

**TOWN OF
MILLIS, MASSACHUSETTS**

SEWER FEASIBILITY STUDY

(Areas BIII, F)

**Prepared by:
GCG Associates, Inc.
84 Main Street
Wilmington, MA 01887**

October 19, 2016

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October 19, 2016

Mr. Suzanne Kennedy
Town Hall
900 Main Street
Millis, MA 02054

RE: Sewer System Feasibility Study
Area BIII and Area F

Dear Suzanne Kennedy:

Our office has completed a feasibility study to provide sewer service to Area BIII and Area F as shown on the enclosed plans and detailed in this report. A portion of Area BIII was previously examined in the 2004 Feasibility Study while Area F is a new study area. Under this study, Area BIII would build upon the previous study and extend the coverage area to the Forest Road/Birch Street intersection. Area BIII will not include the removal of an existing pump station on Heritage Path. Area F would include the Middlesex Street and the Walnut Street Area from the Town Line to Orchard Street.

The designated areas will be serviced by a combination of gravity sewer systems, municipal pump stations and force mains, or low-pressure sewer systems with individual private grinder pumps. One or a combination of these methods was utilized. Preliminary design schematics are based upon a review of the Town Assessor's Maps and GIS Data, USGS Maps and boring information. A detailed survey was not conducted. This report is divided into sections according to each of the service areas. Each section includes a brief description, sewer schematic plans, soil analysis, and detailed construction cost estimate and wastewater flow and betterment analysis for each service area.

The 2004 Feasibility Study examined the expansion of the existing sewer system and looked into the potential for Neighborhood Wastewater Treatment Plants (NWWTP) through land use and soil conditions. This study will only examine the existing soils and their suitability for residential septic.

Our office reviewed the soils present within each service area to determine the suitability for residential septic systems. Soil maps developed by the United States Department of Agriculture and Soil Conservation Service were overlaid onto the Town Assessor Maps to determine the approximate location of the soils.

The hydrological group for a soil, as determined by the "Soil Survey of Norfolk and Suffolk Counties, Massachusetts" - published by the National Cooperative Soil Survey, was used to determine the suitability of the soils within each service area. The hydrological group is useful in estimating the permeability of a soil and may be used as a preliminary means to determine the suitability of soils for septic systems. The four hydrological soil groups are:

- Group A: Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands and gravelly sands. These soils have a high rate of permeability.
- Group B: Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of permeability.
- Group C: Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of permeability.
- Group D: Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, and soils that have clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of permeability.

The soils in hydrological group D are unacceptable for residential septic systems. The soils contain silts or clays and the infiltration rate is expected to exceed the maximum percolation rates allowed by DEP. Soils found in hydrological group B and C are mostly unacceptable with but exceptions require further field investigations to determine the percolation rates and other physical characteristics. Soils found in the hydrological group A are acceptable. See the following sections for location and description of the soils present within each area.

Construction prices for sewer installation were developed from projects recently bid by this office and used to develop the detailed cost estimates for each service area. The ledge quantity used for these estimates was assumed based on boring information in Area BIII and past sewer projects of similar size in Millis constructed by this office, but further subsurface investigations are necessary for more accurate estimates. The low pressure sewer systems do not include the cost for grinder pumps or emergency generators and ends at the Town property line. The sewer construction generally consists of the sewer system installation, 2" trench paving to be weathered through the winter months or a predetermined period of

time, followed by reclaim and grading of the roads, installation of a new binder and top course of pavement and cleanup.

We have summarized the results of the feasibility study in the table on the next page. We trust this information is sufficient for your current needs and welcome the opportunity to meet with you to discuss this report in detail. Please call if you have questions or if additional information is needed.

If you require additional information or have any questions, please call.

Respectfully Submitted,
GCG ASSOCIATES, INC.

Michael J. Carter

Michael J. Carter, P.E.

SEWER SYSTEM FEASIBILITY STUDY
AREA BII and AREA F
SUMMARY TABLE

MILLIS, MA

AREA	TOTAL CONSTRUCTION/ CONTINGENCIES COST (\$)	TOTAL ENGINEERING COST (\$)	TOTAL PROJECT COST (\$)	20% TOTAL CONSTRUCTION COST (\$)	TOTAL BETTERMENT UNITS	BETTERMENT UNIT COST (\$)	80% BETTERMENT UNIT COST (\$)	TOTAL SEWAGE FLOW (GPD)	SEPTIC IMPROVEMENT
Area BIII	3,107,225	350,000	3,457,225	691,445	90	38,414	30,731	64,240	
Area F*	3,944,754	375,000	4,319,754	863,951	184	23,477	18,782	72,820	

Appendix A

“BIII” Service Area

- **Description**
- **Reduced Service Area Plan**
- **Soil Survey**
- **Wastewater Flow and
Betterment Analysis**
- **Detailed Construction
Estimate**

SEWER SERVICE AREA BIII

Area BIII Existing Conditions

As part of the previous sewer feasibility study, the Town considered expansion of the existing sewer system within Area BIII. Service Area BIII would provide sewer to Forest Road from Bow Street to Birch Street, Village Street from Forest Road to Main Street, and Birch Street from Forest Road to Village Street. A capacity of approximately 32,230 gallons per day (gpd) is required to service this entire area.

One additional area not considered in this area is Heritage Path and Pine View Road which are currently serviced by a private pump station that could be connected by gravity connection to Village Street. Installation of the sewers in this area would allow abandonment of the existing private pump station required to service the residences of Heritage Path and Pine View Road. For the purposes of the analysis, the Heritage Path and Pine View Road were not considered in the capacity or betterment calculations.

Prior designs for this area utilized a conventional sewer system consisting of gravity sewers, forced main sewers, pump stations or individual grinder pumps. All service areas connect to the existing sewer system and various options were developed.

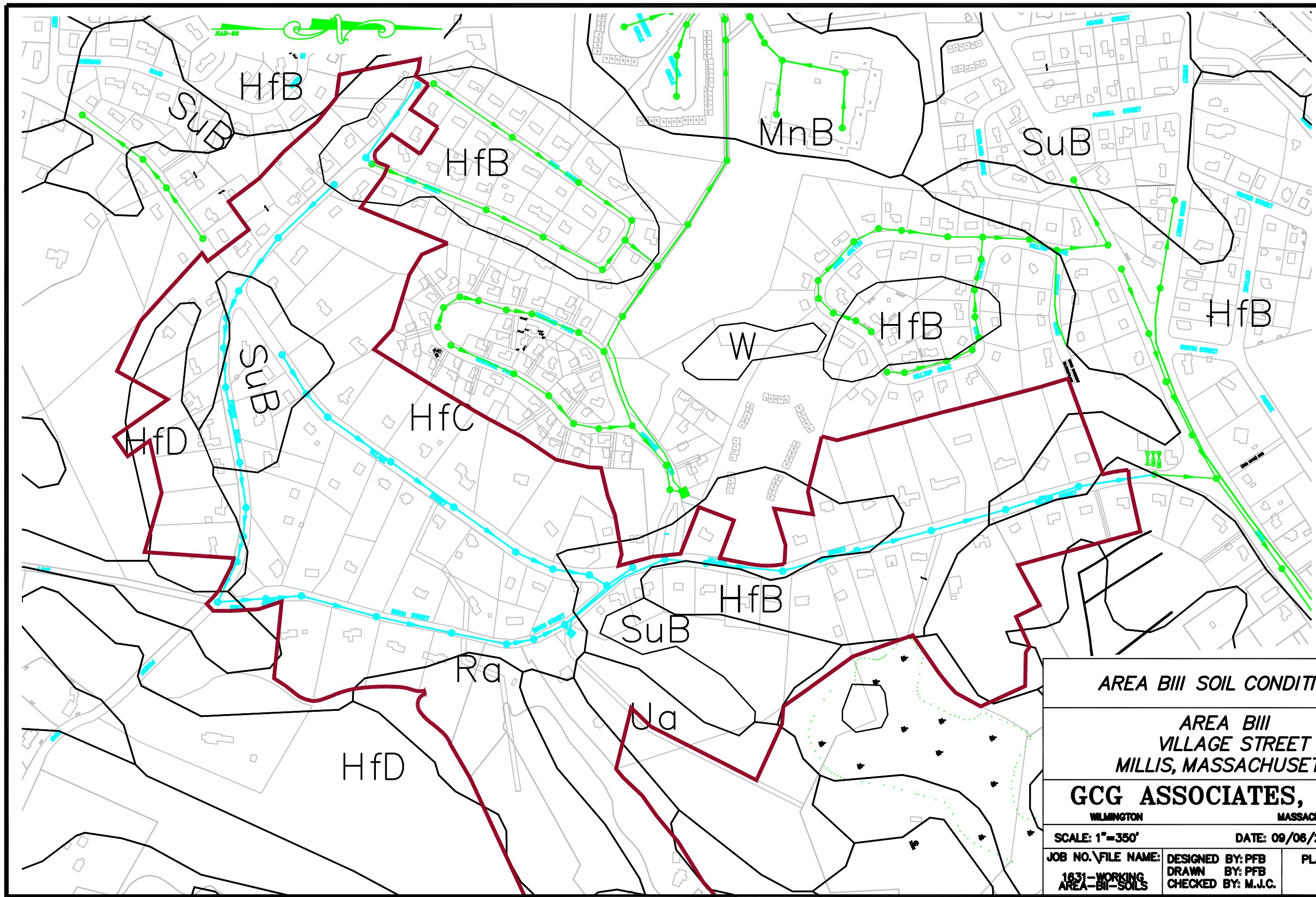
Multiple options for sewer connections of Area BIII were considered. BIII would connect to an 8" gravity sewer on Main Street (Area BI) which flows to the Dover Road pump station and discharges into the gravity sewer on Union Street at the northern limit of Area BIII. At the westerly limit of Area BIII an 8" gravity sewer on Bow Street flows to the into the gravity sewer on Union Street. At the southerly limit, a 10" gravity sewer on Village Street flows to the Norfolk Road/Village Street pump station. For both Area BIII options, it was determined that connecting to the existing Main Street (Area BI) was the best alternative for both options with the exception of 400' of Forest Road at the westerly limit. Under both options, this stretch would utilize the existing Bow Street gravity sewer. This stretch of sewer would serve five (5) parcels and approximately 150' of sewer pipe would not need to be installed by utilizing the existing Bow Street sewer.

