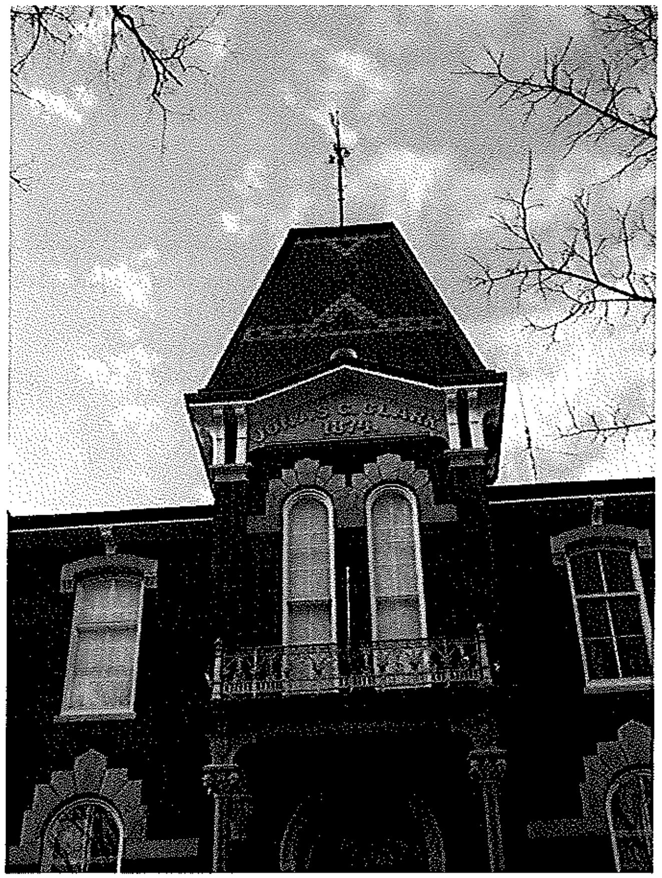
HUBBARDSTON TOWN CENTER PUBLIC WATER AND SEWER FEASIBILITY STUDY



Prepared by:

Montachusett Regional Planning Commission (MRPC)
and
Weston & Sampson

October 2011

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INTRODUCTION

The Town of Hubbardston has been working to develop more sustainable land use practices and the Hubbardston Town Center Public Water and Sewer Feasibility Study assists with this effort. The Town of Hubbardston has a vision to promote commercial development in their Town Center area, maintain its rural scenic character and move away from a suburban sprawl development model. To increase commercial development in the Town Center, the Town will need infrastructure to handle water demands and wastewater discharge. The Town's 2004 Community Development Plan identified the need for adequate infrastructure including water, sewer and drainage for retail business to locate in the Town Center to accommodate the needs of existing business and residential uses to mitigate sprawl of commercial development. The Hubbardston Town Center Public Water and Sewer Feasibility Study will provide guidance to fulfill this objective and the Town of Hubbardston has asked the Montachusett Regional Planning Commission (MRPC) to assist with this study.

On December 15, 2010, The Town of Hubbardston submitted a request for District Local Technical Assistance (DLTA) service from the Montachusett Regional Planning Commission. MRPC awarded DLTA to the Town of Hubbardston on December 30, 2010 to perform a Hubbardston Town Center Public Water and Sewer Feasibility Study. The DLTA program provides technical assistance at no cost to the Town of Hubbardston. The study was funded through the Massachusetts Department of Housing and Community Development (DHCD). The DLTA program was established by Chapter 205 of the Acts of 2006, which enables staff of Regional Planning Agencies (RPAs) such as MRPC to provide technical assistance to communities for "any subject within regional planning expertise." Additionally, this study was funded from $10,000 cash provided by Hubbardston and set aside by the town for this project.

The study provides the Town of Hubbardston with guidance for design, costs and funding sources for appropriate water and wastewater treatment in their town center. Suitable water and wastewater treatment will permit further business development and help the Town move away from sprawl development patterns. This study is a first step to provide public water and wastewater in Hubbardston's Town Center.

Public Outreach

Montachusett Regional Planning Commission held an initial kick-off meeting for the Hubbardston Town Center Public Water and Sewer Feasibility Study Project on May 23rd, 2011 at 10 AM at the Hubbardston Town Hall. There were additional phone and email contact with town officials regarding this study. A public meeting was held on November 21, 2011 at Hubbardston Town Hall to discuss the draft report. (See appendix for full list of scope of services including tasks and meetings.)

Consultant Hiring Process

In order for the Montachusett Regional Planning Commission to complete the Hubbardston Town Center Public Water and Sewer Feasibility Study, it required assistance from an engineering consultant. On February 17, 2011, MRPC issued a Request for Quotations (RFQ) for consultant services for the Hubbardston Town Center Public Water and Sewer Feasibility Study. The RFQ invited consultants to submit proposals by 1:00 PM on March 4, 2011, and included information on the project background, scope of services, specifications, evaluation criteria, general conditions that needed to be met, the contract period, price proposal requirements, and other miscellaneous articles. The RFQ was sent out by email to a list of 21 engineering firms. This list was compiled from CommPass, the State's Procurement Access and Solicitation System, a list of minority-owned and women-owned engineering business directory and from engineers who previously worked with MRPC.

RFQs were received by MRPC until 1:00 PM on Friday, March 4, 2011. Three proposals were received, opened and disseminated to MRPC staff for review. The following consultants submitted proposals:

- Weston & Sampson, 5 Centennial Drive, Peabody, MA 01960-7985
- New England Environmental Design, LLC, P.O. Box 376, Rutland, MA 01543
- Lenard Engineering, Inc., 19 Midstate Dr., Auburn, MA 01501

MRPC staff completed the evaluation, using pre-established criteria, on Friday, March 18, 2011. After evaluating all three consulting firms and opening their sealed bids, the hiring committee endorsed Weston & Sampson. Weston and Sampson has substantial experience with sewer feasibility projects plus a high degree of familiarity with the Montachusett Region especially with the completion of the Ashby Village Sewer Feasibility Study and the inter-municipal agreements relating to Fitchburg; it followed all written procedures in the RFQ, received excellent recommendations and illustrated in written form the necessary skills to best complete the tasks in the RFQ.

MRPC recommended that the Town of Hubbardston hire Weston and Sampson of Peabody, Massachusetts for consulting services described in the RFQ dated February 17, 2011 for the Hubbardston Town Center Public Water and Sewer Feasibility Study. The Town will pay Weston and Sampson directly out of the $10,000 set aside for the project. MRPC project assistance is funded by the MA Department of Housing and Community Development (DHCD) District Local Technical Assistance (DLTA) Program.

