APPENDIX C: PROCEDURES FOR WATER MAIN CLEANING, DISINFECTION, AND BACTERIOLOGICAL TESTING
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PROCEDURES FOR WATER MAIN CLEANING, DISINFECTION, AND BACTERIOLOGICAL TESTING

I PURPOSE
To establish standard procedures for the cleaning, disinfection and bacteriological testing of COUNTY potable water mains. Inclusive in this standard are newly installed, replaced, and relocated water mains, along with water mains being returned to service after being out of service for a period of time.

II DEFINITIONS
Board - the Board of County Commissioners, Hillsborough County, Florida.
Contractor - the person or persons, partnership, firm, or corporation who enters into a water main construction contract to install, extend, relocate, or otherwise modify the COUNTY’s potable water transmission/distribution system. When contracting the work, it is understood that the CONTRACTOR is responsible for executing this procedure and payment of all fees; reimbursement to be made as per the contract.
County - A political subdivision of the State of Florida known as Hillsborough County, as governed by the Board and as administered by the County Administrator.
Department - the County's Public Utilities Department
Environmental Laboratory, Laboratory, or Lab - the DEPARTMENT's laboratory, certified for water quality/bacteriological analysis.
Inspector - a COUNTY employee or representative of the COUNTY assigned to inspect the CONTRACTOR's work to ensure compliance with prescribed standards.
Project Manager - a COUNTY employee assigned to manage and administer the project involving the CONTRACTOR's work. The PROJECT MANAGER may designate a Project Representative to perform certain duties and responsibilities.
Project Representative - a COUNTY employee or representative of the COUNTY designated by the PROJECT MANAGER to act as their representative.
Record Engineer - a professional engineering firm or professional engineer registered in the State of Florida who is responsible for oversight and certification of the water main's construction, including disinfection and testing, permit certification and record drawing.
Resident Engineer - a representative of the RECORD ENGINEER charged with oversight duties.
Water Mains - shall include the pipelines, fittings, valves, and all appurtenances that comprise the potable water distribution or transmission system being installed, replaced, relocated, or being returned to service after being out of service for a period of time.

III PROCEDURES
A. General
1. References: Prior to any portion of the COUNTY’s potable water system being placed into or restored to service, it shall be cleaned, disinfected, and tested for bacteriological contaminants in accordance with the latest applicable provisions of the American Water Works Association (AWWA), "Standard for Disinfecting Water Mains" (AWWA C651); and the Florida Department of Environmental Protection (FDEP), "Permitting, Construction, Operation and
2. **Approved Plan:** Prior to construction, the CONTRACTOR shall submit a **Cleaning, Disinfection and Testing Plan** (CD&T Plan) which meets AWWA C651 standards and the requirements specified in this document, for review and approval by the RECORD ENGINEER and the DEPARTMENT. For developer projects, the **CD&T Plan** shall be submitted to the Development Services Department’s Engineering Review Team. For Capital Improvement Projects (CIP), the CD&T Plan shall be submitted to the DEPARTMENT’s Project Manager. The Plan shall describe the proposed source of potable water and the proposed methods of cleaning, disinfection, final flushing and bacteriological sample collection. The CD&T Plan shall meet the minimum requirements, including minimum number of sample points, specified in the project’s design drawings. The Plan shall incorporate water conservation principles and include provisions for protection of property and the environment.

3. **Preventive and Corrective Measures:** During construction, the CONTRACTOR shall protect the interiors of the Water Mains from contamination. Precautions shall be taken to keep all water main interiors dry and free of particulate, debris and other foreign matter in accordance with the latest edition of AWWA C651, Section 4.3.

4. **Coordination of Activities:** All cleaning, disinfection and flushing activities shall be coordinated with the RECORD ENGINEER and the INSPECTOR; and conducted under the direct supervision of the RECORD ENGINEER or his representative, in the presence of the INSPECTOR and PROJECT REPRESENTATIVE.

