Water Quality Initiatives and Unidirectional Flushing Plan

TATA & HOWARD

Tata & Howard

- Founded in 1992
- Located in Marlborough, MA
- 80% of our business is water
- In business for 27 years
- Total staff of 70
- Working with Town of Shrewsbury for 20 years

Water Treatment Plant Performance

- Received partial activation of plant from MassDEP on October 2, 2018
- Full approval from MassDEP on March 27, 2019
- Treating manganese to below detectable levels
- Plant automation and remote monitoring working well
- Backwashing frequency less than estimated therefore producing less waste

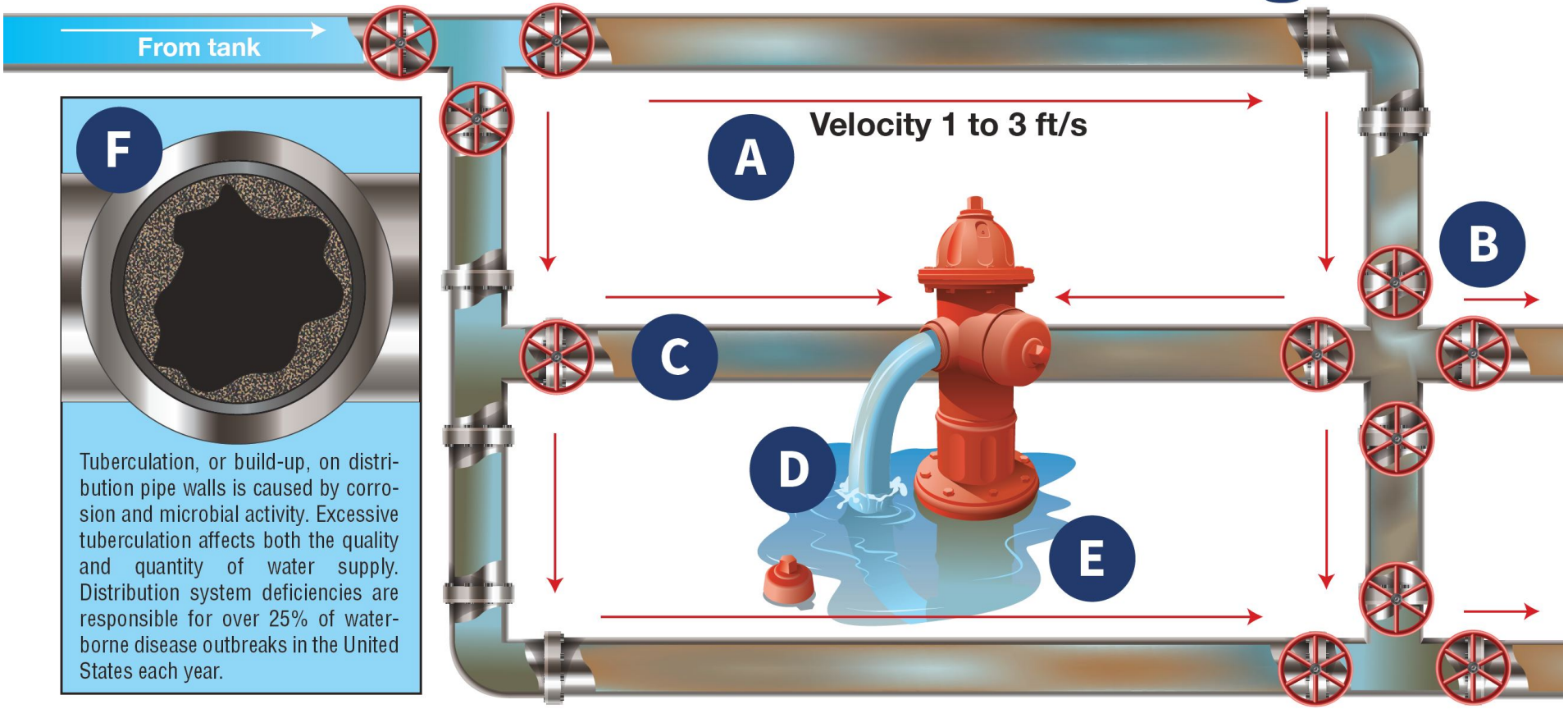
Reasons for Flushing

- AWWA Best Management Practice
- MassDEP Guidelines recommend annual system wide flushing
- Remove as much sediment and loose tuberculation as possible
- Avoids tuberculation/sediment build up when completed regularly
- Allows more water to flow through pipes once deposits are removed