For the previous study, subsurface borings were completed along Village Street and showed a considerable amount of refusal at an average depth of 6 to 9 feet.

Soils projected to be in Area BIII are shown in Table 1.

Table 1
Area BIII Soil Survey

Service Area	Soil Type	Hydrological Group
BIII	HfB - Hinckley Sandy Loam, 3 to 8% slopes HfC - Hinckley Sandy Loam, 8 to 15% slopes HfD - Hinckley Sandy Loam, 15 to 35% slopes MnB - Merrimac-Urban Land Complex, 0 to 8% slopes	A
	SuB - Sudbury Fine Sandy Loam, 2 to 8% slopes	B
	Ra - Raynham Silt Loam, nearly level	C
	None	D
	Ua - Udorthents, sandy - surface material removed W - Surface Water	None



AREA BIII SOIL CONDITIONS		
AREA BIII VILLAGE STREET MILLIS, MASSACHUSETTS		
GCG ASSOCIATES, INC.		
WILMINGTON		MASSACHUSETTS
SCALE: 1"=350'		DATE: 09/06/2016
JOB NO. \FILE NAME: 1631-WORKING AREA-BII-SOILS	DESIGNED BY: PFB DRAWN BY: PFB CHECKED BY: M.J.C.	PLAN NO. 1 of 1

Area BIII Sewer Option - Gravity System with Pump Station

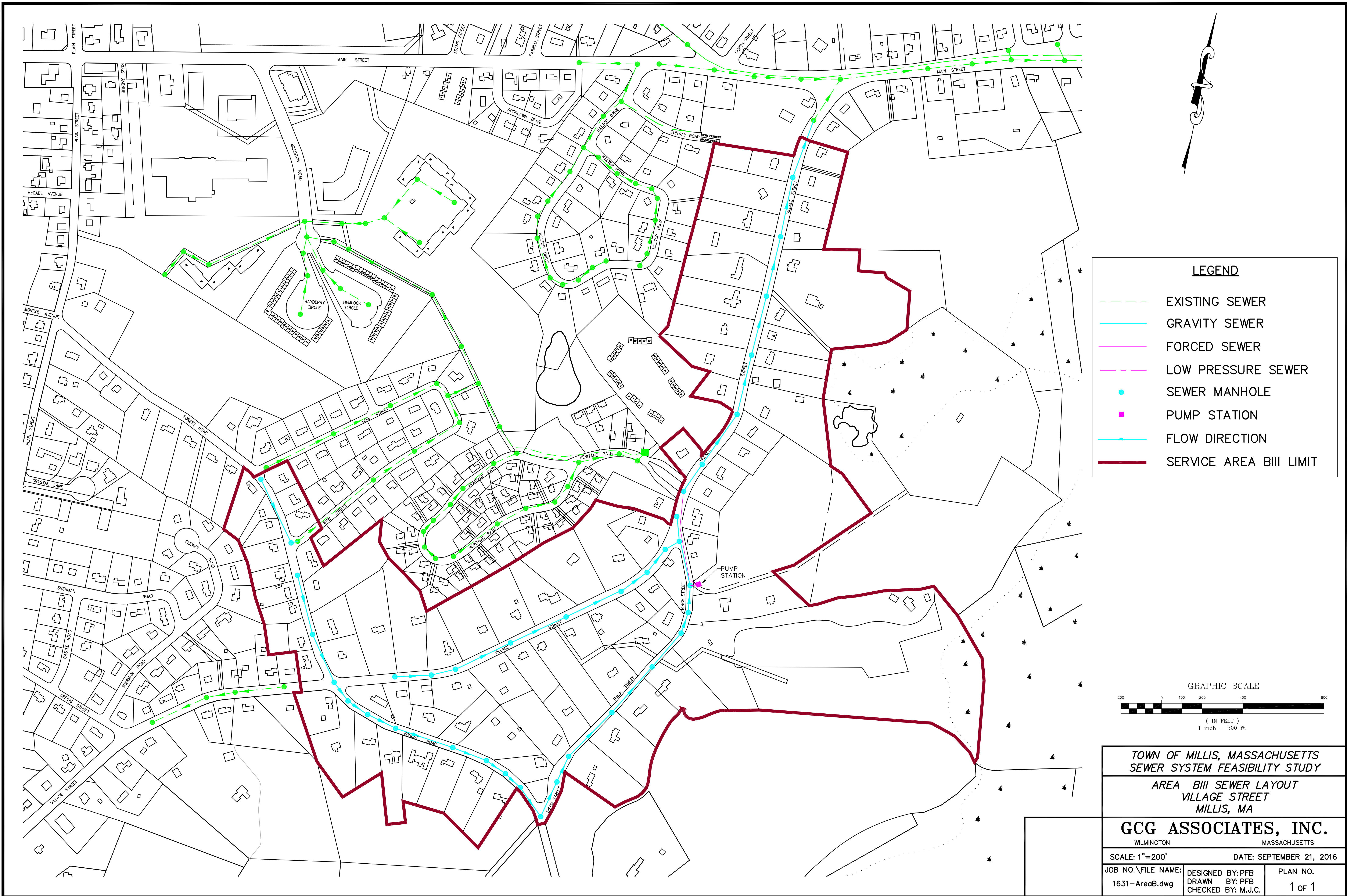
Using the Town of Millis GIS contour data and online elevation tools the proposed Area BIII option is two gravity sewer systems with a pump station being located on Birch Street, servicing one of the gravity sewers.

The first gravity sewer would extend along Village Street from the Heritage Path/Village Street intersection and connect to Main Street. This gravity main would service Village Street north of Heritage Path and allow for shallower sewer pipe depths to reduce the amount of ledge removal required.

The remaining parcels along Village Street, Forest Road, and Birch Street would be serviced by two gravity lines ending at a pump station along Birch Street. The first line would service Village Street north of the Forest Road intersection. The second line would service Forest Road and Birch Street as a continuous gravity sewer. The second line would require two stretches of deep pipe depth. First along Forest Road from 12 feet to 18 feet deep for approximately 200 feet. Second, along Birch Street from 12 feet to 24 feet deep for approximately 350 feet.

A potential of 84 existing units, would be served by this system with an additional 6 units of possible future development. The sewer system consists of approximately 7,800 linear feet of gravity sewer, a pump station, 460 linear feet of force main sewer, and 80 manholes. The existing municipal pump station located on Dover Road may need to be upgraded to handle the additional flows from Area BIII.

We have estimated the cost to construct the Area BIII Sewer Option – Gravity System with Pump Station to be \$3,460,000.



