

TOWN OF ROTTERDAM
Water Distribution System
Universal Metering Initiative
IMPLEMENTATION PLAN

DEC #4-4228-00294/00001 (WWA No. 11,969)

Condition 19: Water Metering and Leak Detection Compliance

Town of Rotterdam, New York 12306



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Project No. 01-1805
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TOWN OF ROTTERDAM

WATER WITHDRAWAL PERMIT CONDITION COMPLIANCE

UNIVERSAL METERING PLAN

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- A. TOWN OF ROTTERDAM WATER WITHDRAWAL PERMIT EFFECTIVE 10/10/2019
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- C. TOWN OF ROTTERDAM WATER METER INSTALLATION PROGRAM FREQUENTLY ASKED QUESTIONS [MIP-FAQ]
- D. ZONE WATER METER INSTALLATION PHASING PLAN DIAGRAM
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- G. ROTTERDAM 2018 WATER QUALITY REPORT
- H. SOURCE METER CUT SHEETS: HONEYWELL ST3000
- I. TOWN OF ROTTERDAM NY CODE WATER CHAPTER 267
- J. PRIME AE GROUP, INC.: TOWN OF ROTTERDAM WATER DISTRIBUTION SYSTEM HYDRAULIC MODEL
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EXECUTIVE SUMMARY

Environmental Conservation Law (ECL) – Article 15, Title 15 requires a permit for the withdrawal and distribution of water. As a result of this Law, the Town of Rotterdam is mandated to remain in substantial conformance with its Water Withdrawal Permit (WWP)ⁱ and incorporated Conditions, which became effective October 10, 2019. The purpose of this report is to address the requirements expressed in Condition #19 as follows:

Condition 19. Water Metering and Leak Detection Compliance: *On or before December 31, 2019, the permittee shall submit a plan for Department review and comment that outlines steps to be taken to comply with Water Withdrawal Public Permit Conditions 14, 15, 17, and 18. A time schedule for water meter installation must be included as part of the plan. Revisions to the plan addressing the Department's written comments shall be resubmitted within 60-days of the date of the written comments. The final plan and schedule will become enforceable under this permit upon written acceptance from the Department.*

The steps to achieve the installation and/or inspection/replacement of all meters across the Town's water system will be costly and require a substantial amount of time. In addition to the outline of broad steps, timeline, and preliminary engineers' opinion of costs; this report provides background information to frame those steps, maintain source metering, improve the dashboard of assorted system data, discuss factors required in the choice of meters and reading technologies, and preferred methodology of enlisting contractor meter installation. The goal is to provide a reasonable framework within which the Town will be able to plan, implement, operate, and manage a Universal Metering Plan. Data acquisition and its management of source flows, user consumption, and strategic meters across Town's water distribution system will not only provide the mandated water withdrawal condition compliance; but also improve allocations of manpower, reduce electrical consumption, allowing for a pay as you use billing system, and provide additional tools to direct resources to a more efficient system of reducing system leaks.

By developing a methodical approach to implementing a sound metering program, in concert with strong public awareness, the Town has the potential to conserve a valuable resource by reducing overall residential, commercial, industrial, and institutional water consumption.ⁱⁱ

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STEPS TO COMPLY WITH WATER WITHDRAWAL PERMIT CONDITION #19

Water Meter Installation Program

The New York Department of Environmental Conservation (NYSDEC) issued to the Town of Rotterdam a Water Withdrawal Permit (WWP) Modification #1, Permit ID 4-4228-00294/00001, under Article 15, Title 15, effective October 10, 2019ⁱⁱⁱ (attached as Exhibit A). This Permit Modification authorizes an increase in taking at the Rotterdam Well Field off Rice Road from 10,000,000 gallons per day (10 MGD) to up to 12 MGD for a total approved withdrawal of 13.152 MGD, including the Rotterdam Junction Well Field. Incorporated in the WWP are twenty-four permit conditions that the Town is required to conform with. Of those conditions; Condition #19 Water Metering and Leak Detection Compliance, is to be addressed “On or before December 31, 2019” and requires the Town of Rotterdam to prepare an Outline of Steps required to comply with WWP Conditions 14, 15, 17 and 18.

The following describes the cursory evaluation of the Town’s water system and development of the Outline of Steps necessary to comply with Condition #19.

Condition #14 - Meter All Sources and Customers

Summary of Current System:

- Sources are metered.
- Users commercial, industrial, and institutional meters with very few residences metered.
- Approximately **12,000** users are not metered.

Source Meters: The Town of Rotterdam has two water mains exiting its well field off Rice Road. Each of these two mains are metered. Installed are two Honeywell ST3000 Smart Pressure Transmitter with Differential Pressure measurements. These meters are calibrated twice annually and were last calibrated November 6, 2019. Although source mains are currently metered with high levels of accuracy, this plan requires a fresh look at the ever changing technologies, how the data is incorporated into the SCADA^{iv} system, and how the SCADA system itself should be optimized to provide improved overall system analysis and control. Each of these steps will require time and financing.

User Meters: The Town currently requires commercial and industrial water users to be metered. Meters are read in gallons annually by Town employees. A Town employee is tasked with gaining access to each meter after receiving authorization from the property owner and/or user. The Town employee reads and records the amount of water that has passed through the meter, and by comparing this to the last reading recorded, the number of gallons of water supplied to that user is calculated and recorded. From this data, a bill is generated. Should the unit be malfunctioning, the property owner is contacted and placed on notice to repair or replace the meter.

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New residential water users outside of the Town's Water Districts are required to install water meters. Presently, these new meters are not read for billing purposes. It is believed that there are approximately 12,000 users that are not currently metered.

Metering Priorities: PRIME AE Group of NY (PRIME) met with key Town staff members to review the existing system's metering capabilities and its deficiencies. Not only was the existing system discussed, but also the potential benefits that additional data points can provide. Additional metering will allow for the ability to bill customers on a volumetric or consumption basis. Meters also provide data on flow and pressure, so strategically placed source meters (i.e., parallel distribution lines) will allow operators to proactively detect system leakages and/or blockages locations.

Meter Installation: The steps to achieve the installation/inspection/replacement of all meters across the Town's water system will be costly, take considerable time, and require significant resources. Recent replacement of existing meters in a nearby town had an average cost of approximately \$250 for the meters and \$100 for installation, for a total average cost of \$350 per meter replacement. This work generally involved shutting off valves on each side of meter, pulling out old meter and installing new meter. An updated data collection system that integrated with their billing system was also included. The Town of Rotterdam would require a new data collection and billing system, and all new installations for nearly all meters, which would require more work to reconfigure the plumbing, valves, and adapt to the unknowns. This would add substantial time and cost to each meter installation resulting in an average closer to \$600 per meter installed.

The following table summarizes the scope of work, tasks and timetable anticipated to install meters throughout the Town of Rotterdam's Water System, inclusive of tasks, duration for each task, anticipated costs, and interdependency of tasks.

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Table 1: Estimated Costs of Town-wide Metering Program Implementation

Task	Action or Requirement	Anticipated Duration	Dependent on Task	Estimate Costs
1	Secure funding and/or develop financial plan for preliminary design phase.	2 to 4 years in conjunction with Task 2	2	\$150,000
2	Preliminary Design Phase. Including provision of Engineer's Opinion of Costs	1 to 2 years in parallel with Task 1	1	\$180,000
3	Public Education and involvement	Throughout project duration	1	\$80,000
4	Refine and adopt Policies, Procedures, and Regulations	3 years	1 2	\$120,000
5a	Pilot Program: 1% representative sample meter install initiative: Design Docs, Bid Doc Prep., RFQ, RFB: Interview Top Three Contractors – award Pilot Program Meter Installs.	1 to 2 years	1 2	\$210,000
5b	Contractor to install representative sample meters. 1% of 12,000 meters. Pilot program install approximately 120 meters (assumes \$650 per install)	1 year	1 5a	\$78,000
6a	Secure funding and/or develop financial plan for design and construction phase.	1 to 3 years	5b	\$150,000
6b	Detail Design of Universal Meter Installation. Provide meter design addressing each user, accounting for anticipated variabilities at each install.	2 to 4 years	5b	\$318,000
7a	Bid, Award, and Construction Phase Services for remaining installs	in conjunction with 7b	7	\$200,200
7b	Contractor and Material Costs: install approx. 11,880 new meters at an average of \$600 per installation [preliminary engineers' opinion of cost].	Up to 10 years*	7a	\$7,130,000
Totals		11 to 23 Years		\$8,616,200

*Note: Assumes 11,880 meters with minimum of 25 meters installation per week at 50 weeks per year.

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Approach to Comply with Condition #14 Meter All Sources and Customers: Under this condition, the Town is required to install and maintain meters on all sources of supply used in the system, and on all customer service connections supplied by the system.

Approximately 12,000 users would require new meter installations and in order to achieve that goal, the steps described in Table 1 would be necessary; while some are dependent on others several can occur in parallel with other efforts.

Tasks 1 & 2: The Preliminary Design and Funding phase is anticipated to take from 4 to 8 years. Funding applications will require preliminary design to a certain level of detail. Given the limited available funding, the more refined the preliminary design is, the greater the potential for securing funding becomes. A year to prepare application, overlapping with first year of preliminary design is minimum. To secure funding, navigating the requirements accompanying assorted funding mechanisms, it is likely to take at least 3 additional years. During this time, there will be engineering costs involved. Tasks 1 and 2 jointly may be accomplished in as little as 4 years, however application and preliminary design require funding as well. Based on this, planning and design funding will need securing to seek additional plan components; adding potentially 4 more years to these initial phases.

As the Office of the State Comptroller states, “state and federal funding is extremely limited”^v. The project may seek planning, design, implementation funding on a whole or according to Task. While the first is preferred the latter may be more realistic. Unless funding mechanism become readily more readily available Preliminary Water Meter Tasks 1 and 2 will require 4 to 8 years.

Preparation of the funding application will require an evaluation that will describe the scope, costs, user costs, and timetable that would be prepared and submitted to the funding agencies.

The following are some of the areas that would be addressed in the evaluation:

- Detailed Study of existing metering and systemwide data with
 - PRIME AE’s Hydraulic Model^{vi} use in meter data supported determination of pipe bursts, within buildings and external leaks across the distribution system. This system audit, usages, leak detection, slow and/or sudden pressure losses or spikes, and provisions for Town Operator dashboard updates, improved SCADA^{vii} to watch and warn of sudden changes in tank levels, or pump station issues.
- Evaluation of Metering Priorities
- Comparison of Meters and Meter Reading Technologies: Water Meter Selection
- Cost analysis of the Meter Alternatives
 - Meter costs
 - Installation Costs for different types of meters.

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- Power Requirements
 - Staffing Levels for minimum Annual Reading Cycle, and compare against the different technologies.
 - Power required.
 - Meter longevity and Anticipated accuracies.
 - Billing and Data Collection software and hardware.

Task 3: Public Information/Education Program to occur continuously throughout the process. This step is paramount to the success of a meter installation program. Without user cooperation, installation of meter into their residence and/or structure, would be extremely difficult.

- Steps include but are not limited to:
 - Informational Articles in the Daily Gazette,
 - Town and County Webpages, and availability of
 - Single point of PRIME Contact available to address, questions, comments, concerns, and suggestions from users as they arise.
 - Provide easy availability of Meter Installation Program Frequently Asked Questions [MIP-FAQ]^{viii} white-paper and metering pamphlets highlighting the benefits of volume-based consumption billing for individuals and the community at large; as well as providing realistic expectations.
 - Provide ample notification and schedule as information is finalized.

Task 4: Preparation and adoption of Policies, Procedures, and Regulations is anticipated to take up to 6 years.

- Adoption of Town of Rotterdam Water Meter Policy and Procedures.
 - The Town has a working draft Water Meter Policy and Procedures^{ix} document
 - Work to assist the Town in completion and adoption.
- Town Code Chapter 267 WATER must be updated, approved, and enacted.
 - Review of existing Code should look to at updating water usage rates and assure substantial general conformance with new Water Meter Policies and Procedures.

Task 5: Development of a Pilot Program, Design, Bid, Award, and Construction Phase; 3 to 6 years.

- Preliminary Design for installation across representative sampling of installs
- Meter Procurement
 - Compare types, technologies, and reading options (telemetry)
- Installation
- Initial Design
- Representative sampling details for anticipated, and unanticipated meter installs.
 - Slab on grade, basements, apartments.
 - Internal, external meter installations.

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- Provide installation details in anticipation of varied installation conditions and specifics.
 - Evaluation of anticipated curb stop access and operation. Ease or difficulty in turning off the water during the installation.
- Understanding how long the water will not be available. From as little as ten minutes, to as long as several hours.
 - Is the water service accessible?
- What to do should the service entering the structure not be exposed. [Finished basement, or blocked by something, such as a water heater...]
- Prepare to place the water systemwide meter installation - out to bid.
- Submit, prepare and place a request for quals to be submitted for contractors capable of a systemwide meter installation project.
- Prepare and implement a pilot program across a representative sampling of various installs to hone design.
- Consider award change order to the contractor / implementor of the pilot install initiative or put the remainder of the project meter installs out to bid.

Task 6: Detail Design and Universal Meter Installation; 4 years following pilot program. Provide meter installation addressing each user. Accounting for anticipated variabilities at each install.

- Develop Bid Documents, or Plan Changes: Applying efficiencies gained through Pilot Program.
 - Detailed Design
 1. Chosen technologies (e.g., meter, telemetries...) anticipated install for different residences.
 2. Internal installations, external installations.
 3. Exact number of installations per zone.
 4. Determine all addresses, and landowner contacts within each zone.
 5. Accommodate for meter installation to each user.

Task 7a and 7b: Bid, Award, and Construction Phase Services.

- If the contractor met expectation throughout the Pilot Program, there is an option here to request a proposal to complete the install.
 - If meets expectation, change order could be implemented directing the Pilot Program Contractor to install the remainder of the meters.
- Otherwise:
 - The project could be repackaged, a new request for quals from submissions top three are chosen and invited to bid on the remaining installs.
 - PRIME AE to provide part time construction oversight, inspection, and coordination.

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- Installation to be implemented across five zones. Installation of 20 percent user meters to occur in each zone, each phase. It is reasonable that at least 20 percent of the users will be open and available to the installation of water meters. Successively becoming more difficult with each 20 percent round. It is predicted that depending on contractor staffing, and meter availability, it is preliminarily estimated 2,400 meters may be installed each one to two-year phase. Resulting in Universal Metering in 5 to 10 years following award.

Condition #14 also emphasizes that:

- Source Meters are to read at a minimum of a weekly basis, and records kept of those readings.
 - This will continue.
 - Also of note, Source Meters are calibrated twice annually.
- User Meters: customer service meters are to be read, and records kept of those readings at least once a year.
- The Town of Rotterdam [Permittee] must maintain records of production (master meter readings) and consumption (service meter readings) for each calendar year.

Condition #15 - Meter Calibration

Approach to comply with Condition #15 – Meter Calibration

The Town is required to have all meters calibrated at a frequency described in the WWP. The Source Master Meters measuring volume out both pipes supplying the entire water distribution system, are calibrated for accuracy twice annually. Records will be kept documenting calibrations.

Small service connection meters less than or equal to one-inch diameter (1" Ø) must be calibrated for accuracy at least once every 15 years.

Calibration must meet standards for the size of the meter used as promulgated by the American Water Works Association (AWWA)^x

Condition #17 – Conduct Water Audits

Approach to Comply with Condition #17 Conduct Water Audits: At least once annually, the permittee must conduct a systemwide water audit that utilizes metered water production and consumption data to determine unaccounted-for water.

In its simplest of forms, water supplied to the system would equal the water used. Statistically speaking, even with the tightest of systems, this is rarely the case. There is almost always source meters reading higher than cumulative user meters. Several reasons are postulated for this discrepancy including, accuracy variation between larger and smaller meters, losses at hydrants not always metered, losses for fire suppression, and water losses from line flushing.

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That said, there is a measurable difference between measured source volumes and measured user volumes. Compared year to year, should this data show an unexpected change to this difference, this information can aid greatly in tracking down leaks, pipe narrowing, and/or obstructions across the system.

With the addition of pressure volume sensors, strategically placed across the distribution network, monies and Town resources can be more efficiently utilized in providing the highest, most cost-effective water system practicable.

With this understanding, as well as Condition #17 of the WWP, the Town will conduct systemwide water audits at least annually. These water audits will utilize metered water production and consumption data to aid in determining unaccounted-for water.

Condition #18 – Leak Detection and Repair Program

Approach to Comply with Condition #18 - Leak Detection and Repair Program:

The Town will develop a leak detection and repair program. Condition #18 dictates the permittee must develop and implement a leak detection and repair program that uses sonic detection equipment to inspect its entire distribution system in a systematic fashion. At a minimum, this program must cover the entire system in a three-year cycle by inspecting at least one-third of the system each year. Whenever two consecutive annual water audits show that unaccounted-for water is 15 percent or less of system production, the leak detection and repair program may be modified to cover the entire system in a longer cycle. Dependent upon additional research, funding, policy, and code, this program may take several years to implement.

Condition #19 – Water Metering and Leak Detection Compliance

Approach to Comply with Condition #19 - Summation: Above in this report is a plan that outlines steps required to meter all sources of water and users of water throughout the Town of Rotterdam's water supply and distribution system. Funding and financial planning are the heart pulse of this plan. Without funding, this plan cannot reach fulfillment of its goals. Some preliminary funding mechanism, and options are provided in the epilogue below.

Timeline:

Fund Pilot Program and Preliminary Design	2 to 4 years
Pilot Program, Design, award, implement:	2 to 4 years
Detail Design & Bid Documents (Across 5 zones):	1 to 2 years
Bid, Contract Award, Install 12,000 meters:	10 to 15 years

Total Duration of Plan may be up to 20 years. The plan may be fast-tracked or delayed dependent upon level of funding.

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CONCLUSIONS

On behalf of the Town of Rotterdam, PRIME AE offers this plan outlining steps to be taken to comply with Water Permit Conditions 14, 15, 17, & 18^{xi}. The plan is divided into discrete Tasks. See Table #1 above. Each task is providing an approximate realistic duration, engineers' opinion of costs, and the interdependence of one task with another. We perceive the complete installation of water meters to be achievable within 20 years.

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EPILOGUE

Below you will find discussion and information pertaining to Funding, System Statistics, Policies & Codes, Phasing, and End Note References and links to attached exhibits.

Financial Options for Metering: The most common funding practices include the following^{xii}

- Universal metering reserve fund – Part of the revenues collected from the flat rate structure allocated to a specific universal metering fund.
- User pay: End users cover the supply and installation cost of water meters, either up front or on utility bill financing.
- Third party financing: Many private companies offer supply and installation programs with appropriate financing options to amortize the universal metering program over several years.
- State and Federal infrastructure programs: Utilities may qualify for water infrastructure grants associated with the installation of water meters.
- A combination of any of the above.

Funding is the keystone piece of this implementation plan. Implementation of Universal Metering cannot occur without funding and support.

State and Federal Aid Is Limited^{xiii}

Given the high cost of major water system repairs and upgrades, local governments often look for federal and state funding to defray these costs. This funding is limited, but there are some recent initiatives that local officials should be aware of.

- Most of the state funding for local water projects comes from the Drinking Water State Revolving Fund (DWSRF), which provides low-cost financing for such improvement projects throughout the State. DOH and the Environmental Facilities Corporation jointly administer this fund. As borrowers pay back the revolving fund's loans, the money becomes available for new projects. The DWSRF can provide market rate financing, reduced interest rate loans, and limited grants for eligible water system projects. The EPA administers the federal money that primarily funds this program.
- Since its establishment in 1996, the DWSRF has assisted public water systems with over \$5.24 billion in financing for drinking water infrastructure throughout the State, although only \$337 million of this was in grants. However, 95 percent of the drinking water infrastructure improvement projects submitted to the DWSRF have received no assistance of either kind.
- The DWSRF has also financially supported the proper training and certification of water system operators.

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- In response to the significant need for water infrastructure funding (both drinking water and wastewater), the State established the NYS Water Infrastructure Improvement Act (Water Grants Program) in 2015. To date, this program offered a total of \$107.5 million in drinking water grants in State fiscal years 2015-16 and 2016-17, just a small fraction of the decade-old, \$39 billion estimate by DOH for work needed over 20 Years.
- The EPA also administers the Water Infrastructure Finance and Innovation Act (WIFIA), which operates in coordination with the DWSRF in order to provide subsidized funding for large projects.
- The Executive Budget for State Fiscal Year 2017-18 proposes a \$2 billion capital appropriation for water quality improvements, providing \$400 million in spending authority annually over five years. The proposal would provide financing for drinking water and wastewater infrastructure upgrades, land acquisition to protect water sources, replacement of lead-contaminated drinking water lines, and remediation of drinking water contamination from solid waste sites. Part of the appropriation would fund a new Regional Water Infrastructure Grants Program that would provide State assistance to municipalities, public benefit corporations and public authorities for water infrastructure projects that have a regional impact.

The Clean Water Infrastructure Act of 2017

The Clean Water Infrastructure Act Provides funding to improve municipal drinking water, improve wastewater treatment infrastructure, expedite the cleanup of hazardous waste that may impact drinking water, and support green infrastructure. The Act is funded at \$2.5 Billion^{xiv}

New York State Regional Water Infrastructure Grants Program

Provides up to \$10 Million for grants to counties and municipalities wastewater infrastructure projects that have a regional impact and demonstrate efficiencies.

Projects must benefit multiple municipalities and may include shared infrastructure, consolidation or interconnection of systems from multiple municipalities. Below you will find additional System Statistics.

System Statistics

Rotterdam is currently divided into three water districts: #3, #4, and #5^{xv}:

Water District #5: contains the most users: ± 11,486 of which 11,102 are not metered.

Commercial Users

- metered commercial users: ±309
- metered ad.hoc commercial users: ±59
- non-metered commercial users. ±98

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Residential Users

- County Line Road: ±11
- Rynex Corners Road: ±5

Water Districts #3 and #4: total number of users ±609 – of which 595 are not metered.

Commercial Users

- metered commercial users: ±10
- metered ad.hoc. commercial users: ±4
- non-metered commercial users. ±19

Residential Users

- No residential Users within Water Districts 3&4 are metered.

Water use data: Provided by The Utility

Water District #5

- Average daily consumption:^{xvi}
 - o 2016 4,052,739 [Gallons]
 - o 2017 3,718,512 [Gallons]
 - o 2018 4,049,222 [Gallons]
 - o 2019 3,401,865 [Gallons]
- Total Yearly Consumption:
 - o 2016 1,483,359,000 [Gallons]
 - o 2017 1,258,777,000 [Gallons]
 - o 2018 1,479,827,000 [Gallons]
 - o 2019 1,234,847,000*[Gallons]*- not including December.
- Total number metered services: 398
- Total number of unmetered services ~11,697

Budgeted Appropriations for Water District 5:

The Town^{xvii} Water District 5 –Operation and Maintenance [O & M]^{xviii}

- 2018 O & M^{xix}: \$1,936,873
- 2017 O & M: \$1,644,791
- 2016 O & M: \$1,661,004

Water Bills

The Town currently issues annual water bills to ±11,697 nonmetered users, ±398 metered, averaging out to approximately 3.5% of all known users metered. There is some evidence there are an additional 7,638 users not currently billed.

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Metering: Code, Policy, Procedures, and Collections

The Town of Rotterdam is currently drafting a Water Meter Policy & Procedures Guidance Document^{xx}. The stated purpose of this DRAFT “policy is to outline the requirements associated with water meters water meter readings, and billings. This policy applies to all existing and new water meter users.”

AWWA guidelines and Standards bolstering the continued improvements to the Town’s Water Utility as it strives to comply with Universal Metering compliance.

Federal laws, including the Safe Drinking Water Act (SDWA), and EPA regulations set the basic regulatory structure and standards.

The Town Code, as it regards to water meters, is included herein for relevancy.

Code: Town of Rotterdam, NY Schenectady County §267 Water

§267-9 I (1-12) Water meters ^{xxi}

- 1) All commercial users shall have water meters. The Department of Public Works reserves the right to order a meter to be placed on any service or to take out a meter and place the consumer on a flat rate whenever, in the opinion of the Department of Public Works, it is for the best interests of Water District to do so. All water passing through a meter will be charged for, whether used or wasted.
- 2) Service in good condition. No meter shall be installed by the Department of Public Works unless the service, service fixtures, and plumbing, adjacent to the proposed location of the meter, are in a good and serviceable condition. The curb box must be readily accessible, the curb cock, stop and waste cock in good working order, and any rusty or unsafe pipes next to the proposed location of the meter replaced. The owner, as shown on the latest assessment roll of the Water District, of the premises in which meter is to be installed, shall be notified in writing by mail addressed to him at such premises of any required repairs under this rule, and if repairs are not made within 10 days.
- 3) Check valves, test tees and bypasses. All meters installed by the Department of Public Works shall have check valves placed next to outlets to prevent hot water from backing through the meter. All services that are metered and require check valves to prevent hot water from backing through the meter shall be supplied, connected and fitted with such check valves up to and including meters of 1½ inches in size by the Department of Public Works. Services requiring a meter over 1½ inches in size, and furnished by the property owner, may be installed by the Department of Public Works, but if check valves are required, same are to be installed by the property owner. All sizes above ¾-inch shall have a test tee next to the outlet of meter and the full size of same, then the check and another valve so that meter can be tested at any time in place. If the owner of premises so desires, meters two inches or larger in size may be installed with bypasses so that meters may be removed for testing, or repairs made without hindering the supply of water.

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The expense of such bypasses and additional work shall be borne by the owner. All such bypasses shall be locked and sealed and under the exclusive control of the Department of Public Works.

- 4) Removal. No meter shall be removed or disturbed without the written permission of the Department of Public Works.
- 5) Testing. Persons making complaints as to the correctness of meter bills and claiming to be overcharged can, by applying at the Department of Public Works within 10 days after meter bills have become due, have the meter examined and the dial reread. The Department of Public Works is authorized to correct any charge due to a fault in the meter or to incorrect reading of the dial but shall have no power to reduce meter bills for any other reason whatsoever.
- 6) Reading of meters. Meters will be read semiannually by regular authorized agents of the Department of Public Works. Bills shall be rendered at such periods of the year as the Water Bureau may direct.
- 7) Schedule bills. All bills for water furnished at schedule rates will be payable annually in advance at the office of the Receiver of Taxes on the 15th day of January in each year. For an intermediate period or for a new or additional service, the bill must be paid before the water is turned on.
- 8) Meter bills. Bills for metered water will be payable annually, on the 15th day of January of each year, at the office of the Receiver of Taxes.
- 9) Special bills. All special bills and charges for services rendered, material sold or expenses incurred by the Department of Public Works in connection with the enforcement of these rules and regulations must be paid at the office of the Receiver of Taxes within 30 days after the bill is rendered. The supply of water may be shut off from the premises with reference to which such charges become due in default of payment of such bills or charges and until bills and charges are paid.
- 10) Default in payment of meter bills. In the case of default of payment for the period of 30 days of a meter bill after the same is due, the Department of Public Works may shut off the water supply at the premises to which such bill relates until such bill is paid.
- 11) Delinquent water rentals. All delinquent water rents except meter bills which shall remain unpaid at the expiration of 30 days from due date thereof shall carry penalties and interest charges as provided by law.
- 12) Nonpayment. Wherever the owner of any premises which are supplied with water shall be charged for water supplied, services rendered, material furnished or expense incurred by the Department of Public Works pursuant to these rules and regulations, and said charges are not paid and the water shall be turned off on account of such nonpayment, no application for water services for such premises need be granted by the Department of Public Works (notwithstanding the said premises may have changed ownership) until such charges shall have been paid in full to the Receiver of Taxes. Further, if water service is not turned off on account of such nonpayment, any such unpaid bills will become a lien against the property and will be added to the Town's assessment rolls for collection.

Town of Rotterdam

Universal Water Metering Implementation Plan

§267-9 O. Commercial Use.

- 1) Definitions. As used in this subsection, the following terms shall have the meanings indicated:

COMMERCIAL RATE

The prescribed rate as hereinafter set forth for the consumption of water by users other than private consumers and applicable to metered premises where owners or occupants in the course of their occupation or in the conduct of their business use and consume large quantities of water.

COMMERCIAL USER

Any person, firm or corporation consuming a large quantity of water in the course of his or its business or trade carried on the premises.

- 2) Sale of water to commercial users.
 - (a) All commercial users, as defined in this section, are hereby required at their own cost and expense and under the supervision of the Department of Public Works to install on the premises a water meter, which meter shall be the property of Water District and not of the consumer, and may be removed by any authorized employee of Water District for repairs and/or Department of Public Works of supply of water to the premises.
 - (b) Upon installation of the meters as aforesaid, the water will be supplied in bulk to the metered premises and charged at the following rate:
 - [1] Basic rate: the rate fixed for private use.
 - [2] Surcharge is superimposed upon the basic rate.
 - [3] An amount in addition thereto shall be charged as follows.
 - [4] Metered water rate:
 - [a] Minimum charge including first 75,000 gallons: \$25.
 - [b] Next 112,500 gallons at \$0.14 per 750 gallons.
 - [c] Next 187,500 gallons at \$0.13 per 750 gallons.
 - [d] Remainder at \$0.12 per 750 gallons.
 - [5] Collection. Water rents will be collected January 15 of each year. Rates are subject to change without notice. Delinquent water rents shall be levied and collected as prescribed by Section 198 of the Town Law.

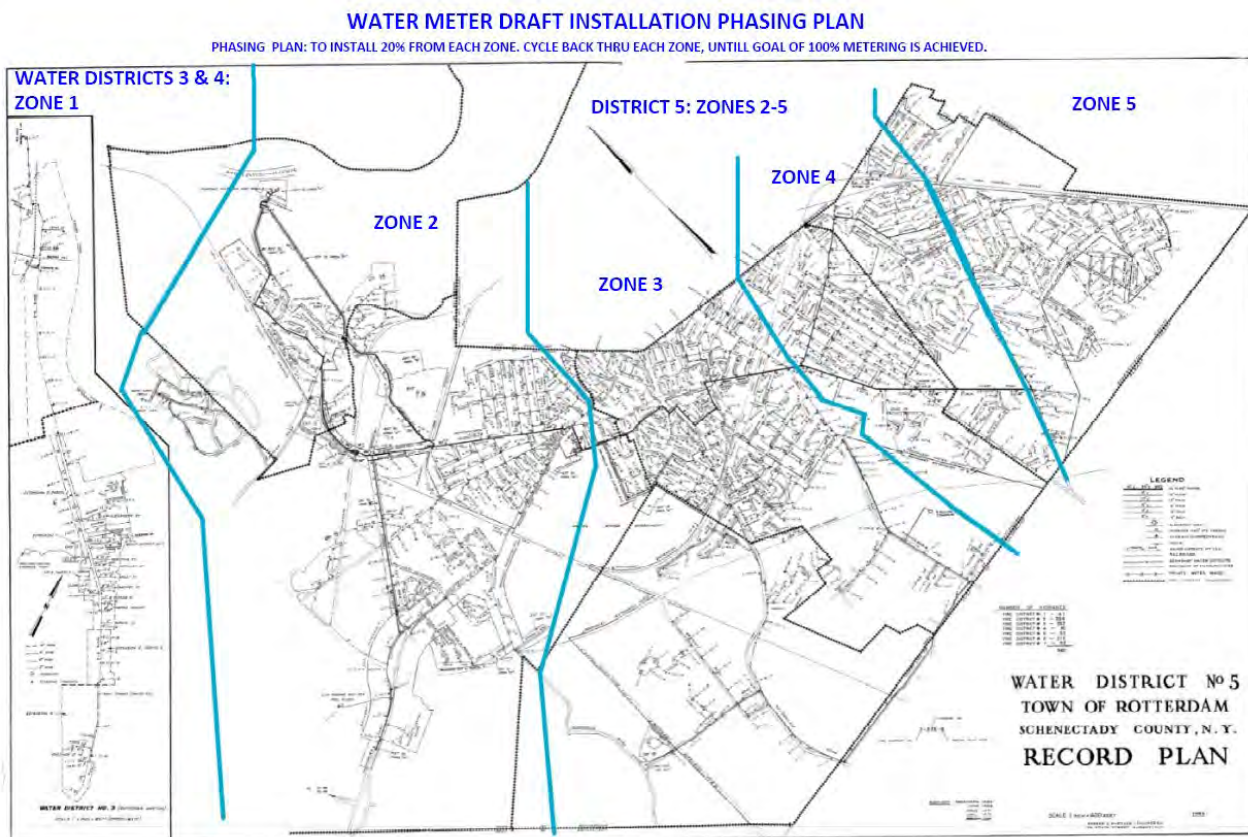
§267-9 P. Should the Department of Public Works determine that water conservation is needed for the health, safety and welfare of the Town, the Town Supervisor may declare the need for water conservation and impose water restrictions, including but not limited to the restriction of water use outside the residence or commercial property.

Town of Rotterdam Universal Water Metering Implementation Plan

- It is policy that Industrial and Commercial users must install water meters.
 - These water meters should read in gallons.
 - These meters are read annually, and should they be found not functioning, the Town Issues a notice to repair.
- Residential Users within water districts are not currently metered.
 - Although those outside the water districts are required to install meters.
- Town of Rotterdam Code Chapter 267 Water:
 - Requires Commercial / industrial meters,
 - Residential Users within water districts are not currently required to install meters.

A sketch of the phasing plan is located below in **Figure 1** below and Exhibit D.

Figure 1:



Phasing: Knowing we are looking at the installation of approximately 12000 meters user service: it quickly becomes clear the installation will need to be phased. Attached is draft Water Meter Installation Phasing Plan mapping of Zones. 20% installation will be achieved in successive zones 1 – 2 – 3 – 4 – 5- 1 -2 – 3 -.... To reach the goal of 100 percent metering.

Town of Rotterdam

Universal Water Metering Implementation Plan

Note it is not in the scope of this outline to determine the exact number of meters to be installed in each phase: only to say the division of zones is based partially on physical boundaries and landmarks as well as an approximation of equality in numbers across the zones. The rationale for 20% incrementation is founded on the realization that there will be some users more accepting of the new installation of meters... it will take others still longer ...

Phasing Plan^{xxii}.

ⁱ See Exhibit A: Water Withdrawal Permit– Article 15, Title 15:ID 4-4228-00294/0001 Effective Date 10/10/2019 and its 24 conditions.

ⁱⁱ National Guide to Sustainable Municipal Infrastructure

ⁱⁱⁱ See Exhibit A: Water Withdrawal Permit

^{iv} See Exhibit O: Glossary

^v See Exhibit M: Office of the New York State COMPTROLLER: Drinking Water Systems in New York: The Challenges of Aging Infrastructure

^{vi} See Exhibit J: PRIME AE Group, Inc.: Town of Rotterdam Water Distribution System Hydraulic Model

^{vii} See Exhibit O: Glossary SCADA: Supervisory Control and Data Acquisition system.

^{viii} See Exhibit C: Town of Rotterdam Water Meter Installation Program (MIP) Frequently Asked Questions [MIP-FAQ]

^{ix} See Exhibit L: Draft Town of Rotterdam Water Meter Policy & Procedures

^x See Exhibits E & F: AWWA Manual M6: Water Meters- Selection, Installation, Testing, and Maintenance. & Addendum to AWWA Manual M6. (November 2018)

^{xi} See Exhibit A: Water Withdrawal Permit– Article 15, Title 15:ID 4-4228-00294/0001 Effective Date 10/10/2019 particularly Conditions 19, 14, 15, 17, and 18.

^{xii} National Guide to Sustainable Municipal Infrastructure

^{xiii} See Exhibit M: Office of the NYS Comptroller Drinking Water System in New York: The challenges of Aging Infrastructure: 02/2017

^{xiv} See Exhibit N: New York State Association of Counties: Clean Water Infrastructure in New York State 12/04/2017

^{xv} See Exhibit B: Town Water Districts 3, 4, & 5 Map.

^{xvi} See Exhibit K: Monthly Gallon Consumption 2016-2019

^{xvii} See Exhibit O: Glossary: The Town - The Town of Rotterdam

^{xviii} See Exhibit K: Rotterdam Water Consumption Averages and Operations and Maintenance Budgets

^{xix} See Exhibit O: Glossary

^{xx} See Exhibit L: Draft Town of Rotterdam Water Meter Policy & Procedures

^{xxi} See Exhibit I: Town of Rotterdam NY Code Water Chapter 267

^{xxii} See Exhibit D: Water Meter Draft Installation Phasing Plan

See Exhibit G: Town of Rotterdam 2018 Water Quality Report

See Exhibit H: Source Meter Cut Sheets: Honeywell ST3000



Exhibits:

- A: Town of Rotterdam Water Withdrawal Permit Effective 10/10/2019
- B: Town of Rotterdam Water Districts 3, 4, & 5.
- C: Town of Rotterdam Water Meter Installation Program Frequently Asked Questions [MIP-FAQ]
- D: Zone Water Meter Installation Phasing Plan Diagram
- E: AWWA Manual M6: Water Meters- Selection, Installation, Testing, and Maintenance.
- F: Addendum to AWWA Manual M6. (November 2018)
- G: Rotterdam 2018 Water Quality Report
- H: Source Meter Cut Sheets: Honeywell ST3000
- I: Town of Rotterdam NY Code Water Chapter 267
- J: PRIME AE Group, Inc.: Town of Rotterdam Water Distribution System Hydraulic Model
- K: Rotterdam Water Consumption Averages 2016-2019
- L: Town of Rotterdam DRAFT Water Meter Policy and Procedures.
- M. Office of the NYS Comptroller Drinking Water System In New York: The Challenges of Aging Infrastructure: 02/2017
- N. NYSAC Clean Water Infrastructure in New York State: 12/04/2017
- O. Glossary of Terms and abbreviations

EXHIBIT A
TOWN OF ROTTERDAM WATER WITHDRAWAL PERMIT
EFFECTIVE 10/10/2019



PERMIT
Under the Environmental Conservation Law (ECL)

Permittee and Facility Information

Permit Issued To:
TOWN OF ROTTERDAM
1100 SUNRISE BLVD
SCHENECTADY, NY 12306-2922

Facility:
Rotterdam Consolidated WD
Rice Rd
Rotterdam, NY

Facility Location: in ROTTERDAM in SCHENECTADY COUNTY

Facility Principal Reference Point: NYTM-E: 582.883 NYTM-N: 4741.524
Latitude: 42°49'18.5" Longitude: 73°59'09.8"

Authorized Activity:

This permit consolidates the approved sources of supply and water service areas of the Town of Rotterdam. This includes the withdrawal of up to 11,152,000 gallons per day from the sources listed in Water Withdrawal Public Permit Condition No. 1. No other sources of supply should be used without further approval by the Department. All previously issued Water Supply Decisions and Permits to the Town of Rotterdam are hereby superseded by this permit.

Modification #1:

The Town is hereby authorized to take up to 12,000,000 million gallons of water from the Rotterdam Well Field for a total approved withdrawal of 13,152,000 gallons per day until August 31, 2021. The Town must submit a permit modification application for an additional water supply source per Water Withdrawal Public Permit Condition No. 2 of this permit by December 31, 2020.

