



# **City of Pembroke Water Purification Plant**

## **Annual Report**

**2005**

Prepared by David Atkinson

# **PEMBROKE WATER PURIFICATION PLANT**

## **ANNUAL REPORT 2005**

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Municipality	Pembroke
Plant	Water Purification Plant
Capacity	36,368m <sup>3</sup>
Water Source	Ottawa River

### **Chemicals Used**

Chlorine Gas  
Pre-hydrated Aluminium Sulphate  
Sodium Silicate  
Sulphuric Acid  
Soda Ash  
Sodium Hypochlorite

## Projects completed in 2005

Construction of backwash storage tank and filter to waste valves to reduce TU spikes after backwashes is on-line. A Suspended Solid meter was purchased to ensure accurate reading and trending of backwash waste. De-chlorination equipment for the discharge water to the Ottawa River added to reduced toxics being pumped to the Ottawa River.

Metering pumps for process chemicals were purchased to allow for improved pumping rates and alarm system to signal to the standby operator equipment failure.

## Projects anticipated for 2006

Quarry Road inlet valve actuator is being replaced and a manual valve is being added to allow for reservoir isolation.

The SCADA computer version is to be updated to allow communication with the SCADA at the Pembroke Pollution Control Centre.

Filter Media, both sand and anthracite will be replaced having been in operation since plant construction.

City of Pembroke  
UTILITIES DEPARTMENT – WATER PURIFICATION PLANT

**ANNUAL COMPLIANCE REPORT 2005**

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This annual report prepared for the City of Pembroke's Water Purification Plant and Distribution Systems is available for inspection at City Hall and is also located on the City of Pembroke website in the Utilities section of City Departments.

**Water System Description**

The Pembroke Water Purification Plant (WPP) is located on the shores of the Ottawa River located in the City of Pembroke. The plant was built in 1984 with an approved capacity of 32,368 m<sup>3</sup>/day.

A 424 metre long, 760-mm diameter intake into the Ottawa River connects an intake crib to the plant raw water well. Four low lift turbine pumps, two rated at 125 litres/sec each, and two smaller pumps, rated at 60 litres/sec each convey raw water through a flow metre and a flash mixer to the flocculation/coagulation tanks (two sets of three tanks in series). Two settling tanks equipped with travelling hydraulic sludge collectors followed by dual media rapid gravity filters (134 m<sup>2</sup> area of filter).

The clearwells have a storage capacity of 8000 m<sup>3</sup>. With high lift pumps as follows:

- two vertical turbine high lift pumps each rated at 275 l/s
- one vertical turbine high lift pump rated at 175 l/s
- one vertical turbine high lift pump rated at 125 l/s

The chemical feed systems generally consist of the following:

- alum feed system (25,000 litres bulk storage tank and two feed pumps and piping)
- soda ash preparation and feed system for raw and treated water alkalinity and pH adjustment, dry feeder chemical feeder, 2,000 litre slurry tank and feed pumps soda ash bulk storage 25 tonnes
- sodium silicate feed system (22,000 litres bulk storage tank and two feed pumps and piping) for enhancement of alum effectiveness
- automatic sulphuric acid preparation and batching system used to activate the sodium silicate
- two vacuum chlorinators for pre- and post-chlorination utilizing one tonne gas cylinders

- one vacuum chlorinator for Contact Time chlorination

There are a total of two storage facilities in the distribution system; a 2,300 m<sup>3</sup> elevated tower at Bell Street and Fraser Street and a 4,500 m<sup>3</sup> in-ground reservoir at Quarry Road, which includes a booster pumping station. Sodium Hypochlorite is added at both locations depending on chlorine requirements. Both locations have automatic chlorine analysers and pH meters relaying all data to the SCADA system located at the main plant for constant monitoring.

**Water Purification Plant Classification**

**Level 3**

Operator Certification Levels as per O. Regulation 128/04

Superintendent	Level 4
Chief Operator	Level 4
Operator 21)	Level 4
Operator (1)	Level 3
Operator (1)	Level 1
Operator (2)	Level OIT

**Distribution System Classification**

**Level 1**

Superintendent	Level 2
Supervisor	Level 1
Operator (5)	Level 2
Operator (4)	Level 1
Operator (2)	OIT

**Accredited Laboratory**

Accutest Laboratory Ltd.  
 146 Colonnade Rd Unit 8  
 Ottawa ON K2E 7Y1 Phone: (613) 727-5692

Sampling as per Ontario Regulation 170/03

Microbiological

Total coliform, Escherichia coli or fecal coliforms, Heterotrophic plate count or total coliform background county by membrane filter analysis.

