Private Inflow Removal Workshop

MWRA Advisory Board Meeting

May 15, 2025

What is I/I?

Infiltration/Inflow (I/I)

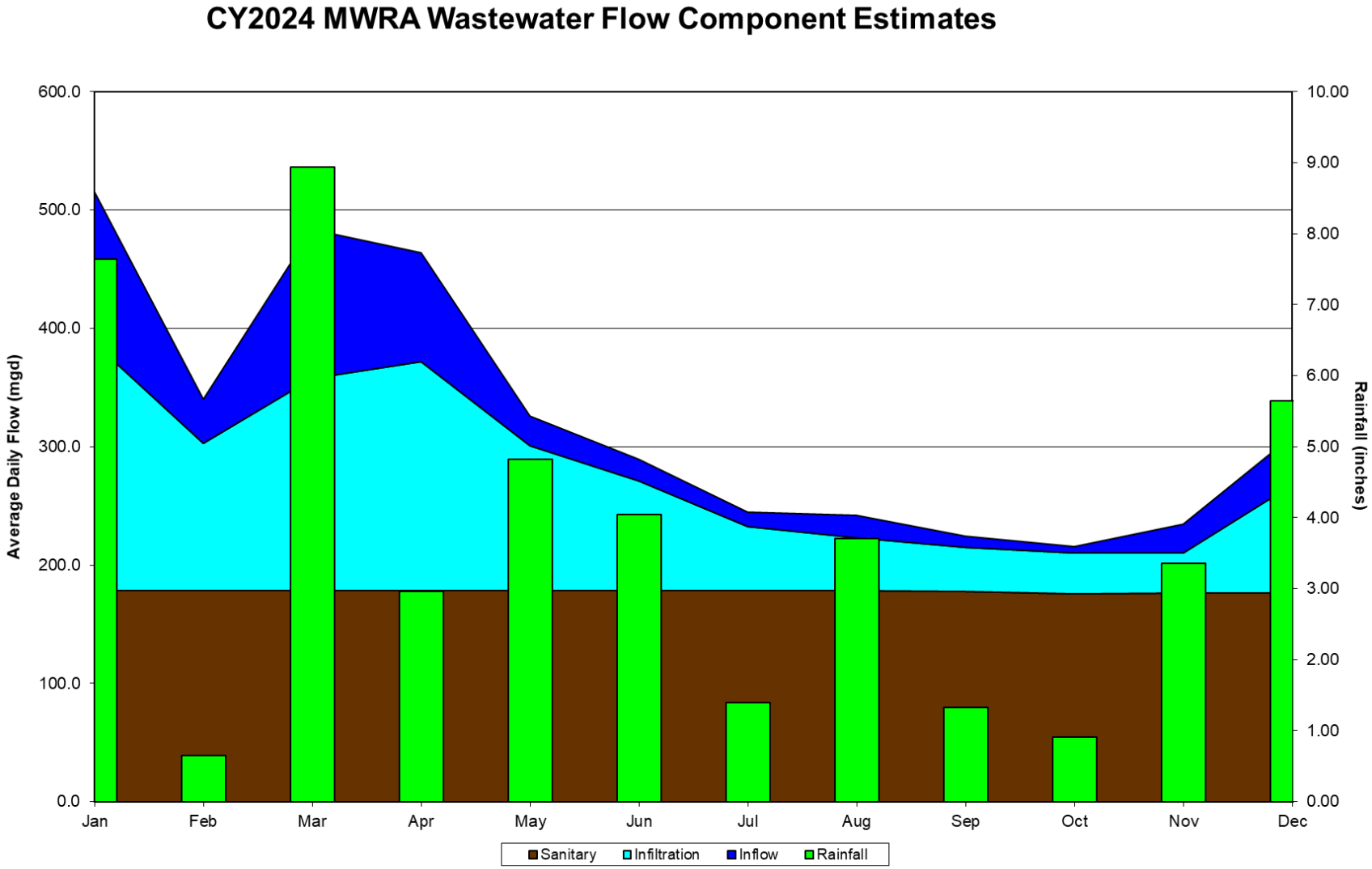
Infiltration
(Groundwater via physical defects)

Inflow
(Stormwater via direct connections)

Infiltration and Inflow in MWRA's System

Approximately **45-50%** of the Flow to Deer Island is Infiltration and Inflow

MWRA Wastewater Flow Components



Sources of Infiltration and Inflow

Sources of Infiltration

- Cracked pipes
- Offset joints
- Leaking service connections
- Breaks in service connections
- Leaking manholes

Sources of Inflow

- Storm drain system
- Sump pumps
- Interior drains
- Roof leaders
- Exterior drains

Sources of Infiltration and Inflow

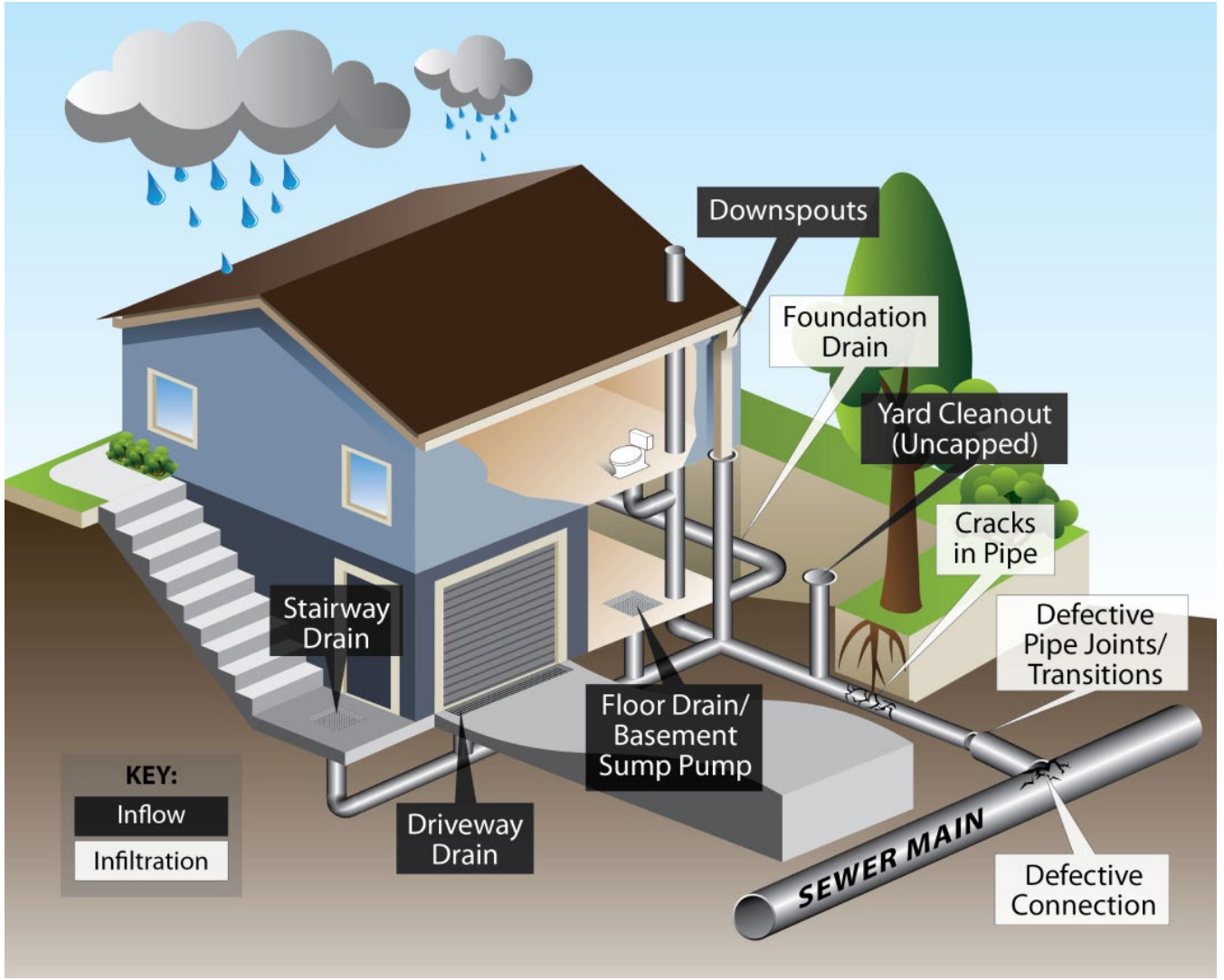


Image Credit: Norwalk CT WPCA

Inflow: Public vs Private

Sources of Public Inflow

- Leaking manhole frames and covers
- Cross connections between sewers and storm drains
- Direct connections of catch basins to the sewer system

Sources of Private Inflow

- Sump pumps
- Open cleanouts
- Basement drains
- Roof leaders
- Driveway/Yard drains

Removing Inflow: Public vs Private

- Public Inflow Sources Usually Easier to Address
- Low Hanging Fruit – Many have been Corrected
- Private Inflow Removal More Complex
  - Requires Extensive Investigation
  - Access to Private Property
  - Communication and Coordination
  - Reluctant Residents
  - Many Possible Smaller Sources – Less Bang for your Buck
  - Possibility of Sources being Reconnected after Removal

Why Remove It?