Permit Authorizations

Water Withdrawal Public - Under Article 15, Title 15

Permit ID 4-4228-00294/00001

(WWA No. 11,969)

New Permit

Effective Date: 10/6/2017

Expiration Date: 10/5/2027

Modification # 1

Effective Date: 10/10/2019

Expiration Date: 10/5/2027

NYSDEC Approval

By acceptance of this permit, the permittee agrees that the permit is contingent upon strict compliance with the ECL, all applicable regulations, and all conditions included as part of this permit.



Permit Administrator: ANGELO A MARCUCCIO, Deputy Regional Permit Administrator
Address: NYSDEC Region 4 Headquarters
1130 N Westcott Rd
Schenectady, NY 12306

Authorized Signature: _____

Date 10/10/2019

Distribution List

Erik Schmitt, DOW, DEC CO
Derek Thorsland, RWE, DEC R4
Jamie Malcolm, DOW, DEC R4
Mickey Maher, Town of Rotterdam
Ian Bonthron, Town of Rotterdam
Tom Bates, PRIME AE
Peter Barber, Supervisor, Town of Guilderland
Scott Alderman, BWSP, NYSDOH
David Phillips, BWSP, NYSDOH
Dominick DiCarlo, Schenectady County DOH

Permit Components

WATER WITHDRAWAL PUBLIC PERMIT CONDITIONS

GENERAL CONDITIONS, APPLY TO ALL AUTHORIZED PERMITS

NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

Permit Attachments

General Map

4/19/2019

WATER WITHDRAWAL PUBLIC PERMIT CONDITIONS

1. Source Approval Table

This table summarizes all system source approvals:



Well Field or Water Supply	Well Number	Status	WSA/ WWA Number	Individual Source Capacities in gallons per minute (gpm)	Maximum Permitted Well Field Capacities in gallons per day (gpd)
Rotterdam Well Field ⁽¹⁾	Well No. 1	Active	2,150	1,200 gpm	12,000,000 gpd ⁽²⁾
	Well No. 2	Active	2,150	2,083 gpm	
	Well No. 3	Active	2,150	2,100 gpm	
	Well No. 4	Active	7,788	2,100 gpm	
	Well No. 5	Active	11,969	3,000 gpm	
Main Street Well Field ⁽³⁾	Well No. 1	Active	1,781	300 gpm	1,152,000 gpd
	Well No. 2	Active	3,348	500 gpm	
TOTAL APPROVAL					13,152,000 gpd

1. The Rotterdam Well Field supplies water to Rotterdam-Consolidated Water District Number 5.
2. See Water Withdrawal Public Permit Condition No. 2.
3. The Main Street Well Field supplies water to Rotterdam Water District Number 3.

2. Requirement for an Additional Source An application for an additional water supply source to meet the approved total Daily Withdrawal and to meet the redundancy requirement must be filed with the Department no later than December 31, 2020. The pumping test for this well must follow the Department's Pumping Test Procedures for Water Withdrawal Permitting. Prior to starting work on any construction, NYS Department of Health Approvals, must be in place and filed with the NYSDEC Regional office.

3. Approval of Plans by NYS DOH Contract plans and specifications, or changes thereto, for a public water supply system for which a permit has been issued by the Department are subject to review and approval by the Department of Health prior to the commencement of construction.

4. Approval of Completed Works from NYSDOH The water withdrawal permittee shall submit to the Department a copy of the Approval of Completed Works issued by the Department of Health before the commencement of final operation of the water withdrawal system.

5. Water Sampled and Approved by NYSDOH Before any water from the source(s) approved herein may be used for any purpose, the permittee shall collect and analyze a sample of the water from each source and shall submit the results of such analyses to the NYS Department of Health (NYSDOH).

6. Protect Land Around Well All land within 200 feet of any well approved herein shall be protected and controlled, in order to prevent pollution of the ground or groundwater, by direct ownership of the land, by the acquisition of protective easements, or by other appropriate measures. Any lesser distances must be acceptable to the NYS Department of Health. This area shall further be protected from pollution by surface waters originating outside thereof by the construction of suitable diversion ditches or embankments, and the construction of the wells shall so be carried out that there shall be no opportunity for pollution to enter the wells.

7. Enclose and Protect Pumping Facilities The physical pumping facilities and controls at any well site approved herein shall be protected against damage or tampering either by a fence or other suitable enclosure or by their manner of construction and installation.



8. Service Area Approval Table

This table summarizes all the Town of Rotterdam's Water District approvals (service areas):

WSA/ WWA No.	Modification No.	Name	Approval Date
409	-	Water District No. 1	8/4/1926
1,771	-	Water District No. 1, Ext. No. 1	8/19/1947
1,848	-	Water District No. 1, Ext. No. 2	8/3/1948
1,781	-	Water District No. 3	10/7/1947
1,840	-	Water District No. 3, Ext. No. 1	7/8/1948
3,244	-	Water District No. 3, Ext. No. 2	8/1/1957
3,311	-	Water District No. 3, Ext. No. 3	1/7/1958
6,974	-	Water District No. 3, Ext. No. 4	6/15/1979
1,763	-	Water District No. 4	6/3/1947
10,386	-	Water District No. 4, Ext. No. 1	10/8/2002
2,150	-	Water District No. 5	1/6/1953
2,338	-	Water District No. 5, Ext. No. 1	4/7/1953
2,353	-	Water District No. 5, Ext. No. 2	5/5/1953
2,354	-	Water District No. 5, Ext. No. 4	5/5/1953
2,436	-	Water District No. 5, Ext. No. 3	11/17/1953
2,999	-	Water District No. 5, Ext. No. 6	6/12/1956
3,095	-	Water District No. 5, Ext. No. 7	11/8/1956
3,455	-	Water District No. 5, Ext. No. 8	8/5/1958
3,869	-	PSA: Cook Property, Duanesburg Road	8/23/1960
5,898	-	Water District No. 5, Ext. No. 9	12/28/1970
5,978	-	Water District No. 5, Ext. No. 10	8/26/1971
6,237	-	Water District No. 5, Ext. No. 11	4/2/1973
6,871	-	Water District No. 5, Ext. No. 13	7/10/1978
7,458	-	Water District No. 5, Ext. No. 14	9/14/1984
7,479	-	Water District No. 5, Ext. No. 15	5/8/1985
8,110	-	Water District No. 5, Ext. No. 16	2/13/1989
8,111	-	Water District No. 5, Ext. No. 17	2/13/1989
8,359	23	Consolidated Water District No. 5*, Ext. No. 18	10/31/1989
8,813	25	Consolidated Water District No. 5*, Ext. No. 19	10/14/1992
8,814	26	Consolidated Water District No. 5*, Ext. No. 20	10/14/1992
10,290	27	Consolidated Water District No. 5*, Ext. No. 21	6/26/2002
10,438	28	Consolidated Water District No. 5*, Ext. No. 22	3/31/2004
10,627	29	Consolidated Water District No. 5*, Ext. No. 23	3/11/2005
*WWS No. 8,359 consolidated Water Districts No. 1, 4, & 5 (all previously approved).			



9. Map of Approved Water Supply Service Area The approved water service area of the Rotterdam Water Supply Area is shown on a map submitted with this application entitled, "Town of Rotterdam Water Districts", by C.T. Male & assoc., dated April 1971; and "Town of Rotterdam Water District 4" by C.T. Male & assoc. and dated October 18, 2002.

10. Treatment Before Distribution Nothing contained in this permit shall authorize the permittee to supply, sell or distribute, for any purpose, water from any source approved herein unless all such water is first treated in a manner satisfactory to the NYS Department of Health (NYSDOH).

11. No Distribution Beyond District Without Approval Nothing contained herein shall authorize the permittee to distribute water to any water district extension or out of district user that has not already been approved by the Department or its predecessors without first obtaining a further permit from the Department.

12. Discharge of Chlorinated Water The permittee shall ensure that water used for disinfecting water mains, storage tanks and other water system appurtenances, if discharged to area streams, has a free chlorine residual not exceeding 0.05 milligrams per liter (mg/l) at the point of discharge.

13. Minimize Erosion During any construction directly or indirectly associated with the activities authorized herein, the permittee shall make provisions to minimize erosion on the construction site and to prevent increased sedimentation in any water body on or adjacent to the site.

14. Meter All Sources and Customers The permittee must install and maintain meters on all sources of supply used in the system and on all customer service connections supplied by the system. Source master meters are to be read, and records kept of those readings on a weekly basis. At a minimum, customer service meters are to be read, and records kept of those readings, at least once per year. The permittee must maintain records of production (master meter readings) and consumption (service meter readings) for each calendar year.

15. Meter Calibration for Publicly Owned Systems At least once every fifteen years, the permittee must have all of its small service connection meters (less than 1-inch in diameter) calibrated for accuracy according to standards of the American Water Works Association (AWWA). Larger service meters and all source meters must be calibrated more frequently, based upon the AWWA standards for the size of the meter used.

16. Permittee Must Maintain Records The permittee must retain records of production and consumption, reports of audit results, and summaries of leaks detected and repaired for at least ten years. The permittee must provide copies of such of these records, reports, and summaries as might be requested in writing by the Department within one month of receiving such a request.

17. Conduct Water Audits At least once annually, the permittee must conduct a system-wide water audit that utilizes metered water production and consumption data to determine unaccounted-for water.

18. Leak Detection and Repair Program The permittee must develop and implement a leak detection and repair program that uses sonic detection equipment to inspect its entire distribution system in a systematic fashion. At a minimum, this program must cover the entire system in a three-year cycle by inspecting at least one-third of the system each year. Whenever two consecutive annual water audits show that unaccounted-for water is 15% or less of system production, the leak detection and repair program may be modified to cover the entire system in a longer cycle.



19. Water Metering and Leak Detection Compliance On or before December 31, 2019, the permittee shall submit a plan for Department review and comment that outlines steps to be taken to comply with Water Withdrawal Public Permit Conditions 14, 15, 17 and 18. A time schedule for water meter installation must be included as part of the plan. Revisions to the plan addressing the Department's written comments shall be resubmitted within 60-days of the date of the written comments. The final plan and schedule will become enforceable under this permit upon written acceptance from the Department.

20. Annual Water Withdrawal Reports The permittee must submit a Water Withdrawal Reporting Form to the Department's Division of Water, Albany, NY by March 31st of each year. The form is available on the Department's website and includes information regarding approved sources of water supply, source capacities, average and maximum day water use data and water conservation and efficiencies employed during the past calendar year.

21. Water Well Protection and Decommissioning The Permittee must properly cap, seal and disconnect from the system any water wells that are not approved for use by the Department. Wells that are to be abandoned must be decommissioned in a manner consistent with the Department's Water Supply Well Decommissioning Recommendations, <http://www.dec.ny.gov/lands/86955.html>. Decommissioning of any potable well must be documented on the form provided at http://www.dec.ny.gov/docs/water_pdf/welldecommissform.pdf. The completed form must be forwarded to the address on the form and to the addresses below:

Regional Permit Administrator
NYSDEC Region 4 Headquarters
1130 N Westcott Rd
Schenectady, NY12306

Regional Water Manager
NYSDEC Region 4 Headquarters
1130 N Westcott Rd
Schenectady, NY12306

22. Transfer of Ownership of Water Withdrawal Systems Unless otherwise specified in this permit, a new water withdrawal permit application is required for the acquisition or condemnation of the approved water withdrawal system.

23. Permit Expiration and Renewal Any permittee who intends to continue to operate a water withdrawal system beyond the period of time covered in the applicable water withdrawal permit must apply for a renewal of the permit at least 30 days prior to its expiration.

24. Right to Rescind The Department reserves the right to rescind this permit or to take whatever action it may deem suitable and proper if the works authorized to be constructed herein are not initiated by December 31, 2021.



GENERAL CONDITIONS - Apply to ALL Authorized Permits:

1. Facility Inspection by The Department The permitted site or facility, including relevant records, is subject to inspection at reasonable hours and intervals by an authorized representative of the Department of Environmental Conservation (the Department) to determine whether the permittee is complying with this permit and the ECL. Such representative may order the work suspended pursuant to ECL 71- 0301 and SAPA 401(3).

The permittee shall provide a person to accompany the Department's representative during an inspection to the permit area when requested by the Department.

A copy of this permit, including all referenced maps, drawings and special conditions, must be available for inspection by the Department at all times at the project site or facility. Failure to produce a copy of the permit upon request by a Department representative is a violation of this permit.

2. Relationship of this Permit to Other Department Orders and Determinations Unless expressly provided for by the Department, issuance of this permit does not modify, supersede or rescind any order or determination previously issued by the Department or any of the terms, conditions or requirements contained in such order or determination.

3. Applications For Permit Renewals, Modifications or Transfers The permittee must submit a separate written application to the Department for permit renewal, modification or transfer of this permit. Such application must include any forms or supplemental information the Department requires. Any renewal, modification or transfer granted by the Department must be in writing. Submission of applications for permit renewal, modification or transfer are to be submitted to:

Regional Permit Administrator
NYSDEC Region 4 Headquarters
1130 N Westcott Rd
Schenectady, NY 12306

4. Permit Modifications, Suspensions and Revocations by the Department The Department reserves the right to exercise all available authority to modify, suspend or revoke this permit. The grounds for modification, suspension or revocation include:

- a. materially false or inaccurate statements in the permit application or supporting papers;
- b. failure by the permittee to comply with any terms or conditions of the permit;
- c. exceeding the scope of the project as described in the permit application;
- d. newly discovered material information or a material change in environmental conditions, relevant technology or applicable law or regulations since the issuance of the existing permit;
- e. noncompliance with previously issued permit conditions, orders of the commissioner, any provisions of the Environmental Conservation Law or regulations of the Department related to the permitted activity.



5. Permit Transfer Permits are transferrable unless specifically prohibited by statute, regulation or another permit condition. Applications for permit transfer should be submitted prior to actual transfer of ownership.

NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

Item A: Permittee Accepts Legal Responsibility and Agrees to Indemnification

The permittee, excepting state or federal agencies, expressly agrees to indemnify and hold harmless the Department of Environmental Conservation of the State of New York, its representatives, employees, and agents ("DEC") for all claims, suits, actions, and damages, to the extent attributable to the permittee's acts or omissions in connection with the permittee's undertaking of activities in connection with, or operation and maintenance of, the facility or facilities authorized by the permit whether in compliance or not in compliance with the terms and conditions of the permit. This indemnification does not extend to any claims, suits, actions, or damages to the extent attributable to DEC's own negligent or intentional acts or omissions, or to any claims, suits, or actions naming the DEC and arising under Article 78 of the New York Civil Practice Laws and Rules or any citizen suit or civil rights provision under federal or state laws.

Item B: Permittee's Contractors to Comply with Permit

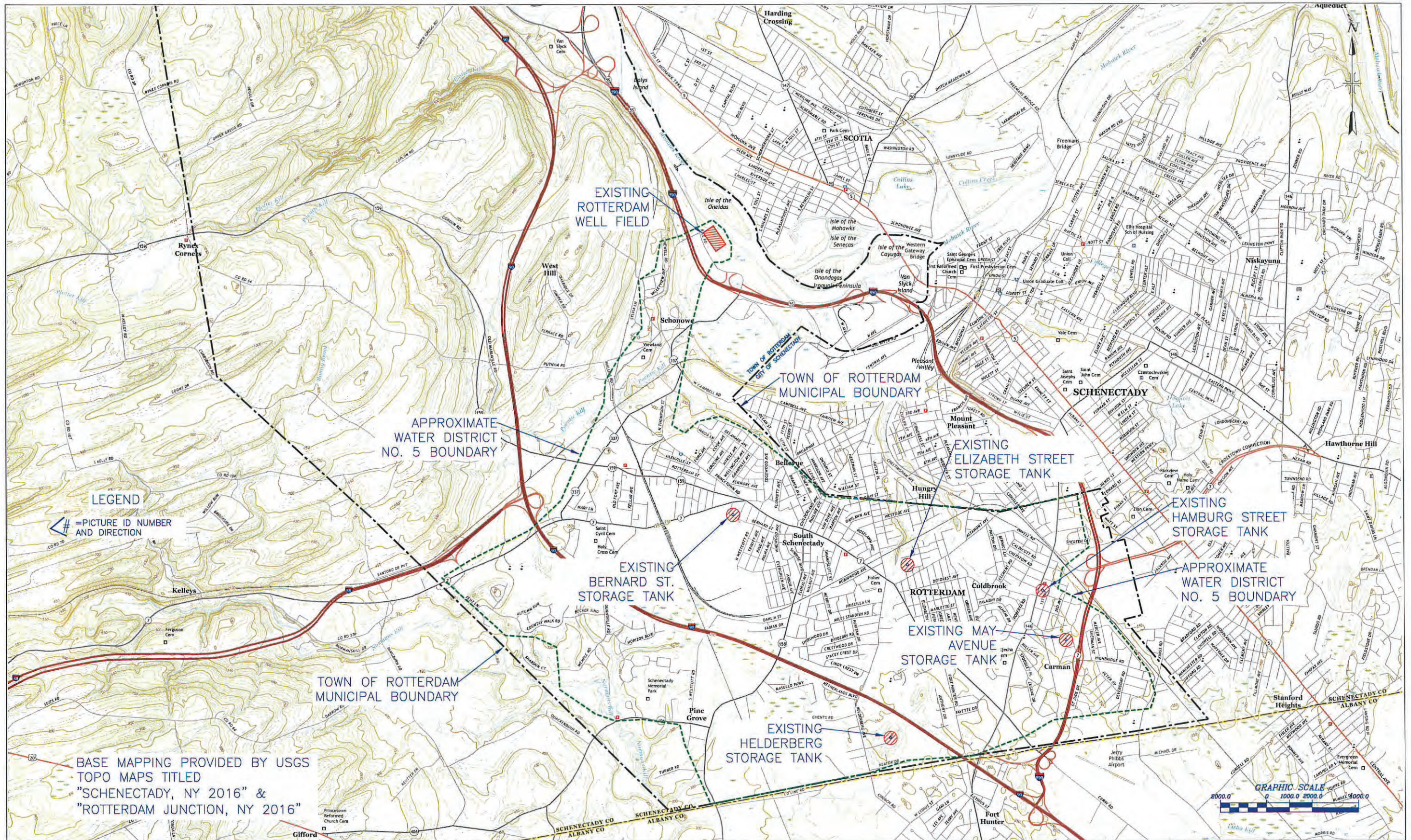
The permittee is responsible for informing its independent contractors, employees, agents and assigns of their responsibility to comply with this permit, including all special conditions while acting as the permittee's agent with respect to the permitted activities, and such persons shall be subject to the same sanctions for violations of the Environmental Conservation Law as those prescribed for the permittee.

Item C: Permittee Responsible for Obtaining Other Required Permits

The permittee is responsible for obtaining any other permits, approvals, lands, easements and rights-of-way that may be required to carry out the activities that are authorized by this permit.

Item D: No Right to Trespass or Interfere with Riparian Rights

This permit does not convey to the permittee any right to trespass upon the lands or interfere with the riparian rights of others in order to perform the permitted work nor does it authorize the impairment of any rights, title, or interest in real or personal property held or vested in a person not a party to the permit.



NO.	DATE	REVISION	BY
00	05/2017	ORIGINAL ISSUE	MAL

Albany Office
 100 Great Oaks Blvd | Suite 114 | Albany, New York 12203
 Ph: 518 382 1774 Fax: 518 382 1776
 www.primeeng.com

PROJ. ENGR.: DPC

DRAWN BY: MAL

CHECKED BY: JMM

UNAUTHORIZED ALTERATIONS TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF NEW YORK STATE EDUCATION LAW

TOWN OF ROTTERDAM
 SCHENECTADY COUNTY

TOWN OF ROTTERDAM
 WATER SYSTEM IMPROVEMENTS

SHEET TITLE:

ROTTERDAM WATER DISTRIBUTION
 SYSTEM USGS OVERALL
 LOCATION MAP

SCALE:
 AS SHOWN

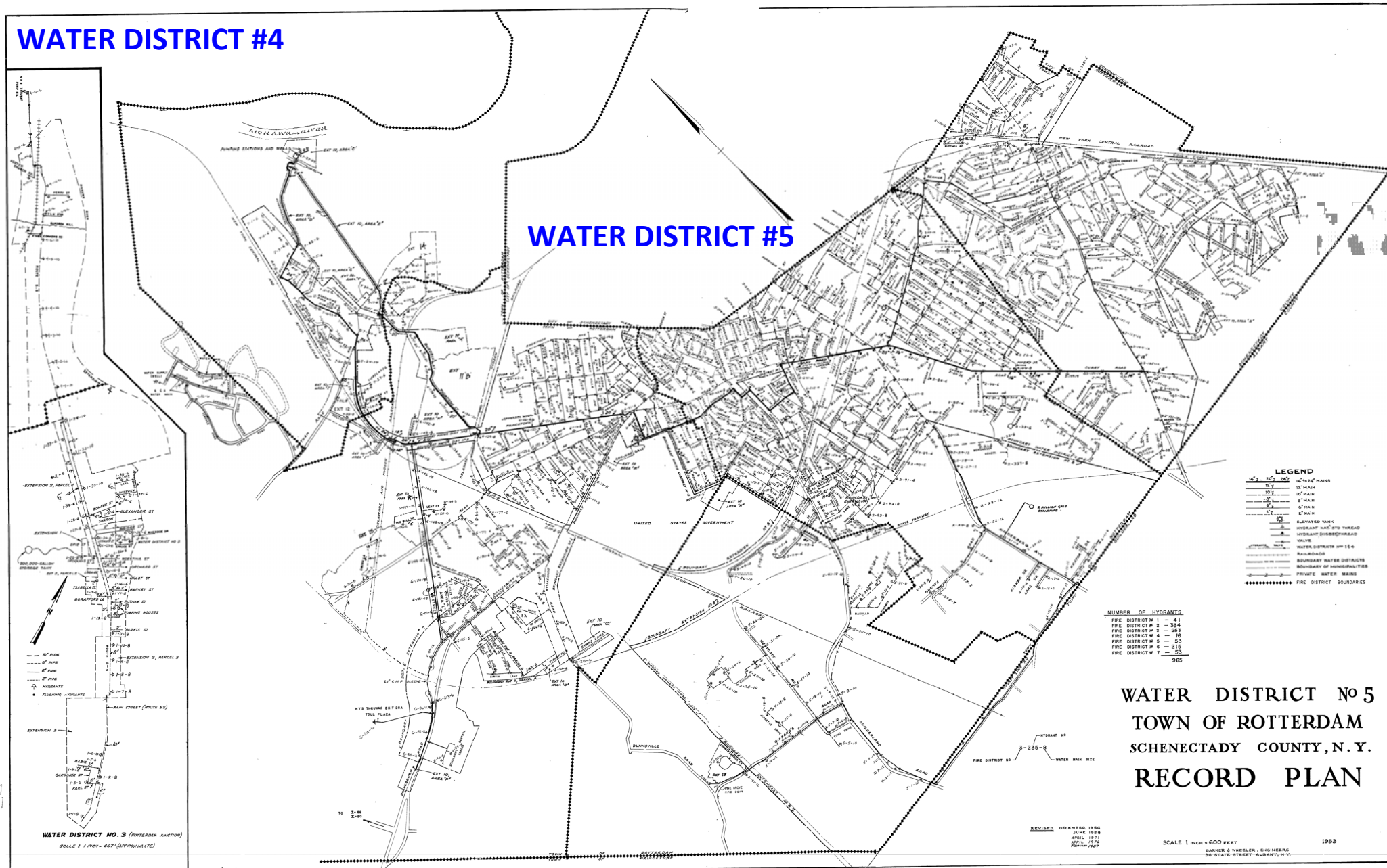
FILE NO.:
 01-1805

DATE:
 MAY 2017

SHEET NO.:
 1

EXHIBIT B
TOWN OF ROTTERDAM WATER DISTRICTS 3, 4, & 5

WATER DISTRICT #3



WATER DISTRICT No 5
TOWN OF ROTTERDAM
SCHENECTADY COUNTY, N. Y.
RECORD PLAN

REVISIONS: DECEMBER, 1950
 JUNE, 1958
 APRIL, 1971
 APRIL, 1976
 February, 1987

SCALE 1 INCH = 600 FEET

BAKER & WHEELER, ENGINEERS
 NEW YORK, N.Y.

EXHIBIT C
TOWN OF ROTTERDAM WATER METER INSTALLATION PROGRAM
FREQUENTLY ASKED QUESTIONS [MIP-FAQ]

Town of Rotterdam
Proposed Water Meter Installation Project [MIP]
Frequently Asked Questions [FAQ]

PLEASE NOTE: This preliminary Meter Installation Program [MIP] Frequently Asked Questions [FAQ] aka: MIP-FACs; Is just that draft preliminary. This MIP-FAC is provided to anticipate questions, comments, and concerns. Several of the responses below are dependent upon type of meters chosen and anticipatory plan structure. Certain language below is Highlighted and font stricken in recognition of these unknowns.

1. *"Why is the water meter project being done?"*

Response: This project will assist with unaccounted for water usage, provide tools for water conservation, re-deploy staff to other needs of the Town and install a new meter or replace existing meters that may be approaching or beyond their recommended service life. These benefits exceed the costs associated with the program and potential disruptions to the customers the project may incur.

2. *"Walk us through the installation process (shutdown to completion)."*

Response: The Contractor will send the customer up to three (3) post cards notifying the residents that they will be in the area and are requesting they call their company to set up an appointment to install or install a new meter or replace their existing meter. The Contractor will go to the residence, inspect the system and take necessary pictures. If the water system is in satisfactory condition the Contractor will exercise the house valve to determine if it is operational. If a good shut down occurs, the Contractor will install a new meter or replace the existing meter ~~and the transmitter unit. The transmitter is turned on and logged into the satellite reader system.~~ The Contractor will complete the installation by turning the house valve back on and cleaning up the work area.

3. *"Am I required to have the meter installed in my property?"*

Response: Yes, all property owners must participate in this program.

4. *"What is being completed?"*

Response: ~~An automated reading system with a~~ Installation of a new meter or replace existing water meters in every home and business in the Town of Rotterdam's Water Distribution System. Using cellular technology similar to systems used by other utilities; the meter will transmit daily data (equivalent to a single line text message) back to the Water Department for its use. The data will contain water consumption and notifications of any issues with the meter.

5. *"Who will be completing the installation?"*

Response: The Town has contracted with *****. to complete the installation of this project.

Town of Rotterdam
Proposed Water Meter Installation Project [MIP]
Frequently Asked Questions [FAQ]

6. *"Is there any flexibility for installation day/time? For example, weekend meter installation."*

Response: Yes, there are opportunities for the contractor to perform work during the early evening hours and on Saturdays. However, these times require authorization by the Town. Since it would be impractical to conduct all the installation during these specialized hours, these time slots are reserved for special circumstances or hardships. We recommend exhausting the normal operational time first before requesting special appointments.

7. *"Do I have to be home during the installation?"*

Response: No, as long as you designate another adult over the age of 18 to be present during the installation, you are not required to be there.

8. *"I unknowingly covered up my meter when I finished my basement. Will the Town uncover the meter and repair the wall?"*

Response: Most residential users do not have an existing meter. Therefore, a new installation. Unfortunately, the Contractor will only install a new meter or replace a meter that is reasonably accessible. You will be responsible for providing reasonable access to any existing meter so as to permit the Contractor to change out an existing meter.

9. *"How much clearance is needed to install the meter?"*

Response: The meter shall be easily accessible to permit the operation of a pipe wrench to remove the meter off the service line. The house valve controlling the flow of water into the structure shall be clear to be shut off. The Contractor must be able to remove the existing meter body and install a new meter or replace it with a new one.

10. *"The unit (reader) installation – will it be installed in the same location, using the same hole in the house?"*

Response: Those residences where this is applicable the new reading endpoint will be installed over the existing external reading unit area so long as this location is easily accessible. The new installation will include a cover to conceal any marks or sealed holes that may exist from the old reader. However, the installer is willing to adjust its location if needed. If necessary, please contact the installer to review prior to scheduled installation.

11. *"Will my water be disrupted or turned off for a period of time?"*

Response: Your water service will only be shut during the install. a new meter or replacement of the meter itself which is estimated to last for less than ~~10~~ 30 minutes for a

Town of Rotterdam
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residential installation.

Commercial installations will be longer due to the size of the meter.

12. *"What if the shut-off valve is stuck (not working)?"*

Response: The Town can turnoff water to the house through the curb stop valve near the main. If we are unable to exercise or locate this valve, the Contractor will deploy a device that will freeze the service line to stop the water flow. This method is an approved industry technique to work on a live service and will not damage the pipe.

13. *"How would I get my information if I do not have a smart phone or computer?"*

Response: You will be able to contact the Town of Rotterdam for information regarding your account. The Town will monitor significant leaks and low temperature alarms it receives and notify the owner.

14. *"What safeguards will be used to protect the computer system or the information from being hacked?"*

Response: The program is operated through a cloud system that is protected through firewalls and other means. This system has similar protections as other critical facilities (banks, retailers, etc.)

15. *"Is it possible for the meter to malfunction?"*

Response: Every electronic and mechanical item is subject to malfunction. However, the specified meter is known for its reliability.

16. *"How does the Town know the numbers are read / transmitted accurately?"*

Response: The meters are calibrated to AWWA Specification by the manufacturer to $\pm 1.5\%$ accuracy at low flow and the information transmitted from the meter is recorded to a file and stored on the meter. The meter also provides readout of the volume consumed at the meter head which can be manually read to verify the information is accurately transmitted or provide data to the town in case of a malfunction of the remote reading system.

17. *"Who will be looking at this information? For example, can people watch to see if homes are unoccupied for a period of time b/c of no water usage?"*

Response: Only select employees of the Town of Rotterdam will have access to individual accounts. Use of the program will be monitored by the Rotterdam Town Board.

18. *"What is the schedule for the installation throughout the Rotterdam Water Distribution System?"*

Town of Rotterdam
Proposed Water Meter Installation Project [MIP]
Frequently Asked Questions [FAQ]

Response: A pilot program install will be implemented. Following which the Installation is proposed to occur in phases. This phasing map will be posted on the Town Website – along with anticipated installation timeline for each of the 5 phase areas. The Contractor will be starting the installation of the new meters within Phase number one as ‘pilot install program’ this will allow for more accurate scheduling for the remaining phases.

19. *“How is the transmitter powered?”*

Response: The transmitter is powered by a small battery in the unit. The battery has a service life of 15 years. The meter will send out an alarm when the battery is dying, permitting the Town to install a new meter or replace the entire transmitter unit located at the exterior of the house.

20. *“Who is responsible for replacing the battery in the transmitter?”*

Response: The Town is responsible for replacing the battery.

21. *“Will the meter read in cubic feet or gallons?”*

Response: All meters are to read gallons.

22. *“What is the lag time from when the meter is installed until the customer can access their account?”*

Response: The anticipated lag time for access to the account is about three (3) weeks after meter installation has been completed. This time may change depending on the installations as we proceed.

23. *“Is the reading technology unsafe?”*

Response: The meters will only broadcast a single line text message for approximately 5 seconds, once between two (2) and three (3) o’clock in the morning. This small amount of cellular service is substantially lower in exposure than most appliances in the home today.

24. *“What happens if the pipes are bad or damaged during installation?”*

Response: The Contractor has a Schenectady County licensed plumber subcontracted for this project.

25. *“Will our water bill be higher? /Will my water consumption increase with the new meters?”*

Response: NOTE this is subject to the final installation plan to determined: response is a part of a tentative preliminary response: Your water bill may increase if your readings were estimated or your existing meter was inefficient or underperforming. Some existing meters are under-reporting the amount of water traveling through the meter.

Town of Rotterdam
Proposed Water Meter Installation Project [MIP]
Frequently Asked Questions [FAQ]

The new meters will have reading accuracies in excess of 98% and your bill may reflect the unaccounted-for water that was unable to be recorded through an existing, underperforming water meter.

26. *“Will the information on the quarterly yearly bill look different?”*

Response: There may be other changes to improve the billing information to assist customers in understanding their bills.

27. *“If I don’t have a smart phone or computer how I will detect a leak?”*

Response: The Town will permit you to authorize a relative or confidant access to your remote account to facilitate the remote viewing and alarm notification of the program. The Town will also monitor any significant potential leaks or temperature alarms and, if needed, notify the customer of any potential issue. The Town will be available to assist the customer if needed.

EXHIBIT D
ZONE WATER METER INSTALLATION PHASING PLAN

WATER METER DRAFT INSTALLATION PHASING PLAN

PHASING PLAN: TO INSTALL 20% FROM EACH ZONE. CYCLE BACK THRU EACH ZONE, UNTILL GOAL OF 100% METERING IS ACHIEVED.

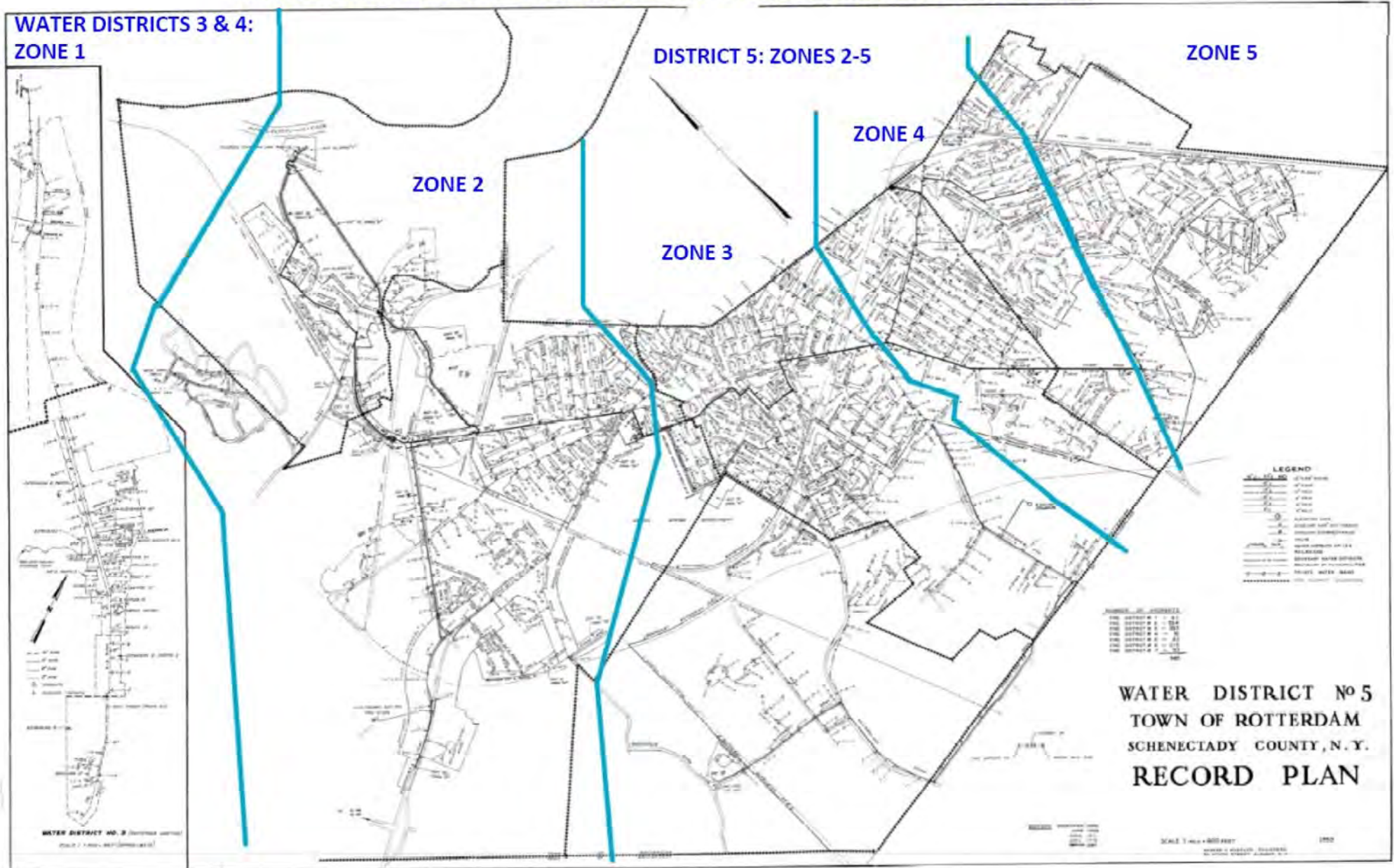


EXHIBIT E
**AWWA MANUAL M6: WATER METERS- SELECTION, INSTALLATION,
TESTING, AND MAINTENANCE**

Water Meters— Selection, Installation, Testing, and Maintenance

AWWA MANUAL M6

Fifth Edition



**American Water Works
Association**



This AWWA content is the product of thousands of hours of work by your fellow water professionals. Revenue from the sales of this AWWA material supports its ongoing development. Unauthorized distribution, either electronic or photocopied, is illegal and hinders AWWA's mission to support the water community.

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Chapter 2

Selecting Meter Types

INTRODUCTION

Selecting water meters for installations serving various types of customers usually presents a problem only when considering commercial or industrial accounts. However, apartment buildings, schools, other large establishments, and the combination of private fire service and general use through a single line (when permitted) also require consideration for satisfactory meter installation.

Selection involves both size and type of meter. Too often, size is chosen merely to match the pipe size; but oversized pipe is often installed to allow for possible future increases in water use or to reduce pressure loss in a long length of pipe. Chapter 3 discusses the method of calculating total friction loss, although the example covers only small services. Based on this principle, plus customer demand information, and pressure-loss data from meter manufacturers' catalogs, the meter size is selected. For example, if a 3-in. (80-mm) meter in a 4-in. (100-mm) line is appropriate, use of a 4-in. (100-mm) meter is inadvisable. It would be unnecessarily expensive, heavy to handle, and less accurate under overall usage conditions. However, it is advisable to provide a suitable transition and extra space in the pipeline and in the meter pit so that a larger meter can be installed later if usage increases.

Undoubtedly, the past tendency to install oversize meters resulted from the desire to use a meter large enough to meet the customer's maximum demands and not to incur additional expense, if a small meter became inadequate. However, with careful study of expected demand, the correct meter size can be determined in advance. A larger meter can be installed later, if necessary, if space is provided at the time of the original installation.

The type of meter to use is determined by the anticipated range of flow rates, plus allowable pressure loss and possible safety requirements (such as fire-service regulations). Several types are available, as shown in Table 2-1. This manual describes only the more common types; information on other meters can be obtained from the respective manufacturers. When calculating flow demand, it is important to consider meter type and suitability for use as a revenue-collecting metering device or a flow-monitoring device.

