

MEMORANDUM

TO: Carl Balduf, Town Engineer

CC: Rick Mattson, Director of Public Works
Scott Gustafson, Water & Sewer Superintendent

FROM: Kate J. Perotti, PE

DATE: January 11, 2024

SUBJECT: East Street 40b Development Peer Review

Weston & Sampson Engineers, Inc., is pleased to submit this technical memorandum as part of the agreement for engineering services for the East Street 40b Development Peer Review in the Town of Walpole, Massachusetts. This report includes a review of existing flow metering data and a theoretical hydraulic capacity analysis of sewers between 1015 East Street and the Massachusetts Water Resources Authority (MWRA) system, and a peer review of the developer's utility plans (which has been revised by the town and verbally accepted by the Developer). This information was collected by Weston & Sampson on behalf of the Town of Walpole through previously performed projects. No additional field work or verification of data was performed as part of this project. In the summarization and interpretation of existing data, Weston & Sampson is acting on behalf of and as an agent of the Town of Walpole.

The purpose of this project is to perform a theoretical hydraulic capacity of the town's municipal sewer system to identify potential deficiencies in the system and to review the proposed sewer layout for general conformance with standard industry practice for the design and construction of gravity sewers.

Project Background & System Description

Strategic Land Ventures is proposing to construct a 142-unit 40b residential development at 1015 East Street in Walpole. A total of 197 bedrooms are proposed to discharge wastewater flow from the development to a portion of the proposed relocated sewer main in the East Street easement. The peak flow from new 142-unit residential development is estimated to be 72,235 gallons per day (gpd) discharge. The hydraulic capacity analysis must account for this increased wastewater discharge. Full calculation breakdown can be found in Appendix A, Peak Flow Calculation. The Town of Walpole requires that an evaluation of the impact of the proposed wastewater flow on downstream sewers be performed prior to permitting the sewer connection.

The flow path downstream of the proposed sewer connection consists of approximately 16,600 linear feet (lf) of sanitary sewers and 77 sewer manholes flowing through Subareas 7, 6, 4, and 1. In its proposed location, wastewater flow would travel through the existing East Street easement and underneath the train tracks through the Elm Street easement, Main Street easement, Plimpton Street easement, and Washington Street easement, where it finally connects to the MWRA interceptor. A theoretical hydraulic capacity analysis of sewer segments between the proposed sewer connection and the end of the town's system where it discharges to the MWRA system are included herein. The sewer flow path is shown in the attached Figure 1.

According to the Preliminary Civil Engineering Plan Set provided August 30, 2023, by Strategic Land Ventures, two (2) new 18-inch gravity sewer lines will be constructed to replace the single existing 24-inch line*. One pipeline is

*Record drawings and field investigations indicate this as a 21-inch line.

proposed to the east of the building and will capture flow from upstream subareas 7, 8, 9, and 10. The second pipeline is proposed to the northwest of the building and will capture flow from the Liberty Station Apartments, Glenwood Avenue, and other local commercial/residential properties. The proposed development and sewer layout is shown in the attached Figure 2.

Review Existing Flow Metering Data

Town-wide flow metering was conducted for a 12-week period from March 7 - June 3, 2022 to obtain current sewer flow information and to qualify and quantify infiltration and inflow (I/I). Instantaneous peak flows experienced at each meter are shown in the table below. The locations of the meters are shown in Figure 1.

Meter #	Subarea	Manhole #	Peak Flow (gpd)
7-001	7	7-001	1,367,883
6-003	6	6-003	2,857,752
1-049	4	1-049	3,853,829
WP-NO-2C	1	1-001	4,401,000

