



Water Distribution Leak Detection & How it Helps During Drought Conditions

Water Monitoring Training
November 17, 2016

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Regional Superintendent, Water Services Department

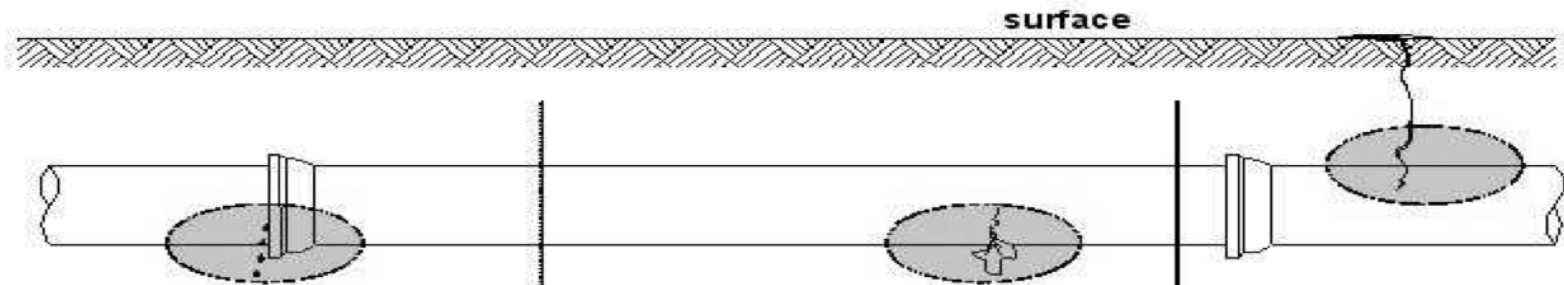


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Water Loss History

- **Halifax Water adopted the AWWA/IWA Water Loss Control Methodology in 2000.**
- **One of the first adopters in North America.**
- **Reduced system inputs by 35 ML/day.**
- **Savings of \$650,000/year.**
- **Reduced ILI from 9.0 to 2.4 (3.9 in 2016)**
- **Reduced real losses from 400 to 170 L/conn/day.**

▶ 3 Types of Leakage



Background leakage

Un-reported and un-detectable using traditional acoustic equipment.

Tools

- Pressure reduction
- Main and service replacement
- Reduction in the number of joints and fittings

Un-reported leakage

Often does not surface but is detectable using traditional acoustic equipment.

Tools

- Pressure reduction
- Main and service replacement
- Reduction in the number of joints and fittings
- Proactive leak detection

Reported leakage

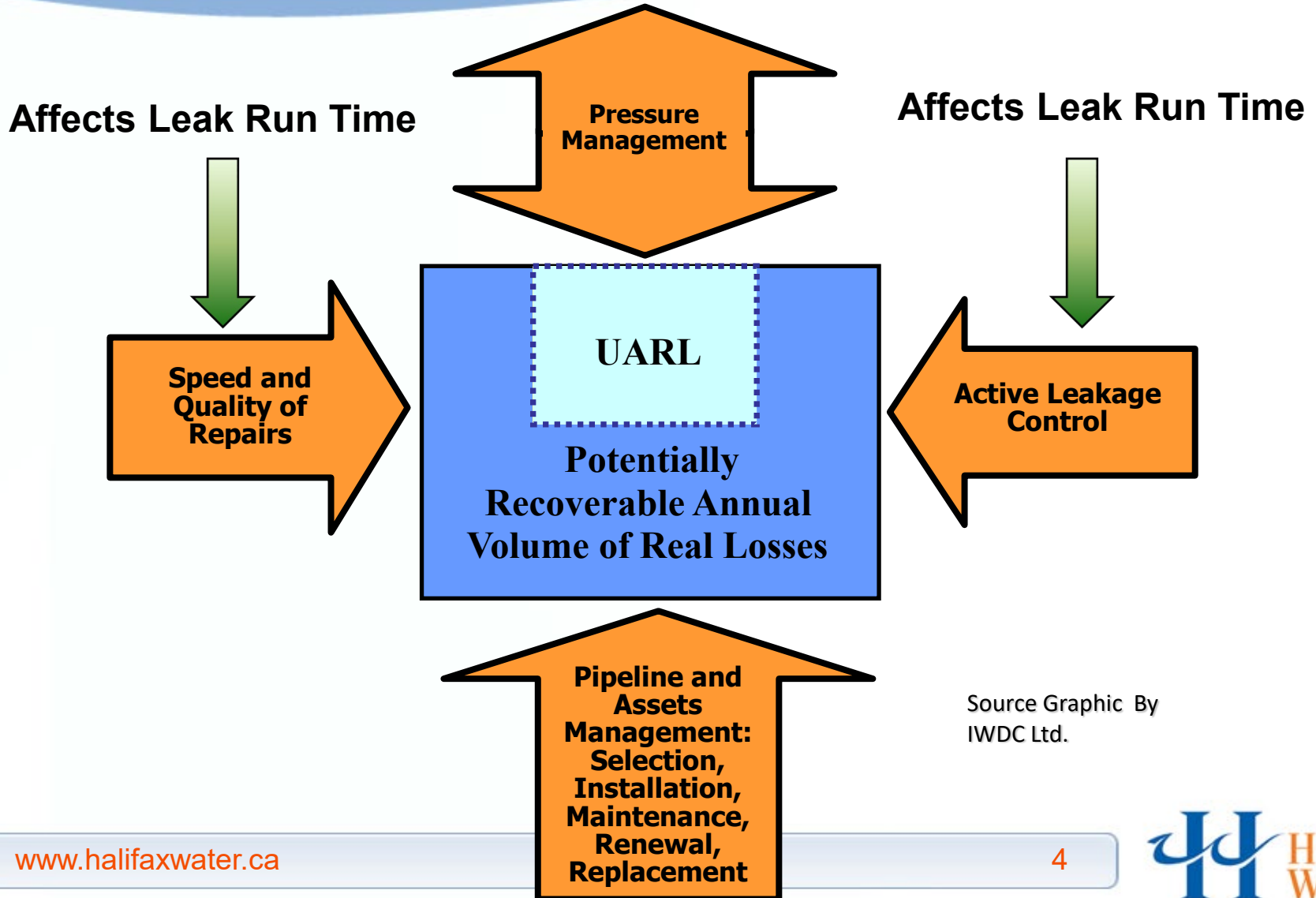
Often surfaces and is reported by the public or utility workers