PROJECT AREA

The project area and parcels to be studied for the feasibility of alternatives to public water supply and wastewater collection, treatment, and disposal in the center of Town were chosen by the Town of Hubbardston in conjunction with the Montachusett Regional Planning Commission. The proposed project area is approximately 840 acres and contains 120 parcels. Its parcels have frontage on Gardner Road, Main Street and Worcester Road. The area includes:

- Single and multiple family homes and mobile homes
- Numerous businesses and offices
- Farmland and woodland
- Town Offices, library, police and fire stations (2), cemeteries (2) and recreation fields
- Center Elementary School
- Approximately 90 acres of developable vacant land
- Approximately 380 acres of watershed protection land
- Approximately 60 acres of undevelopable vacant land

A map of the proposed project area can be viewed in Figure 1.

WASTEWATER FLOW ANALYSIS

To determine which wastewater treatment options can be used in the project area, an estimation of the existing and projected future wastewater flows (in gallons per day (gpd)) were determined. The following paragraphs provide an explanation as to how these estimates and projections were calculated.

Existing Flow

Based on the available information pertaining to the existing properties within the project area and utilizing Title 5 regulations (the Department of Environmental Protection (DEP) State Environmental Code that regulates septic systems (310 CMR 15.00)), estimated wastewater flows for the existing properties have been developed (see Table 1). Based on these estimates, the current wastewater flows for the project area are approximately 45,200 gpd.

Based on these flows, a conventional Title 5 on-site wastewater disposal system to treat wastewater flows from the entire project area is not feasible since the existing flows exceed 10,000 gpd. Therefore, the potential alternatives for providing wastewater treatment for the project area are the connection to an existing sewer system of a neighboring community (if possible) or a wastewater treatment facility discharging to groundwater. Any sewage treatment facility discharging effluent greater than or equal to

Table 1
Town of Hubbardston, Massachusetts
Town Center Public Water and Sewer Feasibility Study
Estimated Wastewater Flows

K:\DLTA ROUND 4\Hubbardston Sewer and Water\From Engineer\[Copy of Table 1-Wastewater Flows.xls]

Map & Parcel Number	Assessor Code	Assigned Lot Number	Property Address	Property Description (1)(2)	Building Size (s.f.) (if applicable)	Lot Size (acres)	Misc. Title V Flow Information	Title V Flow Criteria Type	Title V Flow Criteria (gpd)	Estimated Title V Flows (gpd)	Future Wastewater Flows (3) (4) (gpd)
05-050	101	5	63 Gardner Road	Single Family House	3,372	17.00		Residential	110 gpd/bedroom	440	467
05-081	101	8	60 Gardner Road	Single Family House	2,542	5.00	House plus Auto Sales	Resident./Comm.	110 gpd/bedroom	440	467
05-C-020	101	22	11 Gardner Road	Single Family House	4,764	0.00		Residential	110 gpd/bedroom	440	467
05-C-089	101	44	35 Main Street	Single Family House	7,742	1.00	gas station/store (1 bay)	Commercial	125 gpd/bay	300	318
08-A-022	101	64	19 Main Street	Single Family House	4,420	0.00		Residential	110 gpd/bedroom	440	467
08-A-032	101	73	10 Main Street	Single Family House	4,608	1.00		Residential	110 gpd/bedroom	440	467
08-A-108	101	94	28 Worcester Road	Single Family House	4,926	19.00	house plus farmstand	Resident./Comm.	110 gpd/bedroom	440	467
11-A-001	132	119	Worcester Road	Undevelopable Land	0	52.00	-	Residential	-	0	0
05-079	322	6	52 Gardner Road	Department Store	853	6.00	Photographer	Commercial	50 gpd/1,000 sf (5)	200	212
05-048	1010	4	10 Ragged Hill Road	Single Family House	4,642	28.00		Residential	110 gpd/bedroom	440	467
05-046	1010	2	53 Gardner Road	Single Family House	2,864	2.00	House plus Strip Mall (6)	Resident./Comm.	110 gpd/bedroom	1,040	1,104
05-043	1010	1	49 Gardner Road	Single Family House	4,004	2.00		Residential	110 gpd/bedroom	440	467
05-101	1010	11	12 New Templeton Road	Single Family House	2,916	5.00		Residential	110 gpd/bedroom	440	467
05-C-24A	1010	52	8 New Templeton Road	Single Family House	2,570	2.00		Residential	110 gpd/bedroom	440	467
05-C-024	1010	26	6 New Templeton Road	Single Family House	2,828	3.00		Residential	110 gpd/bedroom	440	467
05-C-022	1010	24	17 Gardner Road	Single Family House	3,750	1.00		Residential	110 gpd/bedroom	440	467
05-C-021	1010	23	15 Gardner Road	Single Family House	3,359	1.00		Residential	110 gpd/bedroom	440	467
05-C-030	1010	31	14 Gardner Road	Single Family House	4,055	1.00		Residential	110 gpd/bedroom	440	467
05-C-018	1010	20	9 Gardner Road	Single Family House	3,194	0.00		Residential	110 gpd/bedroom	440	467
05-C-017	1010	19	7 Gardner Road	Single Family House	3,540	1.00		Residential	110 gpd/bedroom	440	467
05-C-016	1010	18	5 Gardner Road	Single Family House	4,308	2.00		Residential	110 gpd/bedroom	440	467
05-C-035	1010	36	4 Gardner Road	Single Family House	2,844	1.00		Residential	110 gpd/bedroom	440	467
05-C-015	1010	17	4 Williamsville Road	Single Family House	1,884	1.00		Residential	110 gpd/bedroom	440	467
08-A-041	1010	78	14 Main Street	Single Family House	3,485	13.00		Residential	110 gpd/bedroom	440	467
08-A-044	1010	81	26 Main Street	Single Family House	6,294	7.00		Residential	110 gpd/bedroom	440	467
05-C-092	1010	47	1 Williamsville Road	Single Family House	3,504	1.00		Residential	110 gpd/bedroom	440	467
05-C-091	1010	46	41 Main Street	Single Family House	2,232	3.00		Residential	110 gpd/bedroom	440	467
08-A-045	1010	82	30 Main Street	Single Family House	3,900	0.00		Residential	110 gpd/bedroom	440	467
08-A-042	1010	79	22 Main Street	Single Family House	3,640	1.00		Residential	110 gpd/bedroom	440	467
08-A-029	1010	70	4 Main Street	Single Family House	5,496	5.00		Residential	110 gpd/bedroom	440	467
08-A-043	1010	80	24 Main Street	Single Family House	2,722	0.00		Residential	110 gpd/bedroom	440	467
08-A-037	1010	77	20 Main Street	Single Family House	3,370	0.00		Residential	110 gpd/bedroom	440	467
08-A-036	1010	76	2 Maple Avenue	Single Family House	3,856	0.00		Residential	110 gpd/bedroom	440	467
08-A-035	1010	75	16 Main Street	Single Family House	2,295	0.00		Residential	110 gpd/bedroom	440	467
08-A-023	1010	65	17 Main Street	Single Family House	4,042	1.00		Residential	110 gpd/bedroom	440	467
08-A-034	1010	74	12 Main Street	Single Family House	4,015	0.00		Residential	110 gpd/bedroom	440	467
08-A-024	1010	66	15 Main Street	Single Family House	4,043	0.00		Residential	110 gpd/bedroom	440	467
08-A-12A	1010	96	11 Main Street	Single Family House	5,658	2.00		Residential	110 gpd/bedroom	440	467
08-A-025	1010	67	9 Main Street	Single Family House	5,342	1.00		Residential	110 gpd/bedroom	440	467
08-A-82A	1010	97	1 Worcester Road	Single Family House	5,308	2.00		Residential	110 gpd/bedroom	440	467
08-A-083	1010	89	2 Worcester Road	Single Family House	4,642	1.00	vacant house (for sale)	Residential	110 gpd/bedroom	0	440
08-A-084	1010	90	4 Worcester Road	Single Family House	4,581	1.00		Residential	110 gpd/bedroom	440	467
08-A-085	1010	91	6 Worcester Road	Single Family House	3,604	1.00		Residential	110 gpd/bedroom	440	467
08-A-109	1010	95	10 Worcester Road	Single Family House	6,138	10.00		Residential	110 gpd/bedroom	440	467
08-A-073	1010	87	15 Worcester Road	Single Family House	2,720	0.00		Residential	110 gpd/bedroom	440	467
08-A-088	1010	93	26 Worcester Road	Single Family House	6,233	32.00		Residential	110 gpd/bedroom	440	467
08-A-087	1010	92	24 Worcester Road	Single Family House	2,200	2.00		Residential	110 gpd/bedroom	440	467
08-C-013	1010	107	51 Worcester Road	Single Family House	5,219	3.00		Residential	110 gpd/bedroom	440	467