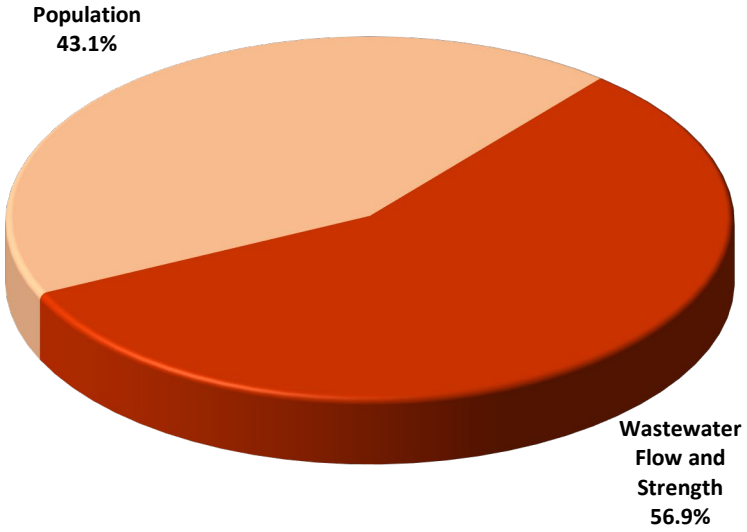
Mitigate SSOs

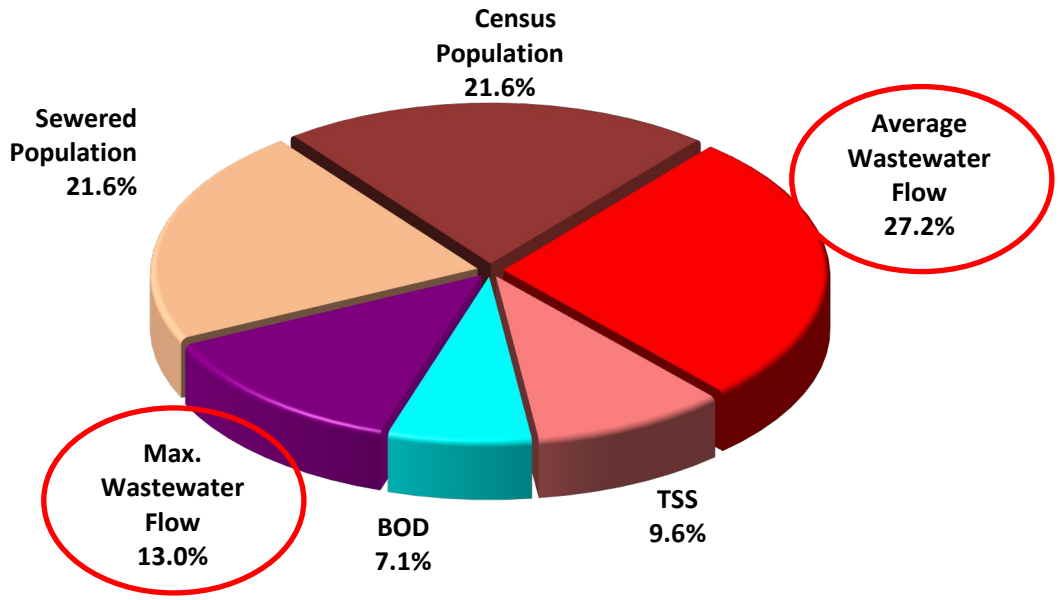
Reclaim Sewer Capacity

Transport and Treatment Costs

MWRA Flow Based Rate Structure

Under MWRA's Proposed FY2026 budget, on average 57% of the FY2026 sewer assessment will be calculated based on average flow and strength of flow, and 43% based on population





Wastewater Flow Challenges

- Capacity of collection system and facilities (pump stations, headworks, etc.)
- Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs)
- Treatment capacity and permit limits
- Changing climate conditions
- I/I removal needed **before** introducing new flow

Next speaker =

Colleen Rizzi

MWRA Director of Environmental and Regulatory Affairs

Community Private Inflow Removal Programs

Next speakers =

Brian White
Director of Public Works, Town of Burlington

Meaghan Cavalier
Assistant Town Manager, Town of Burlington

Town of Burlington
Department of Public Works

Private Inflow Removal Presentation

History

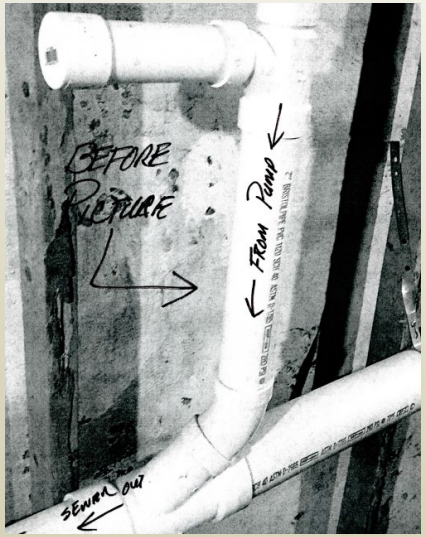
- The Town of Burlington has 115 miles of sewer
- Most of the pipe is AC and was installed in the 60's-70's
- Our population is about 25,000 residents
- Due to raw sewage overflows into the Vinebrook and Horn Pond (Woburn) a sewer moratorium implemented by MassDEP in 1986

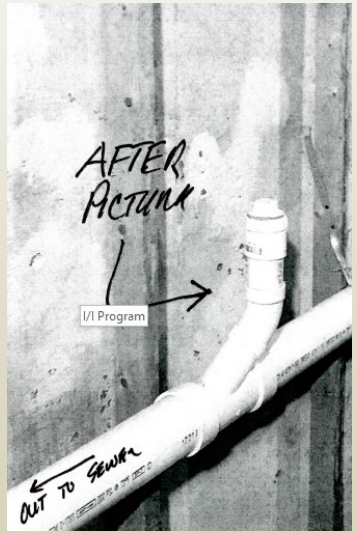
Administrative Consent Order

- The Town of Burlington has been under an ACO since 1986
- It applies to all properties in Burlington that are increasing sewer flow
- ACO required sewer flow calculation based on Title 5 (310 CMR 15)
- The initial removal ratio was a 10:1 however in 2006 due to the Town's efforts that ratio was amended to 4:1
  - The town uses a 5:1 ratio and the extra goes to our sewer bank to help pay for townwide I/I projects
- Fee structure: GPD x 5 x $2.50

I/I Program

- Single residents connecting to sewer or increase usage are required to pay a fee
- A Developer increasing their sewer discharge by more that 1000 GPD will be required to address at least 50% of their increase with I/I removal, the other 50% can be paid for
- The Developer can propose their own method of I/I removal but most opt into our Sump Pump Program





Sump Pump Program

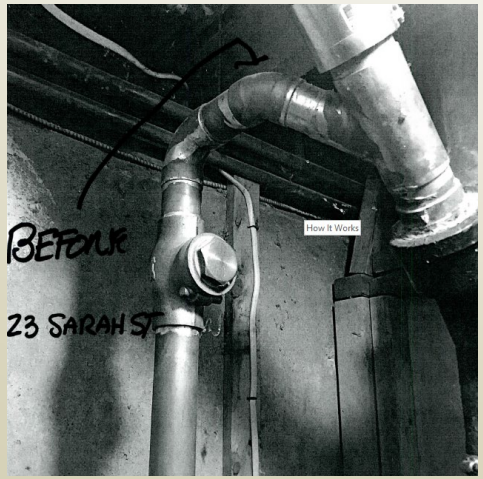
- Sump Pump Amnesty Program started in the late 80's after the moratorium was implemented
- The program was revamped in 2001 and new policies were put in place
- The program connects Developers and Residents to have illicit sump pump connections removed
- To build the Amnesty List required effort from the town to gain the residents trust through informational meetings and Select Board assistance

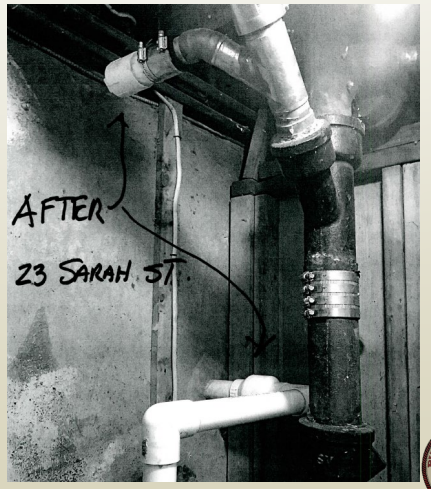
How It Works

- The program creates a triparty agreement between the resident, the town, and the contractor
  - The contractor will commit to a certain number of sump pumps to complete
  - The Town will inform the resident (next on the list) that they have been selected
  - It is up to the contractor to coordinate all work with the resident
  - Contractor must be licensed with the Town
  - On-site system designed by a PE
  - The Town arbitrates fair requests, unresponsive residents, etc.

