Kenora Area Drinking Water System

DWQMS Operational Plan

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QMS REPRESENTATIVE:

Operational Plan Table of Contents

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Element 1 – Quality Management System 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 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. 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 brief, 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 Honorable 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 City of Kenora implements Quality Management. The Plan is written to meet or exceed the requirements of the Ministry of the Environment, Conservation and Park's (MECP's)

prescribed standard and is applicable to the management and operation of those works described in Section 6 of this Plan.

Element 2 – Quality Management System Policy

The Mayor, Council, and employees of the City of Kenora are dedicated to the operation and maintenance of a potable drinking water system that will provide the residents of Kenora with clean and safe drinking water. The system shall be operated in such a manner that it meets the requirements of all applicable governing legislation and regulations.

The City of Kenora shall implement a Quality Management System, which will assist in the management, operation and maintenance of the drinking water system, and will identify any potential hazards, risks or gaps through the internal auditing process.

Internal audits shall be conducted to:

- Confirm the QMS has been effectively communicated throughout the organization;
- Identify any sources of variation;
- Promote awareness of the requirements for quality;
- Ensure the “controls” for quality are in the hands of the process owners;
- Identify any shortfalls in the management, operation and maintenance of the system; and
- Provide the foundation for continual improvement to the Quality Management System and the Drinking Water System.

The QMS shall meet all requirements of the Ministry of the Environment, Conservation and Park’s (MECP) Drinking Water Management Standard and the Operational Plan shall be available online on the City of Kenora website.

Element 3 – Commitment and Endorsement

The Corporation of the City of Kenora, being the Owner and Operating Authority of the Kenora Area Drinking Water System, is committed to the implementation, maintenance, and continual improvement of the Quality Management System. Mayor, Councilors and Top Management recognize the need for sufficient funding and resources to maintain and make continual improvements to the Quality Management System.

Signed — Date — Andrew Poirier, Mayor

Signed — JAN 29/25 — Date — Greg Breen, Director of Engineering and Infrastructure

Signed — Feb 6/25 — Date — Bill Mundy, General Manager of Utilities

Element 4 – Quality Management System Representative

The **Quality Management System Representative** shall:

a) Administer the Quality Management System by ensuring that processes and procedures needed for the Quality Management System are established and maintained;
b) Report to Top Management on the performance of the Quality Management System and any need for improvement:
c) Ensure that current versions of documents required by the Quality Management System are being used at all times;
d) Ensure that personnel are aware of all applicable legislative and regulatory requirements that pertain to their duties for the operation of the subject system; and
e) Promote awareness of the Quality Management System throughout the Operating Authority.

The WTP Chief Operator has been appointed and authorized to the QMS Representative role by Top Management.

The QMS Representative will conduct annual refresher training with frontline Operating Authority staff, reviewing the Operational Plan and how it relates to their job duties. The QMS Representative will also communicate with the QMS Coordinators from both the Treatment and Distribution to ensure that any changes to existing procedures or the addition of new procedures are incorporated into the Operational Plan and that all associated documents are updated accordingly.

The QMS Representative is responsible for coordinating the Internal Audit, and ensuring it is completed by a person or team with the appropriate training and qualifications as detailed in Element 19.

The QMS Representative is responsible for coordinating and scheduling the External Audit with a chosen MECP approved Accreditation Body.

The **QMS Coordinator – Water Treatment** is responsible to ensure that the Quality Management System is incorporated into the daily operation of the Water Treatment Plant as specified in the Operational Plan. The QMS Coordinator – Water Treatment will ensure that current versions of documents required by the Quality Management System are being used at all times and will communicate to the QMS Representative any changes to existing procedures or the addition of new procedures so that they can be incorporated into the Operational Plan. The QMS Coordinator – Water Treatment will assist with the planning and conducting of internal audits of the Quality Management System as required by the DWQMS and will participate in external audits as a key contact for the Water Treatment portion of the City of Kenora Drinking Water System. The QMS Coordinator – Water Treatment will act as an alternate QMS Representative when necessary.

The **QMS Coordinator – Water Distribution** is responsible to ensure that the Quality Management System is incorporated into the daily operation of the Water Distribution System as specified in the Operational Plan. The QMS Coordinator – Water Distribution will ensure that current versions of documents required by the Quality Management System are being used at all times and will communicate to the QMS Representative any changes to existing procedures or the addition of new procedures so that they can be incorporated into the Operational Plan. The QMS Coordinator – Water Distribution will assist with the planning and conducting of internal audits of the Quality Management System as required by the DWQMS and will participate in external audits as a key contact for the Water Distribution portion of the City of Kenora Drinking Water System. The QMS Coordinator – Distribution will act as an alternate QMS Representative when necessary.

The QMS Coordinators are as listed below:
QMS Coordinator – Water Treatment: Blair McCallum
QMS Coordinator – Water Distribution: Dave King

Element 5 – Document and Records Control

5.1 Introduction

The Documents and Records Control Procedures described below contain details for managing documents and records required by the Quality Management System (QMS). The procedures address how documents and records are: made readily identifiable; kept current; protected; kept legible; made available at all times; and ultimately disposed of.

5.2 Documents Control Procedure

Procedure Description

This procedure outlines the methods used by City of Kenora employees to control the creation, approval, distribution, revision, and protection of all documents related to the Quality Management System (QMS).

Reason for Procedure

Consistent control ensures the currency, accuracy, and ease of retrieval of each QMS document. Proper maintenance of documents is critical for conformance with the Drinking Water Quality Management Standard (DWQMS), and also for compliance with drinking water legislation.

Responsibility

The QMS Representative shall be responsible for the control of all QMS documents.

Procedure

a) Documents requiring control by the QMS include:

Internal Documents

- Operational Plan
- Standard Operating Procedures
- Emergency Response Procedures
- Management Review Documentation
- Emergency Contact List
- Watermain Repair Form and Records

- Continual Improvement Forms and Records
- OTJ Training Forms and Records
- Distribution Chlorine Residual Forms and Records
- Operator Logbooks and Logbook Forms

External Documents

- Applicable Drinking Water Regulations
- Applicable Industry Standards
- Equipment Manuals

b) The QMS Representative shall maintain all internal and external documents.

c) Internal Documents

1) A standard header shall identify all QMS internal documents. This header contains the title of the document, QMS element reference, indication of revision frequency, and signature of approval from the QMS Representative.
2) A standard footer shall identify all QMS internal documents. The footer will include the revision number and date as well as the words “Uncontrolled Printed Copy”.
3) All original (electronic) QMS internal documentation shall be stored on the City’s central computer. The electronic version shall be password protected to restrict access to the QMS Representative.
4) New or changed internal documents will be presented to all affected employees.
5) Old revisions of internal documents will be removed from circulation when a new revision is released.

d) External Documents

1) Each external document affected by the QMS shall be clearly marked as “Controlled Copy” and initialed by the QMS Representative.

2) Controlled copies of external QMS documents shall be stored in the Water and Sewer Shop at the Operations Centre or in the Water Treatment Plant.

3) Current equipment manuals shall be indicated on the Equipment Manual Index Form located on the bookshelf in the Water Treatment Plant office. On an annual basis the QMS Representative will confirm that all equipment manuals on hand represent the most up-to-date versions available, and that manuals for new equipment have been incorporated. If a newer version is available the QMS Representative will obtain a copy and replace the outdated one in the manual binder.

e) Communication of Changes or Updates to Documents

When a new internal or external document is created or when an existing one is changed or updated, the Manager of Underground Services will communicate this information to all affected staff during a crew meeting and this communication shall be documented as part of the meeting minutes.

f) Internal and external documents shall be reviewed at least annually, as a component of the annual internal audit and management review. A review may also take place when a significant change occurs in operations, such as a change in the type of process chemical or a change of equipment. Obsolete or out-of-date documents will be disposed of promptly.

5.3 Records Control Procedure

Procedure Description

This procedure provides guidance for the identification, use, retention, storage, protection, and disposal of all records generated that are related to the Quality Management System (QMS).

Reason for Procedure

Consistent control ensures the ease of retrieval of each record generated by City of Kenora employees. Proper maintenance of records is critical for conformance with the Drinking Water Quality Management Standard (DWQMS) and also for compliance with drinking water legislation and regulations.

Responsibility

The QMS Team shall be responsible for ensuring that an effective method for controlling all QMS records exists.

Procedure

1) Records may be retained electronically and/or in hard copy, but always according to the Document and Records Control master list included below at 5.6.
2) All Ministry of the Environment required records shall be maintained as per the relevant regulations at a minimum.
3) Filing and storage of paper records shall be such that they are protected from damage and are readily retrievable. Active records are kept in filing cabinets in the Water Treatment Plant office or at the Water and Wastewater Shop. Older records are stored in banker's boxes, clearly marked with the types of records contained within and the dates those records pertain to. These banker's boxes will be stored either at the Water Treatment Plant or in the Water and Wastewater Shop at the Operations Centre.
4) Records from the Document and Records Control master list that are identified as electronic are stored on the City of Kenora central computer and are backed up each day.
5) Records shall be made available to the public where required by legislation.

5.4 Security and Protection of Documents and Records

An electronic copy of the Operational Plan is maintained by the QMS Representative and is password protected and backed up on a regular basis on the City's computer network.

Any document or record identified as being electronic is stored on the City's network.

Any document or record identified as being hard copy at the Water Treatment Plant is stored in filing cabinets and/or bankers boxes in the office or blower room. These are retained at minimum for as long as required by legislation.

Any document or record identified as being hard copy for the Distribution System is stored in filing cabinets and/or bankers boxes in the Water and Wastewater Shop at the Operations Centre. These are retained at minimum for long as required by legislation.

5.6 Document and Record Master List

The Table below identifies the documents and records associated with the DWQMS program.

Document and Records Control – Document List

Document Title	Document Format	Document Location	Document Source	Treatment Or Distribution
Operational Plan	Electronic	www.kenora.ca Living Here> Water and Sewer> Water Reports> Operational Plan	Internally Created	Treatment and Distribution
WTP Standard Operating Procedures	Electronic Hardcopy	S:\Water Plant\My Documents\SOPs. Shortcut also on operators' desktops. Hardcopies are located in the SOP/ERP binder in the WTP office.	Internally Created	Treatment
Distribution Standard Operating Procedures	Electronic Hardcopy	S:\Operations\Water and Wastewater Division\QMS Controlled Documents\Distribution SOPs. Hardcopies are located in binder in SOP drawer in the Water and Wastewater Office.	Internally Created	Distribution
Emergency Response Procedures	Electronic Hardcopy	S:\Operations\Water and Wastewater Division\QMS Controlled Documents\Emergency Response Procedures. Hardcopies are located in the SOP/ERP binder in the WTP office.	Internally Created	Treatment and Distribution
Emergency Contact List	Electronic	S:\Operations\Water and Wastewater Division\QMS Controlled Documents	Internally Created	Treatment and Distribution
Watermain Repair Form	Electronic	S:\Operations\Water and Wastewater Division\QMS Controlled Documents	Internally Created	Distribution
Continual Improvement Form	Electronic	S:\Operations\Water and Wastewater Division\QMS Controlled Documents	Internally Created	Treatment and Distribution
On the Job Training Form	Electronic	S:\Operations\Water and Wastewater Division\QMS Controlled Documents	Internally Created	Treatment and Distribution

Document Title	Document Format	Document Location	Document Source	Treatment Or Distribution
Operator Logbook Forms	Electronic	S:\Operations\Water and Wastewater Division\QMS Controlled Documents	Internally Created	Treatment and Distribution
Distribution Chlorine Residual Form	Electronic	S:\Operations\Water and Wastewater Division\QMS Controlled Documents	Internally Created	Treatment
Legislation	Electronic	Shortcut to applicable acts and regulations are on each operator's desktop.	E-Laws	Treatment and Distribution
Procedure for Disinfection of Drinking Water in Ontario	Electronic Hardcopy	Shortcuts are on each operator's desktop. Hardcopy is located on the bookshelf in WTP office.	MECP	Treatment
Practices for the Collection and Handling of Drinking Water Samples	Electronic Hardcopy	Shortcuts are on each operator's desktop. Hardcopy is located on the bookshelf in WTP office.	MECP	Treatment
Permit to Take Water	Electronic	S:\Water Plant\My Documents\Permits and Licenses	MECP	Treatment
Municipal Drinking Water License	Electronic	S:\Water Plant\My Documents\Permits and Licenses	MECP	Treatment and Distribution
Drinking Water Works Permit	Electronic	S:\Water Plant\My Documents\Permits and Licenses	MECP	Treatment and Distribution
Operator's Certificates	Hardcopy	WT Certificates are displayed in the WTP lobby. WD certificates are displayed in the Water and Wastewater shop.	MECP / OWWCO	Treatment and Distribution
Maintenance Manuals (See manual index page on WTP office bookshelf for current list)	Hardcopy	Manuals are located on the bookshelf in the WTP office.	Manufacturer	Treatment

Document and Records Control – Record List

Name	Format	Location	Required Retention Time	Actual Retention Time	Treatment or Distribution
Laboratory Analysis Results	Electronic	Electronic files are in the ALS, SGS and Testmark folders in the WTP email account.	Microbiological – 2 years Chemical – 6 years Sodium – 15 years	At minimum as required by regulation	Treatment
On-Site Lab Test Results	Electronic Hardcopy	S:\Water Plant\My Documents\Water Plant Database Files Hardcopy daily entry pads are filed in banker boxes in the blower room when completed.	2 years	At minimum as required by regulation	Treatment
Distribution Chlorine Residual Record	Electronic Hardcopy	S:\Water Plant\My Documents\Distribution Bacti Results and Chlorine Residuals. Working hardcopy sheets are kept on the lab desk in the Distribution Residual Chlorine Tests binder. Completed sheets are filed in banker boxes in the WTP blower room.	2 years	At minimum as required by regulation	Treatment
Operator Logbooks	Hardcopy	Working WT logbook is located on the lab computer desk. Completed logbooks are filed in banker boxes in the WTP blower room. Working WD logbooks are kept in the Water and Sewer shop. Completed logbooks are kept in the Water and Wastewater Office. Older logbooks are stored in the Operations file room.	5 years	At minimum as required by regulation	Treatment and Distribution
Online Monitoring Records	Electronic	SCADA Logs on the WTP SCADA computer, accessed through trends screen.	2 years	At minimum as required by regulation	Treatment
Raw Water Quality	Electronic Hardcopy	S:\Water Plant\My Documents\Water Plant Database Files Hardcopy daily entry pads are filed in banker boxes in the blower room when completed.	2 years	At minimum as required by regulation	Treatment

Name	Format	Location	Required Retention Time	Actual Retention Time	Treatment or Distribution
Internal Instrument Calibrations	Hardcopy	Recorded in Calibration and Maintenance binder stored on lab computer desk.	2 years	At minimum as required by regulation	Treatment
Third Party Instrumentation Calibrations	Electronic	S:\Water Plant\My Documents\Calibration Reports	2 years	At minimum as required by regulation	Treatment
Adverse Records	Electronic	S:\Water Plant\My Documents\AWQIs	2 years	At minimum as required by regulation	Treatment
Training Records	Electronic Hardcopy	S:\Operations\Water and Wastewater Division\Training Records CEU certificates are kept in each operator's personnel file.	Minimum of three years for Certificate or License renewals	At minimum as required by regulation	Treatment and Distribution
Internal Audits	Electronic	N:\DWQMS Documents\Internal Audits	Minimum of three years to match audit cycle	At minimum as required by regulation	Treatment and Distribution
External Audits	Electronic	N:\DWQMS Documents\External Audits	Minimum of three years to match audit cycle	At minimum as required by regulation	Treatment and Distribution
Management Reviews	Electronic	N:\DWQMS Documents\Management Review Agendas and Minutes	Minimum of three years to match audit cycle	At minimum as required by regulation	Treatment and Distribution
Annual Reports	Electronic	www.kenora.ca Living Here> Water and Sewer> Water Reports	6 years	At minimum as required by regulation	Treatment and Distribution
Form 1's	Electronic Hardcopy	S:\Operations\Water and Wastewater Division\Form 1 Hardcopies are kept in the Engineering Department at the Operations building.	10 years	At minimum as required by regulation	Distribution
Form 2's	Electronic Hardcopy	S:\Water Plant\My Documents\Form 2's Hardcopies are stored in the filing cabinet in the office at the WTP.	10 years	At minimum as required by regulation	Treatment and Distribution
Form 3's	Electronic Hardcopy	S:\Water Plant\My Documents\Form 3's Hardcopies are stored in the filing cabinet in the office at the WTP.	10 years	At minimum as required by regulation	Treatment and Distribution
Watermain Repair Records	Electronic Hardcopy	S:\Operations\Water and Wastewater Division\Dig Reports Hardcopies are kept in the Water and Wastewater office.	5 years	At minimum as required by regulation	Distribution

Name	Format	Location	Required Retention Time	Actual Retention Time	Treatment or Distribution
On the Job Training Records	Hardcopy	WT records are stored in the WTP office filing cabinet. WD records are stored in the Water and Wastewater office.	5 years	At minimum as required by regulation	Treatment and Distribution
Continual Improvement Records	Electronic	N:\DWQMS Documents\Continual Improvement Records	N/A	Currently indefinite	Treatment and Distribution

Element 6 – Drinking Water System

General

The City of Kenora Water Supply System provides a potable water supply to the residents and businesses of the City of Kenora. In addition, an agreement is in place to supply water to Wauzhushk Onigum Nation. The facilities, consisting of an MECP Class III conventional water treatment plant having an approved capacity of 25,270 m^3/d, and a Class II water distribution system, are owned and operated by the City of Kenora. Water for the treatment process is drawn from a surface water source (Lake of the Woods) located adjacent to the City through a 900 mm (36”) HDPE intake approximately 275 m (900 feet) southwest of the plant. Potentially pathogenic organisms in the raw water are removed by the following processes:

1. Coagulation/flocculation/sedimentation
2. Filtration
3. Post-chlorination (primary disinfection)
4. Trim Chlorination/Ammonium Sulphate addition for Chloramination (secondary disinfection)

This multiple barrier approach helps to ensure consistently compliant drinking water quality, and ultimately improves the level of public health protection.