Table 2-1 Types of meters for water measurement

Type	Usual Range of Sizes	
	<i>in.</i>	<i>mm</i>
I. Displacement		
A. Nutating disc	1/2–2	13–50
B. Oscillating piston	1/2–2	13–50
II. Nondisplacement		
A. Velocity		
Multijet	5/8–2	15–50
Singlejet	5/8–6	15–150
Fluidic oscillator	1/2–2	13–50
Magnetic-pickup turbine	1/4–12	6–300
Turbine	3/4–20	20–500
Propeller	2–72	50–1,800
Proportional	3–12	80–300
B. Differential pressure		
Fixed opening, variable differential		
Orifice	2–24	50–600
Venturi, flow nozzle, flow tube	2–84	50–2,100
Pitot tube	Unlimited	
Variable opening, fixed differential rotameter	1/4–4	6–100
C. Electronic velocity		
Electromagnetic	1/10–72	2–1,800
Ultrasonic	1/2–72	13–1,800
D. Level measurement		
Weir, Parshall flume, etc.	Unlimited	
III. Compound		
A. Standard compound	2–8	50–200
B. Fire service	3–12	80–300

SMALL FLOWS

In the United States and Canada, the standard meter in 2-in. (50-mm) and smaller sizes has been the displacement meter, of which there are two variations, the nutating piston (disc) and the oscillating piston. Essentially equal in performance, these meters have proven by experience to be unrivaled for their combination of accuracy, long life, simple design, moderate cost, and easy maintenance. Tens of millions of these meters are in use. Since the 1960s, multijet meters have been successfully used in the same applications. Multijet meters are covered in ANSI/AWWA C708, Standard for Cold-Water Meters—Multijet Type.

In the 1990s, singlejet technology was introduced from Europe. Singlejet meters have since been in use for small-meter applications. These meters are covered in ANSI/AWWA C712, Standard for Cold-Water Meters—Singlejet Type, the first edition of which was approved in 2002.

In addition, major advancements have been made in the area of small electronic meters designed primarily for residential service. These include the fluidic-oscillator, ultrasonic, and electromagnetic meters.

The standard for fluidic-oscillator meters is ANSI/AWWA C713, Standard for Cold-Water Meters—Fluidic-Oscillator Type. ANSI/AWWA C750, Standard for Transit-Time Flowmeters in Full Closed Conduits, addresses transit-time ultrasonic

flowmeters used in a variety of applications as flow-monitoring devices (rate measurement); it does not apply to revenue-collecting metering devices specifically. As of 2012, AWWA does not have a standard for electromagnetic meters.

Most residential services are metered with the $\frac{5}{8}$ -in. (15-mm) size having $\frac{3}{4}$ -in. (20-mm) connections. For information on capacity in relation to pressure loss, see chapter 3. Note that normal flows should not be more than approximately one-half of the maximum capacity if long life is the objective.

Today, small magnetic-drive meters have very low pressure loss and a much longer life than older models.

MEDIUM FLOWS

For services that can be metered with $1\frac{1}{2}$ -in. (40-mm) meters, the displacement, multijet, or singlejet meter can be used. The low-flow accuracy of modern $1\frac{1}{2}$ -in. (40-mm) meters is excellent, and compound meters are not usually manufactured in sizes less than 2 in. (50 mm). Where low-flow accuracy is not important, as in services used only for filling tanks at rapid flow, the $1\frac{1}{2}$ -in. (40-mm) turbine meter may be operated safely at a higher average rate than the displacement meter.

The 2-in. (50-mm) displacement, multijet, turbine, singlejet, and compound meters have their places and their advocates. Those who prefer the displacement meter have indicated that it is simpler to use, is lower in cost, and records consumption remarkably well at low flow rates. Proponents of the compound meter emphasize that it is more accurate on very low flows or leaks and has lower pressure loss at high flow rates. Proponents of the multijet and singlejet meters emphasize their quiet operation and their ability to pass dirt particles and other entrained flow debris. The life expectancy of any meter will be greatly limited if exposed to excessive debris.

The choice between compound and turbine meters in 3-in. (80-mm) to 4-in. (100-mm) sizes appears to be determined by the average flow rates to be measured. If close accuracy at very low flows is important, but large capacity is also needed, the compound meter should be used. If large capacity is of primary importance, flows are usually above 10 percent of maximum rating, and low-flow accuracy is secondary, the turbine meter should be used, especially one of the newer models with very low pressure loss.

LARGE FLOWS

For lines 3 in. and larger, the traditional choice of meters is the compound, turbine, singlejet, propeller, or fire-service meter. Ultrasonic and electromagnetic meters are now an option for this type of application, though currently AWWA does not publish a standard on these meter types for revenue-collecting purposes.

For some light commercial or larger living complexes (condos, apartments, and motels), the compound meter is frequently purchased. This type of meter registers well over the widest flow range and has relatively low pressure loss at high flow rates. There are two variations of compound meter design.

In the first, or parallel meter, the main-line meter does not operate until the compounding valve opens. The bypass meter may or may not continue operating when the main-line meter starts. If this meter has two registers, and if either unit fails, the trouble can be detected by the stoppage of its register.

In the second, or series meter, when the compounding valve is closed, water flows through the main-line meter and then through the bypass meter. When the pressure differential in the bypass meter is great enough to cause the compounding valve to open, the main-line meter is already running. The register is driven by a pair of ratchet drives, allowing the unit that is producing more registration to drive the register. The main-line unit is not required to start from rest at the changeover point.

All compound meters lose a certain degree of accuracy operating within the changeover flow range by varying amounts. It is important to size any compound meter installation to minimize the total flow each installation experiences in the changeover flow range.

Turbine and current meters, including electronic flowmeters, are used when flows are large, minimum flows are usually above 10 or 12 percent of maximum rating, and the low-pressure loss at high flows is valuable. These meters have a separate inner measuring chamber or cage, which may be removed with the rotor for servicing. ANSI/AWWA C701, Standard for Cold-Water Meters—Turbine Type, for Customer Service, divides turbine meters into class I and class II meters. Both classes of meters register by recording the revolutions of a turbine set in motion by the force of flowing water striking the blades. Class I turbine meters are the vertical-shaft and low-velocity, horizontal-shaft models. Class II turbine meters are in-line, horizontal-axis, high-velocity turbines characterized by lower head loss and wider normal test-flow limits. Magnetic flowmeters are covered in AWWA Manual M33, *Flowmeters in Water Supply*.

Propeller meters are intended for main-line or pump station discharge measurements. They operate with the minimum of pressure loss for a mechanical meter. In small propeller meters, the propeller is built into a section of pipe of precise diameter and forms part of the meter; in large sizes, saddlemounting of the propeller is customary, with the interior of the pipe serving as the measuring tube. At the point of measurement, the velocity profile should be uniform. This requires that there are no elbows, valves, constrictions, or enlargements in the pipe for several pipe diameters of distance upstream and for a lesser distance downstream. For detailed instructions, users should consult the manufacturer of the proposed meter.

Where fire hydrants or large sprinkler systems are served by the metered line, the insurance underwriters usually insist on using a fire-service meter. Where these service conditions are encountered, the applicable insurance requirements should be ascertained before the meter is selected. Fire-service meters permit day-to-day usage to be drawn from a line serving hydrants or sprinklers, with the entire flow metered. For detecting the unauthorized use of water in lines for unmetered fire-service applications, a unit called a detector check, double check detector assembly, or reduced pressure principle detector assembly is installed. This same construction permits authorized metered use of small quantities of water from a fire-service line.

The detector check meter, a UL-listed, FM-approved device, is designed for dedicated fire-service applications. These devices are not intended to meter consumption; rather, utilities use these devices to detect leaks and unauthorized water usage. A second, normally smaller, service line is installed with an appropriately sized water meter for measurement of normal domestic water consumption.

Consider, for example, a warehouse that requires a high volume of water flow for fire protection but may also have a small bathroom and maybe a coffee maker. By utilizing a detector check meter for the fire-service and a second domestic-service line, the utility can save on initial cost and ongoing maintenance compared to the cost of a fire-service meter.

Detector check meters consist of an automatic-weight or spring-loaded main check valve with an elastomer seal, a bypass piping system that incorporates a $\frac{5}{8} \times \frac{3}{4}$ in. meter, $\frac{3}{4}$ in. check valve, $\frac{3}{4}$ in. ball valves, and a meter test valve. In operation, the main-line valve is held closed by the weight or spring with any low flow being directed through and measured by the bypass meter. When the pressure loss through the bypass reaches the engineered main valve opening point (normally a pressure loss of 1 to 2 psi or approximately 5 to 10 gpm), the main valve opens automatically, allowing full flow for emergencies. Water continues to be measured through the bypass meter, but flow through the main check valve is unmetered.

The detector check meter is the appropriate device for most commercial and industrial fire systems. If, however, the water is from an outside source or additives are present for antifreeze, regulatory agencies for fire-protection systems require a testable backflow preventer. These double check or reduced pressure devices are also available with metered bypasses. AWWA Manual M14, *Recommended Practice for Backflow Prevention and Cross-Connection Control*, contains more information.

Like all measurement devices, detector check meters require some maintenance to ensure proper operation. While the main valve assembly can be virtually maintenance-free, the bypass meter requires examination to ensure continued operation. By opening the meter test valve located downstream of the meter, a small amount of water is vented to the atmosphere, and the dial should be checked to ensure proper meter operation. Because the meter is being used as a tattletale and not as an accurate consumption-measuring device, volumetric accuracy is of less importance. It is very important that the meter register a small flow to detect leaks and unauthorized use. The main check valve elastomer sealing can be tested by setting up a differential pressure (DP) gauge to ensure that a differential pressure of 1 to 2 psi is maintained. This test is done by simply removing the meter and installing the appropriate DP gauge fittings.

Detector check meters can be installed inside a building or outside in a vault. Weight-loaded check valves require horizontal installation for proper operation, whereas spring-loaded valves can be installed horizontally or vertically on the fire-system standpipe.

It is common for utilities to ask building owners to remove a detector check and install a fire-service meter if consumption is registered more than once annually. Normal consumption should occur during the annual fire system test. The selection of the proper device for each application and an understanding of the limitations of a metering device will ensure that the highest value is obtained.

Other types of meters for large lines include the Venturi or its modifications, the flow tube, or the flow nozzle. These meters differ from the other meters because they measure by differential pressure instead of by velocity or quantity. Flow ranges for accuracy vary with size and with details of design, so information should be obtained from the manufacturer of the meter. Although built in smaller sizes, these meters usually are used in 6-in. (150-mm) or larger lines.

Improvements in the microprocessor readouts for both electromagnetic and ultrasonic large electronic velocity meters have enabled these devices to have not only raw and wastewater applications, but also to apply to nonrevenue measurement of finished water and water treatment chemicals. Both meters offer the advantage of an unobstructed flow tube with no moving parts and high accuracy; both, however, require electronic power.

For temporary measurements, the Pitot tube may be used in main lines. In the hands of skilled operators, the meter is valuable in making surveys to ascertain rates of flow in large lines, to locate leaks, and to measure the flow from fire hydrants.

Manifolding of Meters

For 3-in. (80-mm) or larger lines, instead of using one meter to measure the entire flow, multiple smaller-sized meters are installed in a manifold (also called a battery). Typically, a manifold should consist of two meters or more, with each meter one pipe size or more smaller than the main line (e.g., two 2-in. [50-mm] meters in a 3-in. [80-mm] manifold). For example, on a 3-in. (80-mm) line, the manifold may consist of two displacement meters. On a 6-in. (150-mm) or 10-in. (250-mm) line, the manifold

may consist of two or three compound or turbine meters. All meters in a manifold should be of the same brand, model (type), and size.

Branch manifolds are only recommended if there is close coordination of the technical details with the meter manufacturer or other experts in flow hydraulics. It is imperative that the flow through the multiple branches be balanced for proper meter registration and performance. Figure 4-5 illustrates a typical 3-meter and 2-meter hydraulically balanced manifold of large meters.

Manifolding of meters has the following advantages:

1. One meter can be serviced by closing its shutoff valves while the water supply is still available to the customer through the other meter.
2. Since the meters within the manifold are smaller than a single meter for the same service, fewer personnel are required for meter servicing or removal.
3. Inventory of repair parts can be minimized, and the knowledge of repair and testing techniques can be less involved when the variety of size and type of meters in the system is controlled.
4. The manifold can be side-wall mounted to conserve floor space.

EXHIBIT F
ADDENDUM TO AWWA MANUAL M6. (NOVEMBER 2018)



**American Water Works
Association**

Addendum to
AWWA Manual M6,
Water Meters—Selection, Installation, Testing,
and Maintenance, Fifth Edition
(November 2018)

Purpose

The 2018 Addendum to AWWA Manual M6, Water Meters—Selection, Installation, Testing, and Maintenance, fifth edition, provides guidance to users on testing procedures and related topics for meters conforming to standard ANSI/AWWA C715-18 Cold-Water Meters—Electromagnetic and Ultrasonic Type, for Revenue Applications. This standard was approved by the AWWA Standards Committee on Water Meters on February 19, 2018, approved by the AWWA Board of Directors on June 9, 2018, and made effective on October 1, 2018.

The 2018 Addendum is considered a part of AWWA Manual M6 wherever the manual is referenced by AWWA water meter standards or other documents.

The current edition of AWWA Manual M6, the fifth edition, was published in 2012. The AWWA Water Meter Standards Committee believes that the 2018 Addendum to the manual fills an immediate need by water utilities for up-to-date meter testing procedures and that it was important for this information to be published in the interim, as work is continuing on the sixth edition of the manual.

Background

Historically, AWWA Manual M6 has served as a guide to best practices for water meters, as a companion document to the AWWA water meter standards. From a practical standpoint, the manual is often used as a reference tool by utilities in their meter shops for determining and executing the proper testing procedures for the various meter types and sizes.

As the family of AWWA water meter standards has expanded over the years to include new meter types, AWWA Manual M6 has also grown to include information on these new meters. The common practice has been that Manual M6 includes information on the meter types for which an AWWA standard exists. The fifth edition of the manual, for example, was expanded in 2012 to include information on singlejet-type (ANSI/AWWA C712) and fluidic oscillator-type (ANSI/AWWA C713) meters. The sixth edition will include more information on electromagnetic- and ultrasonic-type (ANSI/AWWA C715) meters, as well as meters for residential fire sprinkler systems in one- and two-family dwellings and manufactured homes (ANSI/AWWA C714).

Testing Procedures

Table 5-3 includes recommended data for testing cold-water meters by the volumetric method, using volumetric tanks, or by the gravimetric method, using weight scales. This data may also be used for testing cold-water meters against a master or reference meter that has a known calibration curve. Accuracy standards for new meters are contained in the latest editions of standards ANSI/AWWA C700, C701, C702, C703, C704, C708, C710, C712, C713, C714, and C715. The modified Table 5-3 issued in this addendum reflects the latest accuracy standards from these AWWA standards.

The following listing provides additional guidance on meter testing, beyond the modifications made in Table 5-3.

1. In testing meters to validate their accuracy (either prior to deployment or after some time in service), note that the testing procedures for electronic meters, may be different from those meters previously placed in service. The manufacturer's recommended testing procedures should be followed. Ignoring these recommendations can invalidate the accuracy results.
2. Electronic meters do not have moving parts and, therefore, are not subject to the same wear and tear as mechanical meters. Although AWWA standards for mechanical water meters provide recommended testing frequencies in the appendix of each standard, recommended testing frequencies are not provided in the appendix of ANSI/AWWA C715. Water quality and other local conditions may affect the performance of electronic meters over time. To assess these site-specific effects, the utility may choose to verify the accuracy of electronic meters at the recommended test frequencies provided in AWWA standards for mechanical meters, until the utility establishes its own criteria based on data collected on its operational experience and local conditions.
3. Some of the smaller electronic meters have minimum rate accuracy requirements at lower flow rates than any of the rates given in other AWWA meter standards (i.e., flow rates lower than 0.25 gpm). In other instances, the minimum rate flow rates of electronic meters may be lower than those of the mechanical meters previously deployed by the utility, for any given line size. Accuracy at these lower flow rates, therefore, might be more difficult to test and verify on the existing utility's meter test bench equipment. Gravimetric systems might provide more sensitivity than volumetric systems. In all cases, the testing equipment must be maintained properly, calibrated periodically, and certified to ensure it is working properly.
4. As discussed in item #3, a utility's testing equipment may not be capable of testing electronic meters reliably at the lower flow rates (particularly for flow rates even lower than the minimums given in ANSI/AWWA C715, if part of the manufacturer's warranted accuracy claims). If this is the case, an independent third-party service company with certified and calibrated equipment along with sound testing protocols may need to be engaged to verify accuracy. As provided in one of the footnotes for the modified Table 5-3 in this addendum, a utility may alternatively increase the minimum test rate flow to stay within the capability of their equipment, while holding the electronic meters to their tighter accuracy requirement at these somewhat higher flow rates. Utilities may also wish to use these somewhat higher flow rates when there are test time constraints.
5. Historically, Table 5-3 has included some caveats in test quantity recommendations, relative to the footnote that has called for "not less than 3 min running." This has been most notable for some of the maximum rate test quantities, which would result in test run times well below three minutes in length. This ambiguity recognizes limitations in the number and size of test tanks with which the utility may be equipped. The footnote further provides that, for reduced test quantities, "the resultant increase in total test

uncertainties and errors need to be recognized.” While mechanical water meters may have been able to accommodate those test quantities in Table 5-3 that result in test times of less than three minutes, this may not be the case for some electronic meters. A special test mode—temporarily increasing the sampling rate for the meter—may be available for some electronic meter designs, to mitigate the test uncertainties associated with test times shorter than three minutes.

6. Table 5-3 provides recommended test flow rates. These recommendations are based, in part, on the observation that all meters of the same type (all positive displacement meters, all turbine meters, and so on) will exhibit the same or similar characteristic accuracy curves. This may not be a valid observation for electronic meters, for which distinct calibration algorithms may be in use. As a result, alternate or additional flow test rates may be considered. These would be especially relevant for flow rates given in the manufacturer’s performance claims that significantly exceed the ranges established in AWWA water meter standards.
7. Electromagnetic- and ultrasonic-type electronic meters are inferential in nature, measuring water velocities and inferring volumetric flows based on these velocities. (Many mechanical flow meters are also inferential in nature.) Inferential meters can be susceptible to flow profile disturbances, and to “noisy” flow delivery systems (e.g., pressure pulsations). Care should be taken to ensure that utility test stands do not introduce disturbances or noise at levels that are not representative of those that occur in actual field installations.

For the sixth edition of this manual, expanded information on several aspects of meter testing will be provided; these will include test uncertainties related to testing equipment, test uncertainties related to procedures and practices, and evaluation of accuracy results for meters pulled from service in the field. If users of this manual have any comments, questions, or suggestions regarding this manual, they can contact the AWWA Standards group at standards@awwa.org.

For this 2018 Manual M6 addendum, Table 5-3 of Manual M6, fifth edition (2012) is replaced with the following Table 5-3:

Table 5-3 Test requirements for new, rebuilt, and repaired cold-water meters*
Displacement Meters (ANSI/AWWA C700 and C710)

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)				Minimum Rate (New and Rebuilt)			Minimum (Repaired)		
	Flow Rate†	Test Quantity††		Accuracy Limits	Flow Rate**	Test Quantity††		Accuracy Limits	Flow Rate	Test Quantity††		Accuracy Limits	
		gal	ft³			gal	ft³			gal	ft³		
in.	<i>gpm</i>			<i>percent</i>	<i>gpm</i>			<i>percent</i>	<i>gpm</i>			<i>percent</i>	<i>percent (min)</i>
1/2	8	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101	90
1/2 x 3/4	8	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101	90
5/8	15	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101	90
5/8 x 3/4	15	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101	90
3/4	25	100	10	98.5–101.5	3	10	1	98.5–101.5	1/2	10	1	95–101	90
1	40	100	10	98.5–101.5	4	10	1	98.5–101.5	3/4	10	1	95–101	90
1½	50	100	10	98.5–101.5	8	100	10	98.5–101.5	1½	100	10	95–101	90
2	100	100	10	98.5–101.5	15	100	10	98.5–101.5	2	100	10	95–101	90

Multijet Meters (ANSI/AWWA C708)

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)				Minimum Rate (New and Rebuilt)			Minimum (Repaired)		
	Flow Rate†	Test Quantity††		Accuracy Limits	Flow Rate**	Test Quantity††		Accuracy Limits	Flow Rate	Test Quantity††		Accuracy Limits	
		gal	ft³			gal	ft³			gal			ft³
in.	<i>gpm</i>			<i>percent</i>	<i>gpm</i>			<i>percent</i>	<i>gpm</i>			<i>percent</i>	<i>percent (min)</i>
5/8	15	100	10	98.5–101.5	1	10	1	98.5–101.5	1/4	10	1	97–103	90
5/8 x 3/4	15	100	10	98.5–101.5	1	10	1	98.5–101.5	1/4	10	1	97–103	90
3/4	25	100	10	98.5–101.5	2	10	1	98.5–101.5	1/2	10	1	97–103	90
1	35	100	10	98.5–101.5	3	10	1	98.5–101.5	3/4	10	1	97–103	90
1½	70	100	10	98.5–101.5	5	100	10	98.5–101.5	1½	100	10	97–103	90
2	100	100	10	98.5–101.5	8	100	10	98.5–101.5	2	100	10	97–103	90

Continued

Singlejet Meters (ANSI/AWWA C712)

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)			Minimum Rate (New and Rebuilt)			Minimum (Repaired)			
	Flow Rate†	Test Quantity††		Accuracy Limits	Flow Rate**	Test Quantity††		Accuracy Limits	Flow Rate		Test Quantity††		Accuracy Limits
		gal	ft³			percent	gal				ft³	percent	
in.	<i>gpm</i>							<i>percent</i>				<i>percent (min)</i>	
5/8	15	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101.5	90
5/8 x 3/4	15	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101.5	90
3/4	25	100	10	98.5–101.5	3	10	1	98.5–101.5	1/2	10	1	95–101.5	90
1	40	100	10	98.5–101.5	4	10	1	98.5–101.5	3/4	10	1	95–101.5	90
1½	50	100	10	98.5–101.5	8	100	10	98.5–101.5	1/2	100	10	95–101.5	90
2	100	100	10	98.5–101.5	15	100	10	98.5–101.5	1/2	100	10	95–101.5	90
3	160	500	50	98.5–101.5	20	100	10	98.5–101.5	1/2	100	10	95–101.5	90
4	250	500	50	98.5–101.5	40	100	10	98.5–101.5	3/4	100	10	95–101.5	90
6	500	1,000	100	98.5–101.5	60	100	10	98.5–101.5	1½	100	10	95–101.5	90

Fluidic-Oscillator Meters (ANSI/AWWA C713)

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)				Minimum Rate (New and Rebuilt)			Minimum (Repaired)		
	Flow Rate†	Test Quantity††		Accuracy Limits	Flow Rate**	Test Quantity††		Accuracy Limits	Flow Rate	Test Quantity††			
		gal	ft³			percent	gpm			gal		ft³	percent
in.	<i>gpm</i>			<i>percent</i>				<i>percent</i>				<i>percent (min)</i>	
1/2	8	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101.5	90
1/2 x 3/4	8	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101.5	90
5/8	15	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101.5	90
5/8 x 3/4	15	100	10	98.5–101.5	2	10	1	98.5–101.5	1/4	10	1	95–101.5	90
3/4	25	100	10	98.5–101.5	3	10	1	98.5–101.5	1/2	10	1	95–101.5	90
1	40	100	10	98.5–101.5	4	10	1	98.5–101.5	3/4	10	1	95–101.5	90
1½	50	100	10	98.5–101.5	8	100	10	98.5–101.5	1½	100	10	95–101.5	90
2	100	100	10	98.5–101.5	15	100	10	98.5–101.5	2	100	10	95–101.5	90

Continued

**Class I Turbine Meters,
Vertical-Shaft Type (ANSI/AWWA C701)**

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)				Minimum Rate (New and Rebuilt)				Minimum (Repaired)
	Flow Rate†	Test Quantity††		Accuracy Limits	Flow Rate**	Test Quantity††		Accuracy Limits	Flow Rate	Test Quantity††		Accuracy Limits
<i>in.</i>	<i>gpm</i>	<i>gal</i>	<i>ft³</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>ft³</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>ft³</i>	<i>percent</i>
3/4	30	100	10	98–102	3	10	1	98–102	1½	10	1	98–102
1	50	100	10	98–102	5	10	1	98–102	2	10	1	98–102
1½	100	500	50	98–102	10	100	10	98–102	3	100	10	98–102
2	160	500	50	98–102	16	100	10	98–102	4	100	10	98–102
3	350	1,000	100	98–102	35	100	10	98–102	6	100	10	98–102
4	600	1,500	200	98–102	60	100	10	98–102	8	100	10	98–102
6	1,250	4,000	500	98–102	125	1,000	100	98–102	15	1,000	100	98–102

**Class II Turbine Meters,
In-Line (High-Velocity) Type (ANSI/AWWA C701)**

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)				Minimum Rate (New and Rebuilt)				Minimum (Repaired)
	Flow Rate†	Test Quantity††		Accuracy Limits	Flow Rate**	Test Quantity††		Accuracy Limits	Flow Rate	Test Quantity††		Accuracy Limits
<i>in.</i>	<i>gpm</i>	<i>gal</i>	<i>ft³</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>ft³</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>ft³</i>	<i>percent</i>
1½	100	500	50	98.5–101.5					4	100	10	98.5–101.5
2	160	500	50	98.5–101.5					4	100	10	98.5–101.5
3	350	1,000	100	98.5–101.5					8	100	10	98.5–101.5
4	630	1,500	200	98.5–101.5					15	100	10	98.5–101.5
6	1,400	4,000	500	98.5–101.5					30	1,000	100	98.5–101.5
8	2,400	7,000	900	98.5–101.5					50	1,000	100	98.5–101.5
10	3,800	10,000	1,300	98.5–101.5					75	1,000	100	98.5–101.5
12	5,000	15,000	2,000	98.5–101.5					120	1,000	100	98.5–101.5
16	7,000	30,000	4,000	98.5–101.5					200	1,000	100	98.5–101.5
20	10,000	40,000	5,000	98.5–101.5					300	1,000	100	98.5–101.5

Continued

Propeller Meters (ANSI/AWWA C704)

Size	Maximum Rate (All Meters)				Intermediate Rate (All Meters)				Minimum Rate (New and Rebuilt)				Minimum (Repaired)
	Flow Rate†	Test Quantity††		Accuracy Limits	Flow Rate**	Test Quantity††		Accuracy Limits	Flow Rate	Test Quantity††		Accuracy Limits	Accuracy Limits
		gal	ft³			gal	ft³			percent	gal		
in.	gpm	gal	ft³	percent	gpm	gal	ft³	percent	gpm	gal	ft³	percent	percent (min)
2	100	300	40	98–102					45	200	25	98–102	90
3	250	800	100	98–102					80	200	25	98–102	90
4	500	1,500	200	98–102					85	250	30	98–102	90
6	1,200	2,500	300	98–102					160	500	60	98–102	90
8	1,500	3,000	400	98–102					190	500	60	98–102	90
10	2,000	4,000	500	98–102					260	500	60	98–102	90
12	2,800	6,000	800	98–102					275	750	100	98–102	90
14	3,750	8,000	1,000	98–102					350	1,000	130	98–102	90
16	4,750	10,000	1,300	98–102					450	1,500	200	98–102	90
18	5,625	12,000	1,600	98–102					550	2,000	250	98–102	90
20	6,875	15,000	2,000	98–102					650	2,500	300	98–102	90
24	10,000	20,000	2,500	98–102					1,000	4,000	500	98–102	90
30	15,000	30,000	4,000	98–102					1,600	6,000	800	98–102	90
36	20,000	40,000	5,000	98–102					2,400	7,500	1,000	98–102	90
42	28,000	40,000	5,000	98–102					2,800	10,000	1,300	98–102	90
48	35,000	50,000	6,000	98–102					3,500	12,500	1,500	98–102	90
54	45,000	60,000	8,000	98–102					5,000	16,000	2,000	98–102	90
60	60,000	70,000	9,000	98–102					6,000	20,000	2,500	98–102	90
66	75,000	80,000	11,000	98–102					7,500	25,000	3,000	98–102	90
72	90,000	90,000	12,000	98–102					9,000	28,000	3,500	98–102	90

Continued

Compound Meters (ANSI/AWWA C702)[§]

Size	Maximum Rate (All Meters)				Change Over Point (All Meters)				Minimum Rate (New and Rebuilt)			Minimum (Repaired)
	Flow Rate [†]	Test Quantity ^{††}		Accuracy Limits	Flow Rate ^{**}	Test Quantity ^{††}		Accuracy Limits	Flow Rate	Test Quantity ^{††}		Accuracy Limits
		gal	ft ³			gal	ft ³			gal	ft ³	
in.	gpm			percent				percent	gpm			percent (min)
				Class I								
				Class II								
2	160	400	50	97–103	98.5–101.5			90–103				95–101
3	320	1,000	100	97–103	98.5–101.5			90–103				95–101
4	500	1,500	200	97–103	98.5–101.5			90–103				95–101
6	1,000	3,000	400	97–103	98.5–101.5			90–103				95–101
8	1,600	4,000	500	97–103	98.5–101.5			90–103				95–101
10	2,300	4,000	500	97–103	98.5–101.5			90–103				95–101

Fire-Service Type, Type I and Type II (ANSI/AWWA C703) (Test at intermediate rate not necessary.)[§]

Size	Maximum Rate (All Meters)				Change Over Point (All Meters)				Minimum Rate (New and Rebuilt)			Minimum (Repaired)
	Flow Rate [†]	Test Quantity ^{††}		Accuracy Limits	Flow Rate ^{**}	Test Quantity ^{††}		Accuracy Limits	Flow Rate	Test Quantity ^{††}		Accuracy Limits
		gal	ft ³			gal	ft ³			gal	ft ³	
in.	gpm			percent				percent	gpm			percent (min)
				Type I								
				Type II								
3	350	700	100	97–103	98.5–101.5							90
4	700	1,500	200	97–103	98.5–101.5							90
6	1,600	3,000	400	97–103	98.5–101.5							90
8	2,800	5,000	700	97–103	98.5–101.5							90
10	4,400	9,000	1,200	97–103	98.5–101.5							90

Continued

Fire Service Type, Type III (ANSI/AWWA C703)

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)			Minimum Rate (New and Rebuilt)			Minimum (Repaired)
	Flow Rate [†]	Test Quantity ^{††}	Accuracy Limits	Flow Rate ^{**}	Test Quantity ^{††}	Accuracy Limits	Flow Rate	Test Quantity ^{††}	Accuracy Limits	
<i>in.</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>percent (min)</i>
3	350	700	98.5–101.5	10	100	98.5–101.5	4	100	95–101.5	—
4	700	1,500	98.5–101.5	30	500	98.5–101.5	10	100	95–101.5	—
6	1,600	3,000	98.5–101.5	60	1000	98.5–101.5	20	1000	95–101.5	—
8	2,800	5,000	98.5–101.5	70	1000	98.5–101.5	30	1000	95–101.5	—
10	4,400	9,000	98.5–101.5	110	1000	98.5–101.5	35	1000	95–101.5	—

Continued

**Electromagnetic and Ultrasonic Meters for Revenue Applications,
Type I (ANSI/AWWA C715)**

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)			Minimum Rate (New and Rebuilt)			Minimum (Repaired) Accuracy Limits
	Flow Rate† <i>gpm</i>	Test Quantity†† <i>gal</i>	Accuracy Limits <i>percent</i>	Flow Rate** <i>gpm</i>	Test Quantity†† <i>gal</i>	Accuracy Limits <i>percent</i>	Flow Rate§§ <i>gpm</i>	Test Quantity†† <i>gal</i>	Accuracy Limits§§ <i>percent</i>	
<i>in.</i>										
1/2	8	100	98.5–101.5	0.35	10	98.5–101.5	0.11 (0.18)	10	95–105 (98.5–101.5)	—
5/8	15	100	98.5–101.5	0.4	10	98.5–101.5	0.13 (0.20)	10	95–105 (98.5–101.5)	—
3/4	25	100	98.5–101.5	1	10	98.5–101.5	0.15 (0.5)	10	95–105 (98.5–101.5)	—
1	40	100	98.5–101.5	1.5	10	98.5–101.5	0.3 (0.75)	10	95–105 (98.5–101.5)	—
1½	60	100	98.5–101.5	4	100	98.5–101.5	0.6 (2)	100	95–105 (98.5–101.5)	—
2	100	100	98.5–101.5	5	100	98.5–101.5	1 (2.5)	100	95–105 (98.5–101.5)	—
3	200	500	98.5–101.5	15	100	98.5–101.5	2.5 (7.5)	100	95–105 (98.5–101.5)	—
4	400	1,000	98.5–101.5	20	500	98.5–101.5	3.5 (10)	300	95–105 (98.5–101.5)	—
6	800	2,000	98.5–101.5	40	1,000	98.5–101.5	9 (20)	300	95–105 (98.5–101.5)	—
8	1,000	5,000	98.5–101.5	80	3,000	98.5–101.5	18 (40)	2,000	95–105 (98.5–101.5)	—

Continued

**Electromagnetic and Ultrasonic Meters for Revenue Applications,
Type II (ANSI/AWWA C715)**

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)			Minimum Rate (New and Rebuilt)			Minimum (Repaired)
	Flow Rate†	Test Quantity††	Accuracy Limits	Flow Rate**	Test Quantity††	Accuracy Limits	Flow Rate	Test Quantity††	Accuracy Limits	
<i>in.</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>percent (min)</i>
1/2	8	100	98.5–101.5	2	10	98.5–101.5	0.25	10	95–105	—
5/8	15	100	98.5–101.5	2	10	98.5–101.5	0.25	10	95–105	—
3/4	25	100	98.5–101.5	4	10	98.5–101.5	0.5	10	95–105	—
1	40	100	98.5–101.5	6	10	98.5–101.5	0.75	10	95–105	—
1½	100	100	98.5–101.5	8	100	98.5–101.5	1.5	100	95–105	—
2	150	100	98.5–101.5	12	100	98.5–101.5	2	100	95–105	—
3	350	500	98.5–101.5	30	100	98.5–101.5	4	100	95–105	—
4	600	1,000	98.5–101.5	50	500	98.5–101.5	7.5	300	95–105	—
6	800	2,000	98.5–101.5	110	1,000	98.5–101.5	15	300	95–105	—
8	2,000	5,000	98.5–101.5	200	3,000	98.5–101.5	30	2,000	95–105	—
10	3,000	7,000	98.5–101.5	300	5,000	98.5–101.5	50	3,000	95–105	—
12	4,000	10,000	98.5–101.5	400	5,000	98.5–101.5	65	3,000	95–105	—
16	5,500	50,000	98.5–101.5	750	30,000	98.5–101.5	110	20,000	95–105	—
20	8,000	50,000	98.5–101.5	1,100	30,000	98.5–101.5	175	20,000	95–105	—

**Meters for Residential Fire Sprinkler Systems in One- and Two-Family
Dwellings and Manufactured Homes (ANSI/AWWA C714)**

Size	Maximum Rate (All Meters)			Intermediate Rate (All Meters)			Minimum Rate (New and Rebuilt)			Minimum (Repaired)
	Flow Rate†	Test Quantity††	Accuracy Limits	Flow Rate**	Test Quantity††	Accuracy Limits	Flow Rate§§	Test Quantity††	Accuracy Limits	
<i>in.</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>gpm</i>	<i>gal</i>	<i>percent</i>	<i>percent (min)</i>
3/4	25	100	98–102	3	10	98–102	1/2	10	95–103	90
1	40	100	98–102	4	10	98–102	3/4	10	95–103	90
1½	50	100	98–102	8	100	98–102	1½	100	95–103	90
2	100	100	98–102	15	100	98–102	2	100	95–103	90

Continued

* A rebuilt meter is one that has had the measuring element replaced with a factory-made new unit. A repaired meter is one that has had the old measuring element cleaned and refurbished in a utility repair shop.

† These are suggested test flows and test quantities. Testing for high rates of flow can be achieved by testing the meter at 25% of the meters rating if the manufacturer's original test certificate indicates a linear curve between 25% and 100% of the rated flow range.

†† Quantity should be one or more full revolutions of the test hand / initial dial (see "Maximum Indication on Initial Dial" values specified in mechanical meter standards such as ANSI/AWWA C700, C701, and so on), or a quantity not less than the "Maximum Allowable Indication on Initial Display" values specified in ANSI/AWWA C715. Quantity should result in not less than 3 minutes running. When limited test capabilities force the use of smaller test quantities, the resultant increase in total test uncertainties and errors need to be recognized when establishing acceptance criteria tolerance.

§ The bypass meter should be tested in accordance with the appropriate test requirements for the type of meter used.

** As this rate varies according to manufacturer, it should be determined for each type of meter tested.

§§ Minimum test flow rates with corresponding accuracy limits in parentheses () are alternative values, to accommodate concerns over test times or concerns over test benches being able to conduct testing at the smaller flow rates (without parentheses) reliably. Note that the flow rate values in parentheses are the lowest rates for the normal test limits from ANSI/AWWA C715, and as such would have accuracy limits of 98.5%–101.5%. If these flow rates in parentheses are used in Minimum Rate testing, then the recommended test flow rates for the Intermediate Rate should be twice those listed in the table. However, see the preceding footnote, detailing the preferred use of an intermediate rate determined for each specific make/model.

Metric Conversions: in. $\times$ 25.4 = mm, gal $\times$ 0.003785 = m³, gpm $\times$ 0.2268 = m³/h, ft³ $\times$ 0.02831 = m³.

EXHIBIT G
ROTTERDAM 2018 WATER QUALITY REPORT

Annual Water Quality Report for 2018

Town of Rotterdam

John F. Kirvin Government Center

1100 Sunrise Blvd. Rotterdam, NY 12306

Water District #3 &4 (Public Water Supply Identification Number NY4600067)

Water District #5 (Public Water Supply Identification Number NY4600069)

INTRODUCTION

To comply with State regulations, the Town of Rotterdam, will be annually issuing a report describing the quality of your drinking water. The purpose of this report is to raise your understanding of drinking water and awareness of the need to protect our drinking water sources. Last year, your drinking water met all State drinking water health standards. This report is an overview of last year's water quality. Included are details about where your water comes from, what it contains, and how it compares to New York State standards. Our constant goal is and always has been, to provide to you a safe and dependable supply of drinking water. We want you to understand the efforts we make to continually improve the water treatment process and to protect our water resources. If you have any questions concerning this report or concerning your drinking water please contact: *Mr. Justin Peterson, Water Operator, 49 Rice Road, Schenectady, NY 12306, Telephone (518) 393-1131.* We want our valued customers to be informed about their water service.

WHERE DOES OUR WATER COME FROM?

The Town of Rotterdam draws its water from "groundwater" sources. Groundwater or well water is stored below the surface of the earth in deep, porous rocks called "aquifers." Groundwater is purified naturally as it filters through layers of soil, clay, rock and sand. This process, known as "percolation" takes years to complete. As a result, groundwater requires less treatment than surface water. Both Water District #3 serving Rotterdam Junction and Water District #5 serving Rotterdam, obtain water from the Great Flats Aquifer located adjacent to the Mohawk River. This aquifer is excellent in both quality and quantity, as a groundwater source serving the Town of Rotterdam, as well as the City of Schenectady. A regional watershed board has rules and regulations in place to protect this source of water supply. The two water districts in Rotterdam operate independently with their own wells, pumps, storage tanks and distribution piping systems.

