Annual Waterworks Information

(As required under the *Cities Regulations Part V.1*.)

NAME OF MUNICIPALITY:	City of Yorkton
YEAR:	2019
DATE:	August 28, 2020

WATERWORKS RATE POLICY – *Established by Bylaw No. 20/2006 (repealing Bylaw No. 21/2018)*

Under the water and sewer rates bylaw, the water/sewer consumption rate of $14.10 per 1000 gallons was established. Additionally, a base rate of $11.25/month for residential and $46.12/month for commercial properties is applied. The rate of $7.04 per 1000 gallons of water/sewer consumption is applied on industrial users. A bylaw is passed annually to establish the water and sewer rates of the City.

The water/sewer rates are designed to ensure that total operational revenues for the waterworks utility are greater than expenditures with budgeted surplus being used to plan, save, and invest in infrastructure repair and renewal. The City plans to continue small/moderate increases to the utility rates on an annual basis to ensure that increased operational costs do not degrade from the self-sustainability.

The objectives of the waterworks rates are to provide a self-sustaining water/sewer utility system. The City's goal is to ensure the utility covers all operational costs, but also allows investment in aging infrastructure, without requiring funding from general taxation revenue.

WATERWORKS CAPITAL INVESTMENT STRATEGY

The objectives of this policy are to replace aging water/sewer infrastructure through sustainable rate increases. As well, projects may be considered when there are opportunities to capitalize on available provincial/federal grant funding.

Capital plans are determined based on infrastructure age, condition ratings, maintenance history, required environmental standards and wastewater legislation. Through this analysis, projects are identified and prioritized based on need and financing capabilities.

Sources of funding for capital investments:

- General utility revenues
- Waterworks reserves
- Provincial/Federal grant funding
- External Loans

ANNUAL FINANCIAL OVERVIEW – *For the 2019 Year*

- Total Waterworks Revenues **$8,971,496**
- Total Waterworks Expenditures **$5,772,966**
- Total Debt Payments on Waterworks Infrastructure Loans **$741,000**
- Ratio (Revenues / Expenses + Debt) **1.38**

RESERVES

As of December 31, 2019 - **$8,212,125** is in reserves for water and sewer infrastructure.

- In the 2019 year**, $2,706,472.43** was withdrawn from the utility reserves for capital expenditures.

ATTACHMENTS

- The 2017 Engineering Waterworks Assessments, as required under section 35 of *The Water Regulations, 2002.*
- The 2019 Capital Budget for Waterworks

Respectfully Submitted,

Michael Buchholzer,
Director of Environmental Services

Ashley Stradeski,
Director of Finance

City of Yorkton

City of Yorkton

WATERWORKS SYSTEM ASSESSMENT – Round 3

Draft: December 2016

Final: March 2017

INTEGRATED Engineering

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1. INTRODUCTION

In 1998, the City of Yorkton initiated plans to upgrade and expand the entire water system including the raw water supply, treatment, storage, and distribution system. The work spanned over a period of approximately 15 years and resulted in an updated and expanded water system that will meet the City's projected water demands to the year 2030.

As part of the City's Water System Expansion program, a comprehensive Waterworks System Assessment (WSA) was completed by Associated Engineering (AE). The WSA provided the framework for the development of the Water System Expansion program. The WSA was completed in January 2005 as an interim report and compiled in the Water System Development Plan (WSDP). The WSDP also included the following interim reports: Water System Objectives, Water System Hydraulic Analysis, Water Treatability Review and Water System Options. Refer to: 2005 Water System Development Plan.pdf.

The Queen Street Water Treatment Plant (QSWTP) was officially commissioned in the spring of 2011. The Permit to Operate was issued by the Ministry of Environment (MOE) on April 1, 2011 with an expiration date of April 1, 2014. The Permit to Operate was renewed on April 1, 2014. Refer to: 2014 QSWTP Permit to Operate April 2014 to April 2019.pdf. The permit requires a WSA to be completed by December 31, 2016. Accordingly, the City of Yorkton retained Integrated Engineering Inc. (IEI) to complete a WSA-Round 3 to comply with their Permit to Operate.

2. APPROACH

The assessment of the City's existing waterworks infrastructure was conducted on November 8th and 9th, 2016. The WSA 2014-Round 2 was utilized as the basis for the assessment. In particular, the inspection focused on reviewing the recommendations of 2014 to confirm which deficiencies were corrected, which deficiencies remain to be completed, and to identify any additional deficiencies that were identified during the inspection.

The facilities assessed included all of the operable wells, well pump houses, raw water pipelines, water treatment plant, Hwy 10 reservoir and pumping station, water tower and the distribution system.

The report summarizes the results of the field assessment and presents recommendations for the improvement and/or replacement of the facilities. Conceptual capital cost estimates for the recommended work and infrastructure replacement costs are also presented in this report.

3. POPULATION PROJECTION AND WATER DEMAND

Every year the Saskatchewan Water Security Agency publishes Saskatchewan community water consumption and population data. The data that pertains to the City of Yorkton can be found on the following document: 2015 Water Demand and Population Data.pdf. In general, the City's population and water demands have varied over the past 15 years and can be summarized as follows:

- Population: $16{,}898_{2001}$ to $19{,}588_{2010}$ people;
- Average Day Water Demand: $4{,}878_{2008}$ to $8{,}362_{2015}$ m^3/day;
- Maximum Day Water Demand: $7{,}419_{2008}$ to $12{,}650_{2001}$ m^3/day; and
- Per Capita Demand: 277_{2008} to 439_{2015} L/person-day.

