

# TOWN OF COCHRANE

*CORPORATION OF THE TOWN OF COCHRANE WATER TREATMENT & DISTRIBUTION SYSTEM*

DRINKING WATER QUALITY MANAGEMENT SYSTEM

## OPERATIONAL PLAN



*Revised December 9<sup>th</sup>, 2022 By:  
Melissa Hoogenhoud - Asset Coordinator*

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## 1. Overview

The original Water Treatment Plant was constructed in 1947 on the west side of Spring Lake. Due to poor sub-surface conditions, the structure, constructed of concrete foundation, masonry walls and a wooden roof was subjected to some large settlements after construction was completed. The new Water Treatment Plant was commissioned in 1995 on the east side of Spring Lake.

The source of the raw water is from the existing wells #5, 6 and 7 located on the west side of Spring Lake. Submersible pumps in each of the deep wells pump the water through a 300  $\Phi$  PVC water main to the new water treatment plant on the east side of Spring Lake.

In the WTP the raw water is pre-chlorinated and discharged into a covered head tank, complete with a vent pipe. By pass of the head tank is available for maintenance purposes. It diverts the raw water directly to each clarifier.

From the head tank the raw water is fed by gravity into the 2 clarifiers through independent piping. This allows taking one clarifier at a time out of service for maintenance purposes. Lime slurry for softening and polymer (silicate) for coagulation is added in the clarifiers. The softened water flows over the clarifier weir into pipes on its way to the re-carbonation tank where  $\text{CO}_2$  is added for pH adjustments. From the re-carbonation tank, the water (with adjusted pH) flows by gravity into the filters, where final filtration occurs.

The filter cells can be filled, air scoured, backwashed and drained independently which allows for a continuous water treatment process during any maintenance work on each filter cell. The filtering water drains into reservoir cells 1 and 2, which is separated by a sluice gate. Normally, the sluice gate is open. If closed, the reservoir can be maintained one at a time by simply diverting the discharge of the filtered water into either one of the two cells.

The clean water from the reservoir cells is pumped into the system by three (alternating) high lift pumps, through a 250  $\Phi$  SS discharge header within the building and a 400  $\Phi$  treated water PVC main (yard piping). Magnetic flow meters are used for measuring the pumped raw water, treated water and backwash water volumes. The collected lime sludge in the clarifiers is periodically blown down through a system of pipes and valves into concrete lagoons located outside of the plant where it thickens for disposal. The thickening of the sludge is achieved through drainage and regular pumping of the water collected in the adjacent CMP (Corrugated Metal Pipe) wells, as well as through dewatering of the sludge by draining the supernatant water into a Supernatant Equalization Tank (SET), within the WTP through a system outlet to the existing sewage treatment plant, depending on the results of the supernatant sampling as per the MOE Certificate of Approval.

The backwashed water from the filters can be discharged either into a backwash equalization tank located within the WTP or directly into the lagoons. From the backwash equalization tank, the backwash water can be pumped into any of the three lagoons or it can be recycled back into the head tank.

The chlorine residual in the plant is continuously monitored in the clear well by a chlorine analyzer to ensure the chlorination system is working properly. The chlorine analyzer will alarm if the low or high set points are reached and the high lift pumps will shut down and the on-call operator will respond. The dosage rate is set manually for the feed pumps by the operator and can be adjusted to maintain the set points.

The complete system of the WTP is monitored and controlled by the SCADA system which is equipped with an uninterrupted power supply (UPS). The new system has been upgraded as of February 2009 and further upgrades were incorporated in 2016 to allow for a daily backup of the system. The SCADA system is programmed to alarm when set points are either low or high, such as low chlorine residual or high levels in the reservoir or elevated tank. The on call operator would determine the need for immediate response based on the nature of the alarm. The plant is also equipped with a standby diesel generator and fuel tank for emergency power.

## 2. Water Quality Policy

Through this policy, the Corporation of the Town of Cochrane commits to:

- The provision of safe drinking water
- Continual improvement of the QMS and the water works
- Complying with relevant legislation and regulations
- Communicated to all operating authority, personnel, the owner and the public.

We strive to achieve these goals and adhere to the commitments above through the implementation of a management system comprised of policies, procedures, instructions, and forms that demonstrate risk-based treatment process evaluation, staff competency, open communications, workplace safety, and appropriate contingency/incident response measures.

The Director and employees of the Town of Cochrane who are directly involved in the supply of drinking water, share in the responsibilities of implementing, maintaining, and contributing to the continual improvement of the Quality Management System.

This policy shall serve as the foundation of our drinking water quality management system. It will be communicated to all employees through orientation sessions (QMS and New Hire), internal postings, memos and meetings. It will be communicated to the public through posting of the policy in public areas of the Town Hall, as well as the water and sewer office and the Town of Cochrane web-site and through occasional mailings of flyers and handouts.



Owner Representative

CAO



Operating Authority Representative

Director of Infrastructure Services

### 3. Commitment & Endorsement

The system owner, the Town of Cochrane, and the operating authority, support the implementation, maintenance, and continual improvement of a drinking water Quality Management System (QMS) for the Cochrane water supply system, as documented in this Operational Plan. Endorsement by the owner, (represented by the Town of Cochrane CAO), and top management, (represented by the Director of Infrastructure Services), acknowledges the need for, and supports the provision of sufficient resources to maintain and continually improve the QMS.

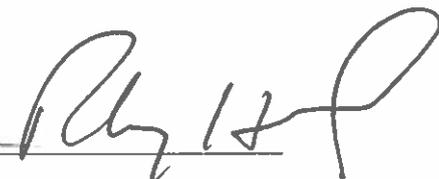
The Designated QMS Representative, appointed by Town of Cochrane QMS Top Management, acknowledge the roles and responsibilities of that appointment.

  
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Mayor

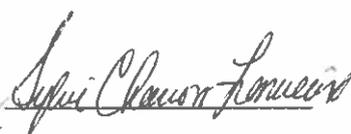
  
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CAO

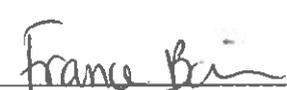
  
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Councilor

  
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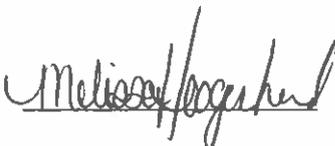
  
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\_\_\_\_\_  
Director of Infrastructure Services/  
QMS Top Management

  
\_\_\_\_\_  
Asset/Compliance Coordinator/  
QMS Representative

  
\_\_\_\_\_  
ORO

## 4. QMS Representative

The Designated QMS Representative is appointed to the Asset/Compliance Coordinator by the Operating Authority.

### Designated QMS Representative and Committee Participants

The designated QMS Top Management is to:

- Ensure that the Quality Management System is in place.
- Ensure the Operating Authority is aware of all applicable legislative and regulatory requirements.
- Determine, obtain, and provide the resources needed to maintain and continually improve the Quality Management System.
- Communicate the relevant aspects of the Quality Management System according to the procedure for communications.
- Appoint and authorize a QMS Representative.
- Participates in the Management Review.

The designated QMS Representative is to:

- Develop, implement and maintain processes and procedures needed for the QMS.
  - Report the effectiveness of the QMS, including the need for improvement, to Top Management.
  - Promote awareness of the QMS throughout the Town of Cochrane and reports QMS results to ToC staff.
  - Ensures documentation is prepared and maintained, as needed.
  - Provides all staff with technical and administrative consultation related to QMS document preparation and implementation, as needed.
  - Reviews and approves QMS documentation; ensures all documents are updated.
  - Implementation and oversight of document control procedure.
  - Internal auditing and external audit liaison.
  - Provide the Purchasing Agent with a communication letter to attach to Purchase Orders for Suppliers.
  - Staff QMs communications and training
  - Reporting of QMS results to top management, and any need for improvement.
  - Ensures that personnel are aware of all applicable legislative and regulatory requirements that pertain to their duties for the Cochrane Water Supply System.
  - Reviews Audit Reports.
- 
- Organize and implement the annual audit process.
  - Ensure all Elements are audited annually.
  - Ensure current versions of documents are available
  - Ensure all documents and records are adequately stored, protected, retained.
  - Ensure all obsolete documents and records are adequately stored or disposed of as required.
  - Assist in the management of all documents relating to the QMS.

The CAO of the Town of Cochrane is to:

- Review and approve QMS documentation.

- Endorses QMS as Top Management representative.

The Director of Infrastructure Services of the Town of Cochrane is:

- The QMS Top Management and will appoint the QMS Representative.
- To provide technical and administrative consultation related to QMS document preparation.

The ORO, and Water Plant Operators are to:

- Assist with QMS technical document preparation.
- Provide technical and risk assessment consultation to others preparing QMS documentation.
- Maintains awareness of Operational Plan requirements and consistently implements the QMS at the treatment facilities.

The QMS Committee consists of the following individuals:

The Director of Infrastructure Services/ QMS Top Management.

ORO

QMS Representative

Three Water System Operator/Distribution

  
\_\_\_\_\_  
QMS Top Management

  
\_\_\_\_\_  
CAO

  
\_\_\_\_\_  
ORO

  
\_\_\_\_\_  
QMS Representative

## 5. Document and Records Control

### 5.1 QMS Document Control (Other than Records)

This procedure is applicable to the following QMS documents:

- Operational Plan
- Quality Policy
- Procedures
- Instructions
- Audit Checklist
- Forms
- Equipment Manuals
- As Built Drawings

#### Creating New or Updating Existing Documents

Any employee of the Water Department may request the creation of a new QMS document or a change to an existing one. The request must be made in writing and submitted to the QMS Representative. The need for new or updated documents may also be identified by audits or management review. The QMS Representative will be assigned the task of creating or revising these documents. The request must include the following information:

1. Reason for new or revised documents – must belong in one or more of these categories:
  - Required by the DWQMS
  - Enhances process control
  - Eliminates risk
  - Supports regulatory requirements
  - May improve operational efficiency
  
2. Outline of document change or new document content – narrative format is acceptable. If approved, the requester shall develop the new/changed document and submit it to the QMS Representative for approval.

