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|  General DWQMS Administration | TITLE: Operational Plan |
| | QMS REFERENCE: N/A |

Drinking Water Quality Management System

Operational Plan for A.L. Dafoe DWS & Sandhurst Shores DWS



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1 Introduction

Quality Management can be defined as the policy and associated organizational structures, procedures, responsibilities, and evaluation measures that ensure the capability of delivering a product to specified standards. The use of Quality Management systems by modern industry has steadily increased over the last 30 years, since the development of the first ISO standard in 1986. Whether implemented voluntarily or as a requirement of suppliers to larger manufacturers, Quality Management has repeatedly proven beneficial in terms of accountability, quality control, efficiency, and productivity.

Although historically used on a voluntary basis by some progressive water utilities, the idea of mandated province-wide implementation of a Quality Management Standard by drinking water system owners originated as a recommendation in the Part Two Report of the Walkerton Inquiry. In summary, Recommendations 51 through 57 from the report state the following:

- Drinking water systems should be operated by authorities that are accredited based on successful third-party audits conducted by a certified accrediting body.
- The Ministry of the Environment, Conservation and Parks, in partnership with other relevant stakeholders, should develop a Drinking Water Quality Management Standard against which the third-party audits will be conducted.
- All municipalities should prepare Operational Plans describing how the requirements of the Quality Management Standard are achieved.

The Provincial Government has committed to implementing all recommendations tabled by the report author, The Honourable Dennis R. O'Connor.

In accordance with those recommendations, this Operational Plan serves as a Quality Management System Guidance Manual that describes the methods by which the Town of Greater Napanee implements Quality Management. The Plan is written to meet or exceed the requirements of the Ministry of the Environment, Conservation and Parks prescribed standard and is applicable to the management and operation of those works described in Section 6.

2 Quality Management System Policy

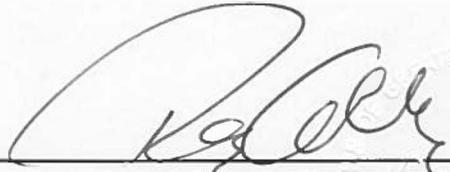
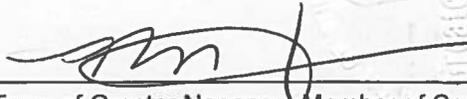
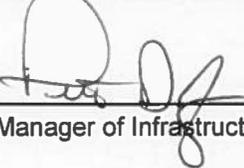
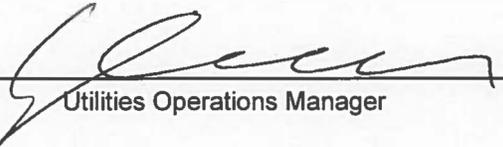
The Town of Greater Napanee is committed to supplying a safe, consistent drinking water supply, and to complying with all applicable regulatory requirements. We strive to achieve these goals through the implementation of a management system comprised of documentation that demonstrates risk-based treatment process evaluation, staff competency, open communications, workplace safety and appropriate emergency response measures.

The managers and employees of the Town of Greater Napanee who are directly involved in the supply of drinking water, share in the responsibilities of implementing, maintaining and contributing to the continual improvement of the Drinking Water Quality Management System.

3 Commitment and Endorsement

The Town of Greater Napanee supports the implementation, maintenance, and continual improvement of a Drinking Water Quality Management System (DWQMS) for the A.L. Dafoe Drinking Water System and the Sandhurst Shores Drinking Water System, as documented in this Operational Plan. Endorsement by the Owner, (represented by the Town of Greater Napanee Chief Administrative Officer and/or one Councillor and/or the General Manager of Infrastructure Services), and Top Management, (represented by the Director of Utilities and/or the Utilities Operations Manager), acknowledges the need for, and supports the provision of sufficient resources to maintain and continually improve the DWQMS.

Endorsement of this Operational Plan is found below. The endorsement is with respect to the generality of its content. The Owner and Top Management will be required to sign a new endorsement within the first Quarter of a new term of Council or when major revisions are made.

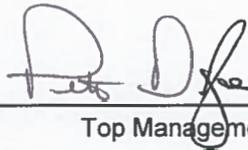
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| <u>APRIL 23, 2019</u> Date |  Town of Greater Napanee, CAO |
| <u>APRIL 23, 2019</u> Date |  Town of Greater Napanee, Member of Council |
| <u>April 26, 2019</u> Date |  General Manager of Infrastructure Services |
| <u>N/A.</u> Date | <u>N/A @ time of endorsement. K.</u> Director of Utilities |
| <u>April 25/19</u> Date |  Utilities Operations Manager |

4 DWQMS Representation

Top Management represented by the Director of Utilities or the General Manager of Infrastructure Services hereby designates the Manager of Environmental Compliance as the Drinking Water Quality Management System (DWQMS) Representative. In the absence of the Manager of Environmental Compliance, the Utilities Operations Manager will fulfill the role as the back-up DWQMS Representative. Top Management and the Designated Representative(s) acknowledge that, regardless of other responsibilities, the Representative(s) shall:

1. administer the DWQMS by ensuring that processes and procedures needed for the DWQMS are established and maintained,
2. report to Top Management the performance of the DWQMS and any need for improvement,
3. ensure that current versions of documents required by the DWQMS are being used at all times,
4. ensure that personnel are aware of all applicable legislative and regulatory requirements that pertain to their duties for the operation of the subject drinking-water system, and
5. promote awareness of the DWQMS throughout the Operating Authority.

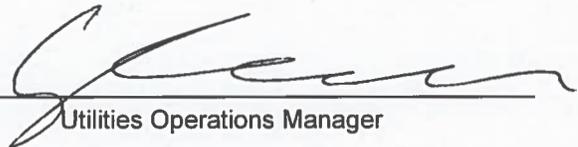
April 26 / 19
Date


Top Management

2019/04/10
Date


Manager of Environmental Compliance

2019/04/25
Date


Utilities Operations Manager

5 DWQMS Document and Records Control

Details regarding DWQMS document identification, retention, storage and disposal are contained within the Document Control Procedure (GEN-P1). DWQMS records are retained according to the Records Control Procedure (GEN-P2).

6 Drinking Water Systems

A.L. Dafoe Drinking Water System Process Description

General

The A.L. Dafoe Purification Plant and distribution system provides a potable water supply to the residents and businesses of the Town of Napanee. The facilities include a Class III conventional water treatment plant having an approved capacity of 10,450 m³/d, and a Class II water distribution system which are owned and operated by the Town of Greater Napanee.

Source water for the treatment process is drawn from Lake Ontario, a surface water source, located approximately 18 km south of the town. Potentially pathogenic organisms are removed from the raw water source by the following processes:

1. Pre-chlorination
2. Coagulation / flocculation / sedimentation
3. Filtration
4. Post-chlorination (primary disinfection)
5. Distribution system chlorine residual (secondary disinfection)

Raw Water Supply

Water is drafted from Lake Ontario and pumped through a 500mm pipeline to a reservoir located at the northeast corner of County Road 8 and Golf Course Lane. Sodium hypochlorite is added at the Lake Ontario intake for zebra mussel control and to provide initial disinfection. The addition of sodium hypochlorite to the raw water supply is referred to as pre-chlorination, and serves primarily as a measure to prevent microbiological growth within the raw water pipeline and reservoir. Pre-chlorine residual is measured continuously in the raw water entering the treatment facility.

If circumstances arise that prevent the transfer of raw water from Lake Ontario, the purification plant can be configured to draw raw water from the Napanee River. Raw water volumes drawn from the surface water source are measured at the inlet to the treatment process.

Coagulation / Flocculation / Sedimentation

Water flows by gravity from the raw water reservoir through two 150mm electrically actuated valves to the water treatment plant. Alum (hydrated aluminum sulphate) is added to the incoming raw water upstream from the flocculation basin to promote settling and enhance filtration. Rapid mixing of the alum with the raw water occurs as the raw water passes through an in-line static mixer. The alum-water solution enters a baffled flocculation basin where gentle mixing promotes the formation of flock masses which attract and gather debris present in the source raw water. Flow is then directed into sedimentation tanks where the flock is provided sufficient detention time for settling. Supernatant (the clear liquid above the settled flock) overflows the sedimentation tank effluent weir to the top of the dual media filters.

Most of the particulate matter that was present in the raw water is captured by the flock particles and removed by gravity in the sedimentation tanks, however, during normal operations, some flock passes from the sedimentation tanks to the top of the filters.

Filtration

The A.L. Dafoe Purification Plant has two parallel dual media filters. The top layer of the filters is granular activated carbon (GAC). The filter media below the GAC layer is sand. The GAC is effective in removing organic compounds, many of which are responsible for unpleasant taste and odour sometimes experienced during the warmer months. Residual particulate matter (flock) carried over from the sedimentation process is trapped primarily in the sand portion of the filter. As debris accumulates in the filters and limits flow, they must be cleaned by reversing the flow (referred to as backwashing) and directing the backwash to a waste holding tank.

Turbidity, a measure of the cloudiness of water, is measured continuously in the effluent from each filter to monitor the effectiveness of the filtration process. If the turbidity rises above a set point value, an alarm warns staff that corrective actions are needed.

Filtered water passes through the filter under-drain into the treated water clearwells. The clearwells are baffled tanks located beneath the filters that are used to store filtered water and to provide disinfectant contact time.

Disinfection (Chlorination)

Primary disinfection (post-chlorination) occurs following filtration, immediately upstream from the treated water clearwells. Primary chlorination disinfects the filtered water, ensuring that any potentially pathogenic organisms that may remain after sedimentation and filtration are rendered harmless prior to distribution to consumers. Disinfection consistency is ensured by continuous monitoring of chlorine residual in the treated

water leaving the facility. If the residual drops below a safe level, pumping to the distribution system is automatically interrupted and an operator is notified to correct the problem.

Secondary disinfection is accomplished by adding sufficient chlorine at the purification plant to maintain a residual throughout the entire distribution system. Secondary disinfection prevents growth of micro-organisms within the distribution system.

Process Waste Residuals Management

Filter backwash water and accumulated alum floc from the sedimentation tanks are directed to an equalization tank from where they are pumped to a residuals thickening process. The sludge collected within the thickening process is pumped to the municipal sanitary sewer. The clarified effluent from the thickener is de-chlorinated and discharged to the Napanee River.