Theoretical Hydraulic Capacity Analysis

A detailed evaluation of the hydraulic capacity of sewers downstream from the proposed connection was performed to determine if the pipe capacity is adequate for existing and proposed future flow. The theoretical hydraulic capacity of individual sewer segments was determined utilizing Manning's Equation for open channel flow assuming clean, circular pipe in good condition without debris or obstructions. The capacity of gravity sewer pipes depends on pipe diameter, slope, and material. These parameters were obtained from record drawings as provided by the town, as part of the "Preliminary Civil Engineering Plan Set for Strategic Land Ventures" dated August 30, 2023 (as shown on the Existing Conditions Plan (by others)), and television inspection data, where available. The hydraulic capacities of individual pipe segments were calculated using Manning's Equation given by:

$$Q = (1.49/n)R^{2/3}S^{1/2}A, \text{ where:}$$

Q = Hydraulic capacity, cubic feet per second

n = Coefficient of roughness

R = Hydraulic radius, feet

S = Slope

A = Cross-sectional area, square feet

The coefficient of roughness is dependent upon the pipe material. The hydraulic capacity of each segment assumes a clean, circular, non-obtrusive pipe, flowing at 100% full. Design capacity is estimated to be 80% of the pipe's full capacity to allow for a factor of safety. Available capacity was calculated by subtracting the existing flow data from the design capacity.

Existing flow data for each individual pipe segment is not available. Therefore, for the purpose of determining existing flow, the 2022 peak instantaneous flow measured at each meter was used to evaluate hydraulic capacity in sewer pipelines downstream from the proposed development, as noted below:

- Meter 7-001 for sewer pipelines between manholes 7-007 to 7-001 (1,367,883 gpd)
- Meter 6-003 for sewer pipelines between manholes 7-001 to 6-003 (2,857,752 gpd)
- Meter 1-049 for sewer pipelines between manholes 6-003 to 1-049 (3,853,829 gpd)
- Meter WP-NO-2C for sewer pipelines between manholes 1-049 to 1-001 (4,401,000 gpd)

The hydraulic capacity analysis was performed for pipe segments beginning at manhole 7-007 on East Street to manhole 1-001 in the Washington Street easement on the Norwood town line. Hydraulic capacity of individual pipes increases and decreases nominally from segment to segment; however, the total hydraulic capacity throughout the flow path remains generally consistent. Estimated flow in two pipe segments on East Street exceeded design capacity.

The table shows two pipe segments on East Street, 7-004 to 7-005 and 7-005 to 7-006, exceed design capacity with the flow from the proposed development. However, existing flow in these two segments is likely much lower than reported in the table. Because flow data for each individual pipe segment is not available, existing flow is based on the instantaneous peak flow observed at meter 7-001; the majority of the flow is generated from Subareas 7, 8, 9, and 10, none of which are tributary to these two segments. The pipe segments that exceeded capacity service only a few buildings in this area. In addition, these segments are also proposed to be removed and re-laid, decreasing the quantity of flow through them. Therefore, these segments are not noted as an area of concern.

Some assumptions, including slope calculations, were made as this data was not available from the record drawings. It is important to note that it is not always accurate to assume a clean, circular pipe. Sags, obstructions, offset joints, tuberculation, and debris can all cause a reduction in capacity. This negatively impacts the pipeline capacity by decreasing the diameter and increasing friction in the pipe. Calculations and assumptions for the hydraulic capacity analysis can be found in Table 1, Theoretical Hydraulic Capacity Analysis.

Review of Developer Utility Plans

Weston & Sampson reviewed specific sheets in a set of plans entitled "Preliminary Civil Engineering Plan Set for Strategic Land Ventures" dated August 30, 2023. Specific sheets reviewed include C-201, Demolition Plan; C-501, Utility Plan (a marked-up version by the Town of Walpole dated September 8, 2023); C-902, Detail Sheet; and Existing Conditions Plan (by others). Hand-written comments by Walpole have been transferred onto a digital PDF format of C-501; sheet C-501 is attached as Figure 2. The hand-written comments have been verbally accepted by the developer, however, a revised plan set has not been completed or provided to date.

The proposed sewer layout consists of demolishing four (4) sections or partial sections of the existing East Street sewer and East Street easement sewer. One 18-inch pipeline is proposed to be relocated to the east of the building and would transport flow from upstream subareas 7, 8, 9, and 10. A new 8-inch section would be installed to capture flow from five (5) local properties, as shown on sheet C-501. A second 18-inch pipeline is proposed to be relocated to the northwest of the building and would transport flow from the Liberty Station Apartments, Glenwood Avenue, and other local commercial/residential properties.

