

# **CHARLES RIVER POLLUTION CONTROL DISTRICT**

## **INFILTRATION/INFLOW REPORT**

January – December 2013



FEB 24 2014

Serving the towns of Franklin, Medway, Millis, Bellingham, Norfolk, Sherborn, Dover, Wrentham,  
Weston, Holliston, and Sharon

66 Village Street  
Medway, MA 02053

## **I/I ANALYSIS METHODOLOGY**

To determine the infiltration/inflow (I/I) trend, the Charles River Pollution Control District (CRPCD) initially compared seven (7) day low flow periods in calendar years 2012 and 2013. The days selected were from August 16<sup>th</sup> to August 22<sup>nd</sup> in calendar year 2012 and October 22<sup>nd</sup> to October 28<sup>th</sup> in calendar year 2013.

By using the total raw wastewater and minimum flows recorded by CRPCD and the flow provided by Garelick Farms, Inc., a significant industrial user, an estimate of the daily dry weather flow was calculated for both weeks.

The daily dry weather flow includes the raw wastewater connected from residential, commercial, and industrial discharges and the minimum expected quantity of I/I. Septage flows were not included in this analysis. The dry weather flow was calculated for these two (2) 7-day periods as follows:

- Garelick Farm's flow was subtracted from CRPCD's total raw wastewater flow. The result was multiplied by 30 percent and Garelick Farm's flow was added back in to determine the expected minimum flow rate.
- The expected minimum flow rate was subtracted from CRPCD's recorded minimum flow rate to determine the dry weather I/I flow.
- The dry weather I/I flow was subtracted from CRPCD total raw wastewater flow to determine CRPCD's dry weather flow.

The daily dry weather flow was multiplied by the number of days in a calendar year to determine the annual dry weather flow (i.e. annual base flow). The annual I/I flow was determined by subtracting the annual dry weather flow from the CRPCD total recorded raw wastewater flow for the year.

The average I/I rate for the year was determined by dividing the annual I/I flow by the total amount of precipitation in the year.

Attached are charts for the seven (7) day periods in calendar years 2012 and 2013 with calculations of the daily base flows.

Determination of Infiltration and Inflow  
Calendar Year 2012

Date	Total Raw Flow (mgd)	Garelick Farms Flow (mgd)	Expected Minimum Flow (mgd)	Recorded Minimum Flow (mgd)	Estimated Daily Infiltration/Inflow (mgd)
16-Aug-12	3.40	0.238	1.188	1.600	0.412
17-Aug-12	3.24	0.303	1.182	1.480	0.298
18-Aug-12	3.38	0.290	1.216	1.590	0.374
19-Aug-12	3.45	0.168	1.152	1.650	0.498
20-Aug-12	3.53	0.232	1.221	1.930	0.709
21-Aug-12	3.43	0.238	1.194	1.820	0.626
22-Aug-12	3.38	0.234	1.178	1.710	0.532
Total	23.796	1.702	8.331	11.780	3.449
Average	3.399	0.243	1.190	1.683	0.493

Calculations:

Weekly Base Flow = Total Raw Flow - Estimated Weekly I/I = 23.796 - 3.449 = 20.347 mg/wk

Daily Base Flow = 20.347 / 7 days/wk = 2.907 mgd

Yearly Base Flow = 2.907 mgd \* 365 days/year = 1,060.925 mg/yr

Annual I/I = Total Flow - Base Flow = 1,540.41 - 1,060.925 = 479.485 mg/yr

I/I per Inch of Rainfall = 479.485 / 43.77 inches of rainfall = 10.95 mg/inch of rainfall

Determination of Infiltration and Inflow  
Calendar Year 2013

Date	Total Raw Flow (mgd)	Garelick Farms Flow (mgd)	Expected Minimum Flow (mgd)	Recorded Minimum Flow (mgd)	Estimated Daily Infiltration/Inflow (mgd)
22-Oct-13	2.73	0.225	0.975	1.250	0.275
23-Oct-13	2.74	0.221	0.976	1.250	0.274
24-Oct-13	2.72	0.238	0.983	1.160	0.177
25-Oct-13	2.75	0.239	0.993	1.330	0.337
26-Oct-13	2.84	0.238	1.017	1.180	0.163
27-Oct-13	2.89	0.139	0.964	1.180	0.216
28-Oct-13	2.71	0.215	0.964	1.030	0.066
Total	19.374	1.515	6.873	8.380	1.507
Average	2.768	0.216	0.982	1.197	0.215