#### Approving Documents

All QMS related documents created by the Town of Cochrane Water Department shall be approved by the QMS Representative before release.

The QMS Representative shall be responsible for ensuring that copies of the new or changed documents are distributed. Obsolete documents (due to changes) shall be collected and destroyed by the QMS Representative.

**Reviewing Documents**

The Operational Plan and procedures shall be reviewed annually for applicability and relevance.

**Document Availability**

All procedures, instructions, forms and checklists are retained in the QMS binders at the Water Treatment Plant, and on Intelex.

Water treatment machinery and equipment manuals are retained at the treatment plant. They are stored in binders that are kept in the Coffee Room. Each binder contains a table of contents. The operational procedures are stored in the QMS binder and on Intelex.

Water treatment drawings, specification and manuals are kept at the water treatment plant in the book shelf in the diesel room book shelves.

Drawings for distribution are kept in the water/wastewater office.

The Permits are located on Intelex. Blank forms and checklists are kept on Intelex. Licenses are kept on the wall and certificates are photocopied and placed on the wall and on Intelex. Intelex contains all updated training for all operators.

Type of Document	Electronic or Hardcopy	Review Frequency	File Location (Master)	Location of Printed Document	Authorized Editor	Reviews / Approvers	Internal or External QMS Document
Operational Plan	Electronic	Annually	Water & Wastewater Office, Intelex	Black cabinet at WTP	Top Management QMS Rep	ORO or Director	Internal
Policies	Electronic	Annually	Water & Wastewater Office	Available on Intelex	CAO, Owner	CAO, Owner	Internal
QMS Procedures	Electronic	Annually	Water & Wastewater Office, Intelex	Available on Intelex	QMS Committee	ORO or Director	Internal
Work Instructions	Electronic	Annually	Water & Wastewater Office, Intelex	Available on Intelex	Supervisor, ORO or Director	ORO or Director	Internal
Standard Operating Procedures	Electronic	Annually	Water & Wastewater Office, Intelex	Available on Intelex	QMS Committee	ORO or Director	Internal

Blank Forms and Checklist	Electronic	Annually	Water & Wastewater Office Intelex	Available on Intelex	QMS Committee	ORO Director or	Internal
Legislation and Regulations	Electronic available on Ministry website	Annually or as required	MOE	Always current and update by viewing online from any work computer	MOE	MOE	External
Permits	Printed copy in filling cabinet	Annually or as required	Water & Wastewater Office	Black cabinet at WTP	MOE	MOE	External
Licenses and Certificates	Original posted on wall at WTP	Annually	WTP, copies at the Water & Sewer Office	License are located on the wall, Certificates are stored in the training binder			External
Industry Standards	Hard copy book located at W&WW office	Annually	Water & Wastewater Office		AWWA	AWWA	External

### QMS Record Control

This procedure is applicable to all records that demonstrate conformance to DWQMS requirements. All records that demonstrate compliance are covered by Ontario Regulations 170/03 and 128/04.

All QMS records are retained for a minimum of 5 years. However, if a QMS records is also required of O. Reg 128/04 and/or 170/03, then the retention time shall be as per the regulation. Once the record retention time has been reached, records shall be destroyed.

### Manual Records

- All manual records shall only use approved QMS forms.
- The record title shall be clearly visible and legible.

- Manual records shall be legible. Pencil or any other erasable marker shall not be used to record process or product information or data.
- QMS records shall be filed by type and date.
- QMS related Water Treatment and distribution records shall be stored and available at the Water Treatment Plant.
- QMS reports shall be stored in such a manner as to prevent deterioration.
- All manual records shall show the name or initials of the recorder and the date (and time if appropriate) the record was generated.

#### **SCADA Records**

- QMS SCADA records are backed up daily.
- Electronic copies of the QMS SCADA records are uploaded daily on InteleX and compiled monthly and stored in the Water Treatment Plant for a minimum of fifteen years.
- Printed copies of the SCADA monthly summaries may be circulated for management and management review purposes. These summaries shall be filed by the Director of Infrastructure Services if being retained for knowledge purposes.

#### **Records Availability**

All records are stored in the black cabinet at the Water Treatment Plant and on InteleX. At the end of the year, records are compiled into binders, labeled and stored in the cabinet in the diesel room.

Safety meeting minutes are located on the safety peg board and on InteleX. At the end of the year all meeting minutes are filed in the filing cabinet that is also located in the diesel room. Operation minutes are submitted on InteleX and available at the Water and Wastewater Office.

Management Review minutes are stored on InteleX

Our current operator log is located on the desk in the office, opened to the designated day. In house lab tests and round sheets are kept on the clipboard in the office. At the end of the month they are stapled and stored in their corresponding spot in the black cabinet. They are also scanned and submitted on InteleX. External lab test results are stored on InteleX.

Completed operator logs, completed checklists, raw water quality records, monitoring records, and training records (in binder) are all stored in the black cabinet in the water treatment plant office.

<b>Type of Record</b>	<b>File Location</b>	<b>Retention Time</b>	<b>Disposal Method</b>
External laboratory test results	Stored on Intellex	<b>Min. 15 Years</b> – O. Reg. 170/03 under SDWA, 2002	Shred as per Authorized Destruction of Records Guidelines & Procedures
Internal laboratory test results	Black cabinet at WTP for the current year and all other years in the Diesel Room Fire Proof Filling cabinet	<b>Min. 15 Years</b> – O. Reg. 170/03 under SDWA, 2002	Shred as per Authorized Destruction of Records Guidelines & Procedures
Completed operator log books	Black cabinet at WTP for the current year and all other years in the Diesel Room Fire Proof Filling cabinet	Indefinitely	Shred as per Authorized Destruction of Records Guidelines & Procedures
Completed checklists	Black cabinet at WTP for the current year and all other years in the Diesel Room Fire Proof Filling cabinet	<b>Min. 5 Years</b> – O. Reg. 128/04 under SDWA, 2002	Shred as per Authorized Destruction of Records Guidelines & Procedures
Raw water quality records	Black cabinet at WTP for the current year and all other years in the Diesel Room Fire Proof Filling cabinet	<b>Min. 15 Years – Indefinitely</b> – O. Reg. 170/03 under SDWA, 2002	Shred as per Authorized Destruction of Records Guidelines & Procedures/NA
Monitoring records	Black cabinet at WTP for the current year and all other years in the Diesel Room Fire Proof Filling cabinet	<b>Min. 5 Years – 15 Years</b> – varied records	Shred as per Authorized Destruction of Records Guidelines & Procedures
Training records	In office and on Intellex, managed by the Asset Coordinator	Indefinitely	Shred as per Authorized Destruction of Records Guidelines & Procedures
Safety meeting Minutes	On safety board and on Intellex	Indefinitely	N/A
Operational meeting minutes	Water & Wastewater Office	Indefinitely	N/A
Management Review/ Risk Assessment Minutes	Water & Wastewater Office	Indefinitely	N/A

## 6. Drinking-Water System

The owner of the drinking water system is comprised of the Mayor, Council and CAO. The operating authority top management is the Director of Infrastructure Services.

### Water Source

The Town of Cochrane obtains its raw water from three drilled wells. Well 5 was constructed in 1982 with a depth of 43.8 m below ground surface. Wells 6 and 7 were constructed in 1989 with a total depth of 51 m below ground surface. The hydro geological study completed confirmed that the wells are true groundwater and not under the influence of surface water. The hydrogeology of the Cochrane area is conceptualized as consisting of four hydrostratigraphic units:

- Silty Clay Aquitard;
- Upper Sand Aquifer;
- Lower Sand and Gravel Aquifer; and
- Precambrian Bedrock Aquitard.

Overburden materials are comprised of a mixture of units including surficial silty clay deposits, sand deposits, and deeper sand and gravel deposits. If present, the sequence of these units from top of bedrock to ground surface is consistent with sands and gravels above bedrock, overlain by sands, overlain by silty clays.

The uppermost overburden unit, where present, is the Silty Clay Aquitard. This unit is comprised of more than 3 to 37 m of overburden (mostly silt to clay till and marine sediments) and has an average hydraulic conductivity, K, of approximately  $7 \times 10^{-7}$  m/s based on MOE well records and hydraulic testing analysis (Golder Associates Ltd., 1987).

The Upper Sand Aquifer lies below the Silty Clay Aquitard, where present. This unit has thickness ranging from 4 m to 49 m based on MOE well records. Based on hydraulic testing by Golder Associates (1987), Dillon Consulting Limited (2003) and MOE well records, it is assumed to have an average K of about  $1 \times 10^{-5}$  m/s.

The deepest of the overburden units, where present, is the Lower Sand and Gravel Aquifer. This unit has a fluvio-glacial origin and fines upwards to eventually grade into the Upper Sand Aquifer. It is primarily located in the deeper bedrock valley and is generally absent outside of these valleys. It has a thickness that ranges from 0 m outside of the bedrock valleys to greater than 38 m at the municipal supply wells near Spring Lake (according to MOE well records). This unit has an average hydraulic conductivity, K, of approximately  $1 \times 10^{-3}$  m/s, based on MOE well records, records of water losses during drilling as part of this study and detailed hydraulic testing in Cochrane (Trow, Dames and Moore, 1990; Lotowater Technical Services Inc., 2003).

