Stantec

Memo

To:	Glenn Clancy Office of Community Development	From:	Lin Liang, PE, BCEE Stantec
File:	195113362	Date:	November 17, 2021

Reference: Revision of Belmont, MA Inflow/Infiltration (I/I) Removal Fee Analysis

INTRODUCTION

The Town of Belmont requested Stantec review and update the current I/I removal fee calculation. In the current fee structure, for every gallon of new sewer flow connected to the Town's sanitary sewer system, five (5) gallons of Infiltration/inflow shall be removed. The removal fee is calculated at $1.26 per gallon of I/I removed. This memo documents the basis and recommendation for the updated I/I removal fee calculation.

RATIO OF I/I TO NEW SEWER FLOW

MassDEP regulation 314 CMR 12.04(2)(d) states:

> *"For those sewer system authorities with NPDES discharge permits for combined sewer overflows, and for all sewer systems tributary to such sewer systems, and for other sewer systems which the Department specifically determines are at risk of wet weather sanitary sewer overflows (SSOs), the infiltration and inflow plan shall also include a program to address impacts from new sewer connections and extensions to the sewer system. All sewer system authorities shall include provisions in their I/I plan for mitigating impacts from any new connections or extensions where proposed flows exceed 15,000 gallons per day. Such mitigation shall require that four gallons of infiltration and/or inflow be removed for each gallon of new flow to be generated by the new sewer connection or extension, unless otherwise approved by the Department. The sewer system authority or the Department may require a higher removal rate per gallon of new flow in sensitive areas such as where overflows have the potential to impact drinking water supplies or nitrogen sensitive areas."*

Based on this, a minimal ratio of 4:1 should be used to calculate the I/I flow based on the new wastewater flow. We could not find any document that explained the basis of the Town's current 5:1 ratio. Moving forward, we recommend using 4:1 ratio to be consistent with the state regulation to avoid dispute.

COST PER GALLON OF I/I REMOVED

For this update, the cost per gallon of I/I removed was estimated based on the 2020 mainline and lateral lining and repair project. The project had a construction cost of $493,200 and engineering services (investigation, design, inspection and construction phase engineering services) cost of $128,465.

The I/I volume removed was estimated based on the linear feet of each size of pipe rehabilitated/replaced multiplied by the I/I reduction per foot derived from the 2007 I&I study report (attached with this memo). The infiltration rate was based on the 2007 monitoring data for a dry period (Table 2 in the attached report). The inflow volume from the 2007 study storm event (total rainfall 3.49", see Table 3 in attached report) was extrapolated to estimate the inflow volume for the MassDEP's standard 1-year 6-hour design storm (total rainfall 1.72") in accordance with MassDEP's *Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation* (May 2017). The average inflow rate (gallons per day, or gpd) is then calculated by dividing the 1-year standard design storm inflow volume by the duration of the wet weather event, assuming the wet weather flow subsides to the dry weather flow 48 hours after the rainfall ends (i.e., for the 6-hour

Reference: **Revision of Belmont, MA Inflow/Infiltration (I/I) Removal Fee Analysis**

design storm, the duration of the wet weather event would be 54 hours which accounts for the direct inflow and delayed inflow periods). The calculation of the cost per gpd of I/I removed is shown in the table below:

Project Component	Mainline Lining	Point Repair	Lateral Replacement	Lateral Lining	Total LF	I&I Reduction gpd/ft [(1)]	I&I Reduction gpd
LF of 6" (Lateral)	--	--	338	3,114	3,452	16.50	56,964
LF 8"	3,297	370	--	--	3,667	21.26	77,967
LF 10"	67	--	--	--	67	24.96	1,672
						Total I&I Reduction, gpd	**136,602**
						Engineering Cost	$ 128,465
						Construction Cost	$ 493,220
						Total Cost	$ 621,685
						$/gpd I&I Reduction	**$ 4.55**

(1) Derived from 2007 I&I study. Inflow was standardized for MassDEP's 1-year 6-hour design storm.