Given the historical population figures, it is reasonable to assume that the population of Yorkton will continue to grow at approximately 1.0% for the foreseeable future. Given the per capita water consumption data, it is also reasonable to assume that the per capita demand will not exceed 450 L/person-day for the foreseeable future. Using these assumptions the following projections are made for the year 2030:

- Population_{2030}: $19{,}588_{2015}$ $(1+0.01)^{15}$ = 22,741 people;
- $\text{Per Capita Demand}_{2030}$: 450 L/person-day;
- $\text{Average Day Water Demand}_{2030}$: 22,741 x 0.450 m^3/person-day = 10,233 m^3/day;
- $\text{Maximum Day Water Demand}_{2030}$: 10,233 m^3/day x $2.0_{\text{peak factor}}$ = 20,467 m^3/day or 237 L/s;
- $\text{Peak Hour Demand}_{2030}$: (10,233 m^3/day x $4.0_{\text{peak factor}}$)/$86.4_{\text{unit conversion factor}}$ = 474 L/s

4. WELLS AND PUMP HOUSES

In 1998, the City of Yorkton retained Beckie Hydrogeologists Ltd. (BHL) to complete an extensive hydrogeological assessment of the aquifers in and around the City of Yorkton. The assessment concluded that there was an abundant supply of groundwater in the area to meet the City's existing and foreseeable future raw water demands.

The following is a summary of work completed to date by BHL for the City of Yorkton:

- 1999 Interim Supplementary Hydrogeologic Assessment.pdf
- 2014 Interim GUDI Report.pdf
- 2000 BHL GWater Field Program and Sturdee Aquifer Prelim Hydro Assessement.pdf
- 2001 BHL GWater Field Program.pdf
- 2002 BHL GWater Field Program.pdf

The following report is available for review by contacting the Saskatchewan Water Security Agency: Aquifer Monitoring Data – Annually submitted to the Saskatchewan Water Security Agency.

The following file is a summary of the wells in the Yorkton area: 2016 Yorkton Wells Summary.pdf

Currently, the City owns and operates 13 production wells within five (5) aquifers located in and around the City of Yorkton. Ten (10) of these production wells are currently in operation and three (3) of the wells are in poor condition but have not yet been decommissioned. These three (3) wells will be decommissioned when they are no longer operable. The ten (10) wells that are currently in operation have the capacity to extract all of the current aquifer allocation. The wells that are to remain operational long term are identified with the aquifer acronym followed by the date of original construction (ie. LW1-2007). The wells that are to be decommissioned when they become inoperable are identified with PW acronym which stands for "Production Well" and followed by the date of construction (ie. PW1A-1966). Refer to: 2014 Aquifer and Well Location Plans.pdf.

As indicated above, BHL has completed all of the hydrogeological work for the City of Yorkton since the late 1990s. Accordingly, BHL has assisted IEI with the completion of this section of the report, including the recommendation for continued GUDI (Groundwater Under Direct Influence of surface water) analysis for wells 11, 12 and 13 as potentially GUDI. Refer to the following interim GUDI report by BHL: 2014 Interim GUDI Report.pdf. Refer to the following reports for the most recent microscopic particulate (MPA) analysis: 2016-09-20_well 13.pdf and 2016-12-8_well 11 & 13 gudi analysis.pdf. **Action By: City of Yorkton.**

The licencing of the wells and aquifer allocation has been on-going for over 15 years. To-date, the City has provided several Approval to Construct and Operate Works applications to the Saskatchewan Water Security Agency (SWSA) for the outstanding water wells. Further, the City has applied for numerous Water Rights Licences for aquifer(s) allocations and to date several of the applications remain outstanding. The SWSA has confirmed that all documentation to evaluate the applications has been received from the City of Yorkton. The following document is a summary of the current aquifer and well allocations held on file by the SWSA: 2016_raw water allocation.pdf. **Action BY: SWSA.**

The following is a summary of the assessment completed on the City's wells and pump houses complete with action items in bold font:

4.1. Production Well 1A–1966 (PW1A-1966):

- Decommissioned in October 2013 under the supervision of BHL.
- The pump house was demolished in 2013.

4.2. PW2A-1959

- Decommissioned in October 2013 under the supervision of BHL.
- The pump house is currently utilized to house the electrical, instrumentation and controls for LW3-2011.

4.3. Logan West 1-2007 (LW1-2007)

- Photos: 2016 LW1 and 2 Photos.pdf
- Operational and in-use.
- Constructed in 2007 under the supervision of BHL.
- Replaced PW1A -1966 which was decommissioned in October 2013.
- Outfitted with a pitless unit.
- Controlled via hard wiring from the QSWTP.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- No deficiencies identified during the field inspection; however, a detailed assessment of this well was not completed since it was constructed after December 5, 2002.
- Maximum Day Pumping Capacity: 11.5 lps.
- Estimated service life: 50+ years.
- Serviced under the direction of BHL in 2016.
- Refer to: 2007 LW1-2007 Record Drawing.pdf

4.4. LW2-2007

- Photos: 2016 LW1 and 2 Photos.pdf
- Operational and in-use.
- Constructed in 2007 under the supervision of BHL.
- Replaced PW1A -1966 which was decommissioned in October 2013. Note that LW1-2007 and LW2-2007 are not operated simultaneously as they are designed as 100% back-up to each other.
- Outfitted with a pitless unit.
- Controlled via hard wiring from the QSWTP.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- No deficiencies identified during the field inspection; however, a detailed assessment of this well was not completed since it was constructed after December 5, 2002.
- Maximum Day Pumping Capacity: 11.5 lps.
- Estimated service life: 50+ years
- Serviced under the direction of BHL in 2016.
- Refer to: 2007 LW2-2007 Record Drawing.pdf.