Unidirectional flushing

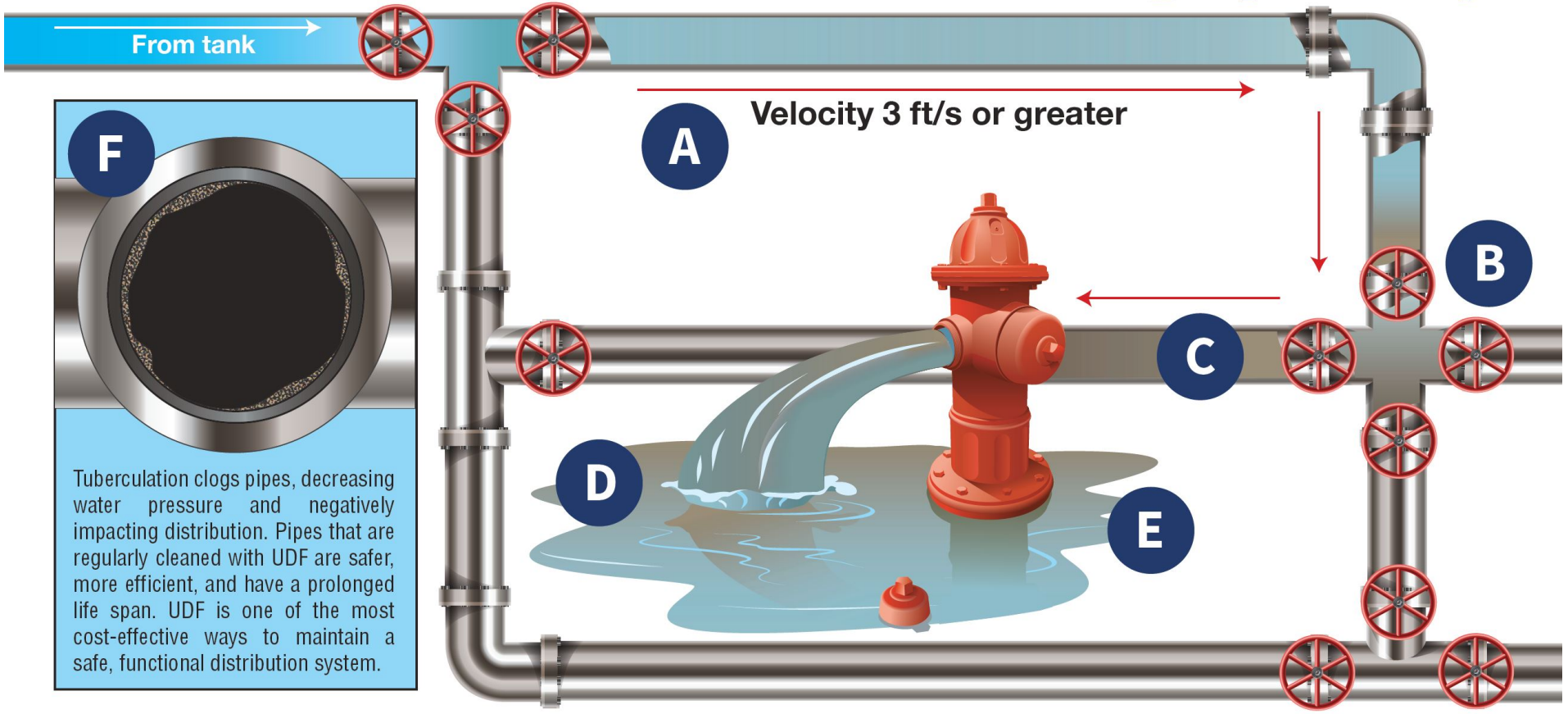
- "Uni" or one directional
  - Always flush from clean water mains
- Start from a source such as a tank or well
- Maintain minimum of 3.0 ft/sec velocity
- Maintain 20 psi system pressure

Conventional Flushing



Tuberculation, or build-up, on distribution pipe walls is caused by corrosion and microbial activity. Excessive tuberculation affects both the quality and quantity of water supply. Distribution system deficiencies are responsible for over 25% of waterborne disease outbreaks in the United States each year.