How It Works

- The Agreement states that the contractor is responsible for all costs associated with the work
- The contractor will need to complete a close out package with photos of before and after, as-builts, etc.
- The resident will not have any cost
- The town will inspect all work that takes place
- One year warranty on the work

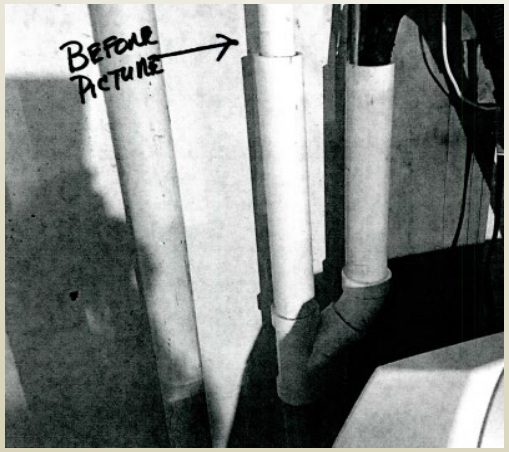


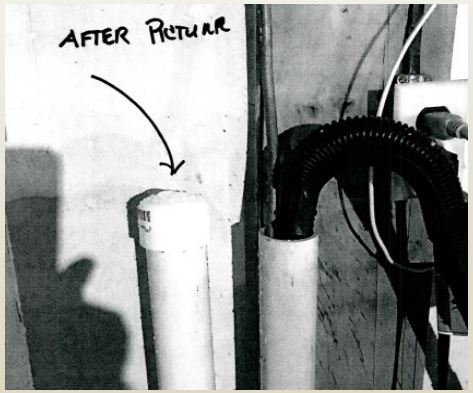


Town of Burlington
Department of Public Works

Benefits

- The contractor will receive 1200 GPD of credit towards their sewer allocation (equivalent to a $15,000 purchase)
- The resident will no longer have an illegal connection
- The Town will have the illicit connection and excess inflow removed from their system
- Allows for liability distancing for the town





Cons

- Largely commercially based
  - Might not be suited for residential communities
- Gaining trust from residents that the list is not available to anyone and they will not be penalized or fined
- Some residents with water problems but not illegal connection have issues with the program
  - People that are doing illegal things get free work
- Stormwater concerns about direct discharges into catch basins and possible downstream flooding

Questions

Quiz Question #1

Quiz Question #1

What is the definition of Private Inflow?

- Flow from Residential Buildings
- Flow from Industrial Facilities
- Flow from Downspouts, Yard Drains, or Sump Pumps
- Flow from Businesses/Commercial Facilities

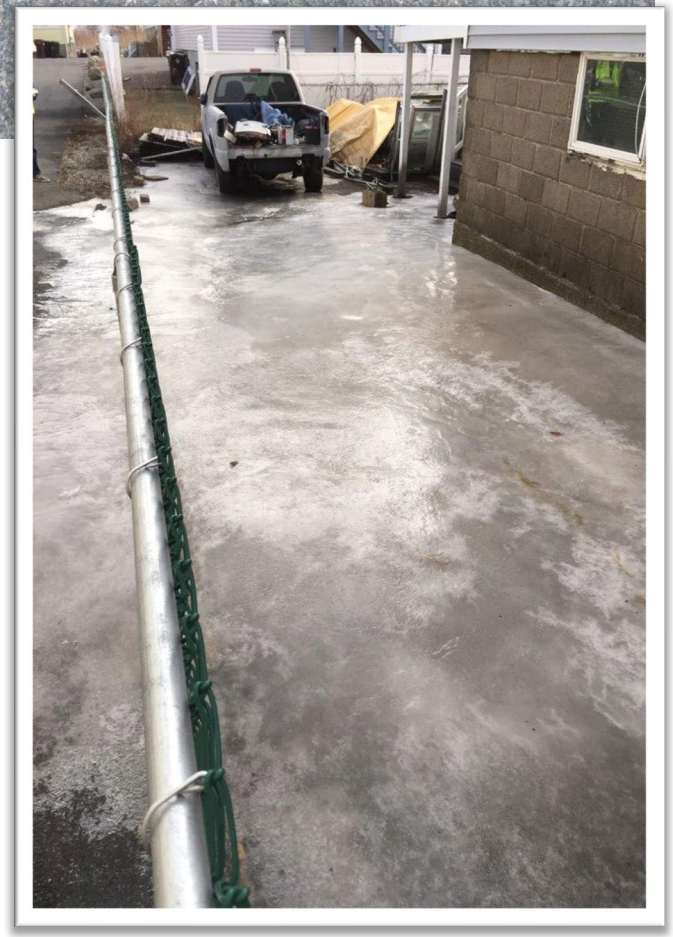
Next speaker =

Nick Rystrom

City Engineer, City of Revere

Revere – Private Inflow Removal Program

- Consent Decree
- Inflow Removal Inspections
- Inflow Redirection Contracts




SEWER

Sump Pump Amnesty Program Development & Outreach

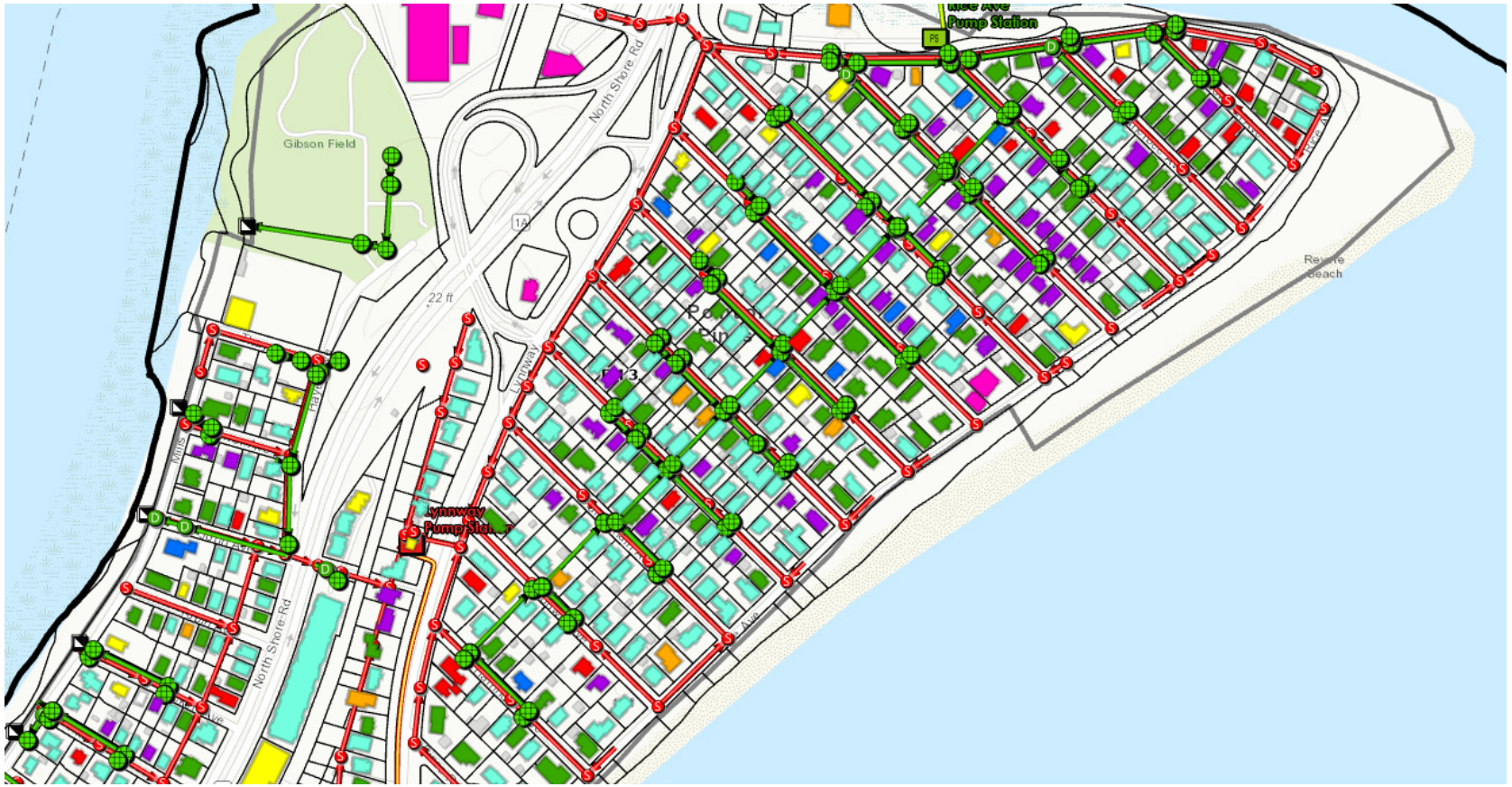
- Amendment to Local Sewer Ordinance (February 2013)
  - *"13.08.640 Discharge of Unpolluted Waters*

  No person shall discharge or cause to be discharged any drainage, unpolluted water, groundwater, roof runoff, subsurface drainage including from sump pumps, uncontaminated cooling waters, live steam or unpolluted industrial process waters, directly or indirectly into the public sewer" Revere, Massachusetts, Municipal Code of Ordinances art. II § 13.08 (2013). "
- Sump Pump Amnesty Program
  - Allows residents opportunity to notify the City of illegal sump pump(s) on their property
  - Free inspection and free redirection of illegal sources

Outreach for scheduling inspections:

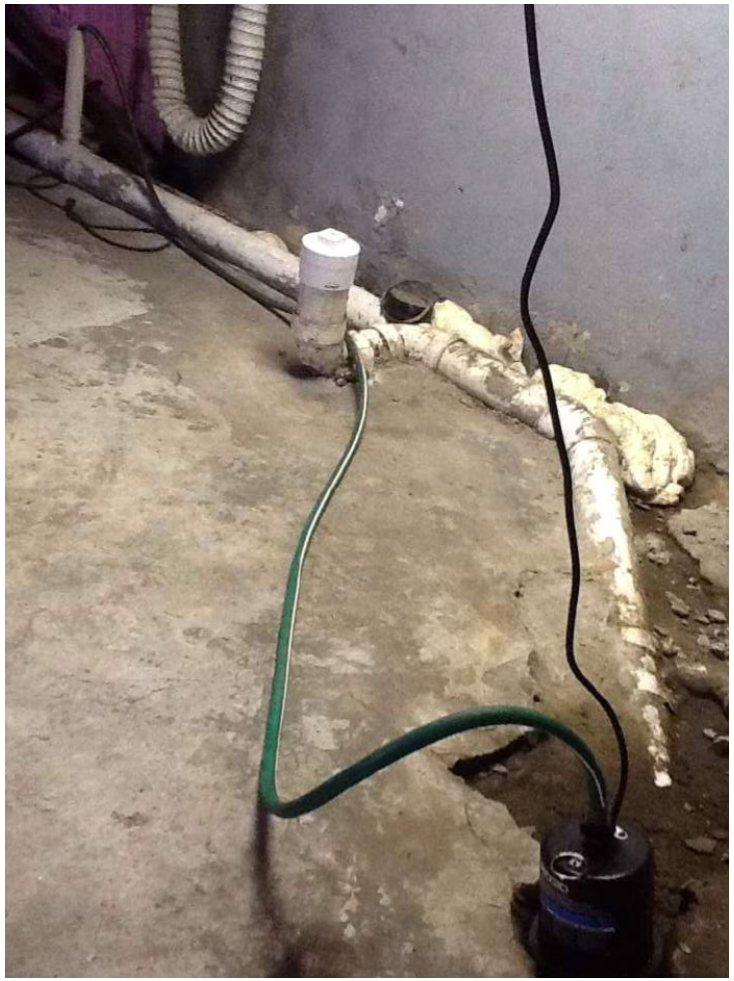
- Water/sewer bills
- Newspaper ads
- City's website & social media outreach
- Mayor's newsletter
- House to house notice distribution
- Translations
- Automatic Meter Reading Installation Program

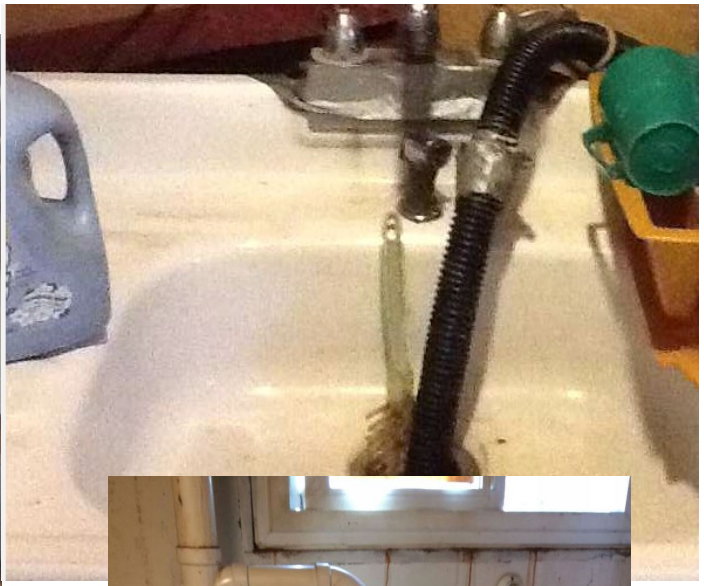
Inspection Results & Program Tracking via GIS App

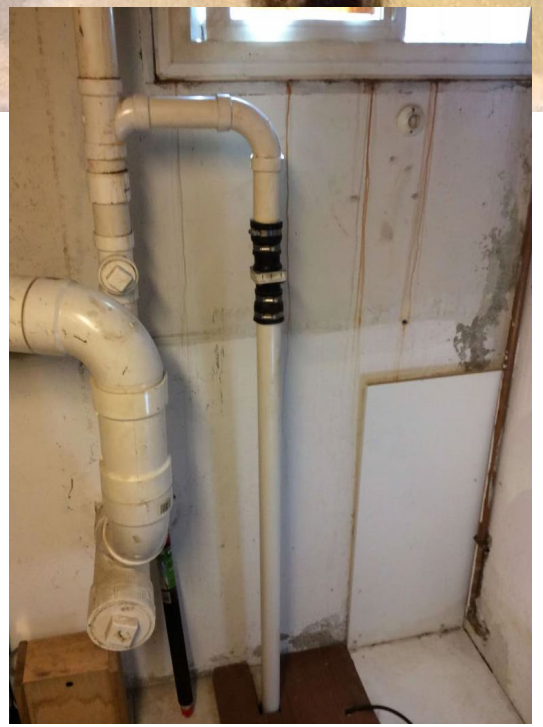


Legal	Illegal	Requires Follow-Up	Redirected	Total Inspections Completed
8,034	1,139	1,666	744	**10,852**

Illegal Sump Pump Connections Found in Revere



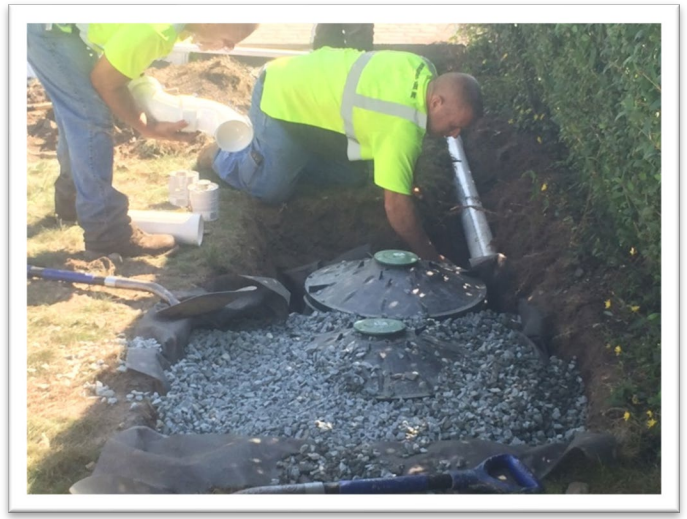


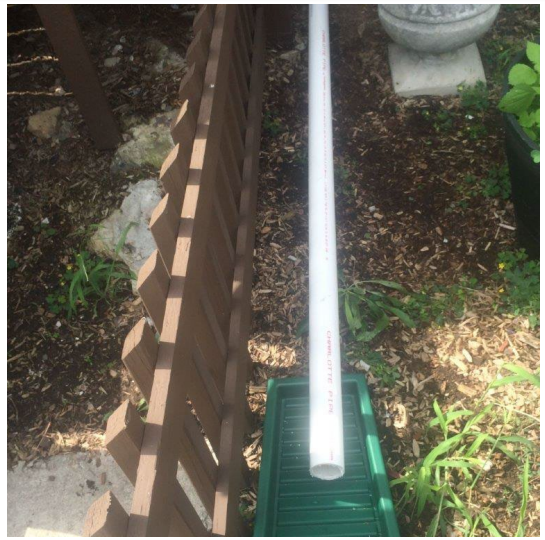


Illegal Roof Drains Found in Revere

Redirections

Type of Redirections
Inflow redirection into a splash-setup system
Inflow redirection into a single infiltration basin system
Inflow redirection into an existing drainage system (either catch basin or main line)
Inflow redirection into new drain extension