WASTEWATER FLOW AND BETTERMENT ANALYSIS - AREA BIII SERVICE AREA																			
Address	Owner	Map No.	Lot	ZONING BYLAW				Actual Lot Size			Existing Houses			Additional Development Potential	Vacant Land		Total Sewage Flow (gpd)	Total Betterment Units	Comments
				Zoning District	Min. Lot Size (acres)	Min. Lot Frontage (ft)	Min. Lot Depth (ft)	Actual Lot Size (acres)	Actual Frontage (ft)	Actual Depth (ft)	# of Ex. Houses	# of Bedrooms	Sewage Flow (gpd)		Estimated Potential Houses	Sewage Flow (gpd)			
15 Village Street		25	91	R-S	0.57	125	200	0.63	129.7	192	1	3	330	No	0	0	330	1	
19 Village Street		25	102	R-S	0.57	125	200	0.84	167.1	220	1	2	330	No	0	0	330	1	
12 Village Street		25	103	R-S	0.57	125	200	0.62	135	200	1	3	330	No	0	0	330	1	
14 Village Street		25	104	R-S	0.57	125	200	0.62	135	200	1	4	440	No	0	0	440	1	
18 Village Street		25	105	R-S	0.57	125	200	0.62	158.56	200	1	5	550	No	0	0	550	1	
23 Village Street		25	106	R-S	0.57	125	200	1.32	139	412	1	3	330	No	0	0	330	1	
27 Village Street		28	7	R-S	0.57	125	200	1.25	139	412	1	3	330	No	0	0	330	1	
31 Village Street		28	8	R-S	0.57	125	200	1.36	138.85	412	1	3	330	No	0	0	330	1	
35 Village Street		28	13	R-S	0.57	125	200	1.3	139	412	1	2	330	No	0	0	330	1	
34 Village Street		28	14	R-S	0.57	125	200	0.58	142.1	237.19	1	4	440	No	0	0	440	1	
30 Village Street		28	15	R-S	0.57	125	200	7.32	204.44	755.37	1	3	330	Yes	3	1320	1650	4	
36 Village Street		28	16	R-S	0.57	125	200	0.83	124.83	237.19	1	2	330	No	0	0	330	1	
37 Village Street		28	17	R-S	0.57	125	200	1.5	150	412	1	3	330	No	0	0	330	1	
41 Village Street		28	18	R-S	0.57	125	200	1.5	158	422	1	3	330	No	0	0	330	1	
40 Village Street		28	19	R-S	0.57	125	200	0.79	92	364.66	1	3	330	No	0	0	330	1	
42 Village Street		28	20	R-S	0.57	125	200	0.79	90	369.17	1	4	440	No	0	0	440	1	
44 Village Street		28	25	R-S	0.57	125	200	5	131	647.57	1	4	440	No	0	0	440	1	
56 Village Street		28	28	R-S	0.57	125	200	0.51	126.99	184	1	3	330	No	0	0	330	1	
60 Village Street		28	29	R-S	0.57	125	200	0.52	124	173	1	3	330	No	0	0	330	1	
64 Village Street		28	30	R-S	0.57	125	200	0.57	165	173	1	2	330	No	0	0	330	1	
69 Village Street		28	32	R-S	0.57	125	200	0.56	125	202	1	3	330	No	0	0	330	1	
68 Village Street		28	33	R-S	0.57	125	200	0.73	243	130	1	3	330	No	0	0	330	1	
72 Village Street		28	34	R-S	0.57	125	200	0.61	143.72	145	1	3	330	No	0	0	330	1	
77 Village Street		28	35	R-S	0.57	125	200	1.32	148.24	355.85	1	2	330	No	0	0	330	1	
74 Village Street		28	36	R-S	0.57	125	200	0.36	115.6	145	1	3	330	No	0	0	330	1	
76 Village Street		28	37	R-S	0.57	125	200	0.34	110	157.86	1	3	330	No	0	0	330	1	
24 Birch Street		28	38	R-S	0.57	125	200	0.45	139.49	100.63	1	3	330	No	0	0	330	1	
67 Village Street		28	40	R-S	0.57	125	200	0.57	130	376	1	3	330	No	0	0	330	1	
68 Village Street		28	41	R-S	0.57	125	200	19.55	76		0	0	0	Yes	1	440	440	1	
55 Village Street		28	42	R-S	0.57	125	200	0.58	125.09	173.91	1	3	330	No	0	0	330	1	
45 Village Street		28	43	R-S	0.57	125	200	0.58	151.07	150	1	3	330	No	0	0	330	1	
48 Village Street		28	45	R-S	0.57	125	200	0.63	135.21	200.9	1	4	440	No	0	0	440	1	
46 Village Street		28	47	R-S	0.57	125	200	0.58	125	200.9	1	4	440	No	0	0	440	1	
27 Birch Street		28	55	R-S	0.57	125	200	1.79	134.52	446.77	1	3	330	No	0	0	330	1	
33 Forest Road		29	58	R-S	0.57	125	200	0.82	176.04	265.11	1	3	330	No	0	0	330	1	
37 Forest Road		29	188	R-S	0.57	125	200	0.34	135.11	265.11	1	3	330	No	0	0	330	1	
38 Forest Road		29	73	R-S	0.57	125	200	0.36	118	129.59	1	3	330	No	0	0	330	1	
39 Forest Road		29	75	R-S	0.57	125	200	0.36	103.29	205.21	1	2	330	No	0	0	330	1	
43 Forest Road		29	76	R-S	0.57	125	200	0.57	125.12	196.25	1	3	330	No	0	0	330	1	
45 Forest Road		29	92	R-S	0.57	125	200	0.41	90	196.25	1	5	550	No	0	0	550	1	
46 Forest Road		29	93	R-S	0.57	125	200	0.4	196.44	130.61	1	3	330	No	0	0	330	1	
50 Forest Road		29	103	R-S	0.57	125	200	1.8	165	469.03	1	3	330	No	0	0	330	1	
49 Forest Road		29	104	R-S	0.57	125	200	0.42	92.5	198.31	1	3	330	No	0	0	330	1	
51 Forest Road		29	123	R-S	0.57	125	200	0.43	92.5	198.31	1	2	330	No	0	0	330	1	
107 Village Street		29	124	R-S	0.57	125	200	1.9	49.07	424.16	1	3	330	No	0	0	330	1	
99 Village Street		29	125	R-S	0.57	125	200	0.97	200	298.35	1	3	330	No	0	0	330	1	
93 Village Street		29	126	R-S	0.57	125	200	1.44	200	309.9	1	3	330	No	0	0	330	1	
89 Village Street		29	127	R-S	0.57	125	200	1.49	200	319.23	1	2	330	No	0	0	330	1	
83 Village Street		29	128	R-S	0.57	125	200	1.25	232.78	332.69	1	3	330	No	0	0	330	1	
81 Village Street		29	129	R-S	0.57	125	200	1.88	160	355.85	1	4	440	No	0	0	440	1	
105 Village Street		29	134	R-S	0.57	125	200	1.98	149.07	531.3	1	4	440	No	0	0	440	1	
55 Forest Road		36	10	R-S	0.57	125	200	0.71	300	120.09	1	3	330	No	0	0	330	1	
56 Forest Road		36	12	R-S	0.57	125	200	0.76	148	191.96	1	3	330	No	0	0	330	1	
60 Forest Road		36	13	R-S	0.57	125	200	0.87	150.87	140.4	1	2	330	No	0	0	330	1	
57 Forest Road		36	14	R-S	0.57	125	200	0.34	130.24	80.98	1	2	330	No	0	0	330	1	
118 Village Street		36	55	R-S	0.57	125	200	0.75	193	200	1	3	330	No	0	0	330	1	
70 Forest Road		36	56	R-S	0.57	125	200	0.58	286.58	205.39	1	3	330	No	0	0	330	1	
108 Village Street		36	57	R-S	0.57	125	200	0.52	125	205.39	1	3	330	No	0	0	330	1	

