

# WATER DISTRIBUTION SYSTEM IMPROVEMENTS



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

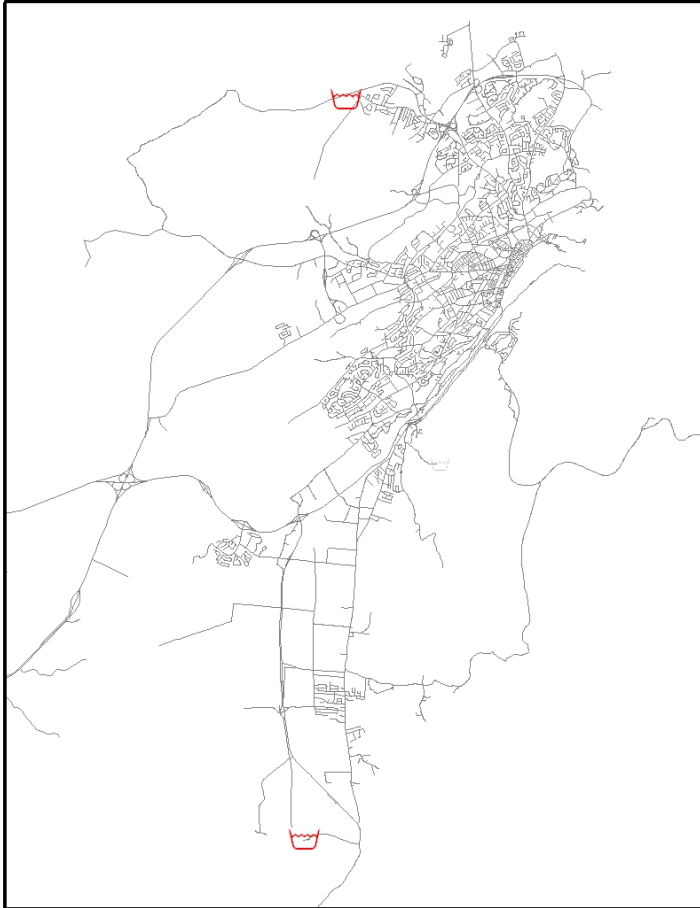
# Overview

- City of St. John's Water Distribution System
- Distribution System Improvements - General
- Completed Projects
- Future Projects

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# CSJ Water Distribution Sys.



## Treatment Plants

### Bay Bulls Big Pond

- 24 MGD
- St. John's (West)
- Mount Pearl
- Paradise
- CBS

### Windsor Lake

- 12 MGD
- St. John's (East)

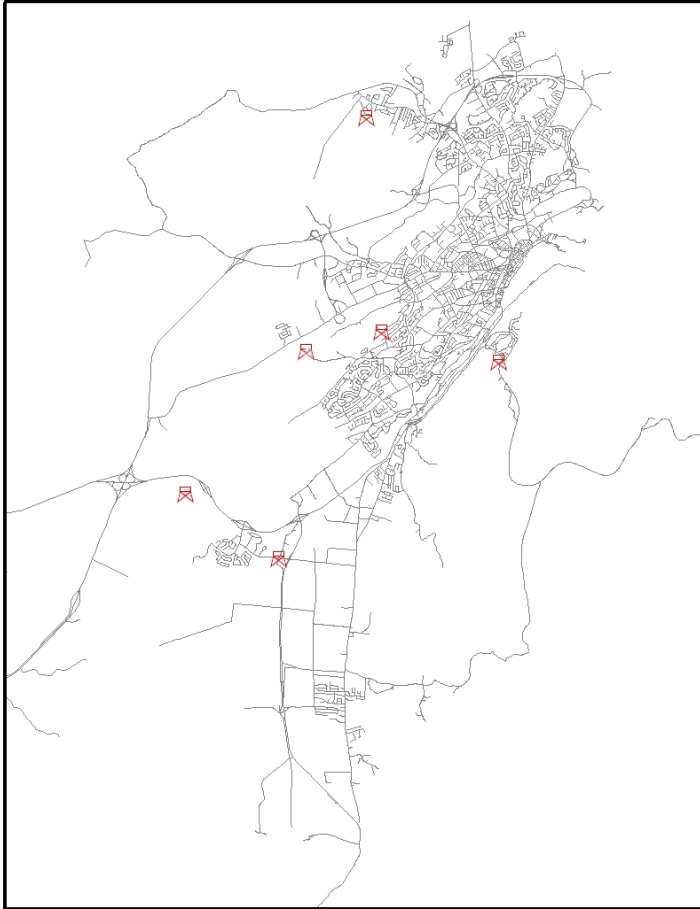
### PHLP

- Under Construction

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# CSJ Water Distribution Sys.



## Water Storage Tanks (10)

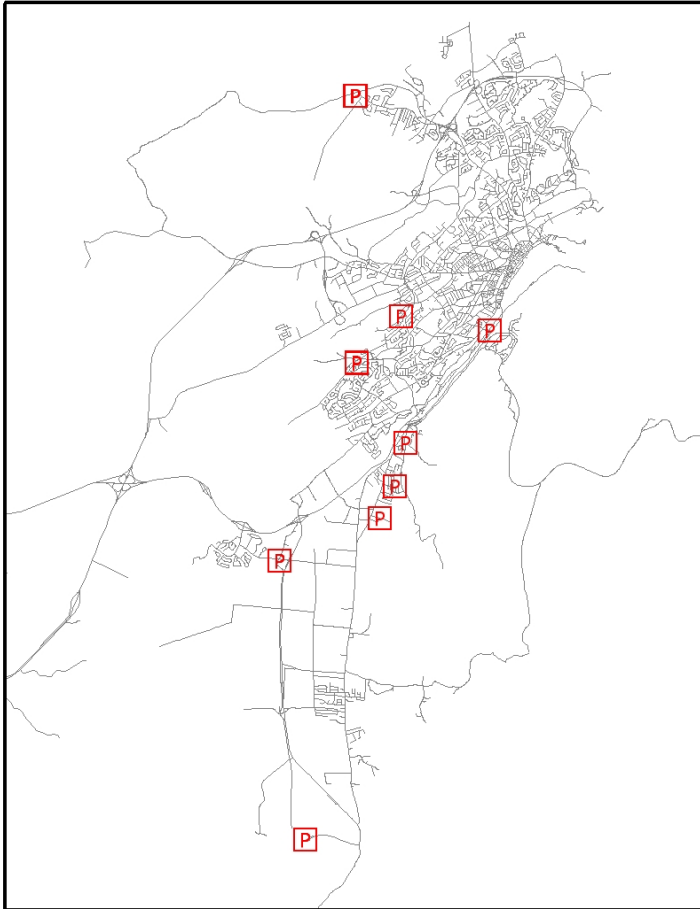
- Ruby Line
- Southlands (2)
- Jensen Camp
- Kenmount Hill (2)
- Shea Heights
- Airport Heights
- Bay Bulls Big Pond
- Windsor Lake

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# CSJ Water Distribution Sys.