5. **Water Source:** Water used for cleaning, disinfection and flushing shall be potable water taken from an approved source.

6. **Operation of Valves:** At all times, valves on existing COUNTY water mains will be operated by DEPARTMENT Field Maintenance staff, or under their direct supervision, during all phases of water main cleaning, disinfection and flushing. All cleaning, disinfection and flushing activities that require the operation of COUNTY water main valves shall be coordinated with Field Maintenance staff, where prior notification of at least one business day is requested. See Exhibit A for a list of contact names and numbers.

7. **Distribution System Pressures:** Adequate system pressures (35 psig or greater) shall be maintained at the metered connection during cleaning and flushing activities.

8. **Water Conservation Measures:** Where possible, quantities of water used for cleaning, disinfection and flushing shall be minimized in consideration of COUNTY water conservation guidelines.

**Discharge and Disposal of Water:** The CONTRACTOR shall take care to ensure that the water used during the cleaning, flushing and disinfection activities, is disposed of in a manner that minimizes damage to property or the environment, and without causing a nuisance. All heavily chlorinated discharge water (greater than 4 mg/L free chlorine, or as directed by jurisdictional authority) shall be dechlorinated prior to disposal, using a neutralizing chemical, such as Sodium Thiosulfate. The CONTRACTOR shall mitigate and restore all damages.

9. **Approved Testing Lab:** All bacteriological testing shall be performed by the DEPARTMENT’s Environmental Laboratory (Lab). When previously approved by the Lab the CONTRACTOR, at his discretion and expense, may take samples for analysis to a NELAC/NELAP certified, State approved (DEP), independent testing laboratory certified for the required testing.
B. Cleaning
1. The CONTRACTOR shall notify the INSPECTOR at least 48 hours prior to commencing any cleaning or flushing activity.
2. The CONTRACTOR shall clean and flush the Water Mains to remove all sand and other foreign matter in accordance with the approved CD&T Plan.
3. The interiors of all new Water Mains shall be cleaned by mechanical means such as a hydraulically propelled foam pig. The pig shall be of an appropriate material so as not to damage the interior lining of the pipeline. The CONTRACTOR shall be responsible for the installation and removal of any connections or appurtenances necessary to accomplish the pipeline pigging. All pigging shall be conducted with the INSPECTOR in attendance.
4. After the Water Mains have been thoroughly cleaned and prior to disinfection, hydrostatic testing shall be conducted in accordance with Hillsborough County Water, Wastewater, and Reclaimed Water Technical Specifications located on the Hillsborough County Public Utilities Department website.

C. Disinfection
1. The INSPECTOR shall be notified at least 24 hours prior to commencing disinfection activities.
2. The CONTRACTOR shall disinfect the Water Mains in accordance with the approved CD&T Plan.
3. The disinfecting agent shall be free chlorine in aqueous solution. The form of chlorine and the application method shall meet the standards prescribed in AWWA C651. Methods generally approved by the COUNTY are the "Tablet Method" and the "Continuous-Feed Method" as outlined in AWWA C651. Use of the "Slug Method" is discouraged and shall only be approved on a case-by-case basis. The forms of chlorine that may be used are sodium hypochlorite solution and calcium hypochlorite granules or tablets as outlined in AWWA C651. The use of chlorine gas (i.e., the "Liquid Chlorine" application method specified in AWWA C651) shall not be approved unless the CONTRACTOR can demonstrate that properly designed and constructed equipment operated by suitably trained and equipped personnel will be used.
4. The initial free chlorine concentration shall not be less than 25 mg/L at all points along the water main. The highly chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants within the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine. To ensure these concentrations are rendered along the entire length of pipe, chlorine concentrations shall be measured at regular intervals, using approved methods. The sample points established for bacteriological testing may be utilized for this purpose.

