

Board of Public Works

March 20, 2018

WATER CONSERVATION INITIATIVE

Advanced Metering Infrastructure

Michael Lowery, Board of Public Works

Tom Holder, Director of Public Works

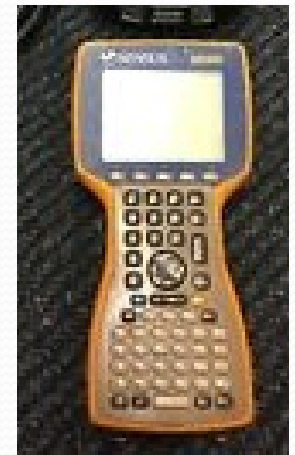


Agenda

- Current Water Division Practices
- AMI Technology
- Concerns
 - Exposure
 - Security
 - Opt Out
- Costs
 - Capital
 - Water Cost Changes
- Benefits

Current System

- Over 20 years old
- Reading Frequency
 - Semi-annual (most meters)
 - Quarterly (commercial / high usage)
- Manual Readings – using reading wand
 - Personnel accesses property to obtain reading
- Readings unloaded at DPW
- Readings transferred to billing system
- Bills manually reviewed and mailed



Limitations with Current System

- Infrequent readings
 - Undetected leaks causing very high bills
 - Abatements
 - No periodic usage record
- Non-uniform billing periods
 - Weather/staffing/equipment
- Billing software errors
 - Incorrect readings
 - No software automated data review
- No automatic leak checking
- Physical bills only way for users to monitor use

WATER BILL
Remit Copy

PLEASE WRITE YOUR ACCOUNT NUMBER ON YOUR CHECK AND
ENCLOSE THIS PORTION OF YOUR BILL WITH PAYMENT.
PLEASE MAKE *ONE CHECK* PAYABLE TO: Fayette County Water System

| | | |
|----------------|-------------------|------------------------|
| Account Number | Past Due Amount | Past Due Amt. Due By |
| 1525 | 0.00 | 04/26/2009 |
| | Current Charges | Current Charges Due By |
| | 17.60 | 04/05/2009 |
| | Amount Due | Due Date |
| | \$17.60 | 04/05/2009 |