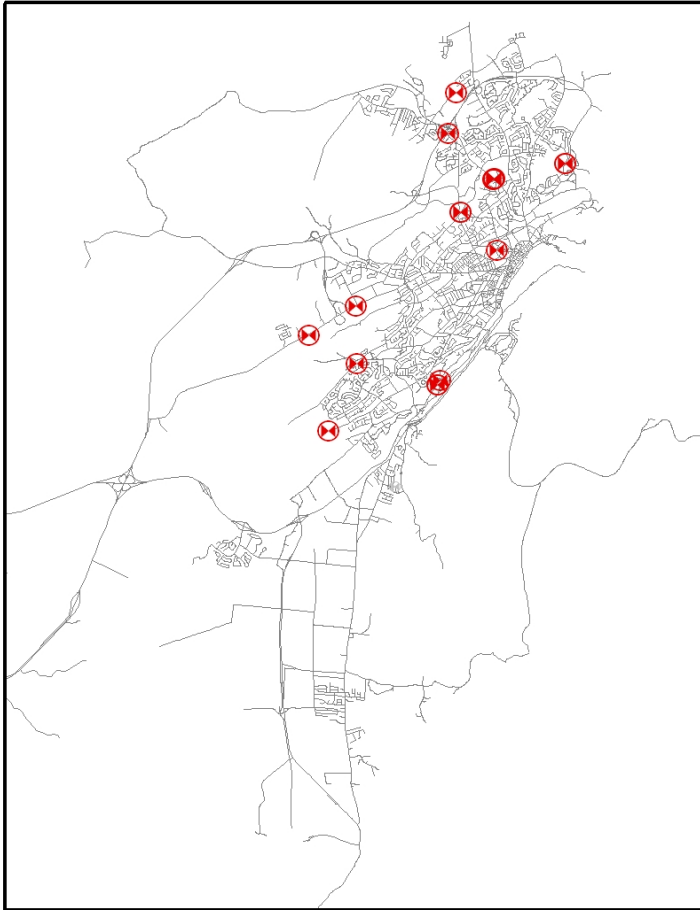
## Pumping Stations (10)

- Bay Bulls Big Pond
- Ruby Line
- Kenmount
- New Pennywell
- Windsor Lake
- Autumn Drive
- Shea Heights
- Densmore Lane
- Fahey Street
- Valleyview

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# CSJ Water Distribution Sys.



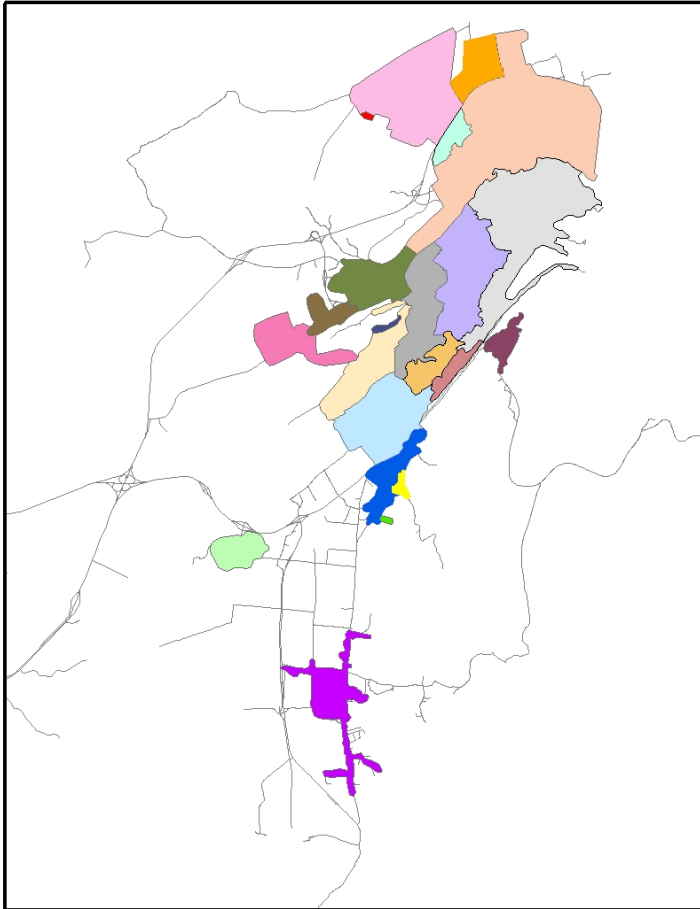
## Pressure Reducing Stations (12)

- Topsail Road
- Waterford Lane
- Waterford Bridge Road
- Kenmount Pump Station
- Kenmount Road - VOCCM
- Kenmount Road @ Pippy Place
- Howley Avenue
- Higgins Line
- Portugal Cove Road (2)
- Janeway Place
- Portugal Cove Place
- Major's Path

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# CSJ Water Distribution Sys.



## Pressure Zones (22)

- Service Area from 190m Contour to Sea Level
- Controlled by
  - Reservoirs (2)
  - Tanks (10)
  - Pump Stations (10)
  - PRV Stations (12)
- Total of 22 Zones
- Future – 30 Zones?

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# CSJ Water Distribution Sys.



## CSJ Infrastructure

- Water Mains  $> 300\text{mm}$ 
  - 74 km
- Water Mains  $\leq 300\text{mm}$ 
  - 516 km
- Fire Hydrants
  - City Owned = 3055
  - Private = 446
- Water Main Valves
  - Valves  $> 9940$

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements

Since the 1990's the City of St. John's has made substantial investment to the expansion and development of the water distribution system. These improvements include:

- Treatment Plants
- Booster Pump Stations
- Storage Reservoirs
- Transmission Mains
- PRV Station

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements

Since 2005 the investment made to the water distribution system has included projects to eliminate or reduce operation and maintenance problems within the system. These projects include:

- Replacement of Water Mains
  - Bay Bulls Road
  - Blackhead Road
  - Torbay Road
  - Newfoundland Drive
  - Logy Bay Road – 2 areas
- Use of New Construction Methods
- Looping of Water Mains