The Bedrock Aquitard has an assumed thickness of 20 m. This unit forms the bottom of the conceptual model and, due to its low hydraulic properties, acts as a hydraulic barrier.

An average K of  $1 \times 10^{-7}$  m/s is assumed for this unit, based on results from the regional compilation of MOE water wells records, detailed studies at East Bull Lake (Raven et al., 1987), Chalk River (Raven, 1986) and professional judgment. The bedrock below the Bedrock Aquitard will be less permeable than the Bedrock Aquitard and for the purpose of the WHPA modeling is assumed to be effectively impermeable.

Porosity values of the Silty Clay Aquitard, the Upper Sand Aquifer, and the Lower Sand and Gravel Aquifer are estimated at 0.3, 0.3 and 0.25, respectively based on previous experience and widely accepted literature values (Freeze and Cherry, 1979; Domenica and Schwartz, 1990). Porosity of the Bedrock Aquitards is comprised of permeable fracture porosity and less permeable matrix porosity. Precambrian Aquitard porosity is likely to range from 0.0001 to 0.01, with a best estimate of 0.001, based on hydro geologic and tracer testing of similar bedrock formations at Chalk River (Raven Beck Environmental Ltd. 1994), and literature review (Domenico and Schwartz, 1990).

Reverse time-of-travel (TOT) capture zones for the municipal wells were defined based on 50-day, 2-year, 10-year and 25-year groundwater travel times to each well. The WHPAs for the Cochrane municipal water supply wells are defined based on these delineated capture zones. The capture zones for the Cochrane municipal wells generally extend to the extents of the deep sand and gravel aquifers in which they are located. The 50-day TOT capture zones are generally oval-shaped areas with a radius ranging from 120 to 175 m, centered on the municipal wells. The 25-year TOT capture zone (the maximum extent of the WHPA) for the Cochrane municipal wells extends up to 3600 m in the southeast direction along the axis of the Lower Sand and Gravel Aquifer. This capture zone extends approximately 1000 to 1600 m in an east-west direction, generally limited by the extents of the Lower Sand and Gravel Aquifer.

Based on historical pumping and water level records compared with an estimate of the amount of recharge to the water supply aquifer, the Cochrane municipal wells pump approximately 30% of the available water. This suggests that an increase in water demand with future population increases should not cause a groundwater mining problem due to increased extraction rates.

Based on 1998 to 2007 monthly and annual pumping summaries, the current average annual pumping rate for the Cochrane municipal water supply wells is 4000 m<sup>3</sup>/day which is 51% of permitted capacity. Divided evenly between all three wells, this equates to an average daily pumping rate of 1333 m<sup>3</sup>/day.

All three Cochrane municipal wells are equipped with submersible pumps capable of delivering flows of 45.3 L/s (3,914 m<sup>3</sup>/day) at a total dynamic head of 32.3 m. The combined pump capacity of these three wells is 11,741 m<sup>3</sup>/day, however the current PTTW (No. 02-P-6030) restricts the combined rate of extraction from Wells 6 and 7 to not exceed 3,928 m<sup>3</sup>/day. The permitted rate for Well 5 is also equal to 3,928 m<sup>3</sup>/day, therefore the combined permitted operating capacity of these three wells is 7,856 m<sup>3</sup>/day.

The Town of Cochrane is capable of storing up to 4800 m<sup>3</sup> of treated water which is divided into two locations. An in-ground reservoir located at the water treatment plant has an operating storage capacity of 2100 m<sup>3</sup> and an elevated storage tank with an operating storage capacity of 2700 m<sup>3</sup> is located on the far side of the water distribution grid.

### **Raw Water Characteristics**

The chemistry of the water makes it highly suitable as a source for drinking water with all parameters well below the Ontario Drinking Water Quality Standards. The wells at the Cochrane Water Treatment plant produce hard raw water averaging around 350-380 mg/L. By adding lime to soften the water the hardness averages 100-140 mg/L. Iron and manganese are also present in the raw water but not in a sufficient quantity to warrant filtration. The water temperature is relatively constant because of the depth and structure of the aquifer. The turbidity is low and the pH is considered normal for groundwater systems.

The raw water consistently tests negative for total coliform and E. coli bacteria, confirming that the water is not under the influence of surface water.

	Temperature	pH	Turbidity	Hardness
<b>Average</b>	9.6 °C	7.3	0.19	355
<b>Range</b>	7.0° to 11.5 ° °C	7.0 to 7.6	0.07 to 0.3	310 to 400

Data collected over the last 15 years indicates that the water sources are stable and consistent in terms of both quality and quantity. The Cochrane Water Treatment Plant is the user taking water from the same aquifer as the wells. There have been no challenges encountered and none are anticipated.

#### **Cochrane Water Treatment Plant**

The Cochrane Water Treatment Plant is located adjacent to the supply wells (with Spring Lake in between the two facilities). The original Water Treatment Plant was constructed in 1947 on the west side of Spring Lake. Due to poor sub-surface conditions, the structure of concrete foundations, masonry walls and wooden roof was subjected to some large settlements, shortly after construction was completed. This required remedial action on the WTP throughout the past 45 years.

Several deficiencies of this WTP led to the decision for construction of a new water treatment facility:

- A. Limited plant capacity of 5000 m<sup>3</sup>/day.
- B. The iron removal/softening step of the water treatment process is eliminated for approximately 2 days during the required annual maintenance of the single solids contact clarifier.
- C. Aging equipment, no back up.
- D. Sub-standard chemical feed facilities.
- E. Poor conditions of the building structure resulting in energy inefficiency and poor aesthetic values of the facility.
- F. Direct discharge of the sludge from the solids contact clarifier and the backwash water from the filters, into Spring Lake.
- G. No SCADA

The new Water Treatment Plant was constructed in 1994 and commissioned in 1995 on the east side of Spring Lake with a cold lime softening facility, unique in using a no-moving parts clarifier for the lime softening process. The water system supplies a connected population of approximately 5,000. Approximately 2100 m<sup>3</sup> of storage is provided at the water treatment plant, and 2700 m<sup>3</sup> of storage is provided in an elevated tank on the south-east side of town. The water system is operated by the Town of Cochrane.

All three wells are located on the west side of Spring Lake. Each of the wells # 5, 6 & 7 is drilled to a depth of 45-50 m and equipped with a submersible well water pump with a rated capacity of 45.3 L/s. All 3 wells are submersible pumps, and each flow is individually metered. One well is used at a time, while the second and third well is used as a stand-by. The three wells are used on a rotation. there is one raw water main that runs to the water treatment plant building.

Pre-chlorination is applied to the raw water as it enters the water treatment plant. The water is then routed to a 'head tank'. This tank serves three functions. First, it allows dissolved gas (such as carbon dioxide) to vent to the atmosphere. Second, it provides a constant head for the well pumps, and for the clarifiers. The head tank can be bypassed for service, if necessary.

Lime slurry is injected just before the raw water enters the clarifiers. The clarifiers are of the "Claricone" type, which have an inverted conical shape. Rapid mixing is provided in the lower portion of the clarifiers. Mixing gradually decreases as the flow moves in a spiral direction up through a sludge blanket, and eventually over a peripheral weir. One clarifier is online at a time. There are flow meters at the entrance of both clarifiers to monitor flow into the clarifiers. In the clarifiers, the pH of the water is increased by the lime, and calcium carbonate, iron and manganese precipitate into a settle able sludge. The sludge is periodically blown down into the sludge dewatering/holding lagoons.

The water from the clarifier is collected and directed into a re-carbonation tank. In this tank, carbon dioxide is added through fine bubble diffusers at the bottom of the tank, and the pH is lowered to halt the precipitation process. An online pH meter monitors the pH level in the re-carbonation tank. Re-carbonated water is then filtered through two dual media gravity filters, where remaining particles are removed. Once water is filtered it is stored in the reservoir until supply is needed in the distribution system or the elevated tank. An online analyzer monitors the chlorine level in the reservoir and alarms when it is either lower or higher than the set points. The high lift pumps are used to pump the water to its destination. Secondary chlorination (post chlorination) is added to the water as it leaves the plant by the high lift pumps to maintain chlorine in the distribution system. An online chlorine analyzer at the tower monitors the chlorine level in the elevated tank.

The SCADA system monitors and records the flow, turbidity, water levels and chlorine levels prior to the entry to the distribution system. It's equipped with an uninterrupted power supply (UPS) and is programmed to alarm when set points are either low or high. The plant is also equipped with a standby diesel generator and fuel tank. The SCADA system monitors the incoming power supply and will start the generator and trip the transfer switch if the loss of grid power is detected.

### **Water Distribution**

Three high lift pumps are used to pump the water into the distribution system, one running and two standby. These high lift pumps are located at the Cochrane Water Treatment Plant. It is at this point that post chlorination is performed in order to maintain specific chlorine residuals in the distribution system as we the *Ontario Drinking Water Standards*. A minimum free chlorine residual in the distribution system shall be maintained at not less than 0.20 mg/L and not more than 4.0 mg/L.

On the eastern side of town stands a 2,700 cubic meter elevated storage tank, which provides gravity flow to the distribution system. This storage is used to supply water during peak demand times during the day and to supply very high flow rates, such as fighting fires. The system has a fully automatic control and alarm system that is backed up by an emergency generator (with a 24 hour fuel supply) in the event of a power failure.