Table 1
Town of Hubbardston, Massachusetts
Town Center Public Water and Sewer Feasibility Study
Estimated Wastewater Flows

K:\DLTA ROUND 4\Hubbardston Sewer and Water\From Engineer\[Copy of Table 1-Wastewater Flows.xls]

Map & Parcel Number	Assessor Code	Assigned Lot Number	Property Address	Property Description (1)(2)	Building Size (s.f.) (if applicable)	Lot Size (acres)	Misc. Title V Flow Information	Title V Flow Criteria Type	Title V Flow Criteria (gpd)	Estimated Title V Flows (gpd)	Future Wastewater Flows (3) (4) (gpd)
08-C-060	1010	116	63 Worcester Road	Single Family House	4,568	2.00		Residential	110 gpd/bedroom	440	467
08-C-042	1010	112	65 Worcester Road	Single Family House	2,896	2.00		Residential	110 gpd/bedroom	440	467
08-C-043	1010	113	67 Worcester Road	Single Family House	2,752	2.00		Residential	110 gpd/bedroom	440	467
05-C-023	1030	25	19 Gardner Road	Mobile Home	1,108	1.00		Residential	300 gpd/home	300	318
05-C-033	1030	34	8 Gardner Road	Mobile Home	984	1.00		Residential	300 gpd/home	300	318
05-C-034	1030	35	6 Gardner Road	Mobile Home	1,284	1.00		Residential	300 gpd/home	300	318
05-C-89A	1040	53	37 Main Street	Two-Family House	5,939	1.00		Residential	110 gpd/bedroom	880	934
08-A-014	1040	57	31 Main Street	Two-Family House	3,488	2.00		Residential	110 gpd/bedroom	880	934
08-A-018	1040	60	27 Main Street	Two-Family House	5,112	0.00		Residential	110 gpd/bedroom	880	934
08-A-019	1040	61	25 Main Street	Two-Family House	5,261	0.00		Residential	110 gpd/bedroom	880	934
08-A-020	1040	62	23 Main Street	Two-Family House	5,616	0.00		Residential	110 gpd/bedroom	880	934
08-A-021	1040	63	21 Main Street	Two-Family House	3,930	1.00		Residential	110 gpd/bedroom	880	934
05-C-019	1060	21	Gardner Road	Access. Land with Imprv. - Garage	0	1.00		Residential	-	0	0
05-047	1090	3	57 Gardner Road	Multiple Houses on one parcel	2,376	3.00	Transportation co.	Residential	110 gpd/bedroom	440	467
08-A-027	1090	68	1 Main Street	Multiple Houses on one parcel	6,347	0.00	Vacant (two hses.)	Residential	110 gpd/bedroom	0	880
05-153	1300	13	Gardner Road	Developable Land	0	7.00	3 future homes (3)	Residential	110 gpd/bedroom	0	1,320
05-C-122	1300	48	Gardner Road	Developable Land	0	0.00	(7)	Residential	110 gpd/bedroom	0	0
05-C-025	1300	27	Gardner Road	Developable Land	0	2.00	1 future home (3)	Residential	110 gpd/bedroom	0	440
05-C-026	1300	28	Gardner Road	Developable Land	0	9.00	4 future homes (3)	Residential	110 gpd/bedroom	0	1,760
05-C-031	1300	32	Gardner Road	Developable Land	0	1.00	Below min. lot size (3)	Residential	110 gpd/bedroom	0	0
08-A-046	1300	83	28 Main Street	Developable Land	0	8.00	4 future homes (3)	Residential	110 gpd/bedroom	0	1,760
05-C-090	1300	45	Main Street	Developable Land	0	0.00	(8)	Residential	110 gpd/bedroom	0	0
08-A-031	1300	72	Main Street	Developable Land	0	0.00		Residential	110 gpd/bedroom	440	467
08-A-080	1300	88	Brigham Street	Developable Land	0	8.00	4 future homes (3)	Residential	110 gpd/bedroom	0	1,760
08-C-001	1300	98	Worcester Road	Developable Land	0	4.00	2 future homes (3)	Residential	110 gpd/bedroom	0	880
08-C-011	1300	106	Worcester Road	Developable Land	0	32.00	17 future homes (3)	Residential	110 gpd/bedroom	0	7,480
08-C-008	1300	104	Worcester Road	Developable Land	0	1.00	Below min. lot size (3)	Residential	110 gpd/bedroom	0	0
08-C-059	1300	115	Worcester Road	Developable Land	0	3.00	1 future home (3)	Residential	110 gpd/bedroom	0	440
11-A-168	1300	120	Worcester Road	Developable Land	0	7.00	3 future homes (3)	Residential	110 gpd/bedroom	0	1,320
10-006	1300	118	Worcester Road	Developable Land	0	8.00	4 future homes (3)	Residential	110 gpd/bedroom	0	1,760
05-082	1310	9	Garnder Road	Potentially Developable Land	0	1.00	Below min. lot size (3)	Residential	110 gpd/bedroom	0	0
05-100	1320	10	New Templeton Road	Undevelopable Land	0	1.00		-	-	0	0
05-C-125	1320	50	Gardner Road	Undevelopable Land	0	5.00		-	-	0	0
05-C-028	3160	29	26 Gardner Road	Warehouse	9,020	2.00	Pallet/Transport.	Commercial	75 gpd/1,000 sf (5)	680	722
08-A-047	3220	84	32 Main Street	Department Store	9,594	2.00	store, restaurant, salon, etc.	Commercial	(9)	1,620	1,719
05-C-088	3220	43	33 Main Street	Department Store	2,376	0.00	vacant store	Commercial	50 gpd/1,000 sf (5)	0	200
10-005	3220	117	72 Worcester Road	Department Store	2,989	2.00	vacant store	Commercial	50 gpd/1,000 sf (5)	0	200
05-C-032	3320	33	10 Gardner Road	Department Store	552	2.00	Constr. Equip. Sales	Commercial	50 gpd/1,000 sf (5)	200	212
05-C-060	3400	38	48 Gardner Road	Office Building	19,532	5.00	Vet/Salon/Fire/Vacant	Commercial	75 gpd/1,000 sf	1,465	1,555
05-C-036	3410	37	2 Gardner Road	Bank	3,604	0.00	Credit Union/Bank	Commercial	75 gpd/1,000 sf	270	287
05-19A	-	14	45 Gardner Road	Single Family House plus Farm Stand	-	-	The Country Hen	Resident./Comm.	110 gpd/bedroom	440	467
05-70A	1010	15	72 Gardner Road	Single Family House	-	-		Residential	110 gpd/bedroom	440	467
05-C-082	3410	39	36 Main Street	Bank	1,008	0.00	Zinnia's Bakery	Commercial	75 gpd/1,000 sf (5)	200	212
08-A-030	3500	71	6 Main Street	Postal Service	2,516	0.00	Post Office	Commercial	75 gpd/1,000 sf (5)	200	212
08-A-015	3900	58	Main Street	Developable Land	0	0.00		Commercial	75 gpd/1,000 sf (5)	0	200
05-080	4000	7	56 Gardner Road	Manufacturing	3,200	3.00	stove shop/sign shop	Industrial	75 gpd/1,000 sf	240	255
08-A-016	4300	59	29 Main Street	Telephone Exchange	1,359	0.00	Verizon	Industrial	75 gpd/1,000 sf (5)	0	0
08-C-034	6100	109	Worcester Road	Farmland	0	4.00		61	-	0	0

