Expect the Unexpected
Preparing for Water Main Breaks

Presented at
Massachusetts Environmental Health Association
Fall Seminar
December 13, 2018
Marlborough, Massachusetts

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Water Main Breaks

- Inevitable in all water systems

Causes

- Old infrastructure
- Corrosion of pipes
- Poor installation
- Defective materials
- Underground construction activities
- Water hammer
- Unknown
- Odd happenings
Water Main Breaks

- Impacts
  - Loss of service
  - Loss of fire protection
  - Damage
  - Water quality impacts
  - Customer impacts
  - Financial implications
Worcester Water System

- 10 Surface Water Reservoirs
- 1 Water Treatment Plant (50 mgd)
- 2 Clearwells and 8 Water Storage Tanks
- High Service/ Low Service/ Super-High Service
- 565 miles of water mains
- 6,000 Valves
- System Demand of 23 MGD average day
- Staffing Levels-132 approved positions
- Customer Base of 40,000 accounts; 200,000 people
- Interconnections / Regional System
City Of Worcester
WATER DISTRIBUTION SYSTEM

Legend:
- Water Lines
- System, Kind
- 1M, 2M, 3M, 4M
- 200, 250, 300, 400, 500
- 600, 700
- Transfer Lines, Transfer Main
November 12, 2012: Water Main Break

- First reports received at 12:25 PM
- Holiday (Veteran’s Day) – Limited Staff
- 30 inch main, cast iron off of a 40 inch main (Low Service Transmission)
- Flooding near break
- Loss of Low Service pressure
- Clearwells drop rapidly leading to the loss of High Service pumping
- High Service Tank levels drop rapidly
Response

- First responder on scene within 30 minutes
- Crew at scene within 1 hour of initial report
- Attempts to shut valves to isolate break unsuccessful
- Order to shut plant issued after 4 hours of attempted valve shutdowns; no flow into City for over 8 hours
- Plant back on line to fill clear wells 6 hours after shutdown; high service pumps on-line 2 hours later
- Broken main repaired and in-service 15 hours after break began
- Staff remain on duty throughout
Impacts

- Fire fighting capabilities compromised; Worcester Fire Dept activates mutual aid to bring tankers from surrounding towns
- Water for sanitary purposes limited; Holy Cross College brings in portable toilets for student use
- Flood damages at Worcester State University
- Hospitals activate emergency plans; limit water use; monitor pressures; cancel surgeries; secure bottled water
- Restaurants close
- Some areas never lost water or pressure
Precautionary Boil Water Order Anticipated; Communications Planned With That In Mind

At 8:00PM MassDEP Confirms Boil Order Will Be Issued

Once System Restored Expedite Sampling and Testing to Minimize Duration of Boil Order

Maximize Chlorine Dose When Flows Into City Resume

Laboratory Opts for Coliform Test Method With Fastest Turnaround; Colilert-18 with 18 hour incubation rather than Membrane Filtration with 24-hour incubation and additional confirmation steps
Distribution System Sampling

- Sampling commenced in late morning of November 13 after system pressures improved
- All coliform sample sites to be tested and checked for total chlorine residual; 39 sites in Worcester, 5 in Elm Hill WD
- Sampling efficiency improved by dividing sites geographically among 5 samplers (2 from Water Ops; 3 from Inspectional Services)
- All samples collected and run by 3:30 PM
- Total Chlorine average 1.23 ppm (max. 2.75 / min. 0.10)
Water Quality Testing Results

- Lab Reported results at 9:30 AM on November 14
- All samples negative for total coliform
- Reported to MassDEP immediately
- Verbal notice from MassDEP at 11:30 AM that Boil Order Lifted; Email Notification from MassDEP received at noon
Public notification process begins 5 hours after break started with calls, social media (facebook and twitter)

First press release and reverse 911 with boil advisory issued 8 hours after break started; R-911 issued to 53,000 households

Second press release and R-911 issued in early morning on November 13

Third press release issued mid-afternoon on November 13

Final press release and R-911 to announce boil order lifted at noon on November 14

Calls to hospitals every 4-6 hours with updates

Recovery

- Mains refilled slowly to minimize water hammer and further damage
- Hydrant opening coordinated with system “restart” to let out air and rusty water
- Chlorine dose maximized at Filtration Plant to reduce chances of bacterial growth
- Followup with total chlorine testing at all coliform sites on November 14 and full set of coliform samples on November 19
- Water chemical analysis at 15 locations on November 15
- Monitor water quality complaints by customers-air in water common for weeks
Results Summary

- Start of Break to Repair Completion – 15 hours
- Volume of Water Lost – estimated 10 million gallons
- Maximum Flow Rate Through Break – estimated at 52 MGD
- Boil Order Duration – 40 hours
- Reverse 911 messages issued to 53,000 households on 3 occasions
- Press releases issued to media on 4 occasions
- Messaging to public via social media including facebook and twitter
- Direct calls to large users, consecutive systems, hospitals, colleges and major apartment complexes (indirectly reach 3,500 residents)
Lessons Learned

- 2009 tabletop emergency planning exercise for this particular situation; emergency response plan for this event was already developed and followed; allowed for prompt decision making.
- Response and repair were completed in timely fashion and aided by favorable weather, availability of key personnel but need for better trained backup team.
- Boil Order duration shortened by way of rapid bacteria testing method and availability of fully certified in-house lab and multiple sample collectors.
- Communication between customers, MassDEP, media, City officials and DPW&P team was continuous.
- Single source of public information critical to controlling message.
- Valve exercising and maintenance must become higher priority.
It All Starts With A Plan...