Calculations:

Weekly Base Flow = Total Raw Flow - Estimated Weekly I/I =  $19.374 - 1.507 = 17.867$  mg/wk

Daily Base Flow =  $17.867 / 7$  days/wk = 2.552 mgd

Yearly Base Flow = 2.552 mgd \* 365 days/year = 931.629 mg/yr

Annual I/I = Total Flow - Base Flow =  $1,495.05 - 931.629 = 563.42$  mg/yr

I/I per Inch of Rainfall =  $563.42 / 46.96$  inches of rainfall = 11.99 mg/inch of rainfall

**RESULTS OF I/I ANALYSIS**

The following table details the I/I analysis for calendar years 2012 and 2013.

<b>Calendar Year</b>	<b>2012</b>	<b>2013</b>
Daily Base Flow (mgd)	2.907	2.552
Annual Base Flow (mgals)	1,061	932
Annual Precipitation (inches)	43.77	46.96
Annual CRPCD Raw Flow (mgals)	1,540.41	1,495.05
Annual I/I (mgals)	479.5	563.4
Annual I/I rate (mgals/inch)	10.95	11.99



## **I/I TRENDS**

To compare the I/I from one year to the next, the flow data from both calendar years 2012 and 2013 had to be adjusted to a typical rainfall year.

The NOAA Station #9316 has maintained rainfall data since 1952. This data shows that the annual precipitation in West Medway from 1981 through 2010 averaged 50.5 inches. Refer to Section 5 for a chart and map illustrating precipitation in our region during calendar year 2013.

The following adjusts the I/I analysis for calendar years 2012 and 2013 to this “average” year of precipitation:

<b>Calendar Year</b>	<b>2012</b>	<b>2013</b>
Daily base flow (mgd)	2.907	2.552
Annual base flow (mgals)	1,061	932
Annual precipitation (inches)	43.77	46.96
Avg. year precipitation (inches)	50.05	50.05
Deviation from avg. year (inches)	-6.28	-3.09
Annual I/I rate (mgals/in.)	10.95	11.99
Annual I/I (mgals ~ avg. yr.)	548	600
Total raw flow (mgals ~ avg. yr.)	1,609	1,532

In calendar year 2013, CRPCD ratified the connection of 86 homes and 2 commercial buildings to its sewer collection system. The daily dry weather flow in calendar year 2013 should have increased approximately 30,690 gpd over the prior year due to these connections

Therefore, comparison of calendar years 2012 and 2013 after adjustment to the “average” rainfall year and addition of new connections shows that the CRPCD I/I flow increased by approximately 63 million gallons from 2012 to 2013.

## **ACTIONS TAKEN TO MINIMIZE I/I**

### The Towns of Bellingham, Franklin, Medway, and Millis

CRPCD requested information regarding improvements to the sewer system that reduce I/I, unauthorized discharges from sewer system and any associated problems with system capacity from representatives of the towns of Bellingham, Franklin, Medway, and Millis. Refer to Section 6 for the letters submitted by each town.

The Town of Bellingham did not make any improvements to their sewer system in 2013. In 2009, the Town of Bellingham completed an analysis of their I /I which indicated that its relatively young sewer system is not a problem and not cost effective. The Town plans to check the flow metering flumes to review the current I/I.

During calendar year 2013, the Town of Franklin has taken several steps to identify the sources of inflow/infiltration in the system. The Town had inspected 56 manholes along the Beaver Street interceptor, lined 1,720 linear feet of sewer pipe (6" and 8"), and made 6 cured-in-place liner spot repairs (6" and 8").

The Town of Medway has received a State Revolving Fund Loan to perform an Integrated Water Resource Management Plan. This plan contains several components involving the evaluation and investigation of the sewer system. Also, after inspecting the Chicken Brook Interceptor, the Town of Medway recently performed repair work to address identified pipeline and manhole deterioration with anticipated results of reducing infiltration by approximately 50,000 gpd within the prominent trunk line.

In 2013 the Town of Millis cleared the Farm Street easement to gain access for pipe and manhole inspections. The Town is sending out quotes to complete the remaining CCTV investigation which consist of the Farm Street Easement, Medway storage sewer easement, and remaining sewer service connections. When the investigations are complete, the Town plans to bid two separate repair contracts consisting of an open excavation and internal repair contract.