WASTEWATER FLOW AND BETTERMENT ANALYSIS - AREA BIII SERVICE AREA

Address	Owner	Map No.	Lot	ZONING BYLAW				Actual Lot Size			Existing Houses			Additional Development Potential	Vacant Land		Total Sewage Flow (gpd)	Total Betterment Units	Comments
				Zoning District	Min. Lot Size (acres)	Min. Lot Frontage (ft)	Min. Lot Depth (ft)	Actual Lot Size (acres)	Actual Frontage (ft)	Actual Depth (ft)	# of Ex. Houses	# of Bedrooms	Sewage Flow (gpd)		Estimated Potential Houses	Sewage Flow (gpd)			
104 Village Street		36	58	R-S	0.57	125	200	0.37	118	112.7	1	3	330	No	0	0	330	1	
74 Forest Road		36	59	R-S	0.57	125	200	0.57	150	118.6	1	3	330	No	0	0	330	1	
102 Village Street		36	61	R-S	0.57	125	200	0.97	194.17	134.56	1	2	330	No	0	0	330	1	
94 Village Street		36	62	R-S	0.57	125	200	1	200	234.56	1	3	330	No	0	0	330	1	
92 Village Street		36	63	R-S	0.57	125	200	0.68	100	283	1	2	330	No	0	0	330	1	
80 Forest Road		36	64	R-S	0.57	125	200	0.72	106.02	293.86	1	3	330	No	0	0	330	1	
86 Forest Road		36	65	R-S	0.57	125	200	1.4	190	248.68	1	3	330	No	0	0	330	1	
90 Forest Road		36	66	R-S	0.57	125	200	0.64	190	134.24	1	4	440	No	0	0	440	1	
89 Forest Road		36	68	R-S	0.57	125	200	1.01	150	343.02	1	3	330	No	0	0	330	1	
83 Forest Road		36	69	R-S	0.57	125	200	1.03	150	304.47	1	3	330	No	0	0	330	1	
79 Forest Road		36	70	R-S	0.57	125	200	1	143.68	304.24	1	3	330	No	0	0	330	1	
77 Forest Road		36	71	R-S	0.57	125	200	0.92	189.66	256.07	1	2	330	No	0	0	330	1	
73 Forest Road		36	72	R-S	0.57	125	200	1.1	140	431.07	1	3	330	No	0	0	330	1	
12 Birch Street		36	102	R-S	0.57	125	200	1.36	125.56	343.05	1	3	330	No	0	0	330	1	
14 Birch Street		36	103	R-S	0.57	125	200	0.6	125.57	253.3	1	3	330	No	0	0	330	1	
67 Forest Road		36	105	R-S	0.57	125	200	0.85	125	241	1	3	330	No	0	0	330	1	
65 Forest Road		36	106	R-S	0.57	125	200	1.28	120	377	1	4	440	No	0	0	440	1	
Forest Lane		36	97	R-S	0.57	125	200	6.1	182	735	0	0	0	Yes	1	440	440	1	
88 Village Street		37	1	R-S	0.57	125	200	1.19	100	478.31	1	3	330	No	0	0	330	1	
82 Village Street		37	2	R-S	0.57	125	200	0.97	180	186	1	3	330	No	0	0	330	1	
23 Birch Street		37	5	R-S	0.57	125	200	1.52	202.7	420	1	4	440	No	0	0	440	1	
19 Birch Street		37	6	R-S	0.57	125	200	1.25	222.19	244	1	3	330	No	0	0	330	1	
15 Birch Street		37	7	R-S	0.57	125	200	1.42	200	269.84	1	3	330	No	0	0	330	1	
9 Birch Street		37	8	R-S	0.57	125	200	1.47	200	300.42	1	4	440	No	0	0	440	1	
84 Village Street		37	15	R-S	0.57	125	200	0.92	200	209	1	3	330	No	0	0	330	1	
16 Birch Street		37	16	R-S	0.57	125	200	1.07	200	217	1	3	330	No	0	0	330	1	
22 Birch Street		37	17	R-S	0.57	125	200	1.13	293	164	1	4	440	No	0	0	440	1	
Birch Street		37	4	R-S	0.57	125	200	19.87	N/A	N/A	0	0	0	Yes	1	440	440	1	
25 Birch Street		37	14	R-S	0.57	125	200	8.2	182	N/A	1	3	330	No	0	0	330	1	
											Existing Buildings			Potential Development			Sewage	Betterment	
						Average Lot Size:		1.60		Totals:	84	256	29590	-	6	2640	32230	90	
Assumptions																			
New House Design Flow				440 gpd (4 bedrooms)															
Existing House Design Flow				110 gpd/bedroom (330 gpd min value)															

VILLAGE STREET, FOREST ROAD, BIRCH STREET

AREA BIII Option		Engineers Estimate		
Item Descript.	Units	Quan.	Unit Cost (\$)	Total Cost (\$)
8" SEWER MAIN PIPE - Less than 12' Depth	L.F.	6680	100.00	668,000.00
8" SEWER MAIN PIPE - Greater than 12' Depth	L.F.	1120	200.00	224,000.00
6" SEWER SERVICE PIPE	EA.	80	1,500.00	120,000.00
LOW PRESSURE SEWER PIPE	L.F.	0	50.00	0.00
LOW PRESSURE SEWER SERVICE	EA.	0	1,500.00	0.00
LOW PRESSURE PUMP	EA.	0	15,000.00	0.00
4' DIA. SEWER MANHOLE	EA.	45	3,800.00	171,000.00
FRAME AND COVER	EA.	45	750.00	33,750.00
8" MANHOLE DROP INLET	V.F.	0	100.00	0.00
6" SERVICE CHIMNEYS	V.F.	120	100.00	12,000.00
PUMP STATION & FM PIPING	L.S.	1	300,000.00	300,000.00
UPGRADE DOVER ROAD PUMPING STATION	L.S.	1	35,000.00	35,000.00
ROCK EXCAVATION	C.Y.	1200	100.00	120,000.00
GENERAL EXCAV.	C.Y.	300	15.00	4,500.00
GRAVEL BORROW	C.Y.	200	25.00	5,000.00
RECLAIM/FINE GRADE	S.Y.	28000	6.50	182,000.00
2" TRENCH PAVING	L.F.	1500	12.00	18,000.00
2 1/2" BASE COURSE	TON	4200	95.00	399,000.00
1 1/2" TOP COURSE	TON	2500	95.00	237,500.00
BASE COURSE(HAND)	TON	150	160.00	24,000.00
TOP COURSE(HAND)	TON	100	160.00	16,000.00
TRAFFIC SYSTEM	L.S.	1	5,000.00	5,000.00
POLICE	HR	2000	50.00	100,000.00
LOAM & SEED	S.Y.	3450	10.00	34,500.00
MOBILIZATION	L.S.	1	50,000.00	50,000.00
MISC. WORK	L.S.	1	50,000.00	50,000.00
EROSIN CONTROL	EA.	1550	10.00	15,500.00
TOTAL		84 work days		2,824,750.00
10% CONTINGENCIES				\$282,475.00
ENGINEERING DESIGN				\$150,000.00
CONSTRUCTION OBSERVATION				\$200,000.00
TOTAL SEWER PROJECT COST				3,457,225.00
20% Town Cost				691,445.00
80% Resident Cost				2,765,780.00
Betterment Cost per Unit		90 Units		\$30,730.89

Appendix B

“F” Service Area

- **Description**
- **Reduced Service Area Plan**
- **Soil Survey**
- **Wastewater Flow and
Betterment Analysis**
- **Detailed Construction
Estimate**

SEWER SERVICE AREA F

Area F Existing Conditions

Area F was identified as an area in the north part of Millis consisting of Middlesex Street north of Ridge Street, Orchard Street, Walnut Street, Walnut Hill Road, and Holbrook Way. Area F consists of multiple high and low points due to the topography of the area and Bogastow Brook. A capacity of approximately 72,820 gpd is required to service this area.

The nearest existing sewer system exists along Orchard Street east of Bogastow Brook and at the Middlesex Street/Ridge Street intersection. Both of these sewer systems flow to the Middlesex Street pump station which pumps sewage to the Exchange Street gravity sewer. The existing Middlesex Street pump station may require upgrade as a result of the additional sewage produced by Area F.

