



# **Water Main Commissioning Technical Document**

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Table of Contents:

- 1. Introduction ..... 3
  - 1.1 General..... 3
  - 1.2 Definitions, Roles, and Responsibilities ..... 3
  - 1.3 Process Overview: Flushing, Testing and Disinfection..... 4
  - 1.4 Prerequisite Requirements..... 5
- 2. Water Main Flushing and Cleaning..... 6
  - 2.1 Preliminary Water Main Flushing and Cleaning ..... 6
- 3. Hydrostatic Leakage/ Pressure Test ..... 8
  - 3.1 Filling, Flushing, Pressure Testing of PVC Water Main ..... 8
  - 3.2 Filling, Flushing, Pressure Testing of HDPE Water Main ..... 9
  - 3.3 Air Testing of Water Mains..... 10
- 4. Water Main Superchlorination/ Disinfecting and dechlorination ..... 11
  - 4.1 Superchlorination of Water Mains ..... 11
  - 4.2 Dechlorination and Final Flushing of Water Mains..... 12
- 5. Bacteriological Testing and Commissioning ..... 13
  - 5.1 Bacteriological Testing..... 13
  - 5.2 Completion of Water Main Commissioning ..... 13
- 6. Monitoring, Documentation and Reporting ..... 14
  - 6.1 Monitoring..... 14
  - 6.2 Documentation ..... 14
  - 6.3 Final Report ..... 14
- Appendix A ..... 15

## 1. Introduction

### 1.1 General

All Developers, Consultants and Contractors shall comply with the following procedures and methodologies for the flushing, testing, and disinfection of any potable water distribution systems or portions thereof, installed within the municipal boundaries of Beaumont. Procedures and methodologies are derived from various water standards and guidelines. These procedures apply to both Private and Commercial sites. A City of Beaumont Representative must be present for all steps throughout the water main commissioning process.

### 1.2 Definitions, Roles, and Responsibilities

**“City”** means the City of Beaumont who is the OWNER of the water distribution system and the final authority as to the acceptability of the work performed, and product delivered by, the Developer.

**“Developer”** means the firm/company/corporation signatory to the Development Agreement between the City and the Developer. The Developer is the party in the first instance, responsible for the execution, product delivery, and compliance with the flushing, testing, and disinfecting requirements contained in this manual.

**“Consultant”** means the Developer’s engineering/design Consultant and their representative(s). It is the responsibility of the Consultant to monitor, inspect, document, and report the Contractor’s compliance with the flushing, testing, and disinfecting requirements contained in this document.

**“Contractor”** means the construction firm engaged by the Developer to construct the sanitary, water, and storm infrastructure. It is the responsibility of the Contractor to comply with the flushing, testing, and disinfecting requirements contained in this document, and to ensure the acceptability of the infrastructure delivered to the Developer and City of Beaumont.

**“Operator”** means a member from the City of Beaumont’s Water & Wastewater department who holds certification in Environment and Parks Alberta water distribution certification.

**“Potable Water”** means water meeting the quality standards outlined in the latest edition of the “Guidelines for Canadian Drinking Water Quality”, published by the federal health ministry.

### 1.3 Process Overview: Flushing, Testing and Disinfection

Sequence of steps required for commissioning of new water mains.

Submission of Water Main Commissioning Plan	Submission is required within four weeks of IFC acceptance letter from the City of Beaumont. First submission to be emailed to engineer development coordinator.
Review and Approval	Approval is required two weeks prior to scheduled fill and flush date. Resubmission of the plan is required if major changes in location of water infrastructure occur after IFC issuance.
Scheduling	Request to commence water main commissioning must be provided a minimum of 5 business days prior to start date. Scheduling should account for other construction related onsite activities.
Fill and Flush Water Main	Water main is to be filled slowly to prevent air entrapment. Flushing is required to remove existing debris, until maximum of 1.0 NTU is observed.
Hydrostatic Pressure/ Allowable Leakage Test	Water main is to be pressured up to approved pressure prior to arrival of City of Beaumont Operator. At the completion of the test, line pressure must be purged at furthest most location(s).
Disinfection/ Superchlorination	Continuous feed method is to be used. Final chlorine reading should be no less than 25 mg/L and no higher than 50 mg/L.
Dechlorination	Residual chlorine should be no less than 10 mg/L. Chlorinated water must be dechlorinated and discharged into the sanitary system.
Bacteriological Sampling	To prevent unintended cross-contamination, all sampling points must be briefly flushed and/or disinfected, especially if hydrants are used. Two consecutive sets of satisfactory water samples are required for successful commissioning.
Waterman in service	Once satisfactory water results have been provided to the Water and Wastewater department and road construction is complete, the water main can be requested to be turned on.