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Map & Parcel Number	Assessor Code	Assigned Lot Number	Property Address	Property Description (1)(2)	Building Size (s.f.) (if applicable)	Lot Size (acres)	Misc. Title V Flow Information	Title V Flow Criteria Type	Title V Flow Criteria (gpd)	Estimated Title V Flows (gpd)	Future Wastewater Flows (3) (4) (gpd)
05-152	7170	12	Gardner Road Cutoff	Productive Woodland	0	32.00		61A	-	0	0
05-C-123	9030	49	Gardner Road	Municipal	0	6.00	Recreation Field	Exempt	-	0	0
05-C-029	9030	30	Gardner Road	Municipal	0	5.00	Recreation Field	Exempt	-	0	0
08-C-003	9030	100	Worcester Road	Municipal	0	7.00	Cemetary	Exempt	-	0	0
08-C-033	9030	108	Worcester Road	Municipal	0	18.00	Leach Field w/ pumps	Exempt	-	0	0
08-C-035	9030	110	Worcester Road	Municipal	0	4.00	Cemetary	Exempt	-	0	0
08-C-036	9030	111	64 Worcester Road	Municipal	6,400	6.00	Highway Department	Exempt	-	200	212
08-A-011	9031	56	8 Elm Street	Municipal	6,326	7.00	School (603 persons)	Exempt	15 gpd/person	9,045	9,599
08-A-011	9031	56	7 Main Street	Municipal	11,280		Town Office, Library, Police	Exempt	75 gpd/1,000 sf	846	898
05-C-083	9032	40, 41, 42	38/40 Main Street	Municipal	4,842	0.00	Fire Station	Exempt	50 gpd/1,000 sf	242	257
05-C-014	9034	16	2 Williamsville Road	Municipal	5,836	1.00	Church (Closed)	Exempt	-	0	0
08-A-028	9034	69	2 Main Street	Municipal	6,532	1.00	Church (100 seats)	Exempt	3 gpd/seat	300	318
05-C-134	9150	51	Gardner Road	District Commission (Watershed)	0	83.00		Exempt	-	0	0
08-A-072	9150	85	Worcester Road	District Commission (Watershed)	0	20.00		Exempt	-	0	0
08-A-072	9150	86	Worcester Road	District Commission (Watershed)	0	20.00		Exempt	-	0	0
08-C-005	9150	101	Worcester Road	District Commission (Watershed)	0	62.00		Exempt	-	0	0
08-C-057	9150	114	Worcester Road	District Commission (Watershed)	0	32.00		Exempt	-	0	0
08-C-009	9150	105	Old Princton Road	District Commission (Watershed)	0	8.00		Exempt	-	0	0
08-C-005	9150	102	Worcester Road	District Commission (Watershed)	0	62.00		Exempt	-	0	0
08-C-005	9150	103	Worcester Road	District Commission (Watershed)	0	62.00		Exempt	-	0	0
08-C-002	9150	99	Off Worcester Road	District Commission (Watershed)	0	29.00		Exempt	-	0	0
									TOTAL (gpd):	45,228	68,836
									Total (gpm)	31.4	47.8

Notes/Assumptions:

1. Assume that all single-family homes are 4-bedrooms
2. Assume that all multi-family homes are multiples of 4-bedroom homes
3. Future wastewater flows for developable land parcels are based on one 4-bedroom home per 1.84 acres of parcel size in accordance with Hubbardston zoning requirements.
4. Future wastewater flows for all developed parcels are based on an assumed 6.1% growth rate over the next 20 years
5. Minimum Allowable GPD for System Design per Title 5 = 200 gpd
6. #53 Gardner Road includes a residential house plus a pizza place, chiropractor, and insurance agency.
7. Existing and Future Wastewater Flows for this lot are included in the flows for #48 Gardner Road.
8. Existing and Future Wastewater Flows for this lot are included in the flows for #41 Main Street.
9. Existing wastewater flows calculated using Title 5 allowable flows for retail stores, beauty salons, and restaurants.