In an attempt to only have one sewer easement through the property, the stationing and slopes provided on the marked-up sheet C-501 were checked. Minimum slope requirements were in accordance with NEIWPCC's TR-16. Calculations confirmed that slopes would not be sufficient for a single sewer easement. Proposed pipeline slopes were checked for accuracy based upon the new manhole stationing and invert elevations provided; these proposed layout slope calculations are shown in Table 2.

Weston & Sampson offers the following comments based on our review of the select plan sheets:

- C-201, Demolition Plan: Plan should be revised based on acceptance of Walpole's sewer flow path changes.
- C-201, Demolition Plan: Plan shows to cut and cap the existing sewer service at property line. It is also recommended to seal the service connection in the manhole (SMH 7-005).

- C-201, Demolition Plan: Revise demolition plan at/near original Prop. SMH-107. If new sewer is not installed in front of 981 and/or 989 East Street, cured-in-place short liners should be installed to abandon those sewer laterals.
- C-501, Utility Plan: Incorporate all sewer revisions put forth by the Town of Walpole.
- C-501, Utility Plan: The proposed 18-inch sewer on the east side of the property should be increased to at least 21-inches in diameter to account for existing flow in the town's municipal sewer system. The existing pipeline is 21-inches in diameter (the survey notes it at 24-inches).
- C-501, Utility Plan: Revise location of the Prop. Underground Stormwater Management System and all related appurtenances due to new location of sewer pipeline. Keep the sewer elevation lower than the drainage system elevation.
- C-501, Utility Plan: Consider including addresses of sewer service connections that will be temporarily interrupted.
- C-902, Detail Sheet: While a 4-foot diameter precast manhole is generally accepted, a 5-foot diameter is recommended due to pipe size and configuration.
- Existing Conditions Plan: Confirm diameters of existing sewer pipelines. Record drawings and previous sewer rehabilitations identify different diameters.

Summary, Conclusions, and Recommendations

Weston & Sampson reviewed existing flow metering data; using that data plus record drawings, parameters for the theoretical hydraulic capacity analysis were generated. The theoretical hydraulic capacity of individual pipes increases and decreases from segment to segment; however, the total theoretical hydraulic capacity throughout the flow path remains generally high and consistent.

The theoretical hydraulic capacity analysis identified two segments that exceed the design capacity. Both segments are shown to be deficient because existing flow for each individual pipeline is not available and therefore, is assumed for the purposes of this analysis. Most of the flow entering meter 7-001 is generated from Subareas 7, 8, 9, and 10, none of which are tributary to these two segments, and it is likely that the peak flows here are significantly lower than the flows used in the table. Therefore, these segments are not noted as an area of concern. Based on our review of existing data and the calculated theoretical hydraulic capacity evaluation, the sewers affected by the proposed connection appear to be capable of handling the proposed sewer discharge from the development.

Weston & Sampson also reviewed the plan set entitled "Preliminary Civil Engineering Plan Set for Strategic Land Ventures". Specific sheets reviewed included C-201, Demolition Plan; C-501, Utility Plan (a marked-up version by the Town of Walpole dated September 8, 2023); C-902, Detail Sheet; and Existing Conditions Plan (by others).

The town-proposed sewer layout consisted of demolishing four (4) sections or partial sections of the existing East Street sewer and East Street easement sewer, installation of a new (recommended) 21-inch pipeline to be located to the east of the building, installation of a second 18-inch pipeline northwest of the building, and installation of a new 8-inch section on East Street. Recommended revisions to the plans include comments made for the general sewer layout, capping of abandoned sewer laterals, increasing mainline pipe diameters, and relocating the proposed underground stormwater system.

Weston & Sampson appreciates the opportunity to work with the Town of Walpole. If you have any questions, please do not hesitate to contact me at 508-203-8308.