Note: All onsite testing requires a representative from the Consultant to witness and record observations. A Water and Wastewater Operator, from The City of Beaumont, must be present to operate City owned water valves and witness all testing.

## 1.4 Prerequisite Requirements

- 1.4.1 The Consultant shall confirm and document that the methodology and equipment to be deployed by the Contractor complies with the City, AWWA, and industry accepted standards and guidelines for this work.
- 1.4.2 No flushing, testing, or disinfection of the water mains shall commence until all the mains, services, and appurtenances are fully installed. No installations of any sort shall be allowed after the mains have been flushed and/or hydrostatic tested.
- 1.4.3 Water main commissioning will not be granted for partial sections of a stage. Furthermore, stages are required to be separated into smaller sections, to prevent recommissioning of entire stages when receiving unsatisfactory water samples.
- 1.4.4 Water main commissioning is to occur from **April 1 – October 31**. Commissioning is to be suspended if daytime highs are below 5 degrees Celsius within the commissioning season.
- 1.4.5 All water mains within a stage must be commissioned as per the approved Water Main Commissioning Plan, prior to applying for CCC – inspection deadline is October 31.
- 1.4.6 Prior to commencing with any flushing, hydrostatic testing, and disinfecting of the water mains, the Consultant shall develop a Water Main Commissioning Plan (WMCP). A plan must also be created for private construction with services greater than or equal to 4 inches/ 100mm, and/or looping within the private site.
- 1.4.7 The Water Main Commissioning Plan shall provide a detailed:
  - 1.4.4.1 Step-by-step outline of the methodology(s) that the Contractor proposes to use when conducting the filling, flushing, hydrostatic testing, disinfecting, final flushing/dechlorination, and bacteriological sampling of the water mains.
  - 1.4.4.2 Maps/diagrams highlighting the process and all valves, blow offs, hydrants, injection points being used. The map/diagram should also show all proposed test locations.
  - 1.4.4.3 MSDS or SDS sheets for the type of chlorination and dechlorination agents to be used for the disinfection and dechlorination process.
- 1.4.8 The Consultant shall submit their WMCP to The City of Beaumont’s Engineering Department for review 4 weeks after IFC acceptance. Approval is required minimum of two weeks prior to anticipated date to fill the water main.
- 1.4.8 Once the WMCP is approved by The City of Beaumont, a minimum notice of 5 business days is required for the Consultant to submit their intentions to commence water commissioning. All valves are to be operated by the City Water and Wastewater Operator.
- 1.4.9 The Consultant shall be present during all steps in the water main commissioning process to ensure the Contractor’s compliance with the requirements of the WMCP. All results of the water commissioning process must be documented.
- 1.4.10 The WMCP is to be executed by competent and experienced personnel using appropriate equipment.
- 1.4.11 All City representatives shall always have unrestricted access to the site during the water main commissioning process.
- 1.4.12 City of Beaumont reserves the right to pause or stop the water main commissioning process due to implementation of Water Demand Measures.
- 1.4.13 All hydrants located on the water main to be commissioned will receive a green “Construction/Out of Order” discs to be placed over one 2.5-inch nozzles at the time of install. These discs will be provided and installed by The City of Beaumont Water & Wastewater Department. See Appendix A for disc schematic.