Treatment of the raw water produced by the wells consists of gas chlorination, which is used for disinfection to protect against contamination from harmful bacteria and other organisms. We also add sodium hexametaphosphate for iron and manganese sequestration and corrosion control. The Town of Rotterdam does not add fluoride to the water. Water softening equipment may be utilized at individual connections at the user's discretion but be aware that softening increases the amount of sodium in your water. You should have a by-pass valve for drinking and cooking with softened water. In general, our water is not considered excessively "hard" as compared to other sources.

In general, the sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activities. Contaminants that may be present in source water include microbial contaminants; inorganic contaminants; pesticides and herbicides; organic chemical contaminants; and radioactive contaminants. In order to ensure that tap water is safe to drink, the State and EPA prescribe regulations, which limit the amount of certain contaminants in water, provided by public water systems. The State Health Department's and the FDA's regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

FACTS AND FIGURES

Water District #3 is served by two drilled wells located off Route 5S in Rotterdam Junction. The permitted pumping capacity is 1,000,000 gallons per day (gpd). Pumping capacity is approximately 1000 gallons per minute. We have a 500,000-gallon storage tank to meet consumer demand and provide adequate fire protection. We provide water through 400 service connections to a population of approximately 1,900 people. Our average daily demand is 246,864 gallons. Our single highest day was 444,700 gallons. The total water produced in 2018 was 89,982,900 gallons. Since residential customers are not metered, the amount of water consumed by various customers utilized for fire protection, or lost from the system due to flushing or leaks is not known. Based on the daily amounts recorded, it is reasonable to say that at least 75% of the water supplied was consumed by households. Fire protection and flushing programs would account for the majority of the remaining 25% of water supplied. The annual water consumption charge for residences, unmetered is \$25.00 per household.

Water District #5 is served by four drilled wells located off Rice Road. The permitted pumping capacity is 10,000,000 gpd; the maximum peak day averages 9,100,000-gallons. Pumping capacity is capable of providing up to 7,000 gallons per minute with elevated storage tanks and standpipe combine to provide 5.2 million gallons of storage capacity. Transmission mains are 24" in diameter. We provide water through 11,000 service connections to a population of approximately 25,000 people. In 2018 Water District #5 provided 1,479,827,000 gallons of water. Our average daily demand was 4,049,222 gallons. Our single highest day was 8,505,000 gallons. With over 90% of the accounts being residential and unmetered, the amount consumed can only be estimated. In addition to water usage for fire protection, flushing and leaks in the system, there were also a number of water main breaks throughout the year. There are a small number of customers in the City of Schenectady, Town of Guilderland and Town of Princetown who also receive water from Rotterdam. There are also a small number of customers in Rotterdam who receive water from the City of Schenectady under agreements with the two public entities. Water District #5 has an emergency interconnect with the City of Schenectady. The annual water consumption charge for unmetered is \$75.00 per household for residential and commercial

ARE THERE CONTAMINANTS IN OUR DRINKING WATER?

In accordance with State regulations, the Town of Rotterdam routinely monitors your drinking water for numerous contaminants. We test your drinking water for inorganic contaminants, radiological contaminants, lead and copper, nitrate, volatile organic contaminants, and synthetic organic contaminants. In addition, we test 30 samples for coliform bacteria in Water District #5 and 3 samples in Water District #3 monthly. The tables presented below depicts which contaminants were detected in your drinking water. The state allows us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

It should be noted that all drinking water, including bottled drinking water, may be reasonably expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily pose a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800-426-4791) or the Schenectady County Public Health Services at (518) 386-2818.

WHAT DOES THIS INFORMATION MEAN?

The attached tables presented depict which compounds were detected in your drinking water. As you can see by the tables, our system had no violations. We have learned through our monitoring and testing that some constituents have been detected; however, these compounds were detected below New York State requirements. Although nitrate was detected below the MCL for Water District #3, it was detected at times at concentrations greater than 5 ppm which is greater than one-half of the MCL. Therefore, we are required to present the following information on nitrate in drinking water:

Nitrate in drinking water at levels above 10 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are caring for an infant, you should ask for advice from your health care provider.

MCL's are set at very stringent levels. To understand the possible health effects described for many regulated constituents, a person would have to drink 2 liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

As the State regulations require we routinely test your drinking water for numerous contaminants. These groups of contaminants followed by the number of contaminants in each group exist at levels that were **NOT DETECTABLE** (Water District #5) in your drinking water volatile organic compounds (52) + MTBE, synthetic organic compounds (38), asbestos, color, odor, radiological chemicals (3) Inorganic contaminants that were **NOT DETECTABLE** are: arsenic, cadmium, chromium, manganese, mercury, selenium, silver, fluoride, antimony, beryllium, thallium and cyanide; radiological chemicals (2) Microbiological Contaminants (1) *E. coli*.

Unregulated Contaminant Monitoring 4 was conducted during 2018. This is a requirement of the 1996 Safe Drinking Water Act amendments. This monitoring provides a basis for future regulatory action to protect the public health. The number in parentheses refers to the number of measured for a total of 30 analytes. The breakdown of analytes is as follows: semi volatile organic chemicals (3), pesticides and pesticide manufacturing byproduct (9), metals (2), alcohols (3), cyanotoxin chemical contaminants (10), brominated haloacetic acid groups(3) and indicator compounds (2). We have listed those compounds that were detected in the table of Detected Contaminants for the Rotterdam WD #5. There are no associated MCL's for these compounds at this time with the exception of Manganese.

DO I NEED TO TAKE SPECIAL PRECAUTIONS?

Although our drinking water met or exceeded state and federal regulations, some people may be more vulnerable to disease causing microorganisms or pathogens in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care provider. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium, Giardia and other microbiological pathogens are available from the Safe Drinking Water Hotline (800-426-4791).

INFORMATION ON LEAD

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Town of Rotterdam is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at <http://www.epa.gov/safewater/lead>

IS OUR WATER SYSTEM MEETING OTHER RULES THAT GOVERN OPERATIONS?

During 2018, Water District #5 system did not exceed any maximum contaminant levels (MCL) for any required sampling. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. However, from 2008-2018, we “did not monitor or test” or “did not complete all monitoring or testing” for Trihalomethanes (THM) and Haloacetic Acids (HAA5) for our annual compliance testing, and therefore have been in violation from 2008-2018. This discovery that we were not collecting samples from a 2nd site during the compliance testing was discovered by EPA during the HAA6 & HAA9 UCMR4 monitoring. This resulted in the New York State Health Department and Schenectady Health Department investigating the waiver for 1 sample a year issued 10 years ago. It was determined that we would have to perform quarterly sampling at 4 sites beginning in 2019; one of which was the site we were using to find the High HAA5 and High THM site for future monitoring. We will redo the UCMR4 Monitoring in 2020, after the conclusion of this quarterly testing. Additionally, we did not test for TOC and Bromide as part of the UCMR4 and will complete that in 2020 along with THM & HAA5 sampling. We were issued a violation for the failure to collect 2 samples.

Similarly, in 2018, Water District #3 system did not exceed any MCL for any required sampling. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. From 2008-2018, we “did not monitor or test” or “did not complete all monitoring or testing” for Trihalomethanes (TTHM) and Haloacetic Acids (HAA5) for our annual compliance testing. Our population requires 2 dual samples from 2 locations in August. We will evaluate new sites during 2019 and commence monitoring in 2020 with 2 sites (high THM/High HAA5) during August. We were issued a violation for the failure to collect samples from 2 locations.

WHAT IS THE SOURCE WATER ASSESSMENT PROGRAM (SWAP)?

To emphasize the protection of surface and ground water sources used for public drinking water, Congress amended the Safe Drinking Water Act (SDWA) in 1996. The amendments require that New York State Department of Health's Bureau of Public Water Supply Protection is responsible for ensuring that source water assessments are completed for all of New York's public water systems.

A source water assessment provides information on the potential contaminant threats to public drinking water sources:

- ◆ each source water assessment will: determine where water used for public drinking comes from (delineate the source areas)
- ◆ Inventory potential sources of contamination that may impact public drinking water sources
- ◆ Assess the likelihood of a source water area becoming potential contaminated

A SWAP summary for our water supply is attached to this report.

WATER CONSERVATION TIPS

The Town of Rotterdam encourages water conservation. There are a lot of things you can do to conserve water in your own home. Conservation tips include:

- ◆ *Use water saving showerheads*
- ◆ *Repair all leaks in your plumbing system*
- ◆ *Water your lawn sparingly in the early morning or in the late evening*
- ◆ *Do only full loads of wash and dishes*
- ◆ *Wash your car with a bucket and hose with a nozzle*

- ♦ *Don't cut the lawn too short; longer grass saves water*
- ♦ *Do not throw or wash materials down Stormwater Catch Basins. This eventually flows to our streams.*

CAPITAL IMPROVEMENTS

The new 5th water well is under construction and expected to be completed in 2019.

CLOSING

Thank you for allowing us to continue providing your family with clean, quality water this year. In order to maintain a safe and dependable water supply we sometimes need to make improvements that will benefit our customers. During 2018, no significant changes were made to the water system. However, new mains, hydrants and valves are planned for the future. You will be informed of system improvements in future Annual Water Quality Reports. We ask that all our customers help us protect our water sources. Please call (518) 393-1131 if you have questions.

ROTTERDAM WATER DISTRICT #3 & #4 TABLE OF DETECTED CONTAMINANTS Public Water Supply Identification Number NY4600067						
Contaminant	Violation Y/N	Level Detected	Unit Measurement	MCLG	MCL	Likely Source of Contamination
Inorganic Contaminants (sample data from 1/19/18 unless otherwise noted)						
Barium	N	47	ppb	2000	2000	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Chloride	N	124	ppm	N/A	250	Geology; Naturally occurring
Chromium	N	1.6	ppb	100	100	Discharge from steel and pulp mills; Erosion of natural deposits.
Copper (data from 7/12/18-9/24/18)	N	0.16 ¹	ppb	13003	AL=1300	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Range of copper concentrations		0.05-0.16				
Lead (data from 7/12/18-9/24/18)	N	3 ²	ppb	0	AL=15	Corrosion of household plumbing systems, erosion of natural deposits
Range of lead concentrations		ND-5				
Nickel	N	1.95	ppb	N/A	N/A	
Nitrate (as Nitrogen) ³ Well#1 (average 4 samples Quarterly 1/19/18, 4/10/18, 8/7/18 & 10/3/18 (range of sample values)	N	5.41	ppm	10	10	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits.
Nitrate (as Nitrogen) ³ Well #2 (average 4 samples Quarterly 1/19/18, 4/10/18, 8/7/18 & 10/3/18 (range of sample values)		4.95-6.24				
		6.46				
		6.1-6.74				
pH	N	7.36	units		6.5-8.5	
Sodium ⁴	N	76.7	ppm	N/A	N/A	Geology; Road Salt
Sulfate	25.8	26.8	ppm	N/A	250	Geology;
Disinfection Byproducts						
Chlorine Residual (average) based on daily readings (range)	N	0.58 0.44-0.76	ppm	MRDLG N/A	MRDL 4	Used in the disinfection and treatment of drinking water
Haloacetic Acids (HAA5) (sample data from 8/14/18)	N	5.8	ppb	N/A	60	By-product of drinking water chlorination
TTHM[Total Trihalomethanes] (sample from 8/14/18)	N	20.7	ppb	0	80	By-product of drinking water chlorination
Radiological Contaminants (samples from 6/4/13)						
Gross Beta Particle Activity (average of 2 samples) Range of values for 2 samples	N	2.8 ND-3.0	pCi/L	0	50	Decay of natural and man-made deposits
NOTES- 1. The level presented represents the 90 th percentile of 10 test sites. A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below it. The 90 th percentile is equal to or greater than 90% of the copper values detected at your water system. In this case, 10 samples were collected at your water system and the 90 th percentile value was the 9 th sample with the second highest value (level detected 0.27 mg/l). The action level for copper was not exceeded at any of the sites tested. 2. The level presented represents the 90 th percentile of 10 test sites. The action level for lead was not exceeded at any of the 10 sites tested 3. Nitrate in drinking water at levels above 10 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are caring for an infant you should ask advice from your health care provider. As you can see our values have been below the MCL. 4. Water containing more than 20 mg/l should not be consumed by persons on severely restricted sodium diets. 5. The MCL for beta particles is 4 mrems/year. The State considers 50 pCi/L to be the level of concern for beta particles <i>Non-Detects (ND)</i> - laboratory analysis indicates that the constituent is not present. <i>Parts per million (ppm) or Milligrams per liter (mg/l)</i> - one part per million corresponds to one minute in two years or a single penny in \$10,000. <i>Parts per billion (ppb) or Micrograms per liter</i> - one part per billion corresponds to one minute in 2,000 years, or a single penny in \$10,000,000. <i>Picocuries per liter (pCi/L)</i> - picocuries per liter is a measure of the radioactivity in water. <i>90th Percentile Value</i> - The values reported for lead and copper represent the 90 th percentile. A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below it. The 90 th percentile is equal to or greater than 90% of the lead and copper values detected at your water system <i>Action Level</i> - the concentration of a contaminant, which, if exceeded, triggers treatment, or other requirements, which a water system must follow. <i>Maximum Contaminant Level</i> - The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology. <i>Maximum Contaminant Level Goal</i> - The "Goal" (MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety. <i>Maximum Residual Disinfectant Level (MRDL)</i> : The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants. <i>Maximum Residual Disinfectant Level Goal (MRDLG)</i> : The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contamination <i>N/A-Not applicable</i>						

ROTTERDAM WATER DISTRICT #5 TABLE OF DETECTED CONTAMINANTS						
Public Water Supply Identification Number NY4600069						
Contaminant	Violation Y/N	Level Detected	Unit Measurement	MCLG	MCL	Likely Source of Contamination
Inorganic Contaminants (sample data from 1/19/18 unless otherwise noted)						
Barium	N	42.6	ppb	2000	2000	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Chloride	N	59.1	ppm	N/A	250	Geology; Naturally occurring
Copper (data from 7/12/18-9/24/18)	N		ppm	1.3	AL=1.3	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Range of copper concentrations						
Lead Range of lead concentrations	N		ppb	0	AL=15	Corrosion of household plumbing systems, erosion of natural deposits
Nitrate (as Nitrogen)	N	0.568	ppm	10	10	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
pH	N	7.56	units		6.5-8.5	
Sodium ³	N	31.4	ppm	N/A	N/A	Geology; Road Salt
Sulfate	N	22.5	ppm	N/A	250	Geology
Disinfection Byproducts (sample data from 8/14/18)						
Chlorine Residual (average) based on daily testing (range)	N	0.56 0.39-0.74	ppm	MRDLG N/A	MRDL 4	Used in the disinfection and treatment of drinking water
Stage 2 Haloacetic Acids [HAA5]	N	11.4	ppb	N/A	60	By-product of drinking water chlorination
Stage 2 TTHM[Total Trihalometbanes]	N	13.7	ppb	0	80	By-product of drinking water chlorination
Principal Organic Compounds/Volatile Organic Compounds (sample from 8/7/18)						
Trichloroethene Well#1	N	0.6	ppb	0	5	Discharge from metal degreasing sites and other factories
Trichloroethene Well#2		0.5				
Trichloroethene Well#3		0.6				
Unregulated Contaminant Monitoring Rule 4 Detected Contaminants (samples from 1/10/18 & 7/23/18)						
Manganese (range of values) 1/10/18 & 7/23/18	N	1.03-2.82	ppb	N/A	300	Erosion of natural deposits
HAA6 (range of values) 2/6/18 & 8/14/18	N	4.3-6.8	ppb	N/A	N/A	
HAA9 (range of values) 2/6/18 & 8/14/18	N	8.7-14.9	ppb	N/A	N/A	
NOTES-						
1. The level presented represents the 90 th percentile of 30 test sites. A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below it. The 90 th percentile is equal to or greater than 90% of the copper values detected at your water system. In this case, 30 samples were collected at your water system and the 90 th percentile value was the 27 th sample with the fourth highest value (level detected 0.57 mg/l). The action level for copper was not exceeded at any of the sites tested.						
2. The level presented represents the 90 th percentile of 30 test sites. The action level for lead was not exceeded at any of the 30 sites tested.						
3. Water containing more than 20 mg/l should not be consumed by persons on severely restricted sodium diets.						
Non-Detects (ND) - laboratory analysis indicates that the constituent is not present.						
Parts per million (ppm) or Milligrams per liter (mg/l) - one part per million corresponds to one minute in two years or a single penny in \$10,000.						
Parts per billion (ppb) or Micrograms per liter - one part per billion corresponds to one minute in 2,000 years, or a single penny in \$10,000,000.						
Picocuries per liter (pCi/L) - picocuries per liter is a measure of the radioactivity in water.						
90 th Percentile Value- The values reported for lead and copper represent the 90 th percentile. A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below it. The 90 th percentile is equal to or greater than 90% of the lead and copper values detected at your water system						
Action Level - the concentration of a contaminant, which, if exceeded, triggers treatment, or other requirements, which a water system must follow.						
Maximum Contaminant Level - The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.						
Maximum Contaminant Level Goal - The "Goal" (MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.						
Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.						
Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contamination						
N/A-Not applicable						

Rotterdam Water District # 3
NY4600067
Source Water Assessment Summary

The NYS DOH has completed a source water assessment for this system, based on available information. Possible and actual threats to this drinking water source were evaluated. The state source water assessment includes a susceptibility rating based on the risk posed by each potential source of contamination and how easily contaminants can move through the subsurface to the wells. The susceptibility rating is an estimate of the potential for contamination of the source water, it does not mean that the water delivered to consumers is, or will become contaminated. The section of the report entitled, "Are there contaminants in our drinking water?" provides a list of the contaminants that have been detected.

As mentioned earlier in this report, our drinking water is derived from 2 drilled wells. The source water assessment has rated these wells as having an elevated susceptibility. In addition, the wells draw from an unconfined aquifer and the overlying soils are not known to provide adequate protection from potential contamination.

A copy of the full Source Water Assessment, including a map of the assessment area, is available for review by contacting us at the number provided in this report.

While the source water assessment rates our well(s) as being susceptible to microbials, please note that our water is disinfected to ensure that the finished water delivered into your home meets New York State's drinking water standards for microbial contamination.

The Rotterdam Water District #3 recognizes the importance of watershed protection by implementing Watershed Rules and Regulations along with zoning restrictions.

Rotterdam Water District # 5
NY4600069
Source Water Assessment Summary

The NYS DOH has completed a source water assessment for this system, based on available information. Possible and actual threats to this drinking water source were evaluated. The state source water assessment includes a susceptibility rating based on the risk posed by each potential source of contamination and how easily contaminants can move through the subsurface to the wells. The susceptibility rating is an estimate of the potential for contamination of the source water, it does not mean that the water delivered to consumers is, or will become contaminated. The section of the report entitled, "Are there contaminants in our drinking water?" provides a list of the contaminants that have been detected.

As mentioned earlier in this report, our drinking water is derived from 4 drilled wells. The source water assessment has rated these wells as having an elevated susceptibility. In addition, the wells draw from an unconfined aquifer and the overlying soils are not known to provide adequate protection from potential contamination.

A copy of the full Source Water Assessment, including a map of the assessment area, is available for review by contacting us at the number provided in this report.

While the source water assessment rates our well(s) as being susceptible to microbials, please note that our water is disinfected to ensure that the finished water delivered into your home meets New York State's drinking water standards for microbial contamination.

The Rotterdam Water District #5 recognizes the importance of watershed protection by implementing Watershed Rules and Regulations along with zoning restrictions.

EXHIBIT H
SOURCE METER CUT SHEETS: HONEYWELL ST3000

ST 3000 Smart Pressure Transmitter Series 900 Differential Pressure Models Specifications

34-ST-03-65, January 2013



Introduction

In 1983, Honeywell introduced the first Smart Pressure Transmitter—the ST 3000®. In 1989, Honeywell launched the first all digital, bi-directional protocol for smart field devices. Today, its ST 3000 Series 900 Differential Pressure Transmitters continue to bring proven “smart” technology to a wide spectrum of pressure measurement applications, from furnace combustion airflow rate to hydrostatic tank gauging. The ST 3000 S900 Differential Pressure Transmitter can be used with any primary flow element to provide proven, repeatable flow measurement.

All ST 3000 transmitters can provide a 4-20 mA output, Honeywell Digitally Enhanced (DE) output, HART® output, or FOUNDATION™ Fieldbus output. When digitally integrated with Honeywell’s Process Knowledge System™, EXPERION PKS™, ST 3000 instruments provide a more accurate process variable as well as advanced diagnostics.

Honeywell’s cost-effective ST 3000 S900 transmitters lead the industry in reliability and stability:

- Stability = $\pm 0.01\%$ per year
- Reliability = 470 years MTBF

Models		
STD924	0 to 400 inH ₂ O	0 to 1,000 mbar
STD930	0 to 100 psi	0 to 7 bar
STD974	0 to 3,000 psi	0 to 210 bar



Figure 1 - Series 900 Differential Pressure Transmitters feature proven piezoresistive sensor technology.

The devices provide comprehensive self-diagnostics to help users maintain high uptime, meet regulatory requirements, and attain high quality standards. S900 transmitters allow smart performance at analog prices. Accurate, reliable and stable, Series 900 transmitters offer greater turndown ratio than conventional transmitters

All ST 3000 transmitters can be ordered to provide one of the following output communication options.

Communications options
4-20 mA
Honeywell Digitally Enhanced (DE)
HART® (versions 5.x or 6.x)
FOUNDATION™ Fieldbus

Description

The ST 3000 transmitter can replace any 4 to 20 mA output transmitter in use today and operates over a standard two-wire system.

The measuring means is a piezoresistive sensor, which actually contains three sensors in one. It contains a differential pressure sensor, a temperature sensor, and a static pressure sensor.

Microprocessor-based electronics provide higher span-turndown ratio, improved temperature and pressure compensation, and improved accuracy.

The transmitter's meter body and electronics housing resist shock, vibration, corrosion, and moisture. The electronics housing contains a compartment for the single-board electronics, which is isolated from an integral junction box. The single-board electronics is replaceable and interchangeable with any other ST 3000 Series 100 or Series 900 model transmitter.

Like other Honeywell transmitters, the ST 3000 features two-way communication and configuration capability between the operator and the transmitter through several Honeywell field-rated portable configuration devices, including the Smart Field Communicator (SFC) and the Multiple Communication Configurator (MC ToolKit). While both are made for in-field use, the MC Toolkit also can be ordered for use in intrinsically safe environments.

The SCT 3000 Smartline® Configuration Toolkit provides an easy way to configure instruments using a personal computer. The toolkit enables configuration of devices before shipping or installation. The SCT 3000 can operate in the offline mode to configure an unlimited number of devices. The database can then be loaded down-line during commissioning.

When digitally integrated with Honeywell's Experion® Process Knowledge System or other TDC/TPS systems, ST 3000 instruments provides local measurement accuracy to the system level without adding typical A/D and D/A converter inaccuracies as well as providing advantages from the many other on-board advanced diagnostic features. Honeywell's high-performance ST 3000 S100 transmitters lead the industry in: Accuracy, Stability, Reliability, Rangeability and Warranty.

Features

- Choice of linear or square root output conformity is a simple configuration selection.
- Direct digital integration with Experion PKS and other control systems provides local measurement accuracy to the system level without adding typical A/D and D/A converter inaccuracies.
- Unique piezoresistive sensor automatically compensates input for temperature and static pressure. Added "smart" features include configuring lower and upper range values, simulating accurate analog output, and selecting preprogrammed engineering units for display.
- Smart transmitter capabilities with local or remote interfacing means significant manpower efficiency improvements in commissioning, start-up, and ongoing maintenance functions.

Advanced Diagnostics

ST 3000 is now available for both HART® 6 and Foundation™ Fieldbus with advanced diagnostics that minimize unplanned plant outages, minimize maintenance costs and by providing the industry's most reliable transmitter.

- Provide advanced warning of possible failure events and avoid costly shutdowns.
- Three levels of failure reporting
- Comprehensive list of on-board diagnostics (Ref. ST 3000 User manual with HART® 6, 34-ST-25-17 Rev: June 09 and Foundation™ Fieldbus option manual 34-ST-25-15 Rev: June 09)

Operating Conditions – All Models

Parameter	Reference Condition (at zero static)		Rated Condition		Operative Limits		Transportation and Storage	
	°C	°F	°C	°F	°C	°F	°C	°F
Ambient Temperature	25±1	77±2	-40 to 85	-40 to 185	-40 to 85	-40 to 185	-55 to 125	-67 to 257
Meter Body Temperature	25±1	77±2	-40 to 110 ¹	-40 to 230 ¹	-40 to 125	-40 to 257	-55 to 125	-67 to 257
Humidity %RH	10 to 55		0 to 100		0 to 100		0 to 100	
Vacuum Region – Minimum Pressure All Models Except STD110 mmHg absolute inH ₂ O absolute	Atmospheric Atmospheric		25 13		2 (short term ²) 1 (short term ²)			
Supply Voltage, Current, and Load Resistance	Voltage Range: 10.8 to 42.4 Vdc at terminals Current Range: 3.0 to 21.8 mA Load Resistance: 0 to 1,440 ohms (as shown in Figure 2)							
Maximum Allowable Working Pressure (MAWP) ⁴ (ST 3000 products are rated to Maximum Allowable Working Pressure. MAWP depends on Approval Agency and transmitter materials of construction.)	STD924, STD930, STD974 = 4,500psi, 310 bar ³ Static Pressure Limit = Maximum Allowable Working Pressure (MAWP) = Overpressure Limit							

¹ For CTFE fill fluid, the rating is -15°C to 110°C (5°F to 230°F); for the STD924 model at temperatures below -15°C (5°F) the URL is reduced to 100" H₂O.

² Short term equals 2 hours at 70°C (158°F).

³ MAWP applies for temperature range -40 to 125°C. However, Static Pressure Limit is de-rated to 3,000 psi from -26°C to -40°C. Use of graphite o-rings de-rates transmitter to 3,625 psi. Use of adaptor with graphite o-rings de-rates transmitter to 3,000 psi.

⁴ Consult factory for MAWP of ST 3000 transmitters with CSA approval.

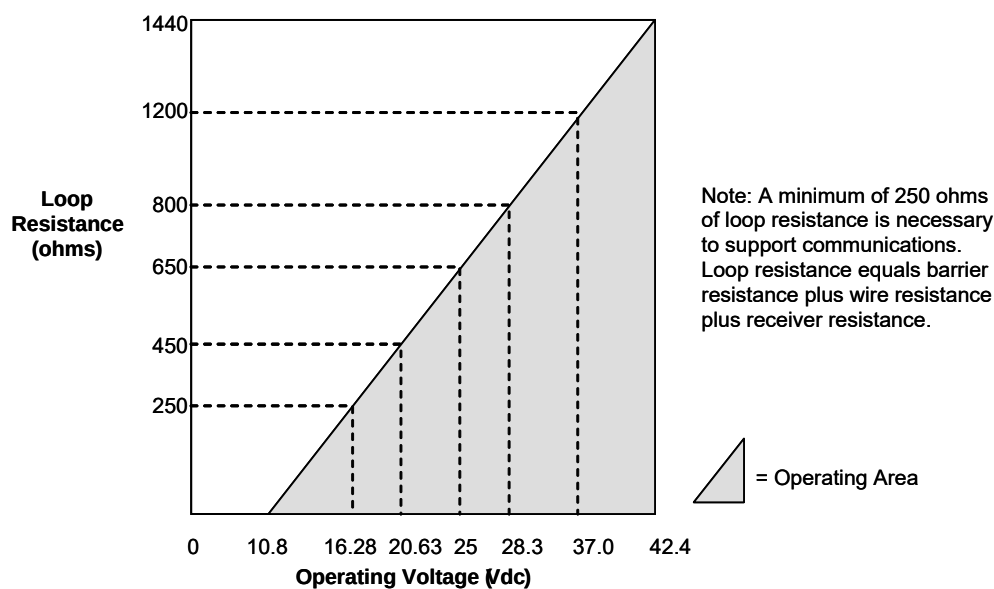


Figure 2 - Supply voltage and loop resistance chart

Performance Under Rated Conditions* - Model STD924 (0 to 400 inH₂O/1,000 mbar)

Parameter		Description
Upper Range Limit	inH ₂ O mbar	400 (39.2°F/4°C is standard reference temperature for inH ₂ O range.) 1,000
Minimum Span	inH ₂ O mbar	4 Note: Recommended minimum span in square root mode is 20 inH ₂ O (50 mbar). 10
Turndown Ratio		100 to 1
Zero Elevation and Suppression		-5 to ±100% URL.
Accuracy (Reference – Includes combined effects of linearity, hysteresis, and repeatability)		In Analog Mode: ±0.075% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 inH₂O), accuracy equals: $\pm \left[0.025 + 0.05 \left(\frac{25 \text{ inH}_2\text{O}}{\text{span inH}_2\text{O}} \right) \right] \text{ or } \pm \left[0.025 + 0.05 \left(\frac{62 \text{ mbar}}{\text{span mbar}} \right) \right] \text{ in \% of span}$ In Digital Mode: ±0.0625% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 inH₂O), accuracy equals: $\pm \left[0.125 + 0.05 \left(\frac{25 \text{ inH}_2\text{O}}{\text{span inH}_2\text{O}} \right) \right] \text{ or } \pm \left[0.0125 + 0.05 \left(\frac{62 \text{ mbar}}{\text{span mbar}} \right) \right] \text{ in \% of span}$
Zero Temperature Effect per 28°C (50°F)		In Analog Mode: ±0.2125% of span. For URV below reference point (50 inH₂O), effect equals: $\pm \left[0.0125 + 0.2 \left(\frac{50 \text{ inH}_2\text{O}}{\text{span inH}_2\text{O}} \right) \right] \text{ or } \pm \left[0.0125 + 0.2 \left(\frac{125 \text{ mbar}}{\text{span mbar}} \right) \right] \text{ in \% of span}$ In Digital Mode: ±0.2% of span. For URV below reference point (50 inH₂O), effect equals: $\pm 0.2 \left(\frac{50 \text{ inH}_2\text{O}}{\text{span inH}_2\text{O}} \right) \text{ or } \pm 0.2 \left(\frac{125 \text{ mbar}}{\text{span mbar}} \right) \text{ in \% of span}$
Combined Zero and Span Temperature Effect per 28°C (50°F)		In Analog Mode: ±0.3% of span. For URV below reference point (50 inH₂O), effect equals: $\pm \left[0.10 + 0.2 \left(\frac{50 \text{ inH}_2\text{O}}{\text{span inH}_2\text{O}} \right) \right] \text{ or } \pm \left[0.10 + 0.02 \left(\frac{125 \text{ mbar}}{\text{span mbar}} \right) \right] \text{ in \% of span}$ In Digital Mode: ±0.275% of span. For URV below reference point (50 inH₂O), effect equals: $\pm \left[0.075 + 0.2 \left(\frac{50 \text{ inH}_2\text{O}}{\text{span inH}_2\text{O}} \right) \right] \text{ or } \pm \left[0.075 + 0.2 \left(\frac{125 \text{ mbar}}{\text{span mbar}} \right) \right] \text{ in \% of span}$
Zero Static Pressure Effect per 1,000 psi (70 bar)		±0.1625% of span. For URV below reference point (50 inH₂O), effect equals: $\pm \left[0.0125 + 0.15 \left(\frac{50 \text{ inH}_2\text{O}}{\text{span inH}_2\text{O}} \right) \right] \text{ or } \pm \left[0.0125 + 0.15 \left(\frac{125 \text{ mbar}}{\text{span mbar}} \right) \right] \text{ in \% of span}$
Combined Zero and Span Static Pressure Effect per 1,000 psi (70 bar)		±0.30% of span. For URV below reference point (50 inH₂O), effect equals: $\pm \left[0.15 + 0.15 \left(\frac{50 \text{ inH}_2\text{O}}{\text{span inH}_2\text{O}} \right) \right] \text{ or } \pm \left[0.15 + 0.15 \left(\frac{125 \text{ mbar}}{\text{span mbar}} \right) \right] \text{ in \% of span}$
Stability		±0.015% of URL per year

* Performance specifications are based on reference conditions of 25°C (77°F), zero (0) static pressure, 10 to 55% RH, and 316 Stainless Steel barrier diaphragm.

Performance Under Rated Conditions* - Model STD930 (0 to 100 psi/7,000 mbar)

Parameter		Description
Upper Range Limit	psi bar	100 7
Minimum Span	psi bar	1 0.07
Turndown Ratio		100 to 1
Zero Elevation and Suppression		No limit except minimum span within $\pm 100\%$ URL.
Accuracy (Reference – Includes combined effects of linearity, hysteresis, and repeatability).		In Analog Mode: $\pm 0.075\%$ of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 inH₂O), accuracy equals: $\pm \left[0.025 + 0.05 \left(\frac{20 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.025 + 0.05 \left(\frac{1.4 \text{ bar}}{\text{span bar}} \right) \right] \text{ in } \% \text{ of span}$ In Digital Mode: $\pm 0.0625\%$ of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (20 psi), accuracy equals: $\pm \left[0.0125 + 0.05 \left(\frac{20 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.0125 + 0.05 \left(\frac{1.4 \text{ bar}}{\text{span bar}} \right) \right] \text{ in } \% \text{ of span}$
Zero Temperature Effect per 28°C (50°F)		In Analog Mode: $\pm 0.1625\%$ of span. For URV below reference point (30 psi), effect equals: $\pm \left[0.0125 + 0.15 \left(\frac{30 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.0125 + 0.15 \left(\frac{2 \text{ bar}}{\text{span bar}} \right) \right] \text{ in } \% \text{ of span}$ In Digital Mode: $\pm 0.15\%$ of span. For URV below reference point (30 psi), effect equals: $\pm 0.15 \left(\frac{30 \text{ psi}}{\text{span psi}} \right) \text{ or } \pm 0.15 \left(\frac{2 \text{ bar}}{\text{span bar}} \right) \text{ in } \% \text{ of span}$
Combined Zero and Span Temperature Effect per 28°C (50°F)		In Analog Mode: $\pm 0.25\%$ of span. For URV below reference point (30 psi), effect equals: $\pm \left[0.10 + 0.15 \left(\frac{30 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.10 + 0.15 \left(\frac{2 \text{ bar}}{\text{span bar}} \right) \right] \text{ in } \% \text{ of span}$ In Digital Mode: $\pm 0.225\%$ of span. For URV below reference point (30 psi), effect equals: $\pm \left[0.075 + 0.15 \left(\frac{30 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.075 + 0.15 \left(\frac{2 \text{ bar}}{\text{span bar}} \right) \right] \text{ in } \% \text{ of span}$
Zero Static Pressure Effect per 1000 psi (70 bar)		$\pm 0.1625\%$ of span. For URV below reference point (30 psi), effect equals: $\pm \left[0.0125 + 0.15 \left(\frac{30 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.0125 + 0.15 \left(\frac{2 \text{ bar}}{\text{span bar}} \right) \right] \text{ in } \% \text{ of span}$
Combined Zero and Span Static Pressure Effect per 1000 psi (70 bar)		$\pm 0.30\%$ of span. For URV below reference point (30 psi), effect equals: $\pm \left[0.15 + 0.15 \left(\frac{30 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.15 + 0.15 \left(\frac{2 \text{ bar}}{\text{span bar}} \right) \right] \text{ in } \% \text{ of span}$
Stability		$\pm 0.04\%$ of URL per year

* Performance specifications are based on reference conditions of 25°C (77°F), zero (0) static pressure, 10 to 55% RH, and 316L Stainless Steel barrier diaphragm.

Performance Under Rated Conditions* - Model STD974 (0 to 3,000 psi/210 bar)

Parameter		Description
Upper Range Limit	psi bar	3,000 210
Minimum Span	psi bar	30 2.1
Turndown Ratio		100 to 1
Zero Elevation and Suppression		−0.6 and +100% URL.
Accuracy (Reference – Includes combined effects of linearity, hysteresis, and repeatability) - Accuracy includes residual error after averaging successive readings. - For FOUNDATION™ Fieldbus use Digital Mode specifications. - For HART® use Analog Mode specifications.		In Analog Mode: ±0.2% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (300 psi), accuracy equals: $\pm \left[0.05 + 0.15 \left(\frac{300 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.05 + 0.15 \left(\frac{21 \text{ bar}}{\text{span bar}} \right) \right] \text{ in \% of span}$ In Digital Mode: ±0.175% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (300 psi), accuracy equals: $\pm \left[0.025 + 0.15 \left(\frac{300 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.025 + 0.15 \left(\frac{21 \text{ bar}}{\text{span bar}} \right) \right] \text{ in \% of span}$
Zero Temperature Effect per 28°C (50°F)		In Analog Mode: ±0.2125% of span. For URV below reference point (500 psi), effect equals: $\pm \left[0.0125 + 0.20 \left(\frac{500 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.0125 + 0.20 \left(\frac{35 \text{ bar}}{\text{span bar}} \right) \right] \text{ in \% of span}$ In Digital Mode: ±0.20% of span. For URV below reference point (500 psi), effect equals: $\pm 0.20 \left(\frac{500 \text{ psi}}{\text{span psi}} \right) \text{ or } \pm 0.20 \left(\frac{35 \text{ bar}}{\text{span bar}} \right) \text{ in \% of span}$
Combined Zero and Span Temperature Effect per 28°C (50°F)		In Analog Mode: ±0.325% of span. For URV below reference point (500 psi), effect equals: $\pm \left[0.0125 + 0.20 \left(\frac{500 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.0125 + 0.20 \left(\frac{35 \text{ bar}}{\text{span bar}} \right) \right] \text{ in \% of span}$ In Digital Mode: ±0.30% of span. For URV below reference point (500 psi), effect equals: $\pm \left[0.10 + 0.20 \left(\frac{500 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.10 + 0.20 \left(\frac{35 \text{ bar}}{\text{span bar}} \right) \right] \text{ in \% of span}$
Zero Static Pressure Effect per 1,000 psi (70 bar)		±0.1625% of span. For URV below reference point (500 psi), effect equals: $\pm \left[0.0125 + 0.15 \left(\frac{500 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.0125 + 0.15 \left(\frac{35 \text{ bar}}{\text{span bar}} \right) \right]$
Combined Zero and Span Static Pressure Effect per 1,000 psi (70 bar)		±0.30% of span. For URV below reference point (500 psi), effect equals: $\pm \left[0.15 + 0.15 \left(\frac{500 \text{ psi}}{\text{span psi}} \right) \right] \text{ or } \pm \left[0.15 + 0.15 \left(\frac{35 \text{ bar}}{\text{span bar}} \right) \right] \text{ in \% of span}$
Stability		±0.03% of URL per year

* Performance specifications are based on reference conditions of 25°C (77°F), zero (0) static pressure, 10 to 55% RH, and 316L Stainless Steel barrier diaphragm.

