Haverhill

Paul J. Jessel, Collection System Supervisor
Water/Wastewater Division
Phone: 978-374-2382 Fax: 978-521-4083
pjessel@haverhillwater.com

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Water Technical Unit (OES04-3)
U.S. EPA - New England, Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912
Attn: Joy Hilton

Massachusetts Department of Environmental Protection
Northeast Regional Office
Bureau of resource Protection
205B Lowell Street
Wilmington, MA 01887

Subject: City of Haverhill NPDES Permit # MA0101621
Infiltration Inflow Report 2011

Dear EPA & DEP:

In accordance with the City of Haverhill's NPDES Permit **# MA0101621**, we are providing this status report as required by item 3 Infiltration/Inflow Plan page 14 of 18. Please note the items in *italic* are taken directly from the NPDES permit followed by a response.

The permittee shall implement a plan to control infiltration and inflow (I/I) to the separate sewer system. The plan shall be kept onsite and shall be made available upon request by EPA or MassDEP. The plan shall describe the permittee's program for preventing infiltration/inflow related effluent limit violations, and all unauthorized discharges of wastewater, including overflows and by-passes due to infiltration/inflow.

The plan shall include:

- *An ongoing program to identify and remove sources of infiltration and inflow. The program shall include the necessary funding level and the source(s) of funding.*

- *An inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts. Priority should be given to removal of public and private inflow sources that are upstream from, and potentially contribute to, known areas of sewer system backups and/or overflows.*

- *Identification and prioritization of areas that will provide increase aquifer recharge as the results of reduction/elimination of infiltration and inflow to the system.*

- *An educational outreach program for all aspects of I/I control, particularly private inflow.*

Reporting Requirements:

A summary report of all actions taken to minimize I/I during the previous calendar year shall be submitted to EPA and the MassDEP annually, by April 30th of each year. The summary report shall, at a minimum, include:

- *A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year.*

- *Expenditures for any infiltration/inflow related maintenance activities and corrective actions taken during the previous year.*

- *A map with areas identified for I/I-related investigation/action in the coming year.*

- *A report of any infiltration/inflow related corrective actions taken as a result of unauthorized discharges reported pursuant to 314 CMR 3.19(20) and reported pursuant to the Unauthorized Discharges section of this permit.*

Please be advise the attached analysis shall demonstrate the non-existence of excessive infiltration/inflow for the City of Haverhill collection system flow. Since, we have demonstrated by the submittal of this report, that we are not experiencing excessive infiltration/inflow, we respectfully request a waiver of Part 1.F.3 of the City's NPDES Permit.

If you require additional information, please call me at 978-374-2382.

Sincerely,

Paul J. Jessel
Collection System Supervisor

cc: Mike Stankovich, DPW Director
Robert Ward, Deputy DPW Water/Wastewater
Fred Haffty WWTP Facility Manager
Don Freeman, CDM
Jeff Kennedy Massachusetts Division of Marine Fisheries
jeff.kennedy@state.ma.us

EXECUTIVE SUMMARY

The City of Haverhill calculated the City Wide Annual Infiltration/Inflow rates using two methods. Method 1 was to breakout the wet days and dry days to arrive at an average I/I rate of 2,083 gpdidm for the wet weather days and an average I/I rate of 1,416 gpdidm for dry days. Method 2 was a calculation for the entire year with a citywide average annual infiltration/inflow rate of 1,683 gpdidm.

Furthermore, the minimum citywide rehabilitation cost is **$24.5-**Million and the maximum rehabilitation is **$104.2**-Million. The loan payment for 20 years at 2% interest, (only if SRF approval if not then this interest could be 4-5%), on $24.5- Million is over $1.4-Million per year. This far exceeds the annual **$71,766** transportation and treatment costs.

Analysis of the City of Haverhill collection system flows for 2012 clearly indicates the non-existence of excessive infiltration/inflow. All design literature and case studies shows that Haverhill's collection system is operating within acceptable quantities for infiltration/inflow. Therefore, the evaluation phase of the study has not been undertaken.

Since, we have demonstrated by the submittal of this report, that we are not experiencing excessive infiltration/inflow, we respectfully request a waiver of Part 1.F.3 of the City's NPDES Permit.