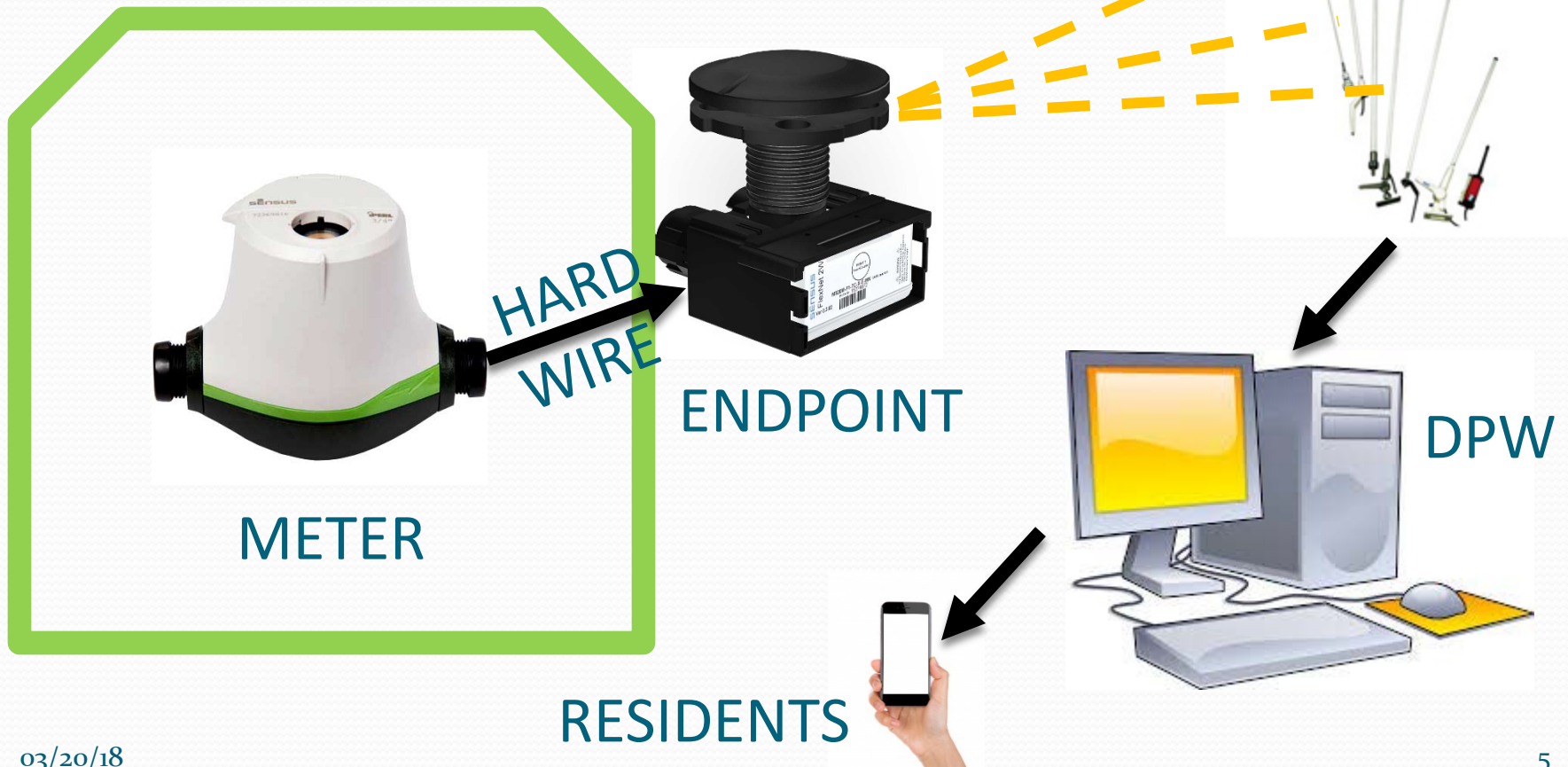
Payments made after 04/05/2009 add 10%
Penalty and Pay \$ 19.36

00006042009901562437200000017608

“AMI”

- Advanced Meter Infrastructure

DATA
COLLECTOR
ANTENNAS



Implementation

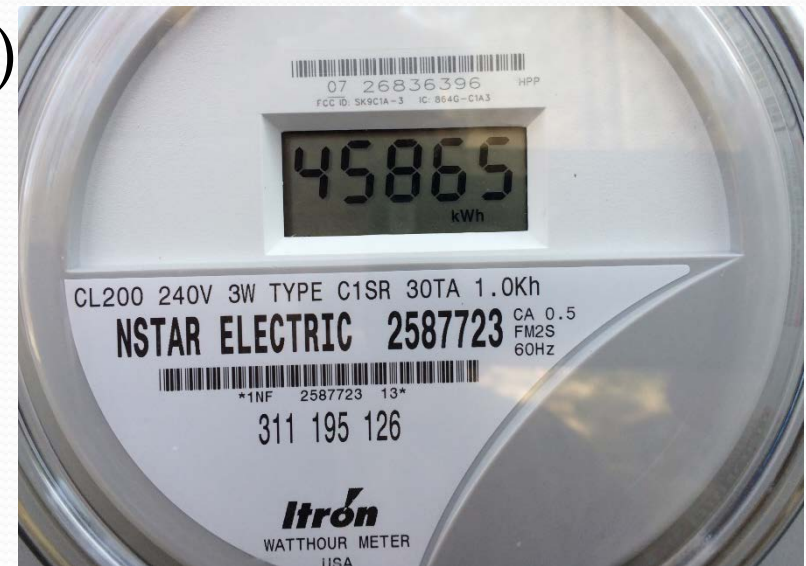
- Coordinated with Meter Replacement Program
- Meters under-read as they get older
 - Should be replaced every 15-20 years
- Appointments will be made to change equipment
- Work will require less than one hour visit to install new equipment (usually only 20 minutes)
- Individuals not wanting upgrade may “Opt Out” of radio endpoint

Exposure

- Exposure – In compliance with all FCC Rules and Regulations
 - In Wide Use
 - Your house: gas/electric meters
 - Boston: 88,000 AMR water meters since 2004
 - Frequency – 900MHz band- similar to other devices
 - Intensity at 1 yard: 0.000015 milliWatts per cm²
 - Time Length of Exposure: 0.5 secs/day
 - Equipment Location – outside the home.