Tools

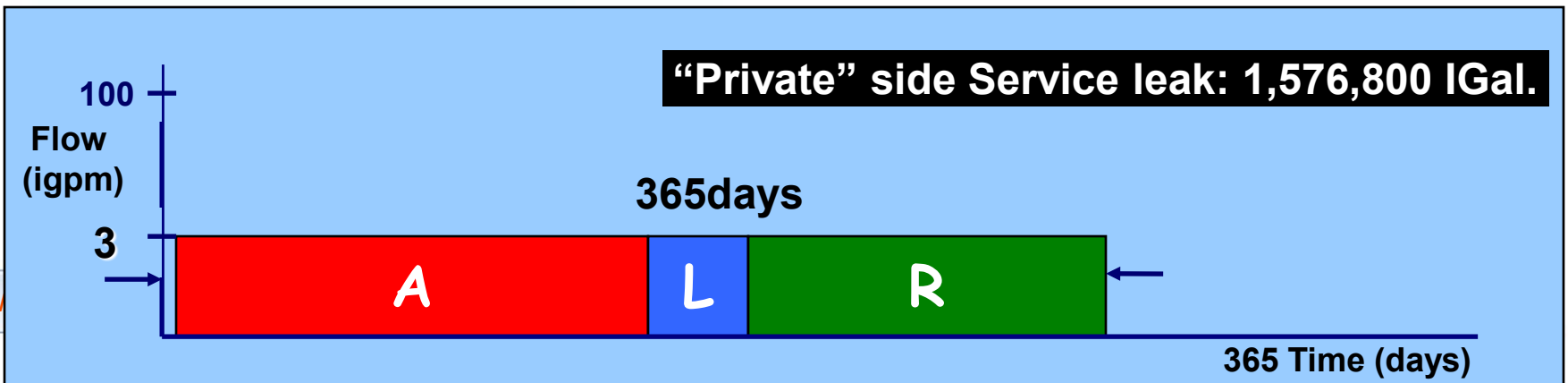
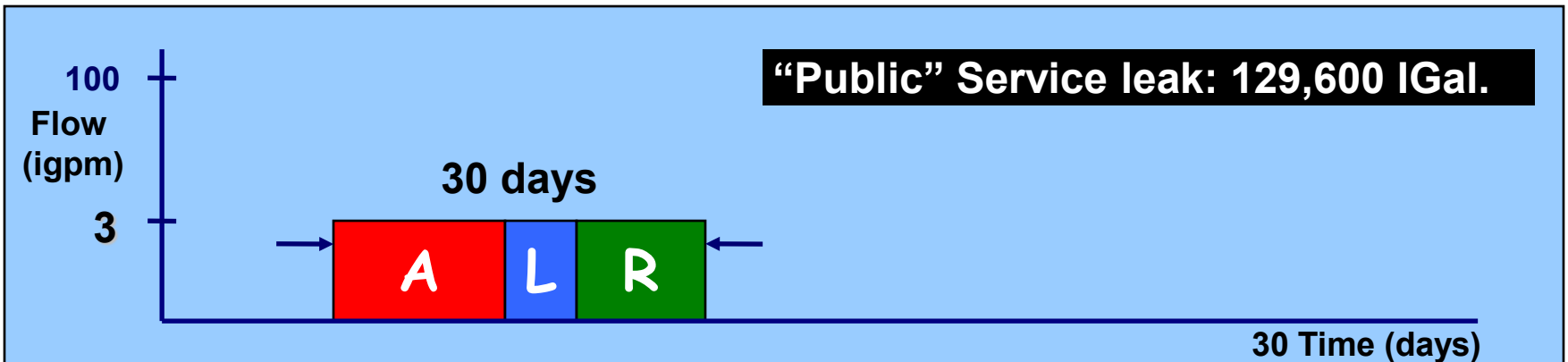
- Pressure reduction
- Main and service replacement
- Optimized repair time

Tardelli Filho, J. 2004. SABESP. Sao Paulo, Brazil: Internal reports

Four Strategies for Reducing Real Losses



▶ The Importance Of Leak Run Time



The Key To Managing Leak Run Time

- **Therefore, the key to managing leak run times for the overall management of real losses is awareness and the willingness to repair leaks.**
- **How does a utility become aware of unreported leaks?**

District Metered Areas

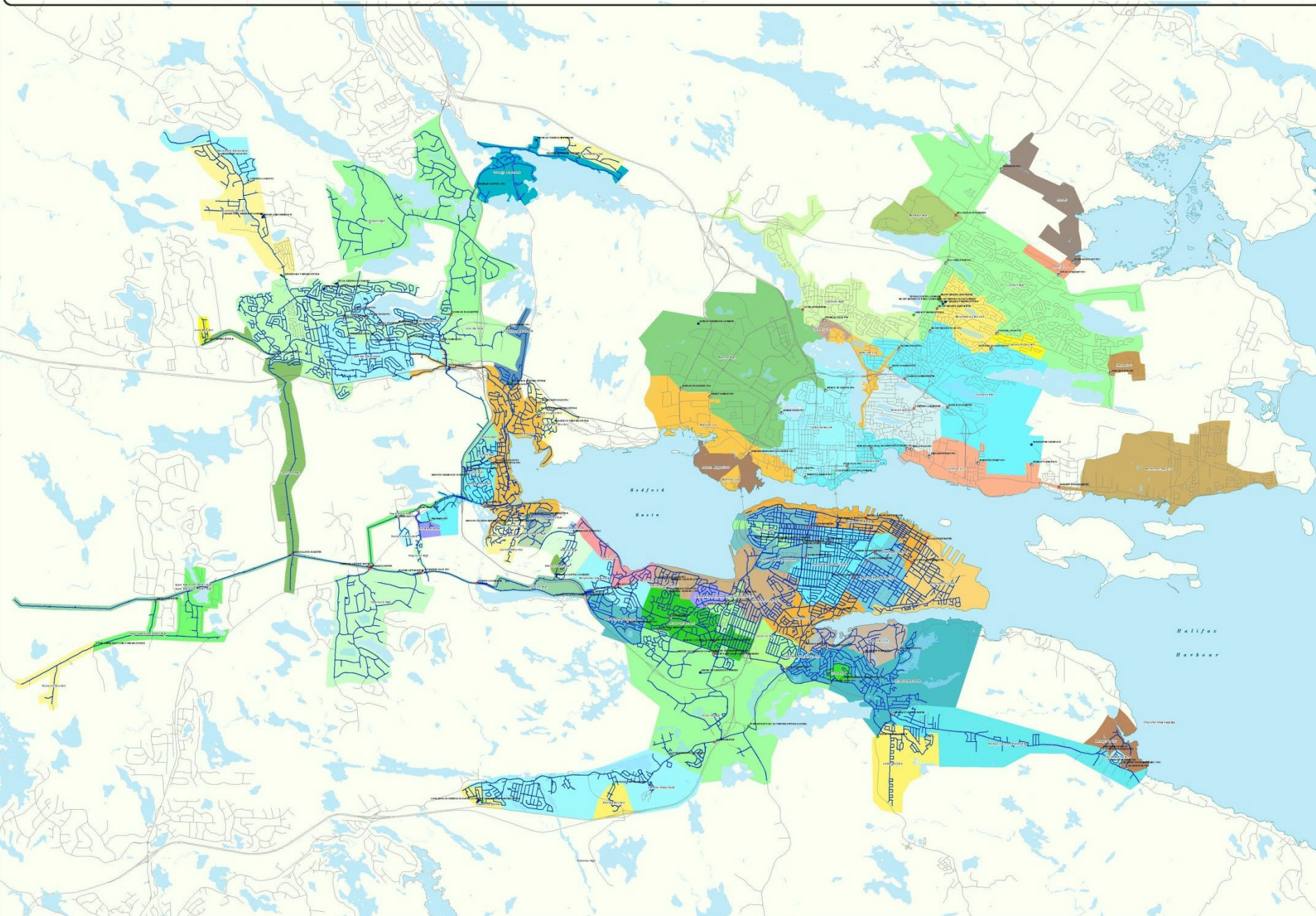
- **District Metered Areas (DMAs) can provide the awareness of leakage in near real time**
 - Allows resolution of leaks via SCADA
 - Manageable zones for acoustic leak detection.
 - Monitor minimum night flows.
- **If you can measure it, you can manage it more effectively.**