Raw Water Supply

Water is drawn from Lake of the Woods into the plant low-lift pumping well eventually being pumped through the plant to the clarifiers.

Coagulation / Flocculation / Sedimentation

Water flows from the low-lift pumping well through the raw water pipeline to a baffled mixing chamber located on the uppermost floor of the water treatment plant. Alum (aluminum sulphate) is added to the incoming raw water upstream from the clarifiers in the raw water pipeline 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. Polymer is added to the alum-water solution in the baffled mixing chamber on the uppermost floor. The alum-water-polymer solution enters the clarifiers where gentle

mixing promotes the formation of floc masses which attract and gather debris present in the source raw water. The process water and floc remain in the clarifiers. The floc is suspended by incoming water. Excess floc is disposed of by an automatic extraction system. Supernatant (the clear liquid above the suspended floc) flows from the clarifiers via open channels to the top of the dual media filters. Most of the particulate matter that was present in the raw water is captured by the floc particles and removed by gravity/extraction in the clarifiers, however, during normal operation, some floc passes from the clarifiers to the top of the filters.

Filtration

The water treatment plant has four units of dual media filters. The top layer of the filter is anthracite while the filter media below the anthracite layer is sand. The anthracite/sand combination is effective in removing residual particulate matter (floc) carried over from the clarifiers. As debris accumulates in the filters and limits flow, the filters must be cleaned by reversing the flow (referred to as backwashing) and directing the backwash to a wastewater 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 clear-well. The clear-well is a baffled tank with three sections located beneath the filters that are used to store filtered water and to provide disinfectant contact time.

Disinfection (Chlorination)

Primary disinfection (post-chlorination) occurs immediately following filtration, after the filter effluent enters the clear-well. Primary chlorination disinfects the filtered water, ensuring that any potentially pathogenic organisms that may remain after clarification and filtration are rendered harmless. Consistent disinfection is ensured by continuous monitoring of the chlorine residual in the treated water leaving the clear-well. If the residual drops to a predetermined level, an alarm is initiated and an operator is notified prior to levels becoming unacceptable and being allowed to enter the distribution

system. If the residual drops further to a predetermined level, the plant will automatically shut down.

Secondary disinfection is accomplished by adding sufficient trim chlorine and ammonium sulphate at the water treatment plant creating chloramines (combined chlorine), to maintain a residual throughout the entire distribution system. Secondary disinfection prevents re-growth of micro-organisms within the distribution system.

Process Waste Residuals Management

Filter backwash water and extracted alum floc from the clarifiers is directed to the wastewater storage tank where it is allowed to settle out where it is then pumped to the municipal sanitary sewer.

Distribution System and Elevated Storage Tanks

Treated water is pumped from the clearwell into the distribution system. Distribution piping typically ranges in size from 150 mm to 300 mm, and may consist of cast iron, ductile iron, concrete, or PVC, depending on the location and time of installation. Six pressure zones exist in the DWS. Three of the pressure zones are regulated by a booster station and standpipe, while the other three are regulated by a booster station only. These pressure zones are used to ensure adequate system pressure in areas of higher elevation or locations significantly remote from the plant or standpipes. A seventh pressure zone exists on Wauzhushk Onigum Nation, who are supplied water through an agreement. A leak in their pressure zone could potentially impact pressures in the Kenora DWS. Typical system pressure ranges from 315 kPa (45 Psi) to 560 kPa (80 Psi). Standpipes in three different locations (Fourth Street North, Valley Drive, and Keewatin) are an integral component of the distribution system to maintain relatively consistent system pressure and a reserve volume of water for community for fire protection and other emergency situations.

Sample Analysis

Provincial regulations dictate the sampling and monitoring requirements for the system. Water quality is tested throughout the treatment process and from various locations

throughout the distribution system. Where required by regulation, samples are submitted to an MECP accredited laboratory for analysis.

Source Water Overview

General

The raw water source for the treatment plant is Lake of the Woods. The water from Lake of the Woods is typically low in turbidity (1.6 - 4.0 NTU), low in color (28-49 apparent unit), slightly basic, and very soft (~54 mg/L as $CaCO_3$). Temperature fluctuates significantly throughout the seasons ranging from approximately 2^0 Celsius in the winter to as high as 25^0 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 lakebed are re-suspended, resulting in increased raw water turbidity. Operators must be prepared to make appropriate plant adjustments to respond to changing turbidity levels experienced throughout the year. Changes in water temperature will also impact treatment process performance (settling and disinfection). Optimal treatment requires adjustments to treatment chemical dosages (disinfectants and coagulants) in response to temperature fluctuations.

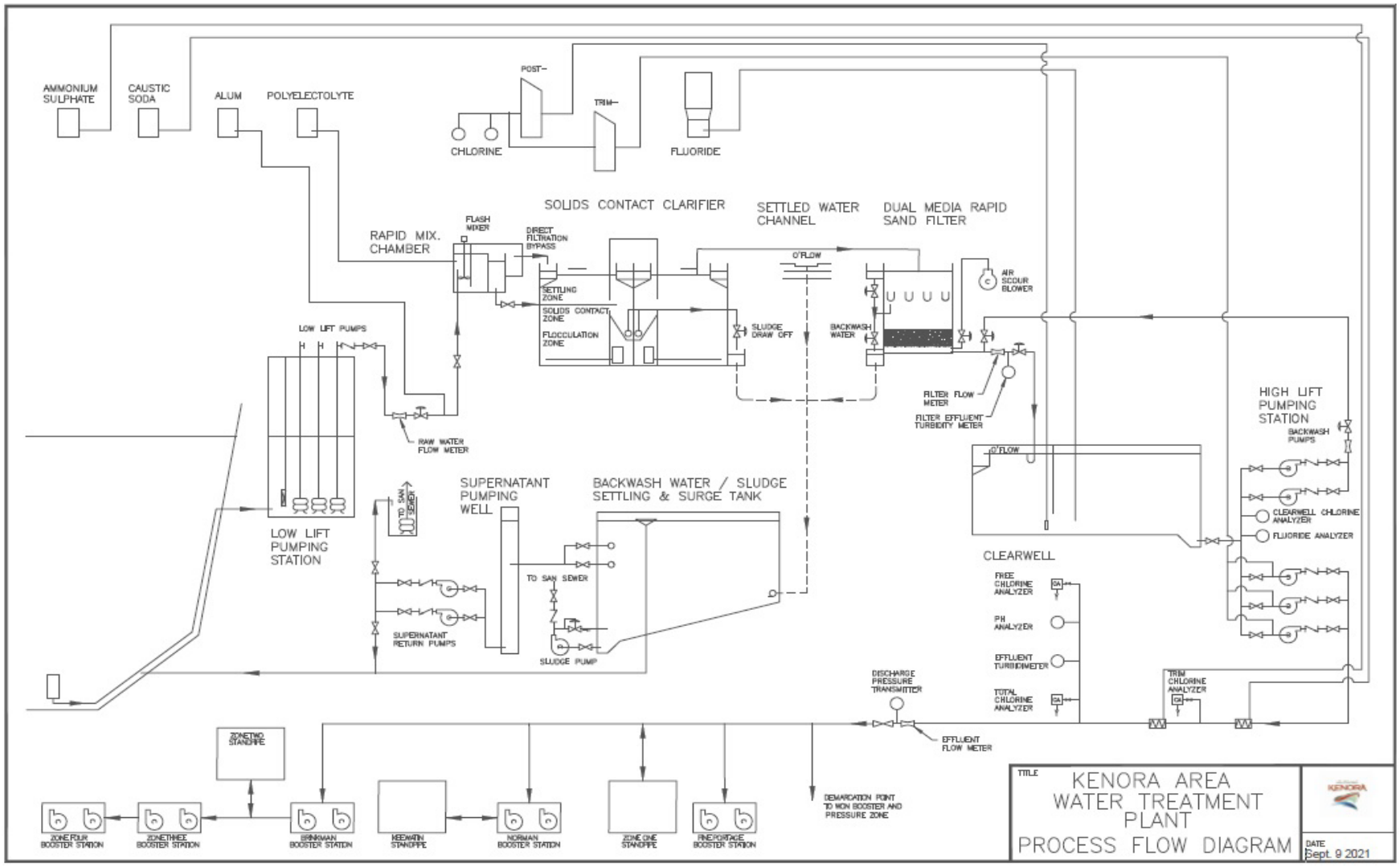
Threats

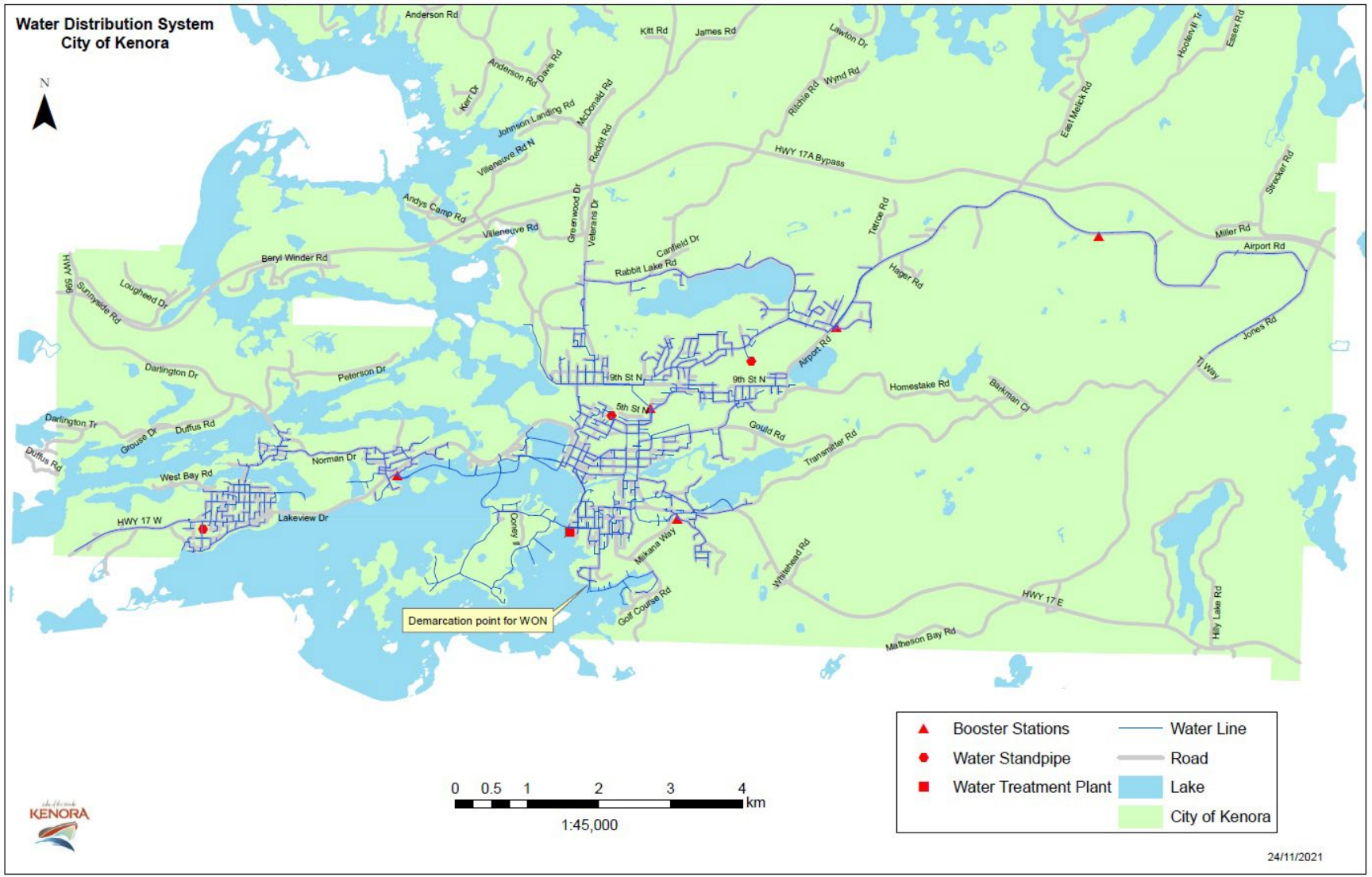
Potential sources of raw water contamination include spills from nearby settling ponds, lake traffic mishaps, and waste from recreational watercraft.

Operational Challenges

Lake of the Woods provides high quality source water, which for the most part is consistently low in bacteriological contamination and turbidity. Operator response is needed for changes in turbidity and temperature levels.

6.1) Drinking Water System Process




Water Distribution System
City of Kenora
N
Anderson Rd
Kitt Rd
James Rd
Lawton Dr
Anderson Rd
Dave Rd
Ker Dr
Johnson Landing Rd
McDonald Rd
Ritchie Rd
Wynd Rd
Hoodenville Tr
Essex Rd
East Melick Rd
Villeneuve Rd N
Reddit Rd
HWY 17A Bypass
Strecker Rd
Andys Camp Rd
Villeneuve Rd
Greenwood Dr
Veterans Dr
Tetroe Rd
Miller Rd
Airport Rd
Canfield Dr
Rabbit Lake Rd
Beryl Winder Rd
HWY 596
Sunnyside Rd
Lougheed Dr
Hager Rd
Jones Rd
Darlington Dr
Peterson Dr
9th St N
9th St N
Airport Rd
7J Way
Homestake Rd
Barkman Cr
5th St N
Darlington Tr
Grouse Dr
Duffus Rd
Gould Rd
Transmitter Rd
Duffus Rd
Norman Dr
West Bay Rd
HWY 17 W
Lakeview Dr
Coney
Mikana Way
Whitehead Rd
HWY 17 E
Demarcation point for WON
Golf Course Rd
Hilly Lake Rd
Matheson Bay Rd
Booster Stations
Water Standpipe
Water Treatment Plant
Water Line
Road
Lake
City of Kenora
0 0.5 1 2 3 4
km
1:45,000
KENORA
24/11/2021

Element 7 – Risk Assessment

The procedure below describes the method of hazard identification, risk assessment, and critical control point determination for the City of Kenora Water System. The procedure consists of hazard identification, risk assessment, critical control point determination, and critical limit identification. The results of the Risk Assessment are incorporated in the table entitled Risk Assessment Outcomes which is included in Element 8. An annual review will be conducted to ensure the currency of the information and the validity of the assumptions used in the risk assessment. A risk assessment will be completed as often as is deemed necessary or at least once every thirty-six months whichever is less. The risk assessment will consider all hazards listed in the most recent version of the Potential Hazardous Events for Municipal Drinking Water Systems to Consider in the DWQMS Risk Assessment document, published by the MECP.

1.0 Procedure Description

This procedure describes the method of hazard identification, risk assessment, and critical control point determination used by the City of Kenora. The procedure consists of hazard identification, risk assessment, critical control point determination, and critical limit identification. Each exercise is described in detail below.

2.0 Reason for Procedure

The systematic approach used for risk identification and assessment lessens the likelihood of overlooking potential treatment process hazards and associated risks to drinking water quality and public health. Hazard analysis, identifying critical control points, establishing critical limits and control instructions provide all operators with consistent direction for responding to conditions that pose a risk of jeopardizing drinking water quality.

3.0 Responsibility

The QMS Representative, with the assistance of the Overall-Responsible Operator, the QMS Coordinators, and Manager of Underground Services familiar with the facilities will do the periodic risk assessment. The same team is responsible for identifying all actual

and potential hazards, assessing the associated risks, determining critical control points, and setting critical limits.

4.0 Procedure

The hazard analysis procedure is reviewed at least annually, prior to the annual management review. These exercises may also be completed when a significant change occurs in operations, such as a change in the type of process chemical or a change of equipment.