Automatic Meter Reading Today

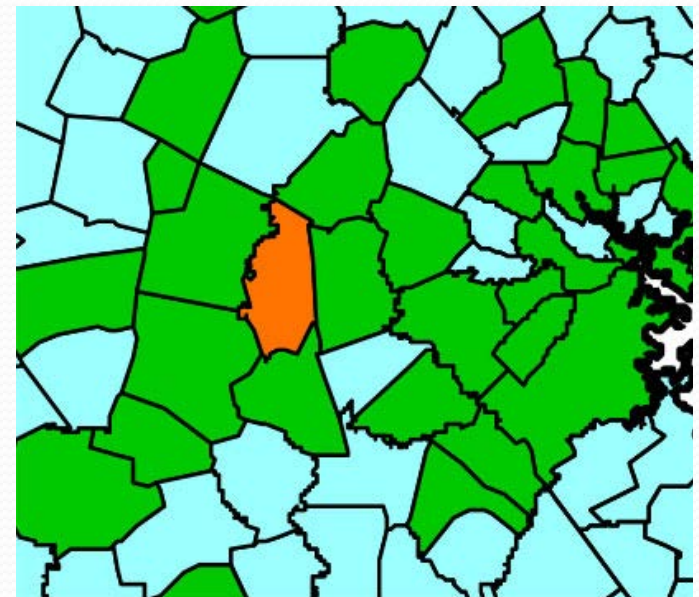
- Private Utilities (RF drive by)
 - Gas
 - Electric



Local Automatic Read Water Systems

- Boston Water and Sewer – 2004
- Fitchburg – 2008

| | | |
|-------------|-----------|-----------|
| Framingham | Sudbury | Brookline |
| Natick | Weston | Dedham |
| Ashland | Hopkinton | Westwood |
| Marlborough | Maynard | Walpole |
| Acton | Westford | Medway |
| Pepperell | Lawrence | Franklin |
| Billerica | Bedford | Arlington |
| Lincoln | Waltham | Medford |
| Newton | Needham | Woburn |