Distribution System and Elevated Storage Tanks

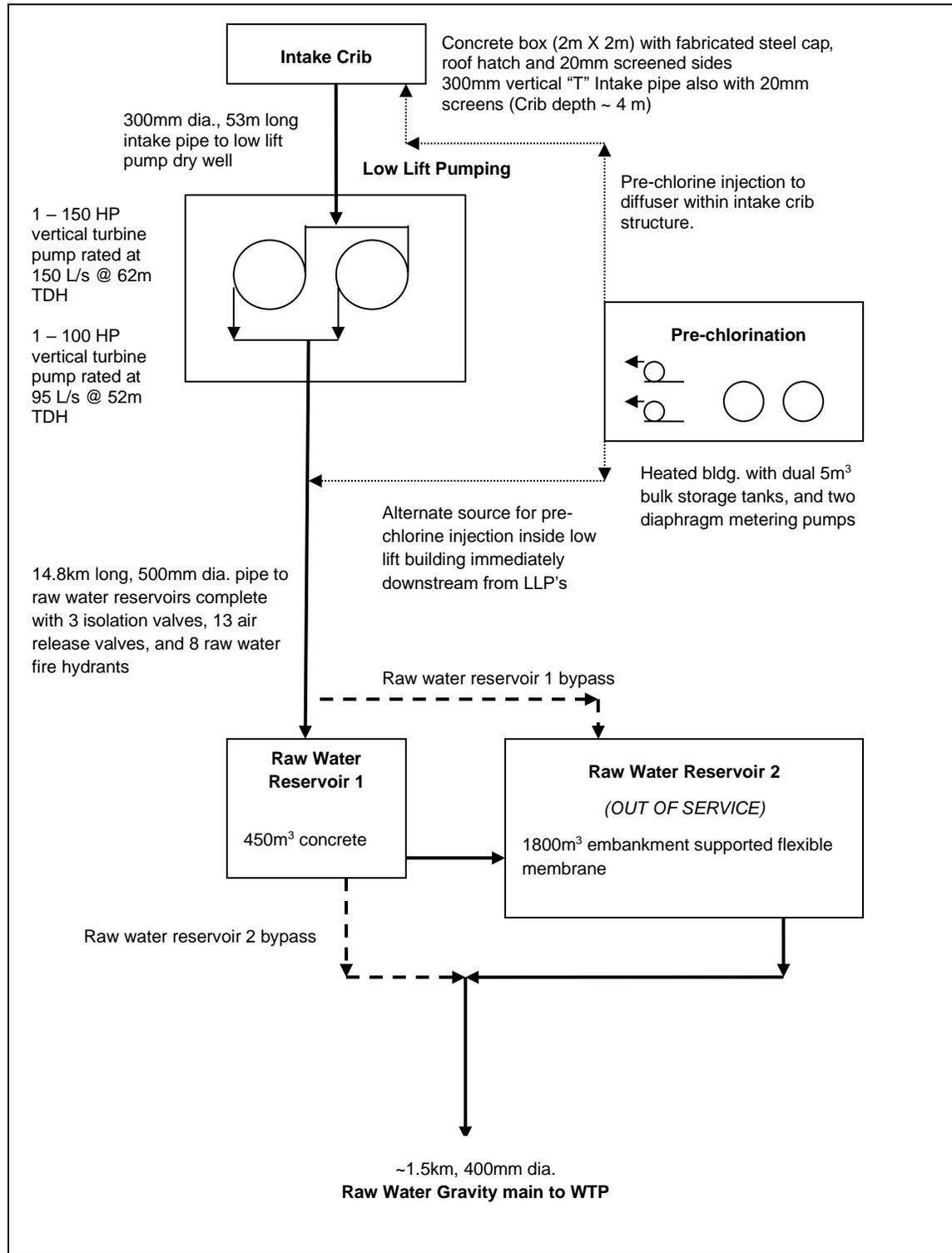
Treated water is pumped from the clearwells into the distribution system. Distribution piping typically ranges in size from 150 mm to 450 mm, and may consist of cast iron, ductile iron, concrete, or PVC, depending on the location and date of installation. Two pressure booster stations, (one at the south end of town on McCabe Street and the other at the north end of town on Community Road), are used to ensure adequate system pressure in areas of higher elevation or locations significantly removed from the plant and elevated storage tanks. Typical system pressure ranges from 45 psi to 80 psi. Two elevated storage tanks (one at the north end of East Street and the other at the top of the hill on Highway 2) are integral components of the distribution system. The purpose of the storage tanks is to provide relatively constant system pressure and a reserve volume of water for community fire protection.

Sample Analysis

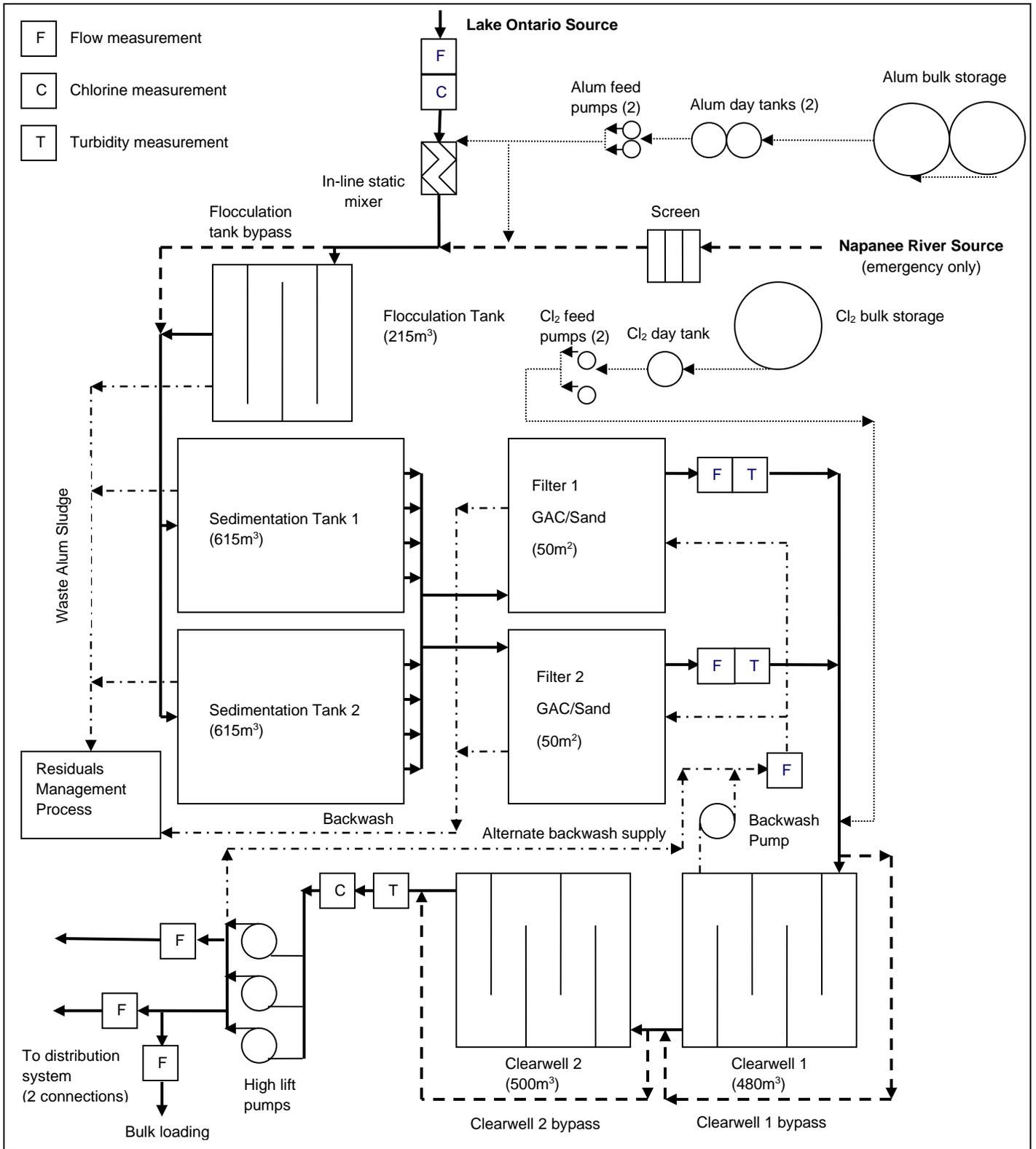
Provincial regulations dictate sampling and monitoring requirements for the system. Water quality is tested throughout the treatment process and from dedicated sampling hydrants located at the extremities of the distribution system. Where required by regulation, samples are submitted to an accredited laboratory for analysis.

Process Diagrams

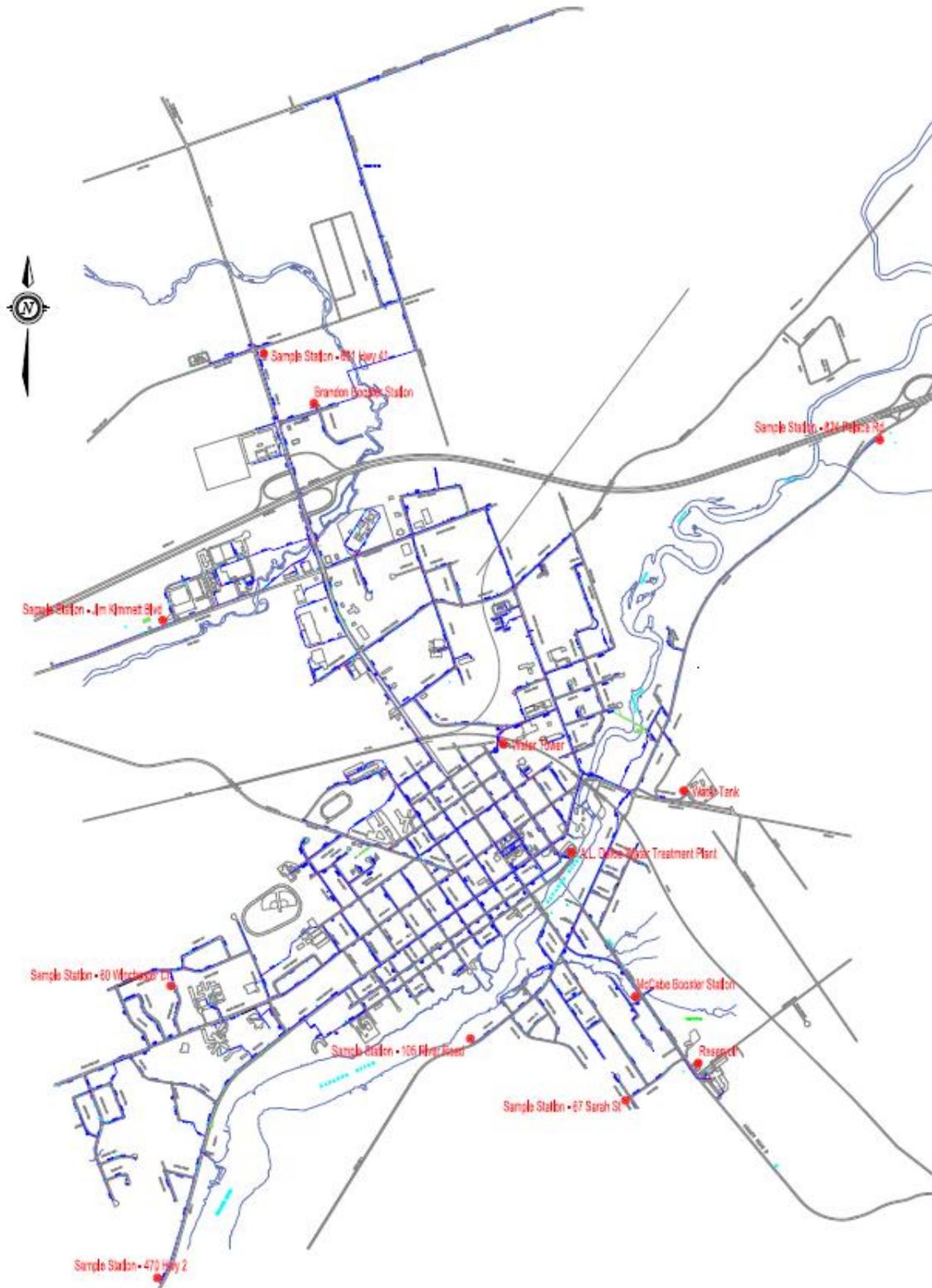
A.L. Dafoe Drinking Water System - Lake Ontario Raw Water Transmission



A.L. Dafoe Purification Plant



Napanee Water Distribution Subsystem



Source Water Overview

General

The primary raw water source for the A.L. Dafoe Drinking Water System is Lake Ontario. Lake Ontario water is typically very low in turbidity (<1 NTU), low in colour, slightly basic, and marginally hard (~120mg/L as CaCO₃) due to the local limestone geology. Temperature fluctuates significantly throughout the seasons ranging from approximately 4 Celsius in the winter to over 20 Celsius during the summer. Chemical and bacteriological analysis of the raw water indicates a source of relatively good quality.

