

Newington Water Treatment Plant

Certificate of Approval No. 0941-5SSJU4 (June 2004)
Works No. 220008051

- 2008 Summary Report -
(revised November 19, 2009)

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NEWINGTON WATER TREATMENT PLANT

2008 SUMMARY REPORT

Facility description:	Communal ground water supply system
Capacity:	328 m³/day
Service area:	Village of Newington
Service population:	150
In-service date:	1937
Water source:	Ground water
Disinfection method:	Sodium Hypochlorite (liquid chlorine)
Operations manager:	Chris Eamon (613)-551-2720

The Newington water works draws groundwater from two wells located within the Newington Fairgrounds. The supply/treatment and storage works (STSW) consists of the two wells and disinfection by sodium hypochlorite.

The wells are operated in series. The first well, known as the “Kraft” well is the primary source of water. It is a dug well which was originally installed in 1937. The well equipment was upgraded in 1988, including pump upgrade, pressure tanks, chlorination equipment, etc.

In dry periods, when the water level hits a minimum depth in the Kraft Well, the pump in the second well, the “Fairgrounds” well, is activated to pump water to the Kraft Well. The Fairgrounds Well is a drilled well originally installed in 1979.

Additional descriptions of the wells and disinfection system are provided in the following sub-sections.

Well #1 – The Kraft Well

Well #1 is a dug well installed at a reported depth of 5.2 m. It is located on Lot 7 of Concession Road 8, Township of South Stormont.

The Permit to Take Water limit for Well #1 is 326.9 m³/d. Groundwater is pumped from one of two submersible pumps (capacity 3.8 L/s @ TDH 52.7 m) each installed in 200 mm diameter well casing. A check valve is located on the discharge of the pumps to prevent backflow. The well discharge is connected to the lift station via 6 meters of 75 mm diameter schedule 80 PVC pipe. Flow is measured by an online Magnetic flow meter.

Well #2 – The Fairgrounds Well

The Fairgrounds Well is located on lot 7 Concession Road 8, Township of South Stormont, approximately 330m north of the Kraft Well. Groundwater is pumped by a single submersible pump. The capacity of the pump is 1.4 l/s @ TDH 30.5 m of head. The Permit to Take Water limit for the well is 65.5 m³/day. The well casing is 200 mm diameter and the well is drilled to a reported depth of 14 m. The piping from the Fairgrounds Well to the pump station is 38 mm Schedule 40 PVC. There is approximately 470 m of piping between the Fairgrounds Well and the water treatment plant. The piping leaves the well, enters the front end of the lift station, passes through the mechanical flow meter, through a 3 – way valve to be either discharged to the drainage system for the purpose of purging the line and then discharges to the Kraft Well. The Fairgrounds Well is currently operated only manually.

Treatment

Disinfection is supplied by 6% sodium hypochlorite. The metering pump rate is set to correspond with the groundwater pumping rate and the chlorine residual in the distribution system. There is one duty chlorine metering pump (and one stand by) that injects the hypochlorite solution into the system when the Kraft well pumps operate.

Pumping is activated by a pressure drop in the distribution system. Pressure is maintained by six (6) pressure tanks in the lift station. The pressure tanks are Amptol, S Model WX-350, "Well-X-Trol". The pressure tanks maintain a pressure of 470 kPa in the feeder main to the distribution system.

The piping from the pump station to the distribution system is mostly 75 mm diameter PE Series 100 pipe. A 21 m length of 600 mm diameter pipe has been installed between the plant and the distribution system to provide additional chlorine contact time prior to the first user.

As water exits the plant, the treated water is monitored for turbidity. Free chlorine is monitored at the end of the contact piping.

Cartridge Filtration

Two series (duty and standby) of 10 micron, 5 micron, and 1 micron "absolute" filters are run in parallel. Each filter train has a differential pressure transmitter and switch which that is connected to a three way solenoid valve. Should the differential pressure exceed 14 m of water (20 psi), the water is directed to the standby water filter train.

Between each filter there is a manual pressure gauge, such that the operator can determine which filters need to be cleaned or changed as a result of the 20 psi pressure differential.

Chlorine Contact Facilities

The cartridge filters provide 2.0-log *Cryptosporidium* cyst inactivation. Therefore, chlorine disinfection contributes a minimum of 1.0-log giardia cyst inactivation and 4-log virus inactivation. The installation of underground piping provides the required chlorine contact time.

The raw water demonstrates the following characteristics pH = 8 and minimum temperature = 5 °C. The operational staff has an operational objective of achieving a free chlorine residual of 0.8 mg/l in the treatment water. Therefore, from the tables in the Procedure for the Disinfection of Drinking Water in Ontario, the CT value required to obtain 1.0-log inactivation of giardia is 70.

A sample line from the downstream side of the retention pipe to the water treatment plant continuously analyzes free chlorine.

Standby Power

C of A (Air) No. 7220-5KTVHV, dated March 24, 2003, has been issued for a 60 kW diesel generator (installed within its own housing to the south west of the Newington WTP). It provides standby power to all components of the plant. A 1,500 L double walled diesel fuel storage tank was installed with the generator.