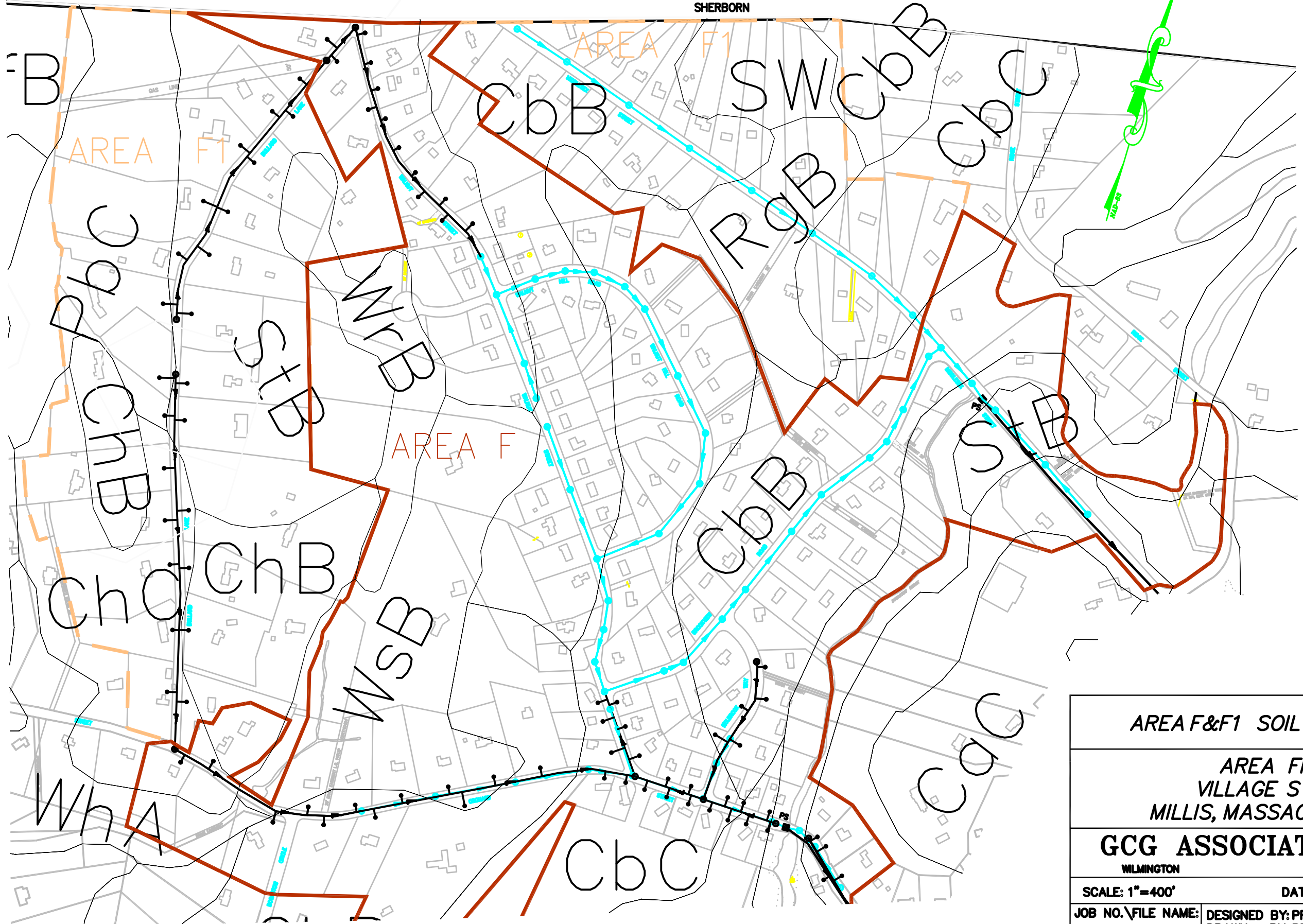
To connect to the existing sewer along Orchard Street or Middlesex Street, any proposed sewer option in Area F would require a pump station to cross Bogastow Brook, a natural low point.

Topography also isolates several areas within Area F that would eliminate a gravity sewer option and require some form of pressure or pumping to service these areas. These areas include Orchard Street at Bogastow Circle, Holbrook Way, and Walnut Street north of Walnut Hill Road. Soils found in Area F are shown in Table 2. The individual homes on the low pressure sewer system would be required to install a grinder pump on their property to connect to the system which could be an additional cost of \$7,000-\$10,000.

Table 2
Area F & FI Soil Survey

Service Area	Soil Type	Hydrological Group
F & FI	None	A
	CaB – Canton Fine Sandy Loam, 3 to 8% slopes CbB – Canton Fine Sandy Loam, stony, 3 to 8% CbC – Canton Fine Sandy Loam, stony, 8 to 15%	B
	ChB- Charlton-Hollis-Rock Outcrop Complex, 3 to 8% ChC- Charlton-Hollis-Rock Outcrop Complex, 8 to 15% PbC – Paxton Fine Sandy Loam, stony, 8 to 15% RgB – Ridgebury Fine Sandy Loam, stony, 2 to 8% StB – Scituate Fine Sandy Loam, stony, 3 to 8% WrB – Woodbridge Fine Sandy Loam, 3 to 8% slopes WsB – Woodbridge Fine Sandy Loam, stony, 3 to 8%	C
	Sw - Swansea Muck, nearly level WhA – Whitman Fine Sandy loam, 0 to 5% slopes	D

SHERBORN



AREA F&F1 SOIL CONDITIONS

AREA FF1
VILLAGE STREET
MILLIS, MASSACHUSETTS

GCG ASSOCIATES, INC.
WILMINGTON MASSACHUSETTS

SCALE: 1"=400'

DATE: 09/06/2016

JOB NO. \FILE NAME:
1631-WORKING
AREA-FF1-SOILS

DESIGNED BY: PFB
DRAWN BY: PFB
CHECKED BY: M.J.C.

PLAN NO.
1 OF 1

Area F Sewer Option – One Pump Station

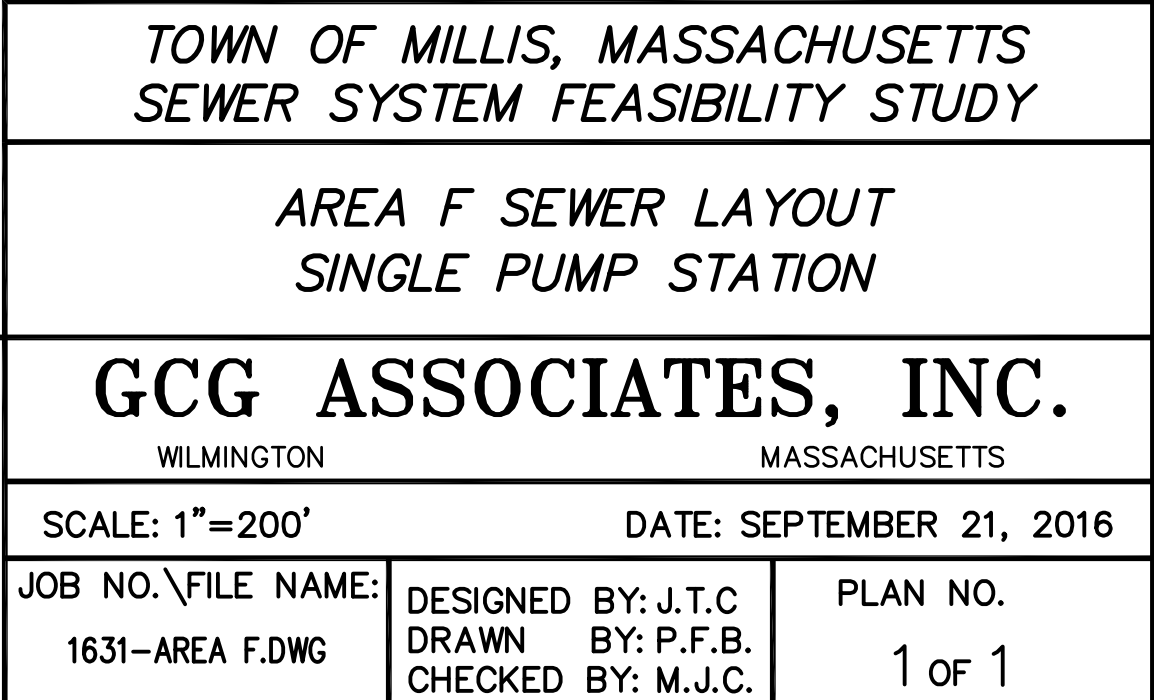
The proposed option for Area F is for one pump station located on Middlesex Street near Brookview Road where all sewage collection would flow to and be pumped to the existing gravity sewer on Middlesex Street.

The Middlesex Road pump station would service Middlesex Street, Brookview Road, Walnut Hill Road and Walnut Street south of Walnut Hill Road by a gravity sewer. Walnut Street north of Walnut Hill Road would be serviced by a low pressure system that would join the gravity sewer on Walnut Hill Road.

Orchard Street, Holbrook Way and Walnut Street south of Brookview Road would be serviced by a low pressure sewer system connecting to the gravity sewer at the Walnut Street/Brookview Road intersection. The portion of Orchard Street east of Bogastow Brook would be serviced by low pressure sewer to the Orchard Street gravity sewer and not the proposed Middlesex Street pump station.

A potential of 164 existing units would be served by this system with an additional 20 units based on possible future development. The sewer system consists of approximately 8,800 linear feet of gravity sewer, 5,800 linear feet of low pressure sewer, a pump station, 1,130 linear feet of force main sewer, and 35 manholes. The existing municipal pump station located on Middlesex Street may need to be upgraded to handle the additional flows from Area F.

We have prepared a cost estimate without cost of the E1 pumps for units connecting to the lower pressure system. The estimated the cost to construct Area F Sewer Option– One Pump Station without the E1 pumps is approximately \$4,320,000.