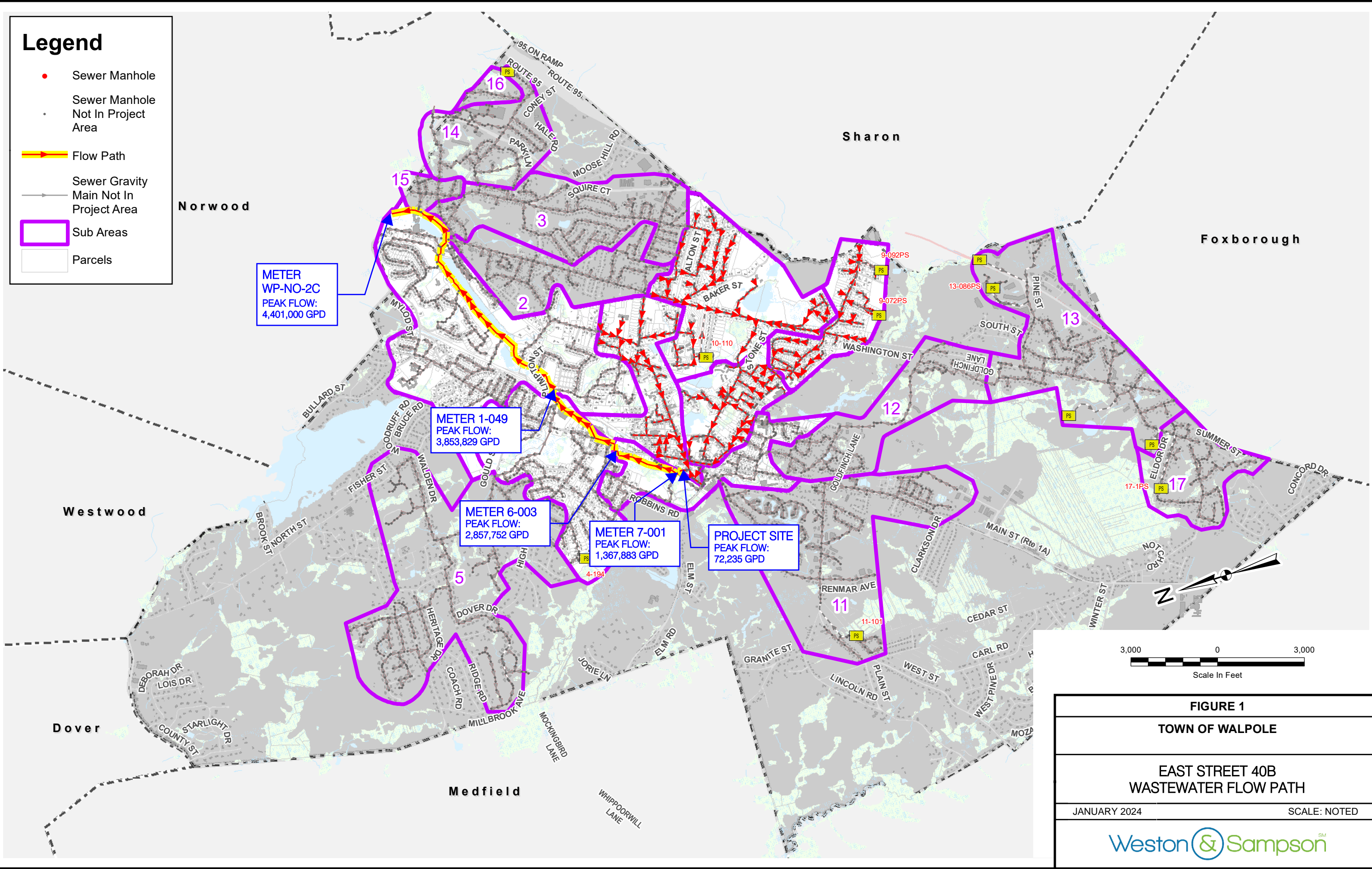
FIGURES

FIGURE 1 – EAST STREET 40b WASTEWATER FLOW PATH

FIGURE 2 – C-501, UTILITY PLAN

Legend

- Sewer Manhole
- Sewer Manhole Not In Project Area
- Flow Path
- Sewer Gravity Main Not In Project Area
- Sub Areas
- Parcels