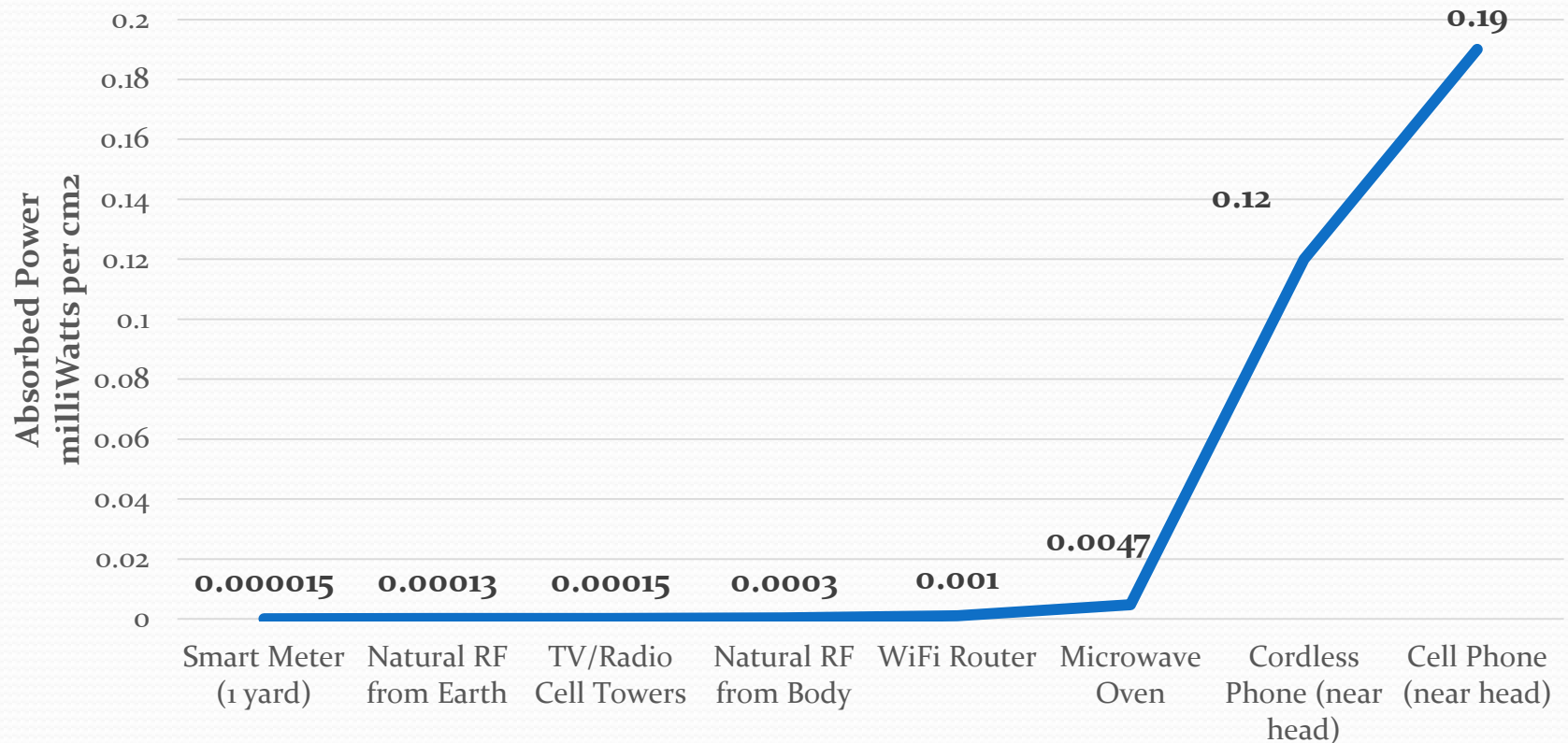


GREEN: Automatic Meter Read

Radio Frequency

| Frequency | Band | Use |
|--------------|-------------------------|---|
| 3-30 Hz | Extremely Low Frequency | Lightning |
| 30-300 Hz | Super Low Frequency | Submarine Communication |
| 300-3000 Hz | Ultra Low Frequency | Voice |
| 3-30 kHz | Very Low Frequency | Time Radio; Radio Navigation |
| 30-300 kHz | Low Frequency | LW radio; Aviation Beacons |
| 0.3-3 MHz | Medium Frequency | AM Radio; Air Traffic Control |
| 3-30 MHz | High Frequency | Shortwave; Aviation Comm. |
| 30-300 MHz | Very High Frequency | FM Radio; Television (VHF); Wayland DPW Radios |
| 300-3000 MHz | Ultra High Frequency | Television(UHF); Cell Phones; Bluetooth; WIFI; Garage Door Opener; AMI Meters ; Cordless Phones; Police and Fire Radio; EZ Pass Transponders |
| 3-30 GHz | Super High Frequency | Microwave Radio; Satellite |
| 30-300 GHz | Extra High Frequency | Radio Astronomy |

Radiated Power Comparison Selected Sources



Data developed by Dr. Yakov P. Shkolnikov, Ph.D.

Exposure Duration

| Item | Time of Transmission / event |
|-----------------------|--|
| AMI Endpoint | Milliseconds / day (0.5 seconds per day total) |
| Natural RF from Earth | Continuous |
| TV/Radio Towers | Continuous |
| Natural RF from Body | Continuous |
| WiFi Router | Continuous |
| Microwave Oven | Minutes |
| Cordless Phone | Minutes - Hours |
| Cellular Phone | Minutes - Hours |

Equipment Location

- Endpoint is Outside - connected by a hardwire from the meter inside the house
- Data Collector Antennas (2-3) mounted on telephone poles



Data Security

- Modern Encryption Practices
- NO Customer indicative data is transmitted
- Only Meter Information is transmitted
 - Consumption
 - Meter and Module numbers
- Each Meter and Endpoint is Unique



“Opt Out”

- Individuals will be allowed to “Opt Out” of the automatic meter reading.
- “Opt Out” users will not qualify for abatements due to high usage / leaks
- Additional fee for manual meter reading
 - Preliminary Estimate - \$20 per read
 - Hardship - \$0 if qualified for real estate tax deferral

Costs

- Advanced Metering Initiative

Installed cost: \$1.63 M*

*Potential reduction in installation cost of \$330K
if meter replacement capital item is approved

- No anticipated water usage fee increase associated with this Article (AMI System)

Benefits of AMI

- Water Conservation
 - More Frequent and Routine Billing
 - Customer Service
 - Leak Detection
-
- 1,400,000 gallons abated (FY2017)
= a football field, with 3 feet of water on it.