WASTEWATER FLOW AND BETTERMENT ANALYSIS - AREA F SERVICE AREA																			
Address	Owner	Map No.	Lot	ZONING BYLAW				Actual Lot Size			Existing Houses			Additional Development Potential	Vacant Land		Total Sewage Flow (gpd)	Total Betterment Units	Comments
				Zoning District	Min. Lot Size (acres)	Min. Lot Frontage (ft)	Min. Lot Depth (ft)	Actual Lot Size (acres)	Actual Frontage (ft)	Actual Depth (ft)	# of Ex. Houses	# of Bedrooms	Sewage Flow (gpd)		Estimated Potential Houses	Sewage Flow (gpd)			
80 Bullard Lane		3	9	R-S	0.57	125	200	1.4	205	570	1	3	330	No	0	0	330	1	
79 Bullard Lane		3	12	R-S	0.57	125	200	1.12	288	185	1	4	440	No	0	0	440	1	
80 Walnut Street		3	13	R-S	0.57	125	200	0.91	125	239	1	3	330	No	0	0	330	1	
85 Walnut Street		3	1	R-S	0.57	125	200	0.57	130.45	314.63	1	3	330	No	0	0	330	1	
83 Walnut Street		3	2	R-S	0.57	125	200	0.59	125	314.63	1	3	330	No	0	0	330	1	
81 Walnut Street		3	3	R-S	0.57	125	200	0.9	125	407	1	3	330	No	0	0	330	1	
57 Walnut Street		3	4	R-S	0.57	125	200	2.15	144	430	1	3	330	No	0	0	330	1	
127 Middlesex Street		3	5	R-S	0.57	125	200	0.76	125	411	1	4	440	No	0	0	440	1	
107 Middlesex Street		3	55	R-S	0.57	125	200	5.15	132	811	1	3	330	Yes	2	880	1210	3	
94 Middlesex Street		3	11	R-S	0.57	125	200	3.05	350	298	1	4	440	No	0	0	440	1	
60 Walnut Street		3	12	R-S	0.57	125	200	0.59	370.64	179.75	1	3	330	No	0	0	330	1	
58 Walnut Street		3	13	R-S	0.57	125	200	0.62	167	250.75	1	3	330	No	0	0	330	1	
56 Walnut Street		3	15	R-S	0.57	125	200	0.35	100	129.78	1	3	330	No	0	0	330	1	
54 Walnut Street		3	16	R-S	0.57	125	200	0.35	100	125.9	1	3	330	No	0	0	330	1	
52 Walnut Street		3	17	R-S	0.57	125	200	0.37	100	128.8	1	3	330	No	0	0	330	1	
55 Walnut Street		3	18	R-S	0.57	125	200	0.41	119.55	199.46	1	3	330	No	0	0	330	1	
26 Walnut Hill Road		3	19	R-S	0.57	125	200	0.59	126.13	177.92	1	4	440	No	0	0	440	1	
96 Middlesex Street		3	20	R-S	0.57	125	200	1.18	125	283	1	4	440	No	0	0	440	1	
20 Walnut Hill Road		3	21	R-S	0.57	125	200	0.72	125	208	1	4	440	No	0	0	440	1	
119 Middlesex Street		3	27	R-S	0.57	125	200	1.31	125	640	1	4	440	No	0	0	440	1	
121 Middlesex Street		3	28	R-S	0.57	125	200	1.23	125	570	1	3	330	No	0	0	330	1	
123 Middlesex Street		3	29	R-S	0.57	125	200	1.14	125	512	1	3	330	No	0	0	330	1	
125 Middlesex Street		3	30	R-S	0.57	125	200	1.04	125	450	1	4	440	No	0	0	440	1	
115 Middlesex Street		3	31	R-S	0.57	125	200	1.5	132	751	1	3	330	No	0	0	330	1	
135 Middlesex Street		3	32	R-S	0.57	125	200	0.69	225	304	1	3	330	No	0	0	330	1	
133 Middlesex Street		3	33	R-S	0.57	125	200	0.7	125	304	1	3	330	No	0	0	330	1	
131 Middlesex Street		3	34	R-S	0.57	125	200	0.72	125	370	1	4	440	No	0	0	440	1	
129 Middlesex Street		3	35	R-S	0.57	125	200	0.71	125	411	1	3	330	No	0	0	330	1	
103 Middlesex Street		3	36	R-S	0.57	125	200	1.13	181	268	1	4	440	No	0	0	440	1	
83 Middlesex Street		3	37	R-S	0.57	125	200	1.7	131	460	1	3	330	No	0	0	330	1	
136 Middlesex Street		3	41	R-S	0.57	125	200	0.99	69	193	1	2	330	No	0	0	330	1	
65 Walnut Street		3	42	R-S	0.57	125	200	0.83	128	355	1	1	110	No	0	0	110	1	
134 Middlesex Street		3	43	R-S	0.57	125	200	0.99	168	260	1	3	330	No	0	0	330	1	
53 Walnut Street		3	44	R-S	0.57	125	200	0.41	114	156.01	1	4	440	No	0	0	440	1	
132 Middlesex Street		3	45	R-S	0.57	125	200	1.06	125	370	1	4	440	No	0	0	440	1	
130 Middlesex Street		3	46	R-S	0.57	125	200	1.06	125	370	1	3	330	No	0	0	330	1	
128 Middlesex Street		3	47	R-S	0.57	125	200	1.06	125	370	1	3	330	No	0	0	330	1	
126 Middlesex Street		3	48	R-S	0.57	125	200	1.06	125	370	1	3	330	No	0	0	330	1	
124 Middlesex Street		3	49	R-S	0.57	125	200	1.06	125	370	1	4	440	No	0	0	440	1	
122 Middlesex Street		3	50	R-S	0.57	125	200	0.85	125	283	1	3	330	No	0	0	330	1	
59 Walnut Street		3	51	R-S	0.57	125	200	1.93	144	343	1	3	330	No	0	0	330	1	
61 Walnut Street		3	52	R-S	0.57	125	200	0.92	125	453	1	3	330	No	0	0	330	1	
63 Walnut Street		3	53	R-S	0.57	125	200	0.98	125	293	1	3	330	No	0	0	330	1	
91 Middlesex Street		3	54	R-S	0.57	125	200	1.54	131	382	1	4	440	No	0	0	440	1	
24 Walnut Hill Road		3	56	R-S	0.57	125	200	0.58	122.92	175.84	1	4	440	No	0	0	440	1	
22 Walnut Hill Road		3	57	R-S	0.57	125	200	0.75	128.2	228.85	1	4	440	No	0	0	440	1	
148 Orchard Street		6	3	R-S	0.57	125	200	1.69	200	346	1	8	880	No	0	0	880	1	
127 Orchard Street		6	19	R-S	0.57	125	200	1.41	216	340	1	4	440	No	0	0	440	1	
125 Orchard Street		6	20	R-S	0.57	125	200	1.4	204	299	1	4	440	No	0	0	440	1	
123 Orchard Street		6	21	R-S	0.57	125	200	1.44	227	291	1	4	440	No	0	0	440	1	
119 Orchard Street		6	23	R-S	0.57	125	200	1.52	212	350	1	4	440	No	0	0	440	1	
8 Walnut Street		6	30	R-S	0.57	125	200	9.7	123	182	1	6	660	Yes	2	880	1540	3	
172 Orchard Street		6	37	R-S	0.57	125	200	1.43	201	369	1	4	440	No	0	0	440	1	
174 Orchard Street		6	38	R-S	0.57	125	200	1.42	200	386	1	4	440	No	0	0	440	1	
170 Orchard Street		6	39	R-S	0.57	125	200	1.44	201	369	1	5	550	No	0	0	550	1	
44 Walnut Street		7	1	R-S	0.57	125	200	5	326	852.03	1	4	440	Yes	1	440	880	2	
47 Walnut Street		7	2	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	