Performance Under Rated Conditions - General for all Models

Parameter	Description
Output (two-wire)	Analog 4 to 20 mA or DE digital communications mode. Options available for FOUNDATION™ Fieldbus and HART® protocol.
Supply Voltage Effect	0.005% span per volt.
Damping Time Constant	Adjustable from 0 to 32 seconds digital damping.
CE Conformity (Europe)	89/336/EEC, Electromagnetic Compatibility (EMC) Directive.
NAMUR NE 43 Compliance Option	Transmitter failure information is generated when the measuring information is invalid or no longer present. Failure information is transmitted as a current signal but outside the normal 4-20 mA measurement signal level. Transmitter failure values are: ≤ 3.6 mA and ≥ 21.0 mA. The normal signal range is ≥ 3.8 mA and ≤ 20.5 mA.
SIL 2/3 Compliance	SIL certified to IEC 61508 for non-redundant use in SIL 2 related Safety Systems (single use) and for redundant (multiple) use in SIL 3 Safety Systems through TÜV Nord Sys Tec GmbH & Co. KG under the following standards: IEC61508-1: 1998; IEC 61508-2: 2000; IEC61508-3: 1998.
Lightning Protection Option (Code "LP")	Leakage Current: 10 microamps max. @ 42.4 VDC, 93°C Impulse Rating: 10/20 μ sec. 5,000 Amps (50 strikes) 10,000 Amps (20 strikes) (rise/decay) 10/1,000 μ sec. 250 Amps (1,000 strikes) 500 Amps (400 strikes)

Physical and Approval Bodies

Parameter	Description
Barrier Diaphragms Material STD924, STD930, STD974	316L SS, Hastelloy® C-276 ² , Monel® 400 ³ , Tantalum, Gold plated 316LSS, Gold plated Hastelloy® C-276 ² , Gold plated Monel® 400 ³
Process Head Material STD924, STD930, STD974	316 SS ⁴ , Carbon Steel (zinc-plated) ⁵ , Monel® 400 ⁷ , Hastelloy® C-276 ⁶
Head Gaskets	Glass filled PTFE standard. Viton® and graphite optional.
Meter Body Bolting	Carbon Steel (Zinc plated) ⁵ standard. Options include 316 SS, NACE A286 SS bolts with NACE 304 SS nuts, and B7M.
Optional Adapter Flange and Bolts	Adapter Flange materials include 316 SS ⁴ , Hastelloy® C-276 ⁶ and Monel® 400 ⁷ . Options for bolting include carbon steel, 316SS ⁴ , NACE A286SS and B7M. Standard adapter flange gasket material is glass filled PTFE. Viton® and graphite optional.
Mounting Bracket	Carbon Steel (Zinc-plated) or Stainless Steel angle bracket or Carbon Steel flat bracket available (standard options).
Fill Fluid	Silicone DC® 200 oil or CTFE (Chlorotrifluoroethylene)
Electronic Housing	Epoxy-Polyester hybrid paint. Low Copper-Aluminum. Meets NEMA 4X (watertight) and NEMA 7 (explosionproof). Stainless steel optional.
Process Connections	1/4-inch NPT; 1/2-inch NPT with adapter. Process heads meet DIN 19,213 requirements.
Wiring	Accepts up to 16 AWG (1.5 mm diameter).
Mounting	Can be mounted in virtually any position using the standard mounting bracket. Bracket is designed to mount on 2-inch (50 mm) vertical or horizontal pipe. See Figure 3.
Dimensions	See Figure 4.
Net Weight	Approximately 9 pounds (4.1 Kg).

² Hastelloy® C-276 or UNS N10276³ Monel® 400 or UNS N04400⁴ Supplied as 316 SS or as Grade CF8M, the casting equivalent of 316 SS.⁵ Carbon Steel heads are zinc-plated and not recommended for water service due to hydrogen migration. For that service, use 316 stainless steel wetted Process Heads.⁶ Hastelloy® C-276 or UNS N10276. Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy® C-276⁷ Monel® 400 or UNS N04400. Supplied as indicated or as Grade M30C, the casting equivalent of Monel® 400

Note: Pressure transmitters that are part of safety equipment for the protection of piping (systems) or vessel(s) from exceeding allowable pressure limits, (equipment with safety functions in accordance with Pressure Equipment Directive 97/23/EC article 1, 2.1.3), require separate examination

Certifications

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
FM Approvals SM	Explosionproof: Class I, Division 1, Groups A, B, C, D locations Dust Ignition Proof: Class II, III, Division 1, Groups E, F, G locations, Enclosure Type 4X	All	All	T5 Ta = 93°C
	Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G locations, Enclosure Type 4X	4-20 mA / DE	Vmax = 42.4V Imax = 225mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = 93°C
		4-20 mA /	Vmax = 30V Imax = 225mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = 93°C
	Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G locations; Class 1, Zone 0, AEx ia Group IIC, Enclosure Type 4X / IP 66/67	Fieldbus – Entity (Not FISCO)	Vmax = 32V Imax = 120mA Ci = 4.2nF Li = 0 Pi = 0.84W	T4 Ta = 40°C T3 Ta = 93°C
		Fieldbus – Entity (Not FISCO)	Vmax = 24V Imax = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T4 Ta = 40°C T3 Ta = 93°C
		FISCO	Vmax = 17.5V Imax = 380mA Ci = 4.2nF Li = 0 Pi = 5.32W	T4 Ta = 40°C T3 Ta = 93°C
	Nonincendive: Class I, Division 2, Groups A, B, C, D locations, Enclosure Type 4X	4-20 mA / DE	Vmax = 42.4V Imax = 225mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = 93°C
		4-20 mA / HART	Vmax = 30V Imax = 225mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = 93°C
	Nonincendive: Class I, Division 2, Groups A, B, C, D; Suitable for: Class II, Division 2, Groups F&G; Class III, Division 2; Class I, Zone 2, Group IIC, Enclosure Type 4X / IP 66/67	Fieldbus – Entity (Not FNICO)	Vmax = 32V Imax = 120mA Ci = 4.2nF Li = 0 Pi = 0.84W	T4 Ta = 40°C T3 Ta = 93°C
		Fieldbus – Entity (Not FNICO)	Vmax = 24V Imax = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T4 Ta = 40°C T3 Ta = 93°C
		FNICO	Vmax = 32V Ci = 4.2nF Li = 0	T4 Ta = 40°C T3 Ta = 93°C

*Li = 0 except Li = 150µH when Option ME, Analog Meter, is selected.

FM ApprovalsSM is a service mark of FM Global

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
Canadian Standards Association (CSA)	Explosion Proof: Class I, Division 1, Groups B, C, D locations Dust Ignition Proof: Class II, III, Division 1, Groups E, F, G locations, Enclosure Type 4X	All	All	T4 Ta = 93°C
	Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G locations, Enclosure Type 4X	4-20 mA / DE	Vmax = 42V Imax = 225mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = 93°C
		4-20 mA / HART	Vmax = 42V Imax = 225mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = 93°C
		Fieldbus – Entity (Not FISCO)	Vmax = 24V Imax = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T4 Ta = 40°C T3 Ta = 93°C
	Nonincendive: Class I, Division 2, Groups A, B, C, D locations, Enclosure Type 4X	4-20 mA / DE	Vmax = 42.4V Imax = 225mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = 93°C
		4-20 mA / HART	Vmax = 30V Imax = 225mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = 93°C
		Fieldbus – Entity (Not FNICO)	Vmax = 24V Imax = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T4 Ta = 40°C T3 Ta = 93°C
	Canadian Registration Number (CRN):	All ST 3000 models except STG19L, STG99L, STG170 and STG180 have been registered in all provinces and territories in Canada and are marked CRN: 0F8914.5C.		

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
IECEX International Electrotechnical Commission (LCIE)	Flameproof, Zone 1: Ex d IIC, Enclosure IP 66/67	All	All	T5 Ta = -50 to 93°C T6 Ta = -50 to 78°C
	Intrinsically Safe, Zone 0/1: Ex ia IIC, Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 85°C T6 Ta = -50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 63°C T6 Ta = -50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T3 Ta = -50 to 93°C T4 Ta = -50 to 40°C

Li = 0 except Li = 150μH when Option ME, Analog Meter, is selected.

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
SAEx (South Africa)	Flameproof, Zone 1: Ex d IIC, Enclosure IP 66/67	All	All	T5 Ta = -50 to 93°C T6 Ta = -50 to 78°C
	Intrinsically Safe, Zone 0/1: Ex ia IIC, Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 85°C T6 Ta = -50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 63°C T6 Ta = -50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T3 Ta = -50 to 93°C T4 Ta = -50 to 40°C
	Multiple Marking: Flameproof, Zone 1: Ex d IIC, Enclosure IP 66/67 Intrinsically Safe, Zone 0/1: Ex ia IIC, Enclosure IP 66/67 NOTE: The user must determine the type of protection required for installation of the equipment. The user shall then check the box [✓] adjacent to the type of protection used on the equipment certification nameplate. Once a type of protection has been checked on the nameplate, subsequently the equipment shall not be reinstalled using any of the other certification types.	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 85°C T6 Ta = -50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 63°C T6 Ta = -50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T3 Ta = -50 to 93°C T4 Ta = -50 to 40°C

* Li = 0 except Li = 150μH when Option ME, Analog Meter, is selected.

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
ATEX (LCIE)	Flameproof, Zone 0: Ⓔ II 1 D, Ex tD Enclosure IP 66/67	All	All	A20 IP6X T95°C Ta = 93°C or T80°C Ta = 78°C
	Flameproof, Zone 1: Ⓔ II 2 GD, Ex d IIC, Ex tD Enclosure IP 66/67	All	All	T5 Ta = -50 to +93°C T6 Ta = -50 to +78°C, A21 IP6X T95°C Ta = 93°C or T80°C Ta = 78°C
	Intrinsically Safe, Zone 0/1: Ⓔ II 1 G, Ex ia IIC, Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 85°C T6 Ta = -50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 63°C T6 Ta = -50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T3 Ta = -50 to 93°C T4 Ta = -50 to 40°C
	Non-Sparking, Zone 2: Ⓔ II 3 G, Ex nA IIC (Honeywell), Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 85°C T6 Ta = -50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 63°C T6 Ta = -50 to 48°C
		Fieldbus (Not FNICO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T3 Ta = -50 to 93°C T4 Ta = -50 to 40°C
	Multiple Marking: Flameproof, Zone 1: Ⓔ II 2 G, Ex d IIC Intrinsically Safe, Zone 0/1: Ⓔ II 1 G, Ex ia IIC Non-Sparking, Zone 2: Ⓔ II 3 G, Ex nA IIC NOTE: The user must determine the type of protection required for installation of the equipment. The user shall then check the box [✓] adjacent to the type of protection used on the equipment certification nameplate. Once a type of protection has been checked on the nameplate, subsequently the equipment shall not be reinstalled using any of the other certification types.	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 85°C T6 Ta = -50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 63°C T6 Ta = -50 to 48°C
		Fieldbus (Not FISCO/FNICO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T3 Ta = -50 to 93°C T4 Ta = -50 to 40°C

* Li = 0 except Li = 150µH when Option ME, Analog Meter, is selected.

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
INMETRO (CERTUSP) Brazil	Flameproof, Zone 1: BR-Ex d IIC Enclosure IP 66/67	All	All	T5 Ta = -50 to 93°C T6 Ta = -50 to 78°C
	Intrinsically Safe, Zone 0/1: BR-Ex ia IIC Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 85°C T6 Ta = -50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi = 1.2W	T4 Ta = -50 to 93°C T5 Ta = -50 to 63°C T6 Ta = -50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi = 1.2W	T3 Ta = -50 to 93°C T4 Ta = -50 to 40°C

* Li = 0 except Li = 150μH when Option ME, Analog Meter, is selected.

ST 3000 Pressure Transmitter Marine Certificate (MT Option)	This certificate defines the certifications covered for the ST 3000 Pressure Transmitter family of products, including the SMV 3000 Smart Multivariable Transmitter. It represents the compilation of the five certificates Honeywell currently has covering the certification of these products into marine applications. For ST 3000 Smart Pressure Transmitter and SMV 3000 Smart Multivariable Transmitter
	American Bureau of Shipping (ABS) - 2009 Steel Vessel Rules 1-1-4/3.7, 4-6-2/5.15, 4-8-3/13 & 13.5, 4-8-4/27.5.1, 4-9-7/13. Certificate number: 04-HS417416-PDA
	Bureau Veritas (BV) - Product Code: 389:1H. Certificate number: 12660/B0 BV
	Det Norske Veritas (DNV) - Location Classes: Temperature D, Humidity B, Vibration A, EMC B, Enclosure C. For salt spray exposure; enclosure of 316 SST or 2-part epoxy protection with 316 SST bolts to be applied. Certificate number: A-11476
	Korean Register of Shipping (KR) - Certificate number: LOX17743-AE001
	Lloyd's Register (LR) - Certificate number: 02/60001(E1) & (E2)

European Pressure Equipment Directive (PED) (97/23/EC)	The ST 3000 Smart Pressure Transmitters are in conformity with the essential requirements of the Pressure Equipment Directive. Honeywell ST 3000 Smart Pressure Transmitters are designed and manufactured in accordance with the applicable portions of Annex I, Essential Safety Requirements, and sound engineering practices. These transmitters have no pressurized internal volume, or have a pressurized internal volume rated less than 200 bar (2,900 psig), and/or have a maximum volume of less than 0.1 liter (Article 3, 1.1.(a) first indent, Group 1 fluids). Therefore, these transmitters are not subject to the essential requirements of the directive 97/23/EC (PED, Annex I) and shall not have the CE mark applied. For transmitters rated > 200 bar (2,900 psig) < 1,000 bar (14,500 psig) Honeywell maintains a technical file in accordance with Annex III, Module A, (internal production control) when the CE mark is required. Transmitter Attachments: Diaphragm Seals, Process Flanges and Manifolds comply with Sound Engineering Practice. NOTE: Pressure transmitters that are part of safety equipment for the protection of piping (systems) or vessel(s) from exceeding allowable pressure limits, (equipment with safety functions in accordance with Pressure Equipment Directive 97/23/EC article 1, 2.1.3), require separate examination. A formal statement from TÜV Industry Service Group of TÜV America, Inc., a division of TÜV SÜD Deutschland, a Notified Body regarding the Pressure Equipment Directive, can be found at www.honeywell.com. A hard copy may be obtained by contacting a Honeywell representative.
CE Mark	<i>Electro Magnetic Compatibility (EMC) (2004/108/EC)</i> All Models: EN 50081-1: 1992; EN 50082-2:1995; EN 61326-1:1997 + A1, A2, and A3 – Industrial Locations
Dual Seal Certification	Dual Seal Certification based on ANSI/NFPA 70-202 and ANSI/ISA 12.27.01 requirements without the use of additional seal protection elements.
Recommended Frequency of Calibration	Honeywell recommends verifying the calibration of these devices once every four years.
Approved Manufacturing Locations	Honeywell Process Solutions - York, PA USA Honeywell (Tianjin) Limited – Tianjin, P.R. China Honeywell Automation India Ltd. – Pune 411013 India

Foundation™ Fieldbus is a trademark of the Fieldbus Foundation.

HART® is a registered trademark of HART Communications Foundation.

Hastelloy® C-276 is a registered trademark of Haynes International.

Monel® 400 is a registered trademark of Special Metals Corporation.

ST 3000® and Experion® are registered trademarks of Honeywell International Inc.

Viton® is a registered trademark of DuPont

Teflon® is a registered trademark of DuPont.

DC® 200 is a registered trademark of Dow Corning.

FM ApprovalsSM is a service mark of FM Global

Options

- **Mounting Bracket (Options MB, MX, SB, SX, FB)**

The angle mounting bracket is available in either zinc-plated carbon steel or stainless steel and is suitable for horizontal or vertical mounting on a two inch (50 millimeter) pipe, as well as wall mounting. An optional flat mounting bracket is also available in carbon steel for two inch (50 millimeter) pipe mounting.

- **Indicating Meter (Options ME and SM)**

Two integral meter options are available. An analog meter (option ME) is available with a 0 to 100% linear scale. The Smart Meter (option SM) provides an LCD display for both analog and digital output and can be configured to display pressure in pre-selected engineering units.

- **Lightning Protection (Option LP)**

A terminal block is available with circuitry that protects the transmitter from transient surges induced by nearby lightning strikes.

- **HART® Protocol Compatibility (Options HC and H6)**

Optional electronics modules for the ST 3000 that provides HART protocol compatibility in either the HART 5.x or 6.x formats. Transmitters with a HART option are compatible with any HART enabled system that provides either 5.x or 6.x format support.

- **FOUNDATION Fieldbus (Option FF)**

Equips transmitter with FF protocol for use in 31.25 kbit/s FF networks. See document 34-ST-03-72 for additional information on ST 3000 Fieldbus transmitters.

- **SIL2/SIL3 Certification (Option SL)**

This ST 3000 product is available for use with safety systems. With the SL option, we are fully certified to SIL 2 capability for single transmitters and SIL 3 capability for multiple transmitter use through TÜV Nord Sys Tec GmbH & Co. KG. We are in compliance with the following SIL standards:

IEC 61508-1: 1998;

IEC 61508-2: 2000;

IEC 61508-3: 1998.

- **NAMUR NE43 Compliance (Option NE)**

This option provides software that meets the NAMUR NE43 requirements for failsafe software. Transmitter failure information is generated when the measuring information is no longer valid.

Transmitter failure values are ≤ 3.6 mA and ≥ 21.0 mA. The normal ST 3000 ranges are ≤ 3.8 mA and ≥ 20.8 mA.

- **Indicator Configuration (Option CI)**

Provides custom configuration of Smart Meters

- **Stainless Steel Tagging (Option TG)**

Up to 30 characters can be added on the stainless steel nameplate mounted on the transmitter's electronics housing at no extra cost. A stainless steel wired on tag with additional data of up to 4 lines of 28 characters is also available. The number of characters for tagging includes spaces.

- **Transmitter Configuration (Options TC and FC)**

With Option TC, the factory can configure the analog, DE or HART® transmitter's linear/square root extraction, damping time, LRV, URV and mode (analog/digital) and enter an ID tag of up to eight characters and scratchpad information as specified.

With Option FC, the Device ID, Transmitter Tag, Unit Level Node Address, Output Mode and Damping Time Constants can be specified.

- **Custom Calibration and ID in Memory (Option CC)**

The factory can calibrate any range within the scope of the transmitter's range and enter an ID tag of up to eight characters in the transmitter's memory.

Model Selection Guides are subject to change and are inserted into the specifications as guidance only. Prior to specifying or ordering a model check for the latest revision Model Selection Guides which are published at: <http://hpsweb.honeywell.com/Cultures/en-US/Products/Instrumentation/ProductModelSelectionGuides/default.htm>

Model Selection Guide

ST 3000 Smart Transmitter Differential Pressure (DP) Series 900 Model Selection Guide



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Instructions

- Select the desired Key Number. The arrow to the right marks the selection available.
- Make one selection from each Table (I, II and IV), using the column below the proper arrow.
- Select as many Table III options as desired plus a communications option selection.
- A (●) denotes unrestricted availability. A letter denotes restricted availability.
- Restrictions follow Table IV.

Key Number I II III (Optional) IV
 [] - [] - [0 0 0 0] - [] + [X X X X]

KEY NUMBER

Span	Selection	Availability
0-4" to 0-400" H ₂ O / 0-10 to 0-1,000 mbar Body Rating: 4,500 psi (310 bar)	STD924	↓
0-1 to 0-100 psi / 0-0.07 to 0-7 bar Body Rating: 4,500 psi (310 bar)	STD930	↓
0-30 to 0-3,000 psi / 0-2.1 to 0-210 bar Body Rating: 4,500 psi (310 bar)	STD974	↓

Important Note: Base STD models no longer include a default communications option. All units now require the selection of a communication option from Table III (AN, DE, HC, H6 or FF).

TABLE I - METER BODY

	Process Wetted Heads	Vent/Drain Valves and Plugs ²	Barrier Diaphragms	Selection			
Materials of Construction	Carbon Steel ¹	316 SS	316L SS	A _ _	●	●	●
	Carbon Steel ¹	316 SS	Hastelloy [®] C-276 ³	B _ _	●	●	●
	Carbon Steel ¹	316 SS	Monel 400 ^{®4}	C _ _	19	19	19
	Carbon Steel ¹	316 SS	Tantalum	D _ _	●	●	●
	316 SS ⁵	316 SS	316L SS	E _ _	●	●	●
	316 SS ⁵	316 SS	Hastelloy [®] C-276 ³	F _ _	●	●	●
	316 SS ⁵	316 SS	Monel 400 ^{®4}	G _ _	19	19	19
	316 SS ⁵	316 SS	Tantalum	H _ _	●	●	●
	Hastelloy [®] C ^{3,6}	Hastelloy [®] C-276 ³	Hastelloy [®] C-276 ³	J _ _	●	●	●
	Hastelloy [®] C ^{3,6}	Hastelloy [®] C-276 ³	Tantalum	K _ _	●	●	●
Fill Fluid	DC [®] 200 Silicone			_ 1 _	●	●	●
	CTFE			_ 2 _	●	●	●
Process Head Configuration	1/4 NPT			_ _ A	●	●	●
	1/2 NPT with Adapter (on 1/4 NPT Head)			_ _ H	t	t	t

TABLE II

	Selection			
No Selection	0 0 0 0	●	●	●

¹ Carbon Steel heads are zinc-plated and not recommended for water service due to hydrogen migration. For that service, use 316 stainless steel wetted Process Heads.

² Vent/Drains are sealed with Teflon[®] or PTFE.

³ Hastelloy[®] C-276 or UNS N10276

⁴ Monel 400[®] or UNS N04400

⁵ Supplied as 316 SS or as Grade CF8M, the casting equivalent of 316 SS.

⁶ Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy[®] C-276

⁷ Supplied as indicated or as Grade M30C, the casting equivalent of Monel 400[®]

⁹ Monel 400[®] or UNS N04400 or UNS N04405

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Availability
 STD9xx ↓ ↓ ↓
 24 30 74

TABLE III - OPTIONS

Communication Options (Must choose a communications option)				
Analog only (can be configured using appropriate Honeywell DE tool)	AN	•	•	•
DE Protocol communications	DE	•	•	•
HART® 6.x Protocol Compatible Electronics	H6	•	•	•
FOUNDATION™ Fieldbus Communications	FF	r	r	r
Indicating Meter Options				
Analog Meter (0-100 Even 0-10 Square Root)	ME	•	•	•
Smart Meter	SM	•	•	•
Custom Configuration of Smart Meter	CI	e	e	e
Local Zero	LZ	x	x	x
Local Zero and Span	ZS	m	m	m
Transmitter Housing & Electronics Options				
No housing conduit plugs or adaptors come standard with the ST 3000.				
For certain approval codes, you must select a certified conduit plug from below and it will come packaged in the box with your transmitter.				
316 SS ⁵ Electronics Housing - (with M20 conduit connections)	SH	n	n	n
316 SS ⁵ Electronics Housing - (with M20 to 1/2 NPT 316 SS conduit adaptor for use with FM and CSA Approval codes)	A3	i	i	i
1/2 NPT Male to M20 Female 316 SS Certified Conduit Adapter (ATEX, CSA & IECEx)	A1	•	•	•
1/2 NPT Male to 3/4 NPT Female 316 SS Certified Conduit Adapter (ATEX, CSA & IECEx)	A2	•	•	•
M20 Male to 1/2 NPT Female 316 SS Certified Conduit Adaptor (ATEX, CSA & IECEx)	A4	•	•	•
1/2 NPT Zinc-plated Certified Conduit Plug (ATEX, CSA & IECEx)	A5	•	•	•
1/2 NPT 316 SS Certified Conduit Plug (ATEX, CSA & IECEx)	A6	•	•	•
M20 316 SS Certified Conduit Plug (ATEX, CSA & IECEx)	A7	•	•	•
1/2 NPT Non-certified Conduit plug (Zinc-plated carbon steel, general use)	A8	•	•	•
NAMUR Failsafe Software	NE	15	15	15
SIL 2 - TÜV Certified transmitter (requires HC/H6 <u>and</u> WP options)	SL	p	p	p
Lightning Protection	LP	•	•	•
Custom Calibration and I.D. in Memory	CC	•	•	•
Transmitter Configuration - (non-Fieldbus)	TC	15	15	15
Transmitter Configuration - (Fieldbus)	FC	21	21	21
Write Protection (Delivered in the "enabled" position)	WP	•	•	•
Write Protection (Delivered in the "disabled" position)	WX	•	•	•
Stainless Steel Customer Wired-On Tag (4 lines, 26 characters per line, customer supplied information)	TG	•	•	•
Stainless Steel Customer Wired-On Tag (blank)	TB	•	•	•
Low Temperature (-50° C Ambient Limit)	LT	18		
Meter Body Options (Seal bolt material depends on Transmitter bolt material)				
316 SS Bolts and 316 SS Nuts for Process Heads	SS	•	•	•
B7M Bolts and Nuts for Process Heads	B7	•	•	•
NACE A286 SS Bolts and NACE 304 SS Nuts for Process Heads	CR	•	•	•
316 SS ⁵ Adapter Flange - 1/2 NPT with CS Bolts	S2	c	c	c
316 SS ⁵ Adapter Flange - 1/2 NPT with 316 SS Bolts	S3	c	c	c
316 SS ⁵ Adapter Flange - 1/2 NPT with NACE A286 SS Bolts	S4	c	c	c
316 SS ⁵ Adapter Flange - 1/2 NPT with B7M Bolts	S5	c	c	c
Hastelloy® C-276 ^{3,6} Adapter Flange - 1/2 NPT with CS Bolts	T2	c	c	c
Hastelloy® C-276 ^{3,6} Adapter Flange - 1/2 NPT with 316 SS Bolts	T3	c	c	c
Monel 400® ^{4,7} Adapter Flange - 1/2 NPT with CS Bolts	V2	c	c	c
Monel 400® ^{4,7} Adapter Flange - 1/2 NPT with 316 SS Bolts	V3	c	c	c
316 SS ⁵ Blind Adapter Flange with CS Bolts	B3	•	•	•
316 SS ⁵ Blind Adapter Flange with 316 SS Bolts	B4	•	•	•
316 SS ⁵ Blind Adapter Flange with NACE A286 SS Bolts	B5	•	•	•
316 SS ⁵ Blind Adapter Flange with B7M Bolts	B6	•	•	•
Side Vent/Drain (End Vent Drain is standard)	SV	•	•	•
316 SS Center Vent Drain and Bushing	CV	•	•	•
Viton® ⁸ Process Head Gaskets (adapter gaskets ordered separately)	VT	•	•	•
Graphite Process Head & Adapter Flange Gaskets	GF	•	•	•
Viton® ⁸ Adapter Flange Gaskets	VF	17	17	17

³ Hastelloy® C-276 or UNS N10276⁴ Monel 400® or UNS N04400⁵ Supplied as 316 SS or as Grade CF8M. the casting equivalent of 316 SS.⁶ Supplied as indicated or as Grade CW12MW. the casting equivalent of Hastelloy® C-276⁷ Supplied as indicated or as Grade M30C. the casting equivalent of Monel 400®⁸ Viton® or Fluorocarbon Elastomer

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Availability

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TABLE III - OPTIONS (continued)

Selection

24

30

74

Transmitter Mounting Bracket Options

Angle Mounting Bracket - Carbon Steel

MB

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•

Marine Approved Angle Mounting Bracket - Carbon Steel

MX

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•

•

Angle Mounting Bracket - 304 SS

SB

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•

•

Marine Approved Angle Mounting Bracket - 304 SS

SX

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•

•

Flat Mounting Bracket (pipe mounting) - Carbon Steel

FB

•

•

•

Diaphragm Options

Gold plated diaphragm(s) on 316 SS

G1

•

•

•

Gold plated diaphragm(s) on Monel 400^{®4} or Hastelloy[®] C-276³ ONLY

G2

•

•

•

Services/Certificates/Marine Type Approvals Options

User's Manual Paper Copy (Standard, HC, H6 or FF ships accordingly)

UM

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Clean Transmitter for Oxygen or Chlorine Service with Certificate (50039190)

0X

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Over-Pressure Leak Test with Certificate (F3392)

TP

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Calibration Test Report and Certificate of Conformance (F3399)

F1

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Certificate of Conformance (F3391)

F3

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Certificate of Origin (F0195)

F5

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•

SIL Certificate (SIL 2/3) (FC33337)

FE

22

22

22

NACE Certificate (Process-Wetted & Non-Process Wetted) (FC33339)

F7

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o

NACE Certificate (Process-Wetted) (FC33338)

FG

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Material Traceability Certification per EN 10204 3.1 (FC33341)

FX

•

•

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Marine Type Approvals (DNV, ABS, BV, KR & LR) (FC33340)

MT

2

2

2

Warranty Options

Additional Warranty - 1 year

W1

•

•

•

Additional Warranty - 2 years

W2

•

•

•

Additional Warranty - 3 years

W3

•

•

•

Additional Warranty - 4 years

W4

•

•

•

		restriction "f".			
		STD9xx	24	30	74
Approval Body	Approval Type	Location or Classification	Selection		
No hazardous location approvals			9X	•	•
FM Approvals SM	Explosion Proof	Class I, Div. 1, Groups A,B,C,D	1C	•	•
	Dust-Ignitionproof	Class II, III Div. 1, Groups E,F,G		•	•
	Non-Incendive	Class I, Div. 2, Groups A,B,C,D		•	•
	Intrinsically Safe	Class I, II, III, Div. 1, Groups A,B,C,D,E,F,G		•	•
Canadian Standards Association (CSA)	Explosion Proof	Class I, Div. 1, Groups B,C,D	2J	24	24
	Dust-Ignitionproof	Class II, III, Div. 1, Groups E,F,G		24	f
	Intrinsically Safe	Class I, II, III, Div. 1, Groups A,B,C,D,E,F,G		24	24
IECEX	Flameproof, Zone 1	Ex d IIC T5 (Ta = -40 to +93°C), T6 (Ta = -40 to +78°C)	CA	24	24
	Intrinsically Safe, Zone 0/1	Ex ia IIC ; T3, T4, T5, T6 See Spec for detailed temperature codes by Communications option		24	24
CERTUSP INMETRO (Brazil)	Flameproof, Zone 1	BR- Ex d IIC ; T5, T6	6D	•	•
	Intrinsically Safe, Zone 0/1	BR- Ex ia IIC ; T4, T5, T6 (See CERTUSP certificate for detailed temperature codes by Communications option)	6S	•	•

Table III Approvals continued next page

³ Hastelloy[®] C-276 or UNS N10276⁴ Monel 400[®] or UNS N04400

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TABLE III - OPTIONS (continued)

Approval Body	Approval Type	Location or Classification	Selection	24	30	74
ATEX ¹⁰ (LCIE)	Intrinsically Safe, Zone 0	 II 1 G Ex ia IIC T4 (Ta = -50°C to +93°C); T5 (Ta = -50°C to +85°C); T6 (Ta = -50°C to +70°C) Enclosure IP 66/67	3S	•	•	•
	Intrinsically Safe, Zone 1	 II 2 G Ex ia IIC T4 (Ta = -50°C to +93°C); T5 (Ta = -50°C to +85°C); T6 (Ta = -50°C to +70°C) Enclosure IP 66/67				
	Dust-tight Enclosure, Zone 0	 II 1 D Ex tD A20 IP6X T95°C (at Ta = 93°C) or T80°C (at Ta = 78°C) Enclosure IP 66/67	33	24	24	24
	Flameproof and Dust-tight Enclosure, Zone 1	 II 2 GD Ex d IIC T5 (Ta = -40°C to +93°C), T6 (Ta = -40°C to +78°C) Supply 11- 42Vdc Ex tD A21 IP6X T95°C (at Ta = 93°C) or T80°C (at Ta = 78°C) Enclosure IP 66/67				
	Non-Sparking, Zone 2	 II 3 G Ex nA, IIC T5 (Ta = -40°C to +93°C), T6 (Ta = -40°C to +78°C); Zone 2 Supply < 42Vdc, 23mA Ex tD A22 IP6X T95°C (at Ta = 93°C) or T80°C (at Ta = 78°C) (Honeywell). Enclosure IP 66/67	3N	•	•	•
	Multiple Marking ¹¹ Int. Safe, Zone 0/1 and Dust-tight Enclosure, or Flameproof, Zone 1 and Dust-tight Enclosure, or Non-Sparking, Zone 2	 II 1 GD Ex ia IIC T4 (Ta = -50°C to +93°C); T5 (Ta = -50°C to +85°C); T6 (Ta = -50°C to +70°C); Ui = 30V; Ii = 100mA Ex tD A20 IP6X T95°C (at Ta = 93°C) or T80°C (at Ta = 78°C)  II 2 GD Ex d IIC T5 (Ta = -40°C to +93°C), T6 (Ta = -40°C to +78°C) Supply 11- 42Vdc Ex tD A21 IP6X T95°C (at Ta = 93°C) or T80°C (at Ta = 78°C)  II 3 GD Ex nA, IIC T5 (Ta = -40°C to +93°C), T6 (Ta = -40°C to +78°C); Zone 2 Supply < 42Vdc, 23mA Ex tD A22 IP6X T95°C (at Ta = 93°C) or T80°C (at Ta = 78°C) (Honeywell) Enclosure IP 66/67	3C	24	24	24
SAEx (South Africa)	Intrinsically Safe, Zone 0/1	Ex ia IIC T4, T5, T6	Z2	•	•	•
	Flameproof, Zone 1	Ex d IIC T5, T6 Enclosure IP 66/67	ZD	•	•	•
	Multiple Marking ¹¹ Int. Safe, Zone 0/1, or Flameproof, Zone 1	Ex ia IIC T4, T5, T6 Ex d IIC T5, T6 Enclosure IP 66/67	ZA	•	•	•

³ Hastelloy® C-276 or UNS N10276

⁴ Monel 400® or UNS N04400

¹⁰ See ATEX installation requirements in the ST 3000 User's Manual

¹¹ The user must determine the type of protection required for installation of the equipment. The user shall then check the box [✓] adjacent to the type of protection used on the equipment certification nameplate. Once a type of protection has been checked on the nameplate, subsequently the equipment shall not be reinstalled using any of the other certification types.

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STD9xx			
	↓	↓	↓
Selection	24	30	74
Factory Identification	X X X X	•	•

TABLE IV

Factory Identification	X X X X	•	•
------------------------	---------	---	---

RESTRICTIONS

Restriction Letter	Available Only With		Not Available With	
	Table	Selection	Table	Selection
b	Select only one option from this group			
c	I	__ H		
e	III	SM		
f	III	This approval code <u>requires</u> the selection of a certified conduit plug: A5, A6 or A7	I	L __
i	III	1C or 2J		
j	I	_ 2 _		
m			III	ME, FF
n			III	1C, 2J
o	III	CR, S4, B5		
p	III	HC or H6 <u>and</u> WP	III	FF, 00
r	III	FISCO/FNICO compliance available only with 1C	III	TC, ME or FISCO/FNICO compliance not available with 3C, 3N, 33, 3S, 2J, CA, Z2, ZD, ZA, 6D & 6S
t	III	S2, S3, S4, S5, T2, T3, V2, V3		
x	III	FF, SM		
2	III	MX, SX	III	FB, MB, SB
15			III	FF
17	III	VT		
18	I	_ 1 _		
19			III	F7, FG
21	III	FF		
22	III	SL		
24	III	This approval code <u>requires</u> the selection of a certified conduit plug: A5, A6 or A7		

Ordering Example: STD924-A1A-00000-HC,WP,1C+XXXX

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1860 West Rose Garden Lane
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EXHIBIT I
Town of Rotterdam NY Code Water Chapter 267

Chapter 267

WATER

GENERAL REFERENCES

Plumbing — See Ch. 213.

Sewers — See Ch. 230.

§ 267-1. Purpose.

The purpose of this chapter is to:

- A. Protect the public potable water supply of the Town of Rotterdam from the possibility of contamination by isolating within its customer's internal distribution system or its customer's private water system such contaminations or pollutants which could backflow into the public water supply system.
- B. Comply with the requirements of the New York State Sanitary Code 5-1.31.

§ 267-2. Definitions; word usage.

- A. For the purpose of this chapter, unless it is plainly evident from the context that a different meaning is intended, certain terms used herein are defined as follows:

AIR GAP SEPARATION — A physical break between a supply pipe and a receiving vessel. The air gap shall be at least double the diameter of the supply pipe, measured vertically above the top rim of the vessel, and in no case less than one inch.

APPROVED CHECK VALVE — A check valve that seats readily and completely. It must be carefully machined to have free-moving parts and assured watertightness. The face of the closure element and valve seat must be bronze, composition or other noncorrodible material which will seat tightly under all prevailing conditions of field use. Pins and bushings shall be bronze or other noncorrodible, nonsticking material, machined for easy, dependable operation. The closure element (e.g., clapper) shall be internally weighted to otherwise internally equipped to promote rapid and positive closure in all sizes where this feature is obtainable.

APPROVED DOUBLE-CHECK-VALVE ASSEMBLY — An assembly of at least two independently acting approved check valves, including tightly closing shutoff valves on each side of the check-valve assembly and suitable test cocks plus connections available for testing the watertightness of each check valve.

APPROVED REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTION DEVICE — A device incorporating two or more check

valves and an automatically operating differential relief valve located between the two checks, two shutoff valves and equipped with necessary appurtenances for testing. The device shall operate to maintain the pressure in the zone between the two check valves, less than the pressure on the public water supply side of the device. At cessation of normal flow the pressure between the check valves shall be less than the supply pressure. In case of leakage to either valve, the differential relief valve shall operate to maintain this reduced pressure by discharging to the atmosphere. To be approved, these devices must be readily accessible for maintenance and testing and installed in a location where no part of the device will be submerged.

APPROVED WATER SUPPLY — Any water supply approved by, or under the public health supervision of, a public health agency of the State of New York, City of Schenectady or the Town of Rotterdam. In determining what constitutes an approved water supply, the Department of Public Health of the State of New York (herein called "State Health Department") shall have the final judgment as to its safety and potability.

AUXILIARY WATER SUPPLY — Any water supply on or available to the premises other than the Town water supply.

CONSUMER — Any person to whom water is sold and furnished from the Town of Rotterdam.

CONTAMINATION — An impairment of the quality of the Town water supply by the presence of any foreign substance (organic, inorganic, radiological or biological) to a degree which creates a hazard to the public health.

CROSS CONNECTION — Any unprotected connection between any part of the Town waterworks system used or intended to supply water for drinking purposes and any source or system containing water or substance that is not or cannot be approved as safe, wholesome and potable for human consumption.

ENGINEER — The Town Engineer at the Town of Rotterdam, or his authorized representative.

NONTOXIC SUBSTANCE — Any substance of a nonpoisonous nature that may create a moderate or minor hazard to the water supply system.

PERSON — Any natural person, firm, association, organization, partnership, trust or association or persons, joint venture, corporation or company, and includes the United States, the State of New York, the County of Schenectady, any special purpose district and any officer or agent thereof.

PREMISES — Integrated land area, including improvements thereon, undivided by public thoroughfares or water distribution mains of the Town of Rotterdam and where all parts of the premises are operated under the same management and for the same purpose.

