The Corporation of the City of Pembroke

Drinking Water Quality Management System: Operational Plan Summary Report

(OPS-UTL-DWS-GEN-OP-001-001)

Revision 6 – Nov 2025

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1.0 Quality Management System

1.1 Purpose

The purpose of this Operational Plan is to document the City of Pembroke's Drinking Water Quality Management System as part of the City's efforts to ensure that clean, safe drinking water is supplied to all of its customers. This Operational Plan was developed in alignment with the requirements of the Ministry of the Environment's Drinking Water Quality Management Standard.

1.2 Scope

This Operational Plan applies to all drinking water-related operations at the City of Pembroke. The contents of the DWQMS Operational Plan include the following:

Part Title	Part
DWQMS Operational Plan Summary Report	Main Report
Council Endorsement & Resolutions	Appendix 3-1
DWQMS System-Level Procedures and Supporting Documentation	Appendix A
DWQMS Risk Assessment Results	Appendix B
Critical Control Limit Monitoring and Response SOPs	Appendix C
Emergency Response Plan for Water Operators	Appendix D

1.3 Definitions

Accreditation Body: Body that conducts accreditation audits and recommends management system accreditation.

City: City of Pembroke

DWQMS: Drinking Water Quality Management System

DWS: Drinking Water System

DWS Vender: Supplier or service provider that provides a product or service related to the drinking-water system

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Ministry: Ministry of the Environment, Conservation and Parks that developed the DWQMS Standard and requires select Ontario municipalities & utilities to develop and implement a DWQMS as a component of the Municipal Drinking Water Licence Program

OIC: Operator in Charge

ORO: Overall Responsible Operator

Owner: Legal or beneficial owner of the DWS. For the City of Pembroke, the Owner is represented by the Mayor and Council. The Chief Administrative Officer has been identified as an Owner Representative.

QMS: Quality Management System

Top Management: Person(s) at the highest management level within the Operating Authority that makes decisions respecting the DWQMS and recommended actions to the Owner regarding the DWS. For the City of Pembroke, Top Management includes the Director of Operations and the Manager of Operations.

WTP: City of Pembroke Water Treatment Plant

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2.0 Quality Management System Policy

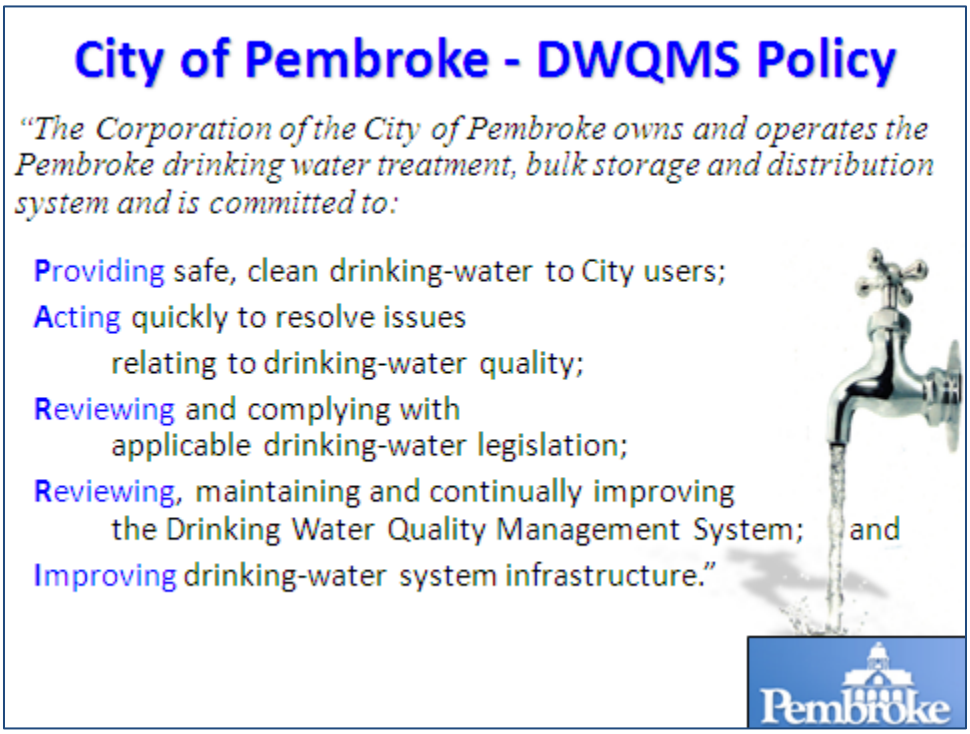
The City of Pembroke's DWQMS Policy is as follows:

"The City of Pembroke owns and operates the Pembroke drinking water treatment, bulk storage and distribution systems.

The City of Pembroke is committed to:

- Providing safe, clean drinking water to City water users;
- Acting quickly to resolve issues relating to drinking water quality;
- Reviewing and complying with applicable drinking-water legislation;
- Reviewing, maintaining and continually improving the Drinking Water Quality Management System; and
- Improving drinking water system infrastructure."

The DWQMS Policy was approved and endorsed by the Owner and Top Management of the drinking water system (See Appendix 3-1 Council Endorsement and Resolutions). The DWQMS Policy is posted at several City of Pembroke Operating Authority facilities & locations, including City Hall, the Water Treatment Plant and the Department of Operations. The DWQMS Policy will also be communicated to the public through posting on the City's website.



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3.0 Commitment and Endorsement

This Operational Plan has been reviewed and endorsed by the City of Pembroke Top Management and Owner. The Operational Plan will be re-endorsed with each new council or with significant changes.

Reference Appendix 3-1: Council Endorsement & Resolutions

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4.0 Quality Management System Representative

The Supervisor Drinking Water Treatment, Douglas O. Burton, or designate, has been appointed as the Quality Management System Representative for the City of Pembroke's DWQMS, and is authorized to carry out all of the duties associated with this role.

In addition to other components of his role, the Supervisor Drinking Water Treatment holds the following responsibilities as QMS Representative for the City's Drinking Water Quality Management System:

- Ensuring that the DWQMS is established, implemented and maintained;
- Reporting to Top Management regarding the status and performance of the DWQMS and any need for improvement;
- Ensuring that current versions of DWQMS documentation are in use at all times;
- Ensuring that staff are aware of all applicable legislative and regulatory requirements as they pertain to the City's drinking water system; and
- Promoting awareness of the DWQMS throughout the Operating Authority.

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5.0 Document and Records Control

5.1 Document Control

A procedure has been developed that outlines document control processes for the Operating Authority. **DWQMS Control of Documents (OPS-UTL-DWS-GEN-PRO-002-001** – see Appendix A*)* describes a process for the creation, modification, review, approval, distribution, retrieval and protection of DWS-related documentation at the City of Pembroke.