Events

Seasonal changes in raw water temperatures cause vertical turnover of the lake water during spring and fall. Turnover typically takes place over a relatively short duration (~2 – 7 days). During that period, settled solids from the lake bed are re-suspended resulting in increased raw water turbidity. Changes in raw water temperature will also have impacts on treatment unit process performance (clarification, disinfection).

Optimal treatment may require adjustments to treatment chemical dosages (disinfectants and coagulants) in response to raw water temperature and turbidity fluctuations.

Threats

Potential sources of raw water contamination include agricultural runoff, spills from nearby highway traffic mishaps, waste from commercial marine freighters and recreational watercraft, and potential spills from the adjacent power plant, the Lennox Generating Station.

The Lake Ontario intake pipe is approximately 50 metres offshore, at a depth of less than 3 metres to the top of the crib. Due to the relatively near shore and shallow positioning of the crib, the intake is susceptible to potential accidental damage from marine craft or ice, and is also vulnerable to intentional acts of vandalism or contamination. Some risk of plugging of the intake screen by Zebra Mussel growth or from other miscellaneous debris in the water also exists.

Operational Challenges

Lake Ontario provides high quality source water, which is, for the most part consistently low in bacteriological contamination and turbidity. While operator response is sometimes needed for events of elevated turbidity and temperature changes, the most significant challenge related to the source water is the vulnerability of the single 16

kilometre transmission line through which the water is transported to the treatment facility. Repairs to pumping equipment or the transmission line results in an interrupted supply to the treatment facility. It is essential that the communications and monitoring equipment from the remote low lift pumping station and raw water reservoir remain in good working order so that problems are identified quickly. Preventive and breakdown maintenance must be carefully planned to minimize the interruption to raw water supply. An inventory of spare parts and repair equipment must be maintained to facilitate rapid restoration of raw water pumping.

The contingency source from the Napanee River should be used only under extreme circumstances as river quality is inferior and therefore more difficult to treat. Additionally, rapid mixing of the alum with the raw water is not possible when using the river source, resulting in less than ideal conditions for coagulant performance.

Secondary (Contingency) Raw Water Source

The secondary intake for the plant is located on the Napanee River immediately upstream from the falls at Springside Park and serves as a contingency supply in the event that flow is interrupted from the primary Lake Ontario source.

River contamination risks include municipal storm water runoff, agricultural runoff, leakage from rural sanitary systems, and industrial discharges from the Strathcona Paper Mill located approximately 5 km upstream. Napanee River water is highly coloured from naturally occurring organic substances, which leach into the water from native watershed flora. Turbidity and temperature fluctuations are more pronounced from the river source when compared to the primary Lake Ontario source. Operators must be prepared to make appropriate changes to coagulant and disinfectant dosages if the contingency source is utilized.

Use of the contingency supply is considered only under extreme circumstances given the process related problems associated with treating a source water of inferior quality.

Sandhurst Shores Drinking Water System Process Description

General

The Sandhurst Shores Water Treatment Plant and distribution system provides a potable water supply to the residents of Sandhurst Shores. The facilities include a Class II chemically assisted filtration package treatment unit (design capacity of 372 m³/d), and a Class II water distribution system, which are owned and operated by the Town of Greater Napanee.

Source water for the treatment process is drawn from Lake Ontario, a surface water source. Potentially pathogenic organisms are removed from the raw water source by the following processes:

1. Pre-chlorination
2. Coagulation / flocculation / sedimentation
3. Filtration
4. Post-chlorination (primary disinfection)
5. Distribution system chlorine residual (secondary disinfection)

Raw Water Supply

Water is drafted from Adolphus Reach, Lake Ontario through a 250mm diameter intake pipe which extends approximately 285 metres into Lake Ontario, submerged to a depth of about 12 metres. Sodium hypochlorite is added at the intake for zebra mussel control and to provide initial disinfection. The addition of sodium hypochlorite to the raw water supply is referred to as pre-chlorination, and serves primarily as a measure to prevent microbiological growth within the raw water pipeline and reservoir. Pre-chlorine residual is measured continuously in the raw water entering the treatment facility.

Screens at the plant inlet prevent any large debris from passing into the treatment process. After passing through the screens, raw water flows into a tank referred to as a low lift well from where it is pumped to the treatment process. The low lift pumps are controlled by the volume of treated water stored at the plant. As community use lowers the level of the treated water storage tanks, the low lift pumps are activated to replenish the used volume. The flow rate of raw water from the surface water source is measured immediately upstream from the inlet to the treatment process.

Coagulation / Flocculation / Sedimentation / Filtration

The Sandhurst Shores treatment process combines coagulation, flocculation, sedimentation, and filtration in one large partitioned steel tank. (See diagram on following page) This integrated process design, which is common in smaller communities, is referred to as a package plant. Within the package plant, raw water first enters a vertical cylinder referred to as a draft tube. The draft tube contains a turbine that creates a rapid mixing zone where coagulation is induced by the addition of alum and polymer. As the coagulating chemicals mix with the water, flocculation (gathering together) of suspended particles occurs. As flow progresses downstream from the draft tube, velocity decreases within the flocculation zone where baffles gently mix the flocculated solids causing them to collide and join together to form larger clumps prior to entering the settling compartment.

The settling compartment contains a series of inclined hollow 50mm plastic tubes. The inclined tubes are designed to maximize the rate at which the flocculated solids settle to the bottom of the tank. The accumulated settled solids are periodically drained from the bottom of the settling compartment to a waste holding tank. The relatively clear water at the top of the settling compartment flows into the dual media (sand and anthracite) filters. The filters remove particulate matter that may remain in suspension following the settling compartment. The filters require regular cleaning which is accomplished by a process referred to as backwashing. Backwashing temporarily reverses flow through the filter and discharges the wash water to a waste holding tank.

Turbidity, a measure of the cloudiness of water, is measured continuously in the effluent from the filters to monitor the effectiveness of the filtration process. If the turbidity rises above a set point value, the low lift pumps automatically turn off to prevent the passage of turbid water to the treated water storage tank. Elevated filtered water turbidity also activates an alarm to alert staff that corrective actions are needed.

Filtered water passes through the filter under-drain nozzles into the treated water reservoirs located below the package plant.

Treated Water Storage

Treated water storage is comprised of four concrete tanks. The first two reservoirs located immediately downstream from the package treatment process have a combined capacity of approximately 365m³ and operate in parallel configuration. Either tank can be isolated and removed from service. The third tank has a volume of approximately 80m³ and is the location of chlorine injection for primary disinfection. Treated water then flows to the 110m³ high lift pump suction well from where it is conveyed to the distribution system by three pumps, one vertical turbine and two submersible.

The high lift pumps are controlled by a programmable logic controller and variable frequency drive that changes pump speed to meet varying system demand while maintaining consistent system pressure. Pressure surges and dips are dampened by two 1000L hydro-pneumatic tanks connected to the high lift pump discharge header. The plant is also equipped with a fourth high lift pump that is sized to satisfy fire flow demand if needed.

Disinfection (Chlorination)

Primary disinfection (post-chlorination) occurs following filtration, immediately upstream from the high lift pump clearwell. Primary chlorination disinfects the filtered water, ensuring that any potentially pathogenic organisms that may remain after sedimentation and filtration are rendered harmless prior to distribution to consumers. Disinfection consistency is ensured by continuous monitoring of chlorine residual in the treated water leaving the facility. If the residual drops below a safe level, pumping to the distribution system is automatically interrupted and an alarm is activated to alert an operator to correct the problem.

Secondary disinfection is accomplished by adding sufficient chlorine at the treatment plant to maintain a residual throughout the entire distribution system. Secondary disinfection prevents growth of micro-organisms within the distribution system. Distribution system chlorine residual is monitored continuously at a public building located in the northeast quadrant of the Sandhurst Shores distribution system.

Distribution System

Treated water is pumped from the clearwells into the distribution system. The Sandhurst Shores distribution system consists of approximately 3,600 metres of PVC piping, ranging in size from 150mm to 200mm. There are approximately 50 valves and 26 hydrants located within the distribution system. Three dedicated sampling hydrants are installed at the far reaches of the system for water quality sampling.