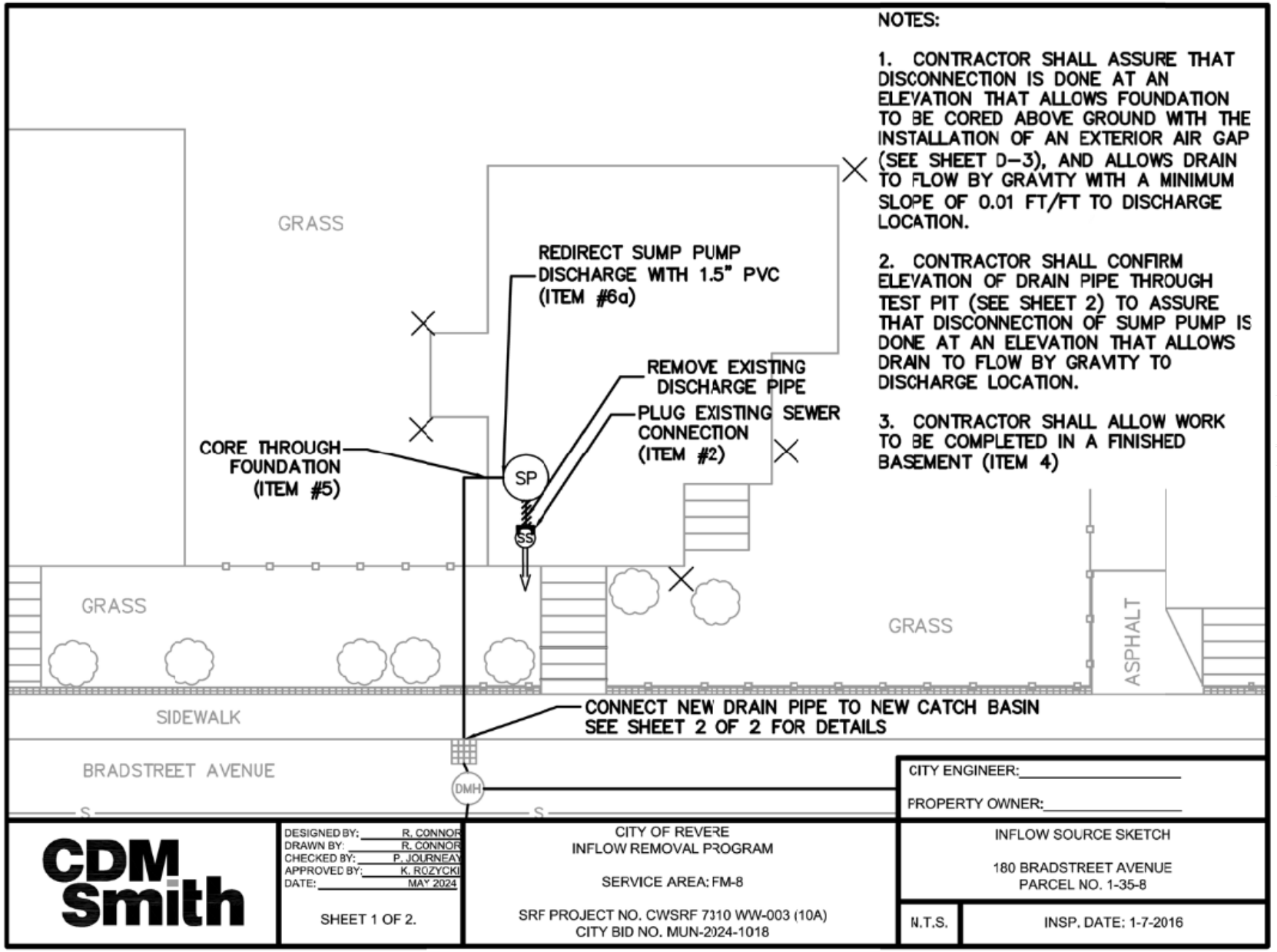
Private Inflow Removal Construction Contracts

Contract	Year	Private Inflow Sources Awarded	Status
2012 Inflow Removal Contract	2012	10 Buildings with Illegal Roof Leaders, 1 Flat Roof Drain, 1 Sump Pump, 10 Yard Drains	Completed. Final Construction Cost: $267,033.52
2013 Inflow Removal Contract	2013	14 Buildings with Illegal Roof Leaders, 1 Sump Pump, 15 Driveway Drains	Completed. Final Construction Cost: $303,658.40
Dix Street Wastewater Pump Station & Revere Beach Parkway Drainage P.S.	2014	1 Parking Lot Disconnection from Sewer on Revere Beach Parkway	Completed. Construction Cost: $540,603.90[2]
House Sump Pump Removal Program/Inflow Removal Project Contract 1A	2015	135 Sump Pumps, 3 Flat Roof Drains, 150 Roof leaders	Completed. Construction Cost: $731,605.00
House Sump Pump Removal Program/Inflow Removal Project Contract 1B	2016	122 Sump Pumps, 160 Roof Leader Redirections, 600 l.f. Drain Extension	Completed: Construction Cost: $1,288,147.00
House Sump Pump Removal Program/Inflow Removal Project Contract 2	2016	126 Sump Pumps, 1 Flat Roof Drain, 570 Roof Leader Redirections	Completed. Construction Cost Awarded: $1,262,597.73
Revere Housing Authority Inflow Removal Project	2016	68 Sump Pumps, 3 Flat Roof Drains	Completed. Construction Cost Awarded: $718,755.00
Inflow Removal Program Contract 3A	2017	96 Sump Pump Properties, 100 Roof Leader Redirections, 983 l.f. Drain Extension	Completed. Construction Cost Awarded: $1,236,798.00 (SRF), $200,000.00 (ineligible)
Inflow Removal Program Contract 3B	2017	59 Sump Pumps, 80 l.f. Drain Extension, 100 Roof Leader Redirections	Completed. Construction Cost Awarded: $433,717.88
Inflow Removal Program Contract 3C	2018	134 Sump Pumps, 23 Roof Leader Redirections, 865 l.f. Drain Extension	Completed. Construction Cost Awarded: $824,045.58
Inflow Removal Program Contract 4 (Flat Roof)	2018	10 Sump Pumps, 3 Flat Roof Drains, 8 Roof Leader Redirections	Completed. Construction Cost Awarded: $262,999.00
Inflow Removal Program Contract 5A	2018	39 Sump Pumps, 4 Roof Leader Redirections, 645 l.f. Drain Extension	Completed. Construction Cost Awarded: $572,719.03
Inflow Removal Program Contract 6A	2019	46 Sump Pumps, 18 Roof Leader Redirections, 1,360 l.f. Drain Extension	Completed. Construction Cost Awarded: $1,174,393.88
Beachmont – Sales Creek Neighborhood Sewer and Drainage Improvements	2019	26 Sump Pumps, 5 Roof Leader Redirections, 2,430 l.f. Drain Extension	Completed. Construction Cost Awarded: $6,869,181.01
Inflow Removal Program Contract 7A	2021	32 Sump Pumps, 15 Roof Leader Redirections, 538 l.f. Drain Extension	Completed. Construction Cost Awarded: $897,489.37
Inflow Removal Program Contract 8A	2022	27 Sump Pumps, 6 Roof leader Redirections, 540 l.f. Drain Extension	Completed. Construction Cost Awarded: $986,738.80
Inflow Removal Program Contract 9A	2023	42 Sump Pumps, 28 Roof leader Redirections, 1,490 l.f. Drain Extension	Ongoing. Construction Cost Awarded: $3,319,741.21
Inflow Removal Program Contract 10A	2024	30 Sump Pumps, 15 Roof leader Redirections, 3,695 l.f. Drain Extension	Ongoing. Construction Cost Awarded: $3,651,802.09

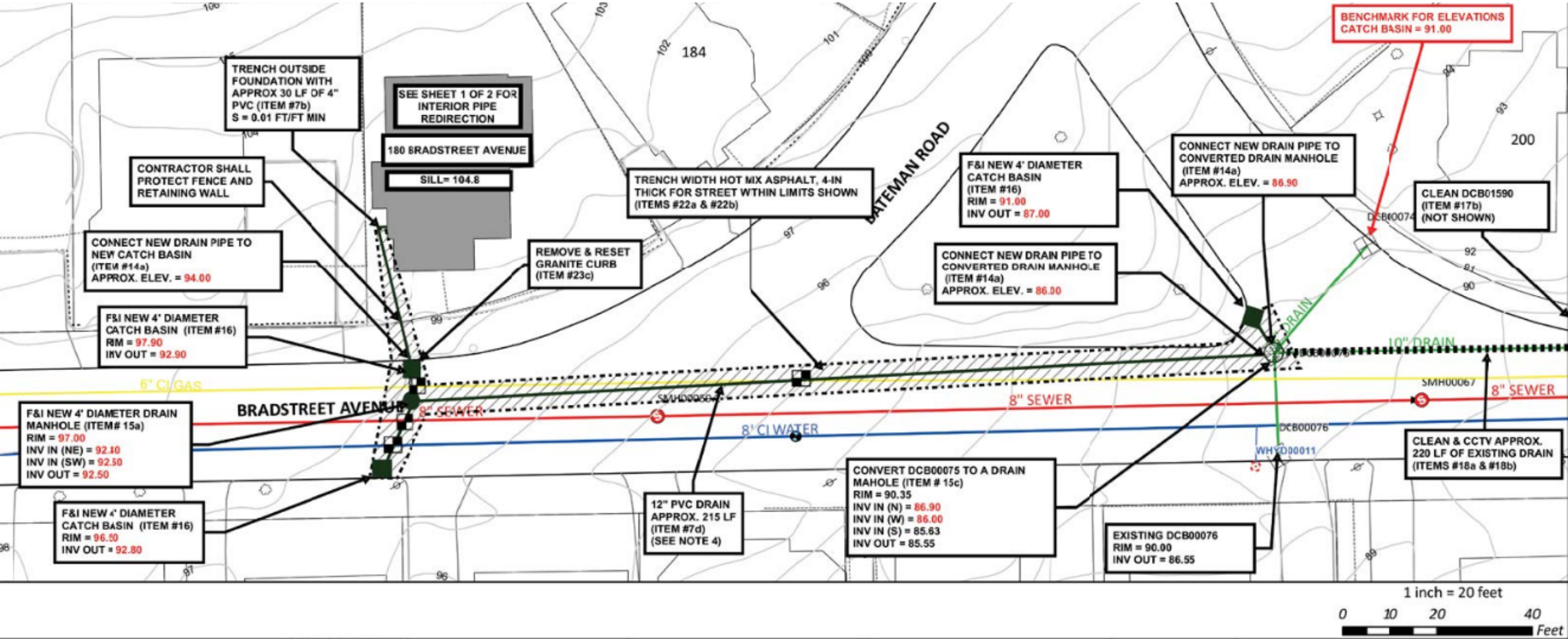
Example Bid Items in Construction Contracts

