




CITY OF SOMERVILLE, MASSACHUSETTS
CAPITAL PROJECTS AND PLANNING DEPARTMENT
JOSEPH A. CURTATONE
MAYOR

ROBERT T. KING, PE, LEED AP

DIRECTOR OF CAPITAL PROJECTS & PLANNING

November 17, 2016

To: Somerville Board of Aldermen
From: Robert T. King, PE – Director of Capital Projects and Planning 
Re: Inflow and Infiltration Program in the City of Somerville

Honorable Members of the Board of Aldermen:

The following memorandum has been prepared to summarize the history of the Inflow and Infiltration (I/I) program in the City of Somerville and to propose our consideration of implementing an ordinance to formalize our process moving forward. Before providing details about the implementation and history of our specific program though, it is important to provide information about these terms in general.

What is I/I:

In basic terms, I/I is stormwater or groundwater that enters the sewer system from a variety of sources. This clean water takes up already allocated capacity in a system that was originally constructed for smaller flows in a sewer collection system. This water is clean and as a result, should not require treatment. However once it enters the sewer system and mixes with wastewater, it must be treated.

In the *Guidelines for Performing Infiltration/Inflow Analyses And Sewer System Evaluation Survey (revised in January 1993)*, the Massachusetts Department of Environmental Protection (DEP) defines I/I the following way:

Inflow - Water other than wastewater that enters a sewer system from sources which include, but are not limited to, roof leaders, cellar drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm waters, surface runoff, street wash waters, or drainage.

Infiltration - Water other than wastewater that enters a sewer system from the ground through means which include, but are not limited to, defective pipes, pipe joints, connections, or manholes.

Why should we work to eliminate it:

DEP also offers a good explanation of our need to reduce or ideally eliminate I/I in the collection system:





CITY OF SOMERVILLE, MASSACHUSETTS
CAPITAL PROJECTS AND PLANNING DEPARTMENT
JOSEPH A. CURTATONE
MAYOR

ROBERT T. KING, PE, LEED AP

DIRECTOR OF CAPITAL PROJECTS & PLANNING

“Extraneous water from infiltration/inflow sources reduces the capacity and capability of sewer systems and treatment facilities to transport and treat domestic and industrial wastewaters.” By eliminating opportunities for stormwater of groundwater to enter our sewer system, we create additional capacity for our system in general.

Are communities mandated to remove I/I?

In Massachusetts, there are a number of communities that have been required to address I/I. This requirement has been in the form of an Administrative Consent Order (ACO) from DEP. In most (if not all) of these cases, this requirement has been triggered by sanitary sewer overflows occurring numerous times throughout the municipality and creating public health and safety issues.

Mitigation requirements have varied throughout the Commonwealth but have typically required that municipalities establish a “sewer bank” which is a method of demonstrating and documenting that the sewer system has adequate capacity for any new proposed connections. In an effort to keep capacity in the sewer bank, municipalities require new developments find and eliminate I/I volumes that are specific multipliers of the wastewater being generated by the project. These multipliers have ranged from a 2:1 multiplier to a 10:1 or even 12:1 multiplier in extreme cases.

An example of this multiplier calculation follows:

Existing site: Empty (no building)

Proposed site: Residential building with 24 bedrooms.

Per DEP Title V regulations:

1 bedroom generates 110 gallons-per-day (GPD) of wastewater.

24 bedrooms x 110 GPD = 2,640 GPD of wastewater generated by the project.

Assuming a 4:1 multiplier being required, the developer would have to find and eliminate 10,560 gallons of I/I (2,640 x 4).

For communities that have established or built (over time) a sewer bank with significant volume, developers can also be presented with the opportunity to purchase capacity, rather than find and eliminate that volume themselves. The municipality would then use this funding to find and eliminate more I/I that would be credited to the sewer bank.

Is Somerville mandated to remove I/I?

