CITY OF WEYBURN
WATER TREATMENT PLANT
ENGINEERING DEPARTMENT

WATERWORKS
QUALITY ASSURANCE/QUALITY CONTROL POLICY

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POLICY STATEMENT:

The City management is committed to managing all aspects of public water system effectively to provide safe and aesthetically appealing water that tastes good and is free from objectionable colour or odour. It is our policy that the drinking water we provide will be produced in accordance with and meet or exceed the drinking water quality standards and objectives prescribed in the *Water Regulations, 2002*.

Purpose of Document

Quality assurance/quality control measures for a water treatment utility are a set of activities that are to be undertaken to ensure compliance and above all, ensure that the water is safe for public consumption in a sustainable manner. Quality control management system refers to organization, planning, data collection, quality control, documentation, and technical activities to ensure production of accurate and reliable results which helps to enhance the credibility of the City of Weyburn's water treatment plant.

This QA/QC policy is required as of permit #00002571-04-00, section 3.4

Rationale for adopting QA/QC Measures

The City of Weyburn is responsible for providing high quality drinking water to consumers which refers to aesthetically appealing water, free of both pathogens and chemical contaminants that have been known to cause undesirable health effects upon the affected individuals. The City of Weyburn operates a surface water treatment plant, which requires, as a condition to operate, that there be a quality control/quality assurance written policy in place that is acceptable to the regulator. Additionally, the regulations require that records be reviewed by the permittee, which may be the administrator or designate on the municipal council on a monthly basis, and that any problems or upsets be reported to Saskatchewan Environment.
Adoption of QA/QC measures will provide a high level of assurance/confidence to the regulator and consumer that the treatment system is in place to produce safe and high quality drinking water. The following additional benefits are achieved by implementing a QA/QC policy;

- Health protection by providing safe water to the consumer
- Well maintained treatment and distribution system
- Identification of potential hazards through risk assessment
- To identify area of responsibility
- Reduction of health care cost
- To Increase involvement of stakeholders and public
- To Increase environmental protection
- To continually improve the performance of water works
- To provide comprehensive strategy to manage the quality of drinking water

Municipal Drinking water policy

The City of Weyburn operates a public water system to provide safe drinking water to residents and businesses. Supplying good quality water is essential to the continued growth, prosperity and well being of our valued citizens. The city staff is committed to managing all aspects of our water system effectively to provide safe and aesthetically appealing water that tastes good and is free from objectionable colour or odour.

The City strictly follows Guidelines for Canadian Drinking Water Quality to meet or exceed the quality of treated water as per Federal and provincial standards.
Our Goals are;

- Continuous cooperation and communication with Ministry of Environment to protect our water source from contamination
- Identification and assessment of any potential risk associated with water quality
- Regular maintenance to our water system, storage reservoir and distribution system
- Ensure adequate funds are available for water system to maintain and upgrade the infrastructure, implement best practices and educate water system employees by providing adequate training courses to get certification
- Establish regular verification of the quality of drinking water provided to our citizen and monitor our process that produces the water
- Effective, timely reporting of water quality to our citizens to provide awareness of our water system
- Develop contingency plans and incident response capabilities in cooperation with health authorities
- Actively participate in research and develop activities to ensure continued understanding of drinking water quality issues and performance
- Actively review water quality guidelines, development and review process
- Regular assessment of our performance and continuous improvement of our practice to produce safe and pleasant water
- Continuous improvement of water quality standards by effective process control and monitoring program
- Freedom of access to our quality standards and process record

Clean, safe and secure drinking water is our responsibility. All City water works employees are responsible for maintaining/exceeding Canadian quality guidelines or provincial standards to improve the Drinking Water Quality Management System.

Operations and maintenance protocols

Community:	City of Weyburn
Population:	10,484

Water Demand	4,000 LPM (Average Demand)
Peak Demand:	10,000 LPM
Source of supply	Surface water (Nickel Lake)
Raw water storage	No
Main Reservoir	1968/ 1MG
First Ave	1968/0.5MG
Any Expansion	yes, 2014-2015
Reservoirs clean out	5years
Treatment Capacity	8 million Liters/day

Processes/Operation

1-Pretreatment

Potassium per magnet KMnO4 is added as oxidant. The dosage range is 2.00-4.5mg/L depends on Mn and organic compounds content in raw water. KMnO4 is fed automatically. Activated Carbon is added in holding tank prior to clarifier process.