10,000 gpd to the ground is subject to the DEP Massachusetts Clean Water Act regulations (314 CMR 5.00).

Future Flows (Developable Land)

Based on the available parcel information, there are 15 parcels that have been identified as "developable land" and 1 parcel that was identified as "potentially developable land." All 16 parcels are zoned as residential. These 16 parcels together equal 91 acres. In accordance with Hubbardston's zoning requirements, the minimum residential lot area is 80,000 square feet (sf) or 1.84 acres. Therefore, in order to generate the future wastewater flows for the developable land, we have assumed that the development of one single-family home with four bedrooms per 1.84 acres would be allowed. The future wastewater flows based on this assumption are 440 gpd per future home using Title 5 regulations for residential single-family dwellings (see Table 1).

Future Flows (Growth Projections)

In order to estimate potential future wastewater flows to be generated by the entire project area, available growth projections were utilized. Based on the 2011 Montachusett Regional Transportation Plan, the population in 2010 for the Town of Hubbardston was 4,382 and the projected population in 2030 is 4,650, resulting in a growth rate of 6.12% over the next 20 years. For the general purpose of this feasibility study, future wastewater flows were calculated based on this 6.12% growth rate.

Using the current existing wastewater flows, projected future wastewater flows for developable land and the 6.12% growth rate, the future wastewater flows (as presented in Table 1) are approximately 68,800 gpd.

WASTEWATER MANAGEMENT ALTERNATIVES

This section identifies potential long-term wastewater management alternatives for the properties within the project area. The alternatives investigated were:

- Alternative 1 – Title 5 repairs/upgrades
- Alternative 2 – Shared septic systems
- Alternative 3 – Decentralized wastewater collection, treatment and disposal
- Alternative 4 – Connection to a centralized wastewater collection system

This section includes a preliminary screening of the identified alternatives as well as a screening of potential wastewater treatment facility and effluent disposal locations.

Alternative 1 – Title 5 Repairs/Upgrades

The entire project area currently utilizes some type of on-site system for wastewater disposal. The existing Center Elementary School and the Town Offices, Police Station and Library all currently share a single septic tank and leaching area located off of Worcester Road. Under this alternative, on-site systems designed and maintained under Title 5 will continue to be utilized for the disposal of wastewater throughout the project area. The purpose of Title 5 is to "provide for the protection of public health, safety, welfare and the environment by requiring the proper siting, construction, upgrade, and maintenance of on-site sewage disposal systems and appropriate means for transport and disposal of septage." As detailed above, it is administered and enforced by the Massachusetts DEP in coordination with local approving authorities. In Hubbardston, the town's Board of Health acts as the local approving authority.

Alternative 2 – Shared Septic Systems

Provisions included in the Title 5 regulations allow for the construction of shared (also known as clustered) treatment and disposal systems. Shared systems require special approval from DEP, as well as legal agreements and documentation regarding ownership, maintenance, and other issues. Shared systems must be pumped once per year. The maximum design flow allowed under Title 5 for a shared system without acquiring a minor groundwater discharge permit is 10,000 gallons per day.

A conventional shared system would include a low-pressure or gravity collection system, a large septic tank, a dosing (pump) chamber, and a large soil absorption system (SAS). Each shared system would require an adequately sized "localized" parcel of land with suitable soil, geologic, and groundwater conditions for effluent disposal. For aggregated design flows over 5,000 gallons per day, leaching trenches are the only type of soil absorption system allowed by DEP. Assuming the use of leaching trenches, the footprint for a 10,000 gpd soil absorption system would be approximately 1 acre or more, including sufficient reserve area.

As discussed above, based on the estimated wastewater flows, one shared system is not a feasible alternative for the entire project area. Multiple shared systems would be required for the project area, if sufficiently sized sites that would be feasible for effluent disposal could be identified within or near the project area. As previously mentioned, the existing school, town offices, police station and library currently have a shared septic system. Based on the current estimated wastewater flows of 45,200 gpd, at least four additional sites with suitable conditions for effluent disposal would be required under this option.

Alternative 3 – Decentralized Wastewater Treatment

Large-scale wastewater treatment requires some form of a wastewater collection system to transport wastewater flows to a treatment plant. If wastewater flows in excess of 10,000 gpd are disposed of in one location, they require a groundwater discharge permit and a minimum of secondary treatment prior to discharge to a groundwater.

A package or small wastewater treatment facility refers to the assembly of various individual treatment process equipment into a compact area. Small facilities are found in the design flow range from individual facilities (300 gpd +/-) up to the range of approximately 100,000 gpd. Small facilities can achieve the same level of treatment as larger municipal wastewater treatment facilities; however, they must be monitored effectively by a certified operator. DEP design requirements necessitate redundant equipment for design flows in excess of 40,000 gpd and local regulations necessitate redundant equipment for design flows in excess of 10,000 gpd. Redundancy increases the complexity of the facility operation and associated capital and operating cost.

A typical custom wastewater treatment facility may consist of the following components:

- Preliminary treatment
- Primary treatment
- Flow equalization
- Secondary/advanced treatment
- Sand filtration
- Disinfection

The size and type of each of these processes will depend on the discharge permit conditions that will have to be met and the amount of flow to be treated. Disinfection may not be necessary for subsurface discharge. An operations building would typically include the electrical controls, a laboratory, operations office, effluent filtration equipment, solids dewatering equipment, and a utility/equipment storage room.

The amount of land required for the wastewater treatment facility and related site items varies with the hydraulic treatment capacity of the plant. Potential size, cost, and siting of a treatment facility will be discussed in the following section.

Alternative 4 – Centralized Wastewater Treatment

Large-scale public sewer systems (municipal wastewater treatment plants) are centralized systems. Centralized systems generally serve established cities and towns and sometimes provide treatment and disposal services for neighboring sewer districts. Where appropriate, centralized systems are generally preferred to decentralized systems, as one centralized system can take the place of several decentralized systems. This makes the centralized systems more economical, allows for greater control, requires fewer people, and produces only one discharge to monitor instead of several. Although the town of Hubbardston does not have a centralized wastewater system and likely cannot justify the construction of such a system, a potential alternative is to connect the project area to an adjacent community, such as the town of Rutland.