SECTION 1: COLLECTION SYSTEM DESCRIPTION

1.1. Description of Wastewater Collection System

The City of Haverhill owns and operates a wastewater collection system that conveys wastewater to the City's wastewater treatment plant, which is located on the southern shore of the Merrimack River. Portions of this collection system have been in service since the late 1800s and portions convey both stormwater and wastewater.

The piping network consists of gravity pipe ranging in size from 8-inches to 72-inches in diameter and force mains ranging in size from 4-inches to 42-inches**.** Approximately 37 percent of the service area has combined sewers. The majority of the combined portion of the collection system is located in the older, more densely populated downtown area, along the Merrimack River. Areas further north or south of the Merrimack River tend to be newer and generally include separate sanitary and storm sewers.

1.2. Wastewater Treatment Plant

1.2.1. CSO Phase I Upgrades

Completed in June 2006 comprise the following major components:

- **Main Wastewater Pump Station Upgrades Now Capable of Pumping 60 MGD**

A pump station conveys all flow from the terminus of the Bradford interceptor to the treatment plant. This station is designed for a peak flow of 60 mgd with 3-pumps in operation and a fourth pump is available as a standby pump. Connecting the pump station to the WWTP is a 42-inch force main with a length of approximately 3,000 feet.

- **Modulating Influent Gate to Control Flow to the Main Wastewater Pump Station**

The potential exists that during extreme high flow and high river elevations the main pump station could become flooded. The modulating gate was installed to prevent flooding from occurring.

- **Supervisory Control And Data Acquisition, (SCADA)**

SCADA provides computer monitoring and control of critical wastewater systems from the main control room and computer terminals throughout the treatment plant. System components are monitored and can be queried through Microsoft Excel Historian. Treatment plant influent flows are monitored at the Parshall flume and were queried for this Infiltration/Inflow report.

- **CSO Wet Weather Upgrades**

Throughout the mid 1990's to 2008, the City of Haverhill implemented on a program of raising CSO weirs throughout the City, which captured 92 percent of the wet weather events.

Phase I CSO required the City to further treat CSO by upgrading the treatment plant's main pumping station to pump 60 million gallon a day, (MGD); wet weather by-pass for 40 MGD maximum; aerated grit facility to capture excessive grit and protect treatment plant equipment; modified five CSO regulators along the South side of the Merrimack River (Bradford side). With these upgrades, the City now captures over 97 percent of the wet weather events in Haverhill.

- **GIS Update**

Geographic Informational System (GIS) is continually updated throughout the year. The Wastewater Division has completed a sewer manhole to sewer manhole review and has made many changes to GIS system. These consist of installation year, material type, sewer diameter, combine or separated. This was a very difficult and time-consuming task, which has taken over six (6) months to complete.

In February 2012, the City's consultant CDM Smith completed the GIS sewer attribute update project. The City is still reviewing this data and can report that the total miles of sewer is 186 see table 2.1. The City shall review and provide need update by the next Infiltration/Inflow annual report. This new updated data was used in this analysis.

Table 1.1: Wastewater Plant Design Parameters

Parameter	Value
Influent Flow (mgd)	
Average	18.1
Maximum Day	39.2
Peak Rate (mgd)	60
Biochemical oxygen demand (lb/d)	17,650
Total Suspended Solids (lb/d)	18,560

SECTION 2: FLOW COMPONENTS

Sanitary sewer system flow has three components: Base Flow, Infiltration and Inflow.

2.1. BASE FLOW

Base flow can be determined in several ways with varying degrees of accuracy. Water consumption data adjusted for seasonal peaks, irrigation, unmetered connections, and water meter inaccuracies are often used. In addition, minimum flow rates can be measured to estimate infiltration rates, which then can be subtracted from metered flow during dry weather conditions.

2.1.1. DATA SUMMARY WASTEWATER

The City's of Haverhill has recently completed a Geographic Information System, (GIS), which was used to obtain the sewer diameters and lengths. Table 2-1: gives a summary for the different sewer diameters and sewer lengths with calculated infiltration rates for the entire City.