The City of Somerville is not under an ACO to eliminate I/I. However, although the City of Somerville is not under a federal or state mandate to reduce I/I, the age, size and condition of our infrastructure and the





CITY OF SOMERVILLE, MASSACHUSETTS
CAPITAL PROJECTS AND PLANNING DEPARTMENT
JOSEPH A. CURTATONE
MAYOR

ROBERT T. KING, PE, LEED AP

DIRECTOR OF CAPITAL PROJECTS & PLANNING

density of our population and associated impervious landscape provides a challenge with capacity in our combined collection system. As a result, if we are going to improve overall capacity in our system, protect the public health and safety for our constituents and provide opportunity for future development, we must take action to eliminate I/I.

There has been mention of Somerville being under an Administrative Consent Order in the past. We do have an ongoing order from DEP (UAO-NE-10-1N004). This order relates to our Illicit Discharge Detection and Elimination (IDDE) program and mandates that we work to remove sanitary flows from our storm drainage infrastructure. It does not pertain to the I/I program.

History of the policy and when it was started:

Based on available information the I/I policy was first implemented in 1990 as part of the City's stormwater policy (see Attachment No. 1). There are no records of this policy being considered for an ordinance and in some cases it was unclear how the policy was enforced between 1990 and 2010. Regardless, the policy provided basic guidance about stormwater and sanitary connections for new development.

Stormwater requirements for new developments required that there be no increase in runoff volume or rate at site boundaries. Essentially this was determined to mean that a new development could not cause more stormwater to leave the site (at any location) at a higher rate or volume than it did during present conditions. Based on this policy, all developers were required to submit a stormwater drainage report that compared site stormwater flows (pre vs. post) for 2-year through 100-year storm events.

For sanitary flows, the policy is vague at best which is the reason the Engineering Department has been working to formalize a policy or ordinance that would provide more predictability and transparency for developers doing work in the City. The policy currently states that "new sanitary sewer connections for flows over 2,000 GPD require a 4:1 removal of infiltration and/or inflow to qualify for a permit." Similar language exists in other municipalities' regulations and in most of those cases, "new sanitary sewer connections" implied that this was for new developments on previously undeveloped sites, and that these developments actually required a "new" sewer connection. In Somerville we would not have many of these situations.

How the policy has been implemented to date:

For projects where the proposed flows exceed 2,000 GPD, an analysis was required of the consulting team. This analysis was based on DEP Title V design criteria (typically used for septic system design).





CITY OF SOMERVILLE, MASSACHUSETTS
CAPITAL PROJECTS AND PLANNING DEPARTMENT
JOSEPH A. CURTATONE
MAYOR

ROBERT T. KING, PE, LEED AP

DIRECTOR OF CAPITAL PROJECTS & PLANNING

Although Somerville has no septic systems in the City, this is a design methodology that is used commonly throughout the Commonwealth. It is predictable, it is defensible and it is understood by the development community and the consultants they work with. It is important to note that proposed flows greater than 2,000 GPD is a substantial project. For example, a residential project constructed on a previously vacant lot, would require a new development to construct 18.2 bedrooms before the I/I mitigation requirement is triggered. Until more recently, there weren't a large number of these projects.

Development projects that were built on larger sites historically provided the City with opportunities to provide flexibility in finding creative ways to reduce impacts to the City's infrastructure. At the Maxwell's Green site for example, the City Engineer gave the developer the opportunity to provide extensive stormwater mitigation on-site (above and beyond what the stormwater policy required) as a credit towards the I/I removal requirement in the City system. This was a defensible approach, as the developer constructed a stormwater system that collected and infiltrated a majority of the site runoff through a sub-surface system. By constructing this system, all of the stormwater that would have otherwise entered our combined sewer system was collected in chambers on the development site. These chambers are open to the earth below and provide opportunity for the stormwater to travel back into the ground on the site. Although the City Engineer could have required the development team mitigate I/I in the City's system, the response from the Developer most likely would have been to reduce the on-site stormwater mitigation in an effort to offset the costs associated with I/I mitigation.