- Private property access/schedule/coordination (up to 3 mailings per property)
- Verify discharge of sump pump/drain/sewer with dye test
- Confirm discharge of up to 15 plumbing fixtures (for interior roof drains)
- Plug existing connection to sewer
- Interior redirection (PVC)
- Core through foundation
- Exterior trenching outside foundation (PVC, DI)
- Connection to existing drain
- New drain pipe, manholes, catch basins, etc.
- Conversion of drain catch basin to manhole
- CCTV and cleaning of adjacent drainage structures and pipe
- Test pits
- Initial and final trench width paving
- Driveway, walkway, sidewalk, curb, and landscaping repairs
- Private property pre/post-construction surveys

Example Design Sheet 1 (Interior Work)



Example Design Sheet 2 (Exterior Work)



CDM Smith

CITY OF REVERE
INFLOW REMOVAL PROGRAM

SERVICE AREA: FM 8

SRF PROJECT NO. CWSRF 7310 WW-003 (10A)
CITY BID NO. MUN-2024-1018

180 BRADSTREET AVENUE

CITY ENGINEER: _____
PROPERTY OWNER: _____

MAY 2024

Sheet 2 of 2

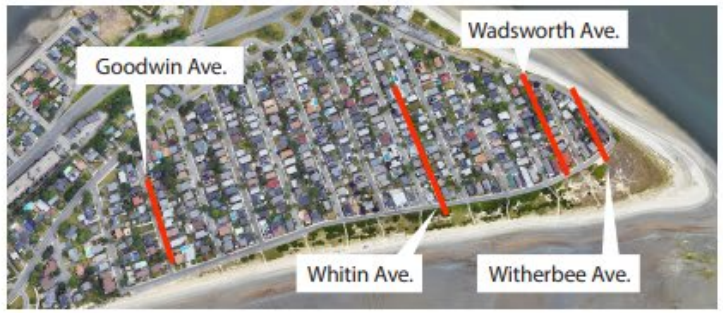
DESIGNED BY:J. BALLERINI
DRAWN BY:R. CONNOR
CROSS CHECKED BY:P. JOURNEAY
APPROVED BY:K. ROZYCKI

Considerations for a Successful Program

- Inspections
  - Property access through other City programs (meter replacement, Educate Inspectional Services & other city departments that may access interiors)
  - Offer Amnesty Program and market as helping to control water and sewer rates
  - Stronger language to encourage homeowners to participate (i.e., potential fines)
  - Train inspectors how to speak with residents and commercial owners about the project and how to create preliminary redirection design during inspection
- Importance of data tracking in GIS/efficiency
  - Electronic folder for each property with scans of all correspondence
- Designs
  - Determine problematic areas in the city for splashing/leaching (icing hazards)
  - Air gaps in redirection design
  - Utilize GIS with supplemental drain survey if needed. Sheet 1 for interior work and Sheet 2 for exterior work.
  - Many bid items covering various scenarios
  - Permits (DOT/DCR Drains)
- Construction
  - Outreach Tri-folds

Example Outreach

The City of Revere
Massachusetts
Inflow Removal Project 10A



maps data ©2024 Google

Project Overview

The City of Revere Inflow Removal Project 10A

The Engineering Department and Department of Public Works identified the need to improve sewer and storm water infrastructure in locations throughout the City of Revere (City) to aid in the overarching removal of "clean" water inflow into the City's Sanitary Sewer System. The goal of this project is to redirect existing public and private inflow sources discharging into the sewer. These sources include but are not limited to sump pumps, roof drains, roof leaders, driveway drains and yard drains. These sources collect "clean" water and are in violation of The Clean Water Act when discharging to the sanitary sewer. Additionally, this project includes installation of new storm water infrastructure on several streets.

Construction initiated August 2024

Benefits of Inflow Removal

Removing clean water inflow from the sanitary sewer systems has many benefits to the City, homeowners, and the environment, including:

- Reduced risk of wastewater backups into private residences
- Reduced risk of wastewater discharging to critically sensitive areas– such as wetlands
- Reduced wastewater treatment costs associated with unnecessary treatment of "clean" water

▲ *Example of a drainage manhole that will be installed.*

Schedule

Year	Month	Phase
2023	JAN –DEC	Design
2024	JAN – APR	Design
	MAY – JUL	Construction Bidding
	AUG – OCT	Construction Begins August 2024
Winter Work Shutdown	NOV – DEC	
	JAN – APR	
2025	MAY – JUN	Final Paving (schedule to be determined)
	JULY	Project Complete July 2025

Excavation work will be suspended from November 2024 through April 2025 and final paving will be completed during the spring of 2025 in a consecutive 30-day period. Completion will be no later than June 30th.

Questions?

For questions related to this project, contact:
Nicholas Rystrom, PE, City Engineer
781-286-8152

AUGUST 2024

I/I Local Financial Assistance Program

Israel Alvarez and Gloria Kazeera
MWRA Community Support Program

MWRA I/I Local Financial Assistance Program Funding Summary

MWRA I/I LOCAL FINANCIAL ASSISTANCE PROGRAM
COMMUNITY FUNDING SUMMARY THROUGH DECEMBER 2024

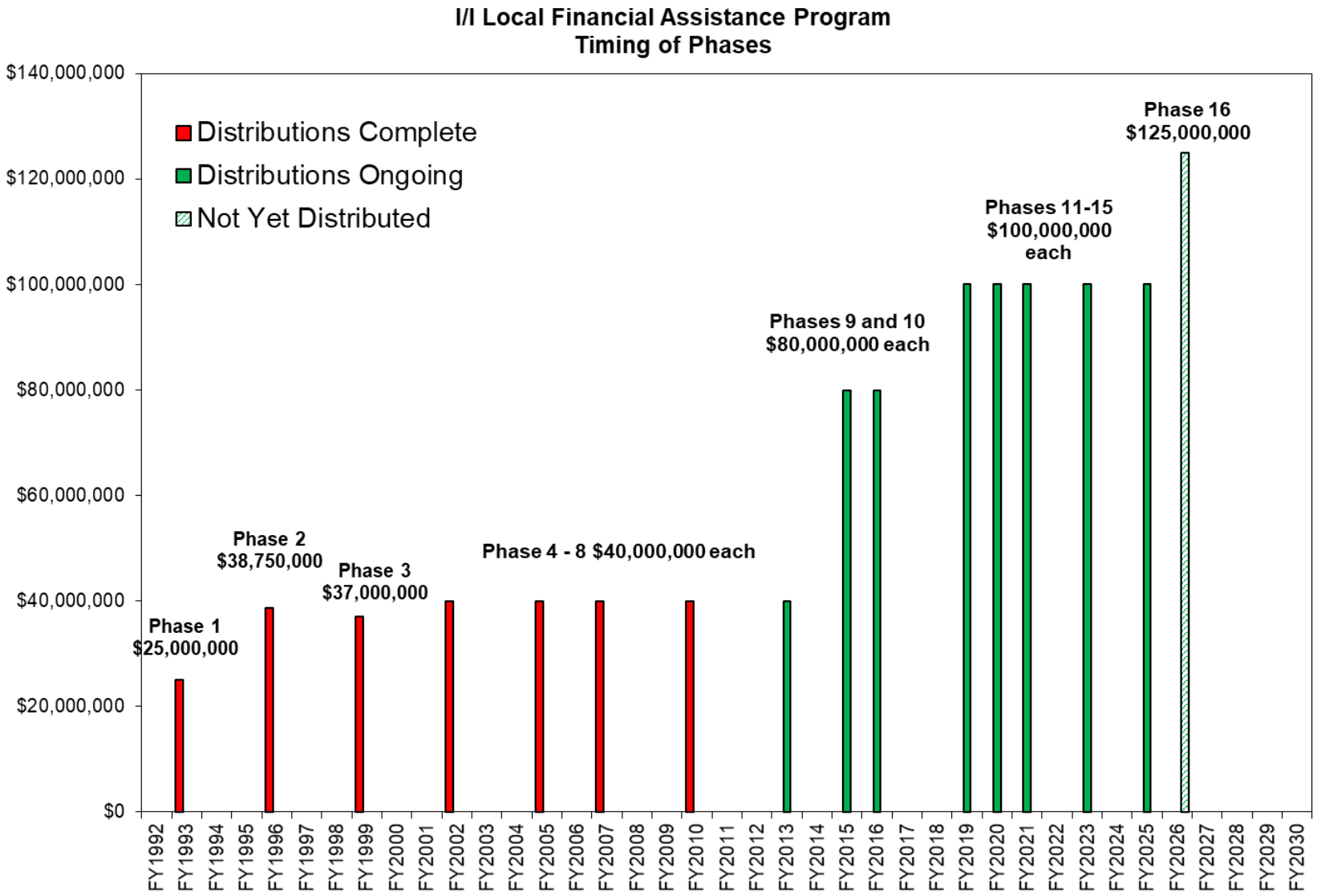
Community	Total Allocations (Phases 1 - 16)	Total Distributions (Phases 1 - 16)	Percent Distributed	Funds Remaining
*Arlington	$19,408,000	$13,015,900	67%	$6,392,100
Ashland	$5,579,500	$2,928,860	52%	$2,650,640
Bedford	$7,955,600	$3,109,158	39%	$4,846,442
Belmont	$11,690,100	$5,135,100	44%	$6,555,000
Boston	$309,135,200	$127,275,449	41%	$181,859,751
Braintree	$20,901,000	$12,272,977	59%	$8,628,023
*Brookline	$29,698,200	$19,666,200	66%	$10,032,000
*‡Burlington	$12,215,800	$8,522,800	70%	$3,693,000
Cambridge	$57,507,100	$28,830,100	50%	$28,677,000
Canton	$9,701,900	$4,464,250	46%	$5,237,650
*†‡Chelsea	$17,586,100	$13,510,100	77%	$4,076,000
*‡Dedham	$13,051,000	$9,240,000	71%	$3,811,000
*Everett	$19,511,500	$11,611,500	60%	$7,900,000
Framingham	$29,111,000	$13,671,000	47%	$15,440,000
*‡Hingham	$4,105,500	$2,812,500	69%	$1,293,000
Holbrook	$4,016,600	$1,349,600	34%	$2,667,000
*‡Lexington	$17,476,300	$12,155,300	70%	$5,321,000
Malden	$29,486,900	$6,725,900	23%	$22,761,000
Medford	$27,868,600	$7,961,600	29%	$19,907,000
*‡Melrose	$14,357,300	$10,106,300	70%	$4,251,000
*†‡Milton	$12,904,500	$10,164,500	79%	$2,740,000
Natick	$13,248,600	$6,832,600	52%	$6,416,000
Needham	$14,302,600	$4,018,600	28%	$10,284,000
*†‡Newton	$49,302,400	$39,277,400	80%	$10,025,000
Norwood	$17,124,400	$6,879,400	40%	$10,245,000
*Quincy	$46,608,000	$32,325,000	69%	$14,283,000
Randolph	$14,423,800	$4,971,058	34%	$9,452,742
*Reading	$10,964,100	$6,709,100	61%	$4,255,000
Revere	$24,325,900	$6,302,900	26%	$18,023,000
Somerville	$36,621,800	$18,995,800	52%	$17,626,000
*†Stoneham	$11,422,900	$7,829,900	69%	$3,593,000
*†‡Stoughton	$11,353,900	$8,962,900	79%	$2,391,000
*‡Wakefield	$13,953,900	$9,836,900	70%	$4,117,000
Walpole	$8,876,000	$5,141,050	58%	$3,734,950
Waltham	$31,278,400	$19,214,560	61%	$12,063,840
*Watertown	$14,457,800	$8,865,800	61%	$5,592,000
Wellesley	$13,282,700	$6,889,700	52%	$6,393,000
Westwood	$6,268,300	$3,091,300	49%	$3,177,000
Weymouth	$27,667,900	$15,548,584	56%	$12,119,316
Wilmington	$6,184,000	$2,462,000	40%	$3,722,000
*Winchester	$9,822,000	$5,923,000	60%	$3,899,000
*Winthrop	$7,963,400	$5,083,400	64%	$2,880,000
*‡Woburn	$23,029,500	$16,515,500	72%	$6,514,000
Totals	$1,085,750,000	$566,205,546	52%	$519,544,454