4.1 Hazard Identification and Control Measures

Using a process flow diagram as a guide, the team studies the water treatment process from the raw water intake to the point of customer use. While studying the diagram, it also reviews the existing list of hazards and identifies any new potential hazards. Special attention is given to areas within the process where changes have occurred since conducting the previous hazard identification exercise. All hazards identified will be recorded in the *Description of Hazardous Event/Hazard Column* of the Risk Assessment Outcomes Table.

Once all of the hazards have been identified, the committee identifies measures in place to control the hazards and those are recorded in the *Control Measures Column* of the Risk Assessment Outcomes Table. The reliability and redundancy of equipment is considered during this exercise.

4.2 Risk Assessment

A risk assessment is performed for all events that are deemed to be controllable and the hazardous results of which are measurable. Controllable events are those that may be prevented through the actions of an operator. All other events are considered “emergency situations” and require the development of an Emergency Response Plan. Each controllable event is assigned a numeric value ranging from 1 to 5 in three different categories: likelihood, consequence, and detectability (see Table 1). The three assigned numbers for each event are then multiplied to determine the overall risk value.

Table 1: Likelihood, consequence, and detectability rating system.

Description	Likelihood of Hazardous Event Occurring	Rating
Rare	May occur in exceptional circumstances and has not occurred in the past.	1
Unlikely	Could occur at some time, historically has occurred less than once every five or ten years.	2
Possible	Has occurred or may occur once or more per year.	3
Likely	Has occurred or may occur on a monthly to quarterly basis.	4
Almost Certain	One or more occurrences on a monthly or more frequent basis.	5

Description	Consequence of Hazardous Event Occurring	Rating
	Insignificant impact, little public exposure, little or no health risk.	1
Minor	Limited public exposure, minor health risk.	2
Moderate	Minor public exposure, health impact on small part of the population.	3
Major	Large part of population at risk.	4
Catastrophic	Major impact for large part of the population, complete failure of systems.	5

Description	Detectability of Hazardous Event	Rating
Very detectable	Easy to detect, on-line monitoring through SCADA	1
Moderately detectable	Alarm present but not in SCADA, may require operator to walk by and notice alarm; problem is indicated promptly by in-house lab test results.	2
Normally detectable	Visually detectable on rounds or through regular maintenance.	3
Poorly detectable	Visually detectable but not inspected on a regular basis; not normally detected before problem becomes evident; lab tests are not done on a regular basis (e.g. quarterly).	4
Undetectable	Cannot be detected.	5

The highest overall risk values are typically indicators of critical events. Based on a review of the overall risk values and the associated events, a threshold number of 18

was chosen. All events associated with risk values which are equivalent to or greater than the threshold number are considered critical. Discretion may be used when determining which events are indeed critical, regardless of the calculated risk. Careful evaluation is required for each hazard event.

In the case where an event having a higher calculated risk value is not determined by the committee to be critical, an explanation of the reasoning for this distinction is required. An explanation of the reasoning is also required when the committee deems an event with a lower calculated risk critical.

Note that there are three events that are always critically hazardous to water quality: high turbidity, inadequate primary disinfection, and low system pressure.

A risk assessment will be completed as often as is deemed necessary or at least once every thirty-six months whichever is less.

4.3 Critical Control Point Determination

From the identified critical events, the committee then traces backwards through the water treatment process to determine the specific points where each critically hazardous event originates. These points then become control points. The final point in a series that leads to a critical event is identified as the critical control point. Critical control points require the establishment of controlled conditions, including: critical control limits, equipment redundancy, and control and recovery procedures.

4.4 Critical Limits

Critical limits are established for values that measure critical events. The limits provide operators with a range of acceptable values within which no preventive or corrective actions are required. Critical limits define the point at which an operator must take action to prevent escalation of the critical event or to correct the critical event. Critical limits are determined based on regulatory requirements, process monitoring capabilities, off-hours response time, and historical plant performance. Process alarms (if available) are normally set at, or near critical limits. Responses to breached critical limits are detailed in the Operations Manual.

Element 8 – Risk Assessment Outcomes

The following tables present the results of the Risk Assessment Outcomes exercise that was conducted subsequent to the Hazard Identification exercise completed as part of Element 7.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Source Water	Chemical spill impacting source water – railcar spill.	Ability to shut down plant for approximately 6-8 hours to allow contaminant to pass intake.	1	4	1	4	No.	None.	Visual and/or notification from authorities. SCADA alarm on low clearwell chlorine (only if contaminant has effect on chlorine residual, otherwise undetectable).	In the event of a known spill or contamination of the raw water source, contact the NWHU and SAC for further guidance. Shut down plant if beneficial.
Source Water	Chemical spill impacting source water – barge / recreational vehicle spill.	Ability to shut down plant for approximately 6-8 hours to allow contaminant to pass intake.	2	2	4	16	No.	None.	Visual and/or notification from authorities. SCADA alarm on low clearwell chlorine (only if contaminant has effect on chlorine residual, otherwise undetectable).	In the event of a known spill or contamination of the raw water source, contact the NWHU and SAC for further guidance. Shut down plant if beneficial.
Source Water	Leak on sewage marine line.	Ability to shut down plant for approximately 6-8 hours to allow contaminant to pass intake. Ability to adjust chlorine dosage to maintain primary disinfection under potential higher bacteriological load.	3	2	1	6	No.	None.	SCADA alarm at WWTP monitoring flow discrepancies across waterbody. SCADA alarm for low clearwell chlorine. Weekly raw bacteriological sampling.	Isolate leak. Shut down plant if beneficial. Increase post chlorine to maintain primary disinfection if necessary.
Source Water	Algal blooms.	None.	5	1	1	5	No.	None.	Visual monitoring.	Increase coagulant as necessary.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Source Water	Blue-green algal blooms.	None.	3	4	2	24	Yes.	Microcystin not detectable in treated water.	Visual monitoring, along with sampling as detailed in the Harmful Algal Bloom Monitoring Plan.	Increased sampling, and communication with NWHU and SAC as detailed in the Harmful Algal Bloom Monitoring Plan.
Source Water	Water supply shortfall.	None.	1	5	1	5	No.	None.	Visual Monitoring of lake level. SCADA alarm for lowlift wetwell low level.	None currently. Develop contingency if future trends show an increased likelihood of occurrence.
Source Water	Long-term impacts of climate change – eutrophication.	Adjust coagulant dosages.	5	2	1	10	No.	None.	Visual monitoring. DOC monitoring.	Adjust coagulant dosages as necessary.
Source Water	Sudden changes to raw water characteristics – turbidity, pH	Adjust coagulant dosages.	1	1	2	2	No.	None.	Visual monitoring of clarifier. Weekly raw water lab tests.	Jar test and adjust chemical dosages as required. Additional backwash as needed.
Intake	Anchor damage.	None.	1	1	5	5	No.	None.	Visual monitoring. Diver / ROV inspection.	None.
Intake	Intake line break.	None.	1	1	3	3	No.	None.	Diver / ROV inspection.	None.
Lowlift	Lowlift pump or VFD failure – inability to pump water to clarifier.	Redundancy – three pumps available, only one to two normally in use.	3	1	1	3	No.	None.	SCADA alarm for low lift failure. SCADA alarm for low channel level in clarifier.	Shut down plant if necessary. Determine low lift fault from fault code. Reset pump unless major problem. Use alternate pump or call electrician for assistance.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Lowlift	Lowlift PLC failure – inability to pump water to clarifier automatically.	Spare PLC parts inventory.	3	3	1	9	No.	None.	SCADA alarm for lowlift PLC failure / loss of communication.	Replace cards as necessary. Call electrician or automation provider if required.
Lowlift	Influent flow transmitter failure – unable to properly dose coagulation chemicals.	Spare parts.	1	4	3	12	No.	None.	SCADA alarm for low influent flow.	Shut down process and replace transmitter.
Coagulation and Flocculation	Alum system failure - loss of coagulant.	Redundancy – spare pump. Automatic plant shutdown on low alum flow.	4	4	1	16	Yes.	Automatic lowlift shutdown on low alum flow.	SCADA alarm on loss of alum flow.	Switch to standby pump and identify problem. Repair as needed.
Coagulation and Flocculation	Polymer Pump Failure - loss of coagulant aid.	Redundancy – spare pump.	4	3	1	12	No	None	SCADA alarm on polymer pump fault.	Switch to standby pump and identify problem. Repair as needed.
Coagulation and Flocculation	Flash mixer failure – inadequate mixing of coagulant/coagulant aid.	None.	3	1	3	9	No.	None.	Daily visual inspection.	Repair as needed. Contact electrician if required.
Coagulation and Flocculation	Vacuum pump failure - sludge blanket collapses due to lack of suspension.	Redundancy – spare pump.	2	1	2	4	No.	None.	Daily visual inspection.	Switch to spare vacuum pump and repair defective unit.
Coagulation and Flocculation	Roof drain leakage – Roof runoff leaks from pipes suspended over clarifier.	None.	2	1	1	2	No.	None.	Daily visual inspection.	Consider replacement of drain piping before it reaches point of failure.
Coagulation and Flocculation	Extractor failure in closed position – causes sludge blank to enlarge.	Spare solenoid and/or rebuild kits.	2	1	3	6	No.	None.	Daily visual inspection. SCADA alarm on high LOH if carryover is significant.	Repair or replace parts as needed. Contact electrician if required.
Coagulation and Flocculation	Extractor failure in open position – Drops level in clarifier and fills wastewater tank.	Spare solenoid and/or rebuild kits.	2	1	1	2	No.	None.	SCADA alarm for low channel level in clarifier. SCADA alarm for high wastewater tank.	Repair or replace parts as needed. Contact electrician if required.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Coagulation and Flocculation	Air compressor failure – loss of pressure in pneumatic extractor lines and wastewater level measurement system.	Redundancy – spare compressor.	2	1	1	2	No.	None.	SCADA alarm for low channel level in clarifier.	Repair or replace parts as needed. Contact electrician if required.
Clarification and Flocculation	Channel level transmitter failure.	None.	2	1	1	3	No.	None.	SCADA alarm for low channel level in clarifier.	Repair or replace. Contact electrician if required.
Filtration	Drain valve failure – water leaks continuously into wastewater tank.	Manually close valve. Take filter offline if required.	2	1	2	4	No.	None.	SCADA alarm for high wastewater tank.	Repair valve. Contact electrician if required.
Filtration	Turbidimeter failure – unable to measure filter turbidity.	Spare parts inventory. Automatic filter shutdown on filter fault. Take filter offline if required.	2	2	1	4	Yes.	Filter shutdown on turbidimeter fault alarm.	SCADA alarm for filter fault.	Repair turbidimeter. Contact electrician if required.
Filtration	Filter Breakthrough – unfiltered water enters into clearwell	Routine backwashing of filters. Automatic shutdown of filter on high loss of head. Automatic filter shutdown of filter on high turbidity.	1	5	1	5	Yes (based on professional judgement)	Range of Values-Turbidity: 0.2-0.3 NTU for alarm and 0.5-0.9 NTU for shut down. Filter head loss: 0.8 – 1.2 m for alarm and 1.2-1.6 m for shutdown.	SCADA alarm on high filter effluent turbidity. SCADA alarm on high loss of head.	Refer to Filter Effluent Turbidity Critical Limit Response Procedure.
Filtration	Filter underdrain failure – unfiltered water enters clearwell	Automatic filter shutdown of filter on high turbidity.	1	5	1	5	Yes (based on professional judgement)	Range of Values-Turbidity: 0.2-0.3 NTU for alarm and 0.5-0.9 NTU for shut down.	SCADA alarm on high filter effluent turbidity.	Refer to Filter Effluent Turbidity Critical Limit Response Procedure.
Filtration	Filter controller failure – actuator stops responding properly to flow signal.	Spare controller.	2	1	3	6	No.	None.	Daily inspection of trend data. Possible SCADA alarm on clearwell level.	Replace controller and ensure settings match. Contact electrician if required.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Filtration	Adder/subtractor failure – may affect primary disinfection.	Spare adder/subtractor.	1	1	1	1	No	None	SCADA alarm on low clearwell effluent chlorine.	Shut down process and replace with spare unit.
Filtration	Filter PLC failure – backwashes unable to be controlled automatically.	Spare PLC parts inventory.	3	3	1	9	No.	None.	SCADA alarm for filter PLC failure / loss of communication.	Replace cards as necessary. Call electrician or automation provider if required.
Backwash	Air blower failure – unable to properly backwash filter.	None.	2	5	1	10	No.	None.	Observation during backwash. Possible SCADA alarm for blower fail to start.	Repair. Contact electrician or supplier if necessary.
Backwash	Backwash pump failure – unable to pump backwash water to filters.	Redundancy – spare pump (both pumps used at times during high temperatures).	2	5	1	10	No.	None.	Observation during backwash. SCADA alarm for lack of flow.	Repair. Contact electrician if necessary.
Waste Management	Wastewater pump failure – unable to pump wastewater to sewer.	Redundancy – spare pump.	3	2	1	6	No.	None.	SCADA alarm for high wastewater tank level.	Repair or replace with spare pump. Use Supernatants to pump wastewater to low lift waste sump.
Waste Management	Lowlift sump pump failure – unable to pump supernatant to sewer.	None.	2	2	1	4	No.	None.	Visual monitoring during pump over.	Arrange for vac truck if required.
Waste Management	Supernatant pump failure – unable to pump supernatant to low lift sump.	Redundancy – spare pump.	2	1	2	4	No.	None.	Visual monitoring during pump over.	Run using single supernatant pump while repairing.
Waste Management	Highlift sump pump failure – potential for flooding in highlift area.	Redundancy – spare pump.	3	1	1	3	No.	None.	SCADA alarm on high sump level.	Replace pump with spare.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Clearwell	Post chlorinator failure – primary disinfection affected.	Redundancy – standby chlorinator. Automatic plant shutdown on low chlorine residual.	2	3	1	6	No.	Alarm at 0.90 mg/L. Automatic shutdown at 0.60 mg/L.	SCADA alarm on low clearwell influent chlorine. SCADA alarm on low clearwell effluent chlorine.	Refer to Primary Disinfection Critical Limit Response Procedure.
Secondary Disinfection	Trim chlorinator failure – secondary disinfection affected.	Redundancy – standby chlorinator.	2	2	1	4	No.	None.	SCADA alarm for low trim chlorine.	Refer to Secondary Disinfection Critical Limit Response Procedure.
Secondary Disinfection	Sodium Hydroxide Pump Failure - Lowers effluent pH	Redundancy – spare pump, parts inventory.	3	1	1	3	No.	None.	SCADA alarm for low effluent pH.	Switch to standby pump and identify problem. Repair as needed.
Secondary Disinfection	Ammonium Sulphate pump failure – loss of nitrogen for chloramination process.	Redundancy – spare pump, parts inventory.	3	1	1	3	No.	None.	SCADA alarm for high effluent free chlorine.	Switch to standby pump and identify problem. Repair as needed.
Treated Water	Highlift pump failure – eventual loss of system pressure.	Redundancy – three pumps available, only one normally in use.	2	1	1	2	No.	None.	SCADA alarm for Zone 1 low level. SCADA alarm for low discharge pressure.	Switch to alternate pump and identify problem. Repair as needed.
Treated Water	Highlift checkvalve failure on closing – chloraminated water flows back into clearwell.	Spare parts.	3	3	1	9	No.	None.	SCADA alarm on low clearwell effluent chlorine. SCADA alarm for low discharge pressure.	Repair check valve. Flush highlift until free residual is back to normal before starting plant.
Treated Water	Highlift checkvalve failure on opening – eventual loss of system pressure.	Spare parts.	3	1	2	6	No.	None.	SCADA alarm for Zone 1 low level. SCADA alarm for low discharge pressure.	Switch to alternate highlift pump. Repair check valve.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Treated Water	Backflow of filter effluent into highlift header.	Manual isolation valves.	2	5	1	10	No.	None.	SCADA alarm for low clearwell effluent chlorine. SCADA alarm for low fluoride.	Troubleshoot to determine source of failure. Refer to Primary Disinfection Critical Limit Response Procedure.
Treated Water	Main PLC failure – plant unable to run automatically.	Spare parts.	2	5	1	10	No.	None.	SCADA alarm for primary PLC failure.	Replace cards as necessary. Call electrician or automation provider if required.
Treated Water	Effluent flow transmitter failure – unable to properly dose secondary disinfection chemicals.	Spare parts.	1	2	1	2	No.	None.	SCADA alarm for low effluent pH. SCADA alarm for high effluent free chlorine.	Shut down process and replace transmitter.
Treatment System	SCADA computer failure – unable to control plant, loss of trending data.	Redundancy – spare HMI computer.	3	2	2	12	No.	None.	Visual monitoring.	Control plant from other SCADA computer until repair /reboot is complete.
Treatment System	Generator failure – Unable to run plant during power outage.	Spare parts.	2	5	1	10	Yes. (professional judgement)	None.	SCADA alarm for power failure. Operator always on site to monitor generator while running.	Refer to Loss of Power Due to Generator Failure Critical Limit Response Procedure.
Distribution	Power failure while standpipe is out of service - negative distribution system pressure.	None.	5	5	1	25	Yes.	None.	SCADA alarm for standpipe low level. Additional pressure switch dialer alarm at Zone 1 Standpipe.	Contact Health Unit and issue boil water advisory. Refer to Distribution System Pressure Critical Limit Response Procedure.
Distribution	Standpipe low level – potential loss of distribution system pressure.	Start pump at appropriate booster station.	2	3	2	12	No.	None.	SCADA alarm for standpipe low level. Additional pressure switch dialer alarm at Zone 1 Standpipe.	Determine cause of low level and take appropriate corrective action.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Distribution	Low chlorine residual – failure of secondary disinfection, potential for bacteriological growth.	Flushing, bleeder installation.	3	2	4	24	Yes.	0.50 mg/l Combined Chlorine.	Routine distribution system chlorine residual testing as per Reg. 170/03.	Report as adverse if below 0.25. Refer to Secondary Disinfection Critical Limit Response Procedure.
Distribution	Water main break resulting in negative pressure – possibility of contamination.	Isolate section with distribution valving.	3	2	2	12	No.	None.	SCADA alarm for low pressure. SCADA alarm for low standpipe level. Visual confirmation. Customer notification of loss of pressure.	Refer to Distribution SOP #22 – Watermain Breaks and Repair. Follow the MECP Watermain Disinfection Procedure.
Distribution	Fire suppression in areas of low system pressure – negative system pressure and possibility of contamination	Firefighter training, communication between firefighting and distribution staff.	1	3	4	12	No.	None.	SCADA alarm for low pressure. SCADA alarm for low standpipe level. Visual confirmation. Customer notification of loss of pressure.	Conduct flushing and confirm chlorine residual as necessary.
Distribution	Sustained extreme temperatures – deep freeze causting frozen water mains.	Bleeders installed in areas with frequent freezing issues.	4	2	2	16	No.	None.	Complaints from residents with no water pressure.	Thaw lines and mains using DBH unit or pulsator.
Distribution	Sustained pressure loss – major water main break or pump failure	Replacement program of aging watermains and infrastructure.	2	2	1	4	No.	None.	SCADA alarms for low pressure at WTP or booster stations, complaints from residents with no water pressure, visible leakage.	Issue a Boil Water Advisory and follow up with NWHU and SAC. Repair watermain or equipment.