The basis for this calculation is one specific project as shown above with majority of the work performed through trenchless CIPP lining. It generally aligns with future projects of this type within the Town. If the Town's capital plan for sewer system improvement involves significant other types of work that would also achieve I/I removal (e.g., manhole rehabilitation, more open-cut pipe replacement, and more extensive private lateral program), it may be appropriate to factor in these future costs. The Town may also make a policy decision to increase or decrease the rate to meet the development/redevelopment needs.

Stantec compared this cost ($4.55) to the available data for other agencies. Boston Water and Sewer Commission currently charges $2.41/gpd I/I removed based on 4:1 I/I to new wastewater flow ratio. Lynn Water and Sewer Commission charges $1.16/gpd, also based on 4:1 ratio. Framingham charges $18/gpd, but it is based on 1:1 ratio, which is equivalent to $4.50/gpd with 4:1 ratio. Some of these fees may be based on combined sewer separation projects which are typically more costly but also result in much higher stormwater inflow reduction, so the unit cost could be lower. I&I removal for separate sanitary sewer system is more difficult and is challenging to quantify, therefore higher unit cost is reasonable.

Should you have any questions, please feel free to contact me.

Stantec Consulting Services Inc.

Lin Liang, PE, BCEE
US North Wet Weather Sector Leader

Phone: 781 496 7018
lin.liang@stantec.com

Attachment: 2007 I&I Study Report

Hummel, Robert

From: Jack Dawley <jdawley@northlandresidential.com>
Sent: Tuesday, November 23, 2021 10:48 AM
To: Hummel, Robert; Clancy, Glenn
Cc: Curtis Quitzau (cquitzau@vhb.com); Jack Dawley
Subject: [EXTERNAL]Sewer Flow and I/I calculation

Robert, Glenn, (Board Chair and Board Members – not copied)

In response to the Stantec memo on I/I and the Board question of sewer line capacity I offer the following:

1. **Sewer Line Capacity** – The existing 8" sewer line prospectively serves Zone 3, 4 and presently receives flows from Zones 2 (Woodlands) 5 (McLean Hospital) and 6 (Waverly Woods). The line was installed in the 2008/2009 timeframe and as designed was to accommodate 486 prospective Zone 3 units inclusive of a full service staff and resident kitchen and dining facility. The propose Zone 3 project is 1/3 (152 vs 489 units) the size of the previously approved project and lacks the staffing, kitchen and dining components of the ARC plan. *The existing sewer lines and related infrastructure are adequate for the proposed development program.*

2. **Sewer I/I** - I first note that the Town has no stated/published I/I Fee program. Based on the recommendation of the Town's Sewer Consultant an I/I mitigation rate of $4.55/gallon of flow x 4 or $18.20/gallon of flow be applied to the proposed Z-3 project. Based on the project's unit composition this equates to a $213,886 I/I payment for the project – see schedule below. I suggest that this payment be made per Subdistrict based on the Subdistrict unit count.

McLean Zone 3
Sewer Flow and I/I Schedule
as of November 22, 2021

Subdistrict A - Age-Restricted @ 55 Townhouses

	Units	Brs/unit	Total Bedrooms		TGPD @ 40/BR
New Townhouses	38	2.6	98.8	40	3952
Chapel Reuse	2	3	6		240
	40				
Note all units are Age Restricted @ 55					
					4192

Subdistrict B Multifamily Apartments

Building 100					
	1 brs	32	32		
	2 brs	18	36		
	3 brs	8	24		
		58	92		3680
Note all blding 100 units are Non-Age Restricted @ 55					
Building 200	1 brs	15	15		
	2 brs	35	70		
	3 brs	4	12		
		54	97		3880
Note all blding 200 units are Age Restricted @ 55					
Blding 100 & 200 Amenity Area(s)					

		I/I Rate/Unit	I/I Pmt
Total Project Sewer Flow	11,752	18.2	$213,886.4
			1407.1

John C. Dawley
President & CEO
Northland Residential Corporation

O – 781-229-4704
C - 617-797-6704

Memorandum

To: Mr. Glenn Clancy, P.E.

Date: December 6, 2021
Project #: 13335.04

From: Curtis Quitzau, P.E.