DWS-related documentation is identified using a unique numbering system specified in **DWQMS Control of Documents (OPS-UTL-DWS-GEN-PRO-002-001)**. The task of creating internal DWS-related documentation is delegated to a Department of Operations staff member who is appropriately qualified regarding the subject matter of the required document. When a draft document has been prepared, review and approval of the document is completed as specified in Table 1 of **DWQMS Control of Documents (OPS-UTL-DWS-GEN-PRO-002-001).**

Revisions to existing documentation are completed by the Document Author and reviewed by the Author's Supervisor as specified in Table 1 of **Control of Documents (OPS-UTL-DWS-GEN-PRO-002-001).**

When a draft document is ready for approval, it is printed and signed by the Document Author and the Document Approver, and both the signed paper-copy and the editable electronic "master copy" of the document are provided to the Supervisor Drinking Water Treatment. The Supervisor Drinking Water Treatment finalizes the document by creating a read-only version and saving it to the "Drinking Water QMS" folder located on the Utilities Server. The Supervisor Drinking Water Treatment also prepares any required hard copies of the document and distributes these copies as specified in the **DWQMS Document Control Matrix (OPS-UTL-DWS-GEN-LM-002-001***)*; these are considered to be "controlled" copies and may not be photocopied or otherwise reproduced. Obsolete versions of documentation may be disposed (via shredding) or may be retained in a protected location as records.

The Supervisor Drinking Water Treatment maintains electronic copies of master (i.e., editable) documentation in a protected location on the Utilities server. These copies are protected from unauthorized distribution or editing.

5.2 Records Control

A procedure has been developed that outlines record control processes for the Operating Authority. **DWQMS Control of Records (OPS-UTL-DWS-GEN-PRO-003-001** – see Appendix A) specifies processes for the collection, identification, storage, maintenance, protection, retention and disposal of drinking water-related records at the City of Pembroke.

The **DWQMS Record Retention Matrix (OPS-UTL-DWS-GEN-LM-003-001)** identifies DWS records that are managed under this procedure. Each record profile within the Matrix lists the record name, minimum record retention time, record owner (i.e., person responsible for the record), and physical form of storage including the storage location(s). Where required by legislation and/or regulations, DWS records are made available for review by customers and/or stakeholders.

Once the indicated minimum retention time has been reached, drinking water system records are destroyed. Records are to be disposed by the end of the calendar year in which their retention time elapses.

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6.0 Drinking Water System – Process Description

6.1 General

The City of Pembroke owns and operates the Pembroke drinking water system (DWS #220000941), which consists of the Pembroke Water Treatment Plant (WTP) and distribution system. The system is considered a large municipal residential drinking water system under O. Reg. 170/03. The WTP is rated as a Class 3 facility, while the distribution system is a Class 2 system. Bulk water storage facilities are rated as Class 3 facilities. A process flow diagram of the Pembroke drinking water system is provided in Figure 6.2.1 Pembroke DWS Process Schematic (page 10).

6.2 Pembroke WTP

The Pembroke WTP is located on Riverside Drive in the City of Pembroke. The WTP was built in 1984 and has a rated capacity of 36,374 m^3/d.

The WTP is a conventional surface water treatment plant. The raw water intake pipe is 424m in length and 760mm in diameter and draws water from the Ottawa River into the plant's raw water/low lift pumping wet wells. The flow of raw water moves through two travelling bar screens where any large debris that may have come through the intake is trapped, protecting the pumps in the next phase of the treatment process.

Four low lift vertical turbine pumps with a total capacity of 370L/s convey raw water to the chemically assisted filtration process, which includes:

- Two coagulation/flocculation trains each consisting of three tanks in series;
- Two sedimentation tanks equipped with travelling hydraulic sludge collectors; and,
- Two dual media rapid gravity filters with a total filter surface area of 102m^2. (These filters act to capture particles that may have been carried over the sedimentation process.)

Chemical feed systems include the following:

- Alum feed system consisting of two 25,000L bulk storage tanks, two feed pumps and associated piping, including one duty and one stand-by injection pump at the low lift pump discharge header for coagulation;
- Soda ash preparation and feed system for raw and treated water alkalinity and pH adjustment, consisting of a 25-tonne soda ash bulk storage tank, a dry chemical feeder, one 2,000L slurry tank and solution feed pumps;
- Activated Silicate System consisting of one 20,000L sodium silicate bulk storage tank and one 1000L sulfuric acid tank, one 1500L batch tank, one 1500L day tank and 2 chemical metering pumps, one transfer pump and associated piping;
- A gas chlorine disinfection system consisting of two one-tonne cylinder weight scales with vacuum regulators and automatic switchover system, four 200kg/d capacity chlorinators (2 duty and 2 standby), complete with associated equipment, instrumentation and controls.

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On-site storage of drinking water is provided by one clearwell with a longitudinal divider wall creating two cells in series with a total capacity of 8,000m^3.

Four high lift pumps deliver treated water to the distribution system.

Backwash, filter-to-waste discharge and sludge from the sedimentation tanks is directed to a wastewater holding tank with a volume of 1,200 m^3. Sludge from the holding tank is directed to the sanitary sewer. Clarified and dechlorinated wastewater is discharged to the Ottawa River via an 800mm-diameter outfall pipe.