Work at the Assembly Row site involved extensive mitigation by the development team as well. Through active negotiations with the City, State, DEP and MWRA, proposed mitigation included complete sewer and stormwater separation of a site that previously drained entirely to the combined sewer system. True separation required the construction of a new, dedicated 72-inch stormwater outfall to the Mystic River. This was expensive and challenging work that required jacking under the MBTA right-of-way while maintaining MBTA operations to continue without interruption. Additional mitigation was completed in the Ten Hills neighborhood in the form of sewer cleaning and lining to remove infiltration and construction of new infrastructure in Shore Drive to eliminate both inflow and infiltration. Lastly, as part of the mitigation package, the Developer was also obligated to contribute \$50,000 to a dedicated I/I fund for future work to be constructed by the City.

Although flexibility in mitigation was an acceptable approach for years, continued discussions between the Engineering Department and DEP suggested that providing developers with the opportunity to provide on-site mitigation was not an equitable opportunity as one developer may have a larger site or better soil conditions than another developer in the City. DEP's opinion was that if we were to have a successful I/I program, we should work to require that mitigation be completed within the public right-of-way, by everyone. The idea of a sewer bank and fee was discussed at great length as well. DEP was in





CITY OF SOMERVILLE, MASSACHUSETTS
CAPITAL PROJECTS AND PLANNING DEPARTMENT
JOSEPH A. CURTATONE
MAYOR

ROBERT T. KING, PE, LEED AP

DIRECTOR OF CAPITAL PROJECTS & PLANNING

support of this concept, provided the City put the funds in an account that would only be used for I/I mitigation projects and that the funds from a project in a specific area of the City be used on a project that would create capacity in that same portion of the City.

Based on these discussions, the Administration worked with the Board of Aldermen to establish a dedicated fund for I/I mitigation. Additionally, the Engineering Department worked with on-call consultants to identify the average cost of I/I removal in the collection system for the City of Somerville. Based on the costs associated with lining our sewer system (one of the most cost effective methods to eliminate I/I), the cost for mitigating one gallon of I/I is estimated to be approximately \$14.35/gallon.

Using the same example provided previously, mitigation is calculated as follows:

Existing site: Empty (no building)

Proposed site: Residential building with 24 bedrooms.

Per DEP Title V regulations:

1 bedroom generates 110 gallons-per-day (GPD) of wastewater.

24 bedrooms x 110 GPD = 2,640 GPD of wastewater generated by the project.

Mitigation = \$37,884 (\$14.35 * 2,640)

To date, the City has received financial contributions for I/I mitigation from three development projects. Projects include Assembly Row, 197 Washington Street and most recently 181 Washington Street. These projects provided \$211,667.10 of mitigation for future I/I projects and funds were deposited into a dedicated fund for the City's use.

What is DEP's role?

It is DEP's opinion/expectation that we take action to formalize our I/I policy. Until late last year, the Engineering Department anticipated that we would be required to formally implement this process through a new ordinance in the City. In December 2015, the Law Department provided an opinion that we would be able to implement this program through the building permit process and that a formal ordinance (although one option for consideration) would not be legally required. Based on continued dialogue with City staff, it is our belief that an ordinance provides better framework for formalization of the I/I policy. In practice, DEP prefers an ordinance as well.

Anticipated Projects With Required I/I Mitigation

See Attachment No. 2





CITY OF SOMERVILLE, MASSACHUSETTS
CAPITAL PROJECTS AND PLANNING DEPARTMENT
JOSEPH A. CURTATONE
MAYOR

ROBERT T. KING, PE, LEED AP

DIRECTOR OF CAPITAL PROJECTS & PLANNING

Moving Forward:

The Engineering Department is working with the Administration and Law Department to develop a draft ordinance that will be presented to the Board for consideration. Our hope is to work with the Board to approve a predictable, transparent and defensible ordinance. We would like to propose increasing the number of projects that trigger the I/I mitigation requirement. By reducing I/I in our collection system, the pipe network is afforded greater capacity. This capacity serves as a buffer which will reduce sewer backups, potential SSO events and work to ultimately protect the public health and safety and the environment.

