli*) bacteria (EC) and General Background Populations (GBP). Data presented in Table 2 is reported as pass or fail. A water sample fails if greater than zero Colony Forming Units (CFU)/100 ml of either Total Coliform or *E. Coli* bacteria are encountered or if General Background Populations exceed 200 CFU/100 ml. If the City encounters a sample failure, the location and surrounding locations of the sample failure are immediately retested. If unacceptable growth in the City’s system is detected, chlorination rates are boosted and water mains in the affected area are flushed to ensure that adequate chlorine residuals reach the affected area. Testing and flushing continue until provincial standards are achieved or exceeded.

**Table 2: Microbiological Test Results for City of North Bay Water Distribution System, 2000**

Month	Total Coliforms			<i>E. Coli</i>			General Background		
	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 <sup>a</sup>
AUG	85	85	0	85	85	0	85	81	4 <sup>a</sup>
SEP	56	56	0	56	56	0	56	56	0
<b>OCT</b>	<b>82</b>	<b>80</b>	<b>2<sup>b</sup></b>	<b>82</b>	<b>82</b>	<b>0</b>	<b>82</b>	<b>82</b>	<b>0</b>
<b>NOV</b>	<b>61</b>	<b>61</b>	<b>0</b>	<b>61</b>	<b>61</b>	<b>0</b>	<b>61</b>	<b>61</b>	<b>0</b>
<b>DEC</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>70</b>	<b>67</b>	<b>3<sup>c</sup></b>
<b>TOTAL</b>	<b>805</b>	<b>801</b>	<b>4</b>	<b>805</b>	<b>805</b>	<b>0</b>	<b>766</b>	<b>754</b>	<b>12</b>

<sup>a</sup> data represents a single event in which there were multiple sample failures.

<sup>b</sup> contaminated sample bottles suspected

<sup>c</sup> two of the reported sample failures were detected in a private line through private sampling

### Notices Given within the Fourth Quarter of 2000

The City and the Ontario Clean Water Agency have initiated an end of water main chlorine residual and microbiological testing program to determine the extent of chlorine residual dissipation at the extremities of the City’s water distribution system and the impact to microbiological growth. Nine “Notices of Adverse Water Quality” were filed with the Medical Officer of Health and the Ministry of the Environment during the period of October 1, 2000 to December 31, 2000. Seven notices resulted from low chlorine residuals detected within the distribution system at the end of water mains and two were reported due to the presence of microbiological indicators. At the seven low chlorine sites free chlorine was measured at less than 0.05 mg/l, the minimum required pursuant to Reg 459. All sites were immediately flushed and restored to above the 0.2 mg/l free chlorine level. In total, 175 ends of lines will be tested over the next 12 months. One site, privately sampled, was reported due to general

background counts above 200 CFU/100 ml in a private line. A second site which had a positive Total Coliform count was attributed to contaminated sample bottles.

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

The City of North Bay has been active on several fronts to seek ways to achieve compliance with Ontario Regulation 459. Ontario Regulation 459, including updated Provincial Water Quality Standards became effective on August 26<sup>th</sup>, 2000. Currently the City has until the end of 2002 to achieve compliance.

North Bay is studying ways to upgrade its water treatment system and to improve chlorination within its distribution system. Ontario Regulation 459 has established a minimum level of treatment for surface water sources, to be achieved by the end of 2002. Chemically assisted filtration and disinfection or other treatment that the Ministry of Environment feels is equal to or better than filtration must be implemented by the end of 2002. The new regulation has set a standard of 1.0 NTU as the maximum acceptable turbidity concentration that can enter the City's water distribution system which could limit options the City might consider to achieve compliance with the new regulation. Ontario Regulation 459 also has implications that will affect the City's water distribution system as end of line testing is showing that residuals fall below the minimum criteria from time to time. In the short term manual flushing of lines will suffice to maintain residuals, however, permanent flushing, looping of lines and changes to chlorination practices may be required to provide relief from continuous manual maintenance activities.

North Bay has completed a fall pilot program to test a new ultra violet irradiation reactor currently being developed by Trojan Technologies Inc. Pilot Study results are pending. UV irradiation was recommended for further investigation in the Trout Lake Parasite Risk Study, completed in 2000. While UV irradiation may be technically equivalent to or better than filtration for North Bay, the effectiveness of this technology could diminish with deteriorating source quality. Trout Lake is currently one of the best municipal water sources in Ontario, however, trends have been difficult to establish. For example a trend of improving raw turbidity through the 1990's ended in 2000 when turbidity reached levels not seen for a decade with several episodic spikes exceeding 1.0 NTU. Historically, turbidity spikes above 1.0 NTU have been encountered once every three years, on average, for a duration of several hours. The most recent spike was experienced on November 11<sup>th</sup>, 2000, when 1.0 NTU was exceeded for several hours and a peak of 1.2 NTU was reached. This exceedance was triggered by a rainfall event and is thought to mark the start of fall lake turnover.

An attractive feature of ultra violet irradiation is its adaptability to the City's current plant. A series of UV reactors could be installed on the discharge line at the Trout Lake Water Treatment plant without impeding flows or restricting pumping rates. The intensity of the irradiation in the reactors would automatically increase or decrease to match pumping rates and turbidity levels. It could provide excellent synergy with current chlorination practices to meet new provincial standards. UV irradiation would supplement current disinfection to help ensure that microbiological life entering the distribution system is inactivated. While UV irradiation offers no protection against rising turbidity levels, its effectiveness has been demonstrated at much higher turbidity levels than historically experienced in North Bay. Pre and post chlorination practices are also being studied as part of the required Engineers Compliance Report that will be completed by March 31, 2001.

The City of North Bay and the Ontario Clean Water Agency have implemented many other measures to comply with the new regulation. Protocols for the reporting of adverse water quality events have been complied with and making data and reports publically available are also now in place. The City is in the process of completing the "Engineers Report" required by Regulation 459. The City has supplemented the Terms of Reference for this report to provide direction on complying with new water treatment standards by the end of 2002. The City has now also prepared a second Quarterly Report and both reports are accessible on the City's Web Site at [www.city.north-bay.on.ca](http://www.city.north-bay.on.ca).