4.5. LW3-2011

- Photos: 2016 LW3-2011 Photos.pdf
- Operational and in-use.
- Constructed in 2011 under the supervision of BHL.
- Replaced PW2A -1959 which was decommissioned in October 2013.
- Along with LW1-2007 or LW2-2007 in operation, this well can extract the current Logan West aquifer allocation.
- Outfitted with a pitless unit.

- Controlled via radio telemetry from the QSWTP.
- Electrical, instrumentation and controls equipment are housed in an adjacent pump house.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- No deficiencies identified during the field inspection; however, a detailed assessment of this well was not completed since it was constructed after December 5, 2002.
- Maximum Day Pumping Capacity: 30 lps.
- Estimated service life: 50+ years
- Refer to: 2016 LW3-2011 Record Drawing.pdf

4.6. PW4A-1987

- Decommissioned and demolished in 2010 under the supervision of BHL.

4.7. PW5-1952

- Decommissioned under the supervision of BHL in 2016.
- The City plans to demolish the pump house in 2017. **Action By: City Of Yorkton.**

4.8. C6-2000

- Photos: 2016 C6-2000 Photos.pdf
- Operational and in-use.
- Constructed in 2000 under the supervision of BHL.
- Outfitted with a pitless unit.
- New radio telemetry equipment was installed in 2012.
- Electrical, instrumentation and controls equipment are housed in an adjacent pump house.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 22.7 lps.
- The record drawing for the well installation is available for review by contacting BHL.
- The adjacent pump house that houses the electrical, instrumentation and controls equipment is in poor condition. The City currently has another building on-site and plans to construct a new foundation and move the building on the foundation and new pitless unit. **Action by: City Of Yorkton.**

4.9. PW7-1967

- Photos: 2016 PW7-1967 Photos.pdf
- Operational but is limited to stand-by operation only.
- Constructed in 1967.
- New radio telemetry equipment was installed in 2012.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 20 lps.
- This well is not required to extract the current Collacott Aquifer allocation.

- Due to its age and limited pumping capacity, the City plans to decommission the well when it becomes inoperable. **Action By: City Of Yorkton and BHL.**

4.10. LL8-1969

- Photos:2016 LL8-1969 Photos.pdf
- Operational and in-use.
- Constructed in 1969.
- Under the direction of BHL, this well was serviced in November 2009.
- The well head is located within the pump house.
- New radio telemetry equipment was installed in 2012.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 40 lps.
- The pump house and well are currently in average condition.
- The City plans to utilize the well for the foreseeable future.

4.11. LL9-1975

- Photos:2016 LL9-1975 Photos.pdf
- Operational and in-use.
- Constructed in 1975.
- Under the direction of BHL, this well was last serviced in September 2008.
- The well head is located within the pump house.
- New radio telemetry equipment was installed in 2012.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 40 lps.
- The pump house and well are currently in below average condition.
- The City plans to replace the well with a new well, pitless unit complete with submersible pumps and an adjacent pumphouse to house the electrical and controls equipment.
- The record drawing for the well installation is available for review by contacting BHL.

4.12. PW10-1979

- Photos: 2016 PW10-1979 Photos.pdf
- Operational but is limited to emergency stand-by operation only.
- Constructed in 1979
- A magnetic style flow meter was installed after the WSA 2005.
- New radio telemetry equipment was installed in 2012.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 30.3 lps (480.3 usgpm).
- This well is not required to extract the current water allocation for the Logan West Aquifer. It has been replaced by the combination of LW1-2007, LW2-2007 and LW3-2011.

- Serviced under the direction of BHL in 2016.
- Due to its age, the City plans to decommission the well when it becomes inoperable. **Action By: City Of Yorkton and BHL.**

4.13. PW11-1981

- Photos: 2016 PW11-1981 Photos.pdf
- Operational but is limited to emergency stand-by operation only.
- Constructed in 1981
- Under the direction of BHL, this well was serviced in August 2006.
- A magnetic style flow meter was installed after the WSA 2005.
- New radio telemetry equipment was installed in 2012.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 50.0 lps.
- This well is not required to extract the current water allocation for the Logan East Aquifer. It has been replaced by LE14-2001.
- Due to its age, the City plans to decommission the well when it becomes inoperable. **Action By: City Of Yorkton and BHL.**
- If the well is going to be utilized, even if limited to stand-by mode, BHL recommends that annual filter sampling and MPA analyses during the peak spring runoff period become part of the City's regular water sampling program. **Action By: City Of Yorkton and BHL.**

4.14. PW12-1987

- Photos: 2016 PW12-1987 Photos.pdf
- Operational but is limited to emergency stand-by operation only.
- Constructed in 1987.
- A magnetic style flow meter was installed after the WSA 2005.
- Under the direction of BHL, this well was serviced in August 2006.
- New radio telemetry equipment was installed in 2012.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 50.0 lps.
- This well is not required to extract the current water allocation for the Logan East Aquifer. It has been replaced by LE14-2001.
- Due to its age, the City plans to decommission the well when it becomes inoperable. **Action By: City Of Yorkton and BHL.**
- If the well is going to be utilized, even if limited to stand-by mode, BHL recommends that annual filter sampling and MPA analyses during the peak spring runoff period become part of the City's regular water sampling program. **Action By: City Of Yorkton and BHL.**