METER WP-NO-2C
PEAK FLOW:
4,401,000 GPD

METER 1-049
PEAK FLOW:
3,853,829 GPD

METER 6-003
PEAK FLOW:
2,857,752 GPD

METER 7-001
PEAK FLOW:
1,367,883 GPD

PROJECT SITE
PEAK FLOW:
72,235 GPD

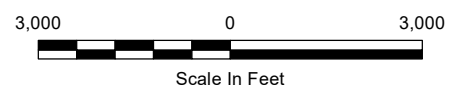


FIGURE 1	
TOWN OF WALPOLE	
EAST STREET 40B WASTEWATER FLOW PATH	
JANUARY 2024	SCALE: NOTED

Path: I:\wse03\local\wal\Design\GIS\data\Client\Walpole MA\Project\ENG23-0298_E\ SewerFlowPath.mxd User: L\A\KAC Saved: 9/16/2023 1:24:57 PM Opened: 9/16/2023 11:45:50 PM

TABLES

TABLE 1 – THEORETICAL LINE HYDRAULIC CAPACITY ANALYSIS

TABLE 2 – PROPOSED SEWER SLOPE CALCULATION

TABLE 1
THEORETICAL HYDRAULIC CAPACITY ANALYSIS
EAST STREET 40B
WALPOLE, MASSACHUSETTS

<u>Location</u>	<u>Upstream MH</u>	<u>Downstream MH</u>	<u>Diameter (in)</u>	<u>Pipe Material</u>	<u>Mannings "n"</u> *	<u>Mannings Capacity (gpd)</u> ¹	<u>Design Capacity (80%) (gpd)</u>	<u>Existing Flow (gpd)</u> ²	<u>Available Capacity (gpd)</u> ³	<u>Comments</u>
East Street	7-004	7-005	15	VC	0.014	1,551,288	1,241,030	1,367,883	(126,853)	From videos, pipe flowing no more than 1/3 full
East Street	7-005	7-006	15	VC	0.014	1,595,200	1,276,160	1,367,883	(91,723)	From videos, pipe flowing no more than 1/3 full
East Street ESMT	7-006	7-002	21	LINED	0.010	4,720,037	3,776,029	1,440,118	2,335,911	Start meter 7-001; includes flow from East Street 40b
East Street ESMT	7-002	7-001	21	LINED	0.010	4,820,956	3,856,764	1,440,118	2,416,646	
East Street ESMT	7-001	6-124	21	LINED	0.010	4,828,878	3,863,103	2,929,987	933,116	Start meter 6-003
East Street ESMT	6-124	6-013	Twin-16	RC	0.012	N/A	N/A	2,929,987	N/A	Invert Elevations Not Known
East Street ESMT	6-013	6-012	Twin-16	RC	0.012	N/A	N/A	2,929,987	N/A	Invert Elevations Not Known
East Street ESMT	6-012	6-016	21	RC	0.012	N/A	N/A	2,929,987	N/A	Invert Elevations Not Known
Elm Street ESMT	6-016	6-015	30	RC	0.012	14,375,735	11,500,588	2,929,987	8,570,601	
Elm Street ESMT	6-015	6-011	30	RC	0.012	18,038,479	14,430,783	2,929,987	11,500,796	
Elm Street ESMT	6-011	6-010	30	RC	0.012	15,456,043	12,364,834	2,929,987	9,434,847	
Elm Street ESMT	6-010	6-009	30	RC	0.012	14,586,265	11,669,012	2,929,987	8,739,025	
Elm Street ESMT	6-009	6-008	30	RC	0.012	15,885,367	12,708,293	2,929,987	9,778,306	
Elm Street ESMT	6-008	6-007	30	RC	0.012	14,379,064	11,503,251	2,929,987	8,573,264	
Elm Street ESMT	6-007	6-006	30	RC	0.012	14,730,015	11,784,012	2,929,987	8,854,025	
Elm Street ESMT	6-006	6-005	30	RC	0.012	22,892,768	18,314,214	2,929,987	15,384,227	
Elm Street ESMT	6-005	6-004	30	RC	0.012	21,734,068	17,387,254	2,929,987	14,457,267	
Elm Street ESMT	6-004	6-003	30	RC	0.012	20,565,400	16,452,320	2,929,987	13,522,333	
Elm Street ESMT	6-003	6-002	30	RC	0.012	22,802,001	18,241,601	3,926,064	14,315,537	Start meter 1-049
Elm Street ESMT	6-002	6-001	30	RC	0.012	28,814,177	23,051,342	3,926,064	19,125,278	
Main Street	6-001	4-014	30	RC	0.012	9,637,514	7,710,012	3,926,064	3,783,948	
Main Street	4-014	4-012	30	RC	0.012	7,976,780	6,381,424	3,926,064	2,455,360	
Main Street	4-012	4-011	30	RC	0.012	14,756,128	11,804,903	3,926,064	7,878,839	
Main Street	4-011	4-010	30	RC	0.012	15,911,485	12,729,188	3,926,064	8,803,124	
Main Street ESMT	4-010	4-009	30	RC	0.012	8,858,846	7,087,076	3,926,064	3,161,012	
Main Street ESMT	4-009	4-008	30	RC	0.012	9,072,312	7,257,850	3,926,064	3,331,786	
Main Street ESMT	4-008	4-007	30	RC	0.012	5,804,120	4,643,296	3,926,064	717,232	
Main Street ESMT	4-007	4-006	30	RC	0.012	12,072,026	9,657,621	3,926,064	5,731,557	