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements

## How do we determine problem areas?

### Asset Management – Review of Records

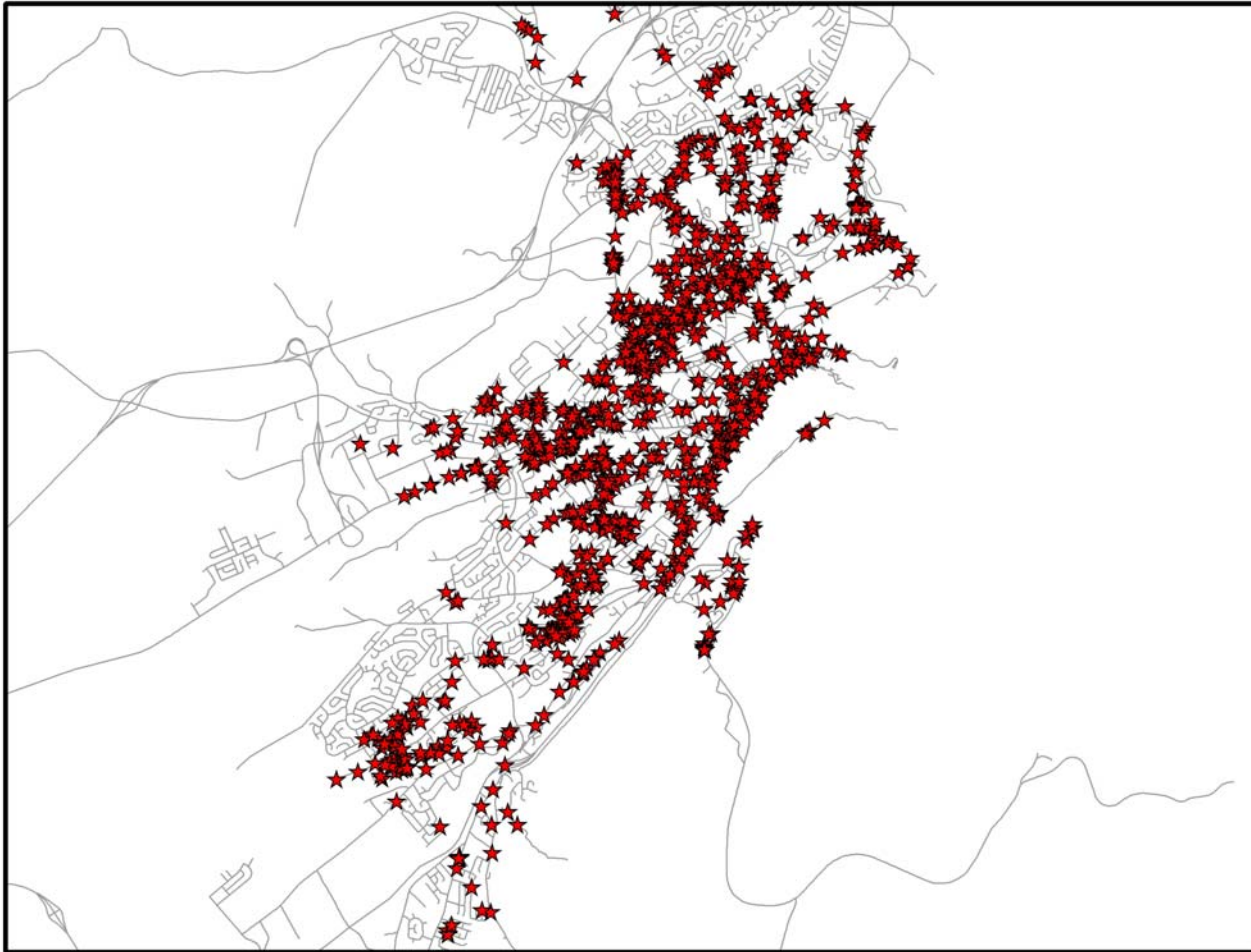
- After each water main break, leak and/or repair a report is completed documenting such items as:
  - Location;
  - Size of Water Main;
  - Material of Construction
  - Type and/or Cause of Water Main Break
- The locations of the above are recorded in GIS system.

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Case Study – Logy Bay Road

- Location – Logy Bay Road at Harding Road
- Water Main Diameter – 400mm
- Water Main Material – Ductile Iron
- Year Installed - 1985
- Recorded Water Main Breaks – 5 between 2001 and 2006
- Comments – Reported corrosion along bottom of pipe with numerous small holes.