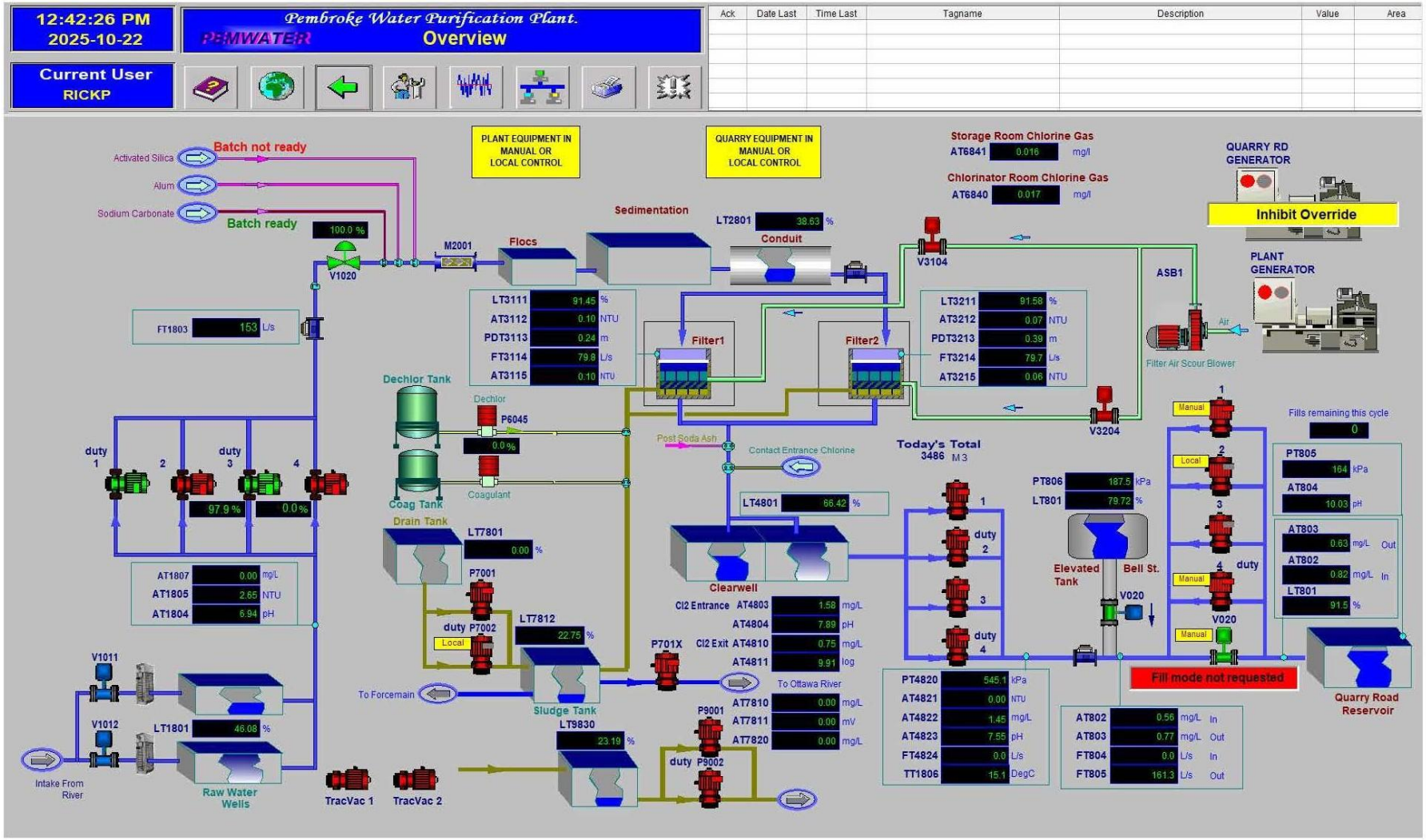
Standby power is provided by a 1000kW diesel engine generator set.

There are two storage facilities in the distribution system: a 2,300m^3 elevated tower located at the intersection of Bell Street and Fraser Street and a 4,500m^3 in-ground reservoir and booster pumping station located at Quarry Road. Re-chlorination facilities using sodium hypochlorite have been installed at both facilities and can be operated on an as-needed basis. Both locations are provided with continuous monitoring equipment (PLC) for chlorine, which are linked to the SCADA system located at the Pembroke WTP.

The Quarry Road Reservoir is connected to a stand-alone 200 kW diesel generator available to supply power in the event of a power outage or other emergency. The Quarry Road Booster Pumping Station supplies water to the distribution system utilizing two 250hp pumps.

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6.2.1 **Figure: Pembroke DWS Process Schematic**



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6.3 Pembroke Distribution System

The distribution system supplies water to a service population of approximately 15,000. The distribution system includes approximately 115km of watermains ranging in size from 4” to 24”; roughly 55% of these are constructed in cast-iron, with the remaining watermains constructed in ductile iron, PVC and high-pressed concrete. Other distribution system infrastructure includes approximately 500 fire hydrants, 940 distribution valves, 450 hydrant valves, and 4,300 service valves. Operating pressures within the system vary, with a low pressure of roughly 30psi at the Bell Street Elevated Tower and a high pressure of roughly 85psi at Joseph Street.

The City of Pembroke also provides treated water to the Township of Laurentian Valley (DWS No. W260007465 – LV Water Works) via the following system connection points:

- Boundary Road at Willow Drive;
- Boundary Road at Karen Street;
- Boundary Road at Bruham Avenue;
- Boundary Road at Elgin Street;
- Pembroke Street West at City limits;
- Pembroke Street East at City limits; and
- Bell Street at Angus Campbell Drive (2026).

Although not a direct connection, the City of Pembroke can also service the Town of Petawawa (DWS No. 2100002101 - OCWA) thru Laurentian Valley.

6.4 Drinking Water Source

The Ottawa River serves as the raw water source for the Pembroke WTP. The second largest river in eastern Canada, the Ottawa River runs along the Quebec-Ontario border and extends 1,271km from its headwaters to the confluence with the St. Lawrence.

The Ottawa River has many of the typical characteristics that are common of waters in the Canadian Shield. The river is naturally high in turbidity, colour and organic matter, but low in hardness and alkalinity.

6.5 Common Event-Driven Fluctuations

Water levels in the Ottawa River fluctuate naturally throughout the year in response to rain and snowmelt. The Ottawa River is a highly regulated river with 13 principal reservoirs and over 50 major dams throughout the watershed. The operation of the dams can also affect water levels in the river. Fluctuations in river water levels are noted on a seasonal basis as a result of dry conditions during summer months or flooding in spring due to melting and run-off. It should be noted, however, that fluctuations in river levels have rarely, if ever, impacted WTP operations.
Significant seasonal variations in turbidity, temperature, colour and organic content can occur. The treatment processes at the WTP are directly impacted by these changes.

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6.6 Operational Challenges and Threats

Seasonal variations in turbidity are common in spring and fall and are mainly caused by heavy rainfall/snowmelt events that contribute to increased run-off from land surfaces into the river. These seasonal turbidity spikes can create operational challenges leading to higher coagulant dosages and chemical usage, greater sludge production, shorter filter run times and more frequent backwashes. These process challenges can reduce the total amount of water that can be produced at the WTP.

The temperature of the Ottawa River can vary between 0.5ºC to more than 25ºC between winter and summer months. Colder water temperatures can create problems with frazil ice in the intake pipe and raw water wet well and may also lead to increased chemical usage, as coagulation, sedimentation and disinfection are less effective at lower temperatures. Higher temperatures may contribute to increased disinfection by-product formation.

Seasonal increases in natural organic matter (NOM) may cause aesthetic problems because it imparts colour to the water, leading to more customer complaints. NOM can also cause operational problems. Increases in NOM concentrations can affect coagulation, as the optimum dosage and pH required to remove NOM differ from those for turbidity removal; increases can also affect disinfection, as the presence of NOM may increase chlorine demand and increase the rate of disinfection by-product formation. The presence of NOM in the treated water may also lead to distribution system water quality problems, as NOM may increase bacteriological re-growth by serving as a food source.