WASTEWATER FLOW AND BETTERMENT ANALYSIS - AREA F SERVICE AREA																			
Address	Owner	Map No.	Lot	ZONING BYLAW				Actual Lot Size			Existing Houses			Additional Development Potential	Vacant Land		Total Sewage Flow (gpd)	Total Betterment Units	Comments
				Zoning District	Min. Lot Size (acres)	Min. Lot Frontage (ft)	Min. Lot Depth (ft)	Actual Lot Size (acres)	Actual Frontage (ft)	Actual Depth (ft)	# of Ex. Houses	# of Bedrooms	Sewage Flow (gpd)		Estimated Potential Houses	Sewage Flow (gpd)			
45 Walnut Street		7	3	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	
43 Walnut Street		7	4	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	
41 Walnut Street		7	5	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	
49 Walnut Street		7	6	R-S	0.57	125	200	0.41	100	181.01	1	3	330	No	0	0	330	1	
21Walnut Hill Road		7	7	R-S	0.57	125	200	0.59	135	254	1	4	440	No	0	0	440	1	
86 Middlesex Street		7	8	R-S	0.57	125	200	0.43	90	272	1	2	330	No	0	0	330	1	
82 Middlesex Street		7	9	R-S	0.57	125	200	0.67	125	278	1	4	440	No	0	0	440	1	
77 Middlesex Street		7	10	R-S	0.57	125	200	3.2	230	444.4	1	3	330	Yes	1	440	770	2	
80 Middlesex Street		7	11	R-S	0.57	125	200	0.59	151	195	1	4	440	No	0	0	440	1	
73 Middlesex Street		7	12	R-S	0.57	125	200	2	123	444.4	1	4	440	No	0	0	440	1	
30 Brookview Road		7	13	R-S	0.57	125	200	0.74	240	158	1	3	330	No	0	0	330	1	
39 Walnut Street		7	14	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	
37 Walnut Street		7	15	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	
22 Walnut Street		7	16	R-S	0.57	125	200	0.97	166.29	233.83	1	3	330	No	0	0	330	1	
33 Walnut Street		7	17	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	
31 Walnut Street		7	18	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	
29 Walnut Street		7	19	R-S	0.57	125	200	0.42	100	181.01	1	3	330	No	0	0	330	1	
25 Walnut Street		7	20	R-S	0.57	125	200	0.41	75	151.06	1	3	330	No	0	0	330	1	
19 Walnut Hill Road		7	21	R-S	0.57	125	200	0.59	138	254	1	4	440	No	0	0	440	1	
21 Walnut Street		7	22	R-S	0.57	125	200	0.41	114.7	161.06	1	2	220	No	0	0	220	1	
17 Walnut Street		7	24	R-S	0.57	125	200	0.67	246.8	212.4	1	3	330	No	0	0	330	1	
17 Walnut Hill Road		7	25	R-S	0.57	125	200	0.59	138	338	1	4	440	No	0	0	440	1	
11 Walnut Street		7	26	R-S	0.57	125	200	0.6	171.38	125	1	3	330	No	0	0	330	1	
28 Brookview Road		7	27	R-S	0.57	125	200	0.74	184	158	1	3	330	No	0	0	330	1	
56 Middlesex Street		7	28	R-S	0.57	125	200	1.42	400	160	1	3	330	No	0	0	330	1	
7 Walnut Street		7	30	R-S	0.57	125	200	0.34	114.3	125	1	3	330	No	0	0	330	1	
3 Walnut Street		7	31	R-S	0.57	125	200	0.34	100	150	1	6	660	No	0	0	660	1	
173 Orchard Street		7	33	R-S	0.57	125	200	19.05	780	1250	1	4	440	Yes	4	1760	2200	5	
189 Orchard Street		7	34	R-S	0.57	125	200	0.46	101	150	1	3	330	No	0	0	330	1	
193 Orchard Street		7	35	R-S	0.57	125	200	0.35	70.1	173	1	4	440	No	0	0	440	1	
200 Orchard Street		7	36	R-S	0.57	125	200	0.34	100	150	1	2	330	No	0	0	330	1	
204 Orchard Street		7	37	R-S	0.57	125	200	0.34	112.97	125	1	3	330	No	0	0	330	1	
206 Orchard Street		7	38	R-S	0.57	125	200	0.34	114.2	125	1	3	330	No	0	0	330	1	
208 Orchard Street		7	39	R-S	0.57	125	200	0.34	100	150	1	3	330	No	0	0	330	1	
212 Orchard Street		7	40	R-S	0.57	125	200	0.49	141	150	1	3	330	No	0	0	330	1	
48 Walnut Street		7	46	R-S	0.57	125	200	0.64	125	309.92	1	3	330	No	0	0	330	1	
88 Middlesex Street		7	47	R-S	0.57	125	200	1.26	85	530	1	4	440	No	0	0	440	1	
24 Walnut Street		7	48	R-S	0.57	125	200	0.68	108.03	240	1	4	440	No	0	0	440	1	
84 Middlesex Street		7	49	R-S	0.57	125	200	0.66	125	368	1	3	330	No	0	0	330	1	
14 Walnut Street		7	50	R-S	0.57	125	200	0.57	138	192	1	3	330	No	0	0	330	1	
12 Walnut Street		7	51	R-S	0.57	125	200	0.58	156	187	1	3	330	No	0	0	330	1	
10 Walnut Street		7	52	R-S	0.57	125	200	0.59	87	182	1	4	440	No	0	0	440	1	
6 Walnut Street		7	53	R-S	0.57	125	200	0.58	125	224	1	3	330	No	0	0	330	1	
4 Walnut Street		7	54	R-S	0.57	125	200	0.58	115	225	1	4	440	No	0	0	440	1	
24 Brookview Road		7	55	R-S	0.57	125	200	0.88	125	421	1	3	330	No	0	0	330	1	
20 Brookview Road		7	57	R-S	0.57	125	200	1.75	50	180	1	4	440	No	0	0	440	1	
18 Brookview Road		7	58	R-S	0.57	125	200	0.76	125	433	1	3	330	No	0	0	330	1	
16 Brookview Road		7	59	R-S	0.57	125	200	0.73	125	433	1	4	440	No	0	0	440	1	
14 Brookview Road		7	60	R-S	0.57	125	200	1.45	50	200	1	4	440	No	0	0	440	1	
12 Brookview Road		7	61	R-S	0.57	125	200	0.71	125	200	1	4	440	No	0	0	440	1	
10 Holbrook Way		7	62	R-S	0.57	125	200	0.86	137	85	1	4	440	No	0	0	440	1	
8 Holbrook Way		7	63	R-S	0.57	125	200	0.98	125	281	1	4	440	No	0	0	440	1	
6 Holbrook Way		7	64	R-S	0.57	125	200	0.78	125	281	1	4	440	No	0	0	440	1	
4 Holbrook Way		7	65	R-S	0.57	125	200	0.85	125	283	1	4	440	No	0	0	440	1	
2 Holbrook Way		7	66	R-S	0.57	125	200	0.97	125	316	1	4	440	No	0	0	440	1	
3 Holbrook Way		7	67	R-S	0.57	125	200	0.58	131	152	1	4	440	No	0	0	440	1	
5 Holbrook Way		7	68	R-S	0.57	125	200	0.58	274	152	1	4	440	No	0	0	440	1	

