Final Report

Town of Dedham, MA

Municipal Building Inspections

October 2012

Weston & Sampson

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Dedham, Massachusetts
Weston & Sampson Job No. 2120285.A

October 9, 2012

Mr. Jason L. Mammone, P.E.
Director of Engineering
55 River Street
Dedham, Massachusetts 02026

Re: Municipal Building Inspections

Dear Mr. Mammone:

Weston & Sampson is pleased to submit this final letter report summarizing the results of the Municipal Building Inspections in accordance with our July 17, 2012 agreement. An analysis of the collected field data and a construction rehabilitation cost estimate are included. Work related to this project was performed in accordance with Department of Environmental Protection (DEP) *Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey, revised January 1993*.

Project Background

Building inspections by a two-person team from Weston & Sampson were conducted at 21 municipal buildings throughout the Town of Dedham to identify sources of inflow to the sanitary sewer system. Possible sources of inflow include: sump pumps, basement floor drains, downspouts/roof leaders, and open sewer cleanouts that allow clean water to enter the sewer system. These sources are illegal and are often used by the building owner to relieve flooding in or around the building during wet weather. The inspections were performed from August 8 through 10, 2012.

The following municipal buildings were targeted for inspection by the town:

- Avery Elementary School – 336 High Street
- Avery Elementary School (Old) – 123 High Street
- Dedham High School – 140 Whiting Avenue
- Dedham Middle School – 70 Whiting Avenue
- Dexter Elementary School – 1100 High Street
- Dolan Center – 269 Common Street
- DPW Office Building – 55 River Street
- DPW Garage – 55 River Street
- Early Childhood Education Center – 322 Sprague Street
- Endicott Estate – 656 East Street
- Endicott Cottage – 231 Mount Vernon Street

- Fire Station (Main) – 436 Washington Street
- Fire Station (East) – 230 Bussey Street
- Greenlodge Elementary School – 191 Greenlodge Street
- Library (Main) – 43 Church Street
- Library (Endicott) – 257 Mount Vernon Street
- Mucciaccio Pool – 336 High Street
- Oakdale Elementary School – 147 Cedar Street
- Police Station – 600 High Street
- Riverdale Elementary School – 143 Needham Street
- Town Hall – 26 Bryant Street

The 21 buildings were visited with a member of the Facilities Department and/or a member of the Engineering Department.

Inspection Results

Exterior and interior building inspections were conducted at all 21 locations. Exterior building inspections were performed to identify external inflow sources such as roof leaders and yard and driveway drains. Internal building inspections were performed to identify sump pumps, floor drains, and open cleanout connections. If the discharge of the roof leaders, drains or sump pumps could not be confirmed by visual inspection or the provided construction plans, a dye test was performed to verify the discharge. The results of the exterior and interior building inspections are detailed in Table 1, Municipal Building Inspection Results, attached.

There were no positive inflow sources identified. However, seven buildings have boiler room sump pumps connected to sewers. According to the Massachusetts Department of Environmental Protection 310 CMR 22, floor drains may be connected to the sanitary sewer system. The sump pumps observed in public buildings do not appear to collect groundwater, but rather runoff from the floor drains. In case of an emergency the pumps would also help prevent any water discharged from the boiler system from flooding the boiler rooms. One suspect source and other issues regarding infrastructure were noticed. These issues are listed below and should be addressed.

Dexter Elementary School – Roof Leader

The Dexter Elementary School, currently occupied by Little Sprouts and The Education Cooperative, was inspected by Weston & Sampson on August 9, 2012. One roof leader drain near the front of the building was uncapped and entered into the ground (see Attached Picture 1). When dye tested, dye was not visible in either the sewer or the drain. The roof leader drain is filled with gravel, but water still flows through fairly easily and should be considered a suspect source of inflow.

Early Childhood Education Center – Sewer Manhole Roots and Access

The Early Childhood Education Center was inspected by Weston & Sampson on August 8, 2012. A sewer manhole on the left side of the building is fenced off with no access point (see Attached Picture 2). The installation of a locked gate could be beneficial for future maintenance or emergency issues. Also, the manhole contains roots and light infiltration

which should be treated to prevent increased infiltration, structural issues and/or blockages (see Attached Picture 3).

Transportation and Treatment Costs

In order to determine if rehabilitation is justified for a particular source of infiltration and inflow (I/I), a cost effectiveness analysis is conducted. The cost effectiveness analysis compares the estimated cost for removing I/I to the estimated savings in transportation and treatment (T&T) costs resulting from the removal of I/I. T&T costs consist of capital costs to expand and upgrade the wastewater system plus annual Operation and Maintenance (O&M) costs. O&M costs are directly related to the quantity of flow being discharged to pump stations and treatment facilities. Increased usage will be reflected by increased O&M costs for electricity, cleaning, equipment repair, etc.