The Town of Petawawa is located upstream of Pembroke and discharges treated wastewater to the Ottawa River. The Chalk River nuclear facility is also located upstream of Pembroke on the Ottawa River. Accidental or untreated discharges from these two facilities could potentially impact Pembroke’s water treatment operations.

Operational challenges in the distribution system are typical of those in older systems. They include aging infrastructure and its impact on watermain break rates, leakage, presence of lead, discoloured water complaints due to deterioration of cast iron mains, etc. The City’s geography has historically led to the presence of dead-end watermains, requiring additional flushing and monitoring at these locations. The low levels of water hardness and alkalinity may also contribute to aggressive conditions within the distribution system.

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7.0 Risk Assessment

A procedure has been created to describe the City of Pembroke's DWQMS Risk Assessment process. **DWQMS Risk Assessment (OPS-UTL-DWS-GEN-PRO-004-001** – see Appendix A*)* documents the process for completing the City of Pembroke's DWQMS Risk Assessment, including the legislative, regulatory and internal requirements for this risk assessment and the criteria for assessing risk.

Members of the City of Pembroke's Risk Assessment Team are identified in **DWQMS Risk Assessment (OPS-UTL-DWS-GEN-PRO-004-001).** Before the risk assessment is initiated, the Risk Assessment Team reviews the description of the drinking water system contained in the Operational Plan and identifies high-risk and/or high quantity users of drinking water in order to ensure their unique requirements are taken into account in completing the risk assessment.

The Risk Assessment Team then examines the City's drinking water system for potential hazards and/or hazardous event that could compromise the performance of the system and/or the quality of the drinking water. The Risk Assessment Team evaluates each identified hazard against criteria outlined in **DWQMS Risk Assessment (OPS-UTL-DWS-GEN-PRO-004-001).** The Team assesses the likelihood of the occurrence of the hazard, the consequences of the hazard's effects, and the detectability of the hazard were it to occur. Using these three criteria, a Risk Rating is determined for each hazard.

Hazards with greater Risk Ratings are evaluated to determine whether a Critical Control Point (CCP) can be established at the hazard location. Where a CCP is identified, critical control limits and monitoring/response procedures are developed to ensure that rapid action can be taken to eliminate or reduce the hazard if and when it is identified. Regardless of Risk Rating, any hazards relating to disinfection processes are identified as CCPs.

The DWQMS Risk Assessment is reviewed annually by the City's Risk Assessment Team in a formal meeting. Once every 36 months, the Risk Assessment team re-evaluates the DWQMS Risk Assessment in its entirety via a formal review and a new Risk Assessment is completed. Details of these reviews and reassessment processes are contained in **DWQMS Risk Assessment (OPS-UTL-DWS-GEN-PRO-004-001).**

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8.0 Risk Assessment Outcomes

The City of Pembroke's initial DWQMS Risk Assessment was completed on November 13th and 14th, 2008. The results of this DWQMS Risk Assessment are documented in Appendix B of this DWQMS Operational Plan. All hazards and/or hazardous events were identified, assessed and addressed according to Section 7.0 of this Operational Plan and the City's **DWQMS Risk Assessment** procedure **(OPS-UTL-DWS-GEN-PRO-004-001)**.

Critical Control Limit Monitoring and Response SOPs can be found in Appendix C and are identified as follows:

- **DWQMS Essential Supplies and Services (OPS-UTL-DWS-GEN-PRO-009-001)**
- **List of Essential Drinking Water System Supplies and Services (OPS-UTL-DWS-GEN-LM-009-001)**
- **DWQMS Review & Provision of Infrastructure (OPS-UTL-DWS-GEN-PRO-010-001)**
- **Filter Backwash (OPS-UTL-DWS-WP-SOP-011-001)**
- **Watermain Repair (OPS-UTL-DWS-WD-SOP-011-001)**
- **Hydrant/Dead End Flushing (OPS-UTL-DWS-WD-SOP-011-002)**
- **Valve Maintenance (OPS-UTL-DWS-WD-SOP-011-005)**
- **DWQMS Sampling, Testing & Monitoring (OPS-UTL-DWS-GEN-PRO-012-001)**
- **Chlorine Residual Sampling and Testing (OPS-UTL-DWS-GEN-SOP-012-002)**
- **Microbiological Sampling (OPS-UTL-DWS-GEN-SOP-012-003)**
- **Monitoring of Algal Blooms (OPS-UTL-DWS-WP-SOP-012-007)**
- **Adverse Water Quality Incident Reporting and Corrective Action (OPS-UTL-DWS-GEN-SOP-012-001)**
- **Chlorine Residual Monitoring at Bulk Water Storage Facilities (OPS-UTL-DWS-WP-SOP-012-001)**
- **Continuous Monitoring of Turbidity and Calibration of Turbidity Meters (OPS-UTL-DWS-WP-SOP-012-004)**
- **DWQMS Emergency Response Plan for Water Operations – Chlorine Emergencies (OPS-UTL-DWS-GEN-SOP-014-005)**
- **By-Law 2011-50, "A By-Law to Amend By-Law Number 2007-24, A By-Law to Regulate the Supply of Safe and Wholesome Water to the Citizens of Pembroke**
- **By-Law 2007-23, "A By-Law to Provide for the Administration, Maintenance, Operation and Regulation of Water Works"**
- **By-Law 2007-24, "Cross-Connection/Backflow Prevention By-Law"**
- **By-Law 2007-25, "A By-Law in the City of Pembroke, in the Province of Ontario, to Provide for Regulation of Public and Private Fire Service Water Mains and Hydrants"**