HALIFAX REGIONAL WATER COMMISSION REGIONAL METER ZONE MAP

© Engineering Dept\Eng Information\Projects\Pressure and Meter Zone Maps\regionalmeterzonemap.mxd April 30, 2010

- Control Chamber
- Meter Chamber
- PRV
- Pumping Station
- Reservoir Chamber

THIS MAP IS FOR HRWC
INTERNAL USE ONLY



Minimum Night Flow Analysis

- **Monitor the net DMA flow between 3:00 AM and 4:00 AM**
 - Flow should be minimal night use and background leakage
 - Should be the same each night
- **An increase in flow from one night to the next could indicate a possible leak**
- **If confident it could be a leak, a leak detection crew is dispatched to the DMA**

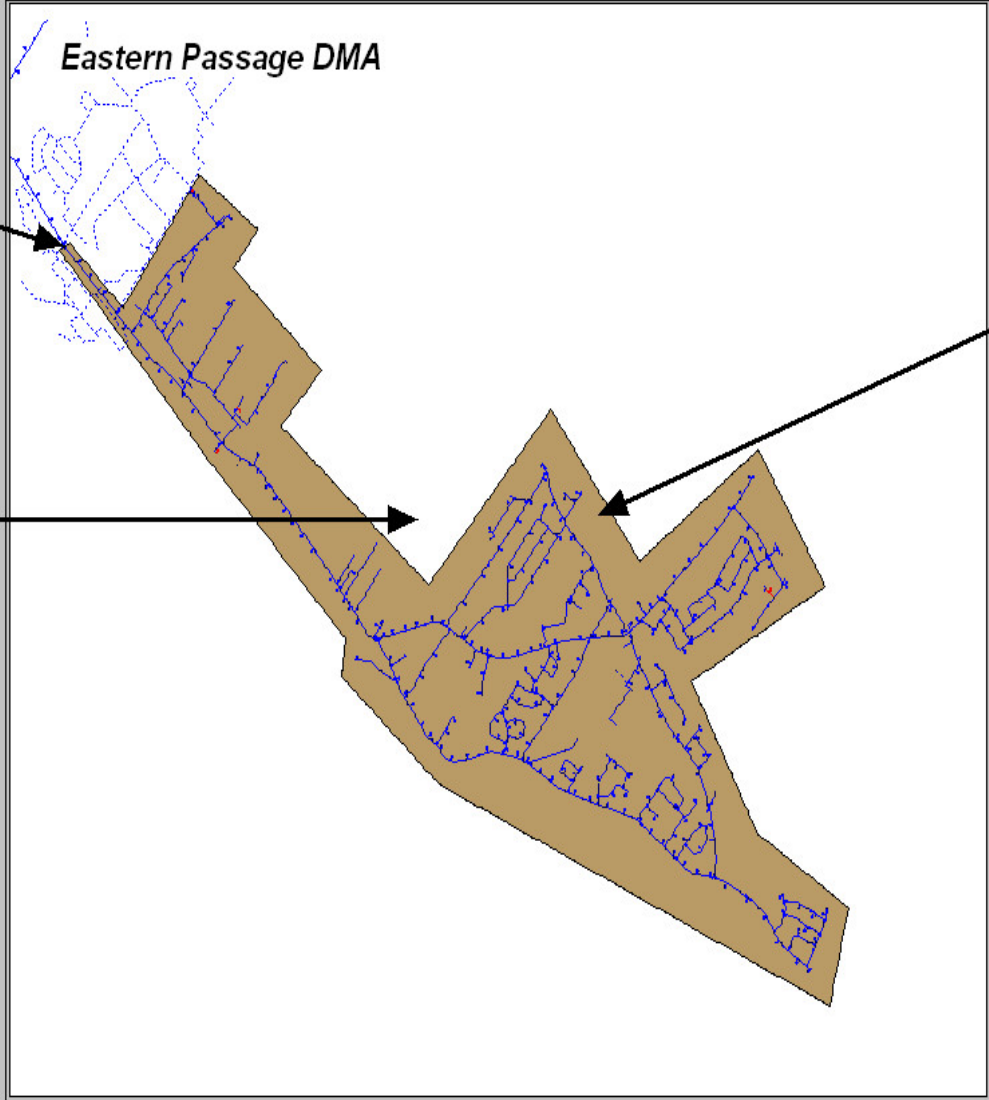


Eastern Passage DMA

Click Value To Trend

Eastern Passage
Flowmeter

98.17 m³/h

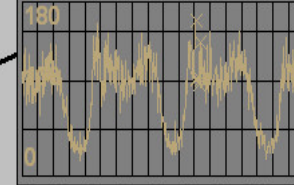


Shearwater - Hines Rd
Flowmeter

2" - 0.00 m³/h
8" - 0.00 m³/h

Eastern Passage
Zone Flow

94.67 m³/h



Calculated Minimum
Night Flow

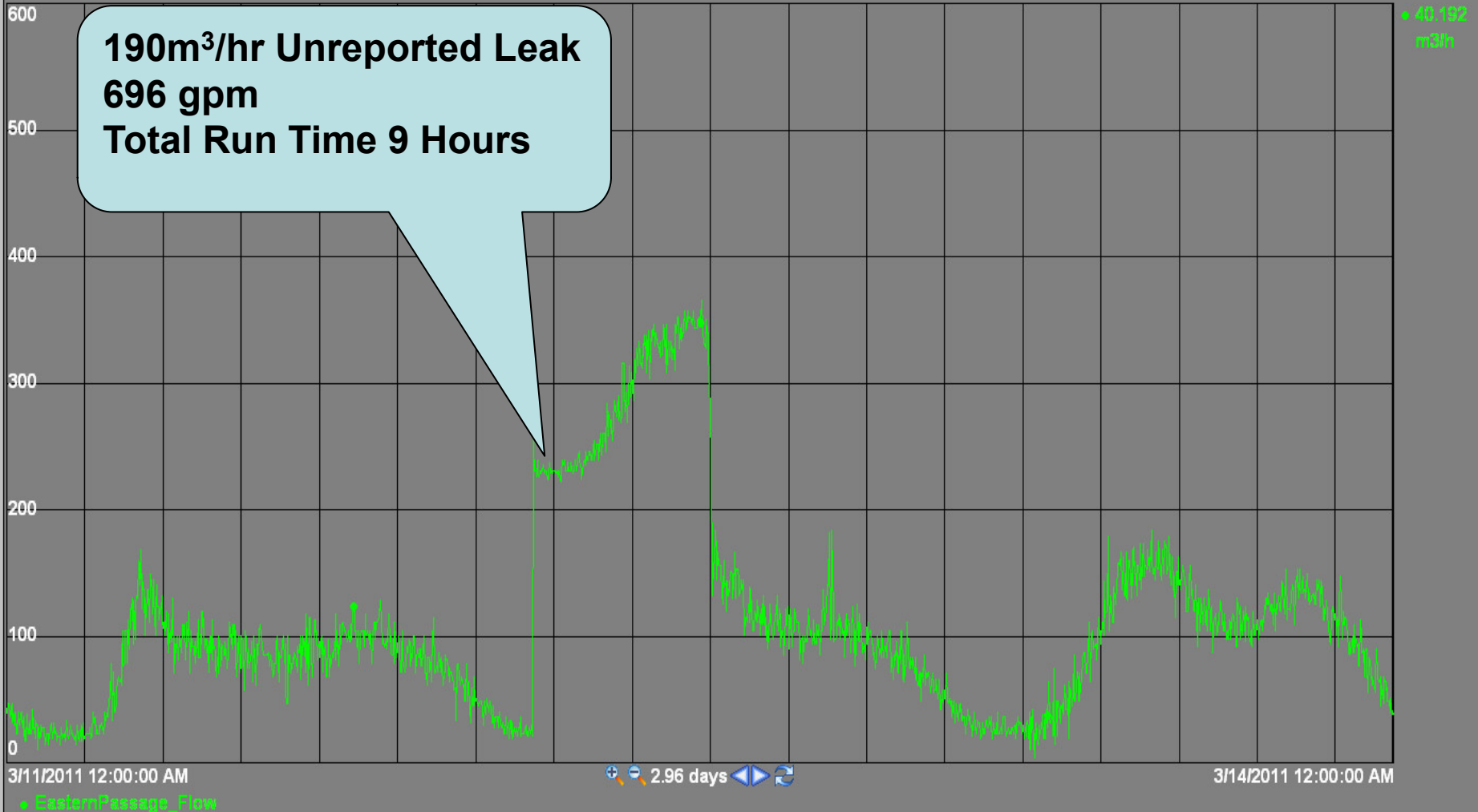
17 m³/h

System Attributes

Length of Pipe - 42.6 km
Public Hydrants - 241
Private Hydrants - 8
Service Connections - 2473
Sprinklers - 13
Average Pressure - 61 M
Density - 58 Conn./km