The Town of Cochrane’s distribution system consists of 42,100 meters of water main ranging in size from 100 mm to 400 mm, and composed of cast iron, ductile iron or PVS pipe. This water main distribution system was generally constructed during the years 1912, 1924, 1953, 1963, 1982, 1994, 2000, 2002, 2007, 2009, 2010, 2011, 2012, 2013, 2018, 2021. The distribution system approximately includes 196 fire hydrants. Distribution system pressure is provided by the elevated tanks and the high lift pumps at the Cochrane Water Treatment Plant facility.

There is backflow prevention valves located on major industries within the system. Backflow preventions were added over the last 8 years purely as a preventative measure. The backflow prevention equipment is included in the regular maintenance/inspection program. Inspection of backflow equipment will be conducted every 5 years commencing in 2012, and backflow preventers will be changed out every 15 years. The change out program will commence in 2025. See by-law.

The pressure entering the distribution system typically varies from 80 to 102 psi, and is capable of maintaining pressure in the distribution system on average between 60 to 80 psi at all locations under peak flow conditions. During fire flows, system pressure may drop to 40 psi.

The Town of Cochrane implemented the numbering and colour coding of our hydrants in 2011. Hydrants are color coded in accordance with NFPA 291 article 6.6.6.1. “Hydrants shall be colour-coded in accordance with NFPA 291, ‘Fire flow testing and Marking of Hydrants’ Using the Hazen-Williams formula we were able to determine the colour-coding of the hydrants.

Hazen-Williams formula is as follows:	$Q_r + Q_f \times \frac{h_r^{0.54}}{h_f^{0.54}}$
<ul style="list-style-type: none"><li>• <b>Q<sub>f</sub> is observed flow in IGPM</b></li><li>• <b>h<sub>r</sub> is the drop in psi from the static pressure to the desired residual baseline(20psi)</b></li><li>• <b>h<sub>f</sub> is the drop in psi from static pressure to the residual pressure that was measured during the earlier test.</b></li></ul>	

Also as per Subsection 6.6.5.8: “A record of the hydrant operation, as described in article 6.6.5.7, shall be kept in conformance with article 1.1.2.1” Records must confirm yearly inspection, and that the hydrant was located where expected and was found operable. Yearly inspection must establish that the hydrant is supplied by water. During our yearly inspection we conduct flow testing and flushing of the hydrants. A record of this information is kept at the Water & Wastewater Office

A diagram of the distribution system is presented below in Figure 1.

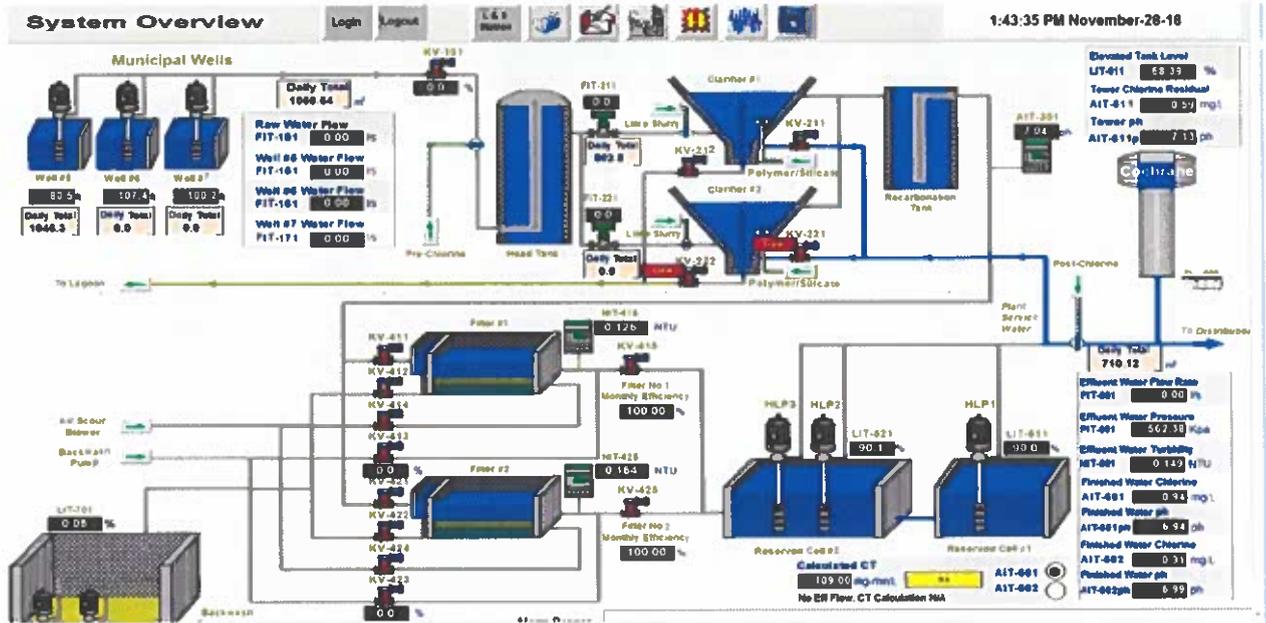


Figure 1 – System Overview/WTP

## 7. Risk Assessment

The Risk Assessment process shall:

- a.) Considers potential hazardous events and associated hazards, as identified in the Ministry of Environment and Climate Change document titled Potential Hazardous Events for Municipal Residential Drinking Water Systems, dated February 2017 as it may be amended.
- b.) Identify potential hazardous events and associated hazards. ( listed section 17 of this plan)
- c.) Asses the Risks associated with the occurrence of hazardous events. ( listed in Appendix A of this Plan)
- d.) Rank the hazardous events according the associated risk ( listed in Appendix A of this Plan)
- e.) Identify control measures to address the potential hazards and hazardous events. ( Listed in Appendix A under the column "Associated Procedures")
- f.) Identify critical control points ( Listed in Appendix A of this Plan)
- g.) Identify a method to verify at least once a year, the currency of the information and validity of the assumptions used in the risk assessment. (Table Top mock emergency conducted annually and documented through minutes of our annual Staff Review)
- h.) Ensure that a risk assessment is conducted at least once every thirty-six months.
- i.) Consider the reliability and redundancy of equipment.

**\*\*\*Risk Assessment/Hazardous Event Table in Appendix A\*\*\***

Location	Capture Zone	Activity of Concern	Monitoring/Mitigation
Rock Shield 4 Boisvert Cres.	10 Year	Wood Manufacturing	Sentinel Well 3A/3B
ONR	10 Year	Railway Yards	Sentinel Well 3A/3B
STP	2 Year	Overflow to Spring lake	Sentinel Wells 4
WTP	2 Year	Storage of Chemicals	Sentinel Wells 4
ONR Railway	10 Year	Waste Generator	Monitoring Well (in place)
Meridian Fuels	10 Year	Gas Station	Monitoring Well (in place)
Golf Course	50 day/2 Year	Pesticides	Sentinel Well 1 and 2 /By-Law

## 8. Risk Assessment Outcomes

The Operating Authority, , ORO, and DWQMS Representative along with any volunteer Water Treatment Plant Operators, shall form a Risk Assessment Team to identify: the potential hazards and hazardous events which could affect the water system; the control measures to address the hazards; the Critical Control Points and control limits; and the associated methods of monitoring critical limits and responding to deviations.

As the first step of the Risk Assessment, the Risk Assessment Team shall review hazards and hazardous events associated with the Distribution System. The monitoring, control measures and emergency procedures or contingency plans which are available are identified. The risks associated with the hazards and hazardous events will then be assessed by the team on the basis of likelihood, severity and detectability, based on the tables below. The reliability and redundancy of equipment is considered when assigning ratings to the hazard and hazardous events.

The rating for the likelihood, severity and detectability is then added to give an overall level of risk for each hazard or hazardous event. All hazards or hazardous events which have an overall risk rating of greater than 9 are considered critical and are associated with a critical control point. The identified risks are documented in Appendix A of this plan and the procedures are stored on Intalex in the SOG folder.

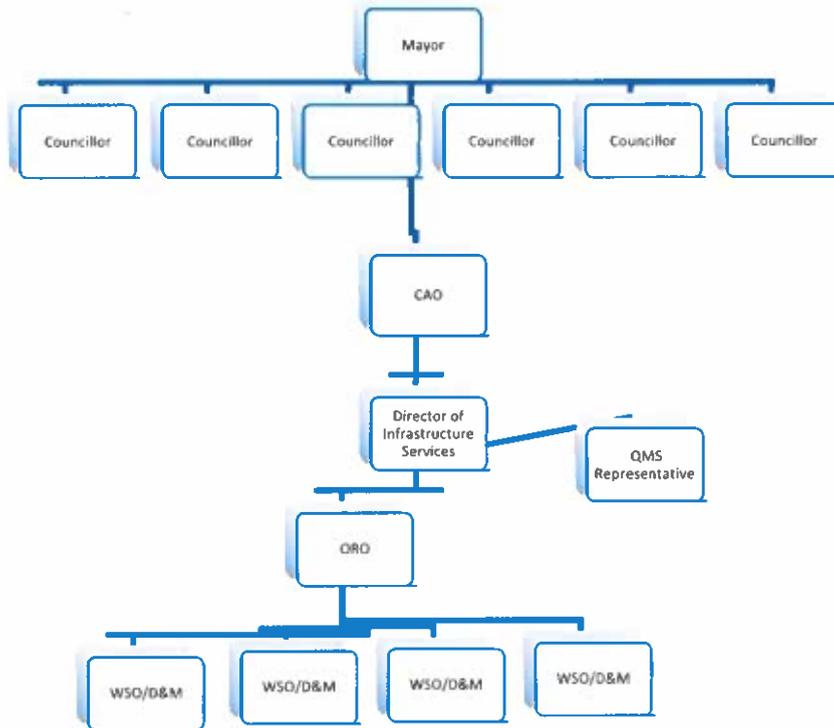
Every year, the QMS Rep will review the risk assessment and ensure that the information and assumptions remain current and valid. Every 3 years the QMS Rep will assemble the Risk Assessment Team to conduct a new risk assessment.