TABLE 2-1: CITY OF HAVERHILL SUMMARY SEWERS WITH CALCULATED INFILTRATION\INFLOW

Diameter	Total Footage	Miles	Total I/I gpdidm
8	509874.1793	96.57	1,265,731
10	83165.19024	15.75	258,066
12	160812.5177	30.46	598,811
14	2639.839855	0.50	11,468
15	55598.26754	10.53	258,786
32	1723.466314	0.33	17,114
36	11528.09712	2.18	128,780
44	628.2396063	0.12	8,578
16	1179.825334	0.22	5,858
18	37502.02204	7.10	209,467
20	5827.080467	1.10	36,163
21	11324.68109	2.14	73,796
22	1974.185587	0.37	13,477
24	33957.05708	6.43	252,889
30	25365.23791	4.80	236,129
42	2643.391911	0.50	34,451
48	11046.47212	2.09	164,533
50	4998.181843	0.95	77,548
54	5826.112884	1.10	97,625
60	6380.278224	1.21	118,790
66	6941.191346	1.31	142,156
72	1780.745173	0.34	39,785
	Total Miles:	**186**	

Haverhill's annual I/I rate for 2012 (gpdidm) **1,638**

2.1.2 CITY OF HAVERHILL WATER/WASTEWATER ACCOUNTS

Water and Wastewater meter readings were obtained from the Water and Wastewater Billing Office. These records were broken out into Residential and Commercial accounts that have City water and City sewerage. In addition Commercial and Residential accounts that have City water but **no** City sewerage. This analysis 2,110 Commercial accounts connected to City sewer system and 15,087 residential accounts connected to City sewer system a total 17,197 in 2012.

2.1.3. CSO PHASE I STUDY

Phase I of the Combine Sewer Overflow study required the City to developed a Supervisory Control And Data Acquisition (SCADA), system, completed in June 2006. The SCADA system was queried to obtain daily flows to the Haverhill Water Pollution Control Facility (HWPCF) for the entire calendar year of 2012.

2.1.4. WASTEWATER ACCOUNTS NOT INCLUDED

HWPCF receives flows from the Town of Groveland, which is pumped into the HWPCF's force main. HWPCF no longer receives flows from Haverhill Paperboard (HPB) and has been eliminated from the calculation. Groveland has updated their flow meter to record daily flows similar to HWPCF .Table 2.2 shows the daily flow rate for Groveland. These flows are subtracted from the HWPCF daily flow rates.

Table 2.2 Groveland Daily Flows

Date	Totalizer Reading	Gallons Pumped
12/31/2011	55894057	
1/1/2012	56164106	251,112
1/2/2012	56415218	280,543
1/3/2012	56695761	247,842
1/4/2012	56943603	264,389
1/5/2012	57207992	249,314
1/6/2012	57457306	211,013
1/7/2012	57668319	229,947
1/8/2012	57898266	269,834
1/9/2012	58168100	237,945
1/10/2012	58406045	228,015
1/11/2012	58634060	218,307
1/12/2012	58852367	289,538
1/13/2012	59141905	202,228
1/14/2012	59344133	273,758
1/15/2012	59617891	244,027
1/16/2012	59861918	295,901

2.1.5. WASTEWATER FLOW SUMMARY

Table 2-3: Wastewater Flows after Groveland Flow Is Subtracted

Date	Water & Sewer Accounts MG	WWTP Actual Flow MG	Rainfall	Groveland Flow	WWTP Groveland subtracted MG
1/1/2012	**3.636**	11.04	0.00	0.25	10.79
1/2/2012	**4.361**	11.63	0.00	0.28	11.35
1/3/2012	**4.211**	10.48	0.00	0.25	10.23
1/4/2012	**5.427**	10.27	0.00	0.26	10.01
1/5/2012	**4.132**	10.27	0.00	0.25	10.02
1/6/2012	**4.673**	10.05	0.00	0.21	9.84
1/7/2012	**3.888**	10.13	0.00	0.23	9.90
1/8/2012	**4.234**	10.00	0.00	0.27	9.73
1/9/2012	**3.950**	9.84	0.00	0.24	9.60
1/10/2012	**4.161**	10.06	0.00	0.23	9.83
1/11/2012	**3.984**	9.72	0.00	0.22	9.50
1/12/2012	**4.378**	18.66	0.89	0.29	18.37
1/13/2012	**4.057**	11.57	0.06	0.20	11.37
1/14/2012	**4.440**	10.82	0.00	0.27	10.55
1/15/2012	**4.954**	10.12	0.00	0.24	9.88
1/16/2012	**4.568**	10.40	0.00	0.30	10.10
1/17/2012	**3.984**	11.38	0.15	0.19	11.19
1/18/2012	**4.287**	10.27	0.00	0.24	10.03
1/19/2012	**4.939**	9.82	0.00	0.22	9.60
1/20/2012	**4.060**	9.80	0.05	0.22	9.58
1/21/2012	**4.659**	9.59	0.00	0.22	9.37
1/22/2012	**4.365**	9.55	0.12	0.22	9.33
1/23/2012	**4.504**	11.30	0.12	0.22	11.08
1/24/2012	**3.976**	11.44	0.01	0.25	11.19
1/25/2012	**4.262**	10.19	0.00	0.20	9.99
1/26/2012	**4.461**	10.00	0.00	0.24	9.76
1/27/2012	**4.246**	27.98	1.36	0.33	27.65
1/28/2012	**4.263**	14.04	0.00	0.30	13.74
1/29/2012	**4.198**	13.03	0.00	0.34	12.69
1/30/2012	**4.293**	12.45	0.00	0.31	12.14
1/31/2012	**3.736**	12.15	0.00	0.30	11.85