Note: Through December 2024, eleven communities have used their entire Phase 14‡ funding allocation,
five communities have used their entire Phase 13† funding allocation and
20 communities have used their entire Phase 12* funding allocation.

* Phase 12 used
† Phase 13 used
‡ Phase 14 used

- $1.086 Billion approved over 16 phases
- Community allocation based on percent share sewer charge
- All 43 communities participating
- $566M distributed to fund 688 projects through December 2024
- 601 projects complete / 87 projects ongoing
- For current phases, funds are distributed at 75% grant/25% loan

I/I Local Financial Assistance Program Phases



I/I Local Financial Assistance Program Funding Process

- Define Your Project
  - Determine Priorities, Project Area and Scope of Work
    - Target Areas for Biggest Impact
    - Coordinate Work with Other Roadway Projects
  - Put Together Bid Documents

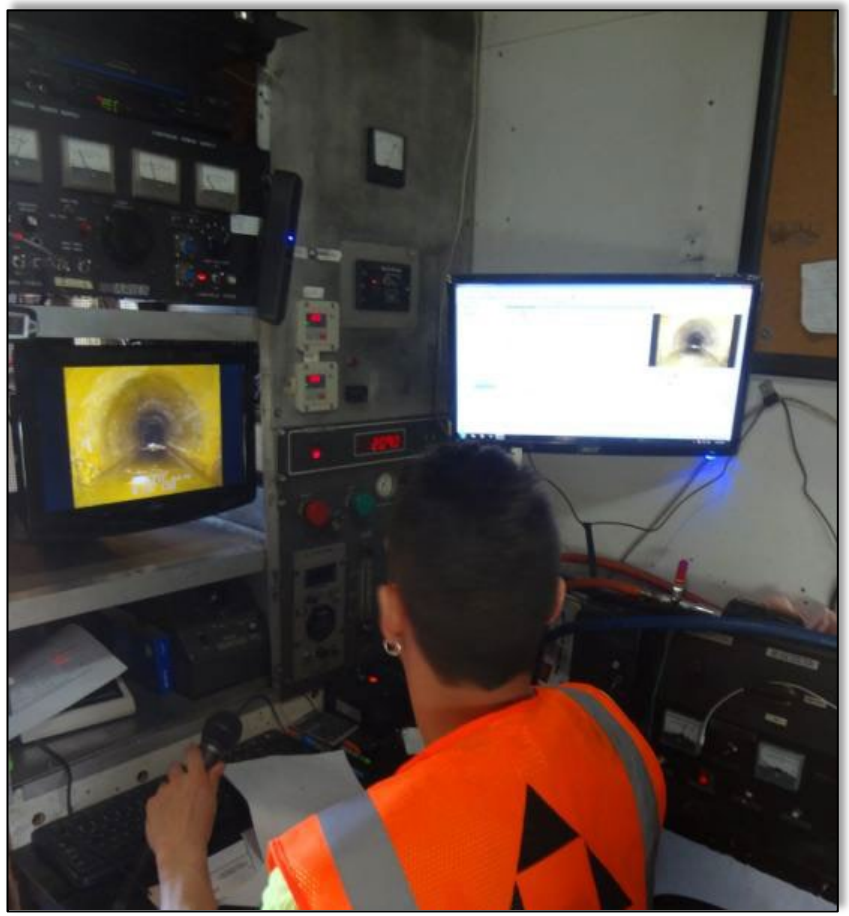
- Get City/Town Approval
  - Need Vote of City Council/Town Meeting to Receive Funding
  - Projects can be Funded Retroactively

- Submit Application
  - Funds are Distributed Quarterly – mid February, May, August and November
  - Applications Due One Month Prior to Funding Date

- Funds Distributed Upfront into Community MMDT Account
  - MWRA Staff Tracks Funds and Interest throughout Project Until Closeout

Planning and Sewer Inspection Projects

- 2,614 miles of sewer TV inspected
- 1,758 miles of sewer flow isolated
- 1,489 miles of sewer smoke tested
- 70,535 sewer manholes inspected
- 79,232 buildings inspected