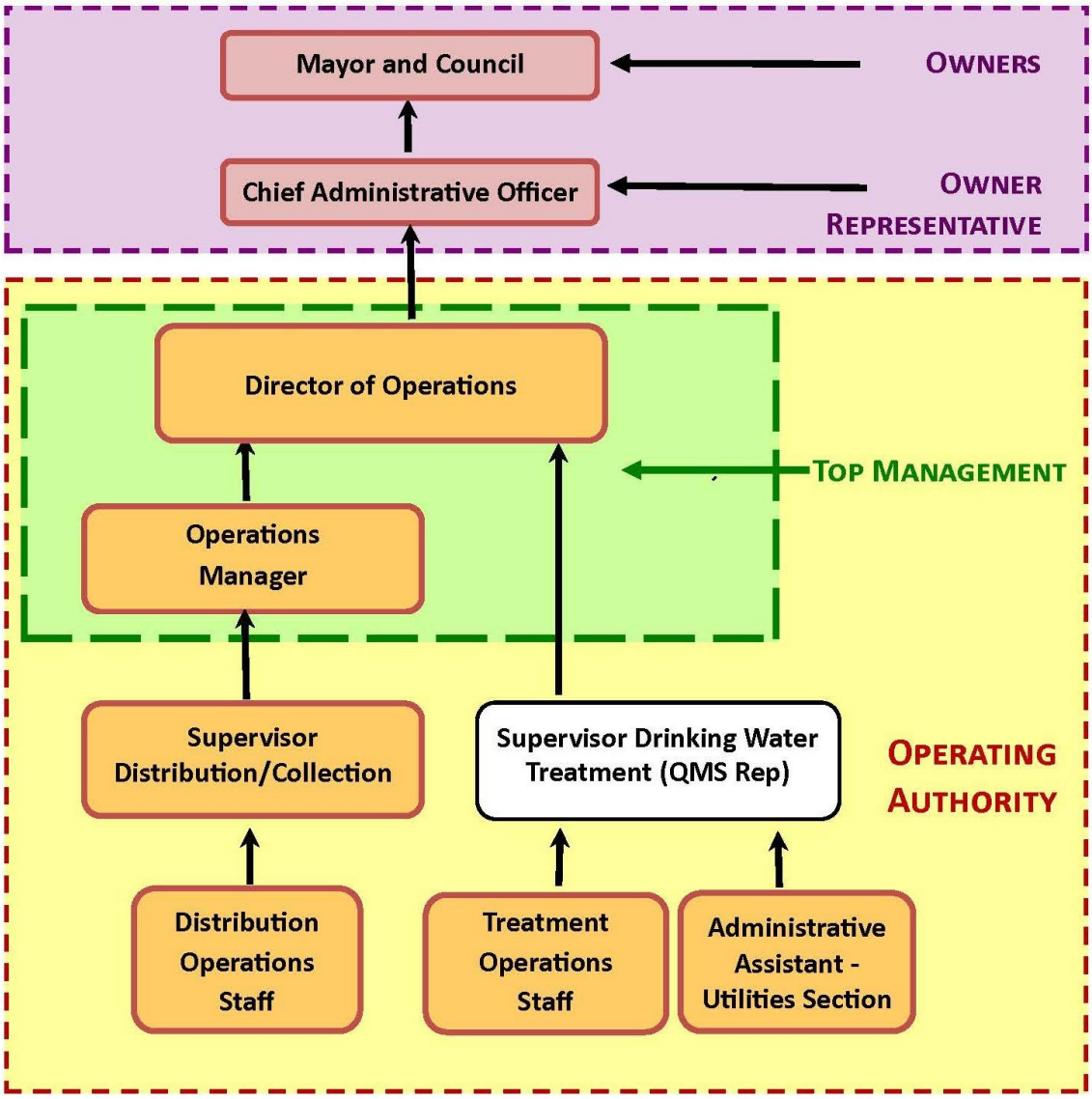
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9.0 Organizational Structure, Roles, Responsibilities & Authorities

9.1 DWQMS Organizational Chart

The DWQMS Organizational Chart for the City of Pembroke's DWS is as follows:

9.1.1 Figure: City of Pembroke's DWQMS Organizational Chart



The DWQMS Organizational Chart is reviewed on an annual basis or if significant organizational changes occur within the Operating Authority.

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9.2 DWQMS Roles, Responsibilities & Authorities

The **DWQMS Roles and Responsibilities Matrix (OPS-UTL-DWS-GEN-LM-005-001 –** see Appendix A) defines the roles, responsibilities and authorities of staff within the City of Pembroke's Operating Authority and includes both general roles as well as DWQMS-specific responsibilities for each role. The Matrix is reviewed periodically as per the **DWQMS Document Control Matrix (OPS-UTL-DWS-GEN-LM-002-001)** or as significant organizational changes occur within the Operating Authority. The Supervisor Drinking Water Treatment, along with relevant Managers and Supervisors, are responsible for ensuring that staff remain aware of their respective roles, responsibilities and authorities.

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10.0 Competencies

A procedure has been developed to outline processes for management of training requirements for Certified Water Operators. **DWQMS Competencies and Training (OPS-UTL-DWS-GEN-PRO-006-001** – see Appendix A) outlines processes for planning, scheduling and tracking training activities for Water Operations staff, including training relating to certification of Water Operators in accordance with O. Reg. 128/04.

The **DWQMS Competencies Matrix (OPS-UTL-DWS-GEN-LM-006-001** – *see* Appendix A) outlines the competencies of those Operating Authority Personnel whose work directly affects drinking water quality. The descriptions highlight only those required competencies relating to work affecting drinking water quality; job descriptions are to be observed as the primary source of inclusive summaries for the listed positions. The **DWQMS Competencies Matrix** is used as a guide in planning upcoming training activities and helps to ensure that Water Operations staff are equipped with competencies and skill sets deemed to be required by the Operating Authority.

A Water Operations training record is established for every new member of Operating Authority staff. These records contain details of the employee's educational history, records of Operator Certification, and records of training activities completed. Spreadsheets are also maintained for each member of Water Operations staff that includes details of Operator Certification (as applicable), details of training activities completed, due dates for recurring training, and information about training hours accrued. The Supervisor Drinking Water Treatment uses these training spreadsheets in conjunction with the **DWQMS Competencies Matrix (OPS-UTL-DWS-GEN-LM-006-001)** to plan and schedule training activities for Certified Water Operators. Training activities are planned and scheduled in consultation with the Supervisor of Pollution Control Centre and the Supervisor of Distribution/Collection.

The Ministry's mandatory course must be completed by all Certified Water Operators at least once during the three-year period of validity of their certification. The course helps to ensure that certified personnel are kept aware of the importance and relevance of their duties and how they affect drinking water quality. The importance and relevance of Certified Water Operator duties are also reinforced through other training activities, procedure reviews, and during delegation of work activities.

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11.0 Personnel Coverage

The **DWQMS Personnel Coverage** procedure (**OPS-UTL-DWS-GEN-PRO-007-001 –** see Appendix A) details processes used by the City of Pembroke to ensure that adequate staffing & personnel are available to operate and maintain the DWS. The procedure details coverage measures to be followed during regular business hours as well as after-hours periods.