D. Final Flushing
1. Prior to the final flushing, the proposed discharge site shall be inspected for conformance with the CD&T Plan by the COUNTY and the applicable regulatory agency for potential environmental impact.
2. After the applicable retention period, the heavily chlorinated water shall be discharged from the Water Mains until the chlorine or chloramine concentration of the discharge water is no higher than that found in the existing, adjacent water distribution system.
3. If it appears that there may be a problem meeting minimum system residual requirements after the Water Mains are flushed, (.2 mg/L free, and .6 mg/L total), the CONTRACTOR should contact the DEPARTMENT’s Distribution System Flushing Team (see Exhibit A for contact names and numbers) for assistance in flushing the existing main.
4. If the adjacent water distribution system is chloraminated, any water with free chlorine residual shall be flushed out so as not to mix with the chloraminated water in the existing distribution system.

5. Prior to discharge into the environment, all heavily chlorinated water shall be dechlorinated using a neutralizing chemical, such as sodium thiosulfate, to thoroughly neutralize the chlorine residual.

E. Bacteriological Sampling & Testing

1. After final flushing, two consecutive sets of water samples, taken at least 24 hours apart (per AWWA C651), shall be collected from the Water Mains in accordance with the approved CD&T Plan. The plan shall include the locations, with map(s) and station numbers, of all proposed sample points.
   a. Sample points shall be located at a minimum of every 1200-feet of water main, at each end of the pipeline, and at each branch in the system. If dirt and debris were allowed to enter the piping system during construction, the sample points shall be at 200-foot intervals – as prescribed in AWWA C651;
   b. Samples shall not be taken from fire hydrants;

2. Prior to sample collection, the CONTRACTOR shall contact the Lab for a sampling kit which will include the following: “lockable” sample bottles, labels, disinfectant residual test kit with deionized water and approved test reagent suitable for determining residual concentrations, alcohol for disinfecting the sample taps, plastic zip-lock bag to store sample bottles in, lockable ice chest (cooler) for sample storage, and a copy of the Water Main Bacteriological Clearance Report and Chain-of-Custody Form (Exhibit C) with a set of instructions for sample collection and delivery (Exhibit D). See Exhibit A for locations, phone numbers and contact names.

3. The CONTRACTOR shall be responsible for measuring and recording the disinfectant residual of the water from each sample tap as well as a system tap upstream of the Water Mains, collecting the required water samples, sealing the sample bottles, labeling the sample bottles, enclosing in zip-lock bags, and placing in the ice chest – with bags in direct contact with wet ice. If the residual from the system tap differs by more than + 0.5 from the samples this is an indication that there is a potential problem with the new main (improper cleaning or flushing of the line).

4. The CONTRACTOR shall also be responsible for completing the required information on the Chain-of-Custody Form as well as the sample containers. A COUNTY representative (e.g., INSPECTOR, PROJECT MANAGER or PROJECT REPRESENTATIVE) must witness the sample collection, lock the ice chest, and certify on the Chain-of-Custody Form that proper procedure was followed. The CONTRACTOR shall hand-deliver the samples contained in ice chest to the Lab.

5. The CONTRACTOR shall be responsible for payment of testing and administration fees for each 2 day sample event. See Exhibit B for a current breakdown of fees. Payments shall be by check or money order only, made out to Hillsborough County BOCC, and are due upon delivery of the second day’s samples (Day 2).

6. After completing the analyses of the second day sample(s), the Lab will email all test results to the PROJECT MANAGER or the RECORD ENGINEER. Release of the test results is contingent upon CONTRACTOR payment of fees and return of the sampling kit to the Lab.

F. Redisinfection

If the initial disinfection fails to produce satisfactory bacteriological results, the Water Main(s) may be relisted and shall be resampled per Section E. If a second set of samples also fail to
produce acceptable results, the CONTRACTOR shall repeat the disinfection and flushing procedures until two consecutive sets of samples taken at least 24 hours apart are satisfactory.