**Ranking Table used for conducting the Risk Assessment**

<i>Description</i>	<b>Likelihood of Hazardous Event Occurring</b>	<i>Rating</i>
Rare	May occur in exceptional circumstances, and has not occurred in past	1
Unlikely	Could occur at some time, historically has occurred less than once every 5-10 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
Very Likely	One or more occurrences on a monthly or more frequent basis	5
<i>Description</i>	<b>Severity of Hazardous Event Occurring</b>	<i>Rating</i>
Insignificant	Insignificant impact, little public exposure, little or no health risk	1
Minor	Limited public exposure, minor health risk	2
Moderate	Minor public exposure, minor health risk	3
Major	Large population at risk	4
Catastrophic	Major impact for large population, complete failure of systems	5
<i>Description</i>	<b>Detectability of Hazardous Event</b>	<i>Rating</i>
Very Detectable	Easy to detect, visual	1
Moderately Detectable	Fairly easy to detect	2
Normally Detectable	Visually detectable but not on rounds or regular basis	3
Poorly Detectable	Visually detectable but not inspected on a regular basis	4
Undetectable	Cannot detect	5

## 9. Organizational Structure, Roles, Responsibilities and Authorities

### 9.1 Organizational Structure



### 9.2 Mayor, Council and CAO (Owners)

The Mayor and Council have the overall responsibility and authority to ensure that the Town of Cochrane waterworks meet all legislation and regulatory requirements. They further have the responsibility and authority to allocate the necessary resources for the safe operation of the works based upon the recommendations from the department.

### 9.3 Director of Infrastructure Services (Operating Authority)

The Director of Infrastructure Services has the responsibility and authority to:

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- Establish staff requirements
- Ensure that the operators and QMS Representative perform their responsibilities
- Maintain good public relations
- Ensure continuous good water quality through fine performance of the facility
- Ensuring that processes needed for the QMS are established, implemented and maintained
- Reporting to the Town Council on the performance of the QMS and any needs for improvement
- Ensuring that the most current versions of documents required by the QMS are being used at all times.
- Ensuring that personnel are aware of all current regulatory requirements that pertain to their duties within the operation of the drinking water system
- Ensuring the promotion of awareness and effectiveness of the QMS throughout the operating authority

#### **9.4 Asset/Compliance Coordinator**

The role of the Asset/Compliance Coordinator is to ensure that the Town of Cochrane and its employees (including the Mayor and Council) comply with the Drinking Water Act and regulations made there under. He or She functions as an objective body that reviews and evaluates compliance issues/concerns within the Town of Cochrane. The position ensures that the mayor, council, management and employees are in compliance with the rules and regulations and that the town's policies and procedures are being followed. The Asset/Compliance Coordinator, together with the ORO and Director of Infrastructure Services is authorized to implement all necessary actions to ensure achievement of the objectives of an effective compliance program.

- Develops, initiates, maintains, and revises policies and procedures for the general operation of the Compliance Program and its related activities to prevent illegal, unethical, or improper conduct. Manages day-to-day operation of the Program.
- Collaborates with other departments (e.g., Risk Management, Internal Audit, Employee Services, etc.) to direct compliance issues to appropriate existing channels for investigation and resolution.
- Responds to alleged violations of rules, regulations, policies and procedures by evaluating or recommending the initiation of investigative procedures. Develops and oversees a system for uniform handling of such violations.
- Acts as an independent review and evaluation body to ensure that compliance Issues/concerns within the organization are being appropriately evaluated, investigated and resolved.
- Monitors, and as necessary, coordinates compliance activities of other departments to remain abreast of the status of all compliance activities and to identify trends.
- Identifies potential areas of compliance vulnerability and risk; develops/implements corrective action plans for resolution of problematic issues, and provides general guidance on how to avoid or deal with similar situations in the future.
- Provides reports on a regular basis, and as directed or requested, to keep management informed of the operation and progress of compliance efforts.
- Monitors the performance of the Compliance Program and relates activities on a continuing basis, taking appropriate steps to improve its effectiveness.
- Notify management of unresolved compliance issues and situations involving potential hazards or violations.
- Develop and distribute Regulatory Fact Sheets.
- Conduct Quarterly Reviews/audits to ensure the Operational plan is being followed.
- Ensure that complete set of records are kept and maintained.
- Assign plant personnel.

- Direct the operations of the waterworks
- Aid and assist in establishing policies relating to the operation of the works and its employees and contractors
- Provide input to the development of operating budgets
  - Maintain the documentation regarding the infrastructure of the department
  - Provide input to the development of operating budgets
  - Itemize problem areas (i.e. sewer flushing, hydrant flushing)
  - Compile inspection logs
  - Assist in the development and revision of policies and procedures for the general operation
  - Assist in conducting Quarterly Reviews/audits to ensure the Operational plan is being followed.
  - Keep accurate records
  - Ensure appropriate personal training and certification is maintained
  - Maintain adequate records including documentation to substantiate compliance
  - Oversee operator training programs
  - Maintain plant operating procedures
  - Ensure compliance with environmental regulations
  - Maintain efficient plant operation and maintenance
  - Maintain good working conditions
  - Maintain good public relations

#### **9.6 Overall Responsible Operator (ORO)**

The ORO has the responsibility and authority to:

- Make recommendations to the Director
- Communicate infrastructure and resource requirements to the Director and provide input to as required.
- Ensure compliance with environmental regulations
- Maintain efficient plant operation and maintenance
- Maintain good working conditions
- Maintain good public relations
- Oversee work tasks.

#### **9.7 Water System Operators / Distribution & Maintenance**

The Water System Operator is responsible for monitoring and maintaining processed water quality and the maintenance of treatment. The Water Systems Operator shall comply with all relevant legislation and regulations, and undertake activities at the request of the ORO. Responsibilities of Water System Operators are:

- Know and follow all proper operational procedures and requirements
- Maintaining a safe working environment – being safety conscious at all times
- Keep ORO informed of issues
- Keep accurate records

- Ensure appropriate training is up to date and certification/licenses' is current
- Keep the plant in good working order
- Keep distribution system in good working order
- Ensure compliance with environmental regulations
- Maintain efficient plant operation and maintenance
- Maintain good working conditions
- Maintain good public relations

The Water Distribution Maintenance Crew is responsible for the maintenance of the distribution system, including valves, hydrants and flushing. The Water Distribution Maintenance Crew shall comply with all relevant legislation and regulations as well as the duty to undertake activities at the request of the ORO.

### **9.8 Satisfying Competencies**

The Town of Cochrane may administer certain tests, conduct interviews, verify references and/or request specific documentation as part of the hiring process in order to verify skills, experience and knowledge.

In order to meet the ongoing changes to technology, software, the requirements of O. Reg 128/04 and Water Department processes, the ORO and the Water System Operators shall receive training as required by O. Reg 128/04, as a minimum. The training may be provided on or off site by qualified employees or contracted subject matter experts. Training effectiveness is evaluated when appropriate through testing, or a demonstration of knowledge gained.

Training records are maintained by each individual.

## 10 Competencies

### 10.1 Competency Requirements Table

<b>Role</b>	<b>Required Competencies</b>	<b>Desired Competencies</b>
Mayor, Council and CAO	Awareness and Knowledge of DWQMS requirements Standard of Care Training	
Director of Infrastructure Services	Awareness and Knowledge of DWQMS requirements Supervision Experience/ Training WHMIS Training  MS Work and Excel Knowledge Standard of Care Training	Leadership Training Project Management Training OIT WTP and Distribution
Asset/Compliance Coordinator	WHMIS Training Internal Auditor Training  MS Word and Excel Knowledge Ability to deal firmly but tactfully with the public Ability to prepare clear and concise reports Ability to deal effectively with MOE Officials and others Ability to act as a conduit for information OIT in WD/WT/WWT/WWC with ability to obtain Class I in all 4 Awareness and Knowledge of DWQMS requirements	Leadership training Distribution I Certification WTP Class I Certification Project Management Training DZ Operator's License
ORO	System Overall Responsible Operator WTP Class III Certification Distribution I Certification SCADA Training WHMIS Training Mechanical Aptitude  Awareness and Knowledge of DWQMS requirements	Leadership Training Project Management Training DZ Operator's License
WTP System Operator	WTP Class I Certification Designated OIC SCADA Training WHMIS Training  Awareness and Knowledge of DWQMS requirements	WTP Class III Certification Internal Auditor Training

Distribution Operator	Distribution Class I Certification Class G license Confined Space Training Mechanical Aptitude  Awareness and Knowledge of DWQMS requirements	Distribution Class II Certification DZ Operator's License
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All Water system distribution operators shall, at a minimum, attain and maintain a Class I certification as per O. Reg. 128/04. The Water Treatment ORO shall maintain, at a minimum, Class II certification.

All Water Department Distribution employees shall, at a minimum, maintain a Class I certification as per O.Reg 128/04 and in accordance with the classification of the works. The water distribution ORO shall maintain, at a minimum, a Class II certification. The ORO shall maintain a minimum classification equal to the level of the Water Treatment Plant.

Additionally, annual training is provided to ensure that personnel meet or exceed minimum standards for annual training house and continuing education hours as established in O.Reg 128/04 to maintain operator certification for the operation of the water works. Training effectiveness is evaluated.