Process Waste Residuals Management

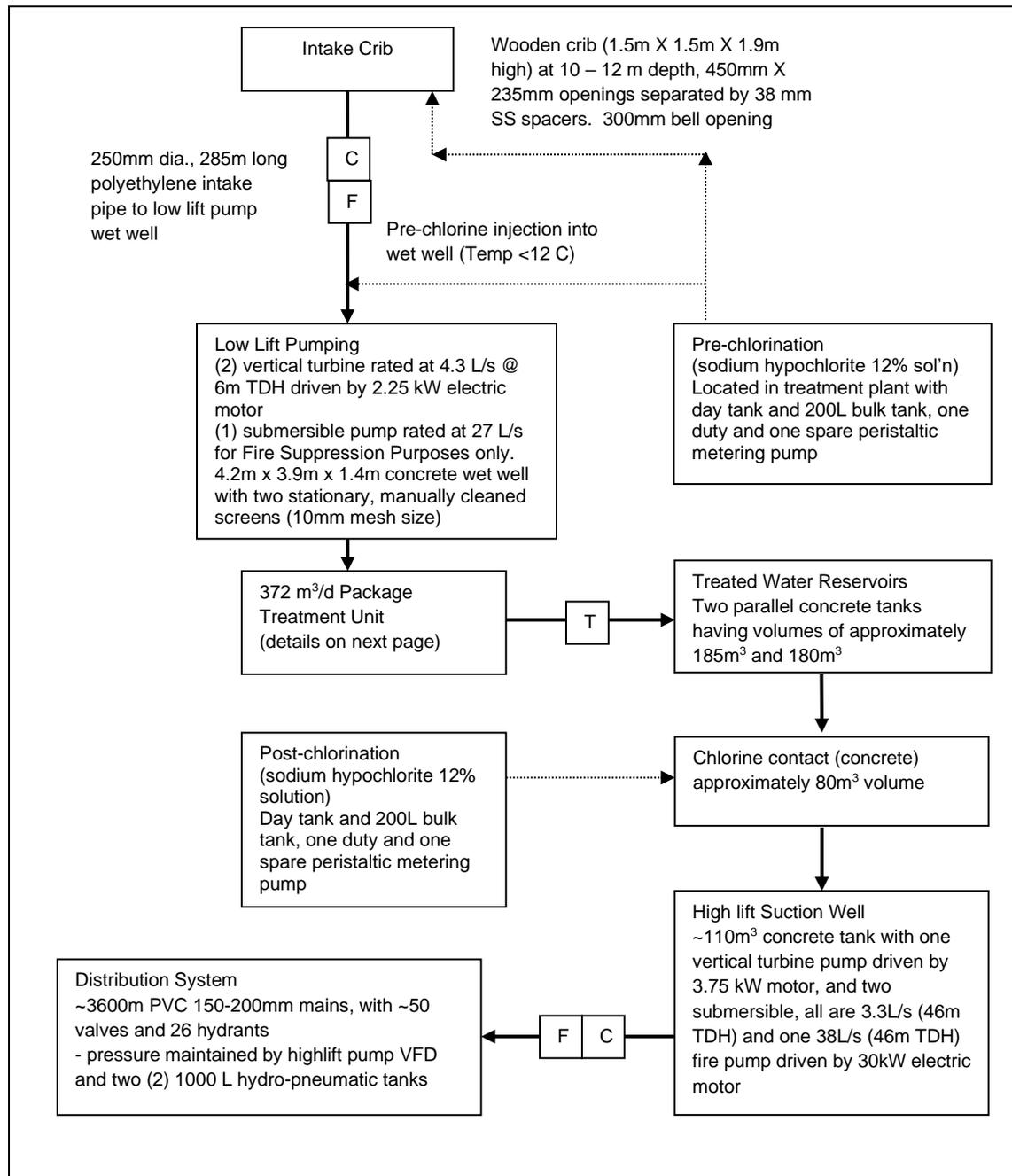
Filter backwash water and accumulated alum floc from the sedimentation tanks are directed to waste holding tank. Suspended solids in the waste tank settle to the bottom portion of the tank from where they are periodically pumped into a tanker truck and hauled to the municipal sanitary sewer in Napanee to receive further treatment. The clarified effluent from the top portion of the waste tank is discharged to a sub-surface exfiltration pit located immediately west of the plant.

Sample Analysis

Provincial regulations dictate the sampling and monitoring requirements for the system. Water quality is tested throughout the treatment process and from dedicated sampling hydrants located at the extremities of the distribution system. Where required by regulation, samples are submitted to an accredited laboratory for analyses.

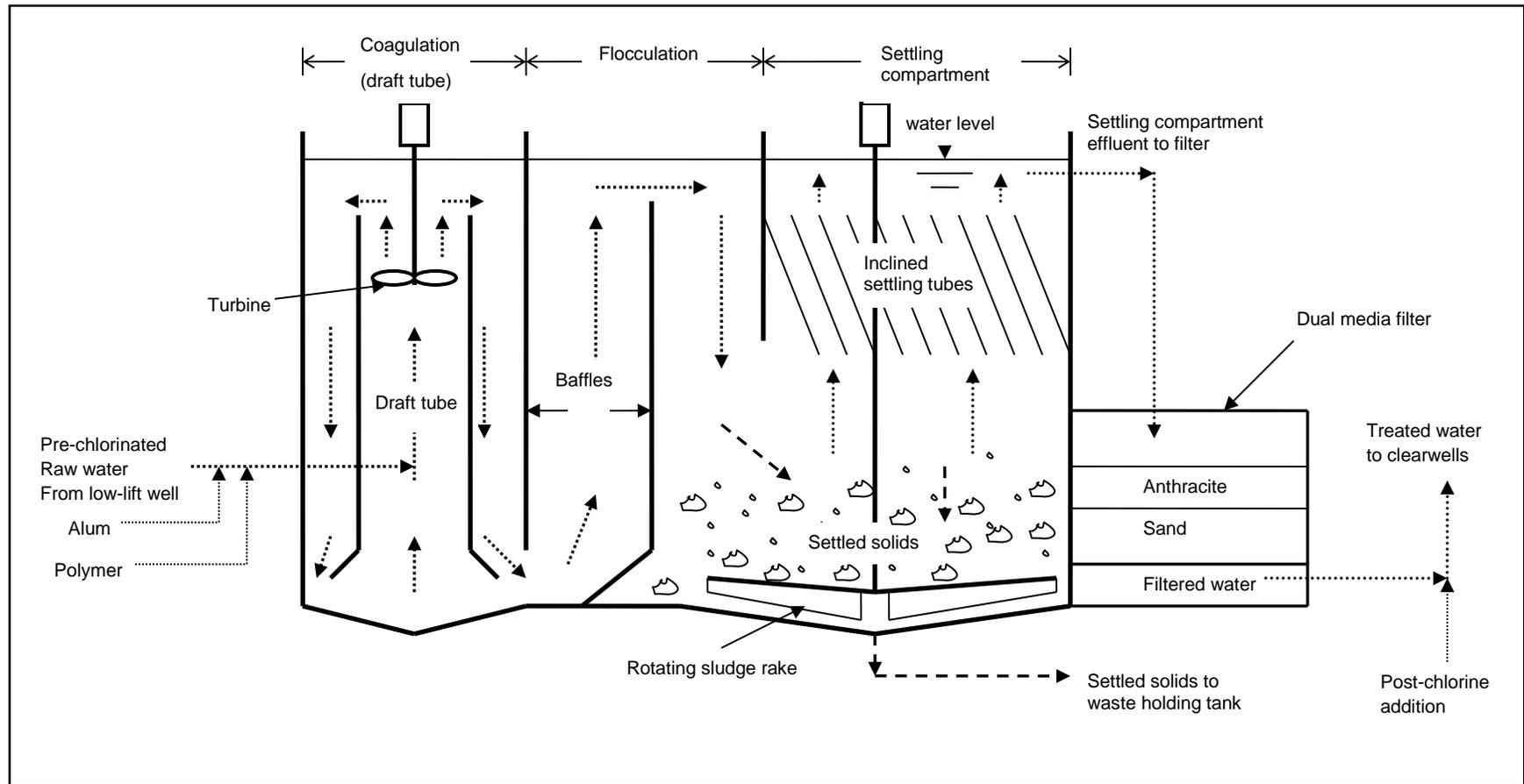
Process Diagrams

Sandhurst Shores Drinking Water System



- F** Flow measurement
- C** Chlorine measurement
- T** Turbidity measurement

Sandhurst Shores Water Treatment Package Plant Schematic



Sandhurst Shores Distribution System



Source Water Overview

General

The primary raw water source for the Sandhurst Shores Drinking Water System is Lake Ontario. Lake Ontario water is typically very low in turbidity (<1 NTU), low in colour, slightly basic, and marginally hard (~120mg/L as CaCO₃) due to the local limestone geology. Temperature fluctuates significantly throughout the seasons ranging from approximately 4°C in the winter to over 20°C during the summer. Chemical and bacteriological analysis of the raw water indicates a source of relatively good quality.

Events

Seasonal changes in raw water temperatures cause vertical turnover of the lake water during spring and fall. Turnover typically takes place over a relatively short duration (~2 – 7 days). During that period, settled solids from the lake bed are re-suspended resulting in increased raw water turbidity. Operators must be prepared to make appropriate plant adjustments to treat the elevated levels of turbidity experienced during turnover events. Changes in raw water temperature will also have impacts on treatment unit process performance (clarification, disinfection). Optimal treatment may require adjustments to treatment chemical dosages (disinfectants and coagulants) in response to raw water temperature and turbidity fluctuations.

Threats

Potential sources of raw water contamination include agricultural runoff, spills from nearby highway traffic mishaps, waste from commercial marine freighters and recreational watercraft, and residential area surface water runoff.

Operational Challenges

Lake Ontario provides high quality source water, which is, for the most part consistently low in bacteriological contamination and turbidity. Operator response is needed for infrequent events of elevated turbidity and for making appropriate chemical adjustments associated with seasonal temperature changes.

7 Risk Assessment

The procedure entitled Drinking Water Hazard Analysis and Critical Control Point Determination (GEN-P4), describes the method of hazard identification, risk assessment, and critical control point determination. The procedure consists of four main exercises: hazard identification, risk assessment, critical control point determination, and critical limit identification.

8 Risk Assessment Outcomes

The following table documents the most recent hazard identification exercise conducted for the A.L. Dafoe Drinking Water System. Hazards were identified and categorized according to the Drinking Water Hazard Analysis and Critical Control Point Determination Procedure (GEN-P4).