▶ Eastern Passage Water Break

Eastern Passage Flow



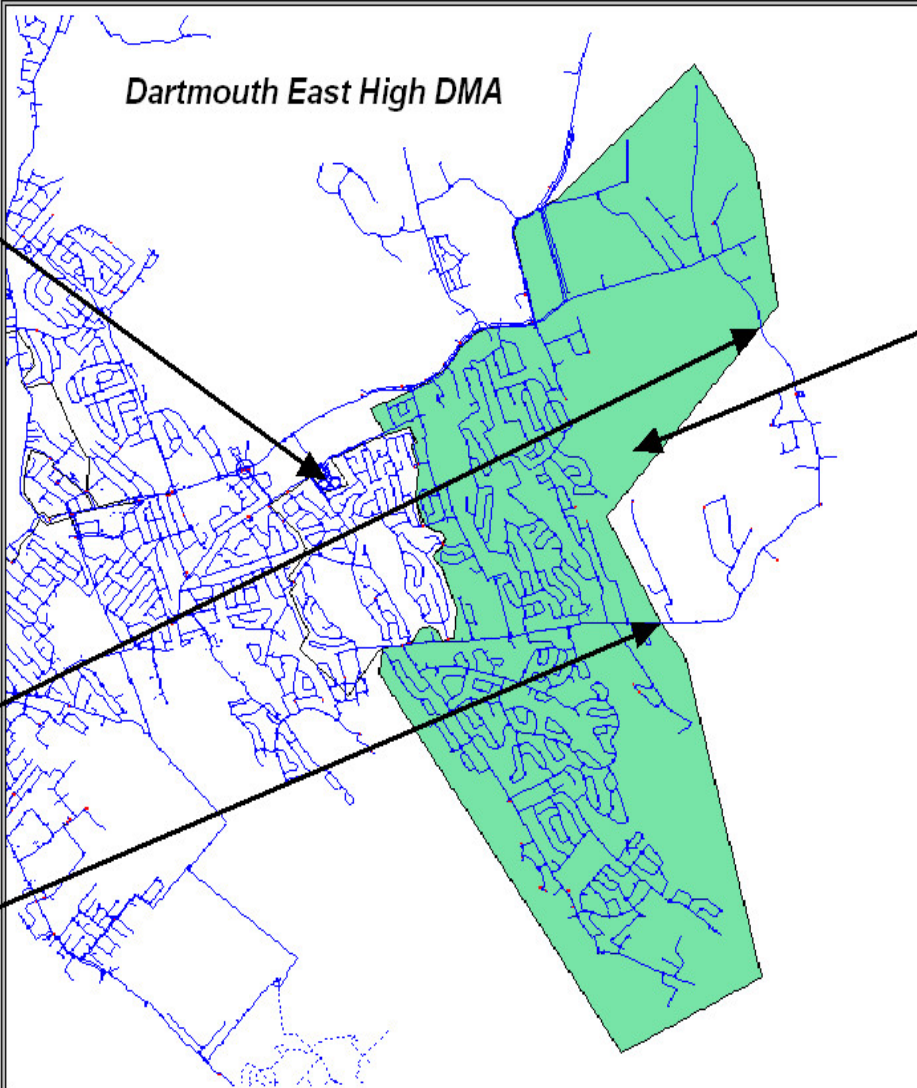
Dartmouth East High DMA

Click Value To Trend

Mt Edward
24" East Meter

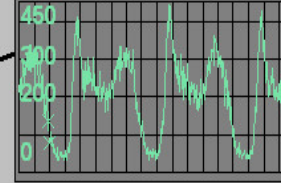
220.66 m³/h

Dartmouth East High DMA



Dartmouth East High
Zone Flow

201.42 m³/h



Calculated Minimum
Night Flow

51.28 m³/h

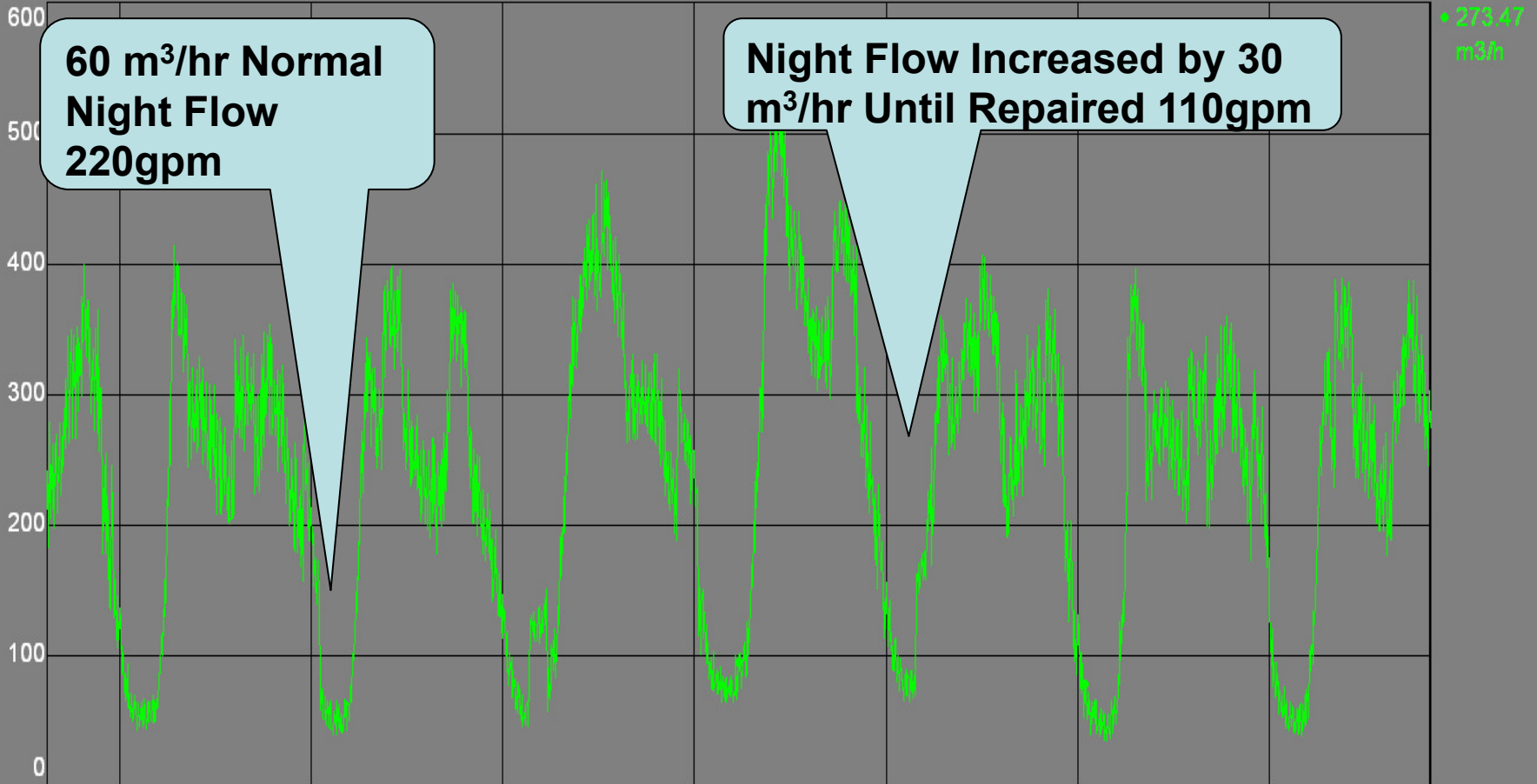
System Attributes

Length of Pipe - 125.8 km
Public Hydrants - 699
Private Hydrants - 40
Service Connections - 7335
Sprinklers - 39
Average Pressure - 55 M
Density - 58.3 Conn./km