G. Letter of Clearance
1. Upon receipt of a set of satisfactory test results, the RECORD ENGINEER shall submit FDEP Form #62-555.900(9), "Certification of Construction Completion and Request for a Letter of Clearance to Place a Public Drinking Water Facility into Service" to the Hillsborough County Department of Health (HCDOH). The certification is also signed by the permittee, usually the PROJECT MANAGER, and the DEPARTMENT Director or designated signature authority. The submittal shall include a set of the Lab's bacteriological test reports showing satisfactory results, a copy of the hydrostatic test report, and a set of record drawings - signed and sealed by the RECORD ENGINEER. The location of sample collection points shall be indicated on the record drawings.

2. Upon approval, the HCDOH will send a letter of clearance to the Permittee, with courtesy copies sent to the RECORD ENGINEER, the DEPARTMENT, and the Development Services Department (formerly Planning and Growth Management).

3. No newly constructed or altered COUNTY water main/system shall be placed into service until a Letter of Clearance is issued for the facility.

H. New Water Main Activation
1. Following HCDOH's clearance, the water main shall be placed into service as soon as possible, with the CONTRACTOR coordinating the water main connection activities with the DEPARTMENT's Field Maintenance Section. If more than sixty (60) calendar days have passed from the date of the successful bacteriological second day test results, the CONTRACTOR shall reflush the Water Main(s) and repeat the sampling and testing procedures, as outlined in Sections D. and E. herein. If these samples fail to produce acceptable results, the CONTRACTOR shall repeat the disinfection and flushing procedures until two consecutive sets of samples taken at least 24 hours apart are satisfactory.

2. No water main shall be placed into service without meeting the disinfection requirements specified in this document and AWWA C651.
EXHIBIT A

HILLSBOROUGH COUNTY
PUBLIC UTILITIES DEPARTMENT

Contact Names/Numbers

Field Maintenance
  Northwest: Leroy Hale, 554-5010
  Central/South: Johnny Palacios, 298-3943 or 671-7604 x248

Water Operations
  South Water Quality: Rich Garner, 744-5544
  North Water Quality: Toby Ruff, 264-3835
  Distribution Flushing Team: Ray Arce, 554-5011

Environmental Laboratory
  9456 E. Columbus Dr., Tampa FL
  Jared Hong, Bacteriological Supervisor, 272-5977, x43636
  Moises Morales (x43652), Keith Roghair (x43639), or Hillary Weber (x43725)

Service Availability
  272-5917
  South/Central: 272-5917, ext. 43141
  North: 272-5917, ext. 43140

Engineering/Hydraulics
  John McCary, 272-5977, ext. 43337

EXHIBIT B

ENVIRONMENTAL LABORATORY FEES

<table>
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<tr>
<th>Testing Fee</th>
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<tbody>
<tr>
<td>Admin Fee</td>
<td>$10.00 / event</td>
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Water Main Clearance

Bacteriological Clearance Report and Chain-of-Custody Form

DAY #

PROJECT NAME / LOCATION:
PROJECT / WORK ORDER / CRP #:
SAMPLE DATE: / / 2017
SAMPLER NAME / TITLE:
PROJECT MANAGER:
PHONE NUMBER:
FAX NUMBER:
CONTRACTOR (Paying for Tests):
ADDRESS:
CITY:
STATE:
ZIP CODE:

EXHIBIT C

Chlorometric Starch Test for Chlorine

Sample No. 1
- Disinfectant residual upstream of new main.