Activity or Process Step	Description of Hazardous Event / Hazard	Control Measures	Likelihood	Consequence	Detectability	Total	CCP?	Critical Control Limits	Monitoring Procedures and Processes	Response Procedures
Distribution	Backflow – cross connections.	Applicable by laws, elimination of cross connections if they are discovered.	1	3	3	9	No.	By-law, elimination of possible or existing cross connection.	Visual, quality issues, sample results.	Enforce applicable by-law, eliminate found and possible cross connections, issue boil water advisory, follow MECP/Health Unit directives.
Entire System	Extreme weather events – ice storm, extreme weather leading to extended power outages.	WTP and critical booster stations have automatic backup generators.	2	2	2	8	No.	None.	SCADA alarms for power failures at all locations with generators.	Monitor generators and fuel levels.
Entire System	Terrorist threats – sabotaging vulnerable treatment units and distribution system, intrusion into infrastructure.	Buildings are locked and gated, cellular dialer alarms, Intrusion alarms.	1	3	1	3	No.	None.	SCADA intrusion alarm, visible on walk through.	Internal and external investigation, notify OPP, follow MECP and Health Unit's directives in the case of any major incident.
Entire System	Vandalism – deliberate damaging of infrastructure.	Buildings are locked and gated, surveillance video at some locations.	3	2	3	18	No.	None.	Visible on walk through, video recording.	Internal and external investigation, notify OPP for further investigation.
Entire System	Cyber Threats – Hacking of WTP or Remote PLC's, SCADA system	Any commercial internet suppliers have a physical firewall, passwords required for remote access to SCADA.	1	3	2	6	No.	None.	Visual monitoring of SCADA system.	Contact IT, police as appropriate.

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:

Number 1 – Filter Breakthrough or Underdrain Failure

Filter Effluent Turbidity Critical Limit Response

The following provides instruction to operators responding to a filter effluent turbidity critical limit alarm. If any circumstances are encountered that are not addressed by the instructions below, the Overall-Responsible Operator must be immediately notified.

1. Check the treated water (not filtered) turbidity reading (and recent trending). A gradual increase in treated water turbidity indicates that the alarm condition is unlikely the result of a false reading and that the condition has been occurring for a significant period of time. If the elevated turbidity is observed in the finished water, proceed immediately to step 3. If not, the filter effluent measurement triggering the alarm may be false, or has not yet begun to affect the treated water.

NOTE: If the filtered water turbidity is measured above 1 NTU for 15 consecutive minutes or longer, the operator must immediately follow the procedure for reporting adverse water quality in accordance with Ontario Regulation 170/03. Without compromising community fire protection or system pressure, every effort must be made to avoid pumping the adverse water to the distribution system. The Overall-Responsible Operator must be immediately notified.

2. Collect and analyze samples of effluent from the abnormal filter(s) to confirm the continuous analyzer readings. If the reading(s) is confirmed proceed to step 3. If the reading cannot be confirmed, and is deemed erroneous, recalibrate the continuous analyzer to resolve the alarm condition.

3. If only one of the four filters is contributing the elevated turbidity, shut off that filter, directing process flow through the remaining filters. Visually examine the problem filter for any abnormalities. If the filter appears normal, proceed with backwashing when conditions are favorable. If, within 15 minutes following the backwash, turbidity levels have not returned to normal, shut off the problem filter and continue troubleshooting.

4. If all filters are contributing to the elevated turbidity, visually inspect the clarifiers and filters for abnormalities. Check for changes in raw water turbidity and coagulant dosages. Adjust and / or resume coagulant flow as needed, based on jar testing results or comparable historical data.

Note that changes resulting from coagulant adjustment may not take full effect for up to 12 hours (3 hydraulic retention times through flocculation tank, sedimentation tanks and filters).

If a filter must be taken off line indefinitely and / or the cause of elevated turbidity cannot be determined and rectified by the above actions, the Overall Responsible Operator and/or the General Manager of Utilities must be immediately notified.

All observations and corrective actions directly and indirectly related to the alarm condition must be detailed in the plant log book in accordance with Ontario Regulation 170/03.

Rationale:

The critical limit of 0.2 – 0.3 NTU is a conservative value, significantly lower than the applicable regulatory and guideline limits. The limit is set between 0.2 – 0.3 NTU to allow adequate time for a corrective response before the regulatory limit is reached. Although much lower than the regulatory maximum, the control limit is approximately 10 times the normal historical average, clearly indicating an abnormal condition that requires further investigation and possible control actions.

Considerations:

. Regulatory limit: 1 NTU
. Procedural limit: 95% of continuous measurement values = <0.3 NTU
. Monitoring capability: continuous with alarm
. Operator response time: 30 minutes
. Historical (normal) performance: <0.05 NTU
. Alarm limit: 0.3 NTU (approximately 10X normal historical average)
.

Safeguards:

The following safeguards are currently in place to prevent the distribution of filtered water that fails to meet the critical limit.

Each filter turbidity analyzer is equipped with a high effluent turbidity (set between 0.2 – 0.3 NTU) that alarms at the plant when operators are present, and signals a dispatch to the on-call operator after normal working hours. The filter effluent turbidity alarms will alert the operator to potential problems before the finished water being pumped to the distribution system is affected. If the turbidity reaches a second alarm set point (0.5 – 0.9 NTU), this will be immediately shut down the filter even if an operator has not yet responded.

Number 2 – Process Flow – Generator Failure

Loss of Power Due To Generator Failure during Power Outage Critical Limit Response

If the generator quits while running or fails to start, immediately shut down Norman and Brinkman booster pumps. If the SCADA system is still powered up by UPS this can be done from the plant, but if the UPS is no longer providing power to the PLC this will have to be done locally at the booster stations.

Troubleshoot generator. Determine problem and repair if possible. Depending on the complexity of the repair, this could be done by operators, city mechanics, or a third party contractor.

With the booster stations shut down, Zone 1 standpipe can last anywhere from four to ten hours depending on demand before pressure loss becomes an issue. If it is determined that the repair will take a few hours or more it may be good to consider contacting the local radio station to advise residents to reduce water usage if possible. The fire department should also be notified as this could affect water availability for fire protection.

If generator repair is not possible within a reasonable time frame a backup generator should be arranged. The generator will need to be rented from a supplier in Winnipeg or Thunder Bay. An electrician will need to be on site to connect the generator to the MCC.

In the case that the generator cannot be repaired before low pressures occur in the distribution system, a boil water advisory will need to be issued.

Number 3 – Power Failure while Standpipe is out of service – Negative Distribution Pressure

Distribution System Pressure Critical Limit Response

The following are instructions for operators responding to a distribution system pressure critical limit alarm. If any circumstances are encountered that are not addressed by the instructions below, the Overall Responsible Operator must be immediately notified.

A) Zone 1 Standpipe Low Level (Standpipe in service)

Critical Limit Values: Zone 1 Standpipe Low Level Alarm = 9 m.

1. Check the operation of the high lift pumps, by checking flow rate. If the highlift is running but there is no flow, the check valve has most likely not opened on startup due to faulty check valve or internal highlift pump failure. If this is the case, shut down the highlift and switch to alternate highlift. Troubleshoot valve and or pump and repair as necessary. If the highlift is not running, check to make sure the tank level is below the start set point on the SCADA system.
2. If flow rate indicates high-lift pump is okay, check the SCADA system for signs of increased system demand or a water main break (indicated by long slow filling cycle, or drop during filling cycle), attempt to determine if high volume water users have increased consumption (i.e. Is there a fire? Is industry consumption up?) If the increased demand is for emergency use, (i.e. a fire), monitor the situation. Depending on the situation it may be beneficial to shut down Norman and/or Brinkman boosters for the time being. Only start up a second high-lift if absolutely necessary.
3. If Zone 1 is dropping off for no apparent reason it is quite possibly due to a leak in the marine line. Check the suction pressure at Norman Booster. If the suction pressure is lower than normal this may indicate trouble with the marine line. Call in the water and wastewater staff to investigate.

B) Zone 1 Standpipe Low Level (Standpipe out of service)

Critical Limit Values: Pressure switch /Paravox dialer = 8.75 m

Phase Failure Alarms WTP

1. A pressure switch and Paravox dialer is installed at Zone 1 Standpipe and may be modified for standpipe maintenance in order to be notified of negative pressure immediately upon hydro or high-lift pump failure at the water treatment plant.

2. Phase failure alarms are installed at the Water Treatment Plant and initiate an alarm should hydro power fail.

If an operator is called out due to a low pressure/hydro failure alarm, immediately contact NWHU and a boil water advisory will be issued for the entire city.

C) Zone 2 Standpipe Low Level (Standpipe in service)

Critical Limit Values: Zone 2 Standpipe Low Level Alarm = 17.0 m

1. Check to see if there is a pump running at Brinkman Booster. Check suction pressure to determine adequate suction supply. Check flow rate to determine if pump is fully functional. Acceptable suction pressure with pump running and zero or low flow rate could indicate internal pump problem or faulty pressure regulating valve. Shut down faulty pump and switch to alternate.
2. If a pump is not running, check to make sure the standpipe level is below the start set point in the SCADA system. If it is below the set point, check if there are any pump faults. Check UPS battery condition as pumps may not start if battery is low.
3. If a pump is running with acceptable suction pressure and adequate flow rate at Brinkman Booster, and Zone 2 Standpipe is still falling, attempt to determine if there are any unusually large volumes of water being used, such as fighting a fire. If so, monitor the tank volume and only turn on a second pump if it is absolutely necessary. If there is no obvious reason that extra water is being used, it is most likely a leak in the distribution system. Call out the sewer and water staff to investigate.

D) Zone 2 Standpipe Low Level (Standpipe out of service)

Critical Limit Values: Modified pressure switch setting

1. Brinkman booster station has a pressure switch that may be modified for standpipe maintenance in order to be notified of negative pressure immediately upon hydro or a booster pump failure at Brinkman Booster.

   Phase failure alarms are installed at Brinkman Booster and initiate an alarm should hydro power fail at Brinkman Booster. If an operator is called out due to a low pressure/hydro failure alarm at Brinkman Booster, immediately contact

NWHU and a boil water advisory will be issued for the Zone 2, Zone 3 and Zone 4 pressure zones.

E) Keewatin Standpipe Low Level (Standpipe in service)

Critical Limit Values: Keewatin Standpipe Low Level Alarm = 14.5 m

1. Check to see if there is a pump running at Norman Booster. If a pump is not running, check to make sure the standpipe level is below the start set point in the SCADA system. If it is below the set point, check if there are any pump faults. Check UPS battery condition as pumps may not start if battery is low.
2. Check Suction pressure to determine adequate suction supply. Check flow rate to determine if pump if fully functional. Acceptable suction pressure with pump running and zero or low flow rate would indicate internal pump problem or faulty pressure regulating valve. Shut down faulty pump and switch to alternate and or repair pressure regulating valve.
3. If a pump is running with acceptable suction pressure and adequate flow rate at Norman Booster and Keewatin Standpipe is still falling, attempt to determine if there are any unusually large volumes of water being used, such as fighting a fire if so, monitor the tank volume and only turn on a second pump if it is absolutely necessary. If there is no obvious reason that extra water is being used, it is most likely a leak in the distribution system. Call out the sewer and water staff to investigate.
4. Check the suction pressure and flow rate at Norman Booster. If Keewatin Standpipe is dropping off along with abnormally low suction pressure and a lower flow rate than normal it is quite possibly due to a leak in the marine line. Call in the sewer and water staff to investigate.

F) Keewatin Standpipe Low Level (Standpipe out of service)

Critical Limit Values: Norman Booster Phase failure due to power failure. Norman Booster low suction alarm (marine line failure).

1. Phase failure alarms are installed at Norman Booster and initiate an alarm should hydro power fail.
2. A low suction pressure switch at Norman Booster will initiate an alarm should the marine line fail.

   If an operator is called out due to a hydro failure alarm, immediately contact NWHU and a boil water advisory will be issued for the Norman / Keewatin pressure zone.

   If an operator is called out due to a low suction pressure alarm determine there is adequate pressure at Keewatin standpipe. If there is inadequate pressure at Keewatin Standpipe immediately contact NWHU and a boil water advisory will be issued for the Norman / Keewatin pressure zone.

G) Booster Station Alarm

1. In the event of a general power failure, at Norman, Brinkman, or Pine Portage Booster contact Synergy North, and for a general power failure at Zone 3 and Zone 4 contact Hydro One to report the problem and to determine when power will resume. Meter numbers for Zone 3 and Zone 4 are 3611934003 and 2603894008 respectively. These numbers will aid Hydro One in identifying booster location when contacted. Backup generators are supplied at Norman, Brinkman, Zone 3 and Zone 4 Boosters. Pine Portage does not have a backup generator.
2. If low suction pressure is preventing booster pump operation, check the related standpipe level. Turn pumps off to prevent damage.
3. If the standpipe level is normal, check the system pressure upstream from the station at the nearest hydrant. If the hydrant pressure is normal, check the suction pressure gauge and repair or replace as needed.
4. If the pump is not operating, check the variable frequency drive and reset if necessary.

5. If the duty pump will not start due to a mechanical or electrical malfunction, switch duty to the lag or standby pump and resume operation.
6. If neither pump will start due to a suspected electrical problem, immediately contact an electrician.

H) Power Interruption at WTP

1. The WTP is equipped with a backup diesel powered generator, capable of running all instrumentation, metering pumps, and one high lift pump. The generator will start automatically following a short delay when power is interrupted. An operator must remain at the plant while the auxiliary diesel generator is running. The operator must monitor all necessary treatment equipment and make arrangements for refilling the fuel tank if needed. The operator must also contact Synergy North to determine the anticipated duration of the interruption so that alternate staffing can be scheduled as needed. If the diesel generator fails to start, immediately notify an electrician.

Rationale:

Positive pressure must be continuously maintained throughout the distribution system to prevent potential incidents of backflow. Backflow occurs when potentially contaminated liquid reverses flow through a private connection and enters the municipal system creating a potentially high health risk to other users. In all zones, pressure is controlled under normal circumstances by the water level in the standpipes. Power failures generally do not affect distribution pressures during normal operation. Pine Portage area may experience lower pressures than normal with a local power failure at the booster although they will still be acceptable. During standpipe maintenance with the standpipe isolated, a power or high lift pump failure will create a problem with negative pressure as there is no buffer to maintain normal system pressure. Under this circumstance the operator must immediately contact the NWHU and a boil water advisory will be issued for the affected area.