Table 2.4 below summarizes the entire flow distribution for the City of Haverhill.

Table 2-4: Wastewater Flow Summary 2012

Annual HWPCF Total Flow, (MG)	**3,217.56**
Average Flow (MGD)	**8.78**
HWPCF Base flow (MGD)	**4.733**
I/I Est. Rate(MGD)	**4.05**

2.2. DATA SUMMARY WATER TREATMENT PLANT

Water pumped from the Water Treatment Plant was captured utilizing SCADA. Daily consumption data was queried with the following equation:

Equation 2-2: Daily Finished Water Flow pump daily **minus** storage tank level increasing **plus** storage tank decreases. This equation was used to develop the daily total water consumption rate for all residents regardless if the resident was on city sewerage.

To derive water consumption flows, which are connected to the City's sewerage system, **Table 2-5** and **Equation 2-3** were developed.

Equation: 2-3: Total Actual Water Demand **minus** (Total Actual Water Demand **multiplied by** (Percentage, based upon flow data, on City sewer).

Example 2-2: January 1, 2012: 4.131 X.8803 = 3.636 MGD water flow consumed and on city sewerage.

This equation was used for each day, which is the City's **BASE FLOW** to the Wastewater Treatment Plant. From this **BASE FLOW** infiltration and inflow amounts can be calculated. The Average Base flow for Calendar year 2012 is **4.734** MGD.

Table 2-5: Total Water Flow Distribution Gallons For 2012

	Gallons	Daily MG
Total Gallons Consumed from Water Treatment	**1,962,465,172**	**5.38**
Total Gallons Commercial on Sewer	747,750,168	**2.05**
Total Gallons Residential On Sewer	913,934,824	**2.50**
Total Public Property on sewer	65,838,960	**0.18**
Total Gallons on Sewer	**1,727,523,952**	**4.73**
-	-	
Total Gallons Commercial **Not** on Sewer	59,707,604	**0.16**
Total Gallons Residential **No**t on Sewer	113,339,204	**0.31**
Total Not on Sewer	**173,046,808**	**0.47**
Percentage, based upon flow data, on City sewer	**88.03%**	
Percentage Not on City Sewer system	**8.82%**	
Water flow data was obtained from SCADA		

In order to calculate population served, which is on City sewerage Table: 2-6 was developed.

Table 2-6: Population Served on City's Sewerage System

Type of Residential Service Connection (single-family, two-family, etc.)	**Total # of service connections to each Type**	**# Of households per service connection (1 for single family, 2 for two-family, etc.)**	**# of households**
Single- Family:	15,188	1	15188
Two-Family:	1929	2	3858
Three Family	464	3	1392
Four or More Family	354	4	1416
		Totals	**21,854**
Wastewater bills 17,159 household out of 19,115 total household that have a water account		% on sewer	89.69%
		Total household on sewer	**19,602**
# of Households	**Average Household Size from DHCD website**		**Population Served**
	2.51		**49,200**
Per Capita Flow Rate	gal./per capita	**Population Served**	**WWTP Base Flow**
	96.20	**49,200**	4.98 MGD

This calculation follows a similar calculation taken from Haverhill's **Public Water Supply Annual Statistical Report, ASR (PWSID # 312800)** and is adjusted base upon of water pumped from the Water Treatment Plant to buildings that are connected into City sewerage system. This table reveals that 49,200 residents are connected into the City sewer system.

2.3. INFILTRATION

Infiltration is the water entering a collection system from groundwater sources, through defective pipes, leaking pipe joints, connections and manhole bases and walls. Water entering the system through this route is usually very clean and pollution free.