4.15. C13-1987

- Photos: 2016 C13-1987 Photos.pdf
- Operational and in-use.
- Constructed in 1987.
- The well head is located within the pump house.
- A magnetic style flow meter was installed after the WSA 2005.
- Under the direction of BHL, this well was serviced in 2009.
- The old in-line vertical turbine pump was replaced with a submersible style pumping unit in 2012.
- New electrical, instrumentation and controls equipment was installed in 2012.
- Controlled via radio telemetry from the QSWTP.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 45 lps.
- The record drawing for the well installation is available for review by contacting BHL.
- Pump and motor were replaced in 2016.
- The pump house and well are currently in good condition; however, there is no all-weather road and the pumping station is in a low lying area. Consideration should be given to removing the building from the well head and installing a pitless unit on the well head. The pitless unit and building should be constructed above an engineered flood proof elevation. **Action By: City of Yorkton.**

4.16. LE14-2001

- Photos: 2014 LE14-2001 Photos.pdf. The well site could not be accessed due to road conditions at the time of the inspection; therefore, no current photos could be taken.
- Constructed in 2001 under the supervision of BHL.
- Under the direction of BHL, this well was serviced in September 2013.
- New radio telemetry equipment was installed in 2012.
- Outfitted with a pitless unit.
- Controlled via radio telemetry from the QSWTP.
- Electrical, instrumentation and controls equipment are housed in an adjacent pump house.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 75 lps
- At the time of the site inspection, the well was not accessible.
- This well can extract all of the current Logan East aquifer allocation.
- The City plans to utilize the well for the foreseeable future.
- Refer to: 2003 LE14 and S15 Pump House Record Drawings.pdf.
- The access road to the well site is not an all-weather road. Access to the well is not possible during heavy rainfall and snowfall events. An all-weather road should be constructed to facilitate maintenance. It should be noted that normal operation and monitoring of the well is possible with the use of radio telemetry. **Action by: City of Yorkton**

4.17. S15-2001

- Photos: 2016 S15-2001 Photos.pdf
- Operational and in-use.
- Constructed in 2001 under the supervision of BHL.
- Under the direction of BHL, this well was serviced in September 2013.
- A new submersible pump and motor were installed in May 2014.
- New radio telemetry equipment was installed in 2012.
- Outfitted with a pitless unit.
- Controlled via radio telemetry from the QSWTP.
- Electrical, instrumentation and controls equipment are housed in an adjacent pump house.
- The well is controlled by the QSWTP PLC when in "Auto" mode or by the operator when in "Hand" mode.
- Maximum Day Pumping Capacity: 75 lps.
- The pump house and well are currently in good condition.
- The City plans to utilize the well for the foreseeable future.
- Refer to: 2003 LE14 and S15 Pump House Record Drawings.pdf.

5. RAW WATER PIPELINES

The raw water pipelines were assessed in detail in the WSA 2005. The intent of the following summary is to identify remaining deficiencies identified in 2005, new deficiencies that have surfaced since 2005 and changes that were made to the raw water system as a result of the decommissioning of the three (3) existing water treatment plants and the construction of the new QSWTP. The site plans for the raw water system have been updated and are available at: 2016 Raw Water System Site Plans.pdf

5.1. Collacott

In the mid 2000's, a 300 mm diameter HDPE DR17 raw water main was constructed from C13-1987 to the QSWTP. The pipeline was required to convey water from the Collacott well field to the new QSWTP. There is no available record drawing(s) for this raw water main which should be compiled to assist with operations and maintenance. **Action By: City of Yorkton.**

Previously, the Collacott aquifer water was pumped to and treated at the West Broadway WTP. Therefore, the only section of the old raw main that remains in operation is from PW7-1967 to the C13-1987 HDPE tie-in location. The majority of this 1952 section of raw water main consists of 200 mm diameter asbestos cement small sections of CI also constructed in 1952. Once PW7-1967 becomes inoperable, the old AC section of pipe remaining in operation will be limited to the section of pipe between C6-2000 and C13-1987. This section of pipe is now 62 years old and should be replaced with HDPE or PVC pipe within the next five (5) years. The old pipe no longer required should be abandoned in-place. **Action By: City of Yorkton.**

In the WSA 2005 there was reference to an annual pipeline swabbing program. This should be continued with consideration to implementing a bi-annual swabbing program.

In the WSA 2005, there was reference to installing a cathodic protection system on the old CI pipe. This has not been completed nor should it be completed provided the City proceeds with the replacement of the raw water piping with new HDPE or PVC pipe.

5.2. Leech Lake

The Leech Lake well field consists of wells LL8-1969 and LL9-1975 and provides water to the QSWTP via a 300 mm diameter pipeline. The pipeline was originally constructed in 1969 and consists of steel and cast iron pipe. Within the last 10 years, the majority of the pipe line south of York Lake has been replaced with 300 mm diameter PVC C900, DR 25 pipe to the City limits.

5.3. Logan West

The Logan West raw water pipelines have been replaced with new HDPE piping. LW1-2007 and LW2-2007 supply pipelines were installed in 2008/2009 when the water treatment plant was under construction. LW3-2011 pipeline was installed in the fall of 2012 and commissioned in the spring of 2013. Given the age and material of the pipelines and no reported leaks, these pipelines are considered to be in very good condition.