Standpipe Critical Level

All standpipes have low level alarms that are below and near the lead start point. The alarm point is chosen to notify operators of problems as they arise as early as possible providing operators with the maximum amount of time available to identify and correct problems before low distribution pressure should become a problem.

High Lift Pump Discharge Pressure Critical Limit

Alarm is in place on the highlift low discharge pressure. Adequate highlift discharge pressure is maintained through adequate standpipe water level. Alarms are provided for standpipe water levels. An alarm is in place for highlift low discharge pressure.

Booster Station Critical Limits

The booster stations provide additional system pressure to areas of the distribution system that experience significant pressure loss due to increased system head loss associated with geographical distance from the related standpipe, and elevation differences in the local geography. Under ideal circumstances, it is desirable to maintain system pressure at or above 315 kPa (45 Psi) in all service areas.

Zone 3, Zone 4 and Pine Portage Boosters

It is important to note that system pressure in Pine Portage area will remain positive even if the booster pumps fail to function. Zone 3 and Zone 4 boosters are equipped with low discharge pressure alarms and immediate contact of NWHU in order to have a boil water advisory issued will be necessary.

Considerations:

Six (6) City of Kenora DWS Pressure Zones including:

1. Zone 1 area of the city fed by WTP high lift pumps and Zone 1 Standpipe west to Norman Booster Station, east to Transmitter Road, north to Brinkman Booster and South to Ridge Road (Golf Course Bay)
2. Norman / Keewatin area fed by the Norman Booster Station and Keewatin Standpipe
3. Pine Portage area fed by the Pine Portage Booster Station off of Zone 1 area
4. Zone 2 area fed by Brinkman Booster and Zone 2 Standpipe
5. Zone 3 area fed by Zone 2 area and Zone 3 Booster Station

6. Zone 4 area fed by Zone 3 area and Zone 4 Booster Station

Pressure controls:

1. Zone 3 and Zone 4 Boosters equipped with lead and lag pumps controlled by variable frequency drives which maintain continuous discharge pressures of 550 kPa (80 Psi) and 580 kPa (85 Psi)respectively.
2. 3 Elevated storage tanks:
   Zone 1 Standpipe
   Zone 2 Standpipe
   Keewatin Standpipe
3. High lift check /pressure regulating valve for standpipe maintenance in Zone 1 (set at approximately 490 kPa (70 Psi)) if elevated storage tank must be isolated.

Monitoring:

1. Continuous pressure monitoring at booster stations equipped with low suction and discharge pressure alarms and user selectable suction or discharge alarm at Brinkman Booster.

2. Continuous standpipe level monitoring with high and low level alarms.

3. Paravox alarm and pressure switch combination at all standpipes as backup low level or standpipe maintenance low pressure alarm.

Safeguards:

The following is a summary of safeguards that are currently in place to prevent or minimize loss of positive distribution system pressure:

1. 3 Standpipes.
2. Continuous standpipe level monitoring complete with conservative low and high level alarms.
3. Paravox alarm and pressure switch combination at all standpipes as backup low level or standpipe maintenance low pressure alarm.
4. Lead, lag, and standby high lift pumps, each capable of meeting current peak demands.

5. Continuous monitoring of low suction / discharge pressure complete with alarms at Zone 3, Zone 4, Norman, Brinkman and Pine Portage Booster Stations.
6. Pump redundancy at all booster stations.
7. Power failure alarms at all booster stations.
8. Generators at the Water Treatment Plant, Zone 3, Zone 4, Norman, and Brinkman Booster Stations.

Reporting and Recording

1. If a low pressure event in the distribution system is encountered where it is suspected that backflow or other contamination of the distribution system may have occurred, the Northwestern Health Unit (NWHU) must be immediately notified as well as the Overall Responsible Operator and the Manager of Water and Wastewater.

   Although reporting low pressure is not required by regulation, notification will also be made to the MECP's Spills Action Center if contamination is suspected.
2. All observations and corrective actions directly and indirectly related to responses to low pressure conditions must be detailed in the plant log book.

Number 4 – Distribution – Low Chlorine Residual

Responses for Critical Limits have been presented in two sections as Primary Disinfection and Secondary Disinfection.

Section A - Primary Disinfection Critical Limit Response

Critical Limit Values:

Clearwell Usable Volume	Minimum Clearwell Level (Plant automatic shutdown)	Minimum Free Cl_2 Residual (mg/L)
919 m^3 (3 Sections Used)	1.5 Meters	1 mg/L @ <.5°C @ 26,000 m^3/day pH ≥6<6.5
320 m^3 (Center and East Section Used)	1.5 Meters	3 mg/L @ <.5°C @ 26,000 m^3/day pH ≥6<6.5

343 m^3 (Center and West Section Used)	1.5 Meters	2.8 mg/L @ <.5°C @ 26,000 m^3/day pH ≥6<6.5

Critical Limit Response Instructions:

The following are instructions for operators responding to a disinfection system critical limit alarm. If any circumstances are encountered that are not addressed by the instructions below, the Overall Responsible Operator and/or the General Manager of Utilities must be immediately notified.

Low Chlorine Residual:

Clearwell Effluent Free Chlorine

NOTE: Table above represents the worst case scenario during winter operation at maximum design flow. If the calculated disinfection CT is inadequate using current conditions, the operator must immediately follow the procedure for reporting adverse water quality in accordance with Ontario Regulation 170/03. Plant and boosters may be shut down in order to determine and correct problem. Without compromising community fire protection or system pressure, every effort must be made to avoid pumping the adverse water to the distribution system. The Overall Responsible Operator and/or the General Manager of Utilities must be promptly notified.

1. Confirm the low continuous analyzer reading by measuring the residual in a grab sample using the portable spectrophotometer. If the continuous analyzer reading is not confirmed, proceed with recalibrating or repairing the continuous analyzer in accordance with the manufacturer's instructions.
2. If the low continuous analyzer reading is confirmed, calculate the disinfection CT using current condition values (pH, temp., effluent flow rate, clearwell level, clearwell effluent chlorine residual) and baffling factor of 0.7. If the CT is adequate, continue troubleshooting to determine the cause of the low residual.
3. If the calculated disinfection CT is inadequate using current conditions, the operator must immediately follow the procedure for reporting adverse water quality in accordance with Ontario Regulation 170/03 after shutting down plant and boosters to prevent

additional adverse water from entering the distribution system and manually shutting down all filters to prevent additional inadequately chlorinated water from entering the clearwell.

Immediately correct the deficiency:

4. Increase the disinfectant dosage rate.

5. Confirm consistent disinfectant flow by checking chlorinators for proper operation. A standby chlorinator is available for use if necessary.

6. Check the disinfectant piping, valves, and check valves for leaks or potential obstructions on the suction and discharge sides of the chlorinator. Clean/repair as needed.

7. Clearwell contents may be pumped to Lake of the Woods, providing chlorine residual is zero, by utilizing sump pumps.

All observations and corrective actions directly and indirectly related to the alarm condition must be detailed in the plant log book in accordance with Ontario Regulation 128/04.

Rationale:

Five variables and one fixed factor including plant effluent flow rate, clearwell volume, free chlorine residual, pH, and temperature as well as a fixed factor of 0.7 (baffling factor) are used to calculate disinfection CT. CT values are calculated using worst case variable values (values of the five variables that would result in the lowest achieved CT using each of the above mentioned factors measured over the previous 24 hours).

Considerations:

- Baffling factor = .7 (Fixed)
- 3 section clear-well configuration in normal operation, two section capability
- Regulatory Limits: 2-log (99%) removal / inactivation of *Cryptosporidium* oocysts
  3-log (99.9%) removal / inactivation of *Giardia* cysts of which
  0.5-log must be provided through disinfection
  4-log (99.99%) removal / inactivation of viruses of which **2-log must be provided through disinfection**

- Disinfecting agent(s): conventional filtration, chlorine gas
- Monitoring capability: Continuous clearwell effluent free chlorine residual, clearwell influent free chlorine residual (sampled at the beginning of the clearwell shortly after chlorinated water has passed the first baffle in the center section) and clearwell level. Both analyzers equipped with alarms.
- Operator response time: 30 minutes

2. Normal clearwell effluent free chlorine residual: 1.0 mg/L – 1.6 mg/L (depending on variable CT factors)
3. A warning alarm will sound when clearwell effluent chlorine drops to 0.90 mg/L, and the plant will automatically shut down if it drops further to 0.60 mg/L.

Section B - Secondary Disinfection Critical Limit Response

The following provides instruction to operators responding to secondary disinfection issue within the plant or distribution system. If any circumstances are encountered that are not addressed by the instructions below, the Overall Responsible Operator and or the General Manager of Utilities must be immediately notified.

Secondary Disinfection issue within the plant:

Critical Limits:

Trim Chlorine = 1.30 mg/L

Plant Effluent Total Chlorine = 1.20 mg/L

Plant Effluent Free Chlorine = 0.80 mg/L

Plant Effluent pH = 6.50

1. Secondary disinfection can be compromised by certain situations within the plant:
    - Trim Chlorinator Failure
    - Clearwell Effluent Analyzer Failure
    - Ammonium Sulphate Pump Failure
    - Sodium Hydroxide Pump Failure (could impede formation of chloramines)

Any alarms relative to the above critical limits should be troubleshot using the available contingency plans. When a problem arises with any related instrumentation, it must be determined whether or not the problem could jeopardize the secondary disinfection process. If the problem will cause issues with secondary disinfection in the distribution system, shut down the plant immediately and deal with the instrument / dosing pump in question.

Secondary Disinfection issue in the distribution system:

Critical Limit = 0.50 mg/L Combined Cl_2

1. If a distribution chlorine sample shows 0.50 mg/L combined chlorine or less, make arrangements with the Distribution crew to flush the area until residuals are at a normal level for the area in question. Continue monitoring the area to ensure the residual does not continue to drop off.

2. If a distribution chlorine sample shows 0.25 mg/L combined chlorine or less, repeat the test to confirm the low chlorine residual. Once confirmed begin reporting process with NWHU and Spills Action Centre (SAC).

NOTE: if a grab sample from the distribution system has a combined chlorine residual below 0.25 mg/L, the operator must immediately follow the procedures for reporting adverse water quality (Schedule 16) and for corrective actions (Schedule 17) in accordance with Ontario Regulation 170/03 as amended. The Overall-Responsible Operator and/or the Manager of Water and Wastewater must be promptly notified.

3. Ensure that the residual of treated water leaving the plant is consistent with recent operating values. If not, determine the cause and make the appropriate repair/correction. (See Primary Disinfection Critical Limit Response).
4. Have the Water and Wastewater staff open the nearest downstream hydrant from alarm condition location and continue flushing until the measured chlorine residual is restored above 1.00 mg/L combined chlorine.
5. If the cause of low distribution system chlorine residual cannot be determined and rectified by the above actions, the Overall Responsible Operator and the Manager of Water and Wastewater must be immediately notified.
6. All observations and corrective actions directly and indirectly related to the alarm condition must be detailed in the plant log book in accordance with Ontario Regulation 128/04, as well as be reported to SAC following the procedure dictated in Reg. 170/03.

Safeguards:

The following safeguards are currently in place to ensure there is adequate secondary disinfection.

1. Secondary disinfection is continuously monitored and controlled to ensure that treated water leaving the WTP enters the distribution system containing a combined chlorine residual of approximately 2.00 mg/L, which under normal

operating conditions will maintain a sufficient residual throughout the entire distribution system.

2. Chlorine residuals are routinely tested throughout the distribution system, with certain dead ends and anticipated trouble spots tested regularly. These testing locations are located on dead ends at the far ends of the distribution system and would be the first to show signs of deteriorating or inadequate secondary disinfection.
3. Daily verification of chemical dosage and analyzer readings.
4. Regular chlorinator maintenance.
5. Daily chemical stock verification.
6. Automatic switchover of chlorine cylinders.
7. Conservative SCADA alarm set points.

Element 9 – Organizational Structure, Roles, Responsibilities and Authorities

Figure 9.1 – City of Kenora QMS Organizational Chart

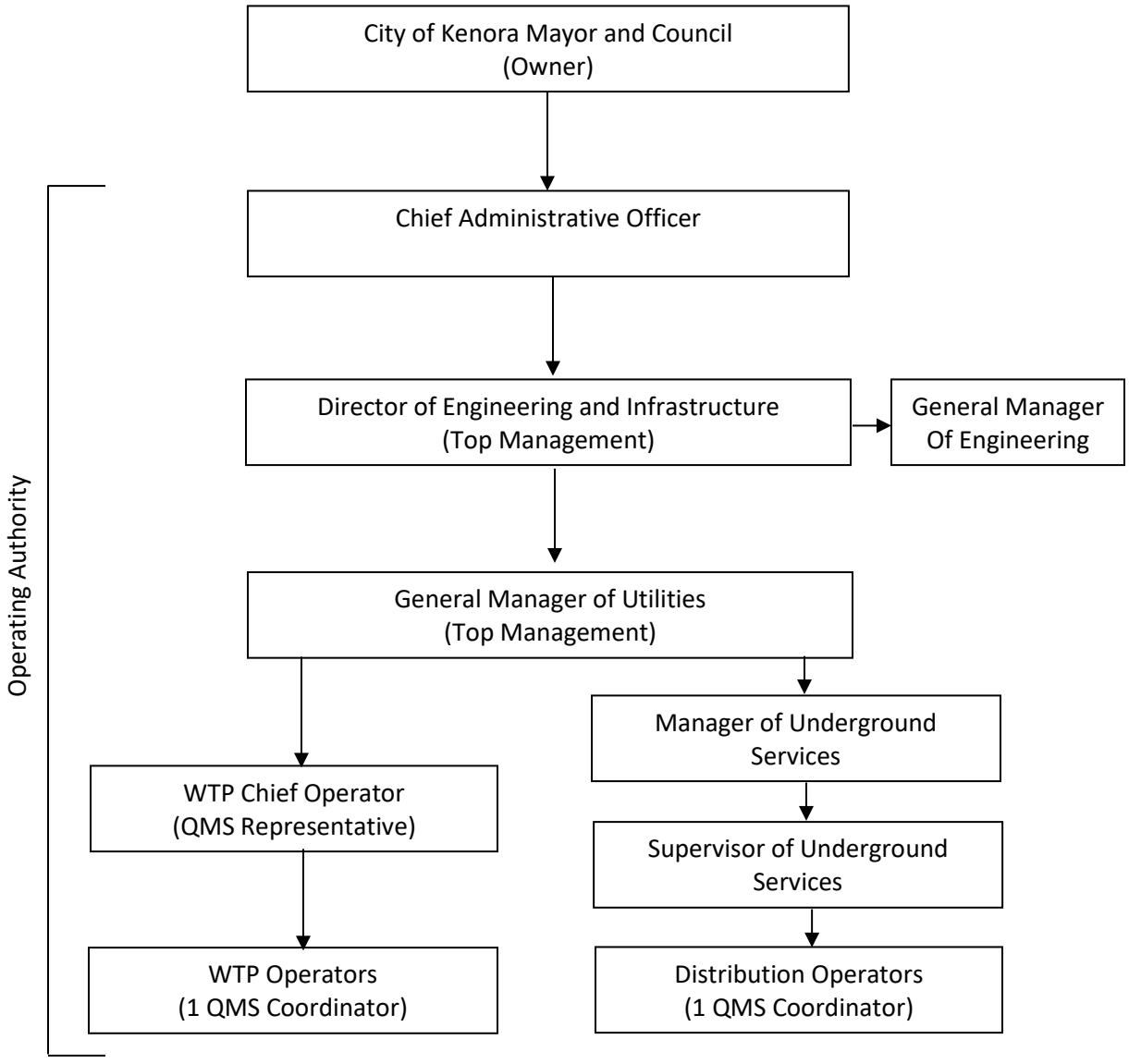


Table 9.2 – QMS Roles, Responsibilities, and Authorities

Title/Role	Responsibilities	Authorities
Mayor and Council (Owner)	-Provide safe drinking water to consumers -Ensure accreditation of Operating Authority (OA) -Endorse Operational Plan (OP) within one year of new council term -to ensure a Quality Management System (QMS) is in place -to ensure compliance with applicable regulations -Review Drinking Water System (DWS) reports -Allocate the necessary resources for the maintenance and safe operation of the DWS -Participate in Standard of Care training within one year of new term	-Review and approve by-laws, user fees and taxation rates -Approve QMS and OP -Approve budget requests -Approve staffing level requests -Authorize the resources needed to continually improve the DWS and QMS
Chief Administrative Officer	-Oversight of Engineering and Infrastructure Department -Bringing concerns from Mayor and Council to Director of Engineering and Infrastructure -Ensuring concerns are addressed in an appropriate manner -Receiving complaints or concerns raised by members of the public -Participate in Management Review as needed	-Give direction to Director of Engineering and Infrastructure