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Case Study – Logy Bay Road

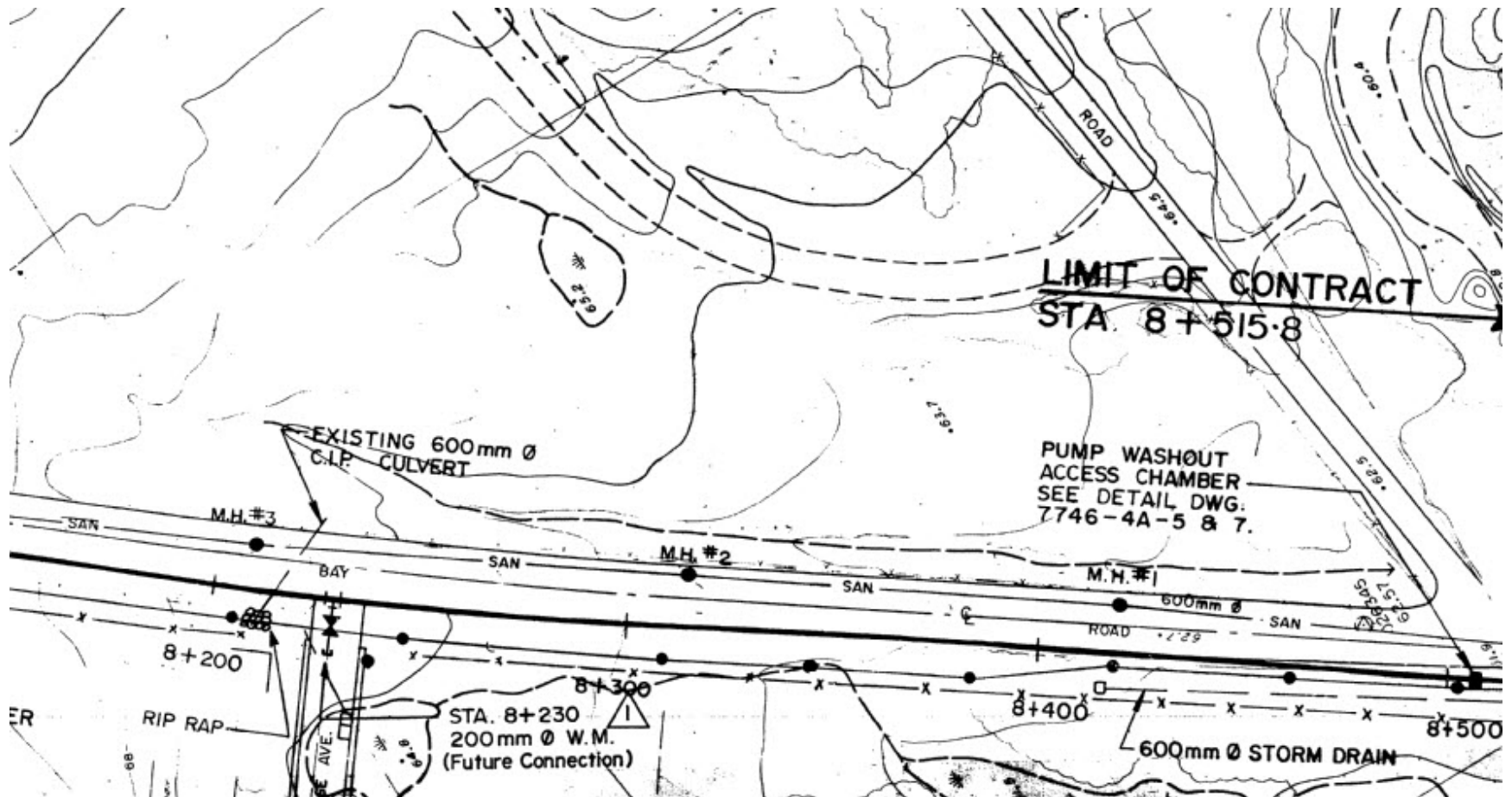


ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Case Study – Logy Bay Road



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Case Study – Logy Bay Road



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Case Study – Summary

- Similar results found at all 6 locations
- Common theme between all sites:
  - Water Main installed adjacent to an existing watercourse or within re-routed watercourse.
- No reported problems since construction completed.
- All water mains replaced using PVC DR18

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements

## Construction Methods

1. Materials of Construction
2. Cathodic Protection
3. Locating / Tracing

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements

## 1.) Materials of Construction

- Replacement of corroded sections of water main replaced with PVC DR18
- First project completed in 2006 and final project completed in 2008.
- Total length installed = 1.5km
- PVC water main added to City of St. John's Specification Book in 2009, ductile iron pipe removed.

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements

## 2.) Cathodic Protection

- PVC water main has been selected as the material of choice for CSJ, however recognize need to protect other metal components.
- Zinc Anodes required to be installed on all metallic fittings, valves, hydrants and existing pipes.
- Anodes attached using CadWeld system

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements

## 3.) Water Main Tracing and Locating

- PVC pipe cannot be traced or located using traditional methods.
- Most municipalities use tracer wire.
- CSJ has selected 3M Locating System

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements



## 3M Locating System

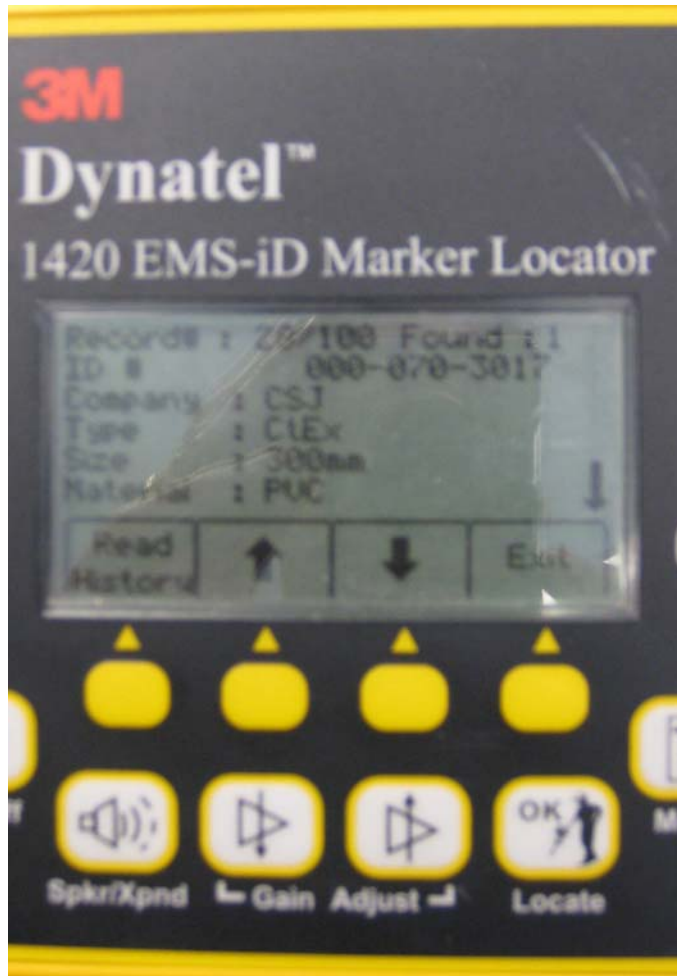
- Marker Balls capable of being programmed with 6 lines of data;
- Different types of balls for various infrastructure
- Locator will communicate with GPS unit



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements



Typ. Data on Marker Ball:

- Company
- Type
- Size
- Material
- Date
- Description

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements



## Marker Ball Locations:

- Bends
- Tees
- Reducers
- Corporations
- Curb Stops
- Stub Ends of Pipe
- Connect to Existing
- Max. 30m Spacing

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements



Data collected from Locator can be received by a GPS Unit and Transferred to GIS System

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements

Attributes of MainShapefile														
FID	Shape	ID#	MODEL	COMPANY	TYPE	SIZE	MATERIAL	DATE	DESCRPTN	FIELD09	FIELD10	FIELD11	FIELD12	LA
0	Point	0000632049	1423-XR/ID Water RFID Ball	CSJ	Tee	150x300	PVC	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
1	Point	0000636035	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
2	Point	0000636037	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Mai	Not Available	Not Available	Not Available	Not Available	
3	Point	0000636041	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y		Not Available	Not Available	Not Available	Not Available	
4	Point	0000632291	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Not Available	Not Available	Not Available	Not Available	Not Available	
5	Point	0000636022	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
6	Point	0000632050	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
7	Point	0000632040	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
8	Point	0000636033	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
9	Point	0000632044	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
10	Point	0000636030	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
11	Point	0000632045	1423-XR/ID Water RFID Ball	CSJ	Tee	150x300	PVC	07/20/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
12	Point	0000614757	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	06/15/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	
13	Point	0000614745	1423-XR/ID Water RFID Ball	CSJ	Corp	25mm	BZ	06/15/10 M/D/Y	Main	Not Available	Not Available	Not Available	Not Available	