Wastewater Collection Alternatives

This section identifies the wastewater collection alternatives typically utilized to convey wastewater from individual residences and businesses. All of the "off-site" alternatives for wastewater management that have been identified require the conveyance of wastewater from each property to a decentralized or centralized location for further treatment prior to effluent disposal.

The following technologies are typically utilized for wastewater collection and have been evaluated for use in this project:

- Conventional gravity sewers, pump stations, and force mains.
- Grinder pumps and low-pressure sewers.
- Combination of these technologies.

The following sections provide a description of each wastewater collection technology evaluated as part of this plan. Innovative, alternative (I/A) technologies, such as septic tank effluent pump (STEP) systems, vacuum sewer systems, and small diameter variable slope (SDVS) gravity sewer systems, were also investigated as part of this study, however they do not lend themselves well to the proposed project and are not recommended.

Conventional Gravity Sewers

A gravity sewer system consists of sewer lines that allow customers to discharge into a sanitary system consisting of gravity pipes, which flow downhill and are not pressurized, and manholes. Gravity sewer systems operate by collecting the wastewater via continuously sloped pipe, 8-inches minimum in diameter, and transport the wastewater to localized low points in the collection system. The design of a gravity sewer system is dependent on the velocity of the wastewater within the pipes. Minimum velocities (approximately 2 feet per second (fps)) are set to assure that suspended matter does not settle out in the conduit, while maximum velocities (typically 8-10 fps) are set to prevent excessive scouring of the pipe. Extremely flat or hilly terrain poses a problem to gravity sewer installations since the gravity sewers must continually slope downward. This results in the sewer becoming increasingly deep or the need for a wastewater pumping station. Pump stations are located at low points to collect and pump the wastewater to the next high point in the collection system, then the process of gravity flow resumes. Manholes are typically 4-foot in diameter and are spaced approximately 300- to 400-feet apart. Manholes are required to connect intersecting streets to the gravity systems. Depths of conventional gravity sewers and manholes typically range from 8- to 15-feet.

This alternative is, typically, the most cost-effective and reliable long-term option and allows for future service area expansion without significant upgrade requirements. Installation costs are impacted by the presence of ledge, high groundwater, poor soils, and severe topography that impacts the depth of excavation.

Grinder Pumps with Low-Pressure Sewers

A low-pressure sewer system (LPSS) has proven to be a viable alternative where implementation of gravity sewer systems is impractical and/or uneconomical. A LPSS includes small diameter pressure sewers fed by individual on-lot grinder pumps at each source or configured to serve multiple sources. A pressure sewer system makes use of small diameter piping, ranging in size from 1 ¼- to 4-inches in diameter, buried at a shallow depth following the profile of the ground. The pressure main and service pipe are generally manufactured from polyvinyl chloride (PVC) or high-density polyethylene (HDPE). The pressure sewer mains and laterals are buried just below the depth of frost penetration and will follow the contour of the ground. Typically, pressure sewers have a minimum of 5-feet of cover.

The LPSS is separated into branches of sewers of different sizes depending on the number of connections to each branch. Standard manholes are not required in a pressure sewer system. Instead, flushing connections/drain manholes are installed at the end of branches and at major changes in direction or changes in pipe diameter. Air relief/vacuum valve manholes are installed at high points in the system to allow trapped air to escape. Each customer utilizes a grinder pump for discharge of sewerage into the main. Each grinder pump unit is equipped with a grinder pump, check valve, tank, and all necessary controls. The units can be buried outdoors close to each customer's existing septic tank or cesspool, so the connection to the existing service pipe exiting the building can be made easily. The units can also be located inside the building. The grinder pump macerates the solids present in the wastewater, produces slurry, and discharges wastewater to the pressure sewer collection pipes. Depending on design flow, some commercial users may require a larger unit with increased reserve capacity. If a malfunction occurs, a high liquid alarm is activated. This alarm may be a light mounted on the outside of the building or an audible alarm that can be silenced by the customer. The customer will then notify the town or a town-approved technician or contractor to come and make the necessary repair.

A LPSS collects and transports the wastewater from each customer located in low points to the nearest gravity sewer or, if appropriate, to the decentralized wastewater treatment facility. Within the right-of-way, air relief manholes with air and vacuum valves would be installed at all high points, and flushing drain manholes would be installed at all low points. In addition, cleanout manholes would be installed approximately every 500- to 1,000-feet to provide access for periodic maintenance.

Grinder pumps and low-pressure sewers are increasingly prevalent due to the lower capital costs, long history of use, and adaptability in poor subsurface conditions (ledge, groundwater, etc.). Public acceptance may be lower due to the presence of a pump at each home or business. Additionally, pressure sewers rely on a consistent electrical power supply, and negative environmental impacts may occur during extended power failures due to the potential for backups and overflows.

Combination of Gravity Sewers and Grinder Pumps

The utilization of a combination of conventional wastewater collection system components, grinder pumps, and pressure sewers has proven to be a cost-effective approach on many recent projects in Massachusetts. These combined systems are designed to maximize the use of gravity sewers; however, where the topography or subsurface conditions (ledge, groundwater, etc.) warrant, a cost-effective approach is to utilize grinder pumps and low-pressure sewers to reduce capital construction costs. The evaluation of this approach is typically completed during the preliminary design of the collection system, when more detailed information (topographic mapping and borings) is available.

Effluent Disposal Alternatives

Wastewater treatment processes typically include effluent discharge facilities designed to minimize the impacts to nearby surface or ground waters. Potential impacts include groundwater mounding or increasing pollutant loads to a receiving water body. The following sections describe the available effluent disposal methods.

Surface Water Discharge

At this time, the DEP is not readily issuing any new surface water discharge permits. Therefore, this option was not considered as an alternative for this project.

Subsurface Discharge to Groundwater

The discharge of treated wastewater to groundwater is the most common option for the disposal of treated wastewater currently being permitted in Massachusetts. This disposal option would involve the discharge of highly treated effluent from a wastewater treatment facility into an infiltration bed or subsurface distribution system, designed to handle the design flows. For purposes of this discussion, the location of the discharge is considered independent of the location of the treatment facility since the treated effluent could be transmitted by force main to the infiltration bed or the subsurface distribution system.

The requirements for groundwater discharge of wastewater are outlined in the Groundwater Discharge Permit Program (314 CMR 5.00 and 6.00). The principal constituent of concern for groundwater discharges is nitrates, a primary component of treated wastewater. Potential sites for use as a groundwater disposal site must be comprised of sandy or gravely soils that exhibit medium infiltration rates. Sites that contain poor soil permeability, high groundwater levels, and ledge, inhibit the downward flow of water and are generally unacceptable. Soil properties can be amended by excavating and amending the soils in the discharge area; this approach may be infeasible for the larger systems designed for large wastewater flows but may be appropriate for small systems.