Title/Role	Responsibilities	Authorities
Director of Engineering and Infrastructure (Top Management)	-Direct oversight of Utilities Division -Ensure QMS is implemented -Endorse OP within one year of new council term -Appoint and authorize QMS Representative -Present to Owner requests and recommendations for the allocation of resources via budgeting process -Ensure compliance with the Municipal Drinking Water License (MDWL) and Drinking Water Works Permit (DWWP) -Participate in the Management Review -Report the results of the Management Review to the Owner -Communicate the findings of the Infrastructure Review to the Owner -Communicate the infrastructure maintenance, rehabilitation and renewal programs to the Owner	-Report to council and the public -Prepare and submit budget requests to council for approval -Recommend improvements or changes to the QMS -Provide the resources necessary to continually improve the DWS and QMS

Title/Role	Responsibilities	Authorities
General Manager of Utilities (Top Management)	-Direct oversight of the Water Treatment (WT) and Water Distribution (WD) subsystems -Endorse OP within one year of new council term -Appoint and authorize QMS Representative -Ensure compliance with the MDWL and DWWP -Ensure compliance with the Safe Drinking Water Act (SDWA) and its associated regulations and procedures -Ensure WT and WD operators are properly certified and trained -Develop operational and capital budgets for water treatment and water distribution infrastructure maintenance, rehabilitation and renewal -Participate in Management Review	-Approve training for WT operators -Submit budget and staffing level requests -Receive and delegate follow-up on customer complaints -Provide the resources necessary to continually improve the DWS and QMS -Participate in annual MECP inspection as needed

Title/Role	Responsibilities	Authorities
General Manager of Engineering	-Participate in the Infrastructure Review -Participate in Infrastructure Maintenance, Rehabilitation and Renewal planning	-Prioritize capital rehabilitation and renewal projects based on risk levels determined within the Asset Management Plan and the outcome of the Infrastructure Review
WTP Chief Operator	-Fulfill the role of QMS Representative -Ensure the treatment plant is operated in compliance with the MDWL and DWWP -Ensure the treatment plant is operated in compliance with the SDWA and its associated regulations and procedures -Maintain certification and complete all required training -Scheduling of water treatment staff, ensuring adequate plant coverage -Procurement of essential chemicals and supplies -Ensure Operations Manual is up to date -Make capital project recommendations to General Manager of Utilities -Participate in the Management Review -Assign priority to maintenance work in the water treatment plant -Direct, instruct and work with treatment operators -Organize training opportunities for water treatment staff	-Give direction to staff at the water treatment plant -Participate in annual MECP inspection -Utilize the resources provided to continually improve the DWS and QMS -Report Adverse Water Quality Incidents (AWQIs) -Develop Standard Operating Procedures (SOPs) for tasks in the water treatment plant

Title/Role	Responsibilities	Authorities
Manager of Underground Services	-Ensure the distribution system is operated in compliance with the SDWA and its associated regulations and procedures -assigning appropriate staff (in terms of numbers and qualifications) to facilitate the distribution of safe drinking water -Make capital project recommendations to General Manager of Utilities -Participate in the Management Review -Organize training opportunities for distribution staff	-Give direction to supervisor and distribution staff -Participate in annual MECP inspection -Utilize the resources provided to continually improve the DWS and QMS -Report AWQIs -Develop Standard Operating Procedures (SOPs) for tasks in the distribution system -Utilize the resources provided to continually improve the DWS and QMS -Approve training for WD operators
Supervisor of Underground Services	-Assign priority to maintenance work in the distribution system -Assign and delegate work to distribution staff	-Give direction to distribution staff -Utilize the resources provided to continually improve the DWS and QMS
Water Treatment Operators	-Maintain their certification -Work in accordance with applicable legislation and the QMS -Follow applicable SOPs -Complete required training hours -Keep records of all activities in logbook or other applicable forms	-Suggest improvements to the QMS -Utilize the resources provided to continually improve the DWS and QMS

Title/Role	Responsibilities	Authorities
Distribution Operators	-Maintain their certification -Work in accordance with applicable legislation and the QMS -Follow applicable SOPs -Complete required training hours -Keep records of all activities in logbook or other applicable forms	-Suggest improvements to the QMS -Utilize the resources provided to continually improve the DWS and QMS
Designated QMS Representative	-Establish, maintain and develop the QMS in accordance with applicable legislative and regulatory requirements -Ensure QMS documentation is prepared and maintained -Promote awareness of the QMS throughout the OA -Review and approve QMS documentation -Schedule internal audit and assign auditor(s) -Arrange external audit -Facilitate and participate in Management Review -Endorse OP within one year of new council term	-Approve changes to the QMS and incorporate changes into the QMS and OP
QMS Coordinator Treatment	-Ensure that the QMS is in place and is used in the treatment portion of the DWS -Assist with the development of water treatment SOPs -Promote awareness of the QMS to water treatment operators	-Suggest improvements to the QMS -Act as alternate QMS Representative when necessary

Title/Role	Responsibilities	Authorities
QMS Coordinator Distribution	-Ensure that the QMS is in place and is used in the distribution portion of the DWS -Assist with the development of distribution SOPs -Promote awareness of the QMS to distribution operators	-Suggest improvements to the QMS -Act as alternate QMS Representative when necessary

Element 10 – Competencies

Water Treatment Plant

The Kenora Water Treatment Plant is a Class 3 subsystem. To operate in this system an operator is required to have at minimum their OIT certificate. To work alone, respond to after-hours call-outs, and provide OIC coverage an operator is required to have at minimum a Class 1 certificate. To provide ORO coverage for the subsystem, an operator is required to have at minimum a Class 3 certificate.

Distribution System

The Kenora Area Distribution System is a Class 2 subsystem. To operate in this system an operator is required to have at minimum their OIT certificate. To work alone, respond to after-hours call-outs, and provide OIC coverage an operator is required to have at minimum a Class 1 certificate. To provide ORO coverage for the subsystem, an operator is required to have at minimum a Class 2 certificate.

Satisfying Competencies

- New employees undergo an onboarding process involving a departmental tour from their supervisor, SOP and ERP review, and are introduced to their job duties by an experienced staff member.
- On the job training is provided to all operators, conducted and documented by experienced staff. Training files are maintained for all City of Kenora staff.
- WTP staff receive a minimum of 40 hours training annually, while distribution operators receive a minimum of 35 hours, as required by O. Reg. 128. Typical topics include safety, treatment process operations, contingency plans, regulatory requirements, equipment operation, and new technologies. The training is provided by experienced City of Kenora staff, technical experts, or contracted professional trainers. 14 hours of the annual training for WTP

operators, and 12 hours of the annual training for distribution operators must be Director approved CEU training.

- The City of Kenora staff are briefed on operating conditions and provided regulatory updates with management staff. Employees are informed of training opportunities, such as relevant conferences and seminars.
- The City of Kenora provides funding to staff for required training provided the training is related to water system duties.

Element 11 – Personnel Coverage

The City of Kenora employs MECP certified operators, all of whom are required to hold operator certification for either water treatment or water distribution corresponding to their position. The Water Treatment Plant is staffed by four (4) Water Treatment Operators, who either have or are working to attain their Class 3 certificate or higher, and in distribution there are twelve (12) Water and Wastewater Operators who either have or are working to attain their Class 2 certificate. Unionized positions include Chief Operator, Water Treatment Operator, and Water and Wastewater Operator. In the event of a staffing shortage, operators may be sourced from a contracted service provider, or the Owner may consider utilizing options provided by the Emergency Situations provisions contained within O. Reg. 128/04 sections 32-35 if they are applicable in the circumstances.

Water Treatment Plant

The Water Treatment Plant is staffed seven days per week from 7:00 to 17:30. During the week there are typically three or four operators on shift depending on the schedule. Water Treatment Operators work under the direction of the Chief Operator in the operation and maintenance of the plant.

On weekends and holidays it is staffed by one operator, and weekend shifts are alternated amongst qualified (class 1 minimum) employees on a two week rotation. Weekend operators are responsible for the basic operation and monitoring of the WTP, boosters and standpipes. During routine weekend operations one operator is normally sufficient, but if the need arises a second operator can be called in for assistance.

When on shift the Chief Operator is automatically designated ORO, and when the Chief Operator is not present ORO coverage is designated to another operator on shift with a class 3 certificate. When no operator on shift has a class 3 certificate or higher, a designated ORO will be available by telephone to the operator for assistance and to come in if needed. After hours ORO coverage is rotated amongst qualified operators. ORO coverage is scheduled on the ORO calendar, and is documented in the log book. The ORO cell phone is always carried by the operator designated as ORO.

After hours alarms are addressed by a rotating call out system activated by both fixed alarm outputs and adjustable alarm set points. An alarm from the SCADA system triggers a cellular dialer which has a rotating call list comprised of all qualified (class 1 or higher) operators cellphone numbers, including the ORO. The operator called in can call in another operator for assistance if needed, and the ORO is available for either on-site or telephone support. The acceptable response time for after-hours alarms is 30 minutes. This response time is considered reasonable based on alarm set points with conservative valves, and automatic shutdowns associated with alarms which are an immediate emergency.

Water Distribution

Water and Wastewater Operators with a Class 1 certificate or higher are rotated on a weekly on-call schedule. One operator is assigned on-call per week. These operators respond to alarms as well as trouble calls, and provide OIC coverage during work done outside of business hours. They are able to call in additional operators for assistance as needed. The on-call schedule is posted on the bulletin board in the Water and Sewer shop. Residents can report a trouble call by phoning the Water and Sewer standby phone, carried by the on-call distribution operator. This phone number is published on the City of Kenora website. ORO Coverage is provided by the Manager of Underground Services. If the Manager of Underground Services is unavailable to act as ORO, they can delegate the responsibility to an Operator holding a Class 2 Certificate.

Element 12 – Communications

Communication is a key aspect of the QMS. Information about the QMS must be communicated to the owner, all operating authority personnel, suppliers, and members of the public. This includes communicating the QMS itself, as well as any changes or updates that are made to the QMS from time to time. The Director of Engineering and Infrastructure for the City of Kenora has been identified as Top Management as it relates to QMS communication responsibilities. The Director of Engineering and Infrastructure may delegate or assign specific QMS communications responsibilities to any member of the QMS team including the QMS Representative, the QMS Coordinators from Treatment and Distribution, the General Manager of Utilities, and the Manager of Underground Services. The table below identifies the various target audiences who require QMS communications, the type of information those audiences require, and the means of conveying the required information to the target audiences, and the member of the QMS team responsible for the communication.

Target Audience	Information to Communicate and Means of Communication
Mayor and Council as **Owner**	The Mayor and Council need to be aware of the status of the City's QMS Program including the results of audits as well as management reviews. The Mayor and Council will review the QMS Policy Statement and renew their commitment to and endorsement of the QMS Program at least annually. The methods of communication will be primarily via e-mail and when necessary, reports will be presented at Council meetings. The Director of Engineering and Infrastructure or General Manager of Utilities, as Top Management, will be responsible for communicating QMS information to the Mayor and Council.
Water Treatment Operators, Water and Sewer Operators as **Operating Authority**	To ensure that all operating personnel are aware of the requirements of the QMS, information sessions will be held to review the QMS and the Operational Plan. Information about the QMS and the Operational Plan will be communicated at Staff Meetings and will be posted on bulletin boards at the Treatment Plant and the Operations Centre. The QMS Representative, Manager of Underground Services or the QMS Coordinators from Treatment and Distribution will be responsible for communicating QMS information to operating personnel.

Suppliers	Pertinent information from the QMS will be communicated to suppliers as needed. Chemical suppliers will be made aware that they are considered to be essential suppliers as designated in the Operational Plan. The QMS Representative, Manager of Underground Services or the QMS Coordinators from Treatment and Distribution will be responsible for communicating QMS information to suppliers.
Public	The DWQMS Operational Plan will be posted electronically on the City of Kenora website. The QMS Representative will be responsible for ensuring that the current version of the Operational Plan is posted on the website. If a member of the public has questions about the QMS it will be the responsibility of the Director of Engineering and Infrastructure or General Manager of Utilities to provide a response.

Element 13 – Essential Supplies and Services

The following table identifies critical equipment and suppliers for the Water Treatment Plant and water distribution. The left-hand column identifies the critical equipment, the center column identifies the primary supplier for that piece of equipment, and the right-hand column identifies the manufacturer of the equipment. When a piece of equipment is needed the primary supplier is the first point of contact to provide said equipment. If for some reason the primary supplier is unable to provide the required equipment, the manufacturer of that equipment must be contacted to discuss alternate means of obtaining the required equipment. Essential Supplies and Services list will be reviewed prior to any Operational Plan revision to ensure it is current.

Low Lift Pumping Station	Supplier	Manufacturer
Low Lift Pumps Three (3) single stage, submersible, vertical turbine	Mid Continental Pump Supply Ltd 1641 Dublin Ave Winnipeg, MB , R3H0G9	FMC Pump Division Peerless Pumps Indianapolis, Indiana
Filter System	**Supplier**	**Manufacturer**
Filters Three(3) rapid gravity dual media and Partilok under drain system	ECODYNE Limited 4475 Corporate Drive Burlington, Ontario L7L 5T9 Canada	ECODYNE Limited 4475 Corporate Drive Burlington, Ontario L7L 5T9 Canada
Filters One(1) rapid gravity dual media and Orthos Monolithic Flat Panel underdrain system	ORTHOS Liquid Systems, Inc. PO Box 1267 Bluffton, SC 29910	ORTHOS Liquid Systems, Inc. PO Box 1267 Bluffton, SC 29910
Backwash Pumps Two (2) single stage, double suction, horizontal centrifugal	Aurora Pump A Unit of General Signal Ltd. 387 Humberline Dr Rexdale, ON M9W 5T5 Ph: (416) 675-1675	Aurora Pump 800 Airport Road North Aurora IL. 60542 U.S.A. Phone: 630-859-7000 Fax: 630-859-7060 (Domestic) 630-859-1226 (International)
Air Blower One (1) multi-stage centrifugal	Hoffman Industries of Canada Limited 58 Bertal Rd Toronto, ON Ph: (416) 763-3528	Hoffman Industries of Canada Limited 58 Bertal Rd Toronto, ON Ph: (416) 763-3528

Wastewater Disposal System	Supplier	Manufacturer
Sludge Pump One (1) SSP Series D Rotating Lobe Pump Model D5-0200-H05	KGO Group Ltd. 1200 Speers Rd., Unit 52 Oakville, ON L6L2X4 (905)-847-1544	SSP Pumps Alfa Laval Eastourne Ltd. +44 1323 414627
Supernatant Pumps Two (2) submersible, with dry pit configuration	Process Flow Systems Ltd. 700 Norah Crescent Thunder Bay, ON P7C 4T8 Ph: (807) 623-1144	Flygt Canada Limited 108 Skyway Ave Rexdale, ON M9W 4Y9 Ph: (416) 675-3630
High Lift Pumping and Storage	**Supplier**	**Manufacturer**
High Lift Pumps Three (3) single stage, double suction, horizontal configuration	Industrial Fluid Consultants Inc. 74 Durand Road Winnipeg, MB R2J 3T2 Phone: 204-632-8311	Allis-Chalmers Industrial Pump Division Cincinnati, Ohio
Chemical System	**Supplier**	**Manufacturer**
Alum Metering Pump Two (2) Blue-White Series M4 Peristaltic Pumps	Industrial Fluid Consultants Inc. 685 Camiel Sys St Winnipeg, MB R2J 1B5 (204) 661-8029	Blue-White Industries 5300 Business Drive Huntington Beach, CA 92649 (714) 893-8529
Polymer Metering Pump Two (2) Blue-White Series M4 Peristaltic Pumps	Industrial Fluid Consultants Inc. 685 Camiel Sys St Winnipeg, MB R2J 1B5 (204) 661-8029	Blue-White Industries 5300 Business Drive Huntington Beach, CA 92649 (714) 893-8529
Polymer Transfer Pump One (1) Viking Series 115 Model: H	Industrial Pump Systems 1148 Lorne St Sudbury, ON P3C 4S9 (705) 675-7867	Viking Pump of Canada Inc. 661 Grove Ave Windsor, ON N9A 6M3 (519) 256-5438
Caustic Soda Transfer Pump One (1) Sethco ModelPM-1040NT	Vissers Sales Corp. 20-220 Industrial Parkway South Aurora, ON L4G3V6 (905) 841-4073	Sethco 700 Emlen Way Telford, Pennsylvania 18969 800-392-7621
Caustic Soda Metering Pumps Two (2) Prominent Sigma 2 Motor Driven Metering Pumps Model# S2CAHM12130PVTS070UD3000C	SCG Process 15 Connie Crescent Concord, ON L4K 1L3 (866) 924-7802	Prominent Fluid Controls 490 Southgate Drive Guelph, ON N1G 4P5 (519) 836-5692
Ammonium Sulphate Transfer Pumps Two (2) Vanton Flex-I-Liner Model: XB-P90B/E	Vissers Sales Corp. 20-220 Industrial Parkway South Aurora, ON L4G3V6 (905) 841-4073	Vanton Pump and Equipment Corp. Hillsdale, New Jersey

Ammonium Sulphate Metering Pumps Two (2) US Filter/Wallace and Tiernan Premia Micro Series Model: P75MPH7XAVTC1	Clearwater Controls Inc. 256 Lampard Cres Red Deer AB T4R 2W5 Ph: (403) 304-4334	US Filter/Wallace and Tiernan Vineland, New Jersey

The following table identifies Essential Supplies or Services required for the Water Treatment Plant and water distribution. The left-hand column lists the supply or service, the centre column identifies the primary supplier for that supply or service, and the right-hand column identifies a contingency supplier for the supply or service. When supplies or services are needed the primary supplier is the first point of contact to provide said supply or service. In the event that the primary supplier is unable to provide the needed supply or service, the contingency supplier must be contacted to make alternative arrangements for the provision of the needed supply or service.