## 2. Water Main Flushing and Cleaning

### 2.1 Preliminary Water Main Flushing and Cleaning

- 2.1.1 Upon completion of installation of all water mains, sanitary mains, storm mains, and services (up to the curb stops), thorough flushing with potable water to remove entrapped air and foreign matter is required.
- 2.1.2 If, in the opinion of the Consultant and/or City, the water mains (regardless of size,) were subjected to severe contamination and/or injected with debris during the installation of the swabbing, flushing must occur in accordance with AWWA requirements. All new water mains of 450 mm diameter or larger must be swabbed and flushed.
- 2.1.3 If swabbing of the water mains is required, the Contractor shall include a Swabbing and Flushing section in the WMCP. The swabbing section shall detail the swabbing and preliminary flushing methodology. Details shall include, but are not limited to:
- 2.1.3.1 A descriptive outline of the swabbing methodology.
  - 2.1.3.2 Type and size of swabs.
  - 2.1.3.3 Swab launch/retrieval locations.
  - 2.1.3.4 Main sections to be swabbed.
  - 2.1.3.5 Flushing velocities and durations.
  - 2.1.3.6 Monitoring and documentation procedures.
  - 2.1.3.7 Swab pumping pressures.
  - 2.1.3.8 Method for collection and disposing of swab debris and flushed water.
  - 2.1.3.9 Schedule for the flushing and swabbing.
  - 2.1.3.10 Source of water for flushing.
- 2.1.4 Swabs shall be urethane type and shall have a diameter of at least 50 mm larger than the largest pipe nominal diameter.
- 2.1.5 A minimum of three (3) swabs must pass through all sections of the water main.
- 2.1.6 Swabbing of the mains shall continue until the swab shows no further evidence of contaminants (dirt) within the pipes.
- 2.1.7 The Contractor shall supply and install temporary launch/retriever ports to facilitate swabbing and is to remove the ports following the completion of swabbing.
- 2.1.8 For exceptionally large water mains (e.g., 500 mm diameter mains or larger), where it is impractical to clean and flush the mains using the methodologies outlined above, the WMCP shall specifically address and detail the methodology proposed for cleaning and flushing the large diameter mains, with references to AWWA standards.
- 2.1.9 If, in the opinion of City, the required swabbing and flushing exceeds the Contractor's capabilities or the degree of the water main contamination is too severe, the City may require the Contractor to engage the services of a firm who specialize in utility systems servicing and maintenance at the expense of the Contractor.
- 2.1.10 The source of the potable water being used for water main commissioning will be the City's distribution system. The Consultant must schedule the boundary valve operation with the City of Beaumont's Water & Wastewater Department.
- 2.1.11 The preliminary flushing procedure shall be as follows:
- 2.1.11.1 Flushing shall be a Uni-Directional Flushing (UDF) methodology, with an ideal flushing run length of 200m.

- 2.1.11.2 Flushing shall be conducted at a minimum velocity of 1.5 m/s (5 ft/s) for a minimum duration of fifteen (15) minutes over a maximum main length of 300 m, for mains 50mm up to and including 300 mm in diameter. The Consultant must verify flow velocities.
- 2.1.11.3 Flushing shall be conducted at a minimum velocity of 0.9 m/s (3 ft/s) for a minimum duration of fifteen (15) minutes over a maximum main length of 450 m, for mains sized 350 to 450mm in diameter. The Consultant must verify flow velocities.
- 2.1.11.4 During a flush, the source water shall flow from larger pipe to smaller pipe, whenever possible.
- 2.1.11.5 Use Table 1 to find the minimum number of hydrant ports and/or 50mm taps required to achieve the requisite velocity. (AWWA C651-14).

Pipe Diameter (mm)	Minimum Velocity Required (m/s)	Required flow (L/s) for Minimum Velocity	Number of 50 mm taps Required	OR	No. of Hydrant Nozzles Required*	
					2.5"	4.5"
50	1.5	2.9	1		N/A	N/A
100	1.5	11.8	1		N/A	N/A
150	1.5	26.5	1		N/A	N/A
200	1.5	47.1	2		1	N/A
250	1.5	73.6	2		2	1
300	1.5	106.0	N/A		2	1
350	0.9	86.6	N/A		N/A	1
400	0.9	113.1	N/A		N/A	1
450	0.9	143.1	N/A		N/A	1

\*With a 280kPa residual pressure a hydrant flowing to atmosphere will discharge 63 L/s from a 2.5" nozzle and 158 L/s from a 4.5" steamer (Source: After AWWA C651-14).