WASTEWATER FLOW AND BETTERMENT ANALYSIS - AREA F SERVICE AREA

Address	Owner	Map No.	Lot	ZONING BYLAW				Actual Lot Size			Existing Houses			Additional Development Potential	Vacant Land		Total Sewage Flow (gpd)	Total Betterment Units	Comments
				Zoning District	Min. Lot Size (acres)	Min. Lot Frontage (ft)	Min. Lot Depth (ft)	Actual Lot Size (acres)	Actual Frontage (ft)	Actual Depth (ft)	# of Ex. Houses	# of Bedrooms	Sewage Flow (gpd)		Estimated Potential Houses	Sewage Flow (gpd)			
8 Brookview Road		7	69	R-S	0.57	125	200	0.68	107	171	1	4	440	No	0	0	440	1	
6 Brookview Road		7	70	R-S	0.57	125	200	0.58	125	181	1	4	440	No	0	0	440	1	
4 Brookview Road		7	71	R-S	0.57	125	200	0.59	125	176	1	3	330	No	0	0	330	1	
3 Brookview Road		7	72	R-S	0.57	125	200	0.58	125	205	1	3	330	No	0	0	330	1	
5 Brookview Road		7	73	R-S	0.57	125	200	0.58	125	244	1	3	330	No	0	0	330	1	
7 Brookview Road		7	74	R-S	0.57	125	200	0.58	125	222	1	4	440	No	0	0	440	1	
9 Brookview Road		7	75	R-S	0.57	125	200	0.59	125	209	1	3	330	No	0	0	330	1	
11 Brookview Road		7	76	R-S	0.57	125	200	0.58	125	208	1	4	440	No	0	0	440	1	
22 Brookview Road		7	56	R-S	0.57	125	200	0.84	93	482	1	3	330	No	0	0	330	1	
15 Brookview Road		7	77	R-S	0.57	125	200	0.58	125	207	1	3	330	No	0	0	330	1	
17 Brookview Road		7	78	R-S	0.57	125	200	0.58	125	207	1	4	440	No	0	0	440	1	
19 Brookview Road		7	79	R-S	0.57	125	200	0.62	125	207	1	4	440	No	0	0	440	1	
21 Brookview Road		7	80	R-S	0.57	125	200	0.68	125	239	1	3	330	No	0	0	330	1	
23 Brookview Road		7	81	R-S	0.57	125	200	0.84	125	271	1	4	440	No	0	0	440	1	
25 Brookview Road		7	82	R-S	0.57	125	200	0.99	125	309	1	3	330	No	0	0	330	1	
27 Brookview Road		7	83	R-S	0.57	125	200	0.59	243	109.75	1	3	330	No	0	0	330	1	
26 Brookview Road		7	85	R-S	0.57	125	200	0.87	125	421	1	3	330	No	0	0	330	1	
176 Orchard Street		7	86	R-S	0.57	125	200	1.5	205	310	1	4	440	No	0	0	440	1	
178 Orchard Street		7	87	R-S	0.57	125	200	1.44	201	310	1	4	440	No	0	0	440	1	
180 Orchard Street		7	88	R-S	0.57	125	200	1.62	209	303	1	4	440	No	0	0	440	1	
15 Walnut Hill Road		7	90	R-S	0.57	125	200	0.59	125	332	1	4	440	No	0	0	440	1	
13 Walnut Hill Road		7	91	R-S	0.57	125	200	0.63	125	332	1	4	440	No	0	0	440	1	
11 Walnut Hill Road		7	92	R-S	0.57	125	200	0.78	130	338	1	4	440	No	0	0	440	1	
9 Walnut Hill Road		7	93	R-S	0.57	125	200	0.8	130	357	1	4	440	No	0	0	440	1	
7 Walnut Hill Road		7	94	R-S	0.57	125	200	0.95	178	383	1	4	440	No	0	0	440	1	
5 Walnut Hill Road		7	95	R-S	0.57	125	200	0.61	141.34	239	1	4	440	No	0	0	440	1	
3 Walnut Hill Road		7	96	R-S	0.57	125	200	0.6	123.38	352.83	1	4	440	No	0	0	440	1	
1 Walnut Hill Road		7	97	R-S	0.57	125	200	0.62	104.67	355	1	4	440	No	0	0	440	1	
4 Walnut Hill Road		7	98	R-S	0.57	125	200	0.64	125.36	138.74	1	4	440	No	0	0	440	1	
6 Walnut Hill Road		7	99	R-S	0.57	125	200	1.29	257.81	189.29	1	4	440	No	0	0	440	1	
8 Walnut Hill Road		7	100	R-S	0.57	125	200	0.8	125	246.01	1	4	440	No	0	0	440	1	
10 Walnut Hill Road		7	101	R-S	0.57	125	200	0.98	125	281	1	4	440	No	0	0	440	1	
12 Walnut Hill Road		7	102	R-S	0.57	125	200	0.86	125	281	1	4	440	No	0	0	440	1	
14 Walnut Hill Road		7	103	R-S	0.57	125	200	1	130	301	1	4	440	No	0	0	440	1	
16 Walnut Hill Road		7	104	R-S	0.57	125	200	0.72	125	295	1	4	440	No	0	0	440	1	
18 Walnut Hill Road		7	105	R-S	0.57	125	200	0.88	125	274	1	4	440	No	0	0	440	1	
92 Middlesex Street		7	106	R-S	0.57	125	200	4.06	125	380	1	4	440	No	0	0	440	1	
28 Walnut Street		7	108	R-S	0.57	125	200	0.72	125	247	1	4	440	No	0	0	440	1	
32 Walnut Street		7	110	R-S	0.57	125	200	7.84	176	943.03	1	4	440	Yes	2	880	1320	3	
30 Walnut Street		7	115	R-S	0.57	125	200	0.77	125	240	1	4	440	No	0	0	440	1	
60 Middlesex Street		7	118	R-S	0.57	125	200	3.58	352	160	1	4	440	No	0	0	440	1	
234 Ridge Street		8	14	R-S	0.57	125	200	7	1061.29		0	0	0	Yes	1	440	440	1	
199 Orchard Street		12	1	R-S	0.57	125	200	0.36	70	160.5	1	4	440	No	0	0	440	1	
203 Orchard Street		12	2	R-S	0.57	125	200	0.39	75	160	1	3	330	No	0	0	330	1	
205 Orchard Street		12	3	R-S	0.57	125	200	0.36	70	130.5	1	3	330	No	0	0	330	1	
207 Orchard Street		12	4	R-S	0.57	125	200	0.37	70	130.8	1	3	330	No	0	0	330	1	
211 Orchard Street		12	5	R-S	0.57	125	200	0.49	130.4	161.37	1	3	330	No	0	0	330	1	
216 Orchard Street		12	6	R-S	0.57	125	200	0.73	125	200	1	3	330	No	0	0	330	1	
220 Orchard Street		12	7	R-S	0.57	125	200	0.67	102.7	200	1	3	330	No	0	0	330	1	
226 Orchard Street		12	8	R-S	0.57	125	200	0.59	125	200	1	4	440	No	0	0	440	1	
219 Orchard Street		12	29	R-S	0.57	125	200	1.8	410	219	1	4	440	Yes	1	440	880	2	
Orchard Street		12	31	R-S	0.57	125	200	44.56			0	0	0	Yes	6	2640	2640	6	
											Existing Buildings			Potential Development			Sewage	Betterment	
						Average Lot Size:		1.27		Totals:	164	579	64020		20	8800	72820	184	
Assumptions																			
New House Design Flow				440 gpd (4 bedrooms)															
Existing House Design Flow				110 gpd/bedroom (330 gpd min value)															

WALNUT STREET AREA, OXFORD STREET, MIDDLESEX STREET

AREA F Option - Without E1 Pumps			Engineers Estimate	
Item Descript.	Units	Quan.	Unit Cost (\$)	Total Cost (\$)
8" SEWER MAIN PIPE - Less than 12' Depth	L.F.	8805	100.00	880,500.00
8" SEWER MAIN PIPE - Greater than 12' Depth	L.F.	0	200.00	0.00
6" SEWER SERVICE PIPE	EA.	66	1,500.00	99,000.00
LOW PRESSURE SEWER PIPE	L.F.	5800	50.00	290,000.00
LOW PRESSURE SEWER SERVICE	EA.	52	1,500.00	78,000.00
LOW PRESSURE PUMP	EA.	0	15,000.00	0.00
4' DIA. SEWER MANHOLE	EA.	43	3,800.00	163,400.00
FRAME AND COVER	EA.	43	750.00	32,250.00
8" MANHOLE DROP INLET	V.F.	0	100.00	0.00
6" SERVICE CHIMNEYS	V.F.	20	100.00	2,000.00
MIDDLESEX PUMP STATION & FM PIPING	L.S.	1	300,000.00	300,000.00
UPGRADE MIDDLESEX PUMPING STATION	L.S.	1	35,000.00	35,000.00
ROCK EXCAVATION	C.Y.	100	100.00	10,000.00
GENERAL EXCAV.	C.Y.	200	15.00	3,000.00
GRAVEL BORROW	C.Y.	200	25.00	5,000.00
RECLAIM/FINE GRADE	S.Y.	44200	6.50	287,300.00
2" TRENCH PAVING	L.F.	1770	12.00	21,240.00
2 1/2" BASE COURSE	TON	6630	95.00	629,850.00
1 1/2" TOP COURSE	TON	3980	95.00	378,100.00
BASE COURSE(HAND)	TON	300	160.00	48,000.00
TOP COURSE(HAND)	TON	200	160.00	32,000.00
TRAFFIC SYSTEM	L.S.	1	5,000.00	5,000.00
CONCRETE	C.Y.	10	100.00	1,000.00
POLICE	HR	2000	50.00	100,000.00
LOAM & SEED	S.Y.	5900	10.00	59,000.00
MOBILIZATION	L.S.	1	50,000.00	50,000.00
MISC. WORK	L.S.	1	50,000.00	50,000.00
EROSIN CONTROL	EA.	2650	10.00	26,500.00
TOTAL		84 work days		3,586,140.00
10% CONTINGENCIES				\$358,614.00
ENGINEERING DESIGN				\$175,000.00
CONSTRUCTION OBSERVATION				\$200,000.00
TOTAL SEWER PROJECT COST				4,319,754.00
20% Town Cost				863,950.80
80% Resident Cost				3,455,803.20
Betterment Cost per Unit		184	Units	\$18,781.54
Betterment Cost per Unit (With Middlesex St)				