PROTECTIVE DEVICE — Any of the following devices:

- (1) Air gap separation.
- (2) Approved reduced pressure principle backflow prevention device.
- (3) Approved double-check-valve assembly.

SERVICE CONNECTION — The terminal end of a service connection from the Town water supply at its point of delivery to the consumer. If a meter is installed, "service connection" means the downstream end of the meter. No unprotected takeoffs from the service line ahead of any meter or backflow protective device located at the point of delivery to the consumer shall be permitted.

TOWN — The Town of Rotterdam.

TOWN WATER SUPPLY — The approved water supply sold and delivered to consumer's premises through the Water Works System of the Town of Rotterdam.

TOXIC SUBSTANCE — Any substance (liquid, solid or gaseous), including raw sewage and lethal substances, that, when introduced into the water supply system, creates or may create a danger to the health and well-being of the consumer.

B. "Shall" is mandatory; "may" is permissive.

§ 267-3. Where protection is required; type of protection.

A. Auxiliary water supply. Each service connection from the Town water supply for furnishing water to premises having an auxiliary water supply shall be protected against backflow of water from the premises into the Town water supply. Where a single- or dual-family residential customer served by a public water supply system has or proposes to install an auxiliary water supply (i.e., well, cistern, spring, etc.) the supplier of water shall protect the public water supply system against backflow by requiring the customer to perform one of the following:
[Amended 5-12-1999 by L.L. No. 7-1999]

- (1) Permanently disconnect the auxiliary water supply from any direct connection to the public water supply system. An inspection to determine compliance with this requirement shall be made by the supplier of water, the local plumbing or building code enforcement official, or their designee. The frequency of inspections shall be at the initial time of disconnection and at periodic intervals thereafter (i.e., every three to five years);
- (2) Abandon the auxiliary water supply in a manner acceptable to the state or local Health Department; or
- (3) Install an approved reduced pressure zone (RPZ) device at the public water supply service connection in accordance with Section 5-1.31 of the State Sanitary Code.

- B. Toxic or hazardous substances. Should a facility be rated hazardous, a reduced pressure zone device would be required independent of a separate system handling the auxiliary water system. We would also require a reduced pressure zone device if the facility were rated nonhazardous and the auxiliary water system did not meet the water quality requirements of the Sanitary Code.
- C. Nonhazardous substances. At the service connection to any premises on which a substance that would be objectionable (but not necessarily hazardous to health) if introduced into the Town water supply is handled in such a manner as to constitute a cross connection, the Town water supply shall be protected by an approved double-check-valve assembly.
- D. Fire systems. At the service connection to any premises in which a fire protection system is installed, the Town water supply shall be protected based on the water source and arrangement of supplies in accordance with the following classifications:
 - (1) Class 1.
 - (a) Direct connection from public water mains only; no pumps, tanks or reservoirs; no physical connections from auxiliary water supplies, no antifreeze or other additives of any kind; all sprinkler drains discharging to atmosphere, dry wells or other safe outlets.
 - (b) Protection: double-check-valve assembly.
 - (2) Class 2.
 - (a) Same as Class 1, except booster pumps may be installed in the connections from the street mains.
 - (b) Protection: double-check-valve assembly.
 - (3) Class 3.
 - (a) Direct connection from public water supply main, plus one or more of the following: elevated storage tanks, fire pumps taking suction from aboveground covered reservoirs or tanks; and pressure tanks.
 - (b) Protection: double-check-valve assembly.
 - (4) Class 4.
 - (a) Directly supplied from public mains similar to Classes 1 and 2 and with an auxiliary water supply on or available to the premises; or an auxiliary supply may be located within 1,700 feet of the pumper connection.
 - (b) Protection: air gap or reduced pressure principle backflow prevention device.

(5) Class 5.

- (a) Directly supplied from public mains and interconnected with auxiliary supplied, such as pumps taking suction from reservoirs exposed to contamination, or rivers and ponds; driven wells; mills or other industrial water systems; or when antifreeze or other industrial water systems; or where antifreeze or other additives are used.
- (b) Protection: air gap or reduced pressure principle backflow prevention device.

(6) Class 6.

- (a) Combined industrial and fire protection systems supplied from the public water mains only, with or without gravity storage or pump suction tanks.
- (b) Protection: determined by the Engineer upon review of engineering drawings of the system.

E. Lawn sprinkling systems. **[Amended 5-12-1999 by L.L. No. 7-1999]**

- (1) Where a single- or dual-family residential customer served by the public water supply system has or proposes to install a lawn sprinkler or irrigation system, the minimum required backflow protection to prevent backsiphonage shall be a vacuum breaker that shall be located, specified, installed, maintained and accessible for inspection in accordance with Sections 902.2(d)(2) and 902.3(a), (b)(1), (c) and (d) of the Uniform Fire Prevention and Building Code (UFP and BC), respectively, in a manner acceptable to the supplier of water and/or the local plumbing or building code enforcement official.
- (2) For the systems described below, the supplier of water shall protect the public water system against backflow by requiring the customer to perform one of the following:
 - (a) Install an approved double-check valve assembly (DCVA) on those systems which may be subject to backpressure from pumps or elevated piping where no chemical injection takes place; or
 - (b) Install an approved RPZ device on those systems where provisions are made for chemical injection.

NOTE: The supplier of water may allow protective devices to be installed in the internal supply pipes to a lawn sprinkler or irrigation system, provided that there are no other hazards associated with a residential user as described in the categories "auxiliary water supplies" and "miscellaneous residential water uses" of this document. Containment at the service connection with an approved DCVA or RPZ shall be required in any other case. For options in Subsection E(2)(a) or (b) above, the device shall be tested in accordance with Section 5-1.31(a)(3) of the State Sanitary Code and maintained in a manner and frequency acceptable to the supplier of water and/or the state or local Health Department.

- (3) Automatic rain shut-off, such as Hunter Mini Klik or equal, must be installed as part of pre-installation. **[Amended 8-8-2001 by L.L. No. 10-2001]**
- (4) An electrical timer shut-off must be installed to control usage of sprinkler system. The timer settings must conform with the rules and regulations for sprinkling as set forth by the town.
- F. Cross-connection control. **[Amended 8-8-2001 by L.L. No. 10-2001]**
 - (1) All portions of the water distribution system serving the swimming pool and auxiliary facilities shall be protected against backflow and back-siphonage. Water introduced into the pool, either directly or to the recirculation system, shall be supplied through an air gap or by another method which will prevent backflow and back-siphonage.
 - (2) Outside water hose bibs shall be protected with a vacuum breaker-backflow preventer such as Watts Series 8 or equal.
- G. All existing systems must comply with this local law by May 1, 2004. **[Amended 8-8-2001 by L.L. No. 10-2001]**

§ 267-4. Responsibility for maintenance.

- A. Consumer responsibility. It shall be the responsibility of each consumer at his own expense to furnish, install and keep in good working order and safe condition any and all protective devices required in this section. The Town shall not be responsible for any loss or damage directly or indirectly resulting from or caused by the improper or negligent installation, operation, use, repair or maintenance of or interfering with any protective device by any consumer or any other person.
- B. Conflicts. Whenever two or more conditions exist on any premises for the correction of which different protective devices are required in this chapter, the consumer shall be required only to install the protective

device which, in the opinion of the Engineer and County Health Officer, affords the maximum protection to the Town water supply.

§ 267-5. Inspection; records; cost. [Amended 6-23-2004 by L.L. No. 5-2004]

The consumer on whose premises any protective device is installed shall have each such device inspected annually by an appropriately certified inspector. If successive inspections disclose repeated failures in the operation of any device, the Public Works Coordinator may require more frequent inspections. Each device shall be repaired, overhauled or replaced at the expense of the consumer whenever it is found to be defective. Records of such tests, repairs and overhauls shall be kept and a copy of such records forwarded to the Public Works Coordinator and the Schenectady County Health Department on an annual basis. The Public Works Coordinator shall have the duty of determining that the inspections required herein are performed properly. If following demand, therefore, the consumer fails to have any of the inspections made as required herein or to make the above-described records available, the Public Works Coordinator shall have the right to inspect the device and the consumer to pay the cost thereof.

§ 267-6. Noncompliance; service to be discontinued; notice; service.

- A. No water service connection shall be installed on the premises of any consumer unless the Town water supply is protected as required by this section.
- B. Delivery of water to the premises of any consumer may be discontinued by the Engineer if any protective device required by this section has not been installed, inspected, tested and maintained or is defective or has been removed or bypassed.
- C. Delivery of water.
 - (1) Delivery of water shall be discontinued immediately and without notice to the consumer if the Engineer or County Health Officer determined that:
 - (a) The Town water supply is being contaminated or is in immediate danger of contamination.
 - (b) A protective device required by this section has not been installed or is defective or has been removed or bypassed.
 - (c) The consumer cannot immediately be located.
 - (2) Delivery of water shall not be resumed until any protective device required by this section and approved by the Engineer has been properly installed or until conditions at the consumer's premises causing the contamination or danger of contamination have been

abated or corrected to the satisfaction of the Engineer and County Health Officer.

D. Notice.

- (1) Except as provided in Subsection C, delivery of water shall not be discontinued until written notice thereof has been given to the consumer. The notice shall state:
 - (a) The conditions or defects which must be corrected.
 - (b) The manner in which the stated conditions or defects are to be corrected.
 - (c) The date on or after which delivery of water will be discontinued, and which shall not be less than 15 nor more than 90 days following the date of delivery of mailing of the notice. The Engineer may grant the consumer an extension of an additional period not to exceed 90 days if he determines the consumer has exercised due diligence but has been unable to comply with the notice within the time originally allowed.
- (2) The notice shall be given by delivering the same to the consumer, the manager or agent thereof, or to any person in charge of or employed in the place of business of the consumer, or, if the consumer has no place of business, then at the place of residence of the consumer if known or by leaving the notice at either the place of business or the residence of the consumer. If the consumer cannot be found, service of the notice shall be mailed, postage fully prepaid, addressed to the consumer at the place of business or residence set forth in the application of the consumer for water service in the records of the town.
- (3) Once discontinued, delivery of water shall not be resumed until any protection device required by this chapter and approved by the Engineer has been properly installed or until the conditions at the consumer's premises creating the need for a protective device have been abated or corrected to the satisfaction of the Engineer.

- E. For the purpose of making any inspections or discharging the duties imposed by this chapter, the Engineer shall have the right to enter upon the premises of any consumer. Each consumer, as a condition of the continued delivery to his premises of water from the Town water supply, shall be considered as having stated his consent to the entry upon his premises of the Engineer for the purposes stated herein.

§ 267-7. Presently installed devices.

All presently installed prevention devices which do not meet the requirements of this section but were approved devices for the purposes described herein at the time of installation and which have been properly maintained shall, except for the inspection and maintenance requirements

under § 267-5, be excluded from the requirements of these rules so long as the Engineer is assured that they will satisfactorily protect the town's water supply. Whenever the existing device is moved from the present location or requires more than minimum maintenance which constitutes a hazard to health, the unit shall be replaced by a backflow prevention device meeting the requirements of this section.

§ 267-8. Enforcement; penalties for offenses. [Amended 7-9-2003 by L.L. No. 9-2003]

- A. Violations. It shall be unlawful for any person, firm or corporation to construct, alter, repair, move, remove, demolish, equip, use, occupy or maintain any premises in violation of any provision of this chapter or to fail in any manner to comply with a notice, directive or order of the Town Engineer, Chief Operator of Water, the Town Building Inspector/ Code Enforcement Officer or the designee of any one of them requiring compliance with this chapter.
- B. Penalties. Any person, firm or corporation who shall violate any of the provisions of this chapter or any rule or regulation made pursuant thereto shall, upon conviction thereof, be punished by a fine of no less than \$500 nor more than \$1,000 or imprisonment for a period not to exceed 15 days, or both, for conviction of a first offense; for conviction of a second offense, both of which were committed within a period of five years, punishable by a fine not less than \$1,000 nor more than \$1,500 or imprisonment for a period not to exceed 15 days, or both; and upon conviction for a third or subsequent offense, all of which were committed within a period of five years, punishable by a fine not less than \$1,500 nor more than \$2,000 or imprisonment for a period not to exceed 15 days, or both. Each day of continued violation shall constitute a separate, additional offense. **[Amended 6-12-2013 by L.L. No. 7-2013]**

§ 267-9. Water and sprinkler regulations for consolidated water districts. [Added 6-26-2013 by L.L. No. 8-2013]

- A. Purpose. Rules, regulations and rates adopted and prescribed by the Town Board of the Town of Rotterdam, Schenectady County, New York, in accordance with § 198 of the Town Law shall apply to the territory of the Town of Rotterdam known and designated as "Water District of the Town of Rotterdam, New York."
- B. Applicability. The rules and regulations herein contained shall apply to every person or user supplied with water by the Department of Public Works, and each such person or user must agree to comply with said rules and regulations as set forth herein, and the same shall constitute a part of the contract, express or implied, between such person or user and the Department of Public Works.
- C. Permits.

- (1) Applications for permits to connect service or supply pipes with either the Water District mains or curb connections must be made in writing at the office of the Department of Public Works by the owner of the premises or his agent on blank forms prepared for that purpose. The application shall specify the particular uses for which water is required. The owner or agent must furnish the Department of Public Works the correct street and lot number as taken from the deed.
- (2) Permits will be issued by the Department of Public Works and shall expire 30 days from date of issuance. All work done under the permit shall be performed by the owner or his agent. No work shall be covered up unless same is first inspected by the Department of Public Works. No work will be inspected until a request by the owner or his agent is made in writing to the Department of Public Works and a request for inspection is given at least 24 hours in advance. All defective work or work done not in accordance with the rules contained herein, the New York State Uniform Fire Prevention and Building Code and the Plumbing Code¹ of the Town of Rotterdam will not be approved and shall be redone, modified or reinstalled in accordance with the directions of the Department of Public Works. Failure to comply by the owner or his agent with the directions of the Department of Public Works to correct any defects in work or to carry out any directions of the Department of Public Works in connection with said work as prescribed herein shall constitute good and sufficient reason for revocation of the permit.
- (3) No plumbing or plumbing fixtures shall be installed in any house, building, or structure thereafter to be erected or remodeled unless and until plans for installation thereof shall be first filed and approved by the Department of Public Works and a permit therefor is obtained.
- (4) No extension or alteration of service pipes, whether involving new uses of water or not, shall be made without the permission of the Department of Public Works, and for any extension involving new uses of water, an application shall be filed with and approved by the Water Commissioner before such extension is made.
- (5) Discontinuance of fixtures. Application must be made for a permit and such permit granted for any desired change in or discontinuance of the use of any fixture on any water service before any such change or discontinuance is made. The charge for the use of water from the fixtures will continue unchanged until the person making such change or discontinuance has notified the office of the Department of Public Works and certified that the change or discontinuance has been made.

D. Connections, construction and maintenance.

1. Editor's Note: See Ch. 213, Plumbing.

- (1) Agent or owner. The agent designated and employed by the owner of the premises will be considered the agent of such owner while employed in the execution of the work of introducing water into said premises, and in no case shall the agent of the Department of Public Works or the Town of Rotterdam be responsible for the acts of such agent.
- (2) Permit required; excavations. No persons, except the properly authorized employees of the Department of Public Works will be permitted to tap or make any connections with street mains or distributing pipes of the Water District. No person shall make any attachment to or connection with the pipes, or make any additions to or alterations of any tap, pipe, cock or other fixture connected with the pipes supplying water to consumers, unless a permit is first obtained. After inspection of excavations, all excavations on the premises shall be backfilled and shall not be disturbed or uncovered without written permission of the Department of Public Works.
- (3) Notice for installation of laterals. After receiving a permit for the installation of any water service, the applicant requesting the work shall notify the Department of Public Works 48 hours in advance of his or her desire to have the lateral installed and shall definitely designate the name of the street and the house or lot number where the lateral is to be installed and the name of the owner or applicant.
- (4) Large cut-in connections. If a larger connection than a 1 1/2 inch-tap is required, a cast-iron pipe service not less than two inches in diameter shall be installed by employees of the Department of Public Works only from the main to the property line of the premises, connections with the street main to be made with patented or standard fittings, all material to be furnished by the Department of Public Works. All such services shall have a gate valve placed in the service pipe near the street main, which gate shall be controlled exclusively by the Department of Public Works. The owner shall be billed for this work at the actual cost of labor, material and pavement out to the Department of Public Works, which amount must be paid to the Receiver of Taxes. No estimate of the cost of installation of any connection, under these rules, shall be binding upon the Department of Public Works or the Town of Rotterdam. Upon failure to pay said charge, the cost of the work performed shall be assessed against said premises and collected as a water charge levied against said premises, in addition to any other remedies provided herein.
- (5) Service pipes and fittings. Existing services installed by the Department of Public Works to the property line are to be connected to by the property owner when he makes application for a service to said property. Any changes in the location of the services shall be done at the owner's expense.

- (6) Installation. The Department of Public Works shall require an inspection to be made by an inspector from the Department of Public Works of each service pipe and trench before any backfilling is done and may refuse to turn on water where backfilling is done before said inspection is made or where the work does not fulfill the requirements of these rules and regulations in every particular.
- (7) Service pipes maintained. The owner of property into which water is introduced by a service pipe will be required to maintain in perfect order, at his own cost and expense, the said service pipe from and including the curb stop to his own premises, including all fixtures therein provided for delivering or supplying water for any purpose, and the curb box must be kept in view and the top thereof even with the sidewalk or street grade at all times, and in a serviceable condition. In case such service and fixtures are not kept in repair, the water may be shut off from the premises until the requirements of this rule are complied with, or the Department of Public Works may make the necessary repairs to conform to this rule and charge the cost thereof to the owner of the property at which this rule is violated and collect such cost from the owner of such property and shut off the water from such property until such charges are paid.
- (8) Defective services. In all premises where water from Water District mains is now supplied by a system of pipes and fixtures for water service, and where the service pipes and fixtures are not of the standard or pattern prescribed in the rules and regulations of the Department of Public Works, or where such fixtures and devices for the prevention of damage to the service or of waste of water, as are prescribed in said rules and regulations, are lacking from said system, the owners of said premises shall, at any time when so required by order of the Department of Public Works, make such changes in and additions to said system or fixtures for said water service as shall be necessary in order to comply with such rules and regulations, and at their own cost and expense. In case of failure to comply with this rule at any premises, the water may be shut off from such premises until this rule is complied with.
- (9) Discontinuance of service. No deduction shall be made from any bill for water for the discontinuance of the water supply to any premises, unless the owner of such premises shall have given notice to the Department of Public Works, in writing, when and where the water is no longer required and have requested same turned off at the curb stop by the Department of Public Works. All consumers will be charged for the use of water until notice as above is given.
- (10) Responsibility for excavations. In the opening of a trench for the introduction of any water service pipe under authority of a permit from the Department of Public Works, the owner and agent will each be held responsible for the trench opened by them. Whenever

any trench is opened for making a connection with or laying any water pipe, public safety and convenience shall be duly regarded and conserved by the construction of such bridges across open trenches as may be required to properly insure safety to the public. Red signal lights, barricades, railings and all other necessary means of protection against accident shall be provided by the agent or owner.

- (11) Inspectors may enter premises. Employees of the Department of Public Works, upon presentation of proper identification, may enter and must be permitted to enter upon any premises in the Water District where water is being supplied or upon any premises when application is made for a permit to connect plumbing with the water pipes for the purpose of inspecting the plumbing and fixtures of the water service, and all work in connection with such service.

E. Shutting off.

- (1) Water may be shut off by the Department of Public Works from any service or main for the purpose of making or constructing new work, or making repairs in the water system, or of enforcement of payment of moneys or charges due the Department of Public Works for water supply and for other matters in accordance with these rules and regulations. In the case of making or constructing new work or in making repairs, the right is reserved to shut off the water from any consumer without notice for as long a period as may be necessary.
- (2) When the water supply has been shut off for a failure to comply with these rules and regulations, it shall not again be turned on except by the Department of Public Works until compliance is made with these rules and regulations in the matter and payment made, by the owner of the premises concerned, to the Receiver of Taxes, of all expenses incurred by the said bureau in so shutting off such water supply. Notice regrading water shutoff shall conform with § 267-6, Noncompliance; service to be discontinued; notice; service.

F. Change of pressure. The Town of Rotterdam or the Department of Public Works shall not be liable for any damage or loss of any kind, to property or persons, which may arise from any or be caused by any change in or increase of water pressure from any cause whatsoever.

G. Lawn sprinkling and supply.

- (1) Sprinkling will be allowed only from May 1 to November 1 and shall not exceed four hours each day, from 7:00 a.m. to 9:00 a.m. and 7:00 p.m. to 9:00 p.m.
- (2) No person will be allowed to sprinkle premises opposite or adjoining his own nor use the water from the said hose attachment

or through said hose for any purpose not authorized by the terms agreed upon with the Department of Public Works.

- (3) Supply to neighboring premises. No person shall supply water in any manner or through any fixtures or devices whatever to the occupants of neighboring premises of any description except by special written permit from the Department of Public Works.
- (4) Supply to contractors.
 - (a) Water will be furnished to builders or contractors as such for construction purposes only, upon application to the Department of Public Works for, and receiving, a permit therefor in writing. Said application shall state in detail the uses for which water is desired, the name of the owner of the property and the street number, the section, block and lot on which water is to be used.
 - (b) The statement must give:
 - [1] The name of the owner of the premises.
 - [2] The name of the builder.
 - [3] The name of the plot.
 - [4] Lot number.
 - [5] The name of the street.
 - (c) Permits under this rule shall terminate on November 1 each year and may be revoked at any time by the Department of Public Works.
- H. Waste of water. Water must not be allowed to run to prevent freezing in the service pipes or their attachments or for the purpose of flushing soil pipes or sewers or for any other purposes on the premises than those paid for or indicated in the application for the same and which are allowed by these rules and regulations. Faucets must be kept properly packed and all other fixtures in repair, so as to prevent leaks.
- I. Water meters.
 - (1) All commercial users shall have water meters. The Department of Public Works reserves the right to order a meter to be placed on any service or to take out a meter and place the consumer on a flat rate whenever in the opinion of the Department of Public Works it is for the best interests of Water District so to do. All water passing through a meter will be charged for, whether used or wasted.
 - (2) Service in good condition. No meter shall be installed by the Department of Public Works unless the service, service fixtures and plumbing adjacent to the proposed location of the meter are in a good and serviceable condition. The curb box must be readily

accessible, the curb cock, stop and waste cock in good working order and any rusty or unsafe pipes next to the proposed location of the meter replaced. The owner, as shown on the latest assessment roll of the Water District, of the premises in which meter is to be installed shall be notified in writing by mail addressed to him at such premises of any required repairs under this rule, and if repairs are not made within 10 days.

- (3) Check valves, test tees and bypasses. All meters installed by the Department of Public Works shall have check valves placed next to outlets to prevent hot water from backing through the meter. All services that are metered and require check valves to prevent hot water from backing through the meter shall be supplied, connected and fitted with such check valves up to and including meters of 1 1/2 inches in size by the Department of Public Works. Services requiring a meter over 1 1/2 inches in size and furnished by the property owner may be installed by the Department of Public Works, but if check valves are required, same are to be installed by the property owner. All sizes above 3/5 inch shall have a test tee next to the outlet of meter and the full size of same, then the check and another valve so that meter can be tested at any time in place. If the owner of premises so desires, meters two inches or larger in size may be installed with bypasses so that meters may be removed for testing or repairs made without hindering the supply of water. The expense of such bypasses and additional work shall be borne by the owner. All such bypasses shall be locked and sealed and under the exclusive control of the Department of Public Works.
- (4) Removal. No meter shall be removed or disturbed without the written permission of the Department of Public Works.
- (5) Testing. Persons making complaints as to the correctness of meter bills and claiming to be overcharged can, by applying at the Department of Public Works within 10 days after meter bills have become due, have the meter examined and the dial reread. The Department of Public Works is authorized to correct any charge due to a fault in the meter or to incorrect reading of the dial but shall have no power to reduce meter bills for any other reason whatsoever.
- (6) Reading of meters. Meters will be read semiannually by regular authorized agents of the Department of Public Works. Bills shall be rendered at such periods of the year as the Water Bureau may direct.
- (7) Schedule bills. All bills for water furnished at schedule rates will be payable annually in advance at the office of the Receiver of Taxes on the 15th day of January in each year. For an intermediate period or for a new or additional service, the bill must be paid before the water is turned on.

- (8) Meter bills. Bills for metered water will be payable annually, on the 15th day of January of each year, at the office of the Receiver of Taxes.
 - (9) Special bills. All special bills and charges for services rendered, material sold or expenses incurred by the Department of Public Works in connection with the enforcement of these rules and regulations must be paid at the office of the Receiver of Taxes within 30 days after the bill is rendered. The supply of water may be shut off from the premises with reference to which such charges become due in default of payment of such bills or charges and until bills and charges are paid.
 - (10) Default in payment of meter bills. In the case of default of payment for the period of 30 days of a meter bill after the same is due, the Department of Public Works may shut off the water supply at the premises to which such bill relates until such bill is paid.
 - (11) Delinquent water rentals. All delinquent water rents except meter bills which shall remain unpaid at the expiration of 30 days from due date thereof shall carry penalties and interest charges as provided by law.
 - (12) Nonpayment. Wherever the owner of any premises which are supplied with water shall be charged for water supplied, services rendered, material furnished or expense incurred by the Department of Public Works pursuant to these rules and regulations, and said charges are not paid and the water shall be turned off on account of such nonpayment, no application for water services for such premises need be granted by the Department of Public Works (notwithstanding the said premises may have changed ownership) until such charges shall have been paid in full to the Receiver of Taxes. Further, if water service is not turned off on account of such nonpayment, any such unpaid bills will become a lien against the property and will be added to the Town's assessment rolls for collection.
- J. Discontinuance of use of water. Any consumer desiring to discontinue the use of water must notify the Department of Public Works, and an employee of the Department of Public Works will shut the water off at the curb. No rebate will be made for any period of discontinuance of such use less than six months from the time of turning off the water by the Department of Public Works. The fact that different portions of premises can be shut off inside of the same buildings will not entitle the owner to rebate.
- K. Partial supply from wells. No rebate shall be made from any water bills under a claim that less water has been used because of a partial use from wells.
- L. Failure to make repairs. No rebate for any water bill will be made in cases where the charges result from the failure on the part of the owner

or consumer to promptly repair any broken, frozen or defective fixtures or service.

M. Fire hydrants.

(1) All street hydrants are under control of the Department of Public Works. No person shall use a wrench for opening hydrants except a wrench furnished by the Department of Public Works for the purpose. No person except an authorized agent or employee of the Department of Public Works, or of the Fire Department, or a person holding a written permit signed by the Coordinator of the Department of Public Works, shall disturb any hydrant or any part thereof, or take any water therefrom under any circumstances whatever; any person found guilty of violating any provision of this rule shall be guilty of a misdemeanor, and in addition thereto he shall pay to the Water District a penalty in the amount of any damage done to said hydrant and the cost of restoring same to its proper condition.

(2) Obstructions. Any person placing any obstructions that would prevent free access to any fire hydrant shall be guilty of obstruction, and such violation shall be punishable pursuant to the New York State Vehicle and Traffic Law or § 247-8, Enforcement; penalties for offenses.

N. Operated by employees of Department of Public Works only. No person except an employee of the Department of Public Works shall open, close or in any way interfere with any valve or gate in any water main, conduit or street pipe. Any person who has disturbed or displaced a valve box so that the valve stem cannot be reached by a key, or has covered a valve box or a valve chamber with dirt, paving plank or other material, shall immediately replace the valve box and remove the obstruction. Any person violating this section shall be guilty of a misdemeanor.

O. Commercial use.

(1) Definitions. As used in this subsection, the following terms shall have the meanings indicated:

COMMERCIAL RATE — The prescribed rate as hereinafter set forth for the consumption of water by users other than private consumers and applicable to metered premises where owners or occupants in the course of their occupation or in the conduct of their business use and consume large quantities of water.

COMMERCIAL USER — Any person, firm or corporation consuming a large quantity of water in the course of his or its business or trade carried on the premises.

(2) Sale of water to commercial users.

- (a) All commercial users, as defined in this section, are hereby required at their own cost and expense and under the supervision of the Department of Public Works to install on the premises a water meter, which meter shall be the property of Water District and not of the consumer, and may be removed by any authorized employee of Water District for repairs and/or Department of Public Works of supply of water to the premises.
 - (b) Upon installation of the meters as aforesaid, the water will be supplied in bulk to the metered premises and charged at the following rate:
 - [1] Basic rate: the rate fixed for private use.
 - [2] Surcharge is superimposed upon the basic rate.
 - [3] An amount in addition thereto shall be charged as follows.
 - [4] Metered water rate:
 - [a] Minimum charge including first 75,000 gallons: \$25.
 - [b] Next 112,500 gallons at \$0.14 per 750 gallons.
 - [c] Next 187,500 gallons at \$0.13 per 750 gallons.
 - [d] Remainder at \$0.12 per 750 gallons.
 - [5] Collection. Water rents will be collected January 15 of each year. Rates are subject to change without notice. Delinquent water rents shall be levied and collected as prescribed by Section 198 of the Town Law.
- P. Should the Department of Public Works determine that water conservation is needed for the health, safety and welfare of the Town, the Town Supervisor may declare the need for water conservation and impose water restrictions, including but not limited to the restriction of water use outside the residence or commercial property.



EXHIBIT J

**PRIME AE Group, Inc.: Town of Rotterdam Water Distribution
System Hydraulic Model**

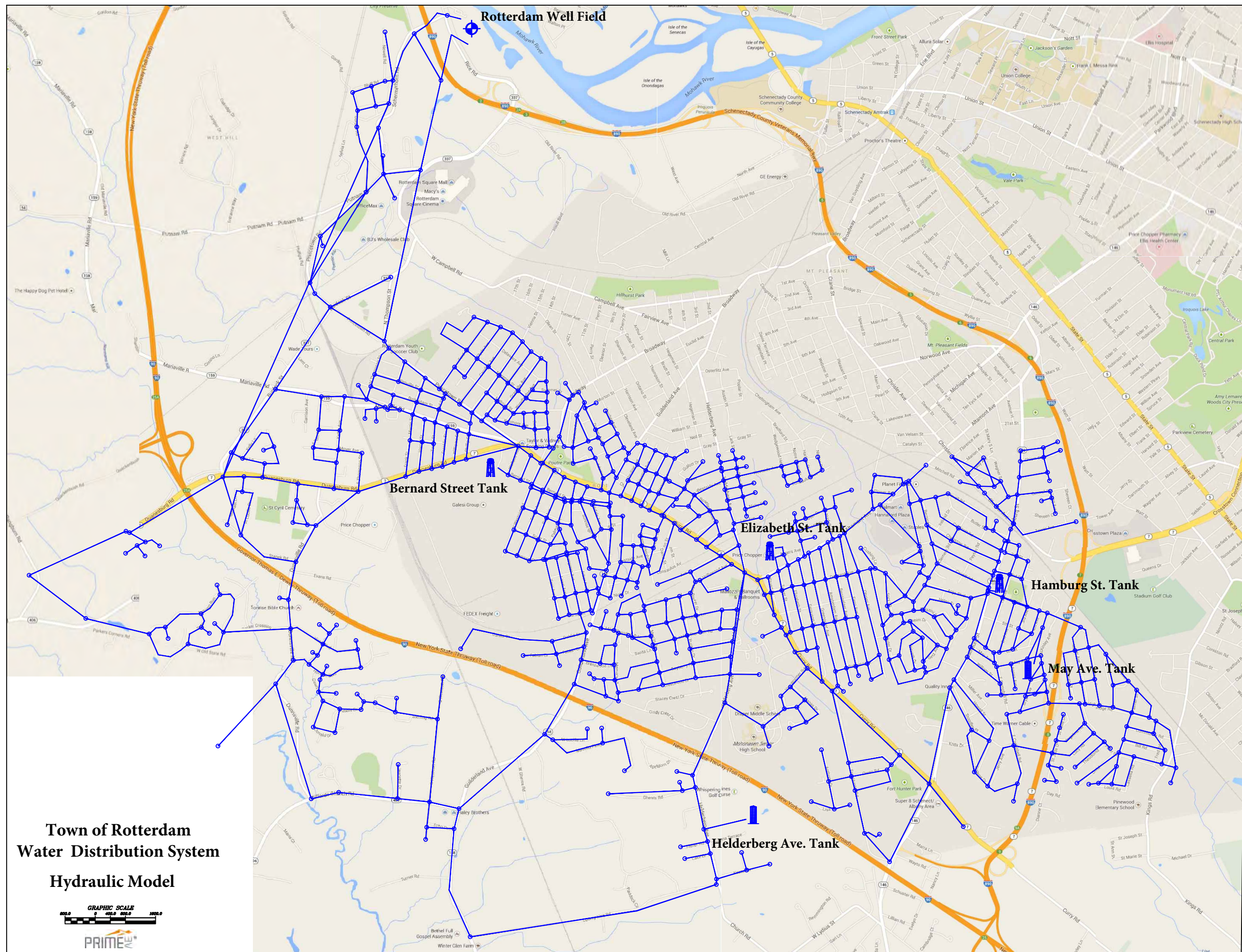


EXHIBIT K
ROTTERDAM WATER CONSUMPTION AVERAGES 2016-2019

WATER 5 APPROPRIATIONS 2018 - 2016

	<u>O & M</u>	<u>Gallons</u>		<u># of Units</u>	<u>Cost/Unit</u>
2018 Budget	1,936,873	1.480	Billion	19,733	\$98.15
2017 Budget	1,644,791	1.259	Billion	16,787	\$97.98
2016 Budget	1,661,004	1.483	Billion	19,773	\$84.00

Monthly Consp. 2016-2019

MONTHLY GALLON CONSUMPTION FOR WATER DIST #5										
YEAR AND DAILY AVERAGE										
MONTH	2016	AVG	2017	AVG	2018	AVG	2019	AVG	2020	AVG
JAN	81,302,000	2,622,645	90,248,000	2,911,226	103,865,000	3,350,484				
FEB	78,307,000	2,700,241	83,959,000	2,998,536	89,551,000	3,198,250				
MAR	83,385,000	2,689,839	92,848,000	2,995,100	98,134,000	3,165,613				
APRIL	94,606,000	3,153,533	100,258,000	3,341,933	97,464,000	3,248,800				
MAY	143,784,000	4,638,194	125,678,000	4,054,129	139,940,000	4,514,194				
JUNE	202,766,000	6,758,867	143,349,000	4,778,300	183,419,000	6,113,967				
JUL	197,274,000	6,363,677	149,009,000	4,806,742	200,792,000	6,477,161				
AUG	156,474,000	5,047,548	149,009,000	4,806,742	146,648,000	4,730,581				
SEPT	159,956,000	5,331,867	133,084,000	4,436,133	135,306,000	4,510,200				
OCT	110,108,000	3,551,871	11,207,000	3,587,323	100,816,000	3,252,129				
NOV	8,505,000	2,860,167	88,730,000	2,957,667	90,477,000	3,015,900				
DEC	90,347,000	2,914,419	91,398,000	2,948,323	93,415,000	3,013,387				
TOTAL	1,483,359,000	4,052,739	1,258,777,000	3,718,512	1,479,827,000	4,049,222				
Highest daily withdrawal		6,758,867								

Monthly Consp. 2011-2015

MONTHLY GALLON CONSUMPTION FOR WATER DIST #5										
	YEAR AND DAILY AVERAGE									
MONTH	2011	AVG	2012	AVG	2013	AVG	2014	AVG	2015	AVG
JAN	86,499,000	2,790,290	87,595,000	2,825,645	85,973,000	2,773,323	86,210,000	2,780,968	95,931,000	3,094,548
FEB	78,546,000	2,805,214	80,295,000	2,768,793	77,099,000	2,753,536	80,203,000	2,864,393	86,804,000	3,100,143
MAR	96,340,000	3,107,742	87,942,000	2,836,839	84,997,000	2,741,839	95,473,000	3,079,774	97,702,000	3,151,677
APRIL	115,864,000	3,862,133	105,562,000	3,518,733	86,418,000	2,880,600	93,242,000	3,108,067	101,463,000	3,382,100
MAY	145,709,000	4,700,290	131,443,000	4,240,097	140,273,000	4,524,935	124,904,000	4,029,161	201,727,000	6,507,323
JUNE	194,972,000	6,499,067	216,871,000	6,995,839	125,973,000	4,199,100	152,651,000	5,088,367	139,124,000	4,637,467
JUL	209,986,000	6,773,742	216,871,000	6,995,839	171,030,000	5,517,097	135,431,000	4,368,742	174,265,000	5,621,452
AUG	133,328,000	4,300,903	160,200,000	5,167,742	159,244,000	5,136,903	143,084,000	4,615,613	180,476,000	5,821,806
SEPT	93,812,000	3,127,067	125,830,000	4,194,333	117,614,000	3,920,467	129,964,000	4,332,133	157,631,000	5,254,367
OCT	87,580,000	2,824,839	81,975,000	2,644,355	95,259,000	3,072,871	99,773,000	3,218,484	95,067,000	3,066,677
NOV	79,985,000	2,666,167	74,298,000	2,476,600	78,679,000	2,622,633	80,717,000	2,690,567	78,562,000	2,618,733
DEC	83,361,000	2,689,065	81,872,000	2,641,032	82,992,000	2,677,161	85,883,000	2,770,419	76,710,000	2,474,516
TOTAL	1,405,982,000	(av)3,845,543	1,450,754,000	(av) 3942154	1,305,551,000	(av) 3,643,372	1,307,535,000	(av)3,582,287	1,485,462,000	4,069,758
Highest daily withdrawal										
	8,885,000		9,037,000		8,338,000					

Monthly Consp. 2016-2019

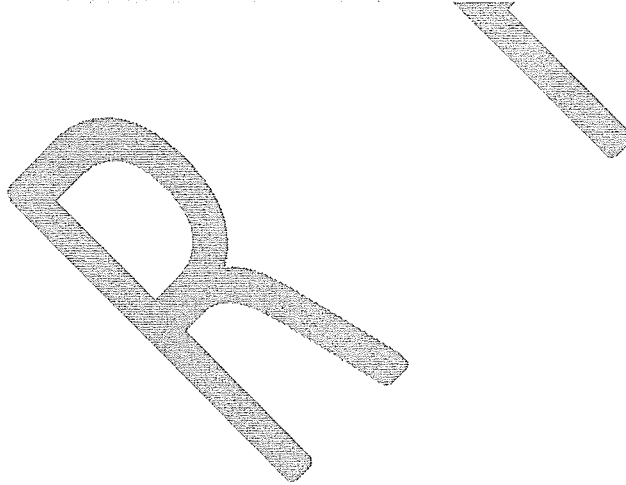
MONTHLY GALLON CONSUMPTION FOR WATER DIST #5										
YEAR AND DAILY AVERAGE										
MONTH	2016	AVG	2017	AVG	2018	AVG	2019	AVG	2020	AVG
JAN	81,302,000	2,622,645	90,248,000	2,911,226	103,865,000	3,350,484	97,057,000	3,130,871		
FEB	78,307,000	2,700,241	83,959,000	2,998,536	89,551,000	3,198,250	95,063,000	3,395,107		
MAR	83,385,000	2,689,839	92,848,000	2,995,100	98,134,000	3,165,613	93,748,000	3,024,129		
APRIL	94,606,000	3,153,533	100,258,000	3,341,933	97,464,000	3,248,800	92,069,000	3,068,967		
MAY	143,784,000	4,638,194	125,678,000	4,054,129	139,940,000	4,514,194	102,030,000	3,291,290		
JUNE	202,766,000	6,758,867	143,349,000	4,778,300	183,419,000	6,113,967	121,517,000	4,250,567		
JUL	197,274,000	6,363,677	149,009,000	4,806,742	200,792,000	6,477,161	175,342,000	5,656,194		
AUG	156,474,000	5,047,548	149,009,000	4,806,742	146,648,000	4,730,581	147,164,000	4,747,226		
SEPT	159,956,000	5,331,867	133,084,000	4,436,133	135,306,000	4,510,200	127,488,000	4,249,600		
OCT	110,108,000	3,551,871	11,207,000	3,587,323	100,816,000	3,252,129	96,602,000	3,116,194		
NOV	85,050,000	2,860,167	88,730,000	2,957,667	90,477,000	3,015,900	86,767,000	2,892,233		
DEC	90,347,000	2,914,419	91,398,000	2,948,323	93,415,000	3,013,387	*	*		
TOTAL	1,483,359,000	4,052,739	1,258,777,000	3,718,512	1,479,827,000	4,049,222	1,234,847,000	3,401,864.83		
Highest daily withdrawal										
	6,758,800		6,914,000		8,505,000		7,286,000			

* Note: 2019 Year and Daily averages not including December 2019 data.