2.3.1 DRY WEATHER

The City defines dry weather as **a Minimum 72 Hours No Rainfall Over 0.1 Inches.** Utilizing this definition, the annual wet days were recorded. The City of Haverhill records rainfall utilizing a

Rainwise Rain Gage, which is recorded in 15-minutes intervals. This gage is use for the City's annual CSO report, Haverhill experienced 91 wet days, and 275 dry weather days for the 2012 calendar year.

Equation 2-4: Wastewater Treatment Plant (WWTP) Flow MGD (after Groveland is subtracted) minus Water Treatment Plant (WTP) Base Flow, (BASE FLOW from Equation 2-2).

Example 2-3: 1/1/2012 10.79 MGD -3.636 MGD = 7.15 MGD

Based upon **Equation 2-4** infiltration was calculated for all days which dry weather occurred, 275-days of dry weather.

Table 2-7: Dry Weather Conditions 2012

Total Dry Weather Flow (MGD):	**2,324**
2012 Average Dry weather I/I	**3.50**
Citywide I/I rate using I/I avg. 5.46 MGD (gpdidm):	**1,416**
Number of dry days	**275**

2.4. INFLOW

Inflow is water discharged to a collection system from roof leaders, cellars, yard drains, combined sewer overflows, catch basins, manhole covers, storm water and/or surface runoff.

2.4.1. INFLOW CALCULATION

Based upon **Equation 2-2** inflow was calculated for all days which wet weather occurred, 275-days for calendar year 2012

Equation 2-5: WWTP Flow MGD - WWTP Base Flow, (BASE FLOW from Equation 2-3).

Example 2-4: 1/12/2012 18.37 MGD -5.645 MGD = 12.73 MGD

Table 2-8: Wet Weather Conditions 2012

Total Wet Weather (MGD):	**893**
2012 Average I/I Wet Weather (MGD):	**5.15**
Citywide I/I using Avg. 5.15 MGD (gpdidm):	**2,083**
Wet Weather (days)	**91**

2.4.2. COMBINE SEWER OVERFLOW CSO

The City has submitted to EPA and DEP "SWMM Model Calibration and Evaluation of Existing Conditions" report prepared by CDM dated August 1, 2011. Total CSO flow volume for calendar year 2012 was 15.56 Million Gallons.

2.5. EXCESSIVE INFILTRATION/INFLOW

Definition of Excessive Infiltration/Inflow: **"-** the quantities of infiltration/inflow which are less costly to remove by sewer system rehabilitation than to transport and treat at the receiving facility, when both capital costs of increased sewerage facilities capacity and resulting operating costs are included."

According to "DEP Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey" Revised January 1993, excessive infiltration is define as 4,000 gallons per day per inch-mile (gpdidm). As can be seen in Table 2.1 Haverhill's total I/I is **1,638 gpdidm,** which clearly demonstrates Haverhill does not have excessive infiltration/inflow. Furthermore, the current treatment capacity is 18.1 MGD and the daily average flows in 2012 were 8.98 MGD.

SECTION 3: INFILTRATION/INFLOW

3.1. TRANSPORTATION OPERATION AND MAINTENANCE COSTS

According to EXISTING SEWER EVALUATION & REHABILITATION WEF Manual of Practice FD-6 " To determine whether I/I is excessive, rough cost comparison between transportation and treatment or elimination of I/I through corrective action are made. If I/I is excessive, the next phase should be the sewer system evaluation survey."

3.1.1. VEHICULAR COSTS

The City repairs Collection Division vehicles under Lift Station Account, (LSTA).

3.1.2. LABORER COSTS

The City of Haverhill currently has the following Job Positions, which deal directly with Collection system

Job Position	Current Staff Size
Collection System Supervisor	1
Senior Collection System operator	1
Collection System Operators	4
Highway Department	2

An analysis was conducted for calendar year for all positions mention above, which included any overtime. Based upon this analysis total labor for 2012 equals **$588,772.**

3.1.3. GASOLINE

Gasoline usage summary was obtain for each vehicle for Wastewater and broken out to services for Collection Division. The following vehicles are use for the collection division S-10 range pick-up Truck; S-12 F250 Utility Truck; S-13 F350 Utility Truck; S-5 Diesel Mack catch Basin Cleaner, and S-11 diesel Sewer Jet Machine. These records revealed total gasoline usage to be **$27,250.80**

3.1.4. POWER COSTS

National Grid bills for the City main pumping station located at 40 South Mill Street, along with the City's 36-sewer lift stations, revealed a total power requirement of **$ 207,698** to pump the City sewerage. It was estimates that 75% of the power was allocated to pumping.