The calculated T&T cost for Dedham, using MWRA and Town of Dedham O&M and capital costs, is $0.9877/gallons per day (gpd). In accordance with DEP Guidelines, the present worth of this T&T cost is extended over the life of the rehabilitation method, estimated at 20 years, using a discount rate (or annual percentage rate) of 4.375%. The present worth of the T&T costs for the Town of Dedham, assuming a 20-year rehabilitation life cycle, is $12.99/gpd. The T&T calculation is provided in **Appendix A.**

The computation of T&T costs for a particular source of I/I is also based upon the portion of the I/I that can be eliminated through rehabilitation. The percentage of I/I that can be removed depends on the source. Direct inflow sources are considered 100 percent removable since the source can be permanently eliminated from the sewer system. Infiltration sources are typically limited to 50 percent removable because infiltration can migrate from a rehabilitated location to a location that did not previously show a need for rehabilitation.

Cost Effectiveness Analysis

A cost effectiveness analysis (CEA) was conducted to determine the relative (financial) benefit of conducting rehabilitation when compared to the costs to transport and treat the I/I. Each source was evaluated for cost-effectiveness of repairs.

The CEA table shows the T&T cost associated with the estimated I/I as well as recommended rehabilitation methods and costs. The CEA results in one of three conclusions:

- EXCESSIVE RECOMMENDED indicates that the cost to rehabilitate the positive source is less than the associated T&T cost and that rehabilitation is recommended.
- NON-EXCESSIVE indicates that the cost to rehabilitate the positive source is more than the associated T&T cost and rehabilitation is not recommended at this time.
- VALUE-EFFECTIVE RECOMMENDED means that the cost to rehabilitate is more than the T&T cost, but rehabilitation is still recommended because of the relative value of the repair. For the analysis, value-effective means the cost of rehabilitation was less than or equal to ten percent of the T&T cost.

The CEA for I/I identified a total of 1,316 gpd of peak design storm I/I that is cost effective/recommended to remove for a total cost of $2,550 as follows:

- The manhole with roots can be rehabilitated and an access point may be established for $2,500.
- The suspect roof leader can be capped for approximately $50.

The CEA for I/I is presented in Table 2 and the associated T&T cost of these defects is $17,095.

Conclusions and Recommendations
The currently proposed rehabilitation costs below are estimated based upon current unit prices. These prices are subject to change.

Estimated Rehabilitation Costs:

Manhole Root Treatment/Cementitous Lining/Access through Fence	$ 2,500
Cap Roof Leader Drain	$ 50
Total	**$ 2,550**

Note: These costs do not include design or construction services.

Weston & Sampson appreciates the opportunity to work with the Town of Dedham and assist in reducing the town's I/I. We are available to meet with you to discuss this letter report. Please contact us to arrange a mutually convenient time. If you have any questions, please do not hesitate to contact me at (978) 532-1900.

Very truly yours,

WESTON & SAMPSON

Donald G. Gallucci, PE
Vice President

cc: Ronald Lawrence, Project Engineer
Deborah A. Finnigan, PE, Infrastructure Engineer