A.L. Dafoe Drinking Water System: Summary and Classification of Identified Hazards

| Hazard | Emergency (Contingency) | Operational (Procedure) | Measured/ Monitored? (Yes/No) | Comments/ Control Measures |
|--|-------------------------|-------------------------|-------------------------------|--|
| Spill of biological or chemical material into source | X | | No | alternate source |
| Harmful Algae Blooms | X | X | No | Visual inspection, sampling, alternative source |
| Damage (i.e. traffic) to Lake Station building | X | | No | alternate source |
| Low lift pump failure (x1) – electrical/mechanical | | X | Yes | redundancy, alarm |
| Low lift pump failure (x2) – electrical/mechanical | | X | Yes | alarm, alternate source |
| Low lift discharge valve failure – electrical/mechanical | | X | Yes | redundancy |
| Pre-chlorination pump failure – electrical/mechanical | | X | Yes | redundancy |
| Break in pre-chlorination pipe | | X | Yes | alternate point of injection |
| Pre-chlorine overdose (high concentration) | | X | Yes | cont. monitoring, daily checks |
| Failure of Intake Crib | X | | No | alternate source |
| Break in raw water main | X | | No | repair parts, alternate source |
| Power outage at reservoir | | X | Yes | APU |
| Failure of raw water valves – electrical/mechanical | | X | Yes | redundancy/manual ops |
| Failure of coagulant pump – electrical/mechanical | | X | Yes | redundancy, alarm, lockout |
| Under dosing coagulant | | X | Yes | turbidity monitoring, alarm, lockout, flow sensors |
| Break in coagulant lines | | X | Yes | (see above), routine rounds |
| Blockage of static mixer | X | | No | redundancy |

| Hazard | Emergency (Contingency) | Operational (Procedure) | Measured/ Monitored? (Yes/No) | Comments/ Control Measures |
|---|-------------------------|-------------------------|-------------------------------|---|
| Failure of baffle curtains in coagulation basin | X | | No | inspected annually |
| Turbidity meter malfunction | X | | Yes | routine maint./calibration |
| Filter under-drain failure | X | | No | redundancy (2 filters) |
| Failure of backwash pump – electrical/mechanical | | X | No | alternate backwash pump |
| Failure of filter valves – electrical/mechanical | | X | Yes | alarm, manual, redundancy |
| Filter breakthrough | | X | Yes | backwash, redundancy, alarm |
| Failure of post chlorine pump – electrical/mechanical | | X | Yes | redundancy, alarm, lockout |
| Break in post chlorine lines | | X | Yes | redundancy, routine rounds, process alarms, lockout |
| Overdosing/under dosing post chlorine | | X | Yes | alarm, lockout |
| High lift pump failure (x1) – electrical/mechanical | | X | Yes | redundancy |
| Pressure relief valve failure | | X | Yes | routine rounds |
| Low pressure in distribution system | | X | Yes | alarms, tower, alternate TW storage tank, VFD |
| Operating without tower | | X | Yes | alternate TW storage, VFD, PRV |
| Security – vandalism, tampering | | X | Yes | fencing, locks, intrusion alarms |
| Failure to receive a critical supply | | X | Yes | alternate suppliers, agreements |
| General power outage | X | | Yes | diesel generators |
| Alarm failure | X | | Yes | routine rounds, monitoring, signal checked daily |
| Instrumentation communications failure | X | | Yes | manual monitoring / control, alarms |
| PLC(s) failure | X | | Yes | manual monitoring / control, alarms |
| SCADA failure | X | | Yes | redundancy, manual control |
| Failure of backflow preventers | X | | No | Annual Inspections/Maint. |

The risk assessment and critical control point determination exercises, also described in the Hazard Analysis Procedure are recorded in the following table.

A.L. Dafoe Drinking Water System: Summary of Risk Assessment and Critical Control Point Determination

| Process Step | Description of Hazard | Result | Available Control Measures | Detectability | Severity | Likelihood | Total | Critical / CCP |
|------------------|---|---|--|---------------|----------|------------|-------|-----------------|
| Raw Water | Low lift pump or discharge valve failure (mech. or elec.) | Loss of lake raw water source | Redundancy; alarms, alternate source – A.L. Dafoe WTP, preventative maintenance; daily inspections, TW storage | 2 | 2 | 1 | 5 | No |
| | Sudden change in raw water characteristics | Potentially difficult to treat; may require process adjustments | Alarms, in-house lab analysis, process chemical dosage adjustments, alternate source | 1 | 2 | 3 | 6 | No |
| Pre-chlorination | Chemical pump failure Break in feed line | Zebra mussel build up causing blockage of raw water intake | Annual inspections, redundancy, alternate point of injection, daily rounds, chlorine residual monitoring | 3 | 2 | 3 | 8 | No |
| | Overdose (high conc.) | Possible elevated THM conc. | Daily inspections (continuous residual monitoring and daily dosage calculations) | 1 | 3 | 2 | 6 | No |
| Raw Water Valves | Valve failure (remaining open or closed) | Plant flooding; loss of raw water source | Redundancy; manual operation, alarmed, alternate RW source | 1 | 1 | 2 | 4 | No |
| Coagulant Dosing | Pump failure, under dosing, break in feed line | Interruption to coagulation/flocculation process resulting in decreased disinfection credit and possible elevated turbidity | Redundancy, continuous turb monitoring, alarm, process lockout, routine daily rounds (calculate dosage and verify turb.) | 3 | 3 | 3 | 9 | Yes / Turb. CLP |
| Filtration | Effluent valve failure | Eliminates or decreases capability of filtering and supplying TW | Redundancy, manual operation, alarm | 2 | 2 | 2 | 6 | No |
| | Filter breakthrough | Increased turbidity | Redundancy; regular backwashes, alarm | 1 | 3 | 1 | 5 | Yes / Turb. CLP |

| Process Step | Description of Hazard | Result | Available Control Measures | Detectability | Severity | Likelihood | Total | Critical / CCP |
|-------------------|---|---|---|---------------|----------|------------|-------|--------------------------------|
| Post-chlorination | Chemical pump failure, under-dosing, break in feed line | Inadequate disinfection | Redundancy, continuous monitoring, daily rounds (calculate dosage and verify residual) alarm, process lockout | 1 | 3 | 3 | 7 | Yes / Primary Disinfection CLP |
| | Overdosing (high conc.) | Health risk if combined residual >3 mg/L combined | Daily rounds (calculate dosage and verify residual) alarm, process lock out | 1 | 2 | 2 | 5 | No |
| Distribution | High lift pump failure | Possible loss of system pressure resulting in risk of backflow contamination | Redundancy; preventative maintenance, alarm, TW storage | 1 | 1 | 2 | 4 | Yes / System Pressure CLP |
| | Water main break | | Alarms, AWWA Standard for repairs | 2 | 2 | 3 | 7 | Yes / System Pressure CLP |
| | Sustained pressure loss | | Alarms, procedures | 2 | 4 | 2 | 8 | Yes / System Pressure CLP |
| Security | Vandalism; tampering | Contamination of drinking water; damage to process equipment | Intrusion alarms, locks, fencing where appropriate | 3 | 5 | 1 | 9 | No |
| Suppliers | Failure to receive a critical supply | Unable to provide minimum treatment requirements | Written communications/ agreements, alternate suppliers | 1 | 4 | 1 | 6 | No |
| General | Long term impacts of climate change | Water supply shortfall (drought conditions), extreme weather events, sustained extreme temperatures, algal blooms | Monitoring, alternate source | 2 | 3 | 3 | 8 | No |

Sandhurst Shores Drinking Water System: Summary and Classification of Identified Hazards

| Hazard | Emergency (Contingency) | Operational (Procedure) | Measured/ Monitored? (Yes/No) | Comments/ Control Measures |
|---|-------------------------|-------------------------|-------------------------------|---|
| Spill of biological or chemical material into source | X | | No | hauling potable water to facility |
| Harmful Algae Blooms | X | X | No | Visual inspection, sampling, alternative source |
| Low lift pump failure (x2) – electrical/mechanical | | X | Yes | alarm, alternate potable water source |
| Pre-chlorination pump failure – electrical/mechanical | | X | Yes | redundancy |
| Break in pre-chlorination pipe | | X | Yes | alternate point of injection |
| Pre-chlorine overdose (high concentration) | | X | Yes | cont. monitoring, daily checks |
| Failure of intake crib | X | | No | hauling potable water to facility |
| Failure of coagulant pump – electrical/mechanical | | X | Yes | redundancy, alarm |
| Under dosing coagulant | | X | Yes | turbidity monitoring, alarm, flow sensors |
| Break in coagulant lines | | X | Yes | (see above), routine rounds |
| Turbidity meter malfunction | X | | Yes | routine maint./calibration |
| Filter under-drain failure | X | | No | redundancy (2 filters) |
| Failure of filter valves – electrical/mechanical | | X | Yes | alarm, manual, redundancy |
| Filter breakthrough | | X | Yes | backwash, alarm, hauled water |
| Failure of post chlorine pump – electrical/mechanical | | X | Yes | redundancy, alarm |
| Break in post chlorine lines | | X | Yes | routine rounds, process alarms |
| Overdosing/under dosing post chlorine | | X | Yes | alarm |
| High lift pump failure (x1) – electrical/mechanical | | X | Yes | redundancy |
| Pressure relief valve failure | | X | Yes | routine rounds |

| Hazard | Emergency (Contingency) | Operational (Procedure) | Measured/ Monitored? (Yes/No) | Comments/ Control Measures |
|--|-------------------------|-------------------------|-------------------------------|--|
| Low pressure in distribution system | | X | Yes | alarms, pressure tanks, SOP |
| Security – vandalism, tampering | | X | Yes | locks, intrusion alarms |
| Failure to receive a critical supply | | X | Yes | alternate suppliers, agreements |
| General power outage | X | | Yes | diesel generators |
| Alarm failure | X | | Yes | routine rounds, monitoring, signal checked daily |
| Instrumentation communications failure | X | | Yes | manual monitoring / control, alarms |
| PLC(s) failure | X | | Yes | manual monitoring / control, alarms |
| Failure of backflow preventers | X | | No | annual inspection/maintenance |

The risk assessment and critical control point determination exercises, also described in the Hazard Analysis Procedure are recorded in the following table.

Sandhurst Shores Drinking Water System: Summary of Risk Assessment and Critical Control Point Determination

| Process Step | Description of Hazard | Result | Available Control Measures | Detectability | Severity | Likelihood | Total | Critical /CCP |
|------------------|---|--|--|---------------|----------|------------|-------|-----------------|
| Raw Water | Low lift pump or discharge valve failure (mech. or elec.) | Loss of lake raw water source | Redundancy; alarms, preventative maintenance; daily inspections, ability to haul potable water from alternate source | 2 | 2 | 1 | 5 | No |
| | Sudden change in raw water characteristics | Potentially difficult to treat; may require process adjustments | Alarms, in-house lab analysis, process chemical adjustments, alternate source of potable water | 1 | 2 | 3 | 6 | No |
| Pre-chlorination | Chemical pump failure Break in feed line | Zebra mussel build up causing blockage of raw water intake | Annual inspections, redundancy, alternate point of injection, daily rounds, chlorine residual monitoring | 3 | 2 | 3 | 8 | No |
| | Overdose (high conc.) | Possible elevated THM conc. | Daily inspections (continuous residual monitoring and daily dosage calculations) | 1 | 3 | 2 | 6 | No |
| Coagulant Dosing | Pump failure, under dosing, break in feed line | Interruption to coagulation/floc culation process resulting in decreased disinfection credit and possible elevated turbidity | Redundancy, continuous turbidity monitoring, alarm, routine daily rounds (calculate dosage and verify turbidity.) | 3 | 3 | 3 | 9 | Yes / Turb. CLP |
| Filtration | Effluent valve failure | Eliminates or decreases capability of filtering and supplying treated water | Redundancy, manual operation, alarm | 2 | 2 | 2 | 6 | No |
| | Filter breakthrough | Increased turbidity | Regular backwashes, alarm | 1 | 3 | 1 | 5 | Yes / Turb. CLP |

| Process Step | Description of Hazard | Result | Available Control Measures | Detectability | Severity | Likelihood | Total | Critical /CCP |
|-------------------|---|---|--|---------------|----------|------------|-------|--------------------------------|
| Post-chlorination | Chemical pump failure, under-dosing, break in feed line | Inadequate disinfection | Redundancy, continuous monitoring, daily rounds (calculate dosage and verify residual) alarm | 1 | 3 | 3 | 7 | Yes / Primary Disinfection CLP |
| | Overdosing (high conc.) | Health risk if combined residual >3 mg/L combined | Daily rounds (calculate dosage and verify residual) alarm | 1 | 2 | 2 | 5 | No |
| Distribution | High lift pump failure | Possible loss of system pressure resulting in risk of backflow contamination | Redundancy; preventative maintenance, alarm, TW storage | 2 | 4 | 2 | 8 | Yes / System Pressure CLP |
| | Water main break | | Alarms, AWWA Standard for repairs | 2 | 4 | 3 | 9 | Yes / System Pressure CLP |
| | Sustained pressure loss | | Alarms, procedures | 2 | 4 | 2 | 8 | Yes / System Pressure CLP |
| Security | Vandalism; tampering | Contamination of drinking water; damage to process equipment | Intrusion alarms, locks, fencing where appropriate | 3 | 5 | 1 | 9 | No |
| Suppliers | Failure to receive a critical supply | Unable to provide minimum treatment requirements | Written communications/agreements, alternate suppliers | 1 | 4 | 1 | 6 | No |
| General | Long term impacts of climate change | Water supply shortfall (drought conditions), extreme weather events, sustained extreme temperatures, algal blooms | Monitoring, ability to haul potable water from an alternate source | 2 | 3 | 3 | 8 | No |