3.1.5. COLLECTION SYSTEM MAINTENANCE

The City of Haverhill has two accounts devoted to the collections system called Lift Station Account, (LSTA) and Sewer Assessment used to televise the City's sewers. Review for calendar year 2012 revealed **$110, 288** was spent on Collection System Maintenance.

3.1.6. DEBT SERVICE

The City has committed to the CSO Phase I and associated treatment plant upgrades, which costs $20.1- million. The annual debt service equals $1,371,860.

3.2. TRANSPORTATION OPERATION & MAINTENANCE COSTS FOR INFILTRATION/INFLOW

Table 3-1: shows the transportation costs to pump infiltration and inflow to the HWPCF base upon energy and operation and maintenance of the collection system.

Table 3-1 2012 TOTAL WASTEWATER TRANSPORTATION O & M COSTS

ITEM		COMMENTS
Wastewater Capital Outlay	$76,979	base cost, independent of flow
LABOR	$588,772	base cost, independent of flow
Gasoline	$27,251	
ENERGY	$207,698	75% of cost is flow driven
CS Maint	$110,288	
Interest on CS Capital	$1,371,860	Capital Projects for Collection System and CSO phase I
TOTAL	**$2,382,848**	
days/year	365	
Avg. Q, gpd.	8,776,263	average daily plant flow includes inflow
factor	1000	
cost/1000gals/day	**$0.744**	wastewater transportation costs per 1000gals/day
ACTUAL COSTS TO PUMP WASTEWATER		
ENERGY	$207,698	75% of cost is flow driven
	$155,773	annual cost to actually pump wastewater
days/year	365	
avg. Q, gpd	8,776,263	average daily plant flow
factor	1000	
cost/1000gals/day	**$0.049**	wastewater transportation costs per 1000gals/day
COST TO PUMP INFILTRATION/INFLOW		
cost/1000gals/day	**$0.049**	wastewater transportation costs per 1000gals/day
I/I in 1000gals/day	4,043.320	Avg. annual I/I in 1000gals/day
days/year	365	
cost to pump I/I	**$71,766**	annual cost to pump I/I wastewater

3.3. REHABILITATION COSTS

According to "***EPA Handbook Sewer System Infrastructure Analysis and Rehabilitation***" 1991, Chapter 6 provides sewer rehabilitation costs for the following type of sewer rehabilitation: Excavation; Grouting; Slip lining using HDPE; Slip-lining using PE pipe; Slip-lining using Thermosetting Resin; Cured-in-Place.

Table 3-2 lists these rehabilitation costs for 1991 costs. The City of Haverhill has different sewer diameters that were not included in EPA's Handbook. Those sewer diameters (in blue) are estimated costs to further refine the City's expected rehabilitation costs. Not included are manhole rehabilitation costs. The minimum rehabilitation cost is $24-Million and the maximum rehabilitation is $104-Million. The loan payment for 20 years at 2% interest on $24-Million is over $**1.5**-Million per year. This far exceeds the **$71,766** transportation and treatment costs.