Supply or Service	Primary Supplier	Contingency Supplier
Accredited Laboratory Services (Bacteriological and general chemistry)	ALS Laboratories 1081 Barton St Thunder Bay, ON P7B 5N3 (807) 623-6463 (Phone) (807) 624-4482 (After Hours) (800) 668-9878 (Toll Free) (807) 623-7598 (Fax)	Testmark Laboratories 1131 Central Ave, Unit #2 Thunder Bay, ON P7B 7C9 (807) 333-0921 (Phone) (807) 333-0924 (Fax)
Accredited Laboratory Services (Specialized organic parameters – Mycrocystin, NDMA)	SGS Canada Inc. 185 Concession St Lakefield, ON K0L 2H0 (705) 652-2000	Testmark Laboratories 1131 Central Ave, Unit #2 Thunder Bay, ON P7B 7C9 (807) 333-0921 (Phone) (807) 333-0924 (Fax)
Disinfectant (Chlorine)	Brenntag 681 Plinquet St Winnipeg, MB R2J 2X2 (800) 563-3013 (Toll Free) (204) 233-3416 (Phone) (204) 233-7005 (Fax)	General Chemical Canada Ltd. 145 MacDougall St Thunder Bay ON P7B 6T9 (800) 585-6844 (Toll Free) (807) 345-7643 (Phone)
Coagulant (Aluminum Sulphate)	Border Chemical 104 Regent Ave West Winnipeg, MB (204) 222-3276 (Phone)	General Chemical Canada Ltd. 145 MacDougall St Thunder Bay ON P7B 6T9 (800) 585-6844 (Toll Free) (807) 345-7643 (Phone)

Coagulant Aid (LT22S Polymer)	Northland Chemical Inc. 2460 Anson Dr., Unit #9 Mississauga ON L5S 1G7 (416)410-1918	Brenntag 681 Plinquet St Winnipeg, MB R2J 2X2 (800) 563-3013 (Toll Free) (204) 233-3416 (Phone) (204) 233-7005 (Fax)
pH Control (Sodium Hydroxide)	Brenntag 681 Plinquet St Winnipeg, MB R2J 2X2 (800) 563-3013 (Toll Free) (204) 233-3416 (Phone) (204) 233-7005 (Fax)	UNIVAR Canada 99 Lowson Crescent Winnipeg, MB R3P0T3 (204) 928-7246
Chloramination (Ammonium Sulphate)	Brenntag 681 Plinquet St Winnipeg, MB R2J 2X2 (800) 563-3013 (Toll Free) (204) 233-3416 (Phone) (204) 233-7005 (Fax)	General Chemical 90 East Halsey Road Parsippany, NJ 07054 (800) 585-6844 (Toll Free) (973) 515-0900 (Phone) (973) 515-3232 (Fax)
Fluoridation (Sodium Silicofluoride)	Univar Canada 99 Lowson Crescent Winnipeg, MB R3P0T3 (204) 928-7246	Brenntag 681 Plinquet St Winnipeg, MB R2J 2X2 (800) 563-3013 (Toll Free) (204) 233-3416 (Phone) (204) 233-7005 (Fax)
Wallace and Tiernan Products (Chlorinators, Chlorine Analyzers)	Clearwater Controls Inc. 256 Lampard Cres Red Deer AB T4R 2W5 Ph: (403) 304-4334	Evoqua Water Technologies Alpharetta, Georgia (866) 926-8420
Hach Products	Hach Sales and Service Canada Ltd. 400 Britannia Rd. E. Unit #1 Mississauga ON L4S 1X9 (800)665-7635	Klearwater Equipment 46 Masters Ave SE Calgary AB T3M 2B1 David Rushka (431) 336-1735
Underwater Services (Water Intake, Marine Line Repairs)	Dominion Divers 19 Archibald Street Winnipeg, MB R2J 0V7 (800) 599-4933 (Toll Free) (204) 237-8639 (Phone) (204) 233-1258 (Fax)	Galcon Marine 7 Alden Avenue Toronto, ON M8Z 1C4 (416) 255-9607 (Phone) (416) 255-0517

Laboratory Supplies	VWR International 2360 Argentia Road Mississauga, ON L5N5Z7 1-800-932-5000 (phone) 1-800-668-6348 (fax)	Cole-Parmer Canada 210-5101 Buchan St Montreal QC H4P 2R9 (800) 363-5900 (888) 281-8109 (Fax)
Instrumentation Calibration	Lakeside Process Controls Ltd. 7 Sylvan Way Winnipeg, MB R2R2B9 (204) 633-9197	Summa Engineering 6423 Northam Drive Mississauga, ON L4V 1J2 (905) 678-3388 (Phone) (905) 678-0444 (Fax)
Electrical Work	City of Kenora Electricians	Lake of the Woods Electric P.O. Box 81 Kenora ON (807) 548-5158
Electrical Supplies	Eecol 1027 Railway Street Kenora, ON P9N 3W8 (807) 468-5070 MGM 15655 Hwy 17 East Dryden, ON P8N 0A2 (807) 937-5636	Westburne Unit 4 – 1 Dennis Place Kenora, ON P9N 3X9 (807) 548-4266 (Phone) (807) 548-5445 (Fax)
Plumbing Supplies	B.A. Robinson Unit 5 – 1051 Railway St Kenora, ON P9N 3W8 (807) 468-9237 (Phone) (807) 468-4434 (Fax)	Wolseley Unit 5 – 1 Dennis Place Kenora, ON P9N 3X9 (807) 548-2177 (Phone)
Golden Anderson Products	Conval Equipment Ltd. 1111 Finch Avenue West, Unit 39 Toronto, ON M3J2E5 (416) 665-8960	Pumps and Systems 1112 Russell Street, Unit 1 Thunder Bay, ON P7B 5N2 (807) 622-3767 (Phone) (807) 622-3804 (Fax) (888) 690-2203 (Toll Free)
Automation and SCADA Services	Automation Now 1131 Central Ave. Suite A Thunder Bay ON P7B 7C9 (807)626-5590	Eramosa 300-6815 8 St NE Calgary AB T2E 7H7 (403) 208-7447
Engineering Services	Stantec Consulting Ltd. 500-311 Portage Avenue Winnipeg MB R3B 2B9 (204) 489-5900	LBE Group Inc. 815 Ottawa St Kenora ON P0V 3G0 (807) 547-4445

Pump Supply and Service	Mid-Continental Pump Supply 73 Airport Road Winnipeg, MB R3H 0V5 (204) 783-8619 (Phone) (204) 783-6085 (Fax)	Industrial Fluid Consultants 585 Plinguet Street Winnipeg, MB R2J 0G3 (204) 661-8029 (Phone) (204) 663-3270 (Fax)
Mechanical Contractors	A.K. Contracting P.O. Box 1830 Kenora, ON P9N 3X8 (807) 543-2493	Migizi Ventures Ltd. 186 Anderson Rd Kenora ON P9N 0C2 (807) 548-5528
Seals	EDA Environmental 180 Wyatt Road Winnipeg MB R2X 2X6 (204) 632-9154	Kepco Sealing Supplies 1560 Orange Street Winnipeg, MB R3E 3H5 (204) 783-9617
Motors	IPS 633 Tyne Avenue Winnipeg, MB R2L1J5 (204) 237-6066	Del's Electric Motor Supply 54 Princess St Winnipeg MB R3B 1K2 (204) 947-1391
Dewatering Contractor	A1 Rentals Steve Bell 610 Norman Drive Kenora ON P9N 3T4 (807) 444-3299	Bell's Septic Kenora Inc. 1523 Agur Street, Kenora ON P9N1M4 (807) 468-7251 (Phone) (807) 468-3660 (Fax)
Safety Equipment	Grainger Canada 1199 St James St Winnipeg MB R3H 0K8 (866) 762-3305	Macmor Industries 1175 Sherwin Road Winnipeg, MB R3H 0V1 (204) 786-5891 (Phone)
Pipe, Hydrants, Fittings and other equipment	FLOCOR Inc. 470 Seaman Street Stoney Creek, ON L8E 2V9 (905) 664-9230 Flo-Crest Equipment 48 Stevenson Road Winnipeg, MB R3H 0W7 (204) 633-0682 (Phone) (204) 632-5461 (Fax)	EMCO 933 Tungsten Street Thunder Bay, ON P7B 5Z3 (807) 345-6543 (Phone) (807) 345-0090 (Fax)

Quality of Supplier Products and Services

The above list identifies all suppliers and services deemed essential for the production and delivery of safe drinking water. All chemical supplies must meet ANSI and NSF standards. Appropriate paper work must be provided upon chemical delivery to confirm the product being delivered, as per WTP SOP #16. All laboratories must be accredited by MECP to test the parameters for all samples that are submitted to them.

Element 14 – Review and Provision of Infrastructure

An infrastructure review ensures the periodic evaluation of the condition and capacity of the City of Kenora's drinking water system's infrastructure components. The results of the review are to be used in consideration to prioritize future resource allocation.

The Infrastructure Review Procedure

1. Procedure Description

This procedure defines the process used by the City of Kenora to review the adequacy of the infrastructure and resources necessary to operate and maintain the drinking water system safely and effectively.

2. Meetings and Meeting Records

2.1. At least once per year, the General Manager of Utilities and the General Manager of Engineering will meet to conduct an infrastructure review.

2.2. Minutes or a summary of the meeting(s) and records of attendance will be documented and distributed to the QMS Representative, Director of Engineering and Infrastructure and all those attending the meeting within 30 calendar days of the conclusion of the meeting(s).

3. Infrastructure Review Procedure

3.1. The General Manager of Utilities and General Manager of Engineering will consider:

3.1.1. The outcomes of the risk assessment documented under Element 8 and ensure that the adequacy of the infrastructure necessary to operate and maintain the City of Kenora's municipal drinking water and distribution system is reviewed.

3.1.2. New infrastructure required in the upcoming year (due to regulations, growth, or unforeseen circumstances)

3.1.3. Recommended infrastructure maintenance, rehabilitation, replacement or renewal for the upcoming fiscal year and looking forward five years.

3.1.4. Other items that may be received to determine priority and needs:

- Input from Operating Staff.
- Future Infrastructure projects.
- MECP Compliance Inspection reports.
- Water consumption and production trends.
- Asset risk levels as identified through the City of Kenora asset management plan.

4. Notification to Owners

4.1. The Director of Engineering and Infrastructure upon conclusion of the review shall report to the Owners prior to budget deliberations.

4.2. The report must include a summary of the findings from Section 3.

Element 15 – Infrastructure Maintenance, Rehabilitation and Renewal

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

Planned Maintenance:

Planned maintenance on the water distribution system is scheduled by the Manager of Underground Services. Maintenance works are documented in the distribution log book. The Chief Operator is responsible for scheduled maintenance at the Water Treatment Plant. Scheduled tasks are typically defined by manufacturer's literature when available. Tasks may be revised or created as needed based on operators' experience and observations. Planned maintenance tasks are communicated to the person responsible by the Chief Operator. Completed maintenance is documented in the appropriate log book.

Unplanned Maintenance:

Unplanned maintenance tasks result from equipment malfunction or breakage. Unplanned maintenance is authorized by the Supervisor of Underground Services, Manager of Underground Services, General Manager of Utilities, Director of Engineering and Infrastructure, or Overall Responsible Operator of the affected facility. The Overall Responsible Operator typically responds to unplanned maintenance during normal working hours while the rotational on-call operator responds during off-hours. Documentation of unplanned maintenance tasks is documented in the appropriate log book.

Measures to prepare for and expedite unplanned maintenance include equipment redundancy (back-up units), spare parts inventory, availability of updated plans / drawings and maps 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 Manager of Underground Services, General Manager of Engineering and General Manager of Utilities. Experience of the operators in Water Treatment Plant and Water Distribution is taken into consideration

before formulating any major replacement and/or rehabilitation plan. All major expenses are identified in the Capital budget and require approval by City of Kenora Mayor and Council.

Where practical, replacement of aging in-ground infrastructure is coordinated with road reconstruction activity conducted by contractor or City Departments.

Infrastructure Maintenance, Rehabilitation and Renewal Procedure

1.0 Procedure Description

This procedure describes the maintenance activities performed within the drinking water systems operated by the City of Kenora, including preventative maintenance, unscheduled maintenance, and system rehabilitation and renewal.

2.0 Reason for Procedure

Maintenance activities may significantly impact the quality of drinking water produced and/or delivered to the customers. Pre-planning and a documented systematic approach to addressing maintenance activities, where possible, can minimize this impact.

3.0 Responsibility

The following are responsible for maintenance and renewal activities depending on the urgency of the task, risk to public health, and financial requirements:

- All concerned departments at the City of Kenora
- Director of Engineering and Infrastructure
- Manager of Underground Services
- General Manager of Utilities
- General Manager of Engineering
- Overall Responsible Operators for treatment and distribution systems

4.0 Procedure

4.1 All maintenance activities shall be in accordance with the manufacturer's O&M manuals and shall be logged in the appropriate log book.

4.2 Routine system rehabilitation and renewal shall be addressed annually during budget preparation. A list of required replacement or desired new equipment is

compiled and prioritized by the City of Kenora's management team, typically including the General Manager of Utilities and the General Manager of Engineering. The Asset Management Plan is used as a guiding document, with asset conditions and risk ratings obtained from life cycle analysis, maintenance schedules and condition assessments tracked within the City's Asset Management Software and its Geographic Information System. A proposed budget is presented by the Director of Engineering and Infrastructure to the Senior Leadership Team with justification provided for the requested maintenance and capital projects. If the proposed budget is not approved, the management team prepares a revised, reduced version by deferring lower priority items.

4.3 Major upgrades and expansion are addressed as needed based on regulatory requirements, assessment of risk to public health, development review, reserve account balances, and grant or loan availability.

4.4 If feasible, rehabilitation or replacement of underground water installations is coordinated with the Engineering Department to coincide with scheduled road resurfacing projects.

4.5 The Director of Engineering and Infrastructure will provide a report to Council containing a summary of the Cities infrastructure maintenance, rehabilitation and renewal programs annually.

5.0 Monitoring for Effectiveness

5.1 The effectiveness of the maintenance and rehabilitation program will be monitored by reviewing the incidents of unplanned or unexpected equipment failure, premature failure of treatment and distribution infrastructure, and customer complaints.

5.2 Regular preventive maintenance is a key contributor to a system that runs effectively and efficiently. When equipment fails unexpectedly it may be an indication that preventive maintenance activities are inadequate or absent. All incidents of unplanned or unexpected equipment failure will trigger a review of the preventive maintenance records for that equipment to determine if the preventive maintenance was

performed according to the manufacturer's recommendations or as determined by the Operators responsible.

5.3 Customer complaints will often trigger maintenance activities and may cause additional maintenance activities to be planned for a particular area or piece of the infrastructure. When repeated customer complaints are received that all relate to a similar concern, maintenance records will be reviewed to ensure that planned maintenance was indeed carried out. In the event that all the planned maintenance was completed and there are still customer complaints, the maintenance plan will be amended or the infrastructure may be replaced.

Element 16 – Sampling, Testing and Monitoring

The City of Kenora uses a sampling program for the Kenora Area Drinking Water System based on legislative requirements. This program is described in detail in the procedure entitled Sampling, Monitoring and Analysis. Operators sample according to the applicable AWWA Standards and MECP water main disinfection procedure for disinfecting water mains throughout any maintenance project undertaken within the City of Kenora water distribution system.

Specific sampling and monitoring procedures are established for operating the Kenora Area Drinking Water System under abnormal circumstances.

Laboratory results are acquired from in-house analyses, as well as from accredited laboratories. In-house laboratory results are entered into an annual spreadsheet by a plant operator and then stored at the WTP. Bacteriological and chemical results from the accredited laboratory are stored at the WTP.