EXHIBIT L
TOWN OF ROTTERDAM DRAFT WATER METER POLICY AND
PROCEDURES

Town of Rotterdam

Water Meter Policy & Procedures



INDEX

Purpose

References

General

Definitions

Timeline

Meter Reading Procedures & Collections

City of Schenectady (Town of Rotterdam Water & Sewer Users) Reading

Procedure & Collections

Town of Rotterdam Meter Reading Procedure & Collections

Penalties for No Reading and/or Non-Payment

Turnoff for Nonpayment

DA

Purpose

The purpose of this policy is to outline the requirements associated with water meters, water meter readings and billing. This policy applies to all existing and new water meter users.

References

Code of the Town of Rotterdam Chapter 267

General

All commercial users shall have water meters. The Department of Public Works reserves the right to order a meter be placed on any service or to take out a meter and place the consumer on a flat rate whenever in the opinion of the Department of Public Works it is in the best interest of the Water District to do so. All water passing through a meter will be charged for whether used or wasted.

Service in good condition. No meter shall be installed by the consumer unless the service, service fixtures and plumbing adjacent to the proposed location of the meter are in good and serviceable condition. The curb box must be readily accessible, the curb cock, stop and waste cock in good working order and any rusty or unsafe pipes next to the proposed location of the meter replaced. The owner, as shown on the latest assessment roll of the Water district, of the premises in which the meter is to be installed shall be notified in writing by mail addressed to him at such premises of any required repairs under this rule, and if repairs are not made within ten (10) days.

Definitions

See also Code of the Town of Rotterdam §267-2. Definitions; word usage.

Consumer

Any person to whom water is sold and furnished water from the Town of Rotterdam.

DPW Department Head

The person whom is in charge of the Department of Public Works or his/her designee.

Person

Any natural person, firm, association, organization, partnership, trust or association or persons, joint venture, corporation or company, and includes the United States, the State of New York, the County of Schenectady, any special purpose district and any officer or agent thereof.

Service Connection

The terminal end of a service connection from the Town Water Supply at its point of delivery to the consumer. If a meter is installed, "service connection" means the downstream end of the meter. No unprotected takeoffs from the service line ahead of any meter or backflow protection device located at the point of delivery to the consumer shall be permitted.

Town

The Town of Rotterdam.

Town Water Supply

The approved water supply sold and delivered to consumer's premises through Water Works System of the Town of Rotterdam.

Water Unit

One (1) water unit equals 75,000 gallons. The rate for the unit is set by the Town Board.

Timeline**September 1 – October 15**

Water meter readings are collected. Tax map numbers, addresses and owners of all billings shall be verified and/or updated utilizing RPS for the January 15th billing.

October 15 – November 15

Enter meter readings. Provide City with meter reading list by the 31st day of October.

November 15 – December 15

Review four (4) spreadsheets (metered, non-metered, adhoc and City of Schenectady) for accuracy, usage charges, and/or tenant space changes.

April 30

On or before the 30th day of April review and provide three (3) spreadsheets (metered, non-metered and adhoc) to the Receiver of Taxes office for the 1st of June water usage billing.

Meter Reading Procedures & Collections Readings

→ How do not, by
case - 2 part

Meters will be read annually by a regular authorized agent of the Department of Public Works by the 15th day of October. While in the field said employee shall determine if reading collected is in sync with prior years. If the reading is not in sync with prior years, said employee shall notify the consumer of issue re; high usage, meter reading appears to be going backward, meter not easily accessible etc.

A complete water meter list with all readings is provided to the Department of Public Works on October 15th of every year. No more water readings shall be gathered for billing purposes after this date for January 15th billing.

No Reading Obtained

If a water meter reading cannot be obtained when the authorized agent of the Department of Public Works is at the property, a secure door hanger will be left to contact the Water Department. The authorized agent of the Department of Public Works will revisit the property and leave a second secure door hanger. Failure to contact the Water Department by the 15th day of October will result in the charge being the highest past rate of preceding three (3) years charged to said premises plus a penalty of \$250.

Multiple Tenants

If premises contain multiple tenants each tenant will be charged one (1) unit at the rate set by the Town Board or be based on the water usage whichever is higher.

Business Closed

If a business is closed and a reading cannot be obtained see No Reading Obtained.

Returned Bills

Water bills are addressed to the person on record utilizing RPS, the Assessor's program, for the Tax Roll for the Town of Rotterdam. One (1) re-attempt will be made to get the consumer their bill.

Failure to receive your bill does not exempt a consumer from payment, late fees and/or interruption

Water Letter, Notices & Shut Offs

Water deficiency letter go out the end of January. The water deficiency letter advises what issue the Town is having with your Water Meter and provides 30 days for a remedy.

Water deficiency notice will go out the beginning of March. The water deficiency notice advises what issue the Town is continuing to have with your water meter and provides 30 days for a remedy. At the end of this 30 days, your water will be turned off at the curb until issue is resolved.

No rebate for any water will be made in the time period for which your water is turned off.

City of Schenectady (Town of Rotterdam Water & Sewer Users) Reading Procedure & Collections

In accordance with agreement between the City of Schenectady and the Town of Rotterdam dated August 19, 2010:

The City provides water to properties outlined in Schedule "A" and as revised with additional properties located in the Town of Rotterdam entitled "Copy of City of Schenectady W-S Charges" with prior year located on Igallo\$ H Drive, Lisa's Files, My Documents, Water, Water Meter Readings with prior year date.

The Town of Rotterdam shall provide water meter readings and direct billing to all above referenced properties.

On or before **December 15th** of each year, the Town of Rotterdam provides the City with water meter readings for preceding 12 months.

Residential: In the event that a residential meter reading cannot be obtained said meter shall be terminated on or before December 31st and the billing for that year shall be two and one half (2 ½) times the minimum charge rate of that year.

Commercial: In the event that a commercial meter reading cannot be obtained said meter shall be terminated on or before December 31st and the billing for that year shall be five (5) times the minimum bill and for all subsequent years 150% of the prior year's billing.

On or before **December 30th** of each year, the City shall provide the Town of Rotterdam the above referenced spreadsheet entitled "Copy of City of Schenectady W-S Charges" with prior year with calculations of charges due to the City of Schenectady.

On or before **February 1st**, the Town of Rotterdam shall pay the City of Schenectady the total amount due. Any amounts not paid by February 1st shall bear interest at a rate of 1.5% per month.

On or before November 15th, of each year during the term of this agreement the City of Schenectady and the Town of Rotterdam shall jointly review and establish an updated and comprehensive Schedule "A."

Rate Adjustment shall be verified by management using the following provided by the City of Schenectady:

All rates and any charges or fees payable by the Town to the City pursuant to this agreement will automatically be adjusted on January 1st of each year (Commencing in 2011) by the percent change in the Consumer Price Index (CPI-U), as published by the U.S Department of Commerce. The amount of the adjustment will be determined by the percent change in the annual CPI-U. The percent change will be computed by comparing the index figure for the month of November immediately preceding the contract commencement year with the index figure published for the month of November immediately preceding the year in which the adjustment is to occur. The new Rate and CPI shall be computed as follows:

New Rate (NR) = Old Rate (OR) X (1+ ((C-Co)/Co)).

C = Current "Consumer Price Index for Urban – NE Consumers: US Cities Average (CPI-U-NE)" as published by the U.S. Department of Labor, Bureau of Labor Statistics for the month of November in the year within which the adjustment is to occur.

Co = Consumer Price Index for Urban – NE Consumers: U.S. Cities Average (CPI-U-NE) as published by the United States Department of Labor, Bureau of Labor Statistics for the month of November in the year immediately preceding the year in which the adjustment is to occur. (For November 2009, the year that will be used as the preceding year for calculating the 2011 rates, the CPIU as referenced is 231.708.)

How rates for the City – reviewed and approved

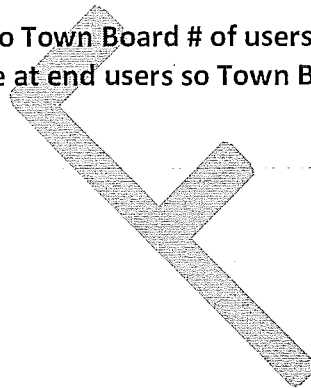
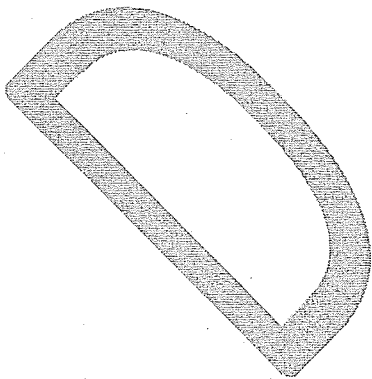
Additional users terminated users and changes to users – policy and procedures change in users can not be made without written authorization approved and documented filed in a logical and organized manner.

Building department provides DPWS with Municipal vouchers for water if OOD added as municipal voucher bill

Annual billing report before OOD bills are finalized to include tax map number, owner, address, prior year usage prior year billing, current year usage, current year billing and explanation column for changes. Reviewed and signed off on by supervisor

Procedure manual for OOD bills and City bills

Annual Report and policy and procedures to Town Board # of users beginning of year, additions, deletions other changes to arrive at end users so Town Board can review and approve

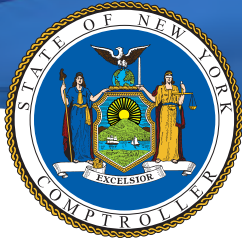


RF

New Users

How rates are determined – reviewed and approved – OOD (Formal review, written approval and document retention) – set up spreadsheet for rates

EXHIBIT M
OFFICE OF THE NYS COMPTROLLER DRINKING WATER SYSTEM IN
NEW YORK: THE CHALLENGES OF AGING INFRASTRUCTURE:
02/2017



Office of the NEW YORK STATE
COMPTROLLER

Drinking Water Systems in New York

The Challenges of Aging Infrastructure



New York State Comptroller
THOMAS P. DiNAPOLI

FEBRUARY 2017

Introduction

New York State has long benefitted from abundant and reliable water resources. Residents expect safe and affordable water for basic daily needs, and industrial, institutional and commercial users depend on the availability of water resources to produce their goods and deliver services. Local governments, water authorities and private water companies serve the important function of delivering water through an extensive but aging infrastructure. The work of upgrading New York's water infrastructure merits sustained attention.

Local government officials and the communities they serve are increasingly concerned about the short and long-term outlook for their water systems. As new examples of the vulnerabilities of water systems, from contamination to water main breaks, continue to emerge in New York State as well as other areas of the country, the public and private sectors will expect government to offer solutions. Paying for these solutions will present a considerable challenge.

New York's Local Water Systems by the Numbers

- **939** local governments have water departments or districts, with a total revenue of **\$1.1 billion** (not including New York City).
- Major municipal water revenues:
 - **79%** water fees
 - **15%** property taxes
- Major municipal water expenditures:
 - **49%** contractual
 - **33%** personal services and benefits
 - **15%** debt service
- **27** public water authorities, with revenues of **\$4.6 billion** (including New York City).
- Typical monthly water costs for consumers range from **\$20** to over **\$100**.
- Estimated 20-year cost of needed water investments:
 - **\$22 billion** (EPA)
 - **\$39 billion** (DOH)

The following report offers an overview of the different ways in which public water supplies are provided, regulated and funded in New York State. It also focuses on some of the specific concerns facing local governments including their own funding trends, capital planning practices and the emerging risk areas of contamination and security.

Water Systems

The fundamental elements of water systems are their ownership, infrastructure and the governmental framework within which they operate. In sparsely populated areas, there may be no water system at all, other than privately maintained wells or surface-water sources. However, in most urban and suburban areas of the State, water is provided by a local government water department or district, a public water authority or a private company. The following discussion focuses on water systems operated by local governments and public authorities.

Physical Infrastructure

Public water systems vary greatly in size and complexity. The smallest systems – for example, those that supply a single business or neighborhood – may use groundwater drawn from a well or nearby surface water source (typically a lake, reservoir or river). Larger systems – like those that serve suburban towns – may also draw from local sources or a regional supplier, and often depend on complex storage and distribution networks. Cities, with their historically dense development, generally import their water from outside their municipal boundaries (often from city-owned sources), both to ensure adequate capacity and to prevent contamination. New York City's water system is by far the largest in the State, drawing water from City owned reservoirs as far away as the Catskill Mountains, conveyed through hundreds of miles of tunnels and aqueducts.¹

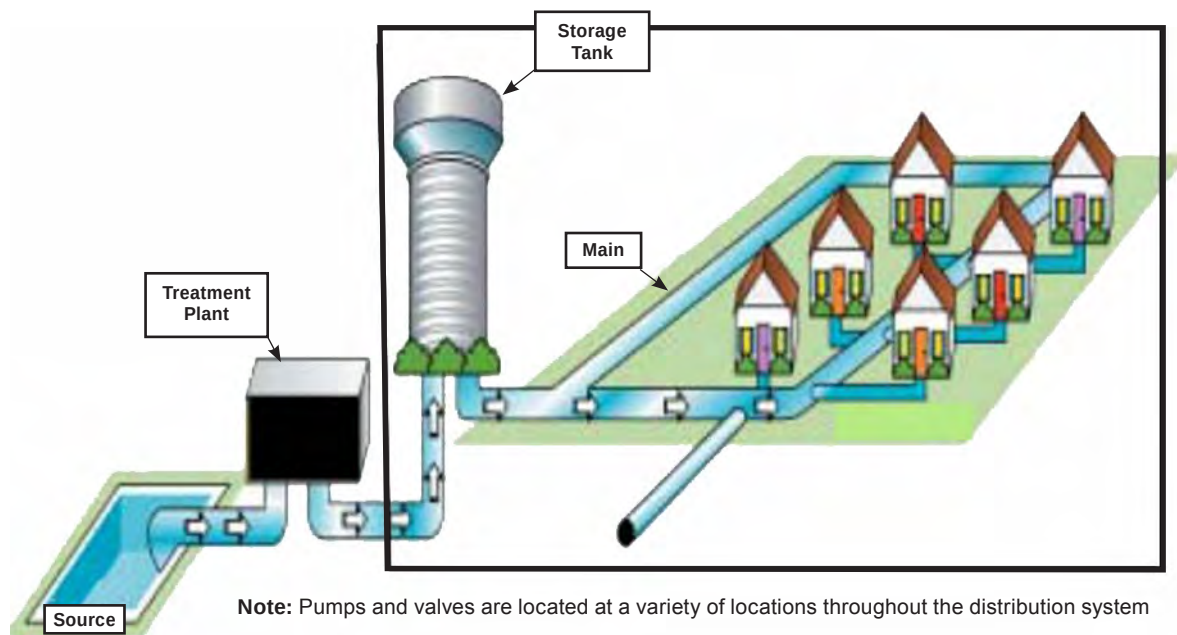


Water Distribution Systems

1. Water originates from a source or sources, generally from a collection point such as a river, lake, reservoir or a well tapping into an aquifer.
2. A treatment plant purifies the water through filtration and/or disinfection, and provides corrosion control if required.
3. Next, the water is often pumped to an elevated storage tank or pressure tank.
4. Finally, water mains and other distribution pipes use gravity or pumps to convey water to users.
5. Most large community public water systems and many small systems include meters to measure water usage for billing and conservation purposes.

Figure 1

Typical Water Supply Distribution System



Source: US Environmental Protection Agency

Government Framework

Many different governmental entities have a role in the ownership, operation and regulation of water services.

- Local governments (cities, villages, towns and a few counties) operate and fund the majority of water systems that supply significant populations.
- Water authorities, which are separate public corporations established by State legislation, also operate some water systems.

Regional water systems, often covering a metropolitan area, may be run by either water authorities or counties. Private water companies’ operations range from small rural systems to large regional enterprises.

See Figure 8 for more information on the largest water systems in New York State.

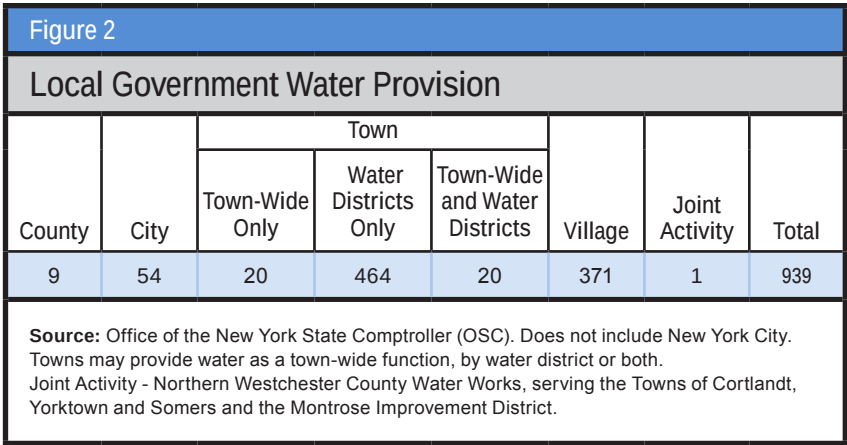
Municipal Water Departments

As part of their financial reporting to the Office of the New York State Comptroller (OSC), most cities and villages report having water departments – or divisions carrying out similar functions – that serve the entire municipality. Additionally, 9 counties and 40 towns report having entity-wide water departments. In all, 474 local governments and 1 joint activity provide water services to all of their residents.

Water Districts

City and village systems generally provide water to the most densely populated areas. The majority of towns do not provide water to all of their residents, but instead provide water to properties in specific areas of the town, known as water districts.² This allows towns to serve only population centers that would benefit from a more centralized water system, while in undeveloped or less-developed areas, private well water may be a better solution.

Town boards generally establish and administer water districts. The properties in a particular district bear the district’s costs, not the taxpayers of the town as a whole. A single town may have multiple water districts, and 484 towns (half of the towns in the State) have at least one.³ Counties also may establish and administer water districts, which operate similarly to town districts.



Water Authorities

At least 27 local authorities in the State report carrying out functions related to public water. They serve areas ranging from a single town or city to a region, and include several of the State's largest public water systems, including New York City's. While most of these authorities own and operate water systems, others have different functions. Water authorities may exist solely to issue bonds for water system improvements that are provided by separate water boards or authorities, for example, or they may conduct water-related activities other than water distribution. On the other hand, some water authorities provide services other than drinking water distribution, such as sewer services.⁴

State and Federal Roles in Water Provision

In New York, the federal and State governments have two major water-related roles: regulating public water systems and providing funding for local water projects.

The regulation of public water systems takes place mainly through the United States Environmental Protection Agency (EPA) and the New York State Department of Health (DOH).

- Federal laws, including the Safe Drinking Water Act (SDWA), and EPA regulations set the basic regulatory structure and standards.⁵
- State laws and DOH regulations then adopt and may expand these basic standards for public water systems in New York State.
- New York City and 36 counties oversee the water systems within their jurisdictions, while DOH has direct oversight of systems in the remaining 21 counties. For example, every public water system is required to create annual Water Quality Reports with information on water sources, treatment and quality. These reports are distributed to the systems' end users, and are filed with the overseeing agency.⁶

In addition, the New York State Department of Environmental Conservation (DEC) regulates drinking water sources (such as lakes and rivers) and their utilization.⁷ Wells that supply individual private residences are generally not regulated, but wells that supply multiple dwellings or the public in stores, hospitals, schools, etc. are regulated as public water systems as described above.⁸

The 277 private water companies that provide water to about 800,000 people in the State are also subject to all the regulations discussed above. In addition, the New York State Department of Public Service regulates these companies as public utilities. Many are very small – homeowners associations run 145 of them – but a few are among the largest water suppliers in the State.⁹

The State and federal governments also provide funding for water infrastructure projects. (See “State and Federal Aid Is Limited” on page 19.)

Water System Challenges

New York State is home to some of the oldest continuously settled communities in North America, and some of the water infrastructure is nearly as old. Many of New York's water system assets are near or past their suggested useful lives. Water mains that carry water throughout the system, transmission lines to specific users, and the pump tanks and treatment facilities are susceptible to deterioration, leading to long-term – sometimes substantial – water loss from leaks, but more commonly evidenced by water main breaks. (See “Water Distribution Systems” on page 3.)

The City of New York's water system is the prime example. It has components that date from the mid-nineteenth century and has become very large and complex. It supplies about one billion gallons of water per day to nine million customers through a system of dams, reservoirs, aqueducts, water tunnels and approximately 6,700 miles of water mains.¹⁰

Water Loss

OSC has conducted audits of local government water departments and districts. These audits have identified numerous water systems that are experiencing excessive water loss in the transmission mains between the source of the water and its metered users. In some cases, this loss exceeds 50 percent.¹¹ Although some water loss is normal and to be expected in certain instances (for example, fire hydrants are unmetered) – high loss rates indicate significant leakage, originating from the underground infrastructure. This is indicative of unseen deterioration or other malfunctions in the distribution system that warrants attention. (See “Water Main Breaks.”)

Water is a valuable asset and it is important to control its loss. Since the local government cannot recoup the cost of lost water with fees, it represents waste of a public resource.

Water Main Breaks

Breaks in water mains can affect an entire community's water supply. Some examples of recent notable water main breaks include:

- The City of Syracuse had 372 water main breaks in 2015 and another 114 through September 2016.¹²
- The City of Albany established water restrictions in 2016 after a water main break caused a sinkhole to form, swallowing a car.¹³
- In the City of Troy, officials declared a state of emergency in January 2016 due to a large water main break that also led to citywide water restrictions. This was one of at least 13 significant water breaks in the City over the last five years.¹⁴
- New York City's large system also suffers from frequent water main breaks. In 2015, there were 562 water main breaks reported. The number of breaks has varied between 350 and 600 a year between 1999 and 2015. Colder temperatures can increase the number of the system's water main breaks.¹⁵

Contamination

The age of many of the State's local water systems and the diverse sources of water pollution make drinking water contamination a highly complex challenge.

Water source contamination often comes from industrial sites (see “Water Source Contamination (Chemical)”), a legacy of manufacturing facilities, both currently operating and abandoned, in the State. Inadequate treatment and separation of sewage and agricultural and storm water runoff are other major contributors (see “Water Source Contamination (Wastewater)”). These are covered by DEC's regulations and are the target of clean-up and prevention programs, including the federal and State Superfund programs for hazardous waste disposal sites.¹⁶

Lead contamination is a growing concern in public water systems. The primary source of lead in drinking water is the corrosion of materials containing lead in the system. In the past, water systems may have used lead service pipes, lead joints in mains, and solder used in home plumbing as well as plumbing fixtures containing lead. This lead can leach into drinking water, especially — as was the case in Flint, Michigan — when the water is corrosive and is not properly treated.¹⁷ In accordance with the SDWA, EPA and the State have established limits for lead in drinking water. The use of lead materials for water infrastructure, solder and plumbing fixtures has been banned since 1986.¹⁸

Recently, after some New York school districts discovered higher-than-acceptable lead levels in their drinking water, the State Legislature enacted legislation that requires all public school districts to periodically test the water supplies for lead contamination, except those determined to be lead-free pursuant to the SDWA.¹⁹ Schools with high levels of lead contamination are required to shut off contaminated outlets, such as water fountains and sinks, and address the problematic fixtures and systems.

Water-source Contamination (Chemical)

In the Village of Hoosick Falls and the Town of Petersburg in Rensselaer County, plastic manufacturing plants had released perfluorooctanoic acid (more commonly known as PFOA) into the environment as a by-product of their industrial processes. The PFOA ultimately found its way into the groundwater sources for both municipalities' drinking water.²⁰

In the City of Newburgh, runoff at the Stewart Air National Guard Base caused contamination by perfluorooctanesulfonic acid (PFOS, a similar chemical to PFOA). The PFOS ended up in Lake Washington, the City's main reservoir. The EPA has issued health advisory warnings regarding PFOA and PFOS, which have been linked to a variety of adverse health effects.²¹

Chemical contamination has also been reported in other parts of the State, including but not limited to Long Island.²²

Water-source Contamination (Wastewater)

Nassau and Suffolk counties on Long Island obtain all of their drinking water from a network of aquifers that underlie the island.²³ Suffolk County's particularly heavy reliance on onsite septic systems has jeopardized local water sources. In many cases, the septic systems were intended for sparse development and seasonal use in areas now densely developed with primarily full-time residents and other users. Many of these systems have effectively failed, but funding to replace them is limited, making solutions including expensive wastewater collection and treatment systems difficult.²⁴ As a result, these systems contribute the majority of nitrogen pollution in the County's drinking water sources, as well as in the Long Island Sound and the eastern and southern coastal areas.²⁵



Security

Water systems can be vulnerable to natural disasters or vandalism that can compromise the purity of their sources or the integrity of their infrastructure. In recent years, however, the danger of terrorist attacks on water systems has become more of a concern. A 2002 federal law requires community water systems that serve more than 3,300 people (covering 90 percent of public water users) to assess their vulnerabilities and create security and emergency response plans.²⁶

One emerging security concern is the potential for cyber-attacks through the growing number of Internet-connected industrial control systems (ICS). Although water system operators at one time controlled their industrial processes manually on site, most facilities now have more automated ICSs. In recent years, facilities have shifted to widely-available lower-cost IT processes with greater Internet connectivity. Increased connectivity enables ICS operators and other support personnel to monitor the system remotely, but it also increases the opportunities for a potential attack. A recent example is a reported cyber-attack on a dam in Rye, New York by operatives linked to the Iranian government. In response, a recently enacted State law requires all water systems to include the possibility of cyber-attacks in their assessments of vulnerability to terrorist attacks.²⁷ During the fiscal year ending September 30, 2015, the U.S. Department of Homeland Security received notice of and responded to 295 ICS cyber-attacks.²⁸



Constraints on Water Supplies

Insufficient water supplies and inadequate infrastructure also cause problems in some parts of the State. For example, water mains that are too small can lead to insufficient water pressure that can hamper development, or result in contaminants entering the system from cross-connections with contaminated flows.

Another issue, although less common in New York State than in other parts of the United States, is restricted development because of a lack of available water sources.

- Orange County, for example, has limited local water sources. Although its local public water systems could tap into the New York City water system through the aqueduct, doing so would be expensive. Municipalities that do this must not only purchase the water but must also build pipelines to the aqueduct, facilities to treat the water and a distribution network. Concerns over how recent growth had affected water supplies have led to building moratoriums in the past.²⁹ Recently, some localities within the County have imposed their own temporary building moratoriums, due in part to limitations in the development of their own water and sewer systems.³⁰
- In Rockland County, a densely populated suburban area, rapid population growth has stretched its water resources to the limit. The County gets 61 percent of its water from groundwater wells. Surface water is also limited in the County and most available surface water sources are already being used. Cyclic declines in precipitation have pushed the whole County into periods of water shortage.³¹
- Long Island's water supply is under intense pressure from population growth and related development. Ground water outflow and saltwater intrusion are documented concerns. The aquifers providing fresh water are entirely reliant upon precipitation to recharge this supply. These issues are the subject of study and initiatives by federal, State and local groups.³²

Potential Effects of Climate Change

Climate change may shrink water supplies as well as degrade the quality of remaining supplies. The EPA has published reports indicating that drought conditions have been increasing in intensity, frequency and duration in many areas of the United States. Together with increasing demand, this trend may affect the sufficiency of ground and surface water.

Overall precipitation has actually been increasing in some areas, including the Northeastern United States. However, more of the precipitation is coming in the form of very heavy rains and snowfalls, which can create runoffs that have adverse impacts on the quality of water sources, not to mention the destructive effect of floods on property and infrastructure of all kinds.

Higher air and water temperatures and intensifying droughts can also negatively affect the quality of water in rivers and lakes, the source for the majority of water in New York State. The location of infrastructure can also be an issue. Relocating facilities to protect them from damage due to the potential rise of sea level or other climate-related changes would be costly and disruptive.³³

Paying For Water Systems

Addressing these serious present and future challenges for local water systems will be extremely expensive. The EPA has estimated that New Yorkers will need to invest \$22 billion over the 20 years between 2011 and 2030 in order to maintain the State's existing drinking water infrastructure.³⁴ A 2007 DOH estimate is higher: over a 20-year period, the agency concluded the State will need \$39 billion in capital financing just for drinking water infrastructure projects.³⁵

Current Water Finances

As previously discussed, the delivery of potable water is often a local government service, but the local entity providing water may be either a municipal government, a local public authority or a private water company. Municipal water departments and water districts may fund this service through property taxes, assessments or fees for usage.³⁶ Municipalities also use property taxes and assessments to pay for capital improvements, including replacement and new construction. Water authorities and private water companies are not permitted to levy property taxes, so they generally must raise revenues through the imposition of fees and other charges and must structure water rates to include the cost of infrastructure maintenance, improvements and expansion. For any of these providers, their financial resources may be used to fund capital projects on a pay-as-you-go basis or to support the issuance of debt (dependent upon their specific authorization).



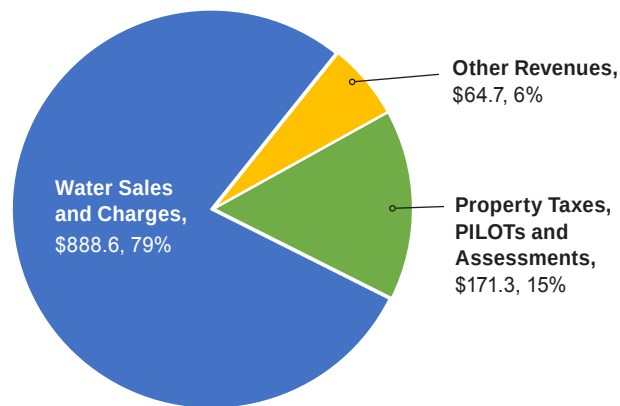
Municipal Operators

Municipal governments file financial data with OSC annually, including information about water fund operating revenue and expenditures. However, municipalities with water systems are not required to have water funds and may report their water-related activities in their general fund. Even if they do have a water fund, they are not required to use it to report water-related debt. Therefore, the amount actually spent on water-related services may be higher than indicated in this report. Additionally, the residents of most large cities and many of the more populous suburbs receive their water from water authorities, not from their municipality.

- In 2015, local governments reported collecting an estimated \$1.1 billion in water fund revenue.
- The bulk of this revenue (\$889 million, or 79 percent of total revenue) was from fees and charges related to the sale of water (see Figure 3).
- Many water funds also received property tax revenue (\$171 million, or 15 percent of revenue).
- Only a small amount of municipal water revenue comes from other sources (\$65 million, or 6 percent), including grants and aid from the State.
- Water fund revenue grew by 35 percent between 2005 and 2015, compared to 27 percent for all local government funds, combined.

Figure 3

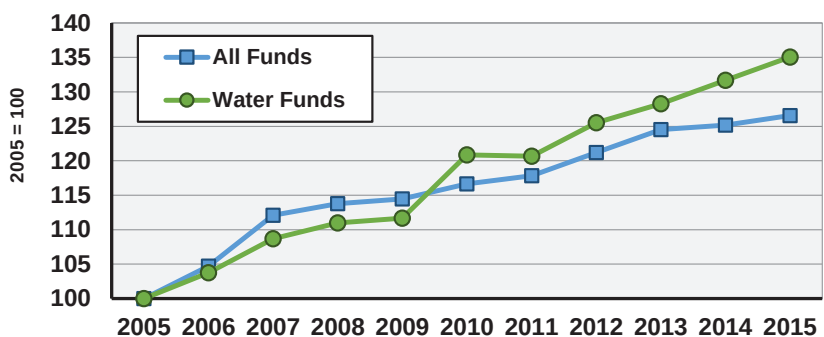
Municipal Water Revenues, FY 2015 (Millions of Dollars)
Excluding New York City and other water authorities



Source: OSC. Includes estimates for some local governments.

Figure 4

Water and All Funds Revenue Growth, 2005 to 2015



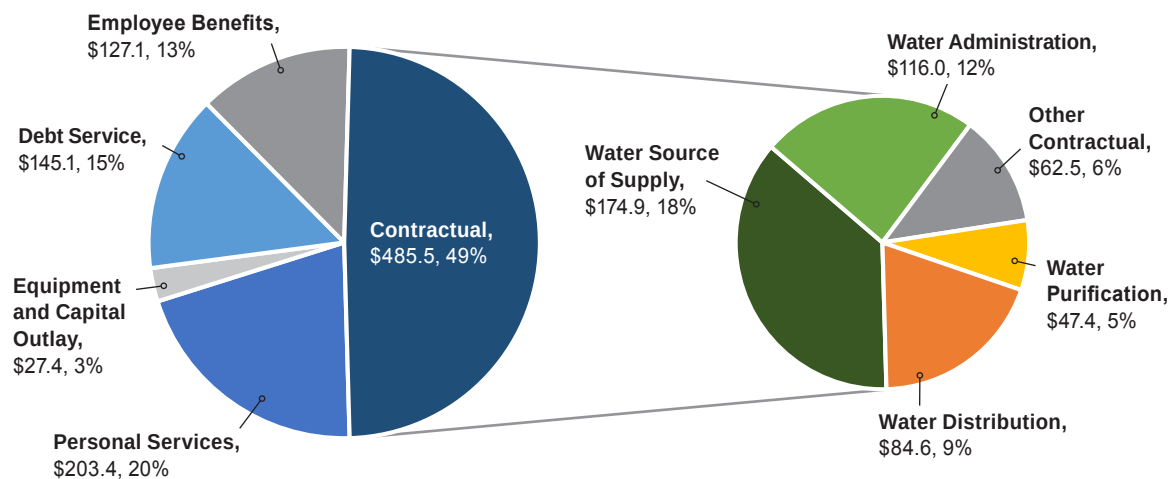
Source: OSC. 2015 includes estimates for some local governments.

Municipalities spend most of this revenue on the day-to-day operation of the water systems, including routine maintenance.

- Contractual spending is the single largest expenditure category (49 percent of expenditures), and typically includes the costs of:
 - The water itself;
 - Purifying (treating) the water;
 - Distributing the water; and
 - Administering the water system.
- Personal services (20 percent) and employee benefits (13 percent) are also major areas of expenditure.
- Debt service that is paid through water funds accounts for about 15 percent of municipal water spending.

Figure 5

Municipal Water Expenditures, FY 2015 (Millions of Dollars)
Excluding New York City



Source: OSC. Includes estimates for some local governments.

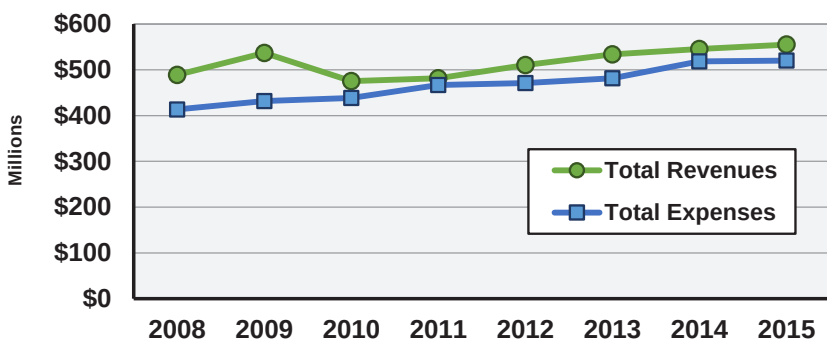
Water Authorities

New York's 27 local water authorities file financial data in a different way than municipal water systems, making direct comparisons difficult. In 2015, however, New York's water authorities reported \$4.6 billion in revenues.³⁷ New York City's water system accounted for \$4.0 billion of the revenues. As mentioned above, some of these authorities have functions other than water provision, so revenue associated with functions such as wastewater and economic development account for some of the total revenue.

As with municipal water funds, there was a spike in water authority revenues around the time of the last recession, with additional federal grant funds and interest rate subsidies for debt, both provided under the American Recovery and Reinvestment Act of 2009.³⁸ However, in general, water authority revenue has been growing at a relatively modest compound annual rate of 1.8 percent between 2008 and 2015, slower than the growth in municipal water revenues.

Figure 6

Water Authority Finances, 2008 to 2015 Excluding New York City



Source: OSC, Public Authorities Reporting Information System.
Data only available beginning in 2008. Includes only Water Authorities that reported in all years.

Public Water Revenues by Region

The mix of water systems varies by region, although it can be difficult to quantify. Figure 7 shows total revenue collected in municipal water funds and by water authorities, though the measures are not entirely comparable, as discussed above. The table does not reflect the revenue of private water companies, which provide water to most of Rockland County and a significant amount of Nassau County, and therefore it understates the revenues of the Mid-Hudson and Long Island regions. It also does not cover private wells, which supply users in many less-developed areas.

In general, municipal water systems account for the bulk of water revenues collected in most regions. In some cases, this includes revenues that the municipalities pay to water authorities for water supplies.

New York City has the largest authority operated system.³⁹ Other large water authorities serve Erie, Monroe, Onondaga and Suffolk counties and the cities of Albany, Buffalo and Niagara Falls. There are no water authorities at all in the Southern Tier region.

New York City has the largest authority operated system. Other large water authorities serve Erie, Monroe, Onondaga and Suffolk counties and the cities of Albany, Buffalo and Niagara Falls.