Data collected from Locator can be received by a GPS Unit and Transferred to GIS System

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements

## **Tracer Wire – Pros**

- Inexpensive
- Easy to Install
- Easy to Trace

## **Tracer Wire – Cons**

- Subject to Damage

## **Marker Ball – Pros**

- Easy to Install
- Collection of Data
- Reference to GPS

## **Marker Balls – Cons**

- Limited Depth – 5ft
- Requires Specialized Equipment

**ST. JOHN'S**

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements

## Water Main Looping

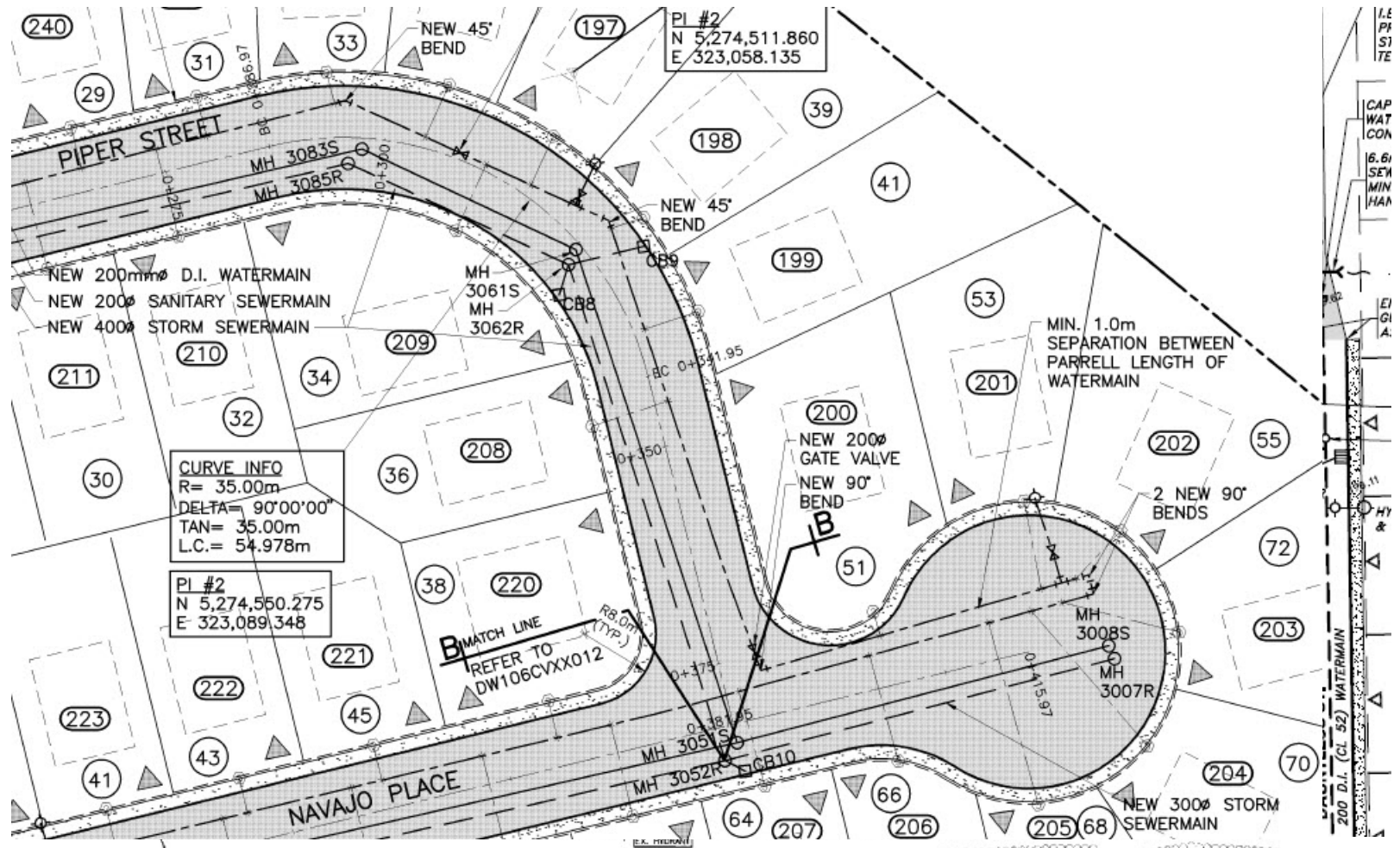
- Water Quality Issues
- Fire Flow
- Secondary Supply of Water

CSJ Subdivision Design Manual requires the water system to be designed to exclude any dead end sections