Dartmouth East High Water Break Leak Identified on 24" Water Meter

Plot-0



**60 m³/hr Normal
Night Flow
220gpm**

**Night Flow Increased by 30
m³/hr Until Repaired 110gpm**

• 278.47
m³/h

2/16/2011 2:59:52 PM

7.21 days

2/23/2011 8:08:01 PM

• Mt_Edward_Reservoir_24inchEast_Flow

▶ Active Leakage Control

- Annual Leak Surveys
- The Noise Mapping Approach



▶ Use the right tools

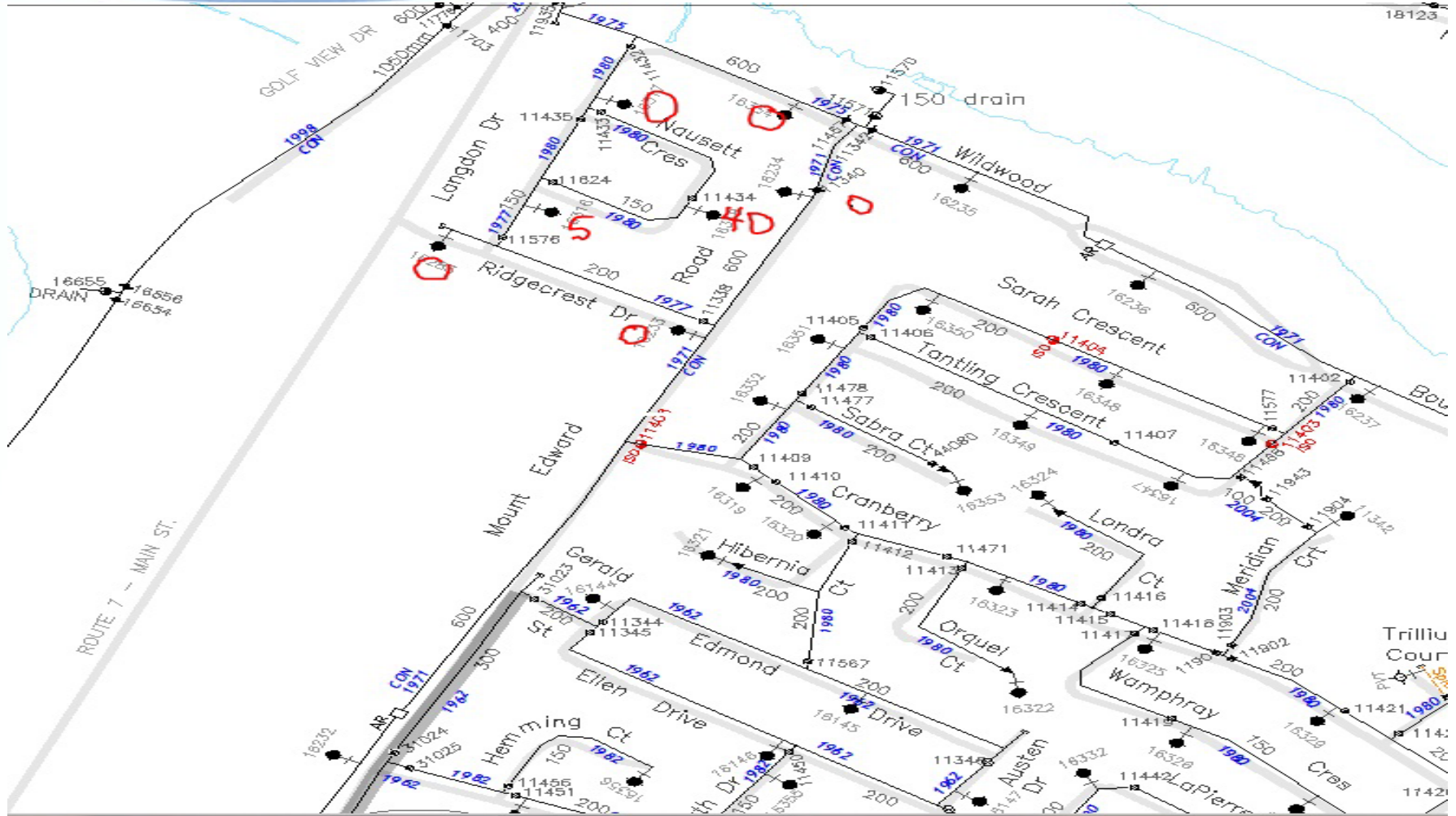




Noise Mapping & Leak Survey



Noise Mapping Process





Spreadsheet Documentation

“Plugging the Process”

24" East High System

LEAK DETECTION EAST REGION

Date _____

Weather _____

Shift _____

Truck _____

Filter _____

Sounder _____

Meter _____

Driver _____

Volume _____

IRON - CAST IRON	PVC - PVC PIPE
PVT - PRIVATE	VLV - VALVE
TRA. - TRANSITE	

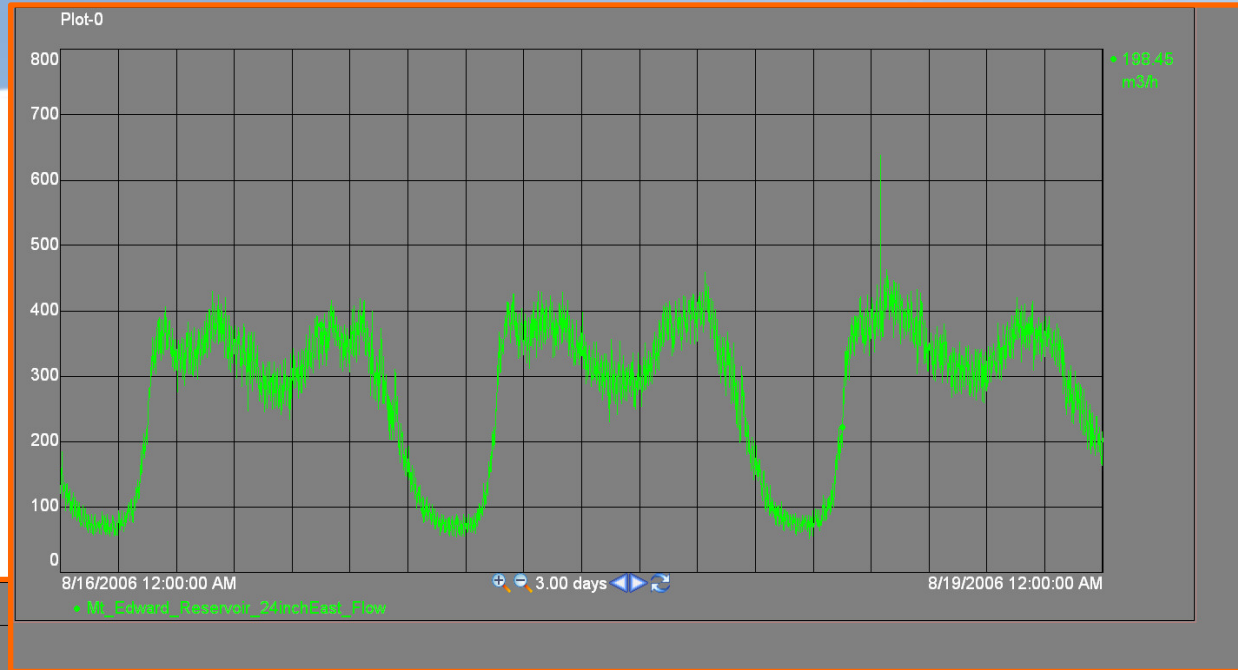
Hyd #	Location	Intensity	Recheck	Description
1	16234 Mt. Edward Rd. @ # 252	0	0	
2	16233 Mt. Edward Rd. @ # 234	0	0	
3	16283 Ridgecrest @ # 4	0	0	
4	16316 Langdon Dr. @ # 40	5	5	
5	16318 Nausett Cres. @ # 18	40	40	service leak at # 38 Nausett
6	16317 Langdon Dr. @ # 24	0	0	
7	16354 Langdon Dr. @ # 9	0	0	
8	16235 Wildwood Blvd. @ # 12			
10	16348 Sarah Cres. @ # 36			
11	16346 Sarah Cres. @ #48			
12	16237 Wildwood Blvd. @ #34			
13	16493 Wildwood Blvd. @ # 42			
14	16345 Wildwood Blvd. @ # 74			
15	16340 Pondicherry @ Pondicherry			
16	16338 Pondicherry @ # 90			
17	16339 Pondicherry @ # 50			