PICTURES AND TABLES

PICTURE 1 – UNCAPPED ROOF LEADER DRAIN

PICTURE 2 – MANHOLE WITH NO ACCESS POINT

PICTURE 3 – DEFECTIVE MANHOLE

TABLE 1 - MUNICIPAL BUILDING INSPECTION RESULTS

TABLE 2 - COST EFFECTIVENESS ANALYSIS FOR I/I

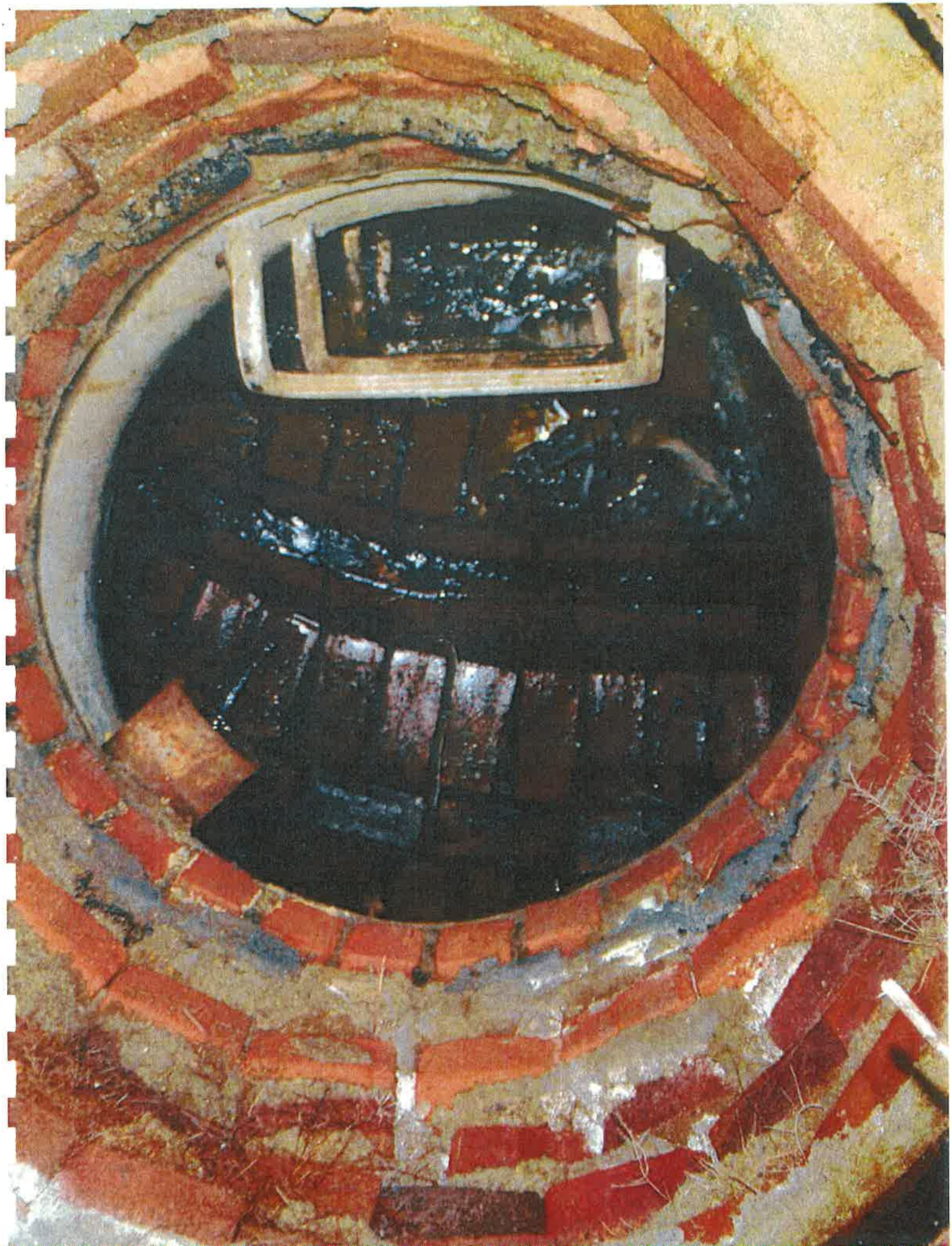

Table 1
Municipal Building Inspection Results
Town of Dedham, Massachusetts

Building Name	Address	Suspect Sources	Positive Sources	Additional Notes
Avery Elementary School	336 High Street			
Avery Elementary School (Old)	123 High Street			
Dedham High School	140 Whiting Avenue			
Dedham Middle School	70 Whiting Avenue			
Dexter Elementary School	1100 High Street	1 Suspect Roof Leader		
Dolan Center	269 Common Street			
DPW Office Building	55 River Street			
DPW Garage	55 River Street			
Early Childhood Education Center	322 Sprague Street			SMH Roots, Light Infiltration and No Access
Endicott Estate	656 East Street			
Endicott Cottage	231 Mount Vernon Street			
Fire Station (Main)	436 Washington Street			
Fire Station (East)	230 Bussey Street			
Greenlodge Elementary School	191 Greenlodge Street			
Library (Main)	43 Church Street			
Library (Endicott)	257 Mount Vernon Street			
Mucciaccio Pool	336 High Street			
Oakdale Elementary School	147 Cedar Street			
Police Station	600 High Street			
Riverdale Elementary School	143 Needham Street			
Town Hall	26 Bryant Street			
Totals		**One Suspect Source**	**N/A**	

Table 2
Cost Effectiveness Analysis for I/I - Positive I/I Sources
Town of Dedham, Massachusetts