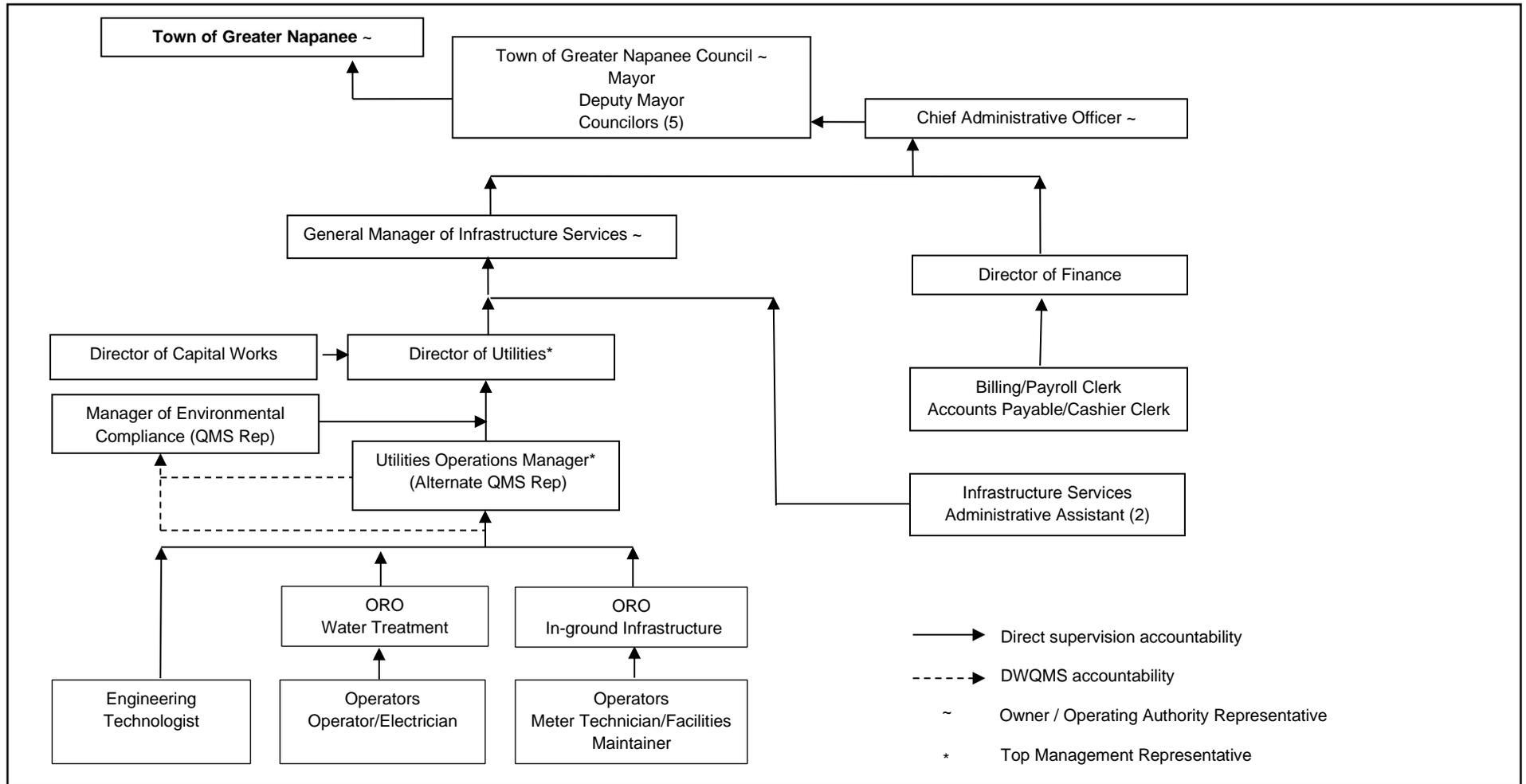
Controlled Conditions for Critical Control Points

Controlled conditions for each critical control point identified in the summary table are described in detail in the following sets of instructions:

1. *Filter Effluent Turbidity Critical Limit Response*
2. *Primary Disinfection Critical Limit Response*
3. *Distribution System Pressure Critical Limit Response*
4. *Secondary Disinfection Critical Limit Response*

In addition to a detailed response procedure, each instructional document includes the considerations and rationale for establishing the critical limits, as well as a listing of the operational safeguards currently in place to prevent a breach of the critical limit.

9 Organizational Structure, Roles, Responsibilities and Authorities



Town of Greater Napanee Council - Owner / Operating Authority

Responsibilities

Council members represent the system Owner and have the responsibility of ensuring safe, compliant, and reliable water and wastewater utilities to serviced properties within the Town of Greater Napanee.

Council responsibilities also include public and staff safety, financial oversight, and compliance with all applicable legislation.

As the system Owner, Council is also responsible for endorsing the ongoing development of the DWQMS.

Additional corporate oversight responsibilities include:

- Municipal bylaw enforcement
- Municipal taxation
- Building permits and inspections
- Land use planning
- Public works
- Parks, recreation and culture
- Emergency services

Authorities

On behalf of the electorate of the Town of Greater Napanee, Council is authorized to:

- ensure sufficient resources for the operation and maintenance of the drinking water system and DWQMS by approving utility budgets, expenditures and user fees
- provide / review / approve utilities administrative policy direction
- hire, discipline, or terminate management staff, make recommendations for drinking water system or DWQMS improvements

Chief Administrative Officer (CAO) – Owner / Operating Authority

Responsibilities

The CAO is responsible for:

- ensuring that the policies and programs of the Town are implemented
- informing and advising Council on the operation and affairs of the Town
- ensuring communication of all relevant legislated responsibilities to Council and staff
- receiving direct reports from all Town General Managers
- strategic planning
- economic development
- human resources management

Authorities

The CAO is authorized to:

- perform listed responsibilities
- delegate listed responsibilities to members of the Town management team
- communicate with Council, regulatory agencies, and public
- participate in hiring and discipline of management, staff and unionized staff
- make recommendations for system or DWQMS improvements and approve the required resources within the constraints of the Council approved budget

General Manager of Infrastructure Services – Owner / Operating Authority

Responsibilities

The General Manager of Infrastructure Services is responsible for:

- general management of the Town of Greater Napanee Infrastructure Services (Public Works, Utilities, Development Services, Parks & Facilities, Environmental Services)
- ensuring that the policies and programs within Infrastructure Services are implemented
- informing and advising Council on the operation and affairs of Infrastructure Services
- ensuring communication of all relevant legislated responsibilities to Council and staff
- supervision of all Infrastructure Services directors and managers
- strategic planning
- may represent Top Management on the DWQMS Management Review Committee
- evaluate and prioritize long-term rehabilitation and upgrading needs

Authorities

The General Manager of Infrastructure Services is authorized to:

- perform listed responsibilities
- delegate listed responsibilities to other Infrastructure Services directors and managers
- communicate with Owner, regulatory agencies, and public
- evaluate and prioritize long-term rehabilitation and upgrading needs
- participate in hiring and discipline of management, staff and unionized staff
- make recommendations for system or DWQMS improvements and approve the required resources within the constraints of the Council approved budget

Director of Utilities - Top Management

Responsibilities

The Director of Utilities is responsible for:

- overall supervision of the Town of Greater Napanee Utilities Department in its entirety
- oversight of Utilities department budget and long-term planning
- attending Council meetings, preparing staff reports to Council, and reporting Utilities activities to the General Manager of Infrastructure Services
- reviewing and commenting on technical reports and proposals
- evaluate proposals/tenders and select contractors, materials, and equipment
- may represent Top Management on the DWQMS Management Review Committee

Authorities

The Director of Utilities is authorized to:

- perform listed responsibilities
- delegate listed responsibilities to other managers
- communicate with the Owner, regulatory agencies, the public and the QMS rep.
- evaluate and prioritize long-term rehabilitation and upgrading needs
- develop, approve and implement operating strategies, administrative and technical policies and procedures
- prepare, review, and approve design specifications
- participate in hiring and discipline of management and union staff
- make recommendations for system or DWQMS improvements and approve the required resources
- allocate / approve adequate resources to maintain the system and the DWQMS
- perform operational duties at all facilities if licenced to do so by the Province of Ontario

Operations Manager - Top Management

Responsibilities

The Operations Manager is responsible for ensuring safe, reliable, and compliant operation of all drinking water and wastewater systems under the responsibility of the Town of Greater Napanee, Infrastructure Services Department.