Sample No. 2

Sample No. 3

Sample No. 4

Sample No. 5

Sample No. 6

Sample No. 7

Sample No. 8

Hillsborough County Public Utilities Department Environmental Laboratory
9456 E. COLUMBUS DR. TAMPA, FLORIDA 33619

DRAFT
EXHIBIT D
HILLSBOROUGH COUNTY PUBLIC UTILITIES
DEPARTMENT ENVIRONMENTAL LABORATORY
BACTERIOLOGICAL CLEARANCE PROCEDURE

1. Water samples for bacteriological analysis may be delivered to the Environmental Laboratory at 9456 East Columbus Dr. between 8:00AM and 4:00PM Monday through Friday.
2. Contact Laboratory Sample Custody at 813-272-5977 Ext. 43635 or Moises Morales at Ext. 43652 to arrange pick up of a sample kit including sterile sample bottles, a chlorine residual test kit, forms, labels, alcohol, DI water and a lockable ice chest.
3. Day #1 Sample Collection:
   a. On the Water Main Clearance Form, fill in all pertinent information including an email address to which the test results are to be sent. Use pen only. DO NOT USE PENCIL.
   b. At a point in the existing system upstream of the new line, measure the chlorine residual as follows: (1) Rinse then fill the two viewing tubes to the second (10 mL) line with sample water; (2) Put the tubes into the color wheel case and add ONE (1) DPD #4 (Total Chlorine) packet to the tube on the right; (3) Agitate the tube until the reagent is dissolved; (4) Wait 3 minutes; (5) Rotate the color wheel until the pink in the left view port matches the pink in the right (sample) port; (6) If the residual is greater than 3.5 mg/L, a dilution is needed. Empty both viewing tubes, rinse with sample, and refill both viewing tubes to the first (5 mL) line with sample. Fill both viewing tubes to the second (10 mL) line with the provided DI water. Repeat steps (2) thru (5) above. Multiply this answer by 2. (7) Record the residual under “Disinfectant Residual (mg/L)” and the time the residual was analyzed under “Sample Time” on the Water Main Clearance form for “Disinfectant residual upstream of new main”. A sample is not collected at this location, only the residual is needed.
   c. At your sampling point, flush the sample tap for 3 to 5 minutes, then measure the chlorine residual in the new line (see “b” above). Record the residual in the column labeled “Disinfectant Residual (mg/L)” on the form. Provide a description of the sample location under “Location”. NOTE: If the new line’s residual is significantly greater or lower than the upstream system residual, the line has probably not been adequately flushed or chlorinated respectively. Contact the Project Manager for further instructions.
   d. Turn off the sample tap and disinfect the inside and outside of the sample spigot using the squirt bottle of alcohol.
   e. Wait 15 seconds, flush the tap for 3-5 minutes, and then reduce the flow to a gentle stream. Open the cap on the sample bottle taking care not to touch the inside lip of the bottle or cap. Do not rinse the bottle, it contains a de-chlorinating agent. Fill the bottle to the 100 mL mark. Close and lock the cap using the locking tab. Record the time the sample was collected under “Sample Time”. Please use military/24hr time.
   f. Repeat the above steps for each additional sample collected.
   g. Record the sample date and sampler name/title at the top of the form. Fill out all information requested on the label provided. Fill out the field code (W-MMDDYY-Location) on the COC and on the label. “W” is code for Water Main, “MMDDYY” for month, day and year, and “Location” for location of sample taken. Place the label on its corresponding sample bottle.
   h. Drain any melted ice from the cooler. Place the sample in a small Ziploc baggie provided by...
the lab. If a Ziploc baggie was not provided, place the sample on ice so that the sample bottle(s) will not be in direct contact with the ice in the cooler. For example, place the ice in a separate plastic bag so that the sample is not in direct contact with the ice or water from melted ice.

i. The County inspector or agent must witness the sample collection and locking of the cooler. After the inspector has verified sample collection and signs the Water Main Clearance form, deliver the locked ice chest and form to the laboratory.

j.

4. **Day #2 Sample Collection:**
   a. Call the lab in the morning to verify that the first samples have passed.
   b. Repeat Step 3 above for Day #2 sample collection.
   c. A report of the test results will not be provided until the sample kit has been returned and payment is submitted. Checks or money order only. No cash will be accepted. Make checks payable to Hillsborough County BOCC. The analytical fee is $10.00 for each bacteriological sample tested in the 2-day clearance and $10.00 for processing for each clearance event.

08/30/17