Green Communities Don't Waste Water!



Benefits of AMI



Vacant Household Leak – 2 Million Gallons
Unmonitored Circumstances



Water Conservation

- **Unaccounted for Water**

- MassDEP Standard <10%
- Wayland is 12.5% (2016)

- **Our Usage**

- MassDEP Standard <65 gallons per person per day
- Wayland (2016) is 70 gallons per person per day

- **Avoiding Waste:**

- Early Notification of Issues
- Avoid Abatements
- Help find distribution system leaks



Billing

- **Quarterly Billing**
 - Reduces Impacts of Semi-annual billing
- **Fixed Billing Periods**
 - Complies with Audit
 - Reliable Bill Period

2018 Calendar

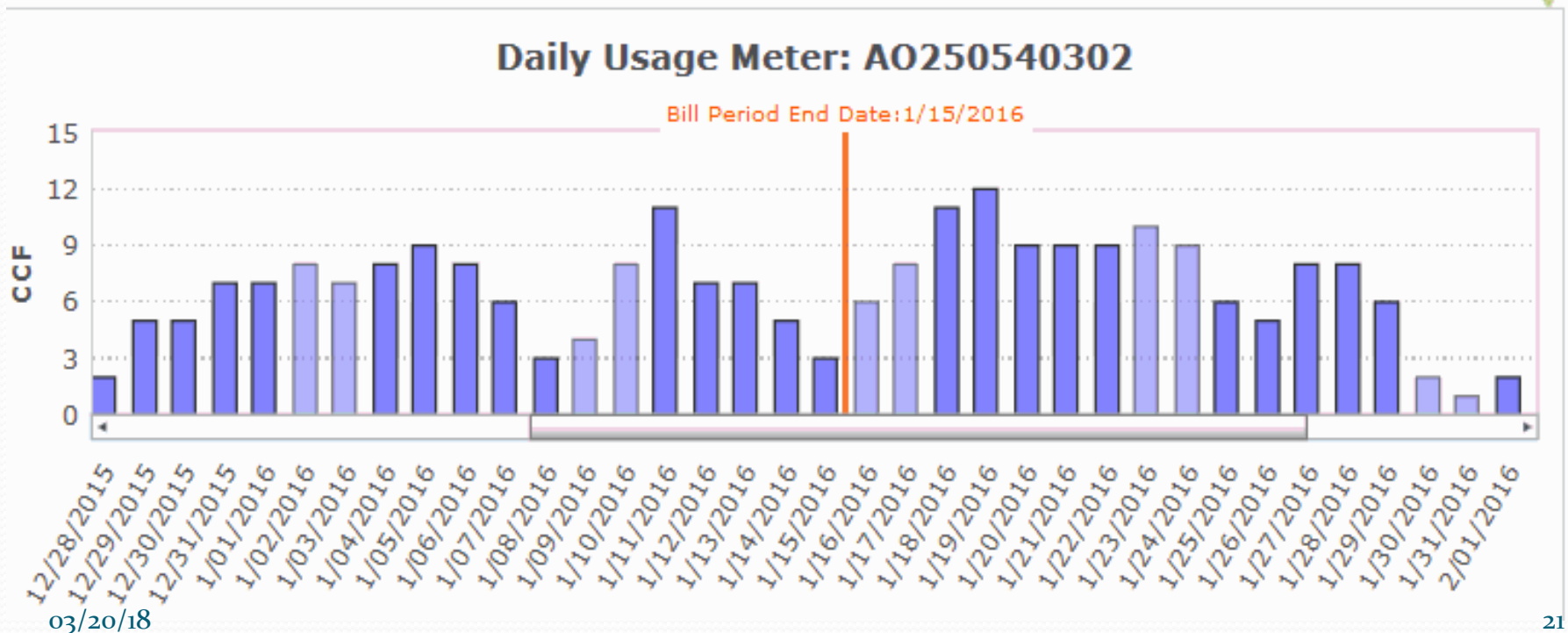
| January 2018 | | | | | | | February 2018 | | | | | | | March 2018 | | | | | | | April 2018 | | | | | | | | | | |
|--------------|----|----|----|----|----|----|---------------|---|----|----|----|----|----|------------|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|----|----|----|
| W | S | M | T | W | T | F | S | W | S | M | T | W | T | F | S | W | S | M | T | W | T | F | S | W | S | M | T | W | T | F | S |
| 1 | | 1 | 2 | 3 | 4 | 5 | 6 | 5 | | | | 1 | 2 | 3 | | 9 | | | | 1 | 2 | 3 | | 14 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 6 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 10 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 15 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 3 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 7 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 11 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 16 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 4 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 8 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 12 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 17 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 5 | 28 | 29 | 30 | 31 | | | | 9 | 25 | 26 | 27 | 28 | | | | 13 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 18 | 29 | 30 | | | | | |