TABLE 1
THEORETICAL HYDRAULIC CAPACITY ANALYSIS
EAST STREET 40B
WALPOLE, MASSACHUSETTS

<u>Location</u>	<u>Upstream MH</u>	<u>Downstream MH</u>	<u>Diameter (in)</u>	<u>Pipe Material</u>	<u>Mannings "n"</u> *	<u>Mannings Capacity (gpd)</u> ¹	<u>Design Capacity (80%) (gpd)</u>	<u>Existing Flow (gpd)</u> ²	<u>Available Capacity (gpd)</u> ³	<u>Comments</u>
Main Street ESMT	4-006	4-005	30	RC	0.012	8,905,079	7,124,063	3,926,064	3,197,999	
Main Street ESMT	4-005	4-004	30	RC	0.012	10,294,677	8,235,742	3,926,064	4,309,678	
Main Street ESMT	4-004	4-002	36	RC	0.012	25,623,273	20,498,618	3,926,064	16,572,554	
Main Street ESMT	4-002	4-001	36	RC	0.012	16,402,735	13,122,188	3,926,064	9,196,124	
Main Street ESMT	4-001	1-049	36	RC	0.012	16,222,461	12,977,969	3,926,064	9,051,905	
Main Street ESMT	1-049	1-048	36	RC	0.012	21,449,191	17,159,352	4,473,235	12,686,117	Start meter WP-NO-2C
Main Street ESMT	1-048	1-047	36	RC	0.012	18,201,558	14,561,246	4,473,235	10,088,011	
Main Street ESMT	1-047	1-046	36	RC	0.012	18,716,997	14,973,598	4,473,235	10,500,363	
Main Street ESMT	1-046	1-045	36	RC	0.012	16,518,510	13,214,808	4,473,235	8,741,573	
Main Street ESMT	1-045	1-044	36	RC	0.012	20,325,494	16,260,395	4,473,235	11,787,160	
Main Street ESMT	1-044	1-043	36	RC	0.012	16,078,847	12,863,078	4,473,235	8,389,843	
Plimpton Street ESMT	1-043	1-042	36	RC	0.012	25,823,940	20,659,152	4,473,235	16,185,917	
Plimpton Street ESMT	1-042	1-041	36	RC	0.012	81,117,092	64,893,673	4,473,235	60,420,438	
Plimpton Street ESMT	1-041	1-040	36	RC	0.012	79,357,367	63,485,894	4,473,235	59,012,659	
Plimpton Street ESMT	1-040	1-039	36	RC	0.012	36,473,169	29,178,535	4,473,235	24,705,300	
Plimpton Street ESMT	1-039	1-038	36	RC	0.012	15,824,072	12,659,258	4,473,235	8,186,023	
Plimpton Street ESMT	1-038	1-037	36	RC	0.012	15,515,662	12,412,530	4,473,235	7,939,295	Assumed Slope
Plimpton Street ESMT	1-037	1-036	36	RC	0.012	13,231,801	10,585,441	4,473,235	6,112,206	Assumed Slope
Plimpton Street ESMT	1-036	1-035	36	RC	0.012	14,287,549	11,430,039	4,473,235	6,956,804	
Plimpton Street ESMT	1-035	1-034	36	RC	0.012	10,938,237	8,750,590	4,473,235	4,277,355	
Plimpton Street ESMT	1-034	1-033	36	RC	0.012	12,414,516	9,931,613	4,473,235	5,458,378	
Plimpton Street ESMT	1-033	1-032	36	RC	0.012	14,268,218	11,414,574	4,473,235	6,941,339	
Plimpton Street ESMT	1-032	1-031	36	RC	0.012	13,887,294	11,109,835	4,473,235	6,636,600	
Plimpton Street ESMT	1-031	1-030	36	RC	0.012	20,810,129	16,648,103	4,473,235	12,174,868	
Plimpton Street ESMT	1-030	1-029	36	RC	0.012	15,617,948	12,494,358	4,473,235	8,021,123	
Plimpton Street ESMT	1-029	1-028	36	RC	0.012	14,307,596	11,446,076	4,473,235	6,972,841	
Plimpton Street ESMT	1-028	1-027	36	RC	0.012	12,397,068	9,917,654	4,473,235	5,444,419	
Plimpton Street ESMT	1-027	1-026	36	RC	0.012	14,226,921	11,381,537	4,473,235	6,908,302	
Plimpton Street ESMT	1-026	1-025	36	RC	0.012	13,194,157	10,555,326	4,473,235	6,082,091	