Miscellaneous Upgrades

Kraft Well Pumps

Due to the pressure differential occurring across the filters, the pumps in the Kraft Well were changed to ensure a design capacity of 227 L/min at 73 m TDH. A flow restrictor was mounted on the discharge of each pump to ensure the pumping rate does not exceed the limitations contained in the Permit to Take Water.

Chlorine Metering Pumps and Free Chlorine Analyzer

A new sodium hypochlorite feed system was installed at the Newington WTP. The chemical feed pumps are rated at 0.59 LPH at a maximum pressure of 102 m. The pumps are equipped with auto-degassing liquid ends to reduce the probability of air locks from occurring. The pumps are controlled by a terminal box which allows for automatic switchover and selection of duty pump.

The sodium hypochlorite is injected via a quill and corporation stop into the centre of the pipe, ensuring mixing of the hypochlorite.

The dosage of the chlorine metering pumps is controlled by a combination of the existing flow meter and the chlorine analyzer. An on-line chlorine analyzer was installed to measure the free chlorine residual of the treated water upstream of the chlorine retention piping (described in Section 2.1.2). The analyzer is equipped with dual alarms for high and low free chlorine residual set points. The flow to the analyzer is approximately 30 litres per hour.

On-line Continuous Turbidity Meter

An on-line turbidity meter was installed to monitor the turbidity from the cartridge filter effluent. The flow through the turbidity meters is not to exceed 40 lph, as per manufacturer specifications.

Modifications to Fairgrounds Transmission Main

The Fairgrounds Well is typically utilized when the Newington Fair takes place (approximately two weeks of every year). Therefore, the pump and the Fairgrounds Well lay dormant for extended periods of time.

In order to provide turnover in the well and drain the forcemain prior to discharge to the Kraft Well, the transmission main was modified such that a discharge line was connected to the main to allow for discharge pumping to the drainage system.

Commissioning of the upgraded facilities commenced in December 2004 and continued into 2005.

Compliance with Terms and Conditions of the Certificate of Approval

The Newington Water Treatment Plant and distribution system is operated and maintained in accordance with O. Reg. 170/03 dated June 1, 2003 and Certificate of Approval No. 0941-5SSJU4 dated June 10, 2004.

A valid Permit to Take Water was issued May 16, 2005 (No. 7850-6B2PSS) and permits the taking of water from two wells – the Kraft Well (326.9 m³/day) and the Fairground Well (65.5 m³/day). The permit expires April 30, 2015.

The water treatment plant is operated to treat water at a rate not exceeding the maximum flow rate of 328m³/day. The average water taking for the year was 87 m³/day, 27% of the authorized water taking. (See Appendix I for total flow, average monthly flow and maximum monthly flow.) The flows into the water treatment plant did not exceed the maximum flow rate of 328m³/day at any time.

The works and related equipment and appurtenances used to achieve compliance with Certificate of Approval No.0941-5SSJU4 are properly operated and maintained, including effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this certificate and the Act and regulations, adequate laboratory facilities, process controls and alarms, and the use of the process chemical that comes in contact with the water being treated is suitable for the process and appropriate for drinking water.

A mechanical meter measures the flow rate and daily quantity of water taken from each well and conveyed to, and through, the water treatment plant. The flow rate of treated water supplied to the distribution system is recorded as total flow (See Appendix I). The flow meter was calibrated June 19, 2008 by Ken Harris Instrumentation.

Free chlorine residual and turbidity in treated water is continuously monitored at the point of entrance into the distribution system. The Prominent chlorine analyzer is accurate to $\pm 2\%$ of the measured value. An alarm system calls out when the chlorine goes below 0.45 mg/L or above 2.50 mg/L. Operators at the Newington Water Treatment Plant try to keep the chlorine residual at around 1.00 mg/L. The on-line chlorine analyzer is checked with the hand-held chlorine analyzer and adjusted as required. The ABB 4670 turbidity is accurate to ± 0.1 NTU (Nephelometric Turbidity Unit). The turbidity analyzer is checked monthly using a hand-held turbidity analyzer and adjusted accordingly. Raw water turbidity is analyzed monthly. The turbidimeter alarms out when the turbidity reaches 1.00 NTU (Nephelometric Turbidity Units) for a period greater than 14 minutes, 50 seconds and will shut the system down to prevent turbid water from entering the contact pipe. (See Appendix I for monthly average turbidity, and minimum, maximum and average chlorine residual.) The chlorine and turbidity analyzers were calibrated June 19, 2008 by Ken Harris Instrumentation.

Operators in charge of the Newington Water Treatment Plant keep a daily log book recording flow meter readings, free and total chlorine residual (both continuous and grab samples), turbidity, and other physical and chemical parameters of the treated water. The WTP is checked (at minimum) every 72 hours.