11.1 Water Treatment

The Supervisor Drinking Water Treatment is appointed as the Primary Treatment ORO for the City of Pembroke's DWS. If the Supervisor is unavailable to fulfill the duties of ORO, an Alternate Treatment ORO is designated. For Treatment Operations, the OIC designation is assigned on a weekly basis in alignment with the rotation of Treatment Standby Operator assignment; the Treatment Standby Operator assumes the role of OIC for the week. (refer to **OPS-UTL-DWS-GEN-PRO-007-001 - DWQMS Personnel Coverage** – see Appendix A)

One day shift operates from 7:30am – 3:30pm daily. Operators typically work from Monday to Friday. One Operator is scheduled to work each weekend in exchange for an extended weekend during the following week; this operator is considered to be the Treatment Standby Operator and is provided with a city-owned mobile device for receipt of after-hours emergency calls. A SCADA system is used to monitor WTP and bulk water storage operations during after-hours periods. In the event of an emergency, the SCADA system auto-dialer places a call to the Treatment Standby Operator's cellphone to alert them of the problem.

11.2 Water Distribution

The Supervisor of Distribution/Collection is appointed as the Primary Distribution ORO for the City of Pembroke's DWS and designates an Alternate Distribution ORO if they are unavailable to fulfill their ORO duties. For Distribution Operations, the Chief Operator is identified as the OIC. In the absence of the Chief Operator, an Acting Chief Operator is designated. Additional OICs may be assigned as required to oversee any maintenance or repair activities.

For Water Distribution Operations, one day shift operates from 7:30am – 3:30pm daily. Operators typically work from Monday to Friday. During after-hours periods, an Operations Standby is appointed on a rotating basis to serve as the primary contact in the event of an emergency affecting Water, Sewer, Roads, etc. The Operations Standby may not be a Certified DWS Operator. After-hours emergency calls are directed to the City of Pembroke dispatch service provider for receipt and forwarding to the designated Operations Standby. Further call-in processes for Water Distribution-related emergencies are detailed in **DWQMS Personnel Coverage (OPS-UTL-DWS-GEN-PRO-007-001).**

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11.3 Labour Disruption

In the event of a labour disruption, the Supervisor Drinking Water Treatment assumes control of treatment processes. For distribution operations, the Supervisor of Distribution/Collection assumes oversight and control of the water distribution system. If required, external labour may be contracted during periods of labour disruption.

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12.0 Communications

A procedure**, DWQMS Communications (OPS-UTL-DWS-GEN-PRO-008-001** – see Appendix A), has been developed to outline the processes and methods used by the Top Management of the City of Pembroke's Operating Authority in communicating relevant DWS-related information to the Mayor and Council, Operating Authority staff, DWS Vendors, and the public. The procedure also outlines policies for communication with the Ministry of the Environment and Climate Change and the DWQMS Accreditation Body.

DWQMS Awareness Training has been developed by the DWQMS Implementation Team on behalf of Top Management. This training is used as a tool to communicate fundamentals of the DWQMS to Operating Authority staff and can be presented to other parties as required.

Top Management communicates the DWQMS to the Owner through presentations at Operations Committee meetings, Reports or Update Documents to Operations Committee, and informal day-to-day communications.

Operating Authority Supervisors communicate with Utilities Staff in the operation and maintenance of the drinking water system through verbal communication, formal and informal written communication, provision of procedures, DWQMS Awareness Training, meetings, and internal and external audit results.

The Operating Authority completes the majority of its communication with DWS Vendors via the Treasury Department. DWS Vendors whose products or services may affect drinking water quality are identified as per **DWQMS Essential Supplies and Services** (refer to Section 13.0 of this Operational Plan).

Drinking-water customers are able to communicate with City of Pembroke staff via the Operations Department (during regular business hours), by logging concerns via the City's website on Access E11 or via the City of Pembroke dispatch service provider (outside of business hours). Calls received at City of Pembroke dispatch service provider are routed to appropriate Water Operations staff for further action.

The Supervisor Drinking Water Treatment is designated as the primary City contact for DWQMS-related communication with the Ministry and the Accreditation Body, and works closely with Top Management in applying for, scheduling, and responding to results of DWQMS Accreditation Audits.

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13.0 Essential Supplies and Services

The **DWQMS Essential Supplies and Services** procedure **(OPS-UTL-DWS-GEN-PRO-009-001** – see Appendix A) describes the processes by which the City of Pembroke identifies the supplies and services that it deems essential to its water-related operations. The procedure also documents the process followed by the Operating Authority in verifying the quality of these essential supplies and services insofar as they impact drinking water quality.

Essential supplies and services are defined as those supplies/services that are essential to the continued delivery of safe drinking water OR that are related to disinfection of drinking water or of drinking water infrastructure. The **List of Essential DWS Supplies and Services (OPS-UTL-DWS-GEN-LM-009-001** – see Appendix A) lists Pembroke's drinking water system essential supplies and services. The List includes minimum quality requirements that must be met by DWS Vendors in order to be considered for use for the DWS.

As required, the Operating Authority completes a quality assurance assessment of its essential supplies and services to ensure that they continue to conform to specified quality requirements. Vendor performance, condition and quality of the provided supply or service, and adherence to the City's specified quality requirements are considered as per **DWQMS Essential Supplies and Services (OPS-UTL-DWS-GEN-PRO-009-001).**

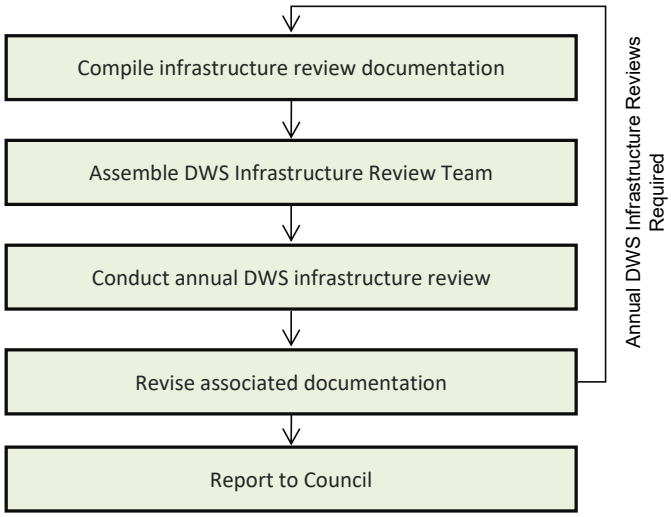
Results of the assessment are forwarded to Top Management along with any recommendations for DWS Vendor non-conformances, continual improvement initiatives or exclusions. Non-conformances may be issued to DWS Vendors and documented as per the **DWQMS Preventive and Corrective Action procedure (OPS-UTL-DWS-GEN-PRO-017-001).** Non-conformances are communicated to Vendors with requested date for response. Vendor non-conformance reports (with corrective actions) are reviewed as part of the Vendor QA Review.

DO NOT PHOTOCOPY

14.0 Review and Provision of Infrastructure

The **DWQMS Review and Provision of Infrastructure** procedure (**OPS-UTL-DWS-GEN-PRO-010-001** – see Appendix A) has been developed to outline the process followed by the City of Pembroke in reviewing the adequacy of its drinking water system infrastructure. The DWS infrastructure review process is shown in Figure below.