| May 2018 | | | | | | | June 2018 | | | | | | | July 2018 | | | | | | | August 2018 | | | | | | | | | | |
|----------|----|----|----|----|----|----|-----------|----|----|----|----|----|----|-----------|----|----|----|----|----|----|-------------|----|----|----|----|----|----|----|----|----|----|
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| 18 | | | 1 | 2 | 3 | 4 | 5 | 22 | | | | | | 1 | 2 | 27 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 31 | | | | 1 | 2 | 3 | 4 |
| 19 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 23 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 28 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 32 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 20 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 24 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 29 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 33 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 21 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 25 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 30 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 34 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 22 | 27 | 28 | 29 | 30 | 31 | | | 26 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 29 | 30 | 31 | | | | | 35 | 26 | 27 | 28 | 29 | 30 | 31 | |

| September 2018 | | | | | | | October 2018 | | | | | | | November 2018 | | | | | | | December 2018 | | | | | | | | | | |
|----------------|----|----|----|----|----|----|--------------|----|----|----|----|----|----|---------------|----|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|
| W | S | M | T | W | T | F | S | W | S | M | T | W | T | F | S | W | S | M | T | W | T | F | S | W | S | M | T | W | T | F | S |
| 35 | | | | | | | 1 | 40 | | 1 | 2 | 3 | 4 | 5 | 6 | 44 | | | | 1 | 2 | 3 | | 48 | | | | | | | 1 |
| 36 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 41 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 45 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 49 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 37 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 42 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 46 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 50 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 38 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 43 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 47 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 51 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 39 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 44 | 28 | 29 | 30 | 31 | | | | 48 | 25 | 26 | 27 | 28 | 29 | 30 | | 52 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 40 | 30 | | | | | | | | | | | | | | | | | | | | | | | 1 | 30 | 31 | | | | | |

Customer Service

- Customer Portal -- Usage Data, Final Reads
- Leak Notification
- Meter Issues (stopped / running backwards)
- Reduce / Eliminate Abatements



Leak Detection

- Hourly Readings – Daily Transmission
- AMI will all but eliminate lost water from household leaks, greatly reduce billing errors, help conserve water.



Regulatory Compliance

WATER CONSERVATION STANDARDS



The Commonwealth of Massachusetts
EXECUTIVE OFFICE of ENERGY AND ENVIRONMENTAL AFFAIRS
and
WATER RESOURCES COMMISSION
July 2006
Updated June 2012

Metering

Page 15 -16 of Water Conservation Standards

“Remote Reading – Communities/water suppliers should consider investing in an automated meter reading system that allows remote reading of meters and facilitates more frequent billing to improve cash flow, eliminates estimated meter readings, utilizes employees efficiently, supports water audits, detects leaks, monitors UAW, enables users to track their water use, and provides water suppliers with more detailed information on water-use patterns in the community that can be useful in enforcing water-use regulations.”

<http://www.mass.gov/eea/docs/eea/wrc/water-conservation-standards-rev-june-2012.pdf>



THANK YOU