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

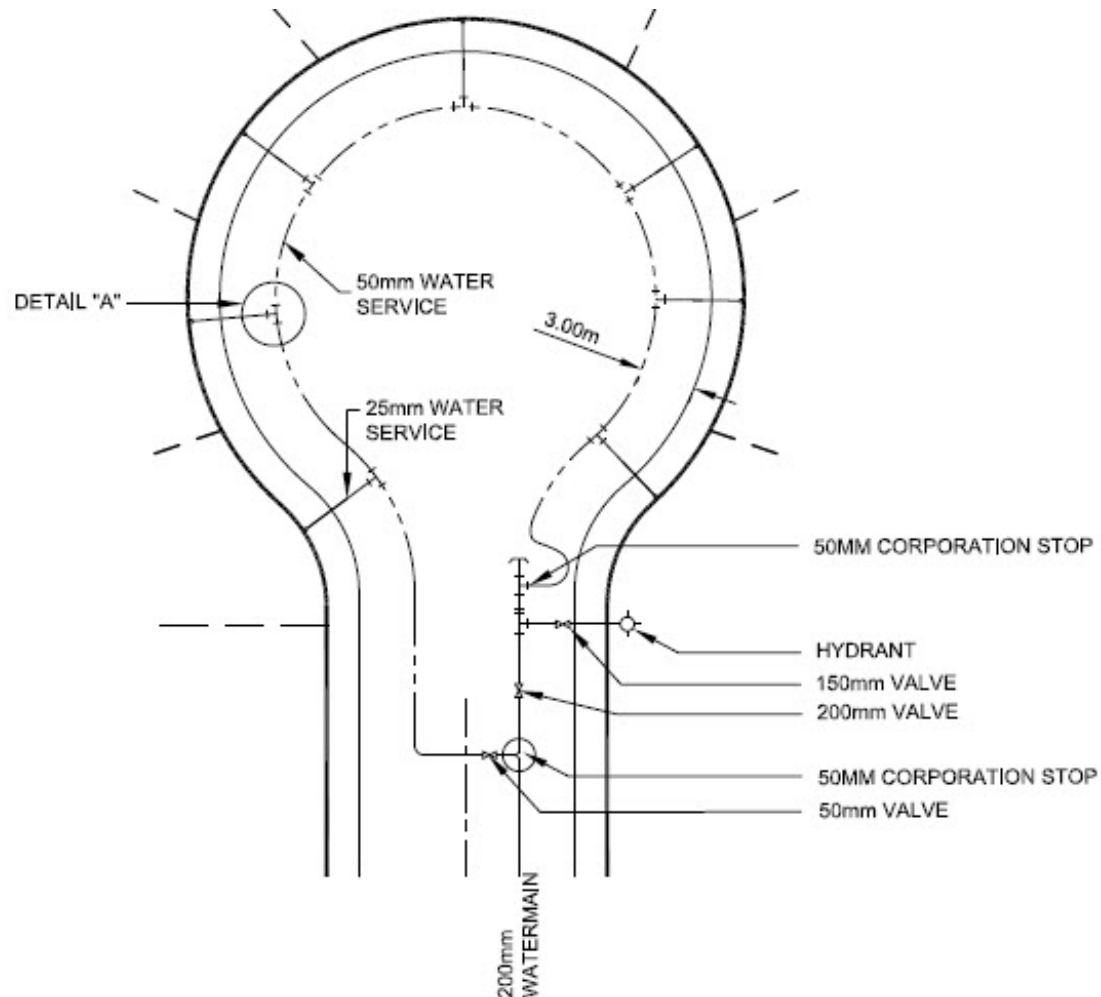
# Water Main Looping



## ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water Main Looping



ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Water System Improvements

## **Trad. Loop – Pros**

- Fire Flow
- Redundant Supply

## **Trad. Loop – Cons**

- Expensive to Install
- Easements between Properties

## **P-Loop – Pros**

- Inexpensive to Install
- No Easements Req'd

## **P-Loop – Cons**

- Possible Reduced Fire Flow
- No Redundant Supply

**ST. JOHN'S**

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements



Replacement of Aging Infrastructure – PRV Station

- Waterford Bridge Road – PRV Station

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Case Study #2 – PRV Replacement



## WBR PRV

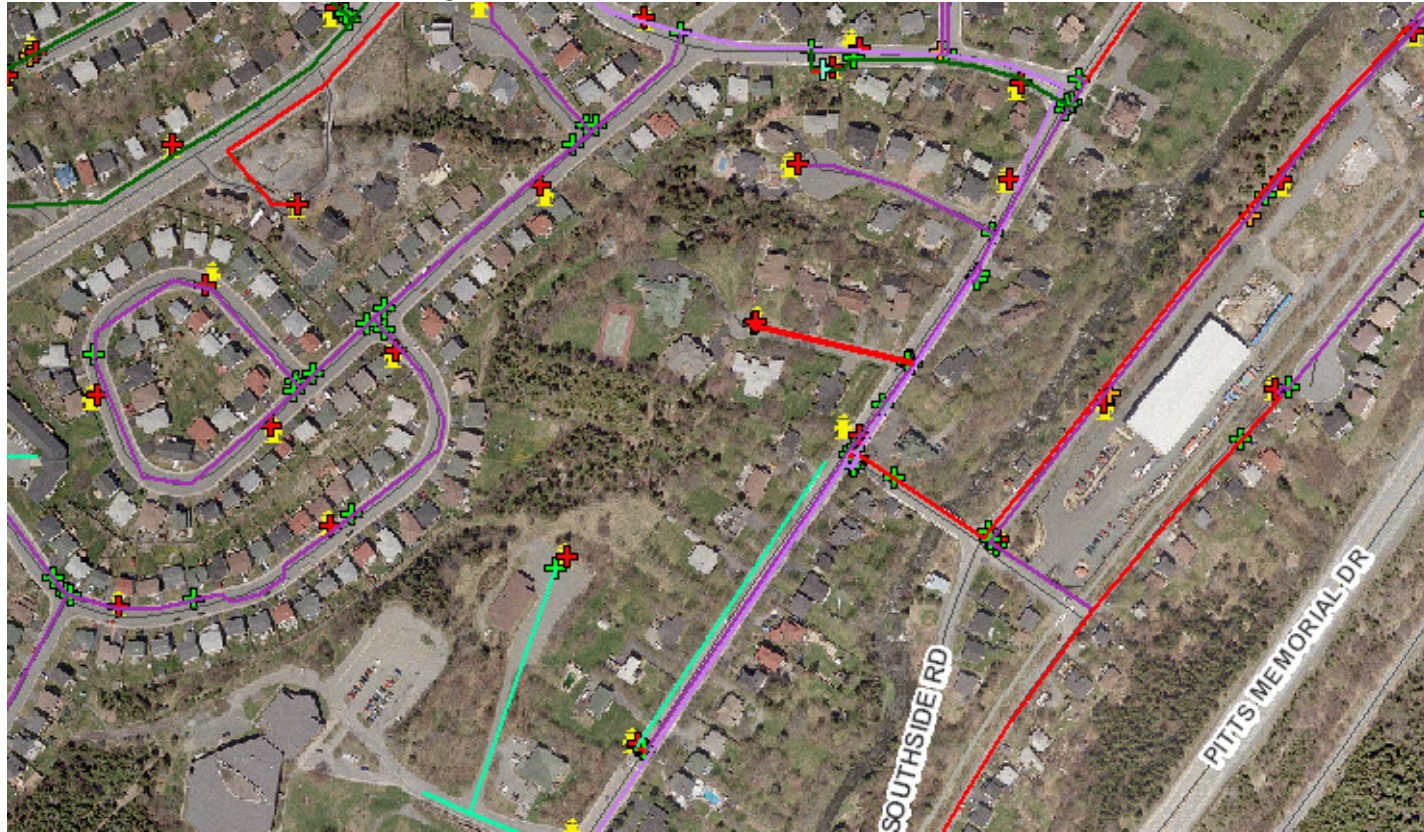
- Constructed 1950's
- Single 200mm PRV
- Small Chamber
- No Electricity
- Confined Space Entry

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Case Study #2 – PRV Replacement