Unidirectional Flushing (UDF)



Tuberculation clogs pipes, decreasing water pressure and negatively impacting distribution. Pipes that are regularly cleaned with UDF are safer, more efficient, and have a prolonged life span. UDF is one of the most cost-effective ways to maintain a safe, functional distribution system.

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Unidirectional vs. Conventional

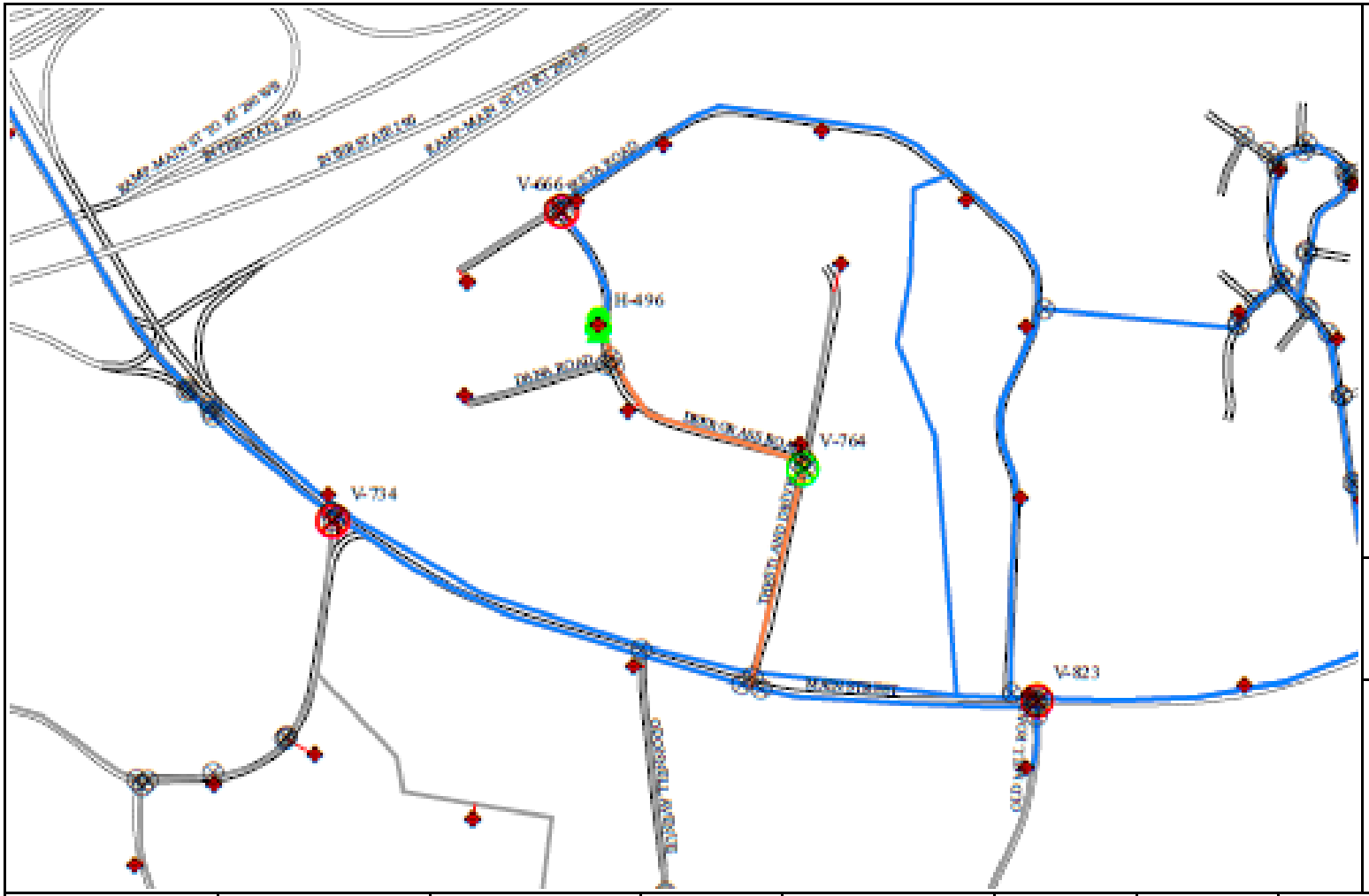
- Inadequate flushing stirs up and move deposits
- Unidirectional allows higher velocities needed to flush a water main
- Unidirectional allows valves to be utilized to isolate areas and prevent re-suspended deposits to travel to already cleaned pipes
- Unidirectional uses less water than conventional