TABLE 3-2: CITY OF HAVERHILLSEWER REHABILITION COSTS

		Excavation Costs		Grouting Costs		Sliplining with HDPE		Sliplining with PE Pipe		Sliplining Thermosetting Resin		Cured in Place					
Dia.	Total Footage	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Min	MAX	Min	MAX
		($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	($/LF)	Costs	Costs
8	468,277	$50	$75	$24	$36	$9	$20	$40	$60	$25	$30	$45	$60	$9	$75	$4,214,495	$35,120,790
10	81,098	$55	$85	$28	$42	$17	$33	$45	$70	$33	$43	$60	$75	$17	$85	$1,378,671	$6,893,355
12	167,226	$65	$95	$32	$48	$25	$45	$50	$75	$40	$55	$68	$100	$25	$100	$4,180,645	$16,722,580
14	2,072	$70	$105	$34	$51	$27	$48	$55	$80	$45	$58	$75	$125	$27	$125	$54,895	$258,940
15	52,251	$73	$108	$36	$54	$28	$51	$58	$83	$50	$62	$80	$131	$28	$131	$1,463,018	$6,844,832
16	1,075	$75	$110	$38	$57	$30	$55	$60	$95	$55	$65	$85	$138	$30	$138	$32,255	$148,375
18	38,919	$80	$120	$40	$60	$33	$68	$65	$80	$63	$75	$90	$145	$33	$145	$1,264,864	$5,643,240
20	7,162	$95	$145	$49	$81	$35	$70	$69	$92	$70	$85	$95	$153	$35	$153	$250,662	$1,092,171
21	11,437	$105	$160	$68	$102	$42	$82	$72	$103	$75	$87	$100	$160	$42	$160	$480,366	$1,829,964
22	746	$115	$175	$72	$90	$49	$94	$75	$115	$80	$88	$105	$175	$49	$175	$36,532	$130,473
24	32,849	$125	$190	$76	$95	$56	$106	$95	$135	$85	$90	$110	$190	$56	$190	$1,839,558	$6,241,359
26	459	$130	$195	$86	$105	$59	$109	$105	$145	$92	$97	$122	$205	$59	$205	$27,055	$94,005
30	24,661	$135	$205	$96	$144	$63	$118	$115	$155	$100	$130	$135	$220	$63	$220	$1,553,616	$5,425,324
32	1,215	$160	$225	$110	$165	$70	$130	$135	$175	$115	$140	$140	$250	$70	$250	$85,065	$303,805
36	12,006	$185	$245	$124	$186	$80	$155	$155	$190	$130	$150	$155	$270	$80	$270	$960,484	$3,241,634
42	2,376	$210	$265	**NA**	**NA**	$93	$193	$190	$230	$145	$175	$165	$305	$93	$305	$219,779	$724,675
48	10,798	$235	$285	**NA**	**NA**	$105	$230	$220	$275	$170	$200	$185	$350	$105	$350	$1,133,815	$3,779,384
50	4,255	$238	$288	**NA**	**NA**	**NA**	**NA**	$240	$302	$180	$208	$195	$370	$180	$370	$765,942	$1,574,435
54	5,833	$240	$295	**NA**	**NA**	**NA**	**NA**	$265	$329	$190	$215	$205	$390	$190	$390	$1,108,197	$2,274,721
60	6,379	$275	$340	**NA**	**NA**	**NA**	**NA**	90	$355	$215	$255	**NA**	**NA**	$215	$355	$1,371,505	$2,264,577
66	7,457	$310	$395	**NA**	**NA**	**NA**	**NA**	$333	$403	$215	$275	**NA**	**NA**	$215	$403	$1,603,184	$3,005,038
72	1,467	$365	$450	**NA**	**NA**	**NA**	**NA**	$375	$460	**NA**	**NA**	**NA**	**NA**	$365	$460	$535,413	$674,768
6	0	$45	$70	$20	$30	**NA**	**NA**	$35	$60	**NA**	**NA**	$30	$45	$20	$70	$0	$0
														Totals:		**$24,560,017**	**$104,288,446**

Minimum Rehab Finance Annual Costs 2% for 20-Years: ($1,502,010.03)

3.4. CONCLUSIONS

The City of Haverhill has clearly demonstrated that there is no infiltration/inflow problem. DEP states that excessive I/I is greater than 4,000 gpdidm, the I/I rate for the City of Haverhill is 1,638 gpdidm for 2012 calendar year.

Analysis of the City's collection system for 2012 clearly indicates the non-existence of excessive infiltration/inflow. All design literature and case studies shows that the City's collection system to be operating within acceptable quantities for infiltration/inflow. Therefore, the evaluation phase of the study has not been undertaken.
Transportation and treatment costs are $**71,766** compared to the rehabilitation costs of over $**1.5-Million per** year.

3.5. WAIVER REQUEST

Since, we have demonstrated by the submittal of this report, that we are not experiencing excessive infiltration/inflow, we respectfully request a waiver of Part 1.F.3 of the City's NPDES Permit.

3.6. REFERENCES

"Sewer System Infrastructure Analysis and Rehabilitation" United States Environmental Protection Agency EPA/625/6-91/030 October 1991 Chapter 6 Sewer System Rehabilitation

"DEP Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey" Revised January, 1993

"Manual of Practice FD-6; *Existing Sewer Evaluation & Rehabilitation.* Water Pollution Control Federation (1983)