With your support, we intend to submit a draft ordinance for consideration at an upcoming Board of Aldermen meeting.





CITY OF SOMERVILLE, MASSACHUSETTS

DEPARTMENT OF PUBLIC WORKS

JOSEPH A. CURTATONE

MAYOR

STAN KOTY
Commissioner

RICK WILLETTE
Director of Operations

February 3, 2011

To: Interested Parties
From: Robert T. King, PE – Director of Engineering
Re: Stormwater Management Policy

Since 1990, the City Engineer has refused permits for new stormwater connections to the city collection system. Capacity problems in the existing system cause combined sewer overflows into local water bodies and flooding of basements and properties during any significant rain event.

To mitigate problems, the Somerville Zoning Ordinance (SZO) forbids adverse development impacts to abutters, city systems and water quality; the SZO encourages diversion, detention, retention and mandates maximum groundwater recharge with no increase in runoff volume or rate at site boundaries. New sanitary sewer connections for flows over 2,000 GPD require a 4:1 removal of infiltration and/or inflow to qualify for a permit.

At the state level, Massachusetts Department of Environmental Protection issued Stormwater Management Regulations in 2008, covering standards, applicability, planning and best management practices. The regulations address both water quality and quantity, and local authorities are empowered under the Wetlands Protection Act and the Clean Water Act to implement the regulations.

Therefore, in view of increased environmental regulations and in the interest of public health and safety, it shall continue to be the policy of this office to enforce a moratorium on stormwater connections, while reviewing all development proposals in light of the most stringent interpretation of the SZO and DEP stormwater regulations for water quality and quantity.

ATTACHMENT No. 2

I/I mitigation per project (estimated). Initial development information provided by the Planning Department.

Address	SF - Total	SF - Retail	SF - Commercial	SF - Residential	Total Housing units	Retail/Commercial Flow (GPD)	Residential Flow (GPD)**	Total Flow	Existing Flow (Estimated)	Flow to Mitigate	I/I Mitigation (\$14.35/Gal)	Est. Date
70 Prospect Street	21,000	648	0	16,224	14	32	3,080	3,112	0	3,112	\$ 44,662.94	mid 2017
315 Broadway	52,726	7,403	0	50,323	46	370	7,590	7,960	0	7,960	\$ 114,228.15	mid 2017
260 Beacon Street	31,246	2,905	0	28,341	17	145	2,805	2,950	0	2,950	\$ 42,336.09	early 2018
176-182 Broadway	29,293	3,297	0	25,996	19	165	3,135	3,300	0	3,300	\$ 47,352.85	early 2018
1323 Broadway	15,225	0	10,150	5,075	7	761	1,540	2,301	0	2,301	\$ 33,022.94	late 2018
485 Mystic Valley Parkway	54,235	0	0	54,235	25	0	4,125	4,125	0	4,125	\$ 59,193.75	late 2018
231 Lowell	34,212	0	1,672	32,540	22	125	3,630	3,755	0	3,755	\$ 53,889.99	late 2018
8 Broadway, 8 Mt. Pleasant	29,555	1,651	0	27,904	14	83	3,080	3,163	220	2,943	\$ 42,225.59	late 2018
350 Mystic Avenue		1,200	0		17	60	2,805	2,865	0	2,865	\$ 41,112.75	late 2018
400-406 Mystic Avenue	31,820	2,974	0	28,846	27	149	4,455	4,604	440	4,164	\$ 59,749.10	late 2018
625 McGrath	34,188	0	0	0	34	0	5,610	5,610	0	5,610	\$ 80,503.50	early 2019
163 Glen Street	9,950	0	0	9,950	11	0	2,420	2,420	0	2,420	\$ 34,727.00	early 2019
434 McGrath Highway	94,924	15,000	0	79,924	48	750	7,920	8,670	0	8,670	\$ 124,414.50	early 2019

Estimated total: \$ 777,419.14

** Residential Flow (GPD) assumes developments with 15 units or more are approximately 1.5 bedrooms per unit. Developments with less than 15 units are 2 bedrooms per unit.