14.1 Figure: DWQMS Infrastructure Review Process



Members of the City of Pembroke's DWS Infrastructure Review Team are listed in **DWQMS Review and Provision of Infrastructure (OPS-UTL-DWS-GEN-PRO-010-001).** The DWS Infrastructure Review Team meets on an annual basis to review the previous year's operational history and proposed infrastructure rehabilitation plans for the subsequent year.

Inputs to Infrastructure Reviews include but are not limited to results of previous infrastructure reviews, relevant operations and maintenance data, summaries of DWS assets and infrastructure, ongoing improvement initiatives, and relevant water quality data. The Team examines these inputs and identifies infrastructure elements of concern within the DWS as well as replacement strategies for these elements. Infrastructure replacement strategies are prioritized based on known water quality issues, ability to meet and maintain fire flows, condition of watermains & related infrastructure, and current, ongoing or planned drinking water quality improvement initiatives.

A DWS Infrastructure Review Report is subsequently prepared for Council that describes the conclusions of the infrastructure review and outlines recommendations regarding proposed DWS infrastructure renewal projects for the subsequent year.

DO NOT PHOTOCOPY

15.0 Infrastructure, Maintenance, Rehabilitation and Renewal

The **DWQMS Infrastructure, Maintenance, Rehabilitation and Renewal** procedure (**OPS-UTL-DWS-GEN-PRO-011-001** – see Appendix A) provides a summary of maintenance programs completed in respect of the City of Pembroke's drinking-water system along with Operational Performance Indicators for these programs. This procedure pertains to the City of Pembroke's drinking-water system infrastructure including raw water intake, water treatment, treated water storage and water distribution infrastructure.

The City of Pembroke's Department of Operations has established several infrastructure maintenance, rehabilitation and renewal programs to protect the integrity of its drinking water system infrastructure and the quality of its drinking water. Infrastructure maintenance programs are completed according to the levels of service outlined in **DWQMS Infrastructure, Maintenance, Rehabilitation and Renewal (OPS-UTL-DWS-GEN-PRO-011-001).**

The City has established Operational Performance Indicators as a means of ensuring the continued performance of its infrastructure and the effectiveness of its maintenance programs. **DWQMS Infrastructure, Maintenance, Rehabilitation and Renewal (OPS-UTL-DWS-GEN-PRO-011-001)** includes a summary of the Operational Performance Indicators used to assess the effectiveness of DWS maintenance programs. Operational Performance Indicators are established based on unexpected failures in infrastructure, and do not include deficiencies discovered during the completion of routine maintenance programs.

The DWS Operating Authority may choose to undertake infrastructure rehabilitation activities if these activities are expected to extend the useful life of the infrastructure at a cost that is reasonable to the Operating Authority. Alternatively, renewal activities may be implemented to address significant issues with infrastructure performance. A cost-benefit analysis may be used as a basis for determining whether rehabilitation is favoured over renewal of the infrastructure in question. Rehabilitation and renewal activities are managed under the Department's Capital Budgeting program and are thus examined during annual DWQMS Infrastructure Reviews. Results of DWQMS Infrastructure Reviews are communicated to the Owner through the DWQMS Management Review (see **DWQMS Review and Provision of Infrastructure, OPS-UTL-DWS-GEN-PRO-010-001***)*.

DO NOT PHOTOCOPY

16.0 Sampling, Testing and Monitoring

The **DWQMS Sampling, Testing and Monitoring** procedure (**OPS-UTL-DWS-GEN-PRO-012-001** – see Appendix A) applies to all sampling, testing and monitoring conducted or delegated by the City of Pembroke's Operating Authority as required by the applicable regulations and/or for the operation of the drinking water system. This procedure describes the required water system sampling, testing and monitoring activities completed by City of Pembroke's Operating Authority Staff, including the types and numbers of samples required, frequency of sampling and Standard Operating Guidelines to be followed.

The minimum sampling and monitoring requirements specified in O. Reg. 170/03 for the City's drinking-water system are identified in **DWQMS Sampling, Testing and Monitoring** procedure **(OPS-UTL-DWS-GEN-PRO-012-001).** As per O. Reg. 170/03, selected samples are required to be taken at a point in the system where conditions are most challenging (if applicable). Where this is a requirement for the sample in question, sample location conditions are also specified in the procedure.

Samples not specifically required by the Regulation but that are required for other reasons (i.e., water treatment process control, distribution system construction or repairs, response to customer complaints) are also identified in **DWQMS Sampling, Testing and Monitoring (OPS-UTL-DWS-GEN-PRO-012-001).**

The City's contracted Accredited Testing Laboratory provides immediate oral notification to the City in the event of an adverse test result. The City then provides immediate oral notification to the Renfrew County & District Health Unit and the Ministry of the Environment, Conservation and Parks Spills Action Centre. Additional reporting requirements, including communication of adverse test results to the Owner, are documented in **Adverse Water Quality Incident Reporting and Corrective Action (OPS-UTL-DWS-GEN-SOP-012-001).**

The Drinking Water System Annual Report is provided to the Owner by March 31st of every year. The Annual Report summarizes drinking water sampling and testing results for the previous calendar year.

DO NOT PHOTOCOPY

17.0 Measurement and Recording Equipment Calibration and Maintenance

The **DWQMS Measurement and Recording Equipment Calibration and Maintenance** procedure (**OPS-UTL-DWS-GEN-PRO-013-001** – see Appendix A) outlines requirements for the calibration and verification of measurement and recording equipment used for sampling, testing and monitoring of the DWS.

Measurement, monitoring and recording devices owned by the City of Pembroke and used in Water Treatment and Distribution Operations are subject to periodic calibration by Operating Authority Staff and to calibration by the manufacturer, if required. The **DWQMS Measurement and Recording Equipment Calibration and Maintenance** procedure **(OPS-UTL-DWS-GEN-PRO-013-001)** identifies the measurement and recording equipment used by the Operating Authority in respect of the drinking water system and outlines the associated calibration requirements for each piece of equipment including calibration frequency and relevant calibration procedures, where applicable.

DO NOT PHOTOCOPY

18.0 Emergency Management

The purpose of **DWQMS Emergency Management (OPS-UTL-DWS-GEN-PRO-014-001** – see Appendix A) procedure is to identify the City's **Emergency Response Plan for Water Operations (OPS-UTL-DWS-GEN-MAN-014-001)**, to specify training and testing requirements for this Plan, and to outline emergency communication protocols and emergency contacts.