- 2.1.12 The Contractor shall accurately time the duration of the flush, at the required velocity. All appropriate planning is required to minimize duration of flush, in the interest of water conservation.
- 2.1.13 Testing of the flushed water is required, using an approved and certified turbidimeter (HACH or approved equivalent) in the presence of the Consultant and a City Water and Wastewater Operator. If the Contractor does not have a turbidimeter, a turbidity sample will be taken by the City of Beaumont Water & Wastewater Department.
- 2.1.14 Flush and test each section of main until the turbidity is 1.0 NTU or less.
- 2.1.15 The flushed water shall not be discharged to the sanitary without prior approval of the City of Beaumont and proper dechlorination.



## 3 Hydrostatic Leakage/ Pressure Test

### 3.1 Filling, Flushing, Pressure Testing of PVC Water Main

- 3.1.1 All testing shall be in accordance with AWWA C605 and AWWA M23 for PVC pipe.
- 3.1.2 Hydrostatic testing is to be conducted by competent and experienced personnel using equipment appropriate for the test pressures applied (such as a pressure gauge).
- 3.1.3 Open all new water main line valves, within the test section.
- 3.1.4 Fill Procedure:
  - 3.1.4.1 Expel air by slowly filling the water main with potable water at velocity of <math><0.5\text{ m/s}</math>.
  - 3.1.4.2 The tested section is to be filled by opening the boundary valve to the stage by a City of Beaumont's Water and Wastewater Operator. All valves in the stage must be open to evacuate the water so as not to cross contaminate the existing water distribution system. Alternatively, the section can be pressurized through a hydrant or blow-off valve, through an approved backflow prevention device, with isolation valves open.
  - 3.1.4.3 Burp and verify all CC valves and hydrants are isolated. Water tanks for hydrostatic testing can be filled at this time.
- 3.1.5 Test pressures should not exceed the pipe manufacturer's recommended maximum test pressure.
- 3.1.6 Do not conduct tests when ambient air temperatures are expected to drop below  $5^{\circ}\text{C}$  during the test period. If the temperature(s) drop below  $5^{\circ}\text{C}$  at any time during the test, the test shall be considered invalid and a re-test will be required.
- 3.1.7 Test pressures are to be the greater of 1,035 kPa (150 psi) or 1.5 times the operating pressure. The maximum length of pipe to be tested at one time is 450m (AWWA M23).
- 3.1.8 Pressure Test Procedure:
  - 3.1.8.1 Once boundary valves are confirmed to be closed, use a pump to raise the pressure in the test section to desired level (1035 kPa or 150 psi). Inspect the test area for leaks or other problems.
  - 3.1.8.2 Mark the gauge and the level of water in the measuring tank prior to the test.
  - 3.1.8.3 The test pressure shall be monitored continuously for a minimum of two (2) hours for any reduction in pressure.
  - 3.1.8.4 Maintain the specified test pressure by injecting additional water if test pressure deviates from the specified pressure by 20.8 kPa (3.0 psi) or more, with permission from City of Beaumont's Water and Wastewater Operator. This volume of water is to be noted for allowable leakage calculations.
  - 3.1.8.5 After two hours have elapsed, any pressure loss requires pumping water into the section until the initial test pressure is achieved. This volume of water to repressurize the test to the original test pressure is the total amount of leakage (in addition to any volume 3.1.8.4).
  - 3.1.8.6 For PVC pipes, determine the allowable leakage using this formula:

$$Q_m = \frac{LD\sqrt{P}}{795,000}$$

Where:

$Q_m$  = allowable leakage, in liters per hour

L = Length of pipe sections being tested, in meters

D = nominal diameter of pipe, in millimeters

P = average test pressure during the test, in kilopascals

- 3.1.8.7 If allowable leakage is exceeded, inspect the test section, remove any trapped air, repair any leaks and /or defective pipes, and repeat the test at a rescheduled time until a satisfactory hydrostatic test result is achieved.
- 3.1.8.8 Record all pressure test results.
- 3.1.8.9 Once the pressure test is successful, the Contractor is to open a hydrant, blowoff or CC valve at the end of the test section.
- 3.1.8.10 A City of Beaumont's Water and Wastewater Operator must be present to witness the start and end pressure readings of the two-hour test.