5.4. Logan East

The Logan East well field currently includes PW11-1981, PW12-1987 and LE14-2001. The raw water pipeline from LE14-2001 to the Hwy 10 Pumping Station consists of a combination of 250 mm and 400 mm diameter, C900/C905 DR25 PVC pipe. This section of pipeline was installed in 2002. The pipeline is in good condition. Refer to: 2002 LE14-2001 Water Supply Main Record Drawings.pdf and 2002 S15-2001 Water Supply Main Record Drawings.pdf.

The pipeline transitions to 500 mm diameter PVC DR32.5 at the Hwy 10 Pumping Station and continues to the QSWTP. This section of pipeline was installed in 2005 and is in good condition. There is no available record drawing(s) for this raw water main which should be compiled to assist with operations and maintenance. **Action By: City of Yorkton.**

5.5. Sturdee

The Sturdee system consists of only S15-2001. The raw water pipeline from the S15-2001 to the LE14-2001 supply line tie-in location consists of 400 mm diameter, C905 DR25 PVC. The pipeline was installed in 2003 and is considered to be in good condition.

6. WATER TREATMENT

In 2003, the City retained AE to complete a Long Term Water System Development Plan to utilize the groundwater resources identified and confirmed by BHL. In summary, the plan recommended the design and construction of a new water treatment facility located adjacent to Queen Street followed by the decommissioning of all three (3) antiquated water treatment plants.

In 2005, AE initiated piloting of the proposed water treatment processes. The pilot program was completed in 2005 and compiled in a *Pilot Testing Report, 2007.* The recommended treatment process consisted of forced draft aeration for oxidation of iron and manganese, detention, chemical oxidation ($KMn0_4$ and/or chlorine) for residual manganese, rapid gravity sand filtration and post filtration disinfection using chlorine. The existing water treatment process used today consists of the recommended process that was established as a result of the piloting program.

Pre-Design work was completed in 2007 and the results were compiled in a report entitled *Queen Street Water Treatment Plant – Pre-Design Report, 2007*. Note: This report is available for viewing in hard copy by contacting the City of Yorkton, Environmental Services Department. The report was used as a basis for detailed design of the following construction contracts:

- 2006 QSWTP Contract 1 - Substructure Contract Documents.pdf
- 2007 QSWTP Contract 2 - Superstructure Contract Documents.pdf
- 2009 QSWTP Contract 3 - Admin Improvements Contract Documents.pdf
- 2009 QSWTP Contract 4 - Process & Bldg Mechanical Contract Documents.pdf
- 2009 QSWTP Contract 5 - Site Grading Contract Documents.pdf
- 2009 QSWTP Contract 6 - Electrical Instrumentation & Controls Contract Documents.pdf
- 2011 QSWTP Contract 7 - Facilities Decommissioning Contract Documents.pdf
- 2011 QSWTP Contract 8 - Roads & Walks Contract Documents.pdf
- 2011 QSWTP Contract 9 - Process Wastewater Treatment System Contract Documents.pdf
- 2011 QSWTP Contract 10 - Water Supply Main Contract Documents.pdf
- 2012 QSWTP LW3 Pipeline Contract Documents.pdf

The QSWTP was officially commissioned in the spring of 2011. The Permit to Operate was issued by the MOE on April 1, 2011 with an expiration date of April 1, 2014. A new Permit to Operate was issued by the SWSA on April 1, 2014 with an expiration date of April 1, 2019 unless cancelled or suspended before that date.

The QSWTP is currently capable of producing 22,000 m^3 of potable water per day. According to the Guide to Water Works Design, published by the SWSA, water treatment facilities should be sized to accommodate the maximum day demand on the water system. The largest maximum day demand that the City has experienced in the last 15 years occurred in 2001 at 12,650 m^3 per day. In 2015, the maximum day demand was 10,014 m^3 per day. The projected maximum day water demand for 2030 is approximately 20,467 m^3 per day. The QSWTP has ample capacity to accommodate future growth for the foreseeable future.

The QSWTP was inspected on Wednesday, November 9th, 2016. The facility is very clean and well maintained. The facility is currently being operated using the same treatment chemicals (potassium permanganate and chlorine) and the same operating logic that was employed during commissioning in 2011. Refer to the following process flow diagram: 2016 Process Flow Diagram.pdf. Refer to the following reservoir pre-design report for the CT calculations: 2005 QS Potable Water Reservoir Pre-Design.pdf

The only two (2) chemicals that are used in the treatment process are chlorine (gas) and potassium permanganate. On average, the chlorine use is in the order of 10 mg/l and considered by NSF as a Typical Use Level (TUL) and is well below the Maximum Use Level (MUL) of 30 mg/l . On average, the potassium permanganate use is in the order of 0.02 mg/l and considered by NSF well below both the Typical Use Level (TUL) of 15 mg/l and Maximum Use Level (MUL) of 50 mg/l. Refer to the following chemical use report for 2016: 2016 WTP Chemical Use.pdf

According to operations staff and verified during the site inspection, the facility has been and is operating very well; no deficiencies were identified on any equipment including the chemical storage and chemical feeders. The reporting and record keeping is automated utilizing a SCADA system (Wonderware Historian) designed and implemented by Stockdales Electric Motor Corporation (SEMC). Minor system improvements have been implemented by SEMC since the WTP was commissioned in 2011.

Refer to the following photos: 2016 WTP Photos.pdf.