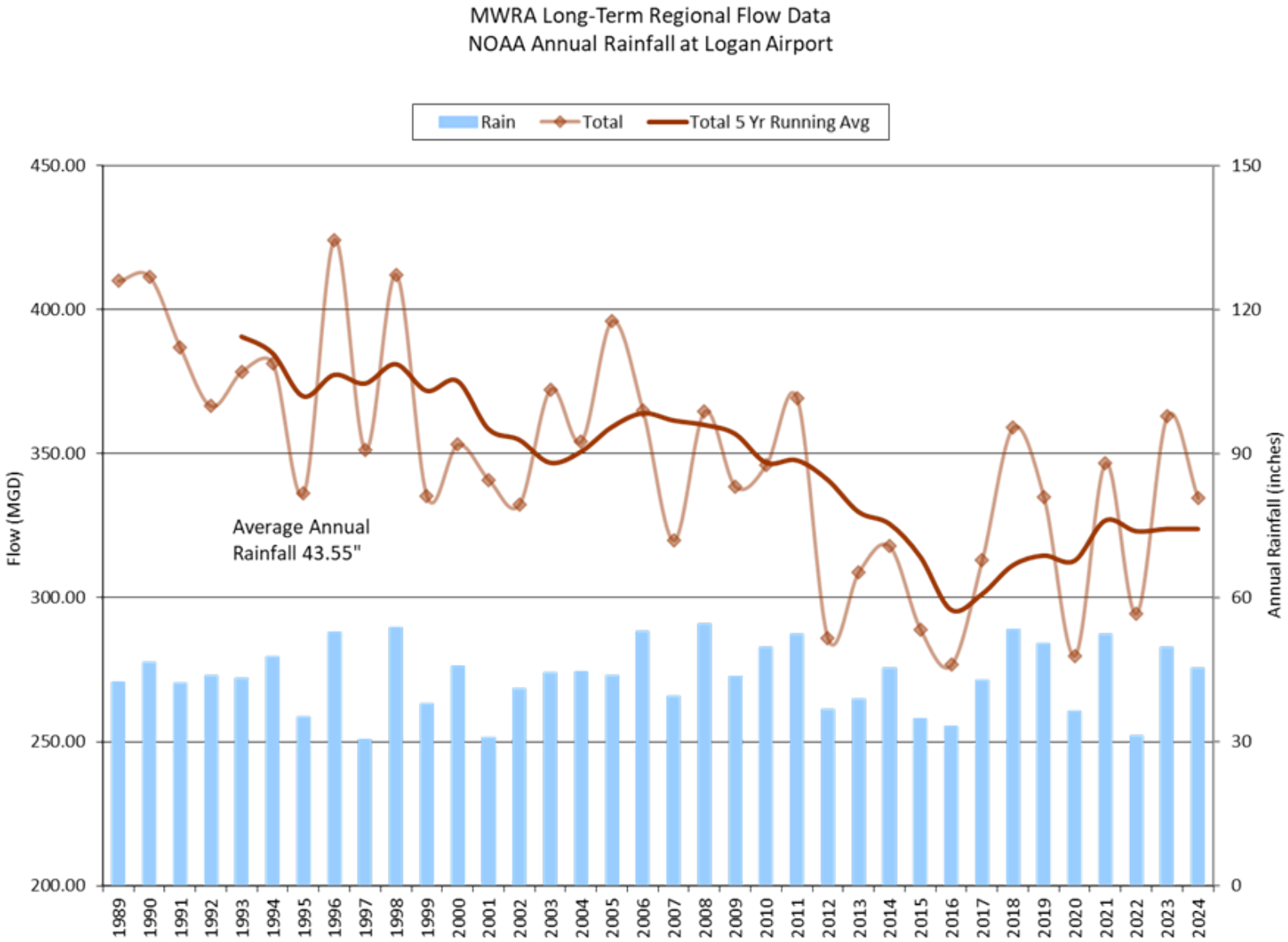
Projects Targeting Infiltration

- 84 miles of sewer replaced
- 365 miles of cured-in-place-pipe (CIPP) liner installed
- 195 miles of sewer tested/chemically sealed
- 3,415 sewer spot repairs
- 20,129 service connection repairs
- 4.8 miles of underdrains sealed

Projects Targeting Inflow

- 1,208 catch basins disconnected
- 49 miles of new or replaced storm drains installed
- 24,994 manholes rehabilitated/sealed
- 4,126 manhole covers replaced or inflow seals installed
- 551 sump pumps redirected
- 5,839 downspouts/area drains disconnected

Flows to Deer Island



Quiz Question #2

Quiz Question #2

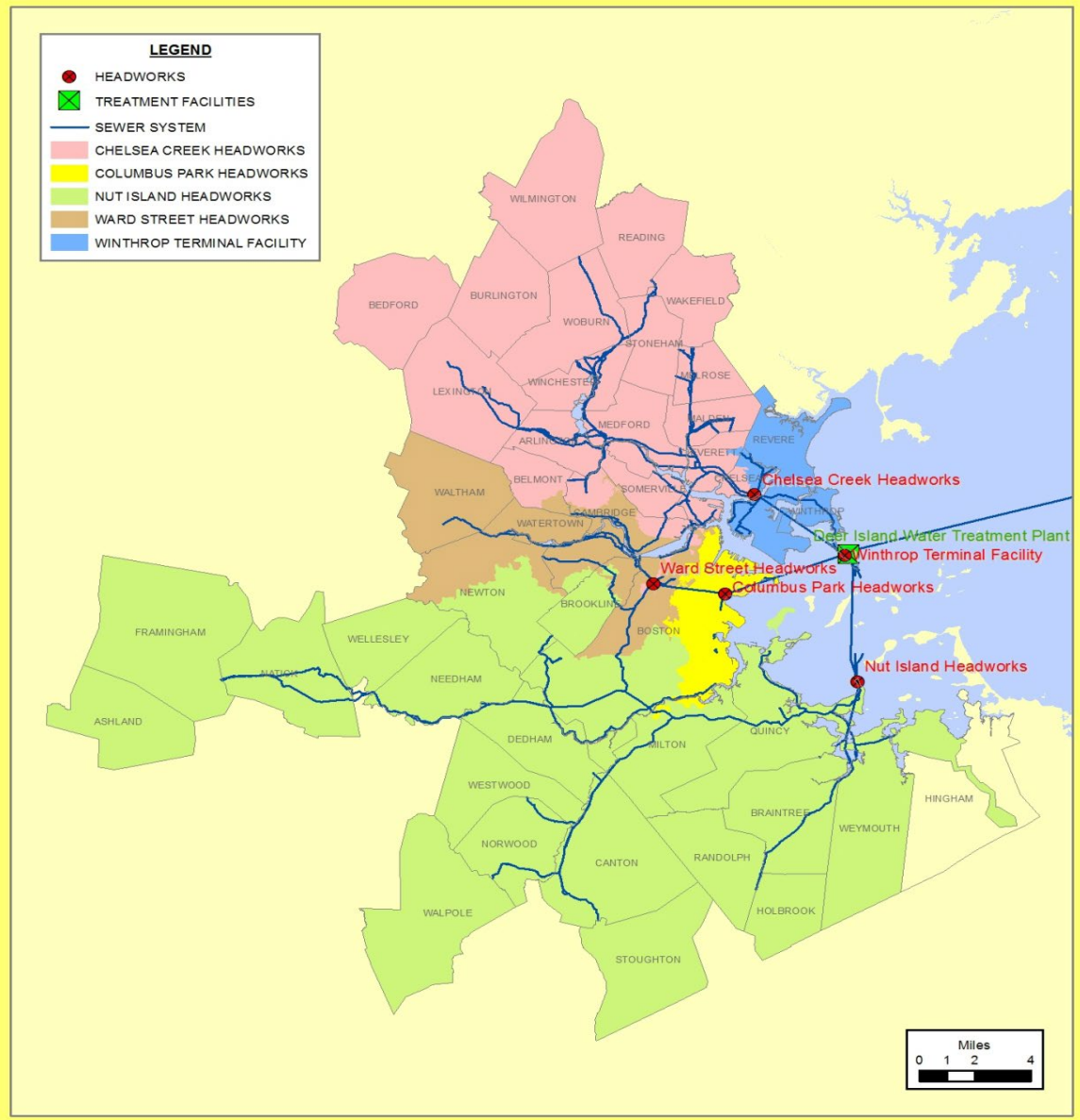
What projects are eligible for funding under the I/I Financial Assistance Program?

- Manhole Inspections
- Catch Basin Disconnections
- Sump Pump Removal
- All of the Above

Infiltration and Inflow Sources in MWRA's System

Stephen Cullen
Director of Wastewater

MWRA System


LEGEND
HEADWORKS
TREATMENT FACILITIES
SEWER SYSTEM
CHELSEA CREEK HEADWORKS
COLUMBUS PARK HEADWORKS
NUT ISLAND HEADWORKS
WARD STREET HEADWORKS
WINTHROP TERMINAL FACILITY
WILMINGTON
READING
BEDFORD
BURLINGTON
WAKEFIELD
WOBURN
STONEHAM
WINCHESTER
MELROSE
LEXINGTON
MEDFORD
REVERE
ARLINGTON
BELMONT
SOMERVILLE
CHELSEA
WINTHROP
WALTHAM
CAMBRIDGE
WATERTOWN
Chelsea Creek Headworks
Deer Island Water Treatment Plant
Winthrop Terminal Facility
Ward Street Headworks
Columbus Park Headworks
NEWTON
BROOKLINE
BOSTON
FRAMINGHAM
WELLESLEY
NEEDHAM
Nut Island Headworks
ASHLAND
DEDHAM
MILTON
QUINCY
WESTWOOD
HINGHAM
BRAINTREE
WEYMOUTH
NORWOOD
CANTON
RANDOLPH
HOLBROOK
WALPOLE
STOUGHTON
Miles
0 1 2 4

Miles of Sewer by Type

Sewer Type	Miles	Percent
Gravity Sewers	227	82.4%
Cross-Harbor Tunnels	18.1	6.6%
Force Mains	20	7.3%
Siphons	7	2.5%
CSO Outfalls	3.4	1.2%
Total	275.5	100%

Sources of Infiltration in MWRA System

MWRA Interceptors and Manholes

- Root Intrusion
- Brick Pipes and Manholes
- Offset Joints
- Pipe Defects

All the Same Issues are Found in MWRA Community Systems

Source of Infiltration – Root Intrusion

Source of Infiltration – Brick Manholes

In House Manhole Structure Rehabilitation

Section 43 – Metropolitan Sewer, Station 74 + 30, Cambridge

Source of Infiltration – Offset Joints

Source of Infiltration – Pipe Defects

Sources of Inflow in MWRA System

MWRA Interceptors

Inflow through Siphon Chambers/Manholes

Local Combined Sewer Areas

(portions of Boston, Cambridge, Chelsea and Somerville)

Local Separate Sewer Areas

Sewer Siphon Chamber/Manhole Rehabilitation

MWRA's Approach – Inspection

- CCTV Inspect 32 Miles/13% of the system annually

  The entire gravity system(227 miles) is inspected once every 7 years

- Inspect 20 Siphons (48 individual barrels)/44% of the system annually

  The entire siphon system(61 siphons, 109 individual barrels) is inspected once every 3 years

- Inspect 650 structures/16% of the system annually

  The entire structure system(4,000 structures) is inspected once every 6 years

Closed Circuit Television Inspection (CCTV)

Closed Circuit Television Inspection (CCTV) – Pipe Transporters

Wrap-up

Kristen Hall
MWRA Planning Department, Senior Program Manager