## 3.2 Filling, Flushing, Pressure Testing of HDPE Water Main

- 3.2.1 All testing shall be in accordance with AWWA M55, ASTM F2164-21 and PPI TN-46 for HDPE pipe.
- 3.2.2 Hydrostatic testing is to be conducted by competent and experienced personnel using equipment appropriate for the test pressures applied. Due to the tensile nature of the pipe, testing should occur when expected ambient temperatures drop below 5 °C (Celsius).
- 3.2.3 Open all new water main line valves, within the test section.
- 3.2.4 Expel air from main by slowly filling main with potable water. Flow into the installed water main shall be monitored and throttled with the boundary valve, by a City of Beaumont Water and Wastewater Operator. Initial flushing at a minimum velocity of 3 ft/s (1.0 m/s) should continue until the discharge appears clear. However, the minimum duration should be based on 3 changes of pipe volume (AWWA M55).
- 3.2.5 Once flushing is completed, the boundary valve will be shut off in preparation for hydrostatic testing. Testing may be conducted on the entire area or on sections of the system. Test section size is determined by the capacity of the filling and pressurizing equipment as the total entire testing time (pressurizing, stabilizing, holding test pressure, and depressurizing) cannot exceed 8 hours. Testing sections should not exceed 450m. (ASTM F2164-21)
- 3.2.6 If retesting is required, the test section should be depressurized for 8 hours prior to retesting.
- 3.2.7 Fill the test section slowly as to ensure that no air is trapped in the test section. Flow velocities during filling should not exceed the capacities of air release devices or openings. Gradually increase pressure in the test section to 1.5 times the rated pressure of the pipe. As the pipe experiences initial expansion, add sufficient make-up water for 4 hours to increase the water main pressure back to 1.5 times the rated pressure of the pipe as necessary.
- 3.2.8 At the end of the 4 hour initial expansion stage, record volume of make-up water. If test pressure cannot be attained or maintained, check for leaks, and depressurize the water main.
- 3.2.9 Reduce the test pressure by 10 psi (69.0 kPa) below 1.5 times the rated pressure of the pipe and record the start time of the test. During the one-hour test, water cannot be introduced or removed from the pipe.
- 3.2.10 Record the time and final pressure at the end of the one-hour test stage. As there is no leakage allowance for heat-fusion joined PE pipe, the water main pressure shall remain steady and not drop more than 5%.

3.2.11 Gradually depressurize the water main. Water must be de-chlorinated and disposed in an appropriate manner.

### 3.3 Air Testing of Water Mains

3.3.1 The use of compressed air for pressure testing water distribution mains shall not be allowed under any circumstances.

3.3.2 Any attempt(s) to use compressed air for testing purposes shall result in the test results being rejected by the City of Beaumont's Water and Wastewater department.