## Site Selection

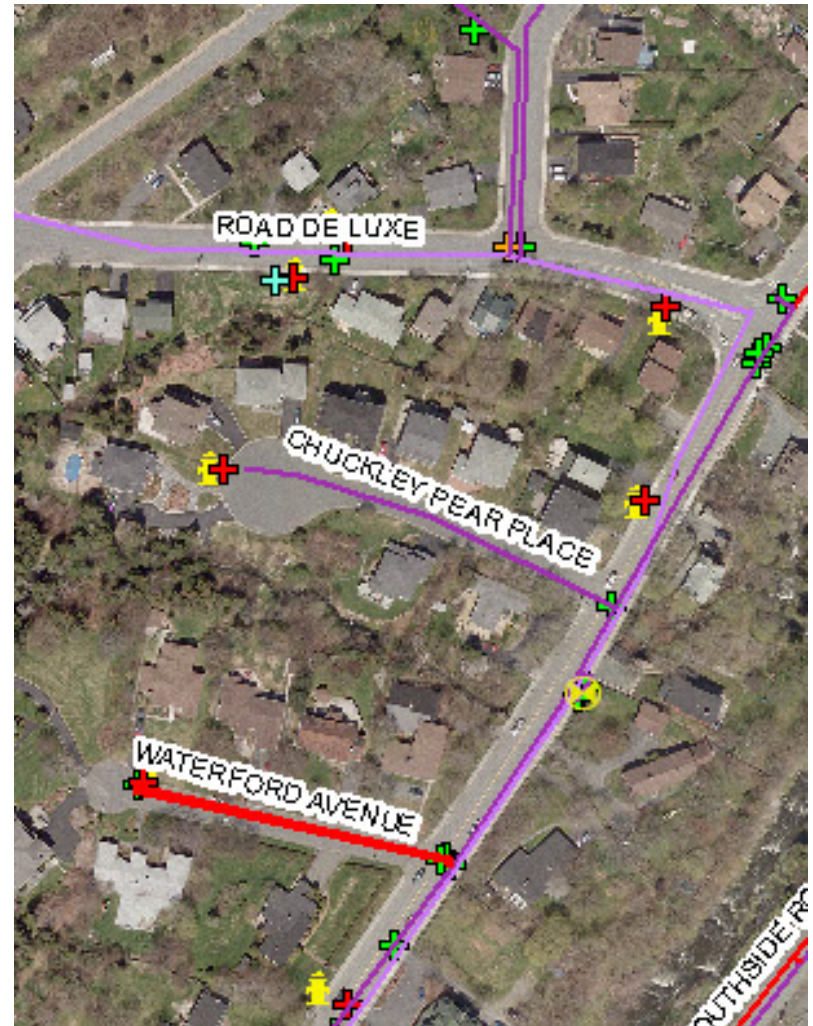
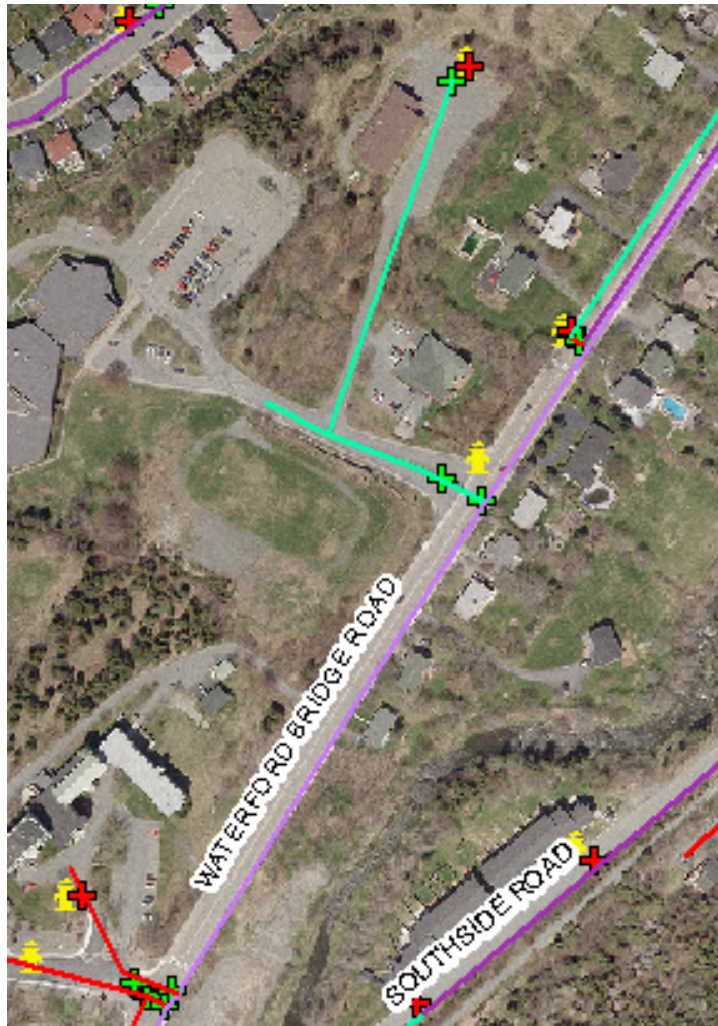
- Limited Space along Waterford Bridge Road
- Site Search Expanded

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Case Study #2 – PRV Replacement