Samples are collected throughout the year from the raw water and treated water to determine whether or not the water is safe for human consumption (in accordance with O. Reg.170/03, Schedule 10 and 13, Microbiological and Chemical Sampling and Testing). Bacteriological analysis is performed weekly (1 sample each per week of raw and treated water, and 8 samples monthly from the distribution system (representing the water stream from which they are taken), from two (2) sampling locations, and chemical analysis is performed once a year (treated – Schedule 23 and 24) and 4 times a year (treated - nitrates and distribution - THMs). Sodium and fluoride (treated water) are tested once every 60 months. Lead is required to be sampled from private plumbing (20 samples), non-residential (2 samples) and in the distribution system (4 samples). (See Appendix II for chemical parameters.) All samples are analyzed at Caduceon Environmental Labs in Nepean, Ontario. Caduceon and its subcontracted labs are accredited by the Standards Council of Canada. Written procedures have been established for the notification of the Medical Officer of Health and the Ministry of the Environment Spills Action Centre should a sample result indicate an exceedance has occurred. (See Appendix III for Procedures for Indicators of Adverse Water Quality.)

Free chlorine residual in the distribution system is monitored by an alarmed online analyzer with datalogging. The analyzer is checked, at minimum, every 72 hours. The analyzer will alarm out

when the chlorine goes below 0.15 mg/L for a period greater than 15 minutes. The online distribution chlorine analyzer was calibrated June 19, 2008 by Ken Harris Instrumentation.

All records and information relating to or resulting from the monitoring, sampling and analyzing activities required by the Certificate of Approval are retained for a minimum of 5 years.

The Newington Water Treatment Plant is classified as a Water Treatment 1 (Certificate No. 3668) and Water Distribution 1 (Certificate Number 903). Operators responsible for the operation of the Newington Water Treatment Plant hold valid licences applicable to this type of water treatment plant.

Following all maintenance or repairs to the water treatment facility, all affected areas are disinfected in accordance with the MOE's "Procedure for Disinfection of Drinking Water in Ontario" dated March 17, 2003. All chemicals used in the treatment process and all materials contacting the water meet both the American Water Works Association (AWWA) quality criteria and the American National Standards Institute (ANSI) safety criteria. All chemicals have been registered by a testing institution accredited under the Standards Council of Canada Act or by ANSI.

A contingency plan and procedures have been established and implemented and adequate equipment and material are available for dealing with emergencies, upset conditions and equipment breakdowns in the works.

An operating manual has been prepared and is kept up to date, incorporating the requirements of the Certificate of Approval, and any adopted operation and maintenance recommendations of the Engineer's Report (May, 2001) based on which this certificate has been issued. The manual includes monitoring and reporting of the necessary raw water and in-process parameters essential for control of the treatment process and for the assessment of the performance of the works. It also contains procedures that are required for adequate operation and maintenance of the monitoring equipment.

Drawings are prepared and kept up-to-date showing the new works as constructed (record drawings), including timely incorporation of all modifications made to the works throughout its operational life.

A Process and Instrumentation Diagram (PID) for the entire water treatment plant has been prepared and is kept up-to-date, including timely incorporation of all modifications made to the works throughout its operational life.

All record drawings and diagrams and all existing record drawings which are currently in retention throughout the operational life of the water works are readily available for inspection by Ministry staff.

Procedures have been established and are followed for receiving, responding to, and recording complaints about any aspect of the works, including recording the steps that were taken to determine the cause of complaint and the corrective measures taken to alleviate the cause and prevent its reoccurrence. (See Appendix IV for complaint form.)

Non-Compliance with Terms and Conditions of the Certificate of Approval

Ministry of the Environment's Compliance Inspection for 2008/2009 was completed on September 24, 2008. A copy of the report and the Township's response is available at the Township Office.

MAINTENANCE

March 3 – investigated electrical failure that caused Feb. 29th call out (checked capacitor and pump control for any electrical problems) (Marleau Mechanical)
March 24 – further investigation into electrical and mechanical problems with well pumps causing alarms (Marleau Mechanical)
March 25 – notified TRG of mechanical problems with both well pumps – loud vibration noise and electrical problem causing electrical faults on pump start up and run time
April 3 – annual inspection of generator (GAL Power)
April 7, 10, 14, 17, 22, 24 & 29 – T.R.G. on site to collect sample of raw water to test for fuel contamination (diesel fuel spill in village)
May – TRG on site to collect raw water samples
June 10 – TRG on site to collect raw water samples
June 11 – serviced fire extinguishers (Pyro Pro)
June 18 – Marleau Mechanical on site to check pump – needs to be removed
June 19 – annual calibration of instruments (Ken Harris Instrumentation)
July 2 – remove pump # 2A for repair (Marleau Mechanical and Alguire Crane)
July 8 – reinstalled pump 2A after being re-built (Marleau Mechanical and Alguire Crane)
August 12 – TRG on site to collect raw water samples
August 13 – Bell Canada technician on site to verify phone line from Fairgrounds well to WTP
August 14 – investigating Fairground communication failure alarm (Marleau Mechanical)
August 19 – replaced blown fuse and contact relay at pump panel at Fairground well (Marleau Mechanical)
August 19 – flushed and sampled Fairground well
August 27 – turned on service for Fairground well
August 28 – sampled Fairground well
September 4 – repaired leaks in filter canisters. Also repaired union on south bank side prior to filters (Eastern Welding)
November 17, 2008 – checked pump 2A – everything seemed normal (Marleau Mechanical)