Re: The Residences at Belmont (McLean Zone 3) Inflow and Infiltration Wastewater Calculation

---

The purpose of this memo is to document our rationale for the wastewater generation estimate used for the attached I/I mitigation calculation. To that end, please consider the following:

1. The Town does not have nor did not legislate within the McLean District Zone 3 Overlay Bylaw a stated policy for the application of sewer infiltration and inflow fees for wastewater generation from the proposed project or from other various land uses allowed in town.
2. 310 CMR 15.00 ("Title V") tends to be the default standard of reference for wastewater generation rates throughout the Commonwealth. However, the flow rates contained within Title V are factored values to be used for the design of in-ground septic disposal systems and are not directly equivalent to wastewater generation rates. These "design flows" enumerated and explained in 310 CMR 15.203 carry a safety factor of 2.0 to account for flow variations appropriate for septic system design purposes. In other words, actual wastewater generation rates for any given use in Title V are effectively one-half of the design flow rate DEP requires be used for safe and reliable septic system design and operation.
3. For residential projects, Title V requires design flows of 110 gallons per day (GPD) per bedroom. This was based on expected wastewater generation of 55 GPD per bedroom.
4. Title V was promulgated in 1995 prior to a societal shift toward conservation and sustainability that manifested in policy changes at all levels of government and practice that led to, for examples, the Stretch Energy Code, changes in the plumbing code, and Leadership in Energy and Environmental Design (LEED). It is now common practice to incorporate (and in many municipalities mandate) use of low-flow plumbing fixtures and high efficiency appliances in new construction. These initiatives have been adopted by Belmont's Stretch Energy Building Code compliance requirements and within the McLean District Zone 3 Zoning Bylaw, which mandates a LEED Silver standard for the proposed project. It is widely understood that theses adaptations in construction and lifestyle significantly reduce water use (and corresponding wastewater generation) by at least 30%.
5. Consequently, a more realistic estimate of wastewater generation per residential bedroom (for new construction in the year 2021) is on the order of 38 or 44 GPD per bedroom using 30% and 20% reduction, respectively.
6. Again, looking at Title V, DEP acknowledges that elderly housing (defined as age >55) consumes less water per 2-bedroom housing unit than an equivalent unit that is not age restricted. Rather than 110 GPD per bedroom (or 220 GPD per housing unit), Title V allows 150 GPD per unit. This means design flows of 75 GPD per bedroom, equivalent to wastewater generation of 75 x 0.5 = 37.5 GPD per bedroom.

1 Cedar Street
Suite 400
Providence, RI 02903-1023
P 401.272.8100

Memorandum

7. The project consists of 152 housing units with a mix of 1, 2, and 3-bedrooms of which 94 of the 152 units are age restricted to 55 and older.

In light of all of the above and to simplify the math, we propose to utilize a wastewater generation rate of 40 GPD per bedroom, and 38 GPD per 1000 sf of office (50% of Title V), to account for the sales center/management/amenity space in the project. Therefore, we estimate that the project will add 11,640 GPD of new flow to the municipal sewer system as calculated on the attached I/I fee calculation spreadsheet.

1 Cedar Street
Suite 400
Providence, RI 02903-1023
P 401.272.8100

McLean Zone 3
Sewer Flow and I/I Schedule
as of November 22, 2021
Revised November 30, 2021

Subdistrict A - Age-Restricted @ 55 Townhouses

	Unit Type	units	Total Bedrooms	Rate	TGPD @ 40 GPD/BR
New Townhouses	2 brs	15	30	40	
	3 brs	23	69		
		38	99		3960
Chapel Reuse	1 brs	1	1		
	3 brs	1	3		
			4		160
Note all units are Age Restricted @ 55					
					4120

Subdistrict B Multifamily Apartments

Building 100					
	1 brs	32	32		
	2 brs	19	38		
	3 brs	7	21		
		58	91		3640
Note all blding 100 units are Non-Age Restricted @ 55					
Building 200	1 brs	15	15		
	2 brs	35	70		
	3 brs	4	12		
		54	97		3880
Note all blding 200 units are Age Restricted @ 55					
Blding 100 & 200 Amenity Area(s)			Sf	38/1000	165.3
			4350		

	I/I Rate/Unit	I/I Pmt
Total Project Sewer Flow	11,640	18.2	$ 211,848.00