2-Coagulation &Flocculation

Aluminum Sulfate is used as primary coagulant. The Average dosage is 200mg/L fed automatically with manual feed Control, Kemira 1986. Polymer is added to enhance Coagulation process.

3-Sedimentation

Water plant has two trains of treatment. Plant 100 treatment capacity is 3 million liters/day. Plant 200 treatment capacity is 5 million liters/day. Both solid Contact clarifiers are circular and carbon steel material. Coagulated water retains in clarifier 1-1.5 hr, hydrated lime or Sodium hydro oxide solution is added for P H adjustment, the sludge or impurities settle at the bottom of clarifier which is removed through automatic blow off valve.

4-Filtration

There are seven automatic dual media gravity filters, of which three operate with plant 100 and four with plant 200.The filters at plant 100 are loaded with dual media that consists of 760-770mm depth of sand and anthracite. The filtration rate for plant 100 is 13.11m/hr and plant 200 is 17.9 m/hr. Under drain for plant 100 is 10 years old whereas plant 200 under drain was replaced in December 2011. Each

filter of plant 100 and 200 is back washed on the basis of turbidity of filtering water or head loss due to accumulation of fine particles on the surface of media.

5-Disinfection

New chlorination feed system has been installed. Chlorine gas is injected after filtration to keep free chlorine 2mg /L in our reservoir all the time for 2.5 log removal of bacteria.

6-Fluoridation

Automatic Fluoride system feeds dosage of liquid fluodilicic acid to keep the fluoride level as per Canadian drinking guidelines and provincial standards.

7-Storage Reservoir

Weyburn water plant has two Reservoirs, one main reservoir of 1MG for distribution system and 0.5MG for chlorine boosting. Total capacity is 1.5MG. Both reservoirs were cleaned in March 2012.

8-Electrical System

Water plant has diesel drive to generate power for complete operation of the system, it starts whenever there is power outage

14- Operational personnel

Two Level 3 certified and two operators in training operators are currently employed.

Water Quality Monitoring, Data Collection, Record Keeping, Record Review and Reporting Procedures

1-Water Quality Monitoring

The City of Weyburn conducts all monitoring standards required by its Permit to Operate Works issued by Water Security Agency. The Environmental Project Officer (EPO) responsible for regulation of the waterworks will be advised of any positive bacteriological sample result as well as any sample which exceeds water quality standards as determined through sampling and analysis for other substances as required by permit. All required drinking water quality monitoring samples, other than on site samples for chlorine residual and turbidity will be sent to and analyzed by an accredited Laboratory.

The City of Weyburn conducts daily lab tests of free and total chlorine, p H, Turbidity and Fluoride of drinking water entering the distribution system. Saskatchewan Environment's EPO, will be advised of any failure to meet a free-chlorine residual of at least 0.1 mg/L for water entering the distribution system. Weyburn water plant has online data collection system which collects data of all turbidity meters, free chlorine and flow entering and leaving water plant.

The City of Weyburn conducts daily tests of turbidity, p H, free chlorine of water entering water plant, clarifier, filters and water entering the distribution system for aesthetic purposes. DR 5000 Spectrometer and 2100N instruments are used to measured the standards of water. Samples which may exceed 1 NTU will be reported to Saskatchewan Environment immediately to EPO.

2-Operational Monitoring

Operational monitoring of water quality and associated reporting requirements will be established for the City of Weyburn waterworks.