Wastewater Reuse

Another option is to reuse the wastewater for non-potable needs. With proper treatment, reclaimed wastewater demonstrates few health risks, while providing the community with an alternative water source. Typical methods of reuse include watering landscape and agriculture. The main problem with this option is that a backup system must be in place to handle the wastewater when it cannot be used for irrigation.

Due to New England's climate, the irrigation method cannot be used year round because the water cannot penetrate the frozen ground; therefore, a subsurface disposal system is still required for the entire quantity of effluent disposal. Since this option requires duplication of disposal areas, this option is not advised for use in Hubbardston.

SCREENING OF ALTERNATIVES

This section provides a screening of the wastewater management alternatives discussed above and analyzes their potential effectiveness in addressing the problems within the project area.

Title 5 Repairs/Upgrades Screening

This alternative relies on the continued use of Title 5 to regulate the design of new systems and repairs/upgrades to all systems throughout the project area. Although this alternative does not provide the same environmental benefit as may be found with alternatives that provide a significantly higher level of treatment prior to discharge to the groundwater, it was used as a "baseline" to evaluate the long-term capital and operations/maintenance costs of other alternatives.

Shared Septic Systems Screening

Shared septic systems can be used for a cluster of businesses where wastewater is collected and treated (conventional Title 5 or I/A technologies) and ultimately discharged using subsurface disposal. This category does not include a treatment plant; therefore, this alternative is for flows less than 10,000 gpd. Each shared system would require a "localized" parcel of land with suitable soil, geologic, and groundwater conditions for effluent disposal.

The current wastewater flow for the project area is 45,228 gpd with an anticipated future flow of 68,836 gpd. Based on these flows, shared septic systems do not appear to be a viable option for the project area since multiple shared systems would be required. It would be necessary to find multiple sufficiently sized sites that would be suitable for effluent disposal within or near the project area. As previously mentioned, the existing school, town offices, police station and library currently have a shared septic system. Based on the estimated existing wastewater flows, at least four additional sites with suitable conditions for effluent disposal would be required under this option. It would be necessary to identify at least three more effluent disposal sites within or near the project area to accommodate the projected future wastewater flows of 68,800 gpd.

Based on a quick review of tax assessor data, it does not appear that there are any town-owned parcels within the project area that would be feasible sites for effluent disposal. All vacant lots within the project area are zoned as either residential or commercial and are privately owned. In order to use these lots, it would be necessary for the town to purchase them or obtain easements from the current property owners. The existing shared septic system for the school, library, police station and town offices is located on a town-owned parcel of approximately 18 acres (Parcel 08-C-033), off of Worcester Road in the southern portion of the project area. As designed, this parcel was provided with a 100% expansion (reserve) area, however the remaining available land on this parcel would be limited by water bodies and wetlands. Based on the projected existing and future wastewater flows, this site does not appear to provide enough effluent disposal for the project area.

Feasible sites for effluent disposal may be available outside of the project area, however since this alternative will require numerous sites and additional costs to purchase land or easements, this alternative is not cost effective and, therefore, shared septic systems were not considered further for this project.

Decentralized Wastewater Treatment Screening

This alternative involves the use of decentralized wastewater treatment. As discussed above, this option requires some form of a wastewater collection system to transport flows to a treatment plant. For the purposes of this study, it will be assumed that the treatment plant would be designed for the projected future wastewater flow of 68,836 gpd.

Wastewater Treatment Facility Siting

The wastewater treatment facility must be sited to function properly and minimize potential impacts during construction and operations. The purpose of this section is to identify and screen alternative locations to site a treatment facility. Should the town decide to proceed with this alternative, a more in-depth screening is recommended, including subsurface borings. A general review of the assessor's maps and resource information was performed for the project area. The investigation was a preliminary screening that did not include soil testing or negotiations for the use of the land. Based on tax assessor data, it appears that there is one town-owned parcel within the project area that may be a feasible site for effluent disposal. This site is #64 Worcester Road, which is the site of the Hubbardston Highway Department (Parcel 08-C-36). The site is located at the southern end of the project area and opposite the existing shared septic system for the school, police station, library and town offices. The parcel encompasses approximately 6 acres of land. According to GIS data, the soils in the area consist of sand and gravel (see Figure 2). This parcel is surrounded by Priority Habitats of Rare Species and Estimated Habitats of Rare Wildlife (see Figure 3). This site may have enough land area available to accept the projected 68,836 gpd. Based on the location of this parcel, and the fact that it is municipally-owned, this site should be considered for further evaluation.

If the town is amenable to investigating private property (through easements) for the siting of the wastewater treatment facility, there may be other alternatives available; however the primary focus of this study was on town-owned land. According to GIS data, the majority of the soil in the project area is either till or bedrock (see Figure 4)