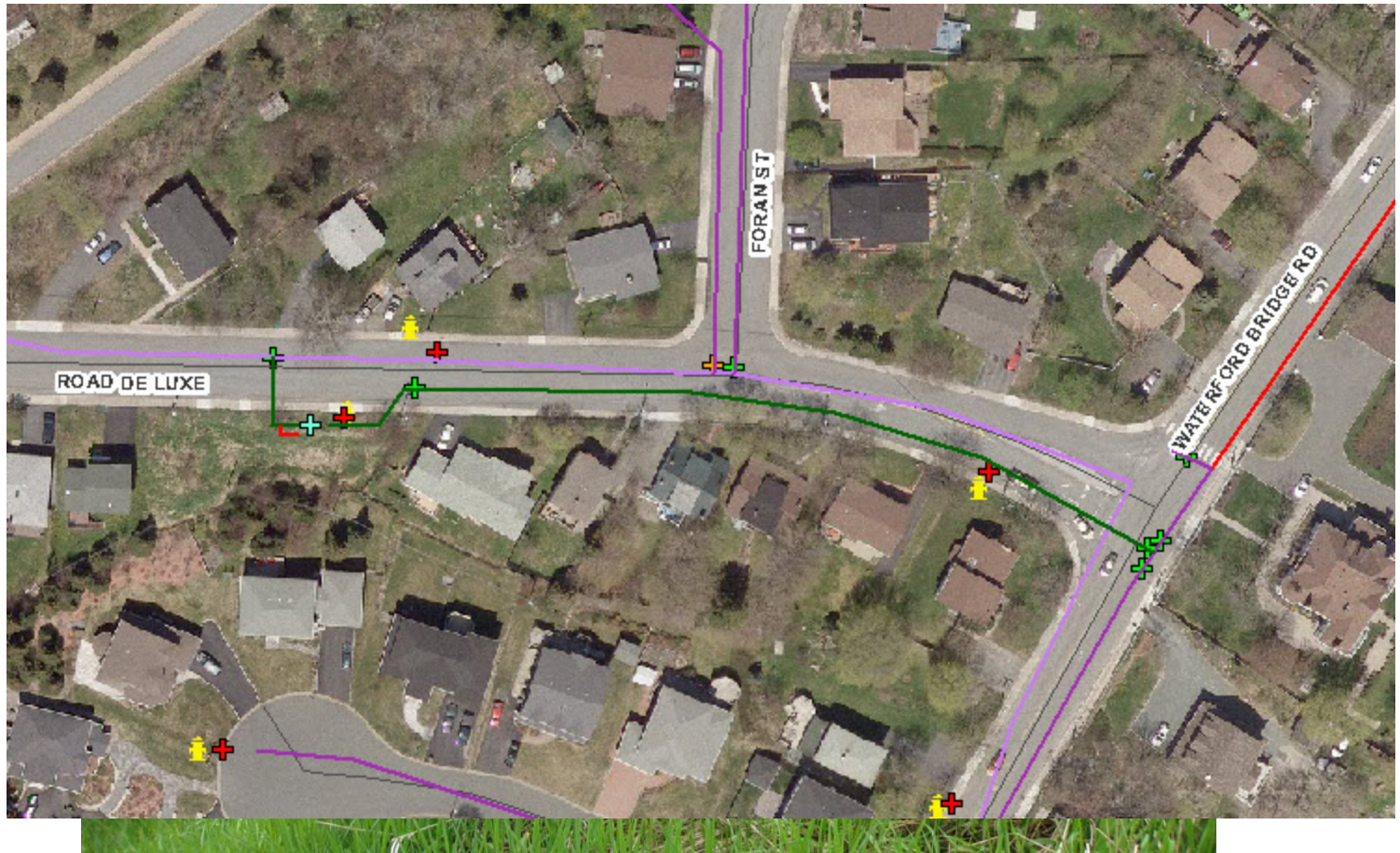


ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Case Study #2 – PRV Replacement



## Site Selection and Design

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Case Study #2 – PRV Replacement



Construction Photos

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Case Study #2 – PRV Replacement



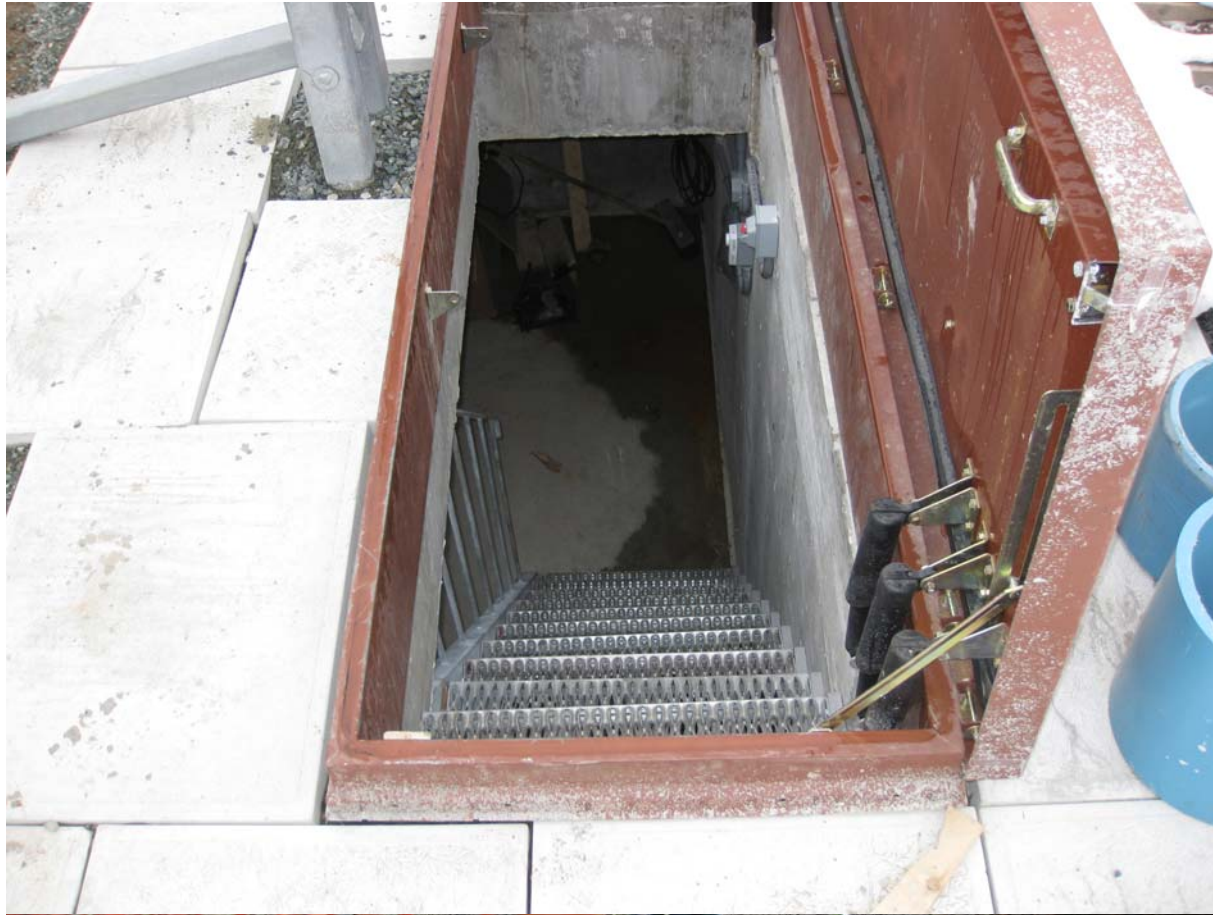
Construction Photos

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Case Study #2 – PRV Replacement



Construction Photos

ST. JOHN'S

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION



# Water System Improvements



Future Projects – Pipe Cleaning and Lining

**ST. JOHN'S**

DEPARTMENT OF PUBLIC WORKS & PARKS  
ENVIRONMENTAL SERVICES DIVISION

# Thank You



## ST. JOHN'S

DEPARTMENT OF PUBLIC PARKS AND PARKS  
ENVIRONMENTAL SERVICES DIVISION