TABLE 1
THEORETICAL HYDRAULIC CAPACITY ANALYSIS
EAST STREET 40B
WALPOLE, MASSACHUSETTS

<u>Location</u>	<u>Upstream MH</u>	<u>Downstream MH</u>	<u>Diameter (in)</u>	<u>Pipe Material</u>	<u>Mannings "n"</u> *	<u>Mannings Capacity (gpd)</u> ¹	<u>Design Capacity (80%) (gpd)</u>	<u>Existing Flow (gpd)</u> ²	<u>Available Capacity (gpd)</u> ³	<u>Comments</u>
Plimpton Street ESMT	1-025	1-024	36	RC	0.012	24,218,173	19,374,538	4,473,235	14,901,303	
Plimpton Street ESMT	1-024	1-023	36	RC	0.012	48,982,920	39,186,336	4,473,235	34,713,101	
Mansion Drive ESMT	1-023	1-022	36	RC	0.012	52,437,226	41,949,781	4,473,235	37,476,546	
Mansion Drive ESMT	1-022	1-201	36	RC	0.012	73,469,070	58,775,256	4,473,235	54,302,021	
Mansion Drive ESMT	1-201	1-021	36	RC	0.012	36,760,898	29,408,718	4,473,235	24,935,483	
Mansion Drive ESMT	1-021	1-020	36	RC	0.012	18,919,128	15,135,302	4,473,235	10,662,067	
Washington Street ESMT	1-020	1-011	36	RC	0.012	16,045,916	12,836,733	4,473,235	8,363,498	
Washington Street ESMT	1-011	1-010	36	RC	0.012	15,869,531	12,695,625	4,473,235	8,222,390	
Washington Street ESMT	1-010	1-009	36	RC	0.012	18,031,261	14,425,009	4,473,235	9,951,774	
Washington Street ESMT	1-009	1-008	36	RC	0.012	16,170,466	12,936,372	4,473,235	8,463,137	
Washington Street ESMT	1-008	1-007	36	RC	0.012	14,001,231	11,200,985	4,473,235	6,727,750	
Washington Street ESMT	1-007	1-006	36	RC	0.012	14,350,369	11,480,295	4,473,235	7,007,060	
Washington Street ESMT	1-006	1-005	36	RC	0.012	57,866,947	46,293,558	4,473,235	41,820,323	
Washington Street ESMT	1-005	1-004	36	RC	0.012	52,853,326	42,282,661	4,473,235	37,809,426	
Washington Street ESMT	1-004	1-003	36	RC	0.012	31,808,462	25,446,770	4,473,235	20,973,535	
Washington Street ESMT	1-003	1-002	36	RC	0.012	11,855,223	9,484,179	4,473,235	5,010,944	
Washington Street ESMT	1-002	1-001	36	RC	0.012	16,672,909	13,338,327	4,473,235	8,865,092	