**Kristen Paradee**

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**From:** DiMartino, Donald <DDiMartino@bellinghamma.org>  
**Sent:** Tuesday, January 21, 2014 9:01 AM  
**To:** 'kparadee.crpcd@verizon.net'  
**Cc:** (eschreiber.crpcd@verizon.net); CRPCD Cheri Cousens  
**Subject:** I&I 2013 - NPDES Permit No. MA0102598

Kristen,

In response to your letter of January 6<sup>th</sup>, 2014.

Bellingham effectively did no I&I investigation or repairs in 2013. Recent reports and studies have indicated that I&I for our relatively young sewer system is not a problem and not cost effective.

We will soon be checking the flow metering flumes at Stanwood and Route 140, this may cause us to review our commitment to I&I in the future.

We had no unauthorized discharges in 2013.

Note: The Bellingham system was design over 25 years ago for build out that will never happen under new initiatives to keep water local. System capacity will never be a problem for Bellingham. Our only CRPCD SSO was caused by pump station alarm system failure and was about five years ago.

I hope this information is useful to you.

**Donald F. DiMartino**  
Bellingham DPW Director  
26 Blackstone Street  
Bellingham, MA 02019-1602  
Phone - 508-966-5813  
Fax - 508-966-5814



**Kristen Paradee**

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**From:** Laurie Ruzala <lruzala@franklin.ma.us>  
**Sent:** Tuesday, February 04, 2014 12:03 PM  
**To:** kparadee.crpdc@verizon.net  
**Subject:** Franklin I/I Work 2013

Hi Kristen,

Sorry for the delay in responding to your letter, but here is what we did to reduce I/I in 2013:

The following work was completed in 2013 (in total):

- 56 MH inspections along the Beaver St. Interceptor were performed in May
- Cleaned 11,675.6 LF of sewer pipe (6", 8", and 10")
- CCTV inspected 14,841.14 LF of sewer pipe (6", 8", and 10")
- Applied chemical root treatment to 2,091.0 LF of sewer pipe (6", 8", and 10")
- Ground 11 sewer service connections
- Tested 19 sewer pipe joints
- Chemically sealed 4 sewer pipe joints
- Chemically sealed 67 service connections
- Made 22 cured-in-place liner spot repairs (6" and 8" pipe)
- Lined 6,490.29 LF of sewer pipe (6" and 8")
- Lined 1,421.6 LF of sewer pipe (10")
- Chemically sealed pipe connections, benches, and inverts of 8 manholes
- Rebuilt 40 chimneys
- Plugged 17 manhole cover holes

We did not have any unauthorized discharges that we know of.

Thanks!

Laurie

Laurie J. Ruzala, P.E.  
Water & Sewer Superintendent  
Franklin Department of Public Works  
257 Fisher Street  
Franklin, MA 02038  
508-520-4910

**Kristen Paradee**

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**From:** Laurie Ruzala <lruzala@franklin.ma.us>  
**Sent:** Tuesday, February 04, 2014 12:29 PM  
**To:** kparadee.crpdc@verizon.net  
**Cc:** Michael Maglio  
**Subject:** Re: Franklin I/I Work 2013

Hi Kristin,

Sorry I need to take that back, that was the total for Phase 4 of our sewer rehab program. Only the following items were completed in 2013:

- 56 MH inspections along the Beaver St. Interceptor were performed in May
- Lined 1,720.83 LF of sewer pipe (6" and 8")
- Made 6 cured-in-place liner spot repairs (6" and 8" pipe)

Thanks!

Laurie

Laurie J. Ruzala, P.E.  
Water & Sewer Superintendent  
Franklin Department of Public Works  
257 Fisher Street  
Franklin, MA 02038  
508-520-4910

**Laurie Ruzala writes:**

Hi Kristen,

Sorry for the delay in responding to your letter, but here is what we did to reduce I/I in 2013:

The following work was completed in 2013 (in total):

- 56 MH inspections along the Beaver St. Interceptor were performed in May
- Cleaned 11,675.6 LF of sewer pipe (6", 8", and 10")
- CCTV inspected 14,841.14 LF of sewer pipe (6", 8", and 10")
- Applied chemical root treatment to 2,091.0 LF of sewer pipe (6", 8", and 10")
- Ground 11 sewer service connections
- Tested 19 sewer pipe joints
- Chemically sealed 4 sewer pipe joints
- Chemically sealed 67 service connections
- Made 22 cured-in-place liner spot repairs (6" and 8" pipe)
- Lined 6,490.29 LF of sewer pipe (6" and 8")

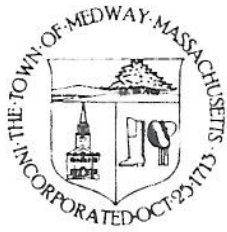
- Lined 1,421.6 LF of sewer pipe (10")
- Chemically sealed pipe connections, benches, and inverts of 8 manholes
- Rebuilt 40 chimneys
- Plugged 17 manhole cover holes

We did not have any unauthorized discharges that we know of.