The Operations Manager assumes all responsibilities defined for the Overall Responsible Operator in O.Reg.128/03 for all drinking water and wastewater systems, if licensed to do so, and is also responsible for:

- approving Utilities expenditures within the constraints of the Council-approved budget
- communicating with the public, regulatory authorities, and other utilities on behalf of the Owner, maintaining communications with the Director of Utilities and Manager of Environmental Compliance
- implement all operational objectives in conjunction with the Manager of Environmental Compliance
- conduct or coordinate maintenance activities that ensure continuous treatment process operations and cleanliness of facilities
- direct supervision and scheduling of all Utilities unionized staff, including issuing work orders, work scheduling, and providing technical advice to Operators
- direct and review (in terms of quality and safety) the activities of contractors and assigned staff
- reporting water and wastewater operating conditions to the Manager of Environmental Compliance
- maintain valid operator certification for all facilities
- may represent Top Management on the DWQMS Management Review Committee
- all other duties as assigned

Authorities

The Operations Manager is authorized to:

- perform the listed responsibilities
- evaluate and prioritize long-term utility needs
- prepare, review, and approve design specifications
- select contractors and equipment
- approve budgeted expenditures
- develop, approve and implement operating strategies, administrative and technical policies and procedures
- hire, discipline or terminate supervised staff

-
- direct operators to make necessary process adjustments
 - communicate with the public on behalf of the Owner
 - evaluate and select appropriate process equipment and treatment chemicals
 - make recommendations for systems or DWQMS improvements and approve the required resources
 - allocate/approve adequate resources to maintain the systems and the DWQMS
 - perform operational duties at all facilities if licensed to do so by the Province of Ontario

Manager of Environmental Compliance - DWQMS Representative

Responsibilities

The responsibilities of the Manager of Environmental Compliance include:

- completion of compliance reports, applications for approvals to regulatory authorities, and technical reports for all Town of Greater Napanee environmental services including drinking water, wastewater, storm water, waste disposal, road salt application
- maintaining communications with the Director of Utilities, the Operations Manager and with regulatory authorities
- reporting and acting on environmental emergencies and incidents of non-compliance
- development, administration, and maintenance of a Quality Management System in accordance with the Ontario Drinking Water Quality Management Standard
- advising General Managers, Directors and Managers on relevant environmental legislation, policies and bylaws
- receiving water and wastewater operating conditions from the Operations Manager, and as directed, reporting to the Owner, and members of the public
- preparation and revision of operational documents and record compilation
- coordination of drinking water and wastewater certification and training, and completion of training summary reports
- preparing and presenting public information materials

Authorities

The Manager of Environmental Compliance is authorized to:

- perform the listed responsibilities
- develop, approve, and implement operating strategies / policies and procedures
- communicate with regulatory agencies and the public on behalf of the Owner
- review and provide comment on technical reports and proposals
- approve budgeted expenditures
- perform operational duties at all facilities if certified by the Province of Ontario
- remove / replace obsolete documentation or implement new documentation for any system in accordance with the Document and Records Control Procedures
- collect any operational or maintenance data required for document preparation or summary reports
- communicate/distribute educational information
- act as the DWQMS Representative

Overall Responsible Operator - Water Treatment and/or In-ground Infrastructure Responsibilities

Act as the Overall Responsible Operator in O.Reg.128/03 for drinking water and/or wastewater systems. The other responsibilities of the Overall Responsible Operators include:

- report and act on emergencies and incidents of non-compliance
- monitor and adjust treatment works processes, to the extent permitted by provincial legislation, to ensure compliance with relevant Provincial and Federal Regulations as well as site-specific Environmental Compliance Approvals
- ensure the maintenance of all records associated with the assigned facilities including laboratory analysis, maintenance records and operational logs in a manner compliant with Provincial and Federal Regulations and Guidelines
- monitor treatment and distribution processes, collect and monitor operating data, collect samples, perform routine analytical testing, and arrange laboratory testing in accordance with legislation
- maintain operator certification at a classification level at least equivalent to the assigned system, as well as valid operator certification for all other systems
- conduct or coordinate maintenance activities that ensure continuous treatment process operations and cleanliness of facilities
- perform OIC duties at any facility as designated and directed by management
- perform repair or replacement of water distribution and wastewater collection piping and equipment as required
- responsible for joint health and safety for assigned staff and contractors
- mandatory participation in the emergency on-call staff rotation and scheduled weekend shifts
- all other duties as assigned

Authorities

The authorities of the Overall Responsible Operator Water Treatment and/or In-ground Infrastructure include:

- perform the listed responsibilities
- within the limits of the approved budget: arrange, direct, and supervise the services provided by specialty contractors when needed
- direct other operators to make necessary process adjustments
- adjust processes based on monitoring data and professional judgement or direct other operators to make necessary process adjustments

Operator

Responsibilities

The responsibilities of the Operator include:

- report and act on emergencies and incidents of non-compliance
- monitor and adjust treatment works processes, to the extent permitted by provincial legislation, to ensure compliance with relevant Provincial and Federal Regulations as well as site-specific Environmental Compliance Approvals
- ensure the maintenance of all records associated with the noted facilities including laboratory analysis, maintenance records, timesheets and operation logs in a manner compliant with Provincial and Federal Regulations and Guidelines
- perform routine maintenance and housekeeping of assigned facilities
- assist with employee training
- maintain valid operator certification for all facilities
- monitor treatment and distribution processes, collect and monitor operating data, collect samples, perform routine analytical testing arrange laboratory testing in accordance with legislation
- perform OIC duties at any facility as designated and directed by management
- may be named as alternate Overall Responsible Operator (ORO) as required, dependent on experience and licensing
- appropriately document all operational actions in accordance to applicable legislation
- mandatory participation in the emergency on-call rotation and scheduled weekend shifts
- all other duties as assigned

Authorities

The authorities of the Operator include:

- perform the listed responsibilities, install, repair, or replace any electronic, electrical, or mechanical equipment if qualified and as approved by management
- perform operational duties at all facilities if directed by management and as certified by the Province of Ontario
- adjust the process based on monitoring data and professional judgement or direct other operators to make necessary process adjustments
- order required process chemicals, lab supplies, analytical services, and equipment replacement parts as approved in budget
- performing repair/replacement of piping systems in accordance with regulatory, Greater Napanee, and other applicable industry codes of practice

Engineering Technologist

Responsibilities

The responsibilities of the Engineering Technologist include:

- customer technical representative
- responsible for engineering services
- inspection of in-ground work by contractors
- monitor and adjust treatment works processes, to the extent permitted by Provincial legislation and licenses to ensure compliance with relevant Provincial and Federal Regulations as well as site-specific Environmental Compliance Approvals
- ensure maintenance of all records associated with the noted facilities including laboratory analysis, maintenance records, timesheets and operation logs in a manner compliant with Provincial and Federal Regulations and Guidelines
- preparation, revision, and maintenance of all utilities engineering drawings in both electronic and hard copy format
- locate and document water and sewer service locations for staff, public, and for other agencies and utilities
- provide Utilities-related drawings as required by other staff, Town departments or other agencies
- issue preventive maintenance work orders according to the Utilities electronic schedule – record completed work and flag outstanding work orders for management

Authorities

The Engineering Technologist is authorized to:

- perform listed responsibilities
- make appointments with customers, contractors, and other agencies to investigate complaints, and to locate utility services
- inspect and approve in-ground water and sewer infrastructure installations and repairs
- prepare, revise, and store all Utilities engineering drawings as directed by management
- perform operational duties at all facilities if directed by management and as certified by the Province of Ontario

Utilities Office Administration and Temporary Staff

The following roles do not impact drinking water quality and therefore have no responsibilities or authorities under the scope of the DWQMS: Treasurer, Deputy Treasurer, Utilities Receivable/Payable Clerk, Billing Clerk, Accounts Clerk, Infrastructure Services Administrative Assistant, Meter Technician/Facilities Maintainer, as well as temporary staff including summer students and others hired to perform general labour.

10 Competencies

The following table lists the competencies required of Utilities staff whose performance may have a direct impact on drinking water quality. Check mark indicates required entry-level competency, "L" - long-term desired competency, "N/A" - not applicable to position, and roman numerals denote required class of operator certification.

| Competency | Director of Utilities | Operations Manager | Manager of Env. Compliance | ORO WT and/or In-ground | Operator | Engineering Technologist |
|--|-----------------------|--------------------|----------------------------|-------------------------|----------|--------------------------|
| WT Certification | III | III | II | II | OIT | N/A |
| WD Certification | II | I | I | II | OIT | OIT |
| Supervisory Skills | ✓ | ✓ | ✓ | ✓ | N/A | N/A |
| Communications / Technical Writing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Presentations / Training | ✓ | ✓ | ✓ | L | L | L |
| Budget Preparation / Long-term Cap. Planning | ✓ | ✓ | L | L | N/A | N/A |
| Staff Scheduling / Work Planning | ✓ | ✓ | N/A | ✓ | N/A | N/A |
| Contract/Project Management | ✓ | ✓ | ✓ | L | L | L |
| Regulatory Requirements | ✓ | ✓ | ✓ | ✓ | ✓ | L |
| Emergency Procedures | ✓ | ✓ | ✓ | ✓ | ✓ | L |
| Water Treatment Unit Processes | ✓ | ✓ | ✓ | ✓ | ✓ | L |
| Process troubleshooting | ✓ | ✓ | ✓ | ✓ | L | N/A |
| Distribution piping installation / repair | L | ✓ | L | ✓ | L | L |
| Laboratory techniques, sampling / preservation | N/A | ✓ | ✓ | ✓ | ✓ | L |
| Pumps and valves (application / maintenance) | L | ✓ | L | ✓ | L | L |
| Electrical instrumentation / controls | L | L | L | L | L | L |
| Interpreting plans / blue-prints | ✓ | ✓ | L | ✓ | L | ✓ |
| Confined space entry | N/A | ✓ | N/A | ✓ | L | L |
| Computer - spreadsheets and word processing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Computer aided design | N/A | L | L | L | L | ✓ |
| SCADA | L | L | L | L | L | L |

Satisfying Competencies

Competency requirements for Utilities staff are satisfied by the following:

- Candidates considered for hire may be requested to submit proof of completing relevant post-secondary education and must demonstrate technical knowledge and communications skills to an interview panel.
- New employees undergo comprehensive on-the-job training at all facilities, conducted and documented by experienced, competent staff. Training documentation (*GEN-F17*, *GEN-F18* & *GEN-F19*) is signed by the employee and trainer, confirming understanding of the training provided. Training files are maintained for all Utilities staff.
- All employees receive ongoing training in various subject areas including safety, treatment process operations, contingency plans, regulatory requirements, equipment operation, and new technologies. The training is provided by experienced staff, technical experts, or contracted professional trainers. Training provision and certification levels meet or exceed those required by legislation. Applicable training sessions communicate the relevance of staff duties to safe drinking water.
- The Town of Greater Napanee provides incentive for staff wishing to upgrade their operating certification as remuneration increases with operator certification level. The Town pays directly for certification examinations and certificate renewal.
- The Town provides funding to staff wishing to independently upgrade their education, provided the training is related to utility duties.

11 Personnel Coverage

The Town of Greater Napanee, Infrastructure Services Department employs certified drinking water system operators, many of whom have operator certification for water treatment, water distribution, wastewater treatment, and wastewater collection facilities. Many of those certified operators are employed according to the terms and conditions of the Collective Agreement between the Town of Greater Napanee and the International Brotherhood of Electrical Workers, Local 636.

A Letter of Understanding between the Union and the Town of Greater Napanee guarantees that the Union waives its right to strike and the Town of Greater Napanee waives its right to lock-out. The Letter of Understanding also provides an alternate dispute resolution process in the event that bargaining under the collective agreement fails.

Summary Table of WTP Personnel Coverage

| | Weekdays (0730hr – 1600hr)* | After Hours (all days) | Weekends / Holidays |
|---|--------------------------------|---------------------------|------------------------|
| Operator (full-time) | X | | |
| Additional Operator(s); Electrician(s); Overall Responsible Operators (ORO) available as needed | X | | |
| On-call Operator (as needed) | | X | X |

* Specified times are typical, however 8-hour day shift start and stop times may vary.