Waterworks Monitoring Schedule

Parameter	Sampling locations	Frequency	Remarks
Bacteriological	Assiniboia park school	3 Samples every week	Repeat samples will be collected when rotien samples indicate positive results.Repeat samples will confirm the presence or absence of total coliform,overgrowth or E.coli bacteria
	Queen Elizabeth Schoo		
	Firemaster		
	Sud City Bath		
	Subway		
	MNP place		Repeat samples will be collected when results of repeat samples indicate positive results. Special samples will be used to determine the extent of contamination within a distribution system and to check if remedial actions have resolved the water quality problems
	St.Michael's school		
	Haig School		
	Esso gas station		
	Canalta Inn		
	Lj's Convenience store		
	Souris School		
Turbidity	Water plant	Continuous data monitoring	Continuous monitoring turbidity of filter, reservoir and distribution system
Chlorine Residual	Water entering distribution	Continuous	Minimum 0.1mg/l free OR Minimum 0.5mg/l total chlorine
Fluoride	Water plant and distribution system	Two times daily from water plant and once in week from distribution system	MAC 1.5 mg/l
Chemical General	Water plant	Once every 3 months	General chemistry should meet or exceed the standards set as of Canadian drinking water guidelines
Chemical Health	Water plant	Once every year	Should meet minimum toxicity limits or exceed the standards set as of Canadian drinking water guidelines
Pesticides	Water plant	Once every 2 years	Should meet minimum toxicity limits or exceed the standards set as of Canadian drinking water guidelines
Trihalomethane	Distribution system	Two samples every quart	MAC 0. 1 mg/l
Halo acetic Acids	Distribution system	One sample every quarte	MAC 0.08 mg/l
Cyanide & Mercury	Water plant	Once every year	Cyanide MAC 0.2mg/l,Mercury MAC 0.001mg/l
Organic	Water plant	Once every two years	should meet or exceed the standards set as of Canadian drinking water guidelines
Microcystin R	Water plant	Once every two years	should meet or exceed the standards set as of Canadian drinking water guidelines
Lead	Distribution system	Once in year	Volunteer sampling

ABBREVIATIONS

MAC- Maximum Acceptable Concentration
Mg/l-Milligram per liter

Permit Limits

Chlorine Residual (a) Free Chlorine residual of

1- Not less than 0.4 mg/l in the water entering the distribution system between May 1st and October 31st.
2- Not less than 1.0 mg/l in the water entering the distribution system between November 1st and April 30th.

(b) A total chlorine residual of not less than 0.5mg/l or free a free chlorine residual not less than 0.1mg/l in the water throughout the distribution system.

Bacteriological

a) Total coliform levels of Zero organisms detectable per 100 mm.
b) Fecal coliform or Escherichia coli levels of Zero organisms detectable per 100 mm
c) Background bacteria levels on a total coliform or fecal coliform membrane filtration plate of less than 200 organisms per 100 mm or no overgrowth.

Turbidity

a) If the monthly average of daily source water turbidity is greater than or equal to1.5NTU the water turbidity levels from each filter shall not exceed 0.3 NTU at least 95% of the time for each calendar month.
b) If the monthly average of daily source water turbidity is greater than or equal to 1.5 NTU the water turbidity levels from each filter shall not exceed 0.3 NTU for more than 12 consecutive hours.
c) If the monthly average of daily source water turbidity is less than 1.5 NTU the water turbidity levels from each filter shall not exceed 0.2 NTU at least 95% of the time for each calendar month.
d) If the monthly average of daily source water turbidity is less than 1.5 NTU the water turbidity levels from each filter shall not exceed 0.2 NTU for more than 12 consecutive hours.
e) The water turbidity levels from each filter shall not exceed 1.0 NTU at any time.

Chemical-Health Category

MAC (Maximum Acceptable Concentration)-Parameter cannot exceed this value.
Guideline- parameter should not exceed this value in order to maintain water quality.

Parameter	MAC mg/l	Guideline mg/l
Aluminum		0.1
Arsenic	0.01	
Barium	1	
Boron	5	
Cadmium	0.005	
Chromium	0.05	
Copper		1
Fluoride	1.5	
Iron		0.3
Lead	0.01	
Manganese		0.05
Nitrate	45	
Selenium	0.01	
Uranium	0.2	
Zinc		5

Chemical-Disinfection By-product

Trihalomethane MAC based on annual average of samples.
Halo acetic Acids Guideline based on running annual average of quarterly samples