## 11 Personal Coverage

This procedure describes the coverage provided for the Town of Cochrane Water Works.

### 11.1 On-site Coverage

The Water Treatment Plant and distribution system is staffed 5days a week, during normal operations for 8 hours a day and on-call as needed.

### 11.2 After-Hours/Stat Holiday Coverage/Emergency

The Water Treatment Plant is monitored by the SCADA system. The SCADA system has an auto-dialer that has been programmed to contact personnel whenever conditions warrant it. The on-call operator is the designated operator in charge and will respond to and investigate all alarms within 45 minutes. An ORO is available when not physically at the system. Alternative ORO's are to be identified in the logbook. The normal on-call schedule starts on the Monday and ends the following Monday. The Director of Infrastructure Services or alternate establishes and maintains the on-call schedule. During Stat Holidays, the scheduled shifts remain the same.

### 11.3 Vacation Coverage

The Director of Infrastructure Services or alternate approves vacation time for employees to ensure that they have the required man power while employees are absent.

## 12 Communications

The QMS Representative shall ensure the owner (Mayor and Council) and Operating Authority (top Management) are provided with a current copy of the Operational Plan. The QMS Representative shall keep the owner and operating authority informed of any changes to the QMS, the adequacy of infrastructure requirements, the outcome of on-going activities as a result of Management Review and other QMS issues, through regular annual meetings. Minutes of these meetings will be maintained by the QMS Representative and filed at the Water & Wastewater Office.

Personnel will be informed of the QMS and any changes or updates to it through annual staff meetings with the QMS Representative. A current version of the Operational Plan is available for review by staff at the Water & Wastewater Office

Essential suppliers shall receive information regarding the QMS annually by the QMS Representative.

Consumers are informed of the QMS and any significant changes by newsletters, flyers/handouts, newspaper ads and through the Town of Cochrane's Water & Wastewater website that are approved by the QMS Representative.

The QMS policy is posted at the Water & Wastewater Office and at the municipal office. It can also be viewed on the Town of Cochrane's website.

## 13 Essential Supplies & Services

This procedure identifies the supplies and services deemed essential to the delivery of safe drinking water and how to ensure the quality of essential supplies and services that can affect water quality.

All process chemicals must meet applicable AWWA and ANSI standards. Proof of chemical product must be provided to the operator upon delivery, prior to unloading by way of a packing slip, or SDS label. All testing conducted at laboratories must be conducted at laboratories that are accredited to conduct the tests.

The following products and services are deemed to be essential to the delivery of safe drinking water:

### WATER PLANT SUPPLIERS & CONTRACTORS

Product/Service	Primary Source
CO <sub>2</sub> and CO <sub>2</sub> Servicing	<b>Air Liquide</b> 1739 Riverside Dr. Timmins, Ontario P4R 1N1 Ph. [705-267-1158] Fax [705-267-3088]
Chlorine	<b>Brenntag Canada Inc.</b> 43 Jutland Rd. Etobicoke, Ontario M8Z 2G6 Ph. [1-800-268-0358] Fax [1-416-233-7706]

Laboratory Testing Chemicals	<p>Reliable Industrial Supply Ltd. 50 Mumford road Lively, Ontario P3Y 1L2 Ph. [1-705-692-2959] Fax [1-705-692-2961]</p>
Laboratory Testing Chemicals	<p>Cleartech Industries Inc. 1500 Quebec Avenue Saskatoon, Saskatchewan S7K 1V7 Ph.[1-800-387-7503]</p>
Lime	<p>Carmeuse Lime Box 190 Ingersoll, Ontario N5C 3K5 Ph. [519-423-6283] Fax [519-423-6135] Email: <a href="mailto:salesinfo@carmeusena.com">salesinfo@carmeusena.com</a></p>
Sodium Silicate	<p>Reliable Industrial LTD 50 Mumford Rd. Lively, ON P3Y 1L2 Ph. (1-705-692-2959) Fax (1-705-692-2961)</p>
Sodium Bicarbonate	<p>Reliable Industrial LTD 50 Mumford Rd. Lively, ON P3Y 1L2 Ph. (1-705-692-2959) Fax (1-705-692-2961)</p>
Water Sample Testing	<p>Testmark Laboratories 100 Wilson Avenue Timmins Ontario, P4N 2S9 Ph. [705-531-1121] Fax [705-531-1125] Email: <a href="mailto:timmins@testmark.ca">timmins@testmark.ca</a></p>
SCADA & PLC Support	<p>NLS Engineering 442 Millen Road, Unit 113 Hamilton, Ontario, L8E 6H2 Office: 800.369.0213 Fax: 905.581.0199 24/7 Support: 905.581.1712 Email: <a href="mailto:scauduro@nlsengineering.com">scauduro@nlsengineering.com</a></p>
SCADA & PLC Support	<p>Steve Hache/Internal IT support Cochrane Telecom Services 143 6<sup>th</sup> Ave Cochrane, Ontario P0L 1C0 705-272-4232 Email: <a href="mailto:it@cochranetel.ca">it@cochranetel.ca</a></p>

<b>Laboratory Testing Chemicals</b>	<b>Hach</b> <b>P.O. Box 389</b> <b>Loveland, Colorado</b> <b>80539-0389</b> <b>Ph. [1-800-387-7503]</b> <b>Fax [970-461-3939]</b>
<b>Valves &amp; Fittings</b>	<b>Wamco Waterworks</b> <b>1771 Old Falconbridge Rd.</b> <b>Sudbury, Ontario P3A 4R7</b> <b>Ph. [705-525-5000]</b> <b>Fax [705-525-5050]</b>
<b>Automated Valves/Valve Calibration</b>	<b>Rotork Controls (Canada) Ltd.</b> <b>838 Upper Canada Dr. Unit #3</b> <b>Sarnia, Ontario N7W 1A4</b> <b>Ph. [519-337-9190]</b> <b>Fax [519-337-0017]</b>
<b>Pump Parts</b>	<b>Metcon Sales &amp; Engineering Ltd.</b> <b>3-15 Connie Cres.</b> <b>Concord, Ontario L4K 1L3</b> <b>Ph. [905-738-2355]</b> <b>Fax [905-738-5520]</b> <b>Email: <a href="mailto:metcon@metconeng.com">metcon@metconeng.com</a></b>
<b>Calibration &amp; Supply</b>	<b>Ontario Clean Water Agency</b> <b>50 Comfort Street</b> <b>Kirkland Lake Ontario, P2N 3B3</b> <b>Ph. [705-567-3955]</b> <b>Email: <a href="mailto:kshorrock@ocwa.com">kshorrock@ocwa.com</a></b>
<b>Electrical Calibration</b>	<b>Accel Electric</b> <b>31 Boisvert Crescent</b> <b>Cochrane, Ontario P0L 1C0</b> <b>Ph. [705-272-2145]</b> <b>Cell [705-272-8767]</b>
<b>Electrician</b>	<b>Northeast Electric Inc</b> <b>Cochrane On, P0L 1C0</b> <b>705-272-3775</b>
<b>Delivery Service</b>	<b>Manitoulin Transport</b> <b>HWY 655</b> <b>North Timmins, Ontario</b> <b>P4N 7W7</b> <b>Ph. [1-800-461-1225]</b> <b>Fax [705-268-5031]</b>
<b>Delivery Service (Lime)</b>	<b>Laidlaw Transit Ltd</b> <b>1111 International Blvd Suite 700</b> <b>Burlington, Ontario</b> <b>L7L 6W1</b> <b>Ph. [1-800-465-8265]</b>
<b>Delivery Service (Sample)</b>	<b>Gold Heart Courier Services</b> <b>558 Cedar Street</b> <b>Timmins Ontario, P4N 2J5</b> <b>705-360-3327</b>

<b>Plumber</b>	<b>GPB Plumbing &amp; Heating</b> 144 4 <sup>th</sup> Street Cochrane, Ontario P0L 1C0 Ph. [705-272-4111] Cell [705-272-9221]
<b>Plumber</b>	<b>Gerry's Enterprise</b> 84 Railway St Cochrane, Ontario P0L 1C0 Ph. 705-272-5975 After hours. 705-272-4328
<b>Excavation Services</b>	<b>Digalot</b> P.O. Box 1438 Cochrane Ontario, P0L 1C0 Ph. [705-272-9586]
<b>Fuel</b>	<b>Meridian Fuels Inc.</b> 10 Highway 11 South Cochrane Ontario P0L 1C0 705-272-5215
<b>Heating</b>	<b>Reliable Home Heating and Cooling</b> Cochrane Ontario P0L 1C0 705-272-9061
<b>Plumbing</b>	<b>Pro pipe Construction</b> 1280 LaForest Rd. Timmins Ontario P4P 7C7 705-264-6014
<b>Construction</b>	<b>Villeneuve</b> 109 HWY 11 Cochrane Ontario, P0L 1C0 705-272-4201
<b>Well Maintenance</b>	<b>Lotowater Technical Services</b> 92 Scott Avenue Paris Ontario N3L 3R1 1-800-923-6923
<b>Well Maintenance</b>	<b>International Water Supply</b> 342 Bayview Drive Barrie Ontario, L4M 4T5 705-733-0111

- Instrumentation parts kits, per the manufacturer's recommendations, are maintained at each facility.
- A minimum seven-day supply of chemicals is maintained at all times.

The OIC is responsible for the maintenance of chemical and instrumentation parts inventories.

## 14 Review and Provision of Infrastructure

The water infrastructure for the Town of Cochrane consists of a water plant, a water distribution system, and a water tower. The distribution system is relatively dated and sections are in need of replacements/repairs.