The **Emergency Response Plan for Water Operations (OPS-UTL-DWS-GEN-MAN-014-001** – see Appendix D) includes detailed emergency response procedures for identified potential emergency events. This **Emergency Response Plan** is included as Appendix D to this Operational Plan. Communication protocols for each emergency scenario are embedded in the respective emergency response procedures.

The **Emergency Response Plan for Water Operations (OPS-UTL-DWS-GEN-MAN-014-001)** includes contact information for personnel who may need to be contacted in an emergency. The list includes contact information for both Operating Authority staff and external parties.

Emergency Response Plan training requirements for general Operating Authority staff, staff with responsibilities for response, and contractors/visitors are outlined **in DWQMS Emergency Management (OPS-UTL-DWS-GEN-PRO-014-001).** On an annual basis, at least one emergency response procedure contained within the **Emergency Response Plan for Water Operations (OPS-UTL-DWS-GEN-MAN-014-001)** is selected for review and testing.

The **Emergency Response Plan for Water Operations (OPS-UTL-DWS-GEN-MAN-014-001)** is reviewed and updated as required in alignment with established document control requirements, periodic testing activities, post-emergency debriefings, and/or any applicable legislative/regulatory changes.

DO NOT PHOTOCOPY

19.0 Internal Audits

A procedure has been created to describe the City of Pembroke's DWQMS Internal Auditing Program & associated processes to evaluate the conformity of the City of Pembroke DWQMS with the requirements of the Drinking Water Quality Management Standard. The **DWQMS Internal Auditing** procedure (**OPS-UTL-DWS-GEN-PRO-015-001** – see Appendix A) documents required activities & processes relating to the planning, execution and documentation of DWQMS Internal Audits, including recording of non-conformances and reporting of results to Top Management and the Owner.

DWQMS Internal Auditors are appointed to the Internal Audit Team by the DWQMS Representative and must achieve and maintain defined competency requirements including the following:

- Internal Auditors must possess an understanding of both the requirements and the intent of the DWQMS Standard;
- Internal Auditors must be competent (i.e., must receive Internal Auditor Training);
- Internal Auditors should have a good knowledge of the drinking water system operation and of drinking water quality requirements;
- Internal Auditors must be familiar with the Department of Operations' DWQMS auditing procedures and protocols.

The Lead Auditor (or an Internal Audit Team delegate) and Supervisor Drinking Water Treatment work together to plan and execute the annual DWQMS Internal Audit with the assistance of the Internal Audit Team. The role of Lead Auditor can be fulfilled by the Supervisor Drinking Water Treatment if desired. Internal Auditors must remain objective and impartial throughout the audit process, and cannot audit their own work or work areas.

Audit conclusions may identify actual or potential non-conformances in current operations or processes, indicating the need for corrective action or preventive action, respectively. Auditors may also suggest potential improvement initiatives. Actual and potential non-conformances must be documented and resolved according to the Operating Authority's defined Continual Improvement process (refer to Section 21.0 of this Operational Plan). Completion and effectiveness of corrective and preventive actions are verified by the Lead Auditor or an Internal Audit Team delegate.

Upon completion of scheduled internal audits, the Supervisor Drinking Water Treatment (or designate) reviews audit findings and compiles the information for presentation to Top Management as part of the annual DWQMS Management Review (refer to Section 20.0 of this Operational Plan). Audit findings must be considered in future relevant audits.

The City of Pembroke's DWQMS must be audited once every 12 months.

DO NOT PHOTOCOPY

20.0 Management Review

A **DWQMS Management Review** procedure (**OPS-UTL-DWS-GEN-PRO-016-001** – see Appendix A) has been developed to document the process followed by Top Management and Operating Authority Supervisors in planning, executing and documenting DWQMS Management Reviews, including provision of feedback to the Operating Authority and reporting of review results to the Owner. The Management Review process ensures that all levels of the organizational structure are kept informed and aware of the DWQMS and DWS performance.

The DWQMS Representative has a significant role in the DWQMS Management Review process, compiling all required input data for presentation to Top Management and attending Management Review meetings as a facilitator. (Required inputs to Management Review are listed in **DWQMS Management Review (OPS-UTL-DWS-GEN-PRO-016-001).** Other City staff may be invited to assist in presenting information to the Management Review Team, or in reviewing the information presented, where they offer additional expertise or insight regarding the subject matter. Top Management and Operating Authority Supervisors are responsible for reviewing the input materials presented and generating outputs as specified in **DWQMS Management Review (OPS-UTL-DWS-GEN-PRO-016-001).**

Management Review meetings may be conducted as a series of smaller meetings over the course of a calendar year, with one Annual General Meeting to summarize all findings and ensure that potential relationships between review inputs are examined. All required review inputs and agenda items are addressed over the course of the year.

DWQMS Management Review outputs must be documented and retained as proof of completion, and results of the Management Review must be communicated to the Owner.

DO NOT PHOTOCOPY

21.0 Continual Improvement

The **DWQMS Preventive & Corrective Action** procedure (**OPS-UTL-DWS-GEN-PRO-017-001** – see Appendix A) was developed to document the process followed to ensure effective resolution of DWQMS non-conformances. This process is used to address both potential and actual non-conformances and includes root cause analysis, identification and implementation of preventive or corrective actions, and verification of their effectiveness.

The handling of Adverse Water Quality Incidents (AWQIs) is not included in the scope of the **DWQMS Preventive & Corrective Action procedure (OPS-UTL-DWS-GEN-PRO-017-001)**. A separate procedure has been developed to document processes for addressing these occurrences; refer to **Adverse Water Quality Incident Reporting and Corrective Action (OPS-UTL-DWS-GEN-SOP-012-001).**

Potential and actual DWQMS non-conformances are identified through several different means, including but not limited to DWQMS audits, internal and external communication, monitoring and measurement of DWQMS performance, employee observations/suggestions, and DWQMS Management Reviews. The non-conformance is documented on a **DWQMS Preventive & Corrective Action Request Form (OPS-UTL-DWS-GEN-FRM-017-001)**, and this form is used to document the Root Cause Analysis, the development & implementation of the Preventive or Corrective Action Plan, and follow-up verification activities. Designated Operating Authority Staff may be delegated to implement preventive or corrective actions. The Supervisor Drinking Water Treatment (or designate) verifies the effectiveness of the preventive or corrective action. The DWQMS Representative (or designate) is responsible for approving and closing DWQMS Preventive and Corrective Requests and will only do so once the effectiveness of the implemented solution has been verified by the Supervisor Drinking Water Treatment.

The Supervisor Drinking Water Treatment retains completed documentation of DWQMS Preventive & Corrective Action Requests and generates an annual summary of the status of non-conformances, preventive actions and corrective actions for presentation as an input to DWQMS Management Reviews.

DO NOT PHOTOCOPY