Figure 7

Water Revenues By Region, FY 2015 (millions of dollars)

Economic Region	Municipal Water Revenues	Water Authority Revenues
Capital District	\$120.5	\$58.0
Central New York	\$74.4	\$45.4
Finger Lakes	\$107.3	\$73.7
Long Island	\$192.3	\$216.3
Mid-Hudson	\$329.9	\$10.9
Mohawk Valley	\$33.4	\$22.4
North Country	\$48.2	\$26.0
Southern Tier	\$69.5	NA
Western New York	\$132.9	\$148.8
New York City	NA	\$3,977.2
Total	\$1,108.3	\$4,578.8

Source: OSC and Public Authorities Reporting Information System.
Does not include private water companies. Some water authority revenues may be from charges to local governments and, therefore, also included under municipal water revenues. Figures may not add due to rounding.

Cost to the Consumer

The cost of water for the consumer varies considerably. (See Figure 8.) For most of the major water systems, the typical cost for a residential customer using 12,000 gallons per month is between \$30 and \$60. The most expensive of the major water providers with a typical cost of over \$110 a month is Suez Water (also known as United Water), a private water company that supplies much of Rockland County. New York American Water in Nassau County, the second highest cost major water system at about \$93 a month, is also a private water system. At the other extreme, the Town of Hempstead Water Department provides water to its residents at a typical cost of only about \$20 each month (system expenses may also be funded with assessments).

Figure 8					
Largest Water System Operators in New York State, 2016					
System	Service Area	Population Served	Water Source	Typical Monthly Water Cost*	Notes
New York City Water System	New York City	8,271,000	Surface (Catskills/ Delaware and Croton Watersheds)	\$61.12	
Suffolk County Water Authority	Suffolk County	1,100,000	Ground	\$29.22	
Monroe County Water Authority	Suburban Monroe County and Parts of Surrounding Counties	496,753	Surface (Lake Ontario, Hemlock Lake)	\$40.38	
Erie County Water Authority	Suburban Erie County	480,939	Surface (Lake Erie, Niagara River)	\$38.04	Operates 15 Systems
Suez Water (United Water)	Parts of Rockland and Westchester Counties.	471,028	Ground and Surface (Lake DeForest)	\$111.85	Private Water Company - 3 Systems
New York American Water	Parts of Nassau County	422,540	Ground	\$92.71	Private Water Company - 4 Systems
Onondaga County Water Authority	Suburban Onondaga County and Parts of Surrounding Counties	300,000	Surface (Lake Ontario, Otisco and Skaneateles Lakes)	\$42.89	
Buffalo Water Authority	City of Buffalo	276,000	Surface (Lake Erie)	\$48.19	
Rochester City	City of Rochester	214,000	Surface (Hemlock and Canadice Lakes)	\$50.00	
Yonkers City	City of Yonkers	196,086	Surface (Purchased from NYC System)	\$79.16	
Syracuse City	City of Syracuse	192,000	Surface (Skaneateles Lake)	\$46.68	
Mohawk Valley Water Authority	Parts of Herkimer and Oneida Counties	130,000	Surface (Hinckley Reservoir)	\$61.08	
Water Authority of Western Nassau	Part of Nassau County	120,000	Ground	\$48.67	
Town of Hempstead Water Department	Part of Nassau County	110,000	Ground	\$20.18	
Albany City	City of Albany	101,082	Surface (Alcove Reservoir)	\$42.83	
Source: Safe Drinking Water Information System, United States Environmental Protection Agency, https://www3.epa.gov/enviro/facts/sdwis/search.html . * Cost for residential customer using 12,000 gallons per month. Calculated by OSC based on information from each water system for the latest available year. Municipal water systems may also be funded with ad valorem or benefit assessments.					

Paying for Water Improvements

Water System Repair and Replacement is Urgently Needed

As discussed above, much of the water infrastructure in New York State is aging and reaching the end of its useful life. Municipal development in the State has been taking place for many decades, in some cases centuries. Therefore, municipal water infrastructure has been in place for a long time, often over 50 years and sometimes over 100 years. In recent decades, having developed infrastructure was financially advantageous because communities did not need to invest in new water systems. As a result, local leaders managed to keep water bills low and focus financial resources elsewhere.

Since much of the water infrastructure is underground, it does not typically draw the attention of residents until failure or contamination occurs. Therefore, it can be difficult for local leaders to give water systems the attention and priority that they deserve. This same characteristic also makes it difficult to determine a water system's condition and accurately budget for needed repairs and replacement. Adding to the desire to keep water bills low was the common perception of water access as a right, a resource that should be available to all property owners, residents and businesses, at nominal prices. However, delays in improvements and replacement add to the cost of these repairs, as they can lead to degraded and disrupted water service and increasing expenditures if emergency repairs become necessary.

Fiscal Impact of Water Conservation

The success of water conservation efforts in recent decades has added to the cost of water for some users. The movement from real property tax-based revenues to metered water sales in the form of fees, combined with the more recent implementation of low-flow water fixtures and efficient appliances, has decreased water usage greatly.⁴⁰ Between 1990 and 2010, the per capita daily use of public water nationally declined from 153 gallons to 134 gallons.⁴¹ Yet the water systems in many larger population centers predate these changes. While water conservation can help with water sufficiency issues and has clear environmental benefits, it also means that users must now pay higher prices per gallon for the water they still use in order to support the existing water infrastructure.⁴²

Water infrastructure replacement will be very expensive, and many local governments face potential costs that are many times their current annual water budgets. For local governments that have been making only minimal investments in their water systems, it may be difficult to quickly and effectively develop the oversight, planning and financial capacity needed to deal with these problems.

Local governments that are in poor financial condition or have urgent competing financial priorities will often postpone or cancel infrastructure projects. Marginal water systems, however, can hinder economic development, as businesses do not want to expand or relocate to areas with unstable or insufficient infrastructure. This can create a vicious cycle where infrastructure problems limit development. Limited development leads to strained finances, and financial problems increase the difficulty of addressing infrastructure needs adequately. (See “Water and Industrial Development.”)

Water and Industrial Development

In some cases, investing in major water system upgrades to aid development can backfire. Businesses can make decisions that have financial implications for water providers and may raise the water cost of other consumers.

- In the early 1990s, the Village of Canajoharie built up its water and sewer infrastructure to support the needs of a Beech-Nut plant. About 15 years later, long before the Village paid off the cost of the upgrade, Beech-Nut moved to a different locale, leaving the village to pay for the now oversized system.⁴³
- The Saratoga Water Authority built a new facility, chiefly to meet the needs of a GlobalFoundries plant in Malta, NY. However, GlobalFoundries then contracted with a private water supplier for a portion of its water needs. This reportedly has left the authority unable to sell enough water to balance its budget.⁴⁴

State and Federal Aid Is Limited

Given the high cost of major water system repairs and upgrades, local governments often look for federal and State funding to defray these costs. This funding is limited, but there are some recent initiatives that local officials should be aware of.

- Most of the State funding for local water projects comes from the Drinking Water State Revolving Fund (DWSRF), which provides low-cost financing for such improvement projects throughout the State. DOH and the Environmental Facilities Corporation jointly administer this fund. As borrowers pay back the revolving fund's loans, the money becomes available for new projects. The DWSRF can provide market rate financing, reduced interest rate loans, and limited grants for eligible water system projects. The EPA administers the federal money that primarily funds this program.
- Since its establishment in 1996, the DWSRF has assisted public water systems with over \$5.24 billion in financing for drinking water infrastructure throughout the State, although only \$337 million of this was in grants.⁴⁵ However, 95 percent of the drinking water infrastructure improvement projects submitted to the DWSRF have received no assistance of either kind.⁴⁶
- The DWSRF has also financially supported the proper training and certification of water system operators.⁴⁷
- In response to the significant need for water infrastructure funding (both drinking water and wastewater), the State established the NYS Water Infrastructure Improvement Act (Water Grants Program) in 2015. To date, this program offered a total of \$107.5 million in drinking water grants in State fiscal years 2015-16 and 2016-17, just a small fraction of the decade-old, \$39 billion estimate by DOH for work needed over 20 Years.⁴⁸
- The EPA also administers the Water Infrastructure Finance and Innovation Act (WIFIA), which operates in coordination with the DWSRF in order to provide subsidized funding for large projects.⁴⁹
- The Executive Budget for State Fiscal Year 2017-18 proposes a \$2 billion capital appropriation for water quality improvements, providing \$400 million in spending authority annually over five years. The proposal would provide financing for drinking water and wastewater infrastructure upgrades, land acquisition to protect water sources, replacement of lead-contaminated drinking water lines, and remediation of drinking water contamination from solid waste sites. Part of the appropriation would fund a new Regional Water Infrastructure Grants Program that would provide State assistance to municipalities, public benefit corporations and public authorities for water infrastructure projects that have a regional impact.

Conclusion and Recommendations

There are many ways in which the responsibility of operating and maintaining a water system can be a significant challenge for a local government and the people it serves. A failure in a water system, whether through contamination, main breaks or deliberate sabotage, can be catastrophic for a community. To further complicate matters, developing the proper safeguards to protect against certain types of risk can require local officials to develop special expertise in more complex areas such as security.

Certain problems cannot be predicted and may unfold without any forewarning. Even when officials are able to think strategically about their short-term and long-term needs, identifying adequate financial resources to pay for improvements and repairs can be a daunting task.

Ideally, water rates and/or property taxes should be sufficient to support all water service expenses, including capital improvements. Municipalities must plan for these realistically and budget with them in mind. While State and federal aid may be of some assistance, it is not currently at a level that will solve the problems associated with water system costs. Capital planning is the only realistic path toward effectively maintaining and improving water systems. Unfortunately, OSC audits have found that many local governments do not consistently use capital planning as a tool. Furthermore, even the most thoughtful plans sometimes take a back seat during tough fiscal times.

As one water industry group has put it, the United States is now in an “Era of Infrastructure Replacement,” when we will need to rebuild our now aging water systems.⁵⁰ Local governments have the primary responsibility for this task, even as their resources are already stretched thin and there is little appetite for increasing taxes, assessments and fees. In addition, many of the existing water systems were designed to serve populations that have shifted, leaving older water systems with excess supply. The potential effects of climate change add another layer of uncertainty to the long-term availability of clean drinking water and dependability of existing infrastructure.

All of these facts make for a challenging environment for municipalities. However, there are some simple steps that can help local officials confront this important issue.

Sustained Commitment to Planning

Every local government should have a multiyear financial plan, a corresponding capital plan, and a workable process to keep both of them up-to-date. A financial plan projects revenues and expenditures for several years into the future, given a set of economic and policy assumptions, while a capital plan balances the need to maintain and improve the local government’s capital assets (essentially everything a local government owns) within the local government’s fiscal constraints. The best capital plans include water asset needs in the context of all municipal needs. For example, repairs and upgrades to drinking water systems should be coordinated with similar wastewater system needs, or even road repairs and other related infrastructure repairs and improvements. Local governments often borrow to achieve these ends, and a good capital plan will include a consideration of how much debt is sustainable.

Understand and Effectively Utilize Capital Reserves

In conjunction with strong planning practices, local governments should also consider appropriate use of capital reserves for water assets. When municipal officials create and use financial plans, they can identify when water rates are insufficient to meet the true costs of water asset repairs, upgrades and replacements. Good planning can help officials avoid situations where they may be tempted to follow unsound practices, such as diverting water fund reserves to plug a structural budget gap in the general fund, for example.

OSC provides training and publications that can help local government officials learn more about capital planning, multiyear financial planning and establishing capital reserves. These can be found at The Academy for New York State's Local Officials.

Develop a Cogent Communication Strategy

Clean, safe drinking water is universally considered to be a critical resource. However, with respect to matters of responsibility and cost, reasonable people may disagree. Local leaders must work diligently to increase civic engagement on this important issue. Communication strategies must convey a simple message about needs, tradeoffs and risks if no action is taken. Such a process can help set the tone for thoughtful deliberation by the community.

A particularly important element in the process is to develop and communicate a long-term approach toward any anticipated rate changes. This requires municipal officials to create a reasonable and defensible estimate of required annual increases to achieve a long-term capital plan, and then ensuring that rate-payers understand what those increases represent and how they are necessary to achieve the established goals.

Be Aware of Funding Opportunities

Although there is more need than funding available, federal and State grants and loans are an important part of a local government's overall resources. As new programs are unveiled, it is critical that local officials stay informed about these opportunities and any conditions that might be attached.

Comptroller DiNapoli has called for more comprehensive capital planning by New York State to inform policymakers and the public as to the level of investment needed for both State and local infrastructure. Such a process would provide a stronger foundation for effective planning and investment.

Future work from this Office will focus on helping local governments learn more about the critical challenges of maintaining and paying for water systems.

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- ² Under Town Law sections 54 and 209-q, water improvements may be undertaken by towns without the formation of a special district. The capital costs may be borne by either an area of benefited properties or as part of the general tax levy on the entire area of the town outside of any incorporated villages. Operation and maintenance costs of these town improvements are borne by the entire town outside village area.
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EXHIBIT N
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Clean Water Infrastructure in New York State



◆
December 4, 2017

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Hon. MaryEllen Odell
President

Stephen J. Acquario
Executive Director

NEW YORK'S AGING WATER INFRASTRUCTURE

Aging water infrastructure, deteriorating pipes, struggling wastewater treatment plants, and water main breaks have become commonplace throughout the state. New York State Comptroller Thomas DiNapoli issued a report in February 2017 indicating the State would need an estimated \$80 billion to repair, maintain, and replace drinking and wastewater infrastructure in New York over the next 20 years. The 2017-18 State Budget responded to this need by making a \$2.5 billion investment in drinking water infrastructure, clean water infrastructure and water quality protection.

CLEAN WATER INFRASTRUCTURE ACT OF 2017

The Clean Water Infrastructure Act provides funding to improve municipal drinking water, improve wastewater treatment infrastructure, expedite the cleanup of hazardous waste that may impact drinking water, and support green infrastructure. The Act is funded at \$2.5 billion and includes six main types of projects:

- Land Acquisition Projects
- Lead Service Line Replacement Grant Program
- Cleanup & Abatement of Solid Waste Sites and Drinking Water Contamination
- New York State Regional Water Infrastructure Projects
- Water Infrastructure Emergency Financial Assistance
- Septic System Replacement Fund

New York State has some of the oldest water infrastructure in the nation. Without this vital funding, the cost of necessary improvements would be passed on to counties and other local governments.

Eligible Projects for Water Act Funding

Land Acquisition Projects (\$110,000,000)

The Clean Water Infrastructure Act of 2017 allows state dollars to be used for land acquisition projects for source water protections to municipalities, not-for-profit corporations, and county soil and water conservation districts. County land acquisition projects can include source protection for aquifers, watersheds, reservoirs, lakes, rivers and streams. Land acquisition projects cannot receive state assistance if the land is taken under eminent domain, unless such process is undertaken with a willing seller. Projects cannot be funded if any town, village, or city within which such project is located formally objects to the acquisition.

Lead Service Line Replacement Grant Program (\$20,000,000)

The NYS DOH may grant awards to municipalities without a formal competitive bid process to replace lead service lines. Priority is given to regions with documented elevated levels of childhood lead blood levels, to low income communities, and to those water systems with a higher number of lead service lines in need of replacement.

Cleanup & Abatement of Solid Waste & Drinking Water Contamination

The Act creates two new accounts: (1) the Drinking Water Response Account to be funded at no more than \$20 million and (2) the Solid waste mitigation account to be funded at no more \$5 million to remediate contaminated drinking water and fund the cleanup and abatement of solid waste sites.

The new program requires the Department of Environmental Conservation, in conjunction with the Department of Health, to develop a system to select and prioritize projects for remediation. Beginning July 1, 2019, and annually thereafter, the Department must prepare and submit the list of priority projects to the Governor and Legislature.

The Act provides protections for the state to recoup money used from the account to remediate contamination. It allows the state to place a lien on property owned by the person or corporation found responsible for the contamination.

Eligible Projects, Continued

New York State Regional Water Infrastructure Grants Program

The new program provides up to \$10 million for grants to counties and municipalities for waste water and drinking water infrastructure projects that have a regional impact and demonstrate efficiencies.

Projects must benefit multiple municipalities and may include shared infrastructure, consolidation or interconnection of systems from multiple municipalities.

Water Infrastructure Emergency Financial Assistance (\$10,000,000)

The Act includes the creation of the Water Infrastructure Emergency Financial Assistance program to provide emergency financial assistance to counties, cities, towns, villages, district corporations, county or town improvement districts, school districts, Indian Nations and Tribes, as well a public benefit corporations or public authorities. Requests for emergency funding can be made to the DEC or DOH with evidence of imminent hazard to public health or the environment for both waste water and clean water infrastructure. Payment can be paid within two days of the request and must be paid back within one year of such assistance. A one year extension may be granted.

Septic System Replacement Fund (\$75,000,000)

The program creates a Septic System Replacement Fund for counties that seek authority to administer a septic system replacement program within their municipal boundaries. The DEC, in conjunction with the DOH, has established priority geographic areas. State financial assistance payments will be made available and may be administered to projects located within municipal boundaries, undertaken by property owners. Where projects are located within a priority geographic area, the new septic system project must reduce nitrogen levels by at least 30%.

Payments will be made monthly to participating counties upon the receipt of total costs incurred by property owners within its municipal boundaries for septic system projects that are eligible for reimbursement from the fund.

Additional Eligible Projects

In addition to the above-mentioned allocations, the \$2.5 billion allocation also includes:

- \$1,000,000,000 to the Environmental Facilities Corporation (EFC) for projects authorized by the New York State Water Infrastructure Improvement Act of 2017;
- \$150,000,000 to the EFC for intermunicipal water infrastructure projects;
- \$245,000,000 for water quality improvement projects, including nonagricultural nonpoint source abatement and control projects, municipal wastewater treatment projects, and municipal separate storm sewer system projects, and including up to \$25,000,000 of such amount for projects for the proper management of road salt;
- \$50,000,000 for green infrastructure projects;
- \$50,000,000 for suballocation to the Department of Agriculture and Markets for state assistance payments, services, and expenses to soil and water conservation districts for the cost of water quality protection projects awarded on a competitive basis prioritizing financial need and hardship, intended to assist concentrated animal feeding operations;
- \$130,000,000 for transfer to the hazardous waste remedial fund for the remediation of sites;
- \$200,000,000 for New York City for water quality projects;
- \$100,000,000 to EFC to support municipal water quality infrastructure programs which may otherwise not qualify for state support, or may require additional state support; and
- \$10,000,000 for the development of information technology systems related to water quality.

DRINKING WATER QUALITY COUNCIL

A Drinking Water Quality Council was created in the enacted State Budget to recommend limits for contaminants in drinking water to the NYS Commissioner of Health. The Council will be responsible for making recommendations of emerging contaminants, levels at which the public should be notified of their presence, timeframes for testing and maximum levels for emerging contaminants.

The 12-member Council will be part of the Department of Health. It will be chaired by New York State Health Commissioner Dr. Howard Zucker and include State Environmental Conservation Commissioner Basil Seggos, with six other individuals appointed by the Governor for their expertise in water operations, risk assessment, microbiology, and environmental engineering. The Council's final four members were appointed by the Governor at the recommendation of the Temporary President of the Senate and the Speaker of the Assembly. These members include water operations representatives and representatives of the public who have a background or expertise in toxicology or health risk assessment.

The Health Commissioner will make the final decisions on implementing these recommendations. Public water systems will be required to test for the list of contaminants once every three years.

An estimated 2.5 million people in New York are served by public water systems serving fewer than 10,000 people, which are not currently required to test for contaminants that the EPA monitors but does not regulate.

REGIONAL GRANTS

The grants in the next pages are part of the \$255 million statewide investment, funded through the Water Infrastructure Improvement Act, as well as the new Intermunicipal Water Infrastructure Grants Program.

In October of 2017, Governor Andrew M. Cuomo announced over grants to support essential drinking water and wastewater infrastructure projects throughout New York State, by region throughout the charts in the following pages.

Western New York

WIIA Grant	Awardee	County	Estimated Project Cost	Estimated Grant Award
Clean Water	Alden, Town of	Erie	\$ 981,933	\$ 285,454
Clean Water	Alden, Village of	Erie	\$ 6,640,000	\$ 1,660,000
Drinking Water	Brocton, Village of	Chautauqua	\$ 5,570,500	\$ 1,000,000
Clean Water	Chautauqua County	Chautauqua	\$ 3,900,000	\$ 975,000
Clean Water	Chautauqua, Town of	Chautauqua	\$ 3,874,000	\$ 968,500
Clean Water	Clarence, Town of	Erie	\$ 1,670,000	\$ 417,500
Clean Water	Depew, Village of	Erie	\$ 1,700,000	\$ 425,000
Drinking Water	Erie County Water Authority	Erie	\$ 2,129,735	\$ 1,277,841
Drinking Water	Fredonia, Village of	Chautauqua	\$ 1,551,718	\$ 931,031
Clean Water	Fredonia, Village of	Chautauqua	\$ 4,768,157	\$1,192,040
Clean Water	Jamestown Board Public Utility	Chautauqua	\$ 1,500,000	\$ 375,000
Drinking Water	Niagara Falls Water Board	Niagara	\$ 400,000	\$ 240,000
Drinking Water	North Collins, Town of	Erie	\$ 695,000	\$ 417,000
Clean Water	Tonawanda, City of	Erie	\$ 19,297,000	\$ 4,824,250
Clean Water	Wellsville, Village of	Allegany	\$ 10,311,000	\$ 2,577,750
Clean Water	West Seneca, Town of	Erie	\$ 6,551,326	\$ 1,637,832
Clean Water	Westfield, Village of	Chautauqua	\$ 4,500,000	\$ 1,125,000
	TOTAL		\$ 76,040,369	\$ 20,289,228

Northern New York

WIIA Grant	Awardee	County	Estimated Project Cost	Estimated Grant Award
Clean Water	Adams, Village of	Jefferson	\$ 4,273,000	\$ 1,068,250
Clean Water	Alexandria, Town of	Jefferson	\$ 2,671,092	\$ 667,773
Clean Water	Ausable, Town of	Clinton	\$ 7,131,744	\$ 1,782,936
Drinking Water	Brownville, Town of	Jefferson	\$ 5,614,000	\$ 3,000,000
Clean Water	Carthage, Village of	Jefferson	\$6,750,000	\$ 1,687,500
Clean Water	Champion, Town of	Jefferson	\$2,010,565	\$ 502,642
Drinking Water	Chaumont, Village of	Jefferson	\$ 1,487,000	\$ 892,200
Clean Water	Dexter, Village of	Jefferson	\$ 3,059,100	\$ 764,775
Drinking Water	Fine, Town of	St. Lawrence	\$ 5,308,000	\$ 1,000,000
Clean Water	Gouverneur, Village of	St. Lawrence	\$ 1,677,500	\$ 419,375
Clean Water	Hammond, Village of	Jefferson	\$ 1,395,000	\$ 348,750
Drinking Water	Hounsfield, Town of	Jefferson	\$ 1,368,000	\$ 820,800
Drinking Water	Jay, Town of	Essex	\$ 3,170,626	\$ 1,902,376
Drinking Water	Lake Placid, Village of	Essex	\$ 4,500,000	\$ 2,700,000
Clean Water	Massena, Village of	St. Lawrence	\$ 2,605,000	\$ 651,250
Clean Water	Ogdensburg, City of	St. Lawrence	\$ 34,891,700	\$ 5,000,000
Clean Water	Peru, Town of	Clinton	\$ 4,025,923	\$ 1,006,481
Clean Water	Ticonderoga, Town of	Essex	\$ 11,516,413	\$ 2,879,104
Drinking Water	Ticonderoga, Town of	Essex	\$ 11,272,911	\$ 1,000,000
Clean Water	Tupper Lake, Village of	Franklin	\$ 6,421,578	\$ 1,605,395
Clean Water	Watertown, City of	Jefferson	\$ 1,650,000	\$ 412,500
	TOTAL		\$ 122,799,152	\$ 30,112,107

Finger Lakes

WIIA Grant	Awardee	County	Estimated Project Cost	Estimated Grant Award
Drinking Water	Alexander, Village of	Genesee	\$ 3,970,000	\$ 1,068,250
Clean Water	Arcade, Village of	Wyoming	\$ 400,000	\$ 667,773
Clean Water	Batavia, Town of	Genesee	\$ 738,000	\$ 1,782,936
Clean Water	Geneseo, Village of	Livingston	\$ 1,794,700	\$ 3,000,000
Drinking Water	Geneva, Town of	Ontario	\$ 227,940	\$ 1,687,500
Drinking Water	Holley, Village of	Orleans	\$ 2,090,000	\$ 502,642
Clean Water	LeRoy, Village of	Genesee	\$ 9,000,000	\$ 892,200
Clean Water	Livingston County WSA	Livingston	\$ 5,650,000	\$ 764,775
Clean Water	Medina, Village of	Orleans	\$1,128,000	\$ 1,000,000
Drinking Water	Mount Morris, Village of	Livingston	\$ 800,000	\$ 419,375
Drinking Water	Naples , Town of	Ontario	\$ 897,000	\$ 348,750
Drinking Water	Newark, Village of	Wayne	\$ 6,600,000	\$ 820,800
Clean Water	Nunda, Village of	Livingston	\$ 2,290,672	\$ 1,902,376
Clean Water	Oakfield, Village of	Genesee	\$ 3,820,000	\$ 2,700,000
Drinking Water	Phelps, Town of	Ontario	\$ 2,329,525	\$ 651,250
Clean Water	Seneca Falls, Town of	Seneca	\$ 2,950,000	\$ 5,000,000
Clean Water	Springwater, Town of	Livingston	\$ 586,763	\$ 1,006,481
Clean Water	Warsaw, Village of	Wyoming	\$ 5,446,000	\$ 2,879,104
Drinking Water	Waterloo, Town of	Seneca	\$ 372,307	\$ 1,000,000
Drinking Water	Waterloo, Village of	Seneca	\$ 6,100,000	\$ 1,605,395
Drinking Water	Wyoming, Village of	Wyoming	\$ 2,220,000	\$ 412,500
	TOTAL		\$ 59,410,907	\$ 22,195,098

Southern Tier

WIIA/IMG Grant*	Awardee	County	Estimated Project Cost	Estimated Grant Award
CWIIA	Addison, Village of	Steuben	\$ 4,224,514	\$ 1,056,129
DWIIA	Binghamton, City of	Broome	\$ 5,600,000	\$ 3,000,000
IMG	Binghamton, City of	Broome	\$ 33,566,277	\$ 10,000,000
CWIIA	Erwin, Town of	Steuben	\$ 1,108,011	\$ 277,003
CWIIA	Norwich, City of	Chenango	\$ 3,297,250	\$ 824,313
CWIIA	Odessa, Village of	Schuyler	\$ 2,765,497	\$ 691,375
DWIIA	Oxford, Village of	Chenango	\$ 2,532,000	\$ 1,519,200
DWIIA	Painted Post, Village of	Steuben	\$ 423,186	\$ 253,912
DWIIA	Roxbury, Town of (Denver WD)	Delaware	\$ 1,018,484	\$ 611,091
DWIIA	Roxbury, Town of (Roxbury-Grand Gorge WDs)	Delaware	\$ 1,605,000	\$ 163,000
CWIIA	Trumansburg, Village of	Tompkins	\$ 6,500,000	\$ 1,625,000
DWIIA	Wayland, Village of	Steuben	\$ 8,705,000	\$ 3,000,000
	TOTAL		\$71,345,219	\$ 23,021,023

*DWIIA or CWIIA denotes a Drinking Water or Clean Water WIIA Grant

Mohawk Valley

WIIA Grant	Awardee	County	Estimated Project Cost	Estimated Grant Award
Clean Water	Amsterdam, City of	Montgomery	\$3,600,000	\$900,000
Drinking Water	Amsterdam, City of	Montgomery	\$5,500,000	\$3,000,000
Clean Water	Barneveld, Village of	Oneida	\$4,112,500	\$1,028,125
Clean Water	Cooperstown, Village of	Otsego	\$3,522,357	\$880,590
Clean Water	Fonda, Village of	Montgomery	\$1,100,000	\$275,000
Drinking Water	Fonda, Village of	Montgomery	\$3,600,000	\$2,160,000
Clean Water	Frankfort, Village of	Herkimer	\$6,200,000	\$1,550,000
Drinking Water	Fultonville, Village of	Montgomery	\$900,000	\$540,000
Drinking Water	Gilbertsville, Village of	Otsego	\$3,000,000	\$1,000,000
Drinking Water	Herkimer, Village of	Herkimer	\$750,000	\$450,000
Drinking Water	Mohawk Valley Water Authority	Oneida	\$3,687,000	\$2,212,200
Clean Water	Oneida Castle, Village of	Oneida	\$4,516,000	\$1,129,000
Clean Water	Oneonta, City of	Otsego	\$8,487,032	\$2,121,758
Clean Water	Rome, City of	Oneida	\$3,750,000	\$937,500
Clean Water	Rome, City of	Oneida	\$14,000,000	\$2,589,700
Drinking Water	Rome, City of	Oneida	\$10,866,000	\$3,000,000
Drinking Water	Schoharie, Village of	Schoharie	\$2,750,000	\$1,650,000
Drinking Water	Sharon Springs, Village of	Schoharie	\$4,223,500	\$2,534,100
Clean Water	St. Johnsville, Village of	Montgomery	\$1,600,000	\$400,000
Clean Water	Utica, City of	Oneida	\$2,710,000	\$677,500
Clean Water	Tupper Lake, Village of	Oneida	\$2,505,000	\$626,250
	TOTAL		\$91,379,389	\$29,661,723

Central New York

WIIA Grant	Awardee	County	Estimated Project Cost	Estimated Grant Award
Drinking Water	Cazenovia, Town of	Madison	\$74,315	\$44,589
Drinking Water	Cleveland, Village of	Oswego	\$3,648,000	\$2,188,800
Clean Water	Cortland, City of	Cortland	\$752,500	\$188,125
Drinking Water	Genoa, Town of	Cayuga	\$1,782,041	\$1,069,225
Clean Water	Hamilton, Village of	Madison	\$13,400,000	\$3,350,000
Drinking Water	Hastings, Town of	Oswego	\$17,140,000	\$3,000,000
Drinking Water	Lenox, Town of	Madison	\$3,300,000	\$1,980,000
Drinking Water	Nelson, Town of	Madison	\$2,850,000	\$1,710,000
Clean Water	Niles, Town of	Cayuga	\$352,000	\$88,000
Clean Water	Oneida, City of	Madison	\$1,520,000	\$380,000
Clean Water	Onondaga County	Onondaga	\$22,740,420	\$3,760,556
Clean Water	Oswego, City of	Oswego	\$5,585,000	\$1,396,250
Clean Water	Owasco, Town of	Cayuga	\$1,545,726	\$386,432
Drinking Water	Pulaski, Village of	Oswego	\$5,255,000	\$3,000,000
Drinking Water	Sullivan, Town of	Madison	\$5,120,000	\$2,910,000
Drinking Water	Syracuse, City of	Onondaga	\$2,000,000	\$1,200,000
	TOTAL		\$87,065,002	\$26,651,977

Capital Region

WIIA Grant	Awardee	County	Estimated Project Cost	Estimated Grant Award
CWIIA	Albany MWFA	Albany	\$22,055,000	\$989,177
IMG	Albany MWFA	Albany	\$45,000,000	\$10,000,000
CWIIA	Albany MWFA	Albany	\$5,693,294	\$1,423,324
DWIIA	Albany MWFA	Albany	\$1,600,000	\$960,000
DWIIA	Albany MWFA	Albany	\$2,115,350	\$1,269,210
DWIIA	Albany MWFA	Albany	\$2,615,650	\$770,790
DWIIA	Bethlehem, Town of	Albany	\$15,332,000	\$3,000,000
CWIIA	Castleton-On-Hudson, Village of	Rensselaer	\$5,454,185	\$1,363,547
DWIIA	Colonie, Town of	Albany	\$1,600,000	\$960,000
DWIIA	Guilderland, Town of	Albany	\$3,954,771	\$2,372,863
CWIIA	Hague, Town of	Warren	\$394,250	\$98,563
CWIIA	Hoosick Falls, Village of	Rensselaer	\$3,792,350	\$948,088
CWIIA	Lake George, Village of	Warren	\$17,095,691	\$4,273,923
CWIIA	New Baltimore, Town of	Greene	\$2,610,000	\$652,500
CWIIA	Rensselaer Co Sewer District	Rensselaer	\$3,361,248	\$840,312
CWIIA	Rensselaer, City of	Rensselaer	\$2,647,785	\$661,947
DWIIA	Rotterdam, Town of	Schenectady	\$5,100,000	\$3,000,000
DWIIA	Round Lake, Village of	Saratoga	\$1,185,000	\$711,000
DWIIA	Saratoga County Water Authority	Saratoga	\$7,665,000	\$3,000,000
DWIIA	Schaghticoke, Village of	Rensselaer	\$3,458,438	\$690,038
CWIIA	Scotia, Village of	Schenectady	\$1,700,000	\$425,000
DWIIA	Washington County SD #2	Washington	\$14,800,000	\$3,700,000
DWIIA	Washington County SD #2	Washington	\$3,903,689	\$975,923
CWIIA	Waterford, Town of	Saratoga	\$1,322,500	\$793,500
	TOTAL		\$174,456,201	\$43,879,705

Mid-Hudson Valley

WIIA Grant	Awardee	County	Estimated Project Cost	Estimated Grant Award
CWIIA	Clarkstown, Town of	Rockland	\$2,494,666	\$623,667
CWIIA	Cold Spring, Village of	Putnam	\$860,000	\$215,000
CWIIA	Cornwall, Town of	Orange	\$7,004,000	\$1,751,000
DWIIA	Croton-on-Hudson, Village of	Westchester	\$452,750	\$271,650
CWIIA	Dutchess Co WWA	Dutchess	\$3,361,087	\$840,272
CWIIA	Dutchess Co WWA	Dutchess	\$3,830,117	\$957,530
IMG	Greenburgh, Town of	Westchester	\$11,946,200	\$4,778,480
CWIIA	Kiryas Joel, Village of	Orange	\$4,990,800	\$1,247,700
CWIIA	Mount Hope, Town of	Orange	\$211,700	\$52,925
IMG	New Rochelle, City of	Westchester	\$14,300,000	\$5,720,000
DWIIA	North Salem, Town of	Westchester	\$799,728	\$479,837
CWIIA	Pawling, Village of	Dutchess	\$13,270,000	\$3,317,500
CWIIA	Port Chester, Village of	Westchester	\$1,875,345	\$468,837
CWIIA	Red Hook, Village of	Dutchess	\$3,700,000	\$925,000
DWIIA	Red Hook, Village of	Dutchess	\$3,800,000	\$2,280,000
CWIIA	Rosendale, Town of	Ulster	\$2,480,000	\$620,000
CWIIA	Suffern, Village of	Rockland	\$721,512	\$180,378
CWIIA	Thompson, Town of	Sullivan	\$3,150,000	\$787,500
DWIIA	Thompson, Town of	Sullivan	\$400,000	\$240,000
CWIIA	Washingtonville, Village of	Orange	\$12,961,508	\$3,240,377
CWIIA	Westchester County	Westchester	\$7,634,024	\$1,908,506
CWIIA	Westchester County	Westchester	\$1,575,505	\$393,877
CWIIA	Westchester County	Westchester	\$6,379,000	\$1,594,750
CWIIA	Westchester County	Westchester	\$14,373,688	\$1,102,868
	TOTAL		\$122,571,630	\$33,997,654

Southern Tier

WIIA Grant	Awardee	County	Estimated Project Cost	Estimated Grant Award
Drinking Water	Carle Place Water District	Nassau	\$7,639,763	\$3,000,000
Drinking Water	Hampton Bays Water District	Suffolk	\$1,200,000	\$720,000
Drinking Water	Hicksville Water District	Nassau	\$5,791,000	\$3,000,000
Drinking Water	Jericho Water District	Nassau	\$10,750,000	\$3,000,000
Clean Water	Locust Valley Water District	Nassau	\$1,440,000	\$864,000
Drinking Water	Long Beach, City of	Nassau	\$18,000,000	\$4,500,000
Clean Water	Plainview Water District	Nassau	\$4,377,000	\$2,626,200
Drinking Water	Riverhead, Town of	Suffolk	\$619,000	\$154,750
Drinking Water	Rockville Centre, Village of	Nassau	\$1,588,535	\$953,121
Drinking Water	Roslyn Water District	Nassau	\$4,410,377	\$2,646,226
Drinking Water	Suffolk County Water Authority	Suffolk	\$2,324,858	\$1,394,915
Drinking Water	Suffolk County Water Authority	Suffolk	\$1,242,355	\$745,413
Drinking Water	Water Authority of Western Nassau County	Nassau	\$11,918,280	\$3,000,000
	TOTAL		\$71,301,167	\$26,604,625



The New York State Association of Counties is a bipartisan municipal association serving the counties of New York State including the City of New York. Organized in 1925, NYSAC mission is to represent, educate and advocate for member counties and the thousands of elected and appointed county officials who serve the public.

December 2017

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EXHIBIT O

GLOSSARY OF TERMS AND ABBREVIATIONS

Glossary

Approved Water Supply: Any water supply approved by, or under the public health supervision of, a public health agency of the State of New York, City of Schenectady or the Town of Rotterdam. In determining what constitutes an approved water supply, the Department of Public Health of the State of New York (herein called "State Health Department") shall have the final judgment as to its safety and potability.

Consumption Meters: Water device that measures water volume passing onto the user's private, residential, commercial, or industrial system for the direct usage of said user.

Commercial User: Any person, firm or corporation consuming a large quantity of water in the course of his or its business or trade carried on the premises.

DEC: New York State Department of Environmental Conservation

DOH: New York State and Schenectady County Departments of Health.

ENGINEER: The Town Engineer at the Town of Rotterdam, or his authorized representative.

Flat rate structure: 1.) each 'user' pays the same, regardless of how much they use. 2.) the first gallon of water cost the user the same as the millionth or 100,000,000th. Note: definitions are not interchangeable.

Full Cost Recovery: A practice which ensures that the total cost of providing any service is recovered.

ICI – Industrial, commercial, and institutional

Non-Revenue Water: The difference between the system input volume and the billed authorized consumption.

O & M: Operation and Maintenance

Real Losses: Water that is produced and distributed but is physically lost from the distribution system up to the point of customer metering.

SCADA: Supervisory Control and Data Acquisition system.

Service Connections: From curb stop to user.

Source Meters: Device inserted to measure the volume of water as it passes from water supply out unto the distribution system.

Supply Meters: see Source Meters

System Input: Volume of water input to a transmission or distribution system.

The Town: The Town of Rotterdam New York, also: The Town of Rotterdam Water Utility

Town Resources: Available funds, personnel, organization, & leadership; as well as resources natural and man-made.

Town Water Supply:

User:

Usage:

Universal Metering: In its simplest definition – universal metering involves moving from a flat rate, or non-metered based system of billing to a volume based metered user pay system. With a flat system: users who consume a high amount of water are billed the same amount as those who use only a little. With a metered system, consumers are billed for the metered volume of water they use.

User Meters: Customer service meters that measure the volume of water at the end of the distribution system (measure in gallons)

Utility: See water utility.

Water Audit:

Water Supply Meters: See Source Meters

Water Unit:

Water Utility: The Water Supply and Distribution operated and maintained by The Town of Rotterdam NY.



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