The need for infrastructure renewal is reviewed on an annual basis and is prioritized and acted on accordingly. The need for new infrastructure and infrastructure renewal will be an agenda item for the annual Management Review.

The adequacy of infrastructure to operate and maintain the DS may be assessed based on Water Dept. staff suggestions, water quality trends and consumer complaints. The Director of Infrastructure Services will communicate to the owner, during the annual Management Review meetings, the infrastructure deemed necessary to operate and maintain the Town of Cochrane DS.

An annual review of the Town of Cochrane's infrastructure needs is conducted by the Director of Infrastructure Services, ORO, Asset/Compliance Coordinator and Municipal Engineering Technologist where recommendations for maintenance, rehabilitation and renewal programs are considered. Recommendations may be as a result of improvements to be made to the drinking water system as identified in risk assessment outcomes which may include input from Operations staff and review of maintenance programs. These programs are implemented in conjunction with input from the Director of Corporate Services and then presented to the Owner for approval. Details of the ten-year forecast can be viewed in the Capital Budget and the Asset Management Plan can be viewed on the citywide program.

## **15 Infrastructure Maintenance, Rehabilitation and Renewal**

The following routine planned maintenance is conducted on the Town of Cochrane distribution system: annual valve inspection/exercising, annual hydrant flushing, annual hydrant inspection/flagging, winterizing and annual pressure testing. All records are maintained and kept in their appropriate binders at the Water & Wastewater Dept. office. All planned maintenance is scheduled and communicated to staff by the Director of Infrastructure Services or alternate

Water main or other equipment replacement is conducted on an as-needed basis. Unplanned maintenance is conducted as required. All unplanned maintenance activities are authorized by the Director of Infrastructure Services or alternate All records are retained at the Infrastructure office.

Once per year, the Asset/Compliance Coordinator prepares a summary of the infrastructure maintenance, rehabilitation, renewal programs and long-term forecast. The Director specifically look at unplanned maintenance work to determine if additional planned maintenance or infrastructure replacement is required. The summaries will be communicated to the owner during the yearly Management Review meeting.

## **16 Sampling, Testing and Monitoring**

This procedure describes the sampling and monitoring activities for the Town of Cochrane Water Works. All sampling is in accordance with O. Reg. 170/03.

### **16.1 Sampling and Testing**

#### **On-Site Sampling**

The date, time, location and results of all in-house samples are recorded on the corresponding Test Sheet. Each sample location has a tap in the lab room indicating its sample location. All samples are taken at least once a day.

Daily Water Analysis for Ground Water Treatment

Raw Water	Drop Box	Recarb	Treated
Hardness	Hardness	Total Chlorine	Free Chlorine
pH	pH	pH	Total Chlorine
Iron			Hardness
Turbidity			pH
Color			Iron
Temperature			Turbidity
			Color
			Temperature

*\*Drop Box Sample – in between cones before entering the recarb.*

*\*Recarb Sample – right after recarbonation tank, before entering the filters.*

Depth are continuously monitored by the SCADA. Daily (Monday to Friday) the operator records the reading on the well depth sheet.

**Accredited Lab**

Weekly samples are taken in the distribution system, the wells and at the Water Treatment Plant for analysis. The chlorine residual is recorded for all treated and distribution water samples.

Sample Type	Source	Frequency
Total Coliforms	Wells (5, 6 and 7), Treated Water (the plant), and in the distribution	Weekly
E.Coli	Wells (5, 6 and 7), Treated Water (the plant), and in the distribution	Weekly
Heterotrophic Plate Count(HPC)	Treated Water (the plant), and in the distribution	Weekly
HAA	Treated Water (the plant), and in the distribution	Quarterly
Nitrate	Treated Water at the plant	Quarterly
Nitrite	Treated Water at the plant	Quarterly
Total Trihalomethanes	Distribution	Quarterly
Chloroform	Distribution	Quarterly
Bromodichloromethane	Distribution	Quarterly
Dibromochloromethane	Distribution	Quarterly
Bromoform	Distribution	Quarterly
Toluene –d8 (Surr.)	Distribution	Quarterly
Lead(on reduced program effective 2010)	Distribution	Bi-annually every 3 year period effective 2010
Alkalinity & pH	Distribution	Bi-Annually
Antimony	Treated Water at the plant	Every 36 Months

Arsenic	Treated Water at the plant	Every 36 Months
Barium	Treated Water at the plant	Every 36 Months
Boron	Treated Water at the plant	Every 36 Months
Cadmium	Treated Water at the plant	Every 36 Months
Chromium	Treated Water at the plant	Every 36 Months
Mercury	Treated Water at the plant	Every 36 Months
Selenium	Treated Water at the plant	Every 36 Months
Uranium	Treated Water at the plant	Every 36 Months
Organics	Treated Water at the plant	Every 36 Months
Sodium	Treated Water at the plant	Every 57 Months
Fluoride	Treated Water at the plant	Every 57 Months

### SCADA Continuous Sampling

The following samples are continuously sampled with online meters.

Sample Type	Source	Device
Flow Rate	Coming in the plant	Mimic Panel
Depth	Reservoir	Mimic Panel
Pressure	Leaving the plant	Mimic Panel
Flow Rate	Leaving the plant	Mimic Panel
Depth	Elevated Tank	Mimic Panel
Raw Flow	Amount of water coming in from wells	Flotec Flow meters
Treated Flow	Amount of water leaving the plant	Flotec Flow meters
Free Chlorine Residual	Leaving the plant	Pre Cl <sub>2</sub> Analyzer
Turbidity	Treated water leaving the plant	Hach Turbidimeters
Turbidity	pH	Hach Turbidimeters

A summary of the sampling and testing results are summarized in the Annual Report. A copy of the Annual Report is provided to council.

## 16.2 Monitoring

### SCADA

The SCADA system is programmed to monitor process parameters and/or water characteristics in several locations including raw water and treated water flow.

- Well levels, pumps, flow meters, analyzer, feed pumps and pressure are all monitored by SCADA. Please refer to the SCADA manual for detailed information
- The operator may adjust processes affecting water quality based upon the information and data provided by SCADA
- Any adjustments made to process parameters shall be recorded in the Daily Logbook

- Chlorine residuals are monitored leaving the plant
- All parameters are trended by the SCADA system
- Continuous monitoring equipment must be reviewed every 72 hours.

**Visual**

- The operator shall conduct a visual inspection (“Round”) of the treatment facility a minimum of once daily (Monday-Friday) when the plant is running. A visual walk around/inspection of the plant should be done at the beginning and the end of every shift to make sure everything is functioning in the normal condition.
- Results shall be recorded in the Daily Rounds log sheet
- Equipment and building conditions, if showing signs of deterioration, shall be noted in the daily logbook and reported to the ORO.

**Sampling/Monitoring Parameters**

Sampling or Monitoring Parameter	Location	Quality Target	Response	Challenging Conditions	Records
pH	Treated Water	Low 6.5	Turn down CO <sub>2</sub>		Record in log book
pH	Treated Water	High 7.9	Check Lime, Make sure CO <sub>2</sub> working - Turn up CO <sub>2</sub> if everything is working properly		Record in log book
pH	Drop Box Sample	High 10.50	Increase Lime Feed Rate	Not getting any lime	Record in log book
pH	Drop Box Sample	Low 8.5	Investigate Lime issue		Record in log book
Hardness	Drop Box	Below 80	Slow down lime auger		Record in log book
Hardness	Drop Box	High 175	Make sure lime is feeding, pumps are working, increase lime auger		Record in log book
Turbidity	All locations	Higher than 0.2	Clean meter, if still high call appropriate personnel	Could be dirt in the meter	Record in log book
Chlorine	Treated water	Below 0.60	Make sure it is feeding if everything looks fine	Something could be in the	Record in log book

			increase feed rate	system using more chlorine	
Chlorine	Treated water	High 1.80	Turn down chlorine feed rate		Record in log book
Chlorine	Analyzer leaving the plant	Low alarm 0.40	Check analyzer for air, take a sample if higher, calibrate the analyzer to appropriate reading, if low take sample from treated (may need to increase chlorine	Something could be in the system using more chlorine or air could be in the analyzer.	Record in log book
Pressure	Leaving the plant	Low	Check pump, call appropriate personnel		Record in log book
Pressure	Leaving the plant	High	Check pump, call appropriate personnel		Record in log book
Depth	Reservoir	Low	Turn on plant/ check reservoir		Record in log book
Depth	Reservoir	High	Turn off plant/ check reservoir, call appropriate personnel		Record in log book
Depth	Elevated Tank	Low	Turn on highlift/ check settings on computer		Record in log book
Depth	Elevated Tank	High	Turn off highlift/ check		Record in log book

			setting on computer		
Water Flow	Leaving the plant	Low	Check highlift/ check setting on computer		Record in log book
Water Flow	Entering the distribution System	High	Check highlift/ check setting on computer		Record in log book
Flow Rate	Entering the plant	Low	Check valve/ check settings		
Flow Rate	Leaving the plant	High	Check valve/ check settings		

### 16.3 Calibration and Maintenance

Sampling, Testing or Monitoring Parameter	Equipment	Method	Frequency
pH	pH Meter	pH meter manual located in the lab	Daily
pH	Online pH Meter	Contractor	Annually
Chlorine Residual Leaving the Plant	Chlorine Analyzer	Instructions printed beside the analyzer. Contractor comes annually to calibrate.	Tested daily to check its accuracy, when off within 0.10 it is calibrated
Distribution Chlorine Residual	Pocket Chlorimeter	Contractor	Annually
Entering the plant and leaving the plants (raw water and treated water)	Flow Meter	Contractor	Annually
Flow Meters (wells)	Flow Meters	Contractor	Annually
Flow Meters (cones)	Flow Meters	Contractor	Annually
DR	Spectrophotometers	Contractor	Annually
Turbidity	Online	Contractor	Annually
Turbidity	Handheld Turbidimeter	Contractor	Annually
Treated Water Pressure	Pressure Relief Valve	Contractor	Annually
Lime Level Indicator	Level Gauge	Contractor	Annually

CO2 Level Indicator	Level Gauge	Contractor	Annually
Reservoir Level Indicator	Level Gauge	Contractor	Annually

## 17 Measurement and Recording Equipment Calibration and Maintenance

The chlorine/pH analyzers, flow meters, turbidity meters, laboratory testing equipment and pocket colorimeter are calibrated by contractors according to the manufacturers' procedure annually. All calibrations are recorded and uploaded onto InteleX. A hard copy can be found at the Infrastructure Service Office.