Copies of bacteriological and chemical analytical results are provided to members of the public upon request. In-house laboratory results may also be provided upon request. All analytical results are reviewed and stored at the WTP. The Annual Report which is provided to Mayor and Council, the Ministry of the Environment, Conservation and Parks (MECP), and any water systems supplied with water from the City of Kenora system also includes lab results as per Ontario Regulation 170/03. The Annual Report is also available free of charge to anyone who requests a copy. An electronic copy is available on the City of Kenora website, and anyone wanting to be provided a paper copy can make arrangements to pick one up from the Water Treatment Plant. Staff at the Water Treatment Plant can be contacted to assist in the interpretation of this report if required.

Sampling, Monitoring and Analysis Procedures

1. Procedure Description

This procedure describes the sampling schedule and analytical program used for monitoring water quality in throughout the Kenora Area Drinking Water System. It also outlines the responsibilities of operators and outside agencies in regards to analyses performed and reporting duties.

2. Reason for Procedure

Regular and strict adherence to a schedule is required to meet legislated and regulatory requirements and to ensure that all operators involved are aware of their responsibilities and the required timing. All sampling and analysis is performed to comply with Ontario Regulation 170/03, as amended, or to monitor additional parameters that affect water quality monitoring or aid in process control.

3. Responsibility

Only those operators who currently possess a valid Drinking Water Operator Certificate or are authorized due to other levels of license are permitted to carry out drinking water sampling and conduct laboratory analyses. The operator on duty performs all drinking water sampling, as well as the daily analyses. All other analyses must be performed by the staff of an accredited laboratory.

4. Procedures

4.1 Continuous Monitoring

4.1.1 The following parameters are monitored continuously with online analyzers with local displays and with HMI/SCADA system displays located in the plant laboratory.

- Filter Effluent Turbidity
- Effluent Fluoride
- Effluent pH
- Effluent Turbidity
- Clearwell Effluent Free Chlorine Residual
- Trim Chlorine Residual
- Effluent Total Chlorine Residual

- Effluent Free Chlorine Residual
- Raw Turbidity
- Raw pH
- Raw Temperature
- East Clarifier Channel Turbidity
- East Clarifier Channel pH
- West Clarifier Channel Turbidity

4.1.2 The operator on duty shall verify online monitoring readings daily by comparison to bench-top results (see section 4.2 Daily Sampling and Analysis). The bench-top results are recorded on the Water Plant Database Spreadsheet and analyzer readings are recorded by the SCADA system.

4.1.3 Chlorine analyzers shall be adjusted when necessary per manufacturer's instructions.

4.1.4 Turbidity analyzers shall be verified at minimum quarterly as per manufacturer's instructions.

4.2 Daily Sampling and Analysis

4.2.1 Routine laboratory tests shall be conducted daily at the plant by the operators on duty to confirm online analyzer readings, as well as to check additional parameters that aid in water quality monitoring and process control.

4.2.2 Data shall be recorded on the Water Plant Database Spreadsheet, and filed in bankers boxes in the blower room.

4.2.3 Samples are taken daily at the following analyzers to verify their reading and adjust if necessary.

- Clearwell Effluent Chlorine Analyzer
- Trim Chlorine Analyzer
- Effluent Total Chlorine Analyzer
- Effluent Free Chlorine Analyzer

4.2.4 The following parameters are tested daily from the treated sample tap in the lab.

- Effluent Turbidity
- Effluent pH
- Fluoride

4.3 Weekly Sampling and Analysis

4.3.1 Weekly bacteriological analysis is performed on raw water, treated water and distribution system water from various points in the distribution system.

The raw water is tested for the following:

- E. coli (quantitative)
- Total Coliform (quantitative)

The treated water is tested for the following:

- E. coli (presence/absence)
- Total Coliform (presence/absence)
- Heterotrophic Plate Count (HPC)

The distribution samples are tested for the following:

- E. coli (presence/absence)
- Total Coliform (presence/absence)
- HPC on at least 25% of samples submitted to lab.

4.3.2 Weekly samples collected for bacteriological testing shall include non-chlorinated raw water, treated water, and distribution samples. Bacteriological Sampling shall be conducted in accordance with the requirements of Ontario Regulation 170/03.

4.3.3 Non-chlorinated raw water shall be collected from the low lift pump discharge sampling point.

4.3.5 Distribution samples shall be collected from several points throughout the distribution system to meet the requirements of Ontario Regulation 170/03.

4.3.6 Three total chlorine samples shall be taken weekly in the distribution system a minimum of seventy-two hours after weekly bacteriological samples are taken. These analyses are performed at various locations in the distribution system in order to confirm that there is adequate secondary disinfection.

4.3.7 A Chain of Custody form, including the sample details and total chlorine residual of the samples, shall be completed and submitted to the laboratory with the samples. One copy of this form is retained for filing at the plant.

4.3.8 Sampling procedures for operators are documented in WTP SOP #35.

4.4 Quarterly Sampling and Analysis

Every three months (normally in January, April, July and October), drinking water from the distribution system shall be tested for Trihalomethanes (THM's) and Haloacetic Acids (HAA's). THM samples must be collected from the farthest point in the distribution system (Sewer Lift #961), which is located on Jones Road. HAA's are required to be collected from a point near the beginning of the distribution system, and are taken at the Kenora Recreation Centre. Nitrates/Nitrites samples are collected from the treated water sample tap on the high lift discharge header. Sampling procedures for operators are documented in WTP SOP #36.

4.5 Annual Sampling and Analysis

Samples are collected every 12 months (normally in January) and must be analyzed for organics and inorganics as per Schedule 23 and 24 of Reg. 170/03. Samples to be analyzed under Schedule 23 and 24 shall be collected from the treated water sample tap located on the high lift discharge header. Sampling procedures for operators are documented in WTP SOP #36.

4.6 Sampling and Analysis Required Every Five Years

Samples are collected every five years to be analyzed for sodium. Samples are collected from the treated water sample tap on the high lift discharge header.

4.7 Lead Sampling Requirements

Under the Lead Sampling Program, samples are collected twice annually from the distribution system as per Schedule 15.1 of Reg. 170/03. Sample locations and quantities vary per year, dependent on a cycle determined in Schedule 15.1. Sampling procedures for operators are documented in WTP SOP #37

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5 Associated Documents

Instructions for testing of: chlorine residuals, fluoride, color

- Hach TU5300 SC User Manual.
- Hach TU5200 User Manual
- Hach SC10 User Manual
- Hach DR 900 User Manual
- Hach Pocket Colorimeter User Manual

Ontario Regulation 170/03 - Refer to Large Municipal Residential schedules for sampling and reporting requirements as well as adverse procedures.

Element 17 – Measurement and Recording Equipment Calibration and Maintenance

Methods of measurement and recording equipment calibration and maintenance are described in detail in the following procedure.

1.0 Procedure Description

This procedure describes the method used by the Kenora Area Water Treatment Plant and Distribution System to ensure that all measurement and recording equipment is calibrated and maintained.

2.0 Reason for Procedure

Accuracy of measurement and recording equipment is essential to providing quality drinking water to the consumer with confidence that the characteristics of the water meet or exceed the legislated requirements and internal targets set by the City of Kenora.

3.0 Responsibility

The operator shall conduct the calibration and maintenance of all continuous monitoring equipment. Recording equipment maintenance and repair will be outsourced as necessary. The operators shall ensure that all calibration and maintenance for bench-top equipment is performed at the required frequency. Calibration records are kept as described in our document and records control list.

4.0 Procedure

In House Equipment Calibration and Maintenance

4.1 The following pieces of equipment in use at facilities operated by the City of Kenora are calibrated and maintained by City of Kenora employees:

- Hach SC10 online chlorine analyzer
- Hach TU5300 SC process turbidimeter
- Hach TU5200 laboratory turbidimeter
- Hach DR 900 spectrophotometer

- Hach Pocket Colorimeter
- Hach CL-17 chlorine analyzer

4.2 The outlook maintenance task list shall be used to indicate that the calibration and maintenance of continuous monitoring equipment is required.

4.3 The frequency of calibration and maintenance shall be maintained as is required by O. Reg.170/03, or as recommended by the manufacturer, whichever is more frequent.

4.4 All calibration and maintenance shall be performed according to the manufacturer's instructions.

4.5 All calibration and maintenance shall be recorded in the maintenance record binder at the water treatment plant.

Third Party Calibration and Maintenance

4.6 The following pieces of equipment in use at facilities operated by the City of Kenora are calibrated and maintained by outside service providers:

- Filter effluent flow meters
- Filter loss of head transmitters
- Influent flow meter
- Effluent flow meter
- Backwash flow meter
- Discharge Pressure Transmitter
- Standpipe level transmitters
- Booster station flow meters
- Booster station pressure transmitters

4.7 The outlook maintenance task list shall be used to indicate that the calibration and maintenance of equipment is required. A reminder prompt will be scheduled for approximately two months prior to the required calibration and maintenance dates to allow time for the outside service provider to arrange and schedule their visit.

4.8 All calibration and maintenance shall be performed according to the manufacturer's instructions.

4.9 Upon completion of the calibration and maintenance by the outside service provider, a Calibration Report will be sent to the City of Kenora. This report will be kept on file at the Water Treatment Plant.

5.0 Associated Documents

The following documents are used to assist with the In House calibration and maintenance:

- Hach TU5300 SC User Manual.
- Hach TU5200 User Manual
- Hach SC10 User Manual
- Hach DR 900 User Manual
- Hach Pocket Colorimeter User Manual

Element 18 – Emergency Management

The procedure entitled Emergency Conditions outlines the conditions at the City of Kenora Water Supply System 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 response plans annually. Emergency procedures are tested on an annual basis, except when required staff are unavailable to participate due to unexpected extenuating circumstances. Training will be provided to all individuals involved in the emergency response procedures so that roles and responsibilities are clearly understood.

Emergency Procedures

1.0 Procedure Description

This procedure describes conditions associated with the City of Kenora Water Supply System that are considered to be emergencies, as well as those persons responsible for initiating the response and recovery measures.

2.0 Reason for Procedure

Establishing a procedure for emergency conditions indicates a level of preparedness, promotes an efficient response, and supports a rapid recovery.

3.0 Responsibility

The certified operator on duty must be capable of identifying and be prepared for responding to any emergency condition that may arise at the water treatment plant or within the distribution system. Operator training is conducted regularly to ensure the safe and timely response to emergencies.

4.0 Procedure

4.1 Potential Emergency Situations

- Breakdown or malfunction of critical treatment process equipment
- Break down or malfunctioning PLC and/or SCADA.
- Major Power Failure
- Insufficient Operators available at Water Treatment Plant
- Loss of essential supplier/chemical shortage
- Security breach/vandalism/acts of terrorism
- Microcystin present in treated water

4.2 Response

Refer to Emergency Response Binder for response procedures for each of the emergency situations referred to above.

4.3 Testing and Training

When practical, emergency procedures are tested on an annual basis. Training will be provided to all individuals involved in the emergency response procedures so that roles and responsibilities are clearly understood. All testing and training will be documented.

Element 19 – Internal Audits

Internal Audits will be conducted at least once every calendar year to determine the effectiveness of the QMS, and to explore opportunities for improvement. All findings from Internal Audits will be reported to Top Management and any recommended changes will be discussed with Top Management.

Detailed Procedures for Conducting Internal Audits

1.0 Procedure Description

This procedure defines the process used by the City of Kenora to conduct internal audits of the Quality Management System (QMS) for the City of Kenora Drinking Water System.

2.0 Reason for Procedure

Internal audits are conducted to confirm that the QMS is effectively implemented and meets or exceeds the requirements of the Ministry of the Environment's Drinking Water Quality Management Standard (DWQMS).

3.0 Responsibility

Internal audits shall only be conducted by persons having following qualifications and approved by the QMS Representative:

- City of Kenora employees who have completed internal audit training.
- Employees of other operating authorities who have completed internal audit training and who have completed at least one internal audit of quality management systems within their own organizations.
- Third party auditing/consulting companies that offer DWQMS auditing services.

4.0 Procedure

4.1 Internal audits are conducted at least once every calendar year.

4.2 Internal auditors will be selected by the QMS Representative.

4.3 Internal auditors shall review the DWQMS and previous internal and external audit reports in preparation for the audit.

4.4 The audit checklist shall be used by the internal auditor as a guideline and for record-keeping purposes for conducting the interviews and document review during the audit.

4.5 The audit report shall be in the form of a completed audit checklist.

4.6 Where a non-conformance to the DWQMS is found during the internal audit, this shall be communicated within the audit report by attaching the Corrective Action Request (CAR) form *(GEN-F7)*. It is the responsibility of the QMS Representative to ensure that all CARs are followed up and responses to the CARs are provided to the internal auditor within 45 days of the internal audit.

4.7 When all CARs have been responded to, the CAR forms are submitted to the Internal Auditor. If the Internal Auditor is satisfied with the responses to the CARs, a clearance letter is issued to the QMS Representative. The internal audit shall be considered closed when this is complete.

5.0 Associated Documents

Internal Audit Checklist

CAR Form

Drinking Water Quality Management Standard Operational Plan

Element 20 – Management Review

A Management Review will be conducted at least once every calendar year with representatives from Top Management, and the QMS Representative. The purpose of the Management Review is to evaluate and ensure the continued suitability, adequacy and effectiveness of the QMS.

Detailed Procedures for Conducting Management Reviews

1.0 Procedure Description

This procedure defines the process for the review of the effectiveness of the Quality Management System (QMS) by the Management Review Committee.

2.0 Reason for Procedure

Management reviews are conducted to assess and ensure the continuing suitability, adequacy, and effectiveness of the QMS.

3.0 Responsibility

Management reviews shall be conducted during a meeting of the following participants that make up the Management Review Committee:

- Director of Engineering and Infrastructure
- General Manager of Utilities
- Manager of Underground Services
- QMS Representative

The meeting is chaired by the QMS Representative. Additional staff may be present if available.

4.0 Procedure

4.1 A Management Review will be conducted at least once every calendar year.

4.2 Prior to the Management Review Meeting, the QMS Representative shall provide a meeting agenda and summaries of the following information to the Management Review Committee:

a) incidents of regulatory non-compliance

b) incidents of adverse drinking-water tests

c) deviations from critical control point limits and response actions

d) the efficacy of the risk assessment process

e) internal and third-party audits results

f) results of emergency response testing

g) operational performance

h) raw water supply and drinking water quality trends

i) follow-up on action-items from previous management reviews

j) the status of management action items identified between reviews

k) changes that could affect the Quality Management System

l) customer feedback

m) the resources needed to maintain the Quality Management System

n) the results of the infrastructure review

o) Operational Plan currency, content and updates, and

p) staff suggestions

4.3 The Management Review Committee shall review and discuss all information presented. The Committee shall make recommendations and develop action items, as appropriate, to improve the content and implementation of the Operational Plan and related procedures, and to ensure the provision of adequate resources. The action items will detail the personnel responsible for completing tasks, and the proposed timelines for the implementation.

4.4 Minutes of management review meetings shall be maintained by the QMS Representative. The minutes shall document all new and outstanding action items as well as any decisions made by the Committee.

4.5 The QMS Representative shall be responsible for the communication of Management Review action items and follow up on their progress. The QMS Representative will provide the minutes of the Management Review to the Director of Engineering and Infrastructure, who will prepare a report to council detailing the results of the Management Review.

Element 21 – Continual Improvement

The Operating Authority will work to continually improve the effectiveness of its Quality Management System (QMS), and will track and measure its continual improvement using the following procedure.

Procedure Description

Sources of continual improvement can include:

- Corrective Actions identified through internal and external audits
- Opportunities for Improvement identified through internal and external audits
- Staff suggestions
- Management Review Process
- Best Management Practices
    - Any BMP's published by the MECP available on ontario.ca/drinkingwater
    - Drinking Water Update emails from the MECP which are sent to the Water and Wastewater Manager and the WTP.
    - Publications by professional organizations.

Responsibility

The QMS Representative and QMS Coordinators are responsible for ensuring identified Corrective Actions are implemented, and to review and incorporate OFI's and other possibilities for continual improvement as identified in Continual Improvement Log Forms.

Considering and Implementing BMP's

Published BMP's will be discussed and reviewed annually as part of the Management Review process. BMP's to be implemented into the QMS will be documented on a Continual Improvement Log Form.

Identifying and Managing Corrective Actions

Non-conformities identified in an internal audit will be managed by completing the steps contained on the Corrective Action Request Form within 45 days, prior to a clearance letter being issued. Non-conformities identified during an external audit will be managed as per the requirements of the Corrective Action provided by the auditor. Non-conformities identified will be discussed during Management Review Meetings.

Identifying and Implementing Preventative Actions

All OFI's identified through internal and external audits will be recorded on a Continual Improvement Log Form for consideration and implementation into the QMS. Other sources of preventative actions such as staff suggestions or considerations for a routine review or the management review process can also be recorded on the Continual Improvement Log form for consideration and implementation. Continual Improvement Log Forms will be discussed during Management Review Meetings.

Associated Documents:

Continual Improvement Log