Following successful commissioning of the QSWTP in the spring of 2011, the water treatment facilities located at West Broadway, Park Street and the WTP No. 4 were decommissioned. In the summer of 2011, the West Broadway and Park Street water treatment plants were demolished.

In 2012, WTP No. 4 was converted to a potable water pumping station and renamed to Hwy No. 10 Pumping Station. This facility was inspected on November 9th, 2016 and found to be clean and in excellent condition; no deficiencies were identified. There are no chemicals added at this pumping station. Refer to the following photos:2016 Hwy 10 Pumping Station Photos.pdf

The following record information documents have been compiled:

- 2009 QSWTP Contract 1 - Sub Structure Record Drawings.pdf
- 2010 QSWTP Contract 2 - Superstructure Record Drawings.pdf
- 2012 QSWTP Contract 4 - Process & Bldg Mechanical Record Drawings.pdf
- 2012 QSWTP Contract 6 - Electrical Instrumentation & Controls Record Manual.pdf
- 2012 QSWTP Contract 7 - Facilities Decommissioning Record Drawings.pdf
- 2010 QSWTP Combined O & M Manual.Contract 4.Process Bldg & Mechanical.pdf
- 2010 QSWTP Combined O & M Manual.Contract 5.Electrical Instrumentation & Controls.pdf
- 2010 QSWTP APD Manual - Entire (Flash & Floc Mixers).pdf
- 2010 QSWTP Blue I HG-602 water quality analyzer.pdf

- 2010 QSWTP Blue I HG-702 water quality analyzer.pdf
- 2010 QSWTP DR890 Colorimeter.pdf
- 2010 QSWTP DR2800 Spectrometer Hach.pdf
- 2010 QSWTP Hach 1720E turbidity meter.pdf
- 2010 QSWTP Hach 2100N Turbidimeter.pdf
- 2010 QSWTP HQd portable meter.pdf
- 2010 QSWTP IM Electric Actuator-Positioner with 4-20 mA Control Board.pdf
- 2010 QSWTP IM25000AA CL2 Handling Manual.pdf
- 2010 QSWTP IM25100AA V10K Chlorinator Manual.pdf
- 2010 QSWTP IM50130AA Acutec 35.pdf
- 2010 QSWTP IM50510BA 510 Vacuum Regulator.pdf
- 2010 QSWTP IM55116AAUA IssB Vacuum Switch.pdf
- 2010 QSWTP Siemens Aerator O & M Manual.PDF
- 2010 QSWTP Solo G2 Manual - RFS.pdf
- 2010 QSWTP Ton Container Scales (Electronic) Manual.pdf

The water is disinfected utilizing chlorine gas as the primary feedstock and injected both upstream (pre-treatment) and downstream (post treatment) of the treatment process. Chlorine levels are monitored by on-line instrumentation and results are stored on the City's SCADA system

Process wastewater is treated on-site using two (2) sedimentation ponds operating in series. The ponds reduce levels of iron, manganese, arsenic and other oxidized minerals that are concentrated by the water treatment system. Treated effluent is disposed of into a storage pond that utilizes infiltration and evaporation to maintain a safe operating level of the pond.

7. POTABLE WATER STORAGE

The potable water storage system consists of three (3) facilities:

- Queen Street Reservoir: ..... 18,000 m^3
- Hwy 10 Reservoir:..... 6,800 m^3
- Park St. Water Tower: ..... 1,300 m^3

Total ..... 26,000 m^3

According the Guide to Water Works Design, published by the SWSA, potable water storage facilities should be sized to a minimum of 2 times the Average Day Demand. According to the records published by the SWSA, the largest average day demand over the last 15 years occurred in 2015 at approximately 8,362 m^3 per day. The projected average day water demand for 2030 is 10,233 m^3/day. This demand results in a minimum storage requirement of approximately 20,500 m^3 to accommodate the demands project to 2030. Therefore, the potable water storage is more than adequately sized to accommodate future growth.

7.1. Queen Street Reservoir

This reservoir was constructed in 2006. Refer to the following record drawings: 2006 QS Potable Water Reservoir Record Drawings.pdf

The reservoirs were cleaned and inspected in 2014 by City forces. The reservoirs are in excellent condition and there were minimal oxidized minerals on the floor of the reservoirs. The City plans to clean and inspect one reservoir chamber per year.

7.2. Park Street Reservoir

This reservoir was recommended for decommissioning in the WSA 2005. This reservoir was decommissioned in 2011; however, it has not been demolished. The structure is in reasonable condition and may be utilized by the City sometime in the future. Refer to: 2012 QSWTP Contract 7 - Facilities Decommissioning Record Drawings.pdf.

7.3. Water Tower

The City of Yorkton uses a water tower as part of the treated water delivery infrastructure. This tower was constructed and activated during the summer of 1999. The tower is 48 m tall and has a capacity of 1,364 m^3. The last detailed water tower inspection was completed in September of 2000 shortly after commissioning. Refer to: 2000 Water Tower Inspection.pdf. In 2016, Scantron Robotic's inspected the tower using a camera. Based on the video results, Scantron Robotics recommended a detailed cleaning and inspection. It is recommended that the City of Yorkton retain the services of a specialist firm to clean and inspect the water tower base, steel tank and appurtenances'. **Action By: City of Yorkton.**

The following photos have been compiled:

- 2016 Water Tower Photos.pdf

7.4. Hwy 10 Reservoir

The reservoir at the Hwy 10 Pumping Station was constructed in 1981. The underground cast in place reinforced concrete structure has a capacity of 6800 m^3 (1.5 million Igal). It was cleaned and inspected by City forces in 2013. The following observations were made:

The columns are in average to good condition. The columns should be inspected annually in conjunction with the annual reservoir cleaning. **Action By: City of Yorkton.**

The joint sealant was found to be in good condition. The sealant should be inspected annually in conjunction with the annual reservoir cleaning. **Action By: City of Yorkton.**

8. DISTRIBUTION SYSTEM

The diameter of the distribution pipes ranges in diameter from 100 mm to 400 mm. The pipes consist of PVC, asbestos cement, cast iron, and ductile iron pipe. The total length of distribution piping is approximately 116 000 m (116 km). In general, the distribution system is in good condition with the exception of the cast and ductile iron piping. The City is working to removing the old cast iron and ductile iron pipe as budget allows. The estimated service life of the piping ranges from nil (cast and ductile iron) to 100+ years for the recent installations of PVC pipe.

In 2005, the potable water distribution system was modeled for existing and future (2030) steady state conditions. The modelling was performed by AE utilizing EPANet steady state software. The information is summarized in the Water System Interim Hydraulic Analysis – Interim Report and referenced as Scenario 3, representing the Water System Expansion option that was implemented. In summary, all of the recommended pipelines identified in scenario 3 to support the new water treatment plant and minimum distribution system pressures to the year 2030 were implemented. Some of the recommended pipe sizes were increased to accommodate higher than modeled growth in the northwest part of the City (ie. Louis Dryfus Foods and James Richardson International Canola Crushing Facilities).

In 2012 and 2013, IEI completed detailed steady-state hydraulic modelling of the distribution system to determine what, if any, distribution system upgrades are required to meet the future demands identified in the City's Official Community Plan (OCP). The OCP utilized a design horizon year of 2036 with a corresponding population of 36,000 in support of a future north industrial development and proposed upgrades along the Broadway St. corridor. In summary the modelling concluded with the recommended distribution system upgrades to meet the projected 2030 which are:

- Extend the 500 mm diameter PVC distribution main pipe along Hwy 9 from its current east terminus at the Yorkton Tourism Centre north to Broadway St.
- Replace the Broadway St. water main with a 450 mm diameter PVC water main from the extended Hwy 9 (east side) trunk main to the existing Hwy 10 (west) 500 mm diameter trunk main. This would provide the City with a diverse service route should one of the two trunk mains require servicing.
- To meet the fire flow requirements for the proposed North Industrial area, loop the 500 mm diameter water main north along Hwy 9 from Broadway St. to Grain Millers Drive, then west along Grain Millers Drive to Sulley Road then South on Sulley Road to where it would connect to the existing 500 mm diameter trunk main.

Refer to the following reports for the detailed hydraulic analysis: 2013 North Industrial Servicing Plan Report.pdf and 2014 Broadway Street Infrastructure Improvements Draft Prelim Design Report.pdf. Refer to the following record drawings: 2010 North Industrial Water Line Record Drawings.pdf

9. WATER QUALITY ANALYSIS

9.1. Raw Water

Iron and Manganese levels for all of the well data reviewed exceed the SWSA Aesthetic Objectives. However, these constitutes are removed at the QSWTP and thus are not a concern with the potable water quality.

The arsenic level in Well C6-2000 exceeds the Maximum Allowable Concentration (MAC) of 0.025 mg/l. However, arsenic is removed in the water treatment process to achieve finished levels well below 0.025 mg/l.

LW1-2007 uranium level is approximately 25ug/l which is slightly higher than the MAC currently regulated at 0.020 mg/l. Since this well is only operated with other wells and is one of the lowest producing wells, the overall combined raw water uranium level is below the MAC. This is confirmed in the potable water analytical results.

Refer to the following test results:

- 2015-07 Wells 5, 6, 7, 8, 9, 13.pdf
- 2015-08 Wells 3, 10, 11, 12, 15.pdf
- 2016-11 Wells 3, 13 ,15.pdf
- 2016-11 Wells 6, 7, 8, 9.pdf
- 2016-12 Wells 1, 1.pdf

9.2. Potable Water

All water data review was within the SWSA Standards and Objectives. Refer to the following test results:

- 2016-08 WTP Analytical Data.pdf
- 2015-12 Distribution Water Data.pdf
- 2015-07 WTP Water Data.pdf
- 2015-01 Distribtuion Water Data.pdf
- 2016 Current Sampling Requirements.pdf
- 2016 Historical Sampling Requirements.pdf

10. SYSTEM DOCUMENTATION

Operational and maintenance manuals are available and appear to be up-to-date. However, there is minimal record information regarding maintenance work. The City should develop an asset maintenance program to ensure required timely maintenance is performed (ie. pump servicing, generator operation, well rehabilitation, etc.) and record drawings are kept up-to-date (ie. water

main breaks, valve replacement, etc). This would require the use of a dedicated computer; printer and software based tracking system. **Action By: City of Yorkton.**

11. COST ANALYSIS AND ECONOMIC SUSTAINABILITY

Overall, the waterworks system from the wells through to the distribution pumping system is in very good condition. Between 2005 and 2011 the majority of the existing wells, raw water pipelines, water treatment plant, reservoirs and pumping station were either replaced with new infrastructure or upgraded to "like new" condition. The operational team appears to be doing an excellent job. Maintenance has been minimal in the last five (5) years as the majority of the water system was either replaced or upgraded between 2005 and 2011. Neither costs savings nor operational improvements were identified. No current or potential risks to the public health or the environment were identified during the Water system assessment.