Parameter	MAC mg/l	Guidelines mg/l
Trihalomethane	0.1	
Halo acetic acids		0.8

Chemical-Pesticides

Parameter	MAC mg/l	IMAC mg/l	Guidelines mg/l
Atrazine		0.005	
Bromoxynil		0.005	
Carbofuran	0.09		
Chlorpyrifos	0.09		
Dicamba	0.12		
Dichlorprop	No MAC,IMAC or Guideline at time of permit issuance		
Diclofop-methyl	0.009		
Dimethoate		0.02	
Ethalfluralin	No MAC,IMAC or Guideline at time of permit issuance		
Glyphosate			0.28
Malathion	0.19		
MCPA			0.1
Pentachlorophenol	0.06		
Picloram		0.19	
Triallate	No MAC,IMAC or Guideline at time of permit issuance		
2,4-D		0.1	
Trifluralin		0.045	

Chemical-Cyanide & Mercury

Parameter	MAC mg/l
Cyanide	0.2
Mercury	0.001

Chemical-Organics

Parameter	MAC mg/l	IMAC mg/L
Benzene	0.005	
Benzo(a)pyrene	0.00001	
Carbon tetrachloride	0.005	
Dichlorobenzene,1,2	0.2	
Dichlorobenzene,1,4	0.005	
Dichloroethane,1,2		0.005
Dichloroethylene,1,1	0.014	
Dichloromethane	0.05	
Dichlorophenol,2,4	0.9	
Ethylbenzene	0.0024	
Monochlorobenzene	0.08	
Tetrachlorophenol,2,3,4,6	0.1	
Toluene	0.024	
Trichloroethylene	0.05	
Trichlorophenol,2,4,6	0.005	
Vinyl chloride	0.002	
Xylene	0.3	

Chemical-Cyanobacterial Toxins

Parameter	MAC mg/l
Microcystin LR	0.0015

3-Record Keeping

Waterworks records and logs will be kept in accordance with the requirements of *The Water Regulations, 2002*. The Superintendent of water plant has responsibility for operational record and log keeping. Operational records and logs will include:

- Total raw water pumped and treated water pumped into the distribution system on a daily, monthly and annually basis;
- Locations from which samples for any tests conducted by waterworks operators taken in accordance with the City's permit and the name of the operator who conducted the sampling or testing and the results of those tests;
- Any departures from normal operating procedures that may have occurred and the time and date that they occurred;
- Any instructions that were given during operation of the waterworks to depart from normal operating practices and the name of the person who gave the instructions;
- Any upset condition or bypass condition, the time and date of the upset condition or bypass condition and measures taken to notify others and resolve the upset condition or bypass condition;
- Any condition of low disinfectant levels, the time, date and location of occurrence and measures taken to restore disinfectant levels to required values;
- The dates and results of calibrating any metering equipment and testing instruments; and
- The dates and types of maintenance performed on equipment and any actions taken to ensure the normal operations of the waterworks.

The operational records or logs mentioned above will be recorded and maintained in the following manner:

- Operational records or logs must be made in chronological order, with the dates, times and testing locations clearly indicated;
- Entries in an operational record or log will only be made by the WTP operators;
- The WTP operator making an entry in an operational record or log shall do so in a manner that allows the individual to be unambiguously identified as the maker of the entry;
- Operational records or logs must be maintained for at least five years;
- Any anomalies or instances of missing entries in an operational record or log must be accompanied by explanatory notes;
- Operational records or logs must only contain data or information that is actually observed or produced;
- Operational records or logs must not contain default values generated manually or by automated means;
- Operational records or logs maintained in accordance with the above requirements must be made available promptly on request of the Minister of Environment or a representative of the Minister.

4-Record Review and Reporting

The Director of Engineering and the Superintendent of water plant review all monitoring results, records and operational logs on a monthly basis. If the review of the records or logs indicates that the quality of water from the waterworks has been adversely affected, the findings will be reported to EPO of Water security agency as soon as reasonably practical after the report has been completed.

EMERGENCY RESPONSE PLANNING

1. City of Weyburn Water Quality Emergency Response Plan

2. Emergency Notification System

The City of Weyburn's Emergency Notification (Alarm System) will be triggered by the following:

Low pressure
Pump failure
Clarifier process upset
Turbidity of filters
Distribution Turbidity
High or low Chlorine
Power failure
Reservoir level
Raw pump
High flow
PLC failure
Communication failure

If an alarm situation occurs, an automated dialer phones the official of water plants, The operators has ability to see operation parameters on line via SCADA system. Response to any upset or alarm is within 15 minutes which is the shortest spans of time the province.