Contractors used for performing calibrations are listed on the Essential Supplier & Services list.

## 18 Emergency Management

This procedure provides the steps taken to respond to a major emergency involving the water works.

A quick summary of potential emergencies are provided in this Operational Plan. The Emergency Procedures for these potential emergencies can be found in the Operational Procedures Manual on InteleX. Records of responses to emergencies shall be maintained in the plant log book as required by O. Reg. 128/04.

All new staff is required to review this operational plan and the Operational Procedures Manual. An employee training acknowledgement sheet will document that the transfer of information. Any changes to the emergency plans will be communicated with staff during meetings, as required. Meeting minutes will record the transfer of information. Once a year and prior to the Management Review, the procedures should be reviewed and signed off.

Testing of emergency situations will be done annually. One event will be selected each year and a mock emergency will be conducted, unless an actual incident should occur.

The Emergency Procedures is to be consulted with any Emergency that occurs. Attached is also the Town of Cochrane's Emergency Plan Appendix B in case we need to reference key contacts.

### 18.1 Potential Emergencies

Potential Emergencies	
Description of Emergency	Potential Outcome
Chemical spill in wellhead capture zone	Health risk, contamination of source water, contamination of environment, service disruption
Biological contamination of source water due to raw sewage bypass	Health risk, contamination of treated water or environment, service health risk
Drought	Water restrictions, inability to meet demand, service disruption, health risk
Construction accident in the distribution system	Loss of system pressure and water supply to area, service disruption, health risk
Fire/Evacuation/Explosion	Health risk, contamination of source water, contamination of treated water, contamination of

	environment, loss or damage to infrastructure, service disruption, employee injury
Loss of essential supplier/chemical shortage	Health risk, service disruption
Power outage	Health risk, inability to maintain system pressure and water supply, service disruption
SCADA failure	Health risk, service disruption
Pandemic	Unavailability of staff for system maintenance and operations, service disruption
Security breach/vandalism/act of terrorism	Health risk, contamination of treated water, loss or damage to infrastructure, service disruption , employee injury
Severe storm/earthquake/tornado/flood lighting strike	Health risk, contamination of source water, contamination of treated water, contamination of environment, loss or damage to infrastructure, service disruption, employee injury.
Adverse Water Quality (raw)	Health risk
Adverse Water Quality (treated/distribution)	Health risk, service disruption, boil water advisory.

### 18.2 Emergency Responsibilities

The following is the chain of command for emergencies that is in place at the Cochrane Water Treatment Plant.

Name and Title	Responsibilities During Emergency
ORO	Owner representative during the emergency, chief liaison between the operating authority and the mayor and council. Authorization of resource requests with input from council. Coordination of activities by municipal personnel.
Director of Infrastructure Services	Overall management and decision making for the water system on behalf of the owner and operating authority. The lead for managing the emergency, providing information to government agencies, the public and the news media.
/QMS Rep	Liaison between the operating authority and the mayor and council. Authorization of resource requests with input from council. Providing information to government agencies, the public and the news media.
Water System Operators/ Distribution	In charge of performing response and recovery activities, including sampling, system operations, inspections and maintenance. Performs duties on behalf of the owner and operating authority.

### 18.3 Emergency Contacts

The emergency contact number sheet can be found at the Water Treatment Plant Office on the peg board and on Intellex.

## 19 Internal Audits

Internal audits are conducted to ensure that the QMS conforms to the requirements of the Town of Cochrane Operational Plan and the DWQMS. These requirements include the ensuring that the QMS has been effectively implemented and properly maintained.

The Town of Cochrane may, from time to time, request that internal audits be conducted by trained auditors from a neighboring municipality. In turn, the Town of Cochrane may provide the same to other municipalities as the case arises.

### 19.1 Audits Conducted by the Town of Cochrane

#### Auditor

All auditors must have successfully completed a recognized 16-hour Internal Auditor workshop.

#### Internal Audit Schedule

Internal audits are scheduled throughout the year for each element. The assigned auditors name also appears on the schedule. The audit schedule is developed and published by the end of the year for the upcoming fiscal year by the Asset/Compliance Coordinator. Each element of the standard is audited at least once during the fiscal year.

#### Audit Planning

The auditor shall review all related QMS documentation and the results from the last internal and external audits prior to the audit. The auditor shall develop or obtain an audit checklist at least one week prior to the audit, which includes all of the requirements of the DWQMS.

#### Conducting the Audit

The auditor shall observe activities, review records and interview personnel as necessary to ensure that the status of the audited element of the QMS has been effectively covered.

#### Reporting the Results

The auditor shall submit a report to the ORO, & Director of Infrastructure Services. The report shall include any requirement for corrective actions to address gaps between the DWQMS and how the QMS is written and implemented. Audit reports are uploaded on Intelex . CAR and OFI are monitored on the audit module on Intelex. Corrective actions shall be communicated to the responsible individual and included as part of the Management Review input.

### 19.2 Audits Conducted by another Municipality

#### Auditors

Outside auditors must provide proof of competency prior to conducting an audit.

#### Audit Schedule

Audits are to be conducted as per the Town of Cochrane schedule.

## **Planning and Conducting the Audit and Reporting the Results**

Audits may be planned and conducted per the procedures of the auditing municipality. Prior approval by the ORO, QMS Representative and Director of Infrastructure Services is required. Audits results may be reported as per the procedures of the auditing municipality as long as the results are documented. Requirements for corrective action must be indicated.

## **20 Management Review**

This procedure defines the Management Review process to ensure the continuing suitability, adequacy and effectiveness of the QMS.

### **20.1 Review Frequency**

Management Reviews shall be conducted on an annual basis prior to completion of the annual budget process.

### **20.2 Review Participants**

The management review is convened by the Operating Authority in conjunction with Top Management. Attendees shall include the Director of Infrastructure Services, QMS Representative, ORO and CAO. Invitees may include the Water Operators.

### **20.3 Review Input**

The Director of Infrastructure Services and QMS Representative shall provide information and data concerning the following categories, for the review:

- Incidents or regulatory non-compliance
- Incidents of adverse drinking water tests
- Deviations from identified critical control limits and actions taken
- The efficacy of the risk assessment process
- Results of internal and 3<sup>rd</sup> party audits
- Results of relevant emergency response testing
- Operational performance and water quality trends
- Follow-up action items from previous management reviews
- Status of action items (if any) identified between management reviews
- Change in resource requirements, infrastructure, process, personnel, DWQMS or regulations that could affect the QMS
- Consumer feedback
- Any resources needed to maintain the QMS
- The results of the infrastructure review
- A summary of the effectiveness of the Maintenance, Rehabilitation and Renewal Program
- Operational Plan currency, content and updates
- Staff suggestions

#### 20.4 Review Process

- The Management Review shall be a planned event. A minimum of 2 hours shall be set aside by the participants to ensure a thorough review of the QMS is conducted.
- Each input category shall be reviewed in order to identify if, where and when improvements to the QMS and its procedures are required.
- The QMS Representatives shall make note of any changes or action items required during the course of the review.

#### 20.5 Review Output

- A list of changes required to be made to procedures or other QMS based documentation.
- A list of 'action' items. All action items shall identify an individual responsible and a timeline to implement the action item.
- Recommendation(s) for any human or financial resources needed for maintenance of improvement of the QMS.
- Minutes of management review shall be maintained by the QMS Representative. These minutes shall include the date and time of the review activity and the name of participants and attendees. The minutes will be provided to council during the next council meeting.

## 21 Continual Improvement

2.1 Element 21 of the DWQMS requires the Operating Authority to strive to continually improve the effectiveness of its QMS through the use of corrective actions. The Town of Cochrane is committed to continually improving its drinking water QMS. Several methods of improvement are embedded in and essential to the system:

- Management Review
- Internal Audits
- External Audits
- Document Review
- Document Change Requests

Corrective actions are generated through audits and management reviews. The department's web-based Intellex (Intellex) application stores, communicates, and tracks progress on corrective actions.

2.2 The Continual Improvement Procedure is used to define how continual improvement of the Quality Management System is tracked and measured and includes:

- a. Reviewing and considering applicable best management practices, including those published by the Ministry of the Environment and Climate Change, at least once every thirty-six months;
- b. Document a process for identification and management of Quality Management corrective actions; and
- c. Documenting a process for identifying and implementing preventive actions to eliminate the cause of potential non-conformities in the Quality Management System.

Review of Corrective Actions and Opportunities for Improvement are done at the annual staff review to continually improve the QMS. During the staff review we will set achievement goals and review each year to ensure they are met. These will be recorded in the minutes and documented on a spreadsheet for continual improvement.