NOTES:

¹Capacity assumes clean, circular, non-obtrusive pipes at 100% full.

²Existing flow assumes instantaneous peak flow from metering data plus proposed peak flow from the East Street 40b Development.

³Available capacity is the design capacity minus the existing flow.

TABLE 2
PROPOSED SEWER SLOPE CALCULATION
EAST STREET 40B
WALPOLE, MASSACHUSETTS

<u>Location</u>	<u>Upstream MH</u>	<u>Downstream MH</u>	<u>Diameter (in)</u>	<u>Segment Length</u>	<u>Invert Out Upstream (ft)</u>	<u>Invert In Downstream (ft)</u>	<u>Slope</u>	<u>Comments</u>
East Street	7-005	PROP. SMH-100	15	48.50	129.10	129.00	0.0021	length scaled from plans
East Street ESMT	PROP. SMH-100	PROP. SMH-101	18	87.65	129.00	128.73	0.0031	
East Street ESMT	PROP. SMH-101	PROP. SMH-102	18	148.62	128.73	128.35	0.0026	
East Street ESMT	PROP. SMH-102	PROP. SMH-103	18	232.13	128.35	127.80	0.0024	
East Street ESMT	PROP. SMH-103	PROP. SMH-110	18	33.82	127.80	127.72	0.0024	
East Street	7-007	PROP. SMH-106	15	232.00	129.40	128.80	0.0026	
East Street	PROP. SMH-104	PROP. SMH-105	8	259.78	129.70	128.80	0.0035	
East Street	PROP. SMH-105	PROP. SMH-106	8	4.18	128.80	128.75	0.0120	length scaled from plans
East Street	PROP. SMH-106	PROP. SMH-107	21	33.12	128.70	128.60	0.0030	length scaled from plans
East Street ESMT	PROP. SMH-107	PROP. SMH-109	21	157.46	128.60	128.20	0.0025	length scaled from plans
East Street ESMT	PROP. SMH-109	7-001	21	99.82	128.20	127.90	0.0030	length scaled from plans
East Street ESMT	7-001	PROP. SMH-110	21	72.92	127.90	127.72	0.0025	length scaled from plans
East Street ESMT	PROP. SMH-110	6-124	21	11.02	127.72	127.70	0.0018	length scaled from plans
Building Connection	S-1	PROP. SMH-109	8	48.27	134.00	132.00	0.0414	

*segment lengths and inverts were taken from sheet C501 or existing survey plan

APPENDIX A

PEAK FLOW CALCULATION

PEAK FLOW CALCULATION

EAST STREET 40b

$$\text{Maximum Daily Flow} = \text{Number of Bedrooms} \times 110 \frac{\text{gpd}}{\text{bedroom}}$$

$$\text{Maximum Daily Flow} = 197 \text{ Bedrooms} \times 110 \frac{\text{gpd}}{\text{bedroom}}$$

$$\text{Maximum Daily Flow} = 21,670 \text{ gpd}$$

$$\text{Average Daily Flow} = \text{Maximum Daily Flow} \times \left(\frac{2}{3}\right)$$

$$\text{Average Daily Flow} = 21,670 \text{ gpd} \times \left(\frac{2}{3}\right)$$

$$\text{Average Daily Flow} = 14,447 \text{ gpd}$$

$$\text{Peak Flow} = \text{Average Daily Flow} \times \text{Peaking Factor}$$

$$\text{Peak Flow} = 14,447 \text{ gpd} \times 5$$

$$\text{Peak Flow} = 72,235 \text{ gpd}$$