North Bay Water Treatment Plant and Distribution System Report for the Period of January 1 to March 31, 2001 (Third 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).

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 248 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 as well as at the CFB reservoir and at the Canadore Pumping Station. 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 54,000 and the 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=s water taking permit allows a maximum withdrawal of 79,500 m^3/day from Trout Lake.

Table 1: Summary of Chemical and Physical Characteristics[a,b] of Raw Water and Treated Water entering or in the North Bay Distribution System, 2001 (with January 1 to March 31, 2001 highlighted)

Month/ 2000	Total Flow (m^3)	Ave/Day Flow (m^3)	Max/Day Flow (m^3)	Ave Turbidity (NTU) (Raw)	Max Turbidity[c] (NTU) (Raw)	Ave Free Chlorine Residual (mg/L)	Ave Total Chlorine Residual (mg/L)	Ave Fluoride (mg/L)	Max Fluoride (mg/L)	pH	Ave Temp ^{o}C	Distribution System THM[d] (ug/l)	Distribution System Lead (ug/l)
JAN	**880,590**	**28,406**	**31,855**	**0.38**	**0.42**	**1.00**	**1.21**	**0.79**	**0.90**	**7.3**	**3.7**		
FEB	**761,081**	**27,181**	**29,280**	**0.33**	**0.42**	**0.98**	**1.21**	**0.75**	**0.84**	**7.0**	**3.6**	**40.0**	
MAR	**848,109**	**27,358**	**28,980**	**0.38**	**0.60**	**1.01**	**1.18**	**0.77**	**0.84**	**7.2**	**3.3**		
APR													
MAY													
JUN													
JUL													
AUG													
SEP													
OCT													
NOV													
DEC													
Total AVG:												40.0	
MAX:													
PDWS[e]:				1.00			100.0		0.80				

1) 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.

2) 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 for other parameters are available from the Engineering and Environmental Services Department upon request.

3) Turbidity: A measure of water clarity. AThe maximum acceptable concentration is 1.0 Nephelometric Turbidity Unit (NTU) for water entering the distribution system.@ AAn 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)

4) 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.

5) 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. Microbiological monitoring consists of testing for Total Coliforms (TC), *Escherichia Coli (E. Coli)* bacteria (EC) and General Background Populations (GBP) in the distribution system. Data presented in Table 2 is reported as pass or fail. A water sample fails to meet Provincial Water Quality Standard 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 within the distribution system. 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, 2001

	Total Coliforms			*E. Coli*			General Background		
Month	No. Taken	Pass	Fail	No. Taken	Pass	Fail	No. Taken	Pass	Fail
JAN	**75**	**75**	**0**	**75**	**75**	**0**	**75**	**75**	**0**
FEB	**59**	**59**	**0**	**59**	**59**	**0**	**59**	**59**	**0**
MAR	**60**	**60**	**0**	**60**	**60**	**0**	**60**	**60**	**0**
APR									
MAY									
JUN									
JUL									
AUG									
SEP									
OCT									
NOV									
DEC									
TOTAL	194	194	0	194	194	0	194	194	0
Ave/mth*	64.7	64.7	0	64.7	64.7	0	64.7	64.7	0

*Reg 459 requires the City to take a minimum of 62 samples per month in the distribution system

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. This program was suspended in the first quarter of 2001 due to winter conditions. Two ANotices of Adverse Water Quality@ were filed with the Medical Officer of Health and the Ministry of the Environment during the period of January 1, 2000 to March 31, 2001. The two notices resulted from low chlorine residuals detected within the distribution system near the end of water mains. At the low chlorine sites free chlorine was measured at less than 0.05 mg/l, which is the threshold of having no chlorine as defined by Ont Reg 459. All sites were immediately flushed and restored to

above the 0.2 mg/l free chlorine level.

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, came into effect on August 26th, 2000 and the City has until the end of 2002 to achieve compliance.

On March 31, 2001 the City of North Bay filed its Engineers Report with the Ministry of the Environment in compliance with Ont Reg 459. This report has a companion report entitled AEvaluation of UV Disinfection for the North Bay Water Treatment Plant@. Both reports have been completed by CH_2M Hill Canada Ltd. The Engineers Report provides a thorough evaluation of raw source water as well as treated and distributed water in the North Bay system. and makes recommendations on compliance issues and ways to improve North Bay=s water supply system.

The Engineers Report recommends that, in order to comply with Ont Reg 459, the City should add membrane filtration to its Treatment Facility on Lakeside Drive. The only other form of filtration that was determined to meet new regulation treatment objectives was conventional filtration. Membrane filtration, the act of extracting ultra pure water through microscopic holes in a membrane, which leaves the dirt and particles behind, is judged to be less expensive, it produces a better quality product and it can be made to fit at the existing site on Lakeside Drive. The UV report indicates that UV should also be able to achieve compliance with the new regulations if the province is willing to consider US Environmental Protection Agency (USEPA) filtration avoidance guidelines. The substitution of UV treatment in place of membrane filtration could be linked to other considerations such as stronger watershed protection programs. The implementation of UV would initially be on an experimental or probationary basis and would be accompanied with in-depth assessment of raw water quality to confirm design engineering considerations. Once UV was in place, should the province accept the merits of USEPA filter avoidance criteria, the City could also initiate pathogenic analysis of its raw water supply.

Conventional Treatment has been costed at $32 million with an operation and maintenance burden of $1 million/year; micro filtration is costed at $25 million with an operation and maintenance cost of $1 million/year; and Ultra Violet treatment is costed at $1.6 million with an operation and maintenance cost of $84,000/year (UV operating costs are on top of existing operational costs of the current plant).

As well as the obvious cost advantage of the UV option there are other factors that must be taken into consideration. Treatment with ultraviolet light does not take anything out of the water, it merely inactivates living particles so that they cannot reproduce and thus infect humans. Such a barrier adds little protection from spills into the supply and it could be rendered ineffective if there is significant deterioration in the quality of the source supply. Filtration on the other hand may provide a better barrier against some types of spills and it provides a quality product irrespective of what happens to the quality of the source over time. The level of interest of source protection by the City is directly dependant on the method of treatment that the City selects. The total cost of UV, however may be increased if other watershed protection costs, such as extending sanitary sewers to Anita Avenue, is considered in the overall price. Many communities are considering the addition of UV to their treatment system, even after filtration, to add another level of disinfection and to reduce by products in the distribution systems.

The Engineers Report has several other recommendations for the City to implement to achieve compliance with

Ont Reg 459 including improvements to the City-s chemical storage and dispensing equipment, improved monitoring of raw and treated water quality, improving chlorine contact by moving the point of application to the inlet of the intake, improving data collection and retrieval mechanisms and improving the Operations manual at the treatment plant. A study of the distribution system was also recommended as well as a continuation of distribution system testing and flushing which has already been initiated by the City.

Quarterly Reports are available from City Hall or at North Bay-s Web Site at www.city.north-bay.on.ca.