## 4 Water Main Superchlorination/ Disinfecting and dechlorination

### 4.1 Superchlorination of Water Mains

- 4.1.1 All superchlorination and dechlorination steps must be witnessed by an Operator from the City of Beaumont's Water and Wastewater Department. As per the AWWA C651-14 standard, the prescribed continuous feed method is the only method to be used in City of Beaumont. The use of chlorine tablets will not be allowed as a method to disinfect the new water mains. Calcium hypochlorite shall conform to AWWA B300-99. Sodium hypochlorite shall conform to AWWA B301-99. Only approved test kits (HACH or an approved alternatives) are to be used when taking chlorine samples. Sampling and testing can be done either by the Contractor or Consultant, while witnessed by a City of Beaumont's Water and Wastewater Operator.
- 4.1.2 Upon the successful completion of hydrostatic leakage testing, all water mains and services shall be disinfected in accordance with the approved WCMP.
- 4.1.3 The Contractor shall provide the Consultant and City of Beaumont with SDS (Safety Data Sheets) for the chlorination and dechlorination agents to be used.
- 4.1.4 Boundary valves shall be isolated from the newly installed water system at this time.
- 4.1.5 Fill barrels with potable water and chlorination mixture. Water may be supplied from a hydrant via temporary backflow protected connection to the distribution system. The City of Beaumont will supply the backflow prevention device upon request for a Hydrant Use Permit.
- 4.1.6 The chlorine solution shall be injected via a bleeder or service line, closest to the boundary valve of the water main test section with the discharge at the end of the test section.
- 4.1.7 Fire hydrants are not to be used as a feed point. As per 4.1.5, hydrants can be used to fill barrels to mix a chlorine solution.
- 4.1.8 A City of Beaumont's Water and Wastewater Operator must witness all chlorine residual sampling during disinfection: high-end superchlorination residual at beginning, low-end superchlorination residual at end of 24hr test period, low-end dechlorination residual, turbidity, and bacteriological sampling after final flush has been completed.
- 4.1.9 In the continuous feed method, an aqueous chlorine solution of sodium hypochlorite (HTH) shall be injected into the main being disinfected while sufficient water is being discharged through the main to bring the chlorine concentration throughout the main to a minimum concentration of 25 mg/L (25 ppm).
- 4.1.10 Constant flow from a hydrant, blowoff, or bleeder must be maintained when chlorine is being injected. Appropriate dechlorination must be in place for discharged water into approved storm or sanitary manhole.
- 4.1.11 Once the Contractor and City of Beaumont's Water and Wastewater Operator has confirmed that the entire test section is at the specified chlorine concentration, the upstream and then downstream valves shall be closed, and the test section left to stand a minimum of twenty-four (24) hours.
- 4.1.12 At the beginning of the contact period, all valves (including hydrant valves) and hydrants shall be operated to ensure that all parts have been in contact with the chlorine solution.
- 4.1.13 Samples will be taken at various points along the water main and tested, using an approved test kit (HACH or an approved alternatives), to confirm that the entire test section is at the specified chlorine concentration. After 24 hours, check total chlorine residual. If the total chlorine residual is less than 10 mg/L, flushing and re-chlorination is required. Approved kits are to be used for chlorine sampling; test strips will not be accepted as final chlorine readings (AWWA C651-14).

4.1.14 No sampling point should have a chlorine residual exceeding 50 mg/L, otherwise a flush will be required to dilute the chlorine residual. If the chlorine residual is too low, flushing for debris, contaminants and air entrapment may be required, following re-chlorination to 25 mg/L (AWWA C651-14).

## 4.2 Dechlorination and Final Flushing of Water Mains

4.2.1 The test section is to be flushed with potable water to expel all super chlorinated water.

4.2.2 Discharge from super chlorinated water main must be dechlorinated before being discharged to the sanitary main and shall never be discharged to the stormwater system or environment. Dechlorination of the superchlorinated water shall be done by adding sodium thiosulphate or an approved dechlorinating agent into the discharge stream.

4.2.3 A City of Beaumont's Water and Wastewater Operator must operate the boundary valve to displace the superchlorinated water. Constant discharge flow is to be always maintained.

4.2.4 The dechlorination of the superchlorinated water must be continually field tested to confirm the effectiveness of the dechlorination process. The Consultant must be on-site to ensure the Contractor follows appropriate dechlorination steps. If this water has a chlorine concentration higher than <5 mg/L, discontinue flushing and increase the strength of the dechlorinating agent before continuing.

4.2.5 Continue flushing until test section has a chlorine residual of 1.0 mg/L - 1.5mg/L (or equal to the City of Beaumont's distribution system) with a turbidity level of <1.0 NTU.

4.2.6 Flow restrictors are required on any hydrant and/or device used for flushing of the super chlorinated water into the sanitary system, to ensure the capacity of the sanitary main is not exceeded.

4.2.7 Upon satisfactory completion of the dechlorinating and final flushing, the tested section of water main shall be isolated from all other water mains pending satisfactory results of the bacteriological testing.