Raw water	94 samples annually
Filtered water	52 samples annually
Treated water	94 samples annually
Bell Street Tower	50 samples annually
Quarry road in-ground reservoir	50 samples annually
Distribution	385 samples annually

Sampling as per Ontario Regulation 170/03 Schedule 23 Inorganics and Schedule 24 Organics

Included is THM's, Lead, Nitrate & Nitrite, Sodium and Fluoride (Distribution)

- TU continuous monitoring (raw water, filter water, treated water)  
Grab sample taken daily to confirm filter monitoring results
- Chlorine analysis continuous monitoring  
Grab sample taken daily to confirm instrumentation results

### **Treatment Process Monitoring and Controls**

#### Raw Water and Treated Water

- Flow transmitters serviced by plant electrician
- Serviced and calibrated by plant operators as per instrument manuals
- Storage wells are drained, flushed and inspected annually as per maintenance manuals
- Pumps are serviced and inspected annually
- All records of calibrations and inspections are kept on file

#### On Line Instrumentation

Monitored by plant SCADA system. Data is collected and stored on hard drives and hard copy files.

#### Chemical Metering Pumps

Calibrated weekly to ensure proper dosing to both raw water and treated water. Results are recorded and filed. Drives and speed controllers are serviced by plant electrician.

#### Plant operations require staff to conduct analysis for

- Temperature, pH, total alkalinity, colour, turbidity, aluminum, free, combined and total chlorine residual and hardness
- Daily grab samples are submitted to the Radiation Protection Service of the Ministry of Labour in Toronto for radiological testing
- Drinking Water Sampling Program (DWSP) is ongoing
- Atomic Energy of Canada Limited (AECL) are sent a 1000 ml sample daily

### **Indicators of Adverse Water Qualities**

- Any count of e-coli or fecal coliform
- Any count of total coliform
- Unchlorinated water or where water has a 0.05 chlorine residual or less
- Water having 500 colonies per mL on a heterotrophic plate count
- Samples containing more than 200 background colonies on a total coliform membrane filter analysis
- Aeromonas, pseudomonas aeruginosa, staphylococcus aureus, clostridium or fecal streptococci
- Sodium exceeding 20 mg/l
- A pesticide not listed

### **Water Purification Plant and Distribution: Occurrence of Adverse Water Quality**

1.	January 12, 2005	Total Coliform	Water treatment Plant	Re-sampled
2.	March 24, 2005	Total Coliform	Isabella Street	Re-sampled
3.	August 9, 2005	Low Free Chlorine	Pollution Control Centre	Flushed
4.	August 13, 2005	Low Free Chlorine	Pollution Control Centre	Flushed
5.	November 23, 2005	Background	Boundary Road	Flushed

## PEMBROKE WATER PURIFICATION PLANT

### 1. Compliance with Terms and Conditions of the Certificate of Approval

The City of Pembroke confirms that the water treatment is operated and maintained in such a manner that the water supplied meets the requirements of the "Ontario Drinking Water Standards".

The Water Purification Plant has not exceeded its rated capacity as per the Permit To Take Water #80-P-4029.

All disinfection facilities in the water treatment plant are operated and maintained in accordance with Ministry Procedure B13-3. Post filtration disinfection achieves 0.5-log removal/inactivation for Giardia Cysts and 4-log removal/inactivation for viruses at the plant capacity with unit processes providing contact time at a minimum operating level and under limiting temperature and pH conditions.

### 2. Upgrades Completed in 2004 to meet Terms and Conditions of the Certificate of Approval

- Construction of a concrete backwash storage tank with 1200 m<sup>3</sup> capacity
- Transfer pumps in the backwash storage tank including a force main for discharged water to the Ottawa River and one for sludge to the collection system.
- Filter to waste valves and piping.
- Turbidity meters at filter effluents
- New de-chlorination system for backwash water
- New ORP sensor to detect chlorine in discharge water
- Adjust overflow weir and modify flap gate at clearwell effluent
- 100 kW diesel/generator in a self contained outdoor enclosure

### 3. Modified Operations for Monitoring Purposes

- Purchased and installation of aluminium pumps and remote controls with automatic changeovers on failure
- Achieve and maintain adequate disinfection after filtration as per B13-3
- Improved SCADA fir diesel control and remote operation

## SUMMARY OF QUANTITY OF WATER SUPPLIED IN 2005

### Item

#### Water Purification Plant

Average daily flow in m <sup>3</sup> /day	9 125 m <sup>3</sup>
Maximum daily flow m <sup>3</sup> /day	13 582 m <sup>3</sup>
Minimum monthly average of chlorine	0.97 mg/L
Maximum monthly average of chlorine	1.11 mg/L
Rated plant capacity m <sup>3</sup> /day	36 352 m <sup>3</sup> /day

#### Bell St Tower

Minimum monthly average of chlorine	0.73 mg/l
Yearly average of chlorine	0.79 mg/L

#### Quarry Rd

Minimum monthly average of chlorine	0.64 mg/L
Yearly average of chlorine	0.81 mg/L

### Attachments:

1. [System Calibration – June 2005](#)
2. [Transmitter Calibration](#)
3. [Instrument Output Signal Calibration](#)
4. [Distribution Bacti Results and Free Chlorine Residuals](#)
5. [Report of Analysis](#)
6. [Annual Summary](#)
7. [Microbiological](#)