Shrewsbury's UDF Plan

- Hydraulic model developed and updated over numerous projects between the year 2000 and present
- Hydrants and valves mapped as part of separate Town project
  - Tata & Howard had to re-digitize valve locations based on system maps and valve card database
- Hydraulic model used for flushing plan development
  - Design plan to maintain recommended velocities
  - Maintain system pressures around 20 psi
  - Avoids isolating customers from water supply

Shrewsbury's UDF Plan

- Consists of 12 flushing zones
- Each service area has 4 flushing zones
- Due to location of tanks, ice pigging efforts, and transmission mains it does not matter which service area is completed first



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SHREWSBURY UNIDIRECTIONAL FLUSHING PROGRAM

Note:

Zone	2	Sequence	15	Hydraulics	Model	Field	Water Quality	Initial Value	Final Value
Date of Flush		Start Time		Static Pressure	64.22 psi				
Duration	8.7 min.	Open Hydrant	H-496	Res. Pressure	32.00 psi		Turbidity		
Valves to Open	V-764			Discharge Flow	951.24 gpm		Disinf. Res.		
				Available Flow	1,139.02 gpm		pH		
Valves to Close	V-666,V-823,V-734,V-1 [illegible]			Total Pipe Len.	1,384.1 ft		Iron		
				Min Flushing Vol	2,757.58 gal		Odor		
Pipes to Flush				Desired Flushing Vol	8,272.74 gal		HPC		
				Min Flushing Time	2.9 min.		Color		
				Desired Flushing Time	8.7 min.		Other		

Zone	Number of Sequences	Miles Flushed	Valves Operated	Minimum Completion Time* (days)
1	36	7	36	3
2	138	25	111	8
3	113	18	172	9
4	70	13	48	5
5	96	18	144	8
6	105	18	132	8
7	100	16	182	9
8	53	9	54	4
9	49	9	50	5
10	93	17	112	7
11	69	15	84	5
12	70	13	56	5
Totals	992	178	1181	76

*Completion time depends on crew size, time to flush until water is clear, ability to operate hydrants and valves

Implementation

- Notify customers of potential water quality concerns/low pressures
- Notify fire department that low pressures may cause fire suppression system alarms
- Record flow rates and flushing times
  - Historical records can be used to identify system issues
- Record discrepancies between maps and field conditions
- Maintain list of valve and hydrant conditions

Ice Pigging

- Isolates section of water main and utilizes an ice slurry to collect sediment and wipe biofilm from pipes
- Outside contractors necessary to complete work
- Associated costs could make it impractical for entire system
- Can be more effective than flushing
- Can be used to supplement a flushing plan in select areas

Hydrant and Valve Maintenance Program

- Hydrant flushing and maintenance part of the Town's fire insurance rating
- Maintained hydrants allows for faster response times from first responders
- Reliable valves allows for less disruption during water main repairs

Hexavalent Chromium Initiatives

- 2017 through 2019 sampling from Home Farm Wells have shown relatively consistent concentrations
  - 6-1 approximately 10 ppb
  - 6-3 approximately 10 ppb
  - 6-4 between 10 and 15 ppb
  - 6-2 and 6-5 below detection limit
  - Finished water between 2 and 4 ppb
- Working on installing replacement wells to reduce pumping of wells seeing hexavalent chromium

Hexavalent Chromium Piloting – Phase 1

- Town has an approved procedure for completion of a pilot study for a biological treatment system
- Piloting test well installed at property line
- Began piloting Summer 2018
- Hexavalent chromium not detected in test well
- Developed plan to address low concentrations
- Ran out of time due to the demolition of the former Water Treatment Plant

Hexavalent Chromium Piloting – Phase 2

- Update pilot test procedure to include second treatment option
- Pilot testing modifications
  - Supply to be modified to address pumping challenges
  - Hexavalent chromium piloting concentration
  - Equipment storage to protect existing supplies with removal of original building
  - Determining appropriate discharge location

Hexavalent Chromium Piloting – Phase 2

- Planning to begin piloting April 2020
  - Allows time to contract and schedule with piloting company
  - Allows flexibility with equipment location due to weather
  - Allows time for updating Pilot Test Protocol with MassDEP
- Piloting expected to take 3 to 4 months
- Piloting results available Summer 2020
- Pilot test report to be completed and submitted Fall 2020
- Results provide recommendations for future action items

Questions?