Thanks!

Laurie

Laurie J. Ruzala, P.E.  
Water & Sewer Superintendent  
Franklin Department of Public Works  
257 Fisher Street  
Franklin, MA 02038  
508-520-4910



**TOWN OF MEDWAY**  
**DEPARTMENT OF PUBLIC SERVICES**  
**MEDWAY, MASSACHUSETTS**

*Entrusted To  
Manage The  
Public  
Infrastructure*

**THOMAS M. HOLDER**  
DIRECTOR

**DAVID D'AMICO**  
DEPUTY DIRECTOR

January 9, 2014

Kristen Paradee  
Engineer / IPP Coordinator  
Charles River Pollution Control District  
66 Village Street  
Medway, MA 02053

**RE: Infiltration / Inflow Report – 2013**

Dear Kristen:

This writing is in response to your recent request for information regarding Medway's efforts to minimize inflow and infiltration (I/I) and to further report on unauthorized sewer discharges due to capacity limitations. In working with your office to advance our sewer collection and conveyance programs, the Town of Medway is taking significant actions toward identifying and eliminating extraneous inflow and infiltration into the Town's sewer system. We have received a State Revolving Fund Loan to perform an Integrated Water Resources Management Plan which includes several components involving sewer system evaluation and investment. Additionally, as a result of the inspection of the Chicken Brook Interceptor, we have recently performed repair work to address identified pipeline and manhole deterioration with an anticipated result of reducing infiltration by approximately 50,000 gpd within this prominent trunkline. The Town continues to demonstrate its commitment to identifying and reducing I/I through the funding and performance of its annual Sewer Improvement Program.

A recent review of sewer system response activities indicates that there were no occasions of unauthorized sewer discharges due to system capacity limitations. The few instances of sewer backups were attributed to obstructions in the pipelines and were located on private service lines.

I hope that this information provides an overview of the Town's approach to the management and operation of its sewer system as related to I/I. Please feel free to contact me with any questions or comments you may have regarding this or other Department issues.

Respectfully submitted,

*Tom Holder*  
Thomas Holder | Director  
Department of Public Services

ECopy: Suzanne Kennedy  
Dave D'Amico  
William Donahue  
Water & Sewer Commission

**HIGHWAY - WATER - SEWER - FLEET - PARKS - FACILITIES - SOLID WASTE**

TOWN OFFICES | 155 VILLAGE STREET | MEDWAY, MASSACHUSETTS 02053 | TEL 508-533-3275



**Kristen Paradee**

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**From:** Charles J. Aspinwall <caspinwall@millis.net>  
**Sent:** Thursday, February 06, 2014 11:01 AM  
**To:** 'Kristen Paradee'  
**Cc:** James McKay  
**Subject:** RE: Millis Infiltration/Inflow Report- 2013

The only I/I work completed during 2013 was the clearing of the Farm Street easement to gain access for pipe and manhole inspections. A resident installed a fence on our easement and it took months for them to move it which delayed our work on the Farm St. easement pipe. We are sending out quotes to complete the remaining CCTV investigation work, which consists of the Farm Street Easement, Medway storage sewer easement and remaining sewer service inspections.

After the completion of these investigations, we expect to bid two separate repair contracts consisting of an open excavation and internal repair contract.

*Charles J. Aspinwall  
Town Administrator  
900 Main St.  
Millis, MA 02054  
508-376-7040  
508-376-7053 (fax)*

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**From:** Kristen Paradee [<mailto:kparadee.crpcd@verizon.net>]  
**Sent:** Tuesday, February 04, 2014 1:59 PM  
**To:** [caspinwall@millis.net](mailto:caspinwall@millis.net)  
**Subject:** Millis Infiltration/Inflow Report- 2013

Dear Mr. Aspinwall,

I had sent a letter in early January requesting information regarding the sewer system during the 2013 calendar year. I have not heard back from anyone, and was hoping you could respond to me as soon as possible with any actions taken to minimize infiltration/inflow and a list of unauthorized discharges from the sewer system.

Thanks,

Kristen Paradee  
Charles River Pollution Control District  
66 Village Street  
Medway, MA 02053  
Phone: 508-533-6762