In the event of the absence of the designated ORO's, alternates are available as necessary.

A.L. Dafoe Drinking Water System

An Operator attends the A.L. Dafoe Purification Plant facility on a full-time basis, typically eight hours per day, five days per week. The Operator is supported as needed by another Operator.

Operation and maintenance of the A.L. Dafoe Water Distribution System is normally conducted as needed by the Chief Operator – In-ground Infrastructure supported by additional Operators as needed.

Under abnormal circumstances (i.e. emergencies), additional assistance is available from any of the other certified Operators assigned to other facilities, as directed by management.

Sandhurst Shores Drinking Water System

An Operator attends the Sandhurst Shores Water Treatment Plant facility for approximately one hour per day, five days per week. The Operator is supported as needed by another Operator.

Operation and maintenance of the Sandhurst Shores Distribution System is normally conducted as needed by the Chief Operator – In-ground Infrastructure supported by additional Operators as needed.

Under abnormal circumstances (i.e. emergencies), additional assistance is available from any of the other certified operators assigned to other facilities, as directed by management.

Weekend & Holiday Shifts

Weekend and holiday shifts, as well as off-hours duties that may arise due to alarms, customer complaints or emergencies, are covered by the On-call Operator. All the unionized staff with valid drinking water system certification take turns as the designated On-call Operator according to a weekly rotating schedule. In addition to monitoring the A.L. Dafoe Drinking Water System, the On-call Operator is responsible for monitoring the Sandhurst Shores Drinking Water System and the Napanee Water Pollution Control Plant and Wastewater Collection system.

Alarm System

All drinking water & wastewater facilities are monitored by an alarm system, which transmits a signal to a contracted security alarm service when alarm conditions are detected. The security service dispatcher then notifies the On-call Operator by telephone. All certified operators are issued cellular telephones. The On-call Operator must be available by phone from one hour prior to the end of a day shift through to one hour after the beginning of the following day shift. Response to critical alarms must be within 30 minutes of receiving the call, in accordance with the Collective Agreement. Call outs are recorded on Alarm/Call Response Records.

Rationale

One operator is capable of completing all minimal weekend monitoring tasks at the Water and Wastewater Treatment facilities during routine operations. Similarly, based on past experience, most alarm conditions can be addressed by one operator. If circumstances arise where additional staff is required, the on-call operator may request the assistance of any of the other off-duty operators.

The required 30-minute emergency response time is considered reasonable based on the extent of alarm coverage, conservative alarm set points, and the multiple monitoring

and treatment barriers in place that prevent risk to public health.

12 DWQMS Communications

The procedure for communicating aspects of the DWQMS specifically is contained within the Communications Procedure (GEN-P9).

13 Essential Supplies and Services

| Supply or Service | Primary Supplier |
|------------------------------------|------------------|
| Accredited Laboratory Services | |
| Alarm Service (Security/Process) | |
| Diesel Generator Service | |
| Coagulant (Aluminum Sulphate) | |
| Construction Contracting Services | |
| Distribution Parts | |
| Disinfectant (Sodium Hypochlorite) | |

| Supply or Service | Primary Supplier |
|--|------------------|
| Fuel Supplies | |
| Instrumentation Parts (Metering pumps, online analyzers etc.) | |
| Instrumentation Calibration | |
| Laboratory Supplies | |
| Underwater Services (Water Intake, Storage Tank Inspections) | |
| SCADA | |

Quality of Supplier Products and Services

Assurance of the quality of essential supplies and services is achieved through documentation of applicable accreditation, licenses and certifications. The Town of Greater Napanee, Infrastructure Services Department requires that suppliers of process chemicals verify the quality of each product through documented certification of chemical analysis. A mailing provides an overview of the Town of Greater Napanee DWQMS with specific reference to communications and supplier participation. The detailed procedure related to essential services and supplies is entitled Quality of Essential Supplies and Services (GEN-P10).

14 Review and Provision of Infrastructure and Resources

The detailed procedure for review and provision of infrastructure and resources is in the Infrastructure Review Procedure (GEN-P8).

15 Infrastructure Maintenance, Rehabilitation and Renewal

Infrastructure maintenance, rehabilitation, and renewal are addressed by the following:

Planned Maintenance: Planned maintenance is scheduled using a preventative maintenance software program stored on the central office computer server. Server files are backed up daily. Scheduled tasks are typically defined by manufacturer's literature and revised (or created) as needed according to operator experience / observations. Planned maintenance tasks are communicated to the person responsible by work orders from the Operations Manager. Completed work orders are reviewed and signed by the Operations Manager or the Director of Utilities.

Unplanned Maintenance: Unplanned maintenance tasks result from equipment malfunction or breakage. Unplanned maintenance is authorized by the Director of Utilities, Utilities Operations Manager, the Manager Environmental Compliance, or an Operator in Charge. An Operator responds to unplanned maintenance during normal working hours while the On-Call Operator responds during off-hours. Documentation of unplanned maintenance tasks are recorded in the appropriate log book and may be recorded on work orders.

Measures to prepare for and expedite unplanned maintenance include equipment redundancy (back-up units), spare parts inventory, availability of updated plans / water and sewer atlas, as well as documented repair and safety procedures.

Renewal / Capital Upgrades: Replacement of aging fixed heavy equipment, as well as upgrades, expansions, and in-ground systems improvements are planned by the Operations Manager, the Director of Utilities and/or the Director of Capital Works. All renewal / capital upgrade expenses are identified in the budget approved by the Town of Greater Napanee Council.

Where practical, replacement of aging in-ground infrastructure is coordinated with road reconstruction activity conducted by the Town of Greater Napanee or the County of Lennox and Addington.

Long-Term Infrastructure Upgrade Forecast: Five-year department goals are identified below. Priorities, dates, and specifics are subject to change.

| Infrastructure Forecasting – Five Year | | |
|--|--|--------------------------------|
| Category | Description | Estimated Date of Construction |
| WT | Liner replacement in the Large Raw Water Reservoir (Golf Course Lane & Cty Road 8) | 2020 |
| WD | Graham St. E. from John St. to East St. | 2020 |
| WD | Dundas St., Phase 4 - Adelphi St. to East of CN Tracks | 2020 |
| WD | Water St. from Centre St. to West side of Robinson St. | 2020 |
| WD | Robinson St. from Mill St. to Baker St. | 2020 |
| WD | Water St. from Robinson St. to Richard St. | 2020 |
| WD | East St. from Dundas St. to Mill St. | 2021 |
| WD | Mill St. from East St. to John St. | 2021 |
| WD | Richard St. from Dundas St. to South of Shoreline Cres. | 2022 |
| WD | Drive-In Rd. from County Road 41 to Trailer Park | 2022 |
| WD | East St. from Dundas St. to North of Isabella St. | 2024 |
| WD | Hessford St. from Dundas St. to Water St. | 2025 |
| WD | Water St. from Union St. to Hessford St. | 2025 |
| WD | Mill St. from Napier St. to Hessford St. | 2025 |

Infrastructure maintenance, rehabilitation, and renewal are described in greater detail in the Maintenance Procedure (GEN-P3).

16 Sampling and Monitoring

The Town of Greater Napanee Utilities Department follows a sampling program for all Drinking Water Systems, based on legislative requirements. This program is described in detail in the procedure entitled Drinking Water Sampling, Monitoring and Analysis (NAP-DW-P1 and SHS-P1).

Throughout any maintenance project undertaken within the distribution system, operators sample according to the AWWA Standards for Disinfecting Water Mains.

Specific sampling and monitoring procedures are established for operating the A.L. Dafoe Purification Plant or the Sandhurst Shores Water Treatment Plant under

abnormal circumstances. A detailed set of instructions for sampling and monitoring in response to adverse water quality is available in the facility Operation and Maintenance Manuals and on the electronic server.

Laboratory results are acquired from in-house analyses, as well as from a selected accredited laboratory. In-house laboratory results are entered into electronic spreadsheets and stored on the server. The spreadsheets can be viewed by all Operations staff and Management. Bacteriological and chemical results from the accredited laboratory are emailed to the Operations Manager, the duty Operator(s) and the Manager of Environmental Compliance.

Copies of bacteriological and chemical analytical results are available to members of the public at the Infrastructure Services office by request. In-house laboratory results may also be provided upon request. All analytical results are summarized in tables at the end of the calendar year and are discussed in the Annual Reports. These reports are also made available to any interested member of the public upon request. Annual Reports are also posted on the Town of Greater Napanee website.

17 Measurement and Recording Equipment Calibration and Maintenance

Methods of measurement and recording equipment calibration and maintenance are described in detail in the procedure GEN-P5.

18 Emergency Management

The procedure entitled Emergency Conditions (GEN-P11) outlines the conditions within the drinking water systems that are considered to be major emergencies. This procedure also lists those persons responsible for initiating the response and recovery measures, as well as the process to be followed as emergencies escalate.

Specific instructions for responding to emergencies, including emergency situations that have the potential to result in acute drinking water health risks, are included in the plant and distribution system operations manuals. Each operator is required to review the written emergency procedures annually. When practical, emergency procedures are tested.

Emergency Contact List

| Town of Greater Napanee Contacts | | |
|---|---------------|----------------|
| General Manager of Infrastructure Services | Peter Dafoe | |
| Director of Utilities | Todd Harvey | |
| Utilities Operations Manager | Kyle Sinclair | |
| Manager of Environmental Compliance | Kristie Kelly | |
| Overall Responsible Operator Water Treatment | Shawn Grant | |
| Overall Responsible Operator In-ground Infrastructure | Mark Corkey | |
| Town Hall | | |
| Emergency Management Co-ordinator | Peter Dafoe | |
| Ministry of the Environment, Conservation and Parks Contacts | | |
| Spills Action Centre | | 1-800-268-6060 |
| District Office - Kingston | | 613-549-4000 |

19 Internal Audits

Internal Audits are conducted at a minimum of once every calendar year, according to procedure GEN-P6 to determine the effectiveness of the DWQMS, and to explore opportunities for improvement. Internal Audits in addition to Third-party Audits are mechanisms used to fulfill the “check” and “improve” imperatives of the quality management system.

20 Management Reviews

Management reviews are conducted at a minimum of once every calendar year, according to procedure GEN-P7, following the internal audit.

21 Continual Improvement

Continual improvement can be described as initiatives that can be triggered from Internal or External Audits, Management Reviews, Customer calls or complaints, Staff meetings, compliance inspections, adverse water quality incidents or health & safety inspections, in accordance with GEN-P12. Improvements are to be detailed on Continual Improvement Report(s) (GEN-F13) and must be verified and signed off by the designated DWQMS Representative or other employee(s) who have been designated. Continual Improvement Report(s) are logged within an electronic spreadsheet entitled CIR Progress Tracker (GEN-F15).