Street/Location	Description of Inflow Source	Estimated Peak I/I (gpd)	Removable Peak I/I (gpd)	T&T Cost	Rehabilitation Method	Rehabilitation Cost	Conclusion
Dexter Elementary School	Suspect Roof Leader	1,172	1,172	$15,224	Replace Cap on Roof Leader Drain	$50	**EXCESSIVE RECOMMENDED**
ECEC	SMH Access	0	0	$0	Install a door/gate into existing fence	$1,000	**NON-EXCESSIVE RECOMMENDED**
ECEC	SMH Roots	144	144	$1,871	Manhole Root Treamment and Cementitious Lining	$1,500	**NON-EXCESSIVE RECOMMENDED**
TOTAL NON-EXCESSIVE		**0**	**0**	**$0**		**$2,500**	**NON-EXCESSIVE RECOMMENDED**
TOTAL EXCESSIVE RECOMMENDED		**0**	**0**	**$0**		**$50**	**EXCESSIVE RECOMMENDED**
TOTAL VALUE EFFECTIVE RECOMMENDED		**0**	**0**	**$0**		**$0**	**VALUE EFFECTIVE RECOMMENDED**
TOTAL		**1,316**	**1,316**	**$17,095**		**$2,550**	**TOTAL**

Z:\MA-Peabody-Projects\Dedham MA\2120285 - Annual Program\Municipal Building Inspections\Reports\Dedham - Mun Bldg Insp - Tab 2 - CEA.doc

APPENDIX A

MEMORANDUM – TRANSPORTATION AND TREATMENT COST

MEMORANDUM

DATE: May 14, 2012

FROM: Nathan Michael

TO: File 2120285.A

SUBJECT: T&T costs for Dedham, Massachusetts using MWRA methodology

Fiscal year 2012 Transportation & Treatment (T&T) costs for sewerage in the Town of Dedham can be calculated using both the MWRA Operation & Maintenance (O & M) and Capital charges, and the town's O & M and Capital costs. MWRA previously billed on a population basis but has since converted to a flow-based billing system. Therefore, MWRA charges are based mainly on sewage flow exiting the Town of Dedham. MWRA's sewerage charges to the Town of Dedham are shown in Table A, and Table B shows Dedham's FY12 O & M and Capital costs.

TABLE A - MWRA CHARGES TO THE TOWN OF DEDHAM

ITEM	FLOW (gallons/year)	FLOW (gallons/day)	MWRA CHARGE	COST ($/GPD)
Average Strength Flow*				
Annual Wastewater Volume	1,454,819,000	3,985,805	$1,232,630	$0.3093
Total Suspended Solids (O & M and Capital)	1,454,819,000	3,985,805	$416,366	$0.1045
Biochemical Oxygen Demand (O & M and Capital)	1,454,819,000	3,985,805	$326,350	$0.0819
Maximum Monthly Flow	N/A	7,230,000	$781,617	$0.1081
Population **	1,454,819,000	3,985,805	$2,162,592	N/A
TOTAL			**$4,919,555**	**$0.6038**

NOTE:
*MWRA's charges only apply to average strength flow.
**MWRA's population charges are not flow based, so it is not to be included in T & T cost.

TABLE B – TOWN OF DEDHAM SEWERAGE COSTS

ITEM	FLOW (gallons/year)	FLOW (gallons/day)	DEDHAM COST	COST ($/GPD)
Debt Service (Capital Costs)	1,454,819,000	3,985,805	$400,000	$0.1004
O & M	1,454,819,000	3,985,805	$1,130,000	$0.2835
TOTAL			**$1,530,000**	**$0.3839**

Therefore, the total FY12 T&T cost for both the MWRA charges and the Town of Dedham's costs are $0.9877 /GPD ($0.6038 + $0.3839).

According to the Department of Environmental Protection's (DEP) Guidelines for Performing I/I Analyses and SSES this cost of $0.9877/GPD needs to be extended throughout the life of a rehabilitative measure. The life cycle for a rehabilitative measure can be set by good engineering judgement as well as backup documentation, depending on the type of rehabilitation. For this study, Weston & Sampson will use a life cycle of twenty years.

To find the present worth of a rehabilitative measure over a twenty-year period, a discount rate, or annual percentage rate, is required. According to the DEP, the discount rate for FY12 is 4.375%. To calculate the T&T cost in order to account for this twenty-year period, a present worth analysis must be done. The following formula will calculate the present worth of the T&T cost for the next twenty years:

PRESENT WORTH ANALYSIS:

Discount Rate = 4.375% (DEP FY12 Information)

Present Worth Factor:

$$\frac{(1+i)^n - 1}{i\,(1+i)^n}$$ where: i = discount rate, or interest rate
n = number of years

$$\frac{(1 + 0.04375)^{20} - 1}{0.04375\,(1 + 0.04375)^{20}} = 13.15$$

Present Worth T&T Cost:

(Present Worth Factor) x (FY12 T & T cost)

13.15 x $0.9877/GPD = $12.99/GPD

Therefore, the T&T cost for the Town of Dedham, utilizing a present worth of the rehabilitation for a twenty-year period, with a discount rate of 4.375%, is $12.99/GPD.

Town of Dedham T&T costs were derived using MWRA sewerage costs.