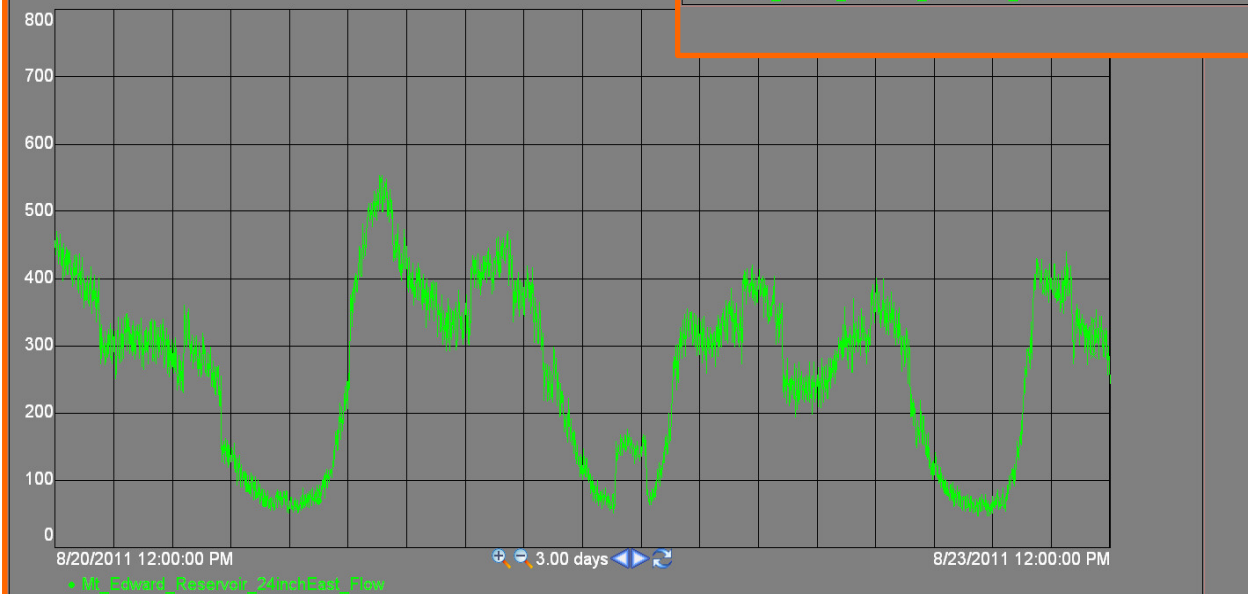
How Effective Are Your Active Leak Detection Efforts

Population 20,000 People

2006 Minimum Night Flow 180 gpm



Mt Edward 24 East



2011 Minimum Night Flow 180 gpm

Impact of Drought on Lake Major

September 1, 2011



December 11, 2014



107 mm rain fell in a
48 hour period
(Halifax Intl Airport)



December 11, 2014



January 17, 2015



January 17, 2015







Nova Scotia drought unusual, catches people unprepared

'People aren't as familiar with managing through drought situations'

By Rachel Ward, CBC News Posted: Sep 18, 2016 7:47 AM AT | Last Updated: Sep 18, 2016 7:47 AM AT



CANADA September 16, 2016 3:29 pm

Updated: September 16, 2016 4:58 pm

Drought reaches 1,000 families in southwestern Nova Scotia



By Natasha Pace

Reporter Global News

News / Halifax

Halifax Water implements mandatory water restrictions over critically low levels

Windsor residents ordered to conserve water to avoid 'critical' shortage

Order affects thousands of people in Hants County as conditions 'worsen on a daily basis.'

By Paul Palmeter, CBC News Posted: Sep 16, 2016 6:05 PM AT | Last Updated: Sep 16, 2016 6:05 PM AT



The water level at Mill Lake, which serves as Windsor's water supply, has dropped by more than 60 centimetres since the spring. (Paul Palmeter/CBC)

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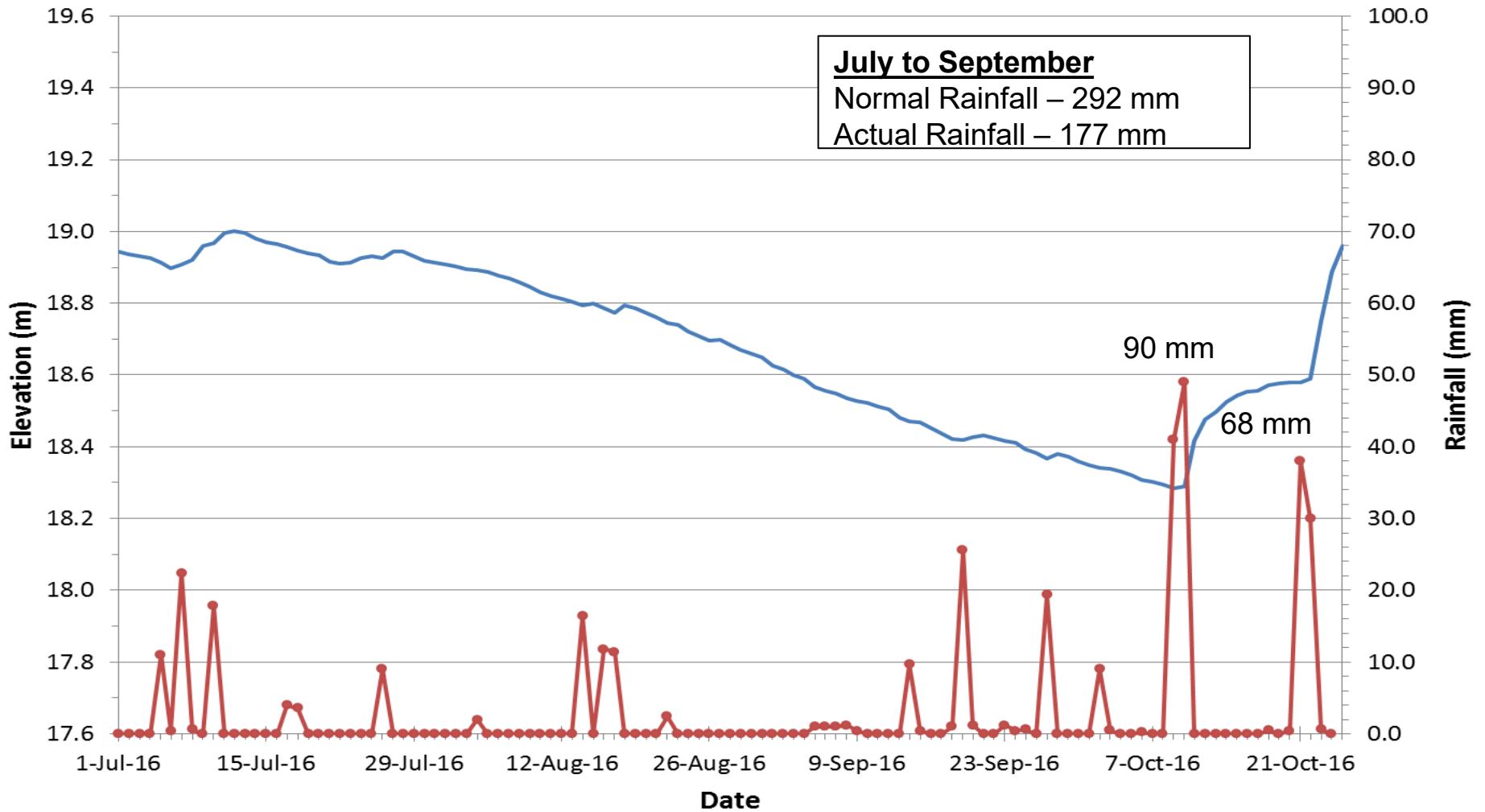
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Lake Major Water Level