Wells range in age from the 1960s to the early 2000s. The raw water lines range in age from the 1950s to the early 2000s. The WTP and adjacent potable water reservoir were constructed new between 2007 and 2010. The booster pumping station was converted from a WTP to a booster station in 2010. The water tower was constructed new in 1999. Given the age of the facilities that were not upgraded or renovated between 2005 and 2011, there are a few items that require decommissioning, upgrading and/or replacement and these items are noted below. In general, the age and condition of the wells and the distribution system should be considered as the “weak link” in the system. The City should focus of upgrading these two (2) sub-systems to avoid future system bottlenecks.

The City's water Utility is a self-funding utility that utilizes a capital reserve account to fund capital projects for water and sewer infrastructure. The Utility is focused on establishing water and sewer rates to allow the Utility to maintain adequate reserves to match depreciation of its assets plus annual operation and maintain costs. Refer to the following water rates used by the utility: 2016 Water Rates.pdf

The following conceptual cost estimates are presented in 2016 dollars. No allowance for estimated year of upgrades or replacement has been made. All values are exclusive of GST.

11.1. Recommended Upgrades (Not Immediate)

The following recommended upgrades are not considered immediate risks. However, these items should be completed within a ten (10) year period.

Item	Description	Cost
1.0	**WELLS & PUMP HOUSES**	
1.1	C6-2000: Replace Existing Pump House	$150,000
1.2	PW7 – 1967: Well Decommissioning	$20,000
1.3	PW10 – 1979: Well Decommissioning	$20,000
1.4	PW11 – 1981: Well Decommissioning	$20,000
1.5	PW12 – 1987: Well Decommissioning	$20,000
1.6	C13 – 1987: New Building & Pitless Unit	$150,000
1.7	C13 – 1987: All Weather Access Road	$50,000
1.8	LE14 – 2001: All Weather Road	$100,000
1.9	Annual Hydrogeological Services 10 years @ $50,000/year	$500,000
	Sub-Total	**$1,030,000**
2.0	**RAW WATER PIPELINES**	
2.1	Collacott System – Update Record Drawings	$10,000
2.2	Collacott System – Replace old AC Line with 200 HDPE/PVC 700 m @ $300/m	$210,000
2.3	Logan East – Compile Record Drawings	$10,000
	Sub-Total	**$230,000**
3.0	**WATER TREATMENT**	**Nil**
4.0	**POTABLE WATER STORAGE**	
4.1	QS Reservoir	Nil
4.2	Hwy 10 Reservoir	Nil
4.3	Water Tower – Complete Inspection	$20,000
	Sub-Total	**$20,000**
5.0	**DISTRIBUTION SYSTEM**	
5.1	Extend 500 mm Dia. PVC main to Broadway St.	$900,000
5.2	Replace Broadway St. main with 400 mm Dia. Main	$5,800,000
	Sub-Total	**$6,700,000**
	TOTAL	**$7,980,000**

11.2. Capital Replacement Cost

The water systems overall life expectance is in the order of 30 to 50 years of age. Based on the current water demands and consumption trends, the system will easily meet to City's 25 year

requirements. The only exception to this statement is the fact that additional ground water wells will have to be developed as existing wells fail and current allocation is used up.

The following table outlines the capital replacement costs of all water infrastructure owned by the City's Water Utility.

Item	Description	Cost
1.1	Wells: 9 ea. @ $250,000	$2,300,000
1.2	Well Pump Houses: 9 ea. @ $300,000	$2,700,000
1.3	Raw Water Pipelines	$44,000,000
1.4	Queen Street Water Treatment	$40,000,000
1.5	Queen Street Potable Water Reservoir	$10,000,000
1.6	Hwy 10 Potable Water Reservoir	$5,000,000
1.7	Hwy 10 Pumping Station	$5,000,000
1.8	Park Street Water Tower	$5,000,000
1.9	Distribution System	$149,000,000
	TOTAL	**$263,000,000**

12. CLOSURE

I, the undersigned, declare that the information contained within this submission is, to the best of my knowledge, complete and accurate and has been prepared in accordance with the standards for this submission as published by the Saskatchewan Water Security Agency.

Respectfully submitted,

Darren Anholt, P.Eng.

2019 & 2020 Capital Budget - Waterworks

			Total Cost	From Reserves	Grants	External Loan Proceeds	Utility Surplus	Capital Budget
2019 Rollovers:								
Waste Water	North Sewer System Upgrades							0
	- Storm Drainage Channel	$	3,751,667	(1,348,559)	(2,403,108)			0
	- Sanitary Sewer Trunk	$	3,491,667	(1,255,101)	(2,236,566)			(0)
	- Bridge Construction (start of long-term drainage project)	$	3,411,667	(1,226,344)	(2,185,323)			0
Waste Water	Sludge Lagoon Repairs	$	73,215				(73,215)	0
Waste Water	WPCP Down Stream Study/Master Plan	$	297,520	(297,520)				0
Water Works	Well 9 & 10 Improvements	$	481,008	(100,000)			(381,008)	0
Water Works	Well #16 - purchase of land	$	100,000	(100,000)				0
2020 Projects Proposed:								
Water Works	Water Pollution Control Plant Expansion Pre-Design Phase II	$	300,000	(300,000)				0
			11,906,744	(4,627,524)	(6,824,997)		(454,223)	0