## 5 Bacteriological Testing and Commissioning

### 5.1 Bacteriological Testing

- 5.1.1 Samples shall be obtained from points along the water main, hydrants, service(s) or temporary bleeders, which are predetermined and approved in the submitted WMCP.
- 5.1.2 The Contractor or Consultant shall obtain one (1) set of water samples immediately after the dechlorination flush is complete. A second set of samples is to be taken at a minimum of 16 hours later (AWWA C651-14).
- 5.1.3 A bacteriological sample is to be collected every 370 meters on the new water main, plus one set from the end of the line and at least one from each branch greater than one pipe length (AWWA C651-14)
- 5.1.4 Samples taken from temporary flushing hoses and devices are not acceptable. Sampling for hydrants is not recommended but can be used if necessary.
- 5.1.5 Water samples shall be submitted immediately after sampling by the Consultant, to the Provincial Laboratory for Public Health (ProvLab), 8440 112 St NW, Edmonton, AB T6G 2J2.
- 5.1.6 The samples shall be tested for turbidity, total chlorine residual, prior to taking a bacteriological sample. A City representative must be present for all these tests.
- 5.1.7 Copies of the laboratory report shall be submitted to the Consultant and the City of Beaumont's Engineering and Water & Wastewater departments.
- 5.1.8 Should any bacteriological results be unsatisfactory or fail to meet the requirements and definitions for potable water according to the Guidelines for Canadian Drinking Water Quality and Alberta Environment and Park's guidelines, the Contractor shall flush the water main and resample. If flushing the water main yields in further unsatisfactory results, Superchlorination by continuous-feed method is required until satisfactory bacteriological results are obtained (AWWA C651-14).
- 5.1.9 If a sample is deemed unsatisfactory, the entire sample set must be resampled. Invalid results are considered as failed samples.
- 5.1.10 Two consecutive sets of bacteriological samples must pass from a total of four allowed sampling sets.

### 5.2 Completion of Water Main Commissioning

- 5.2.1 A request to the Water & Wastewater Department must be made to turn on the boundary valve once a final report along with satisfactory bacteriological results has been submitted to the City of Beaumont's Water & Wastewater Department. At this point, the new water main as part of the City of Beaumont's water system. Access to blowoffs and hydrants must be maintained throughout construction of the stage. All green "Construction/Out of Order" discs will be removed at this time.
- 5.2.1 If the tested and disinfected water mains (or portions thereof) lie dormant for a period of greater than 30 days and the boundary valves are not turned on, the stagnant water in the dormant water mains shall be flushed out with potable water until chlorine residual in these water mains is  $>1$  mg/L, turbidity  $<1$  NTU and both sets of bacteriological results are satisfactory.

## 6 Monitoring, Documentation and Reporting

### 6.1 Monitoring

- 6.1.1 The Consultant shall be the primary authority responsible for monitoring and inspecting the work for compliance with these and other applicable requirements, as well as the quality control standards.
- 6.1.2 The City of Beaumont's Water & Wastewater Department shall have full and unrestricted access to always inspect the work.
- 6.1.3 The City of Beaumont's Water & Wastewater Department shall conduct inspections at their discretion and report any deficiencies or workmanship concerns, and issues to the Consultant.
- 6.1.4 All noted deficiencies, quality control concerns, and workmanship issues must be addressed and resolved to the satisfaction of the Consultant and City of Beaumont prior to the issuance of the Construction Completion Certificate (CCC).

### 6.2 Documentation

- 6.2.1 The Consultant shall document the detailed methodologies and results of all aspects of the water main commissioning procedures to be included in the final report.
- 6.2.2 The documentation shall include a brief description of any unforeseen events that may have occurred during the construction that led to the selection of a particular methodology for flushing the mains.
- 6.2.3 Documentation shall be provided for all sections of water mains flushing, disinfection and testing, including failed bacteriological samples and re-samples.
- 6.2.4 The City of Beaumont reserves the right to monitor the Consultant's documentation of pressure testing and the disinfecting procedures.
- 6.2.5 The City of Beaumont's comments and concerns, brought to the Consultant's attention, shall be addressed by the Consultant to the City of Beaumont's satisfaction.

### 6.3 Final Report

- 6.3.1 The Consultant shall prepare a Final Report of the flushing, hydrostatic testing, and disinfecting of the water mains, based on the documented information compiled during the execution of these procedures.
- 6.3.2 The Final Report shall include:
  - 6.3.4.1 The Water main Commissioning Plan
  - 6.3.4.2 The documentation of all testing and sampling results.
  - 6.3.4.3 Any photographs taken to record the flushing, testing, and disinfecting of water mains.
  - 6.3.4.4 Hydrant flow testing data
- 6.3.3 The deliverables submitted to City of Beaumont shall include a PDF of the Final Report sent to the attention of the City of Beaumont's Engineering Department. The Final Report must be received by City of Beaumont, prior to the issuance of the Construction Completion Certificate (CCC) to the Consultant/Developer.

Appendix A



This disc will be placed during the water commissioning process and will be removed once satisfactory bacteriological tests are received and boundary valves are turned on.