— Water Elevation —●— Rainfall







Drought Timeline

July 12 – 19.00 m

Highest level of the summer

August 11 – 18.82 m

Activated siphons

August 20 – 18.78 m

Lake stops spilling

September 6 – 18.56 m

Siphons stop working –

Out of compliance

September 19 – 18.42 m

Water restrictions enacted

October 9 – 18.28 m

Historic low water level

October 10 – 18.29 m

90 mm of rain

October 21 – 18.58 m

68 mm of rain

October 24 – 18.89 m

Water restrictions lifted

Dam is spilling

In compliance

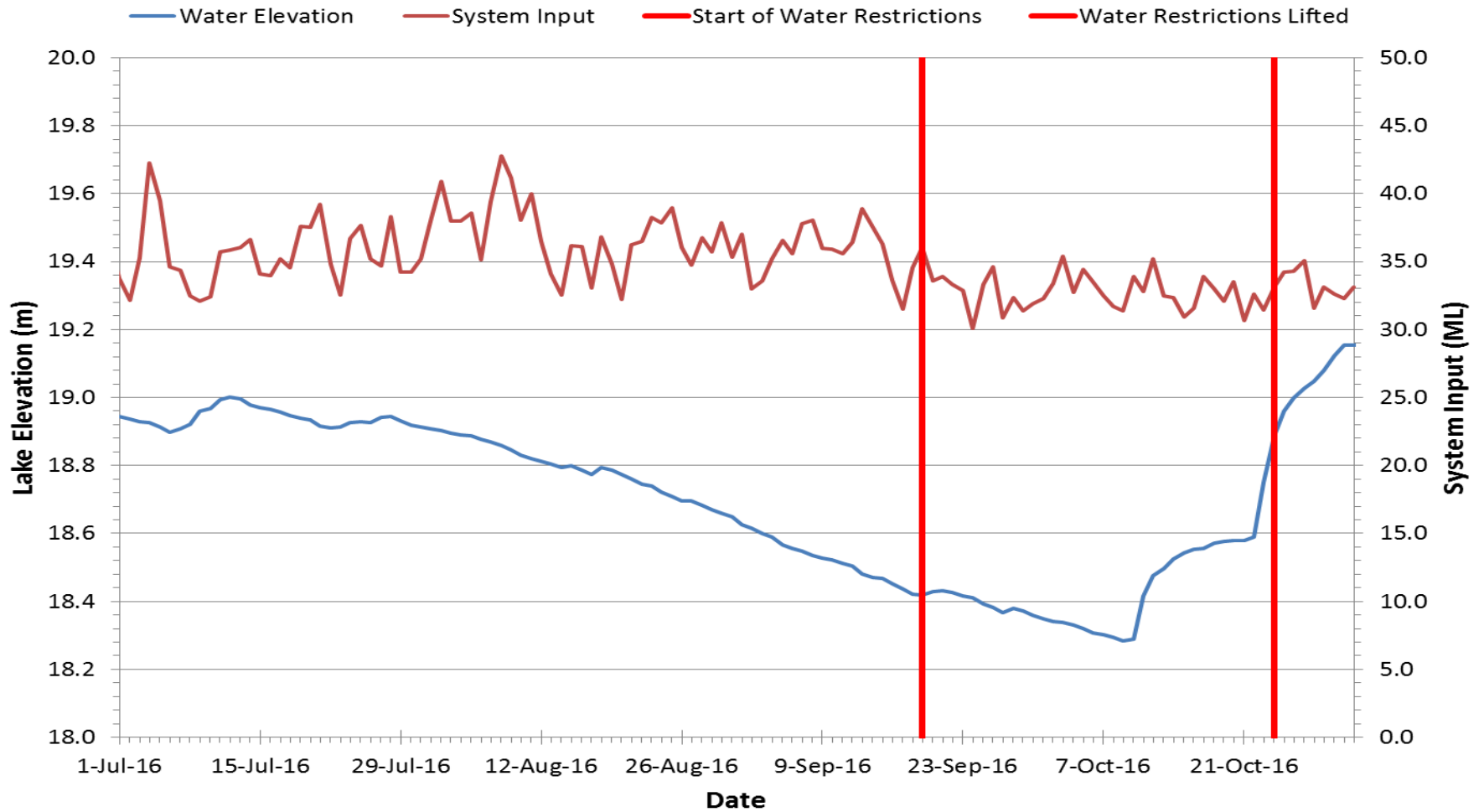
October 28 – 19.05 m

37 mm of rain

November 2 – 19.16 m



Lake Major Water Level & Dartmouth Water Consumption



Drought Response

- **Activated the Incident Command System**
 - Plan in case lake levels fell below the operating level of the intake pumps
- **Water Restrictions**
 - 36 ML/day to 33 ML/day
 - Increased leak detection to reduce water loss
- **Work with Nova Scotia Environment**
 - Address fish maintenance flows
 - Weekly reporting
 - Variance request



**Questions or
Comments?**