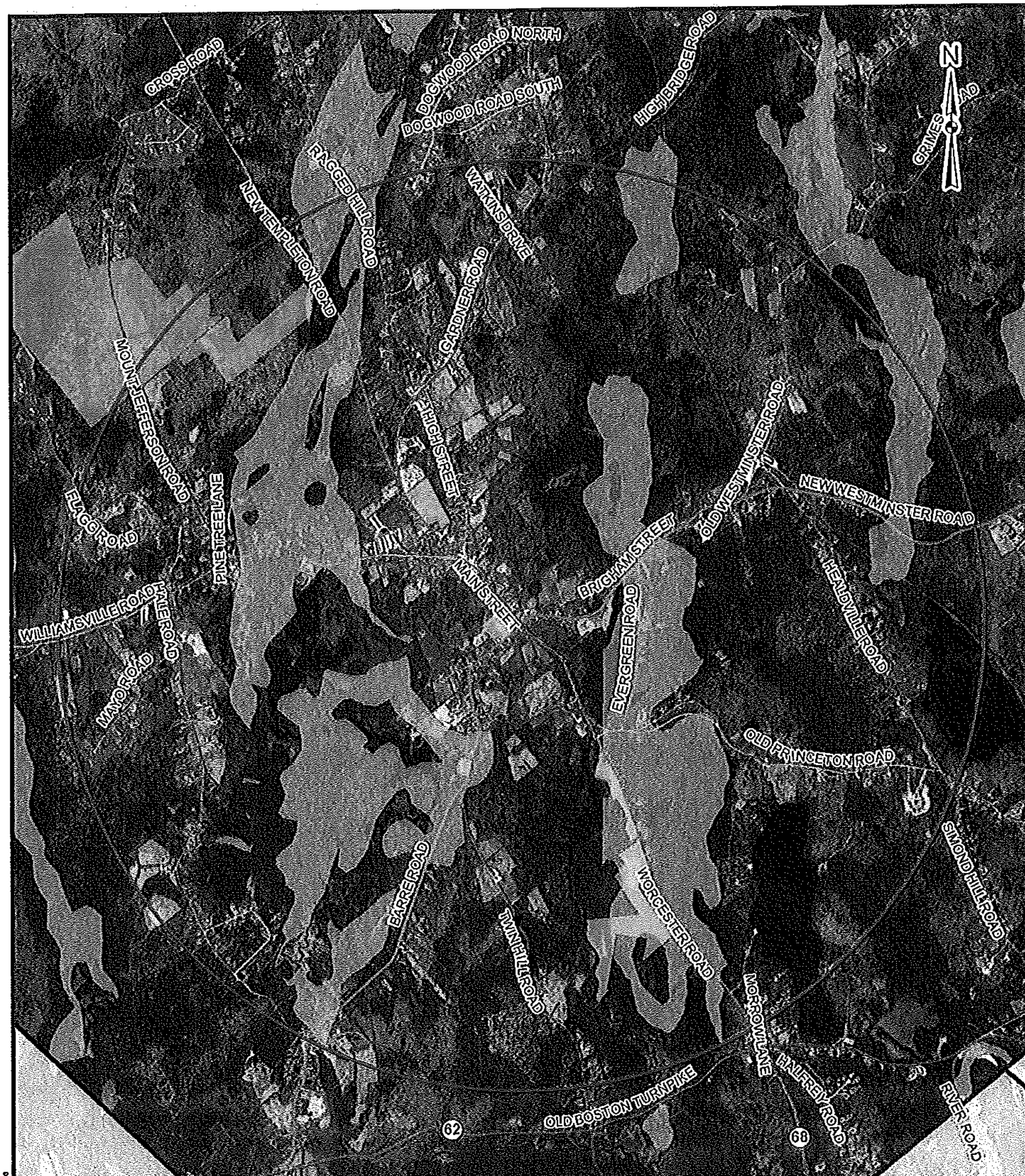


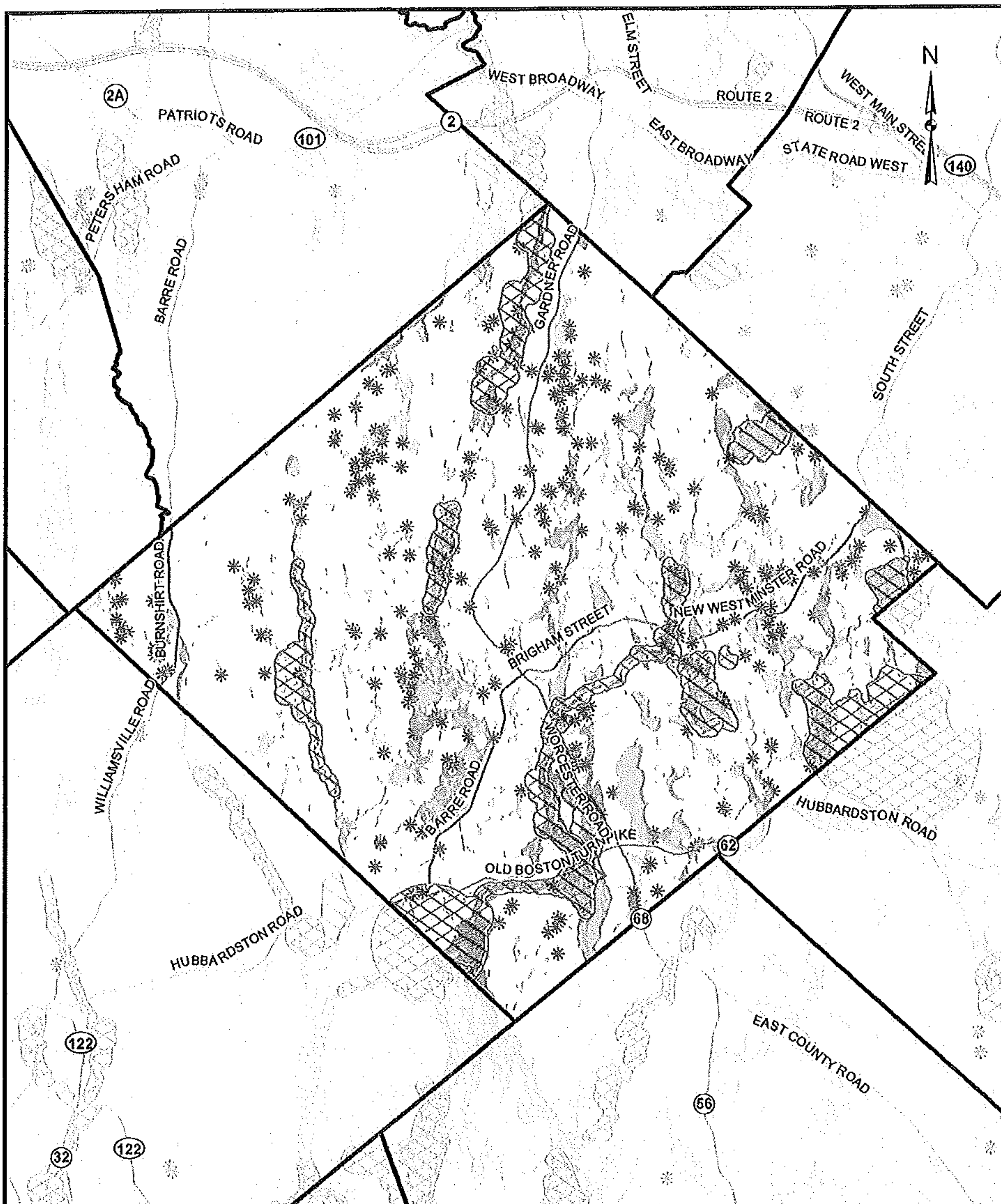
FIGURE 2
Hubbardston, MA

Municipal Open Land

- Towns
- 2 mile radius
- Municipal
- Sand and Gravel

Miles: 0 0.2 0.4 0.8 1.2

Weston&Sampson



* NHESP Certified Vernal Pools
- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- DEP wetlands
- 100-Year Flood Zone
- Towns

FIGURE 3
Hubbardston, MA

Environmental Receptors

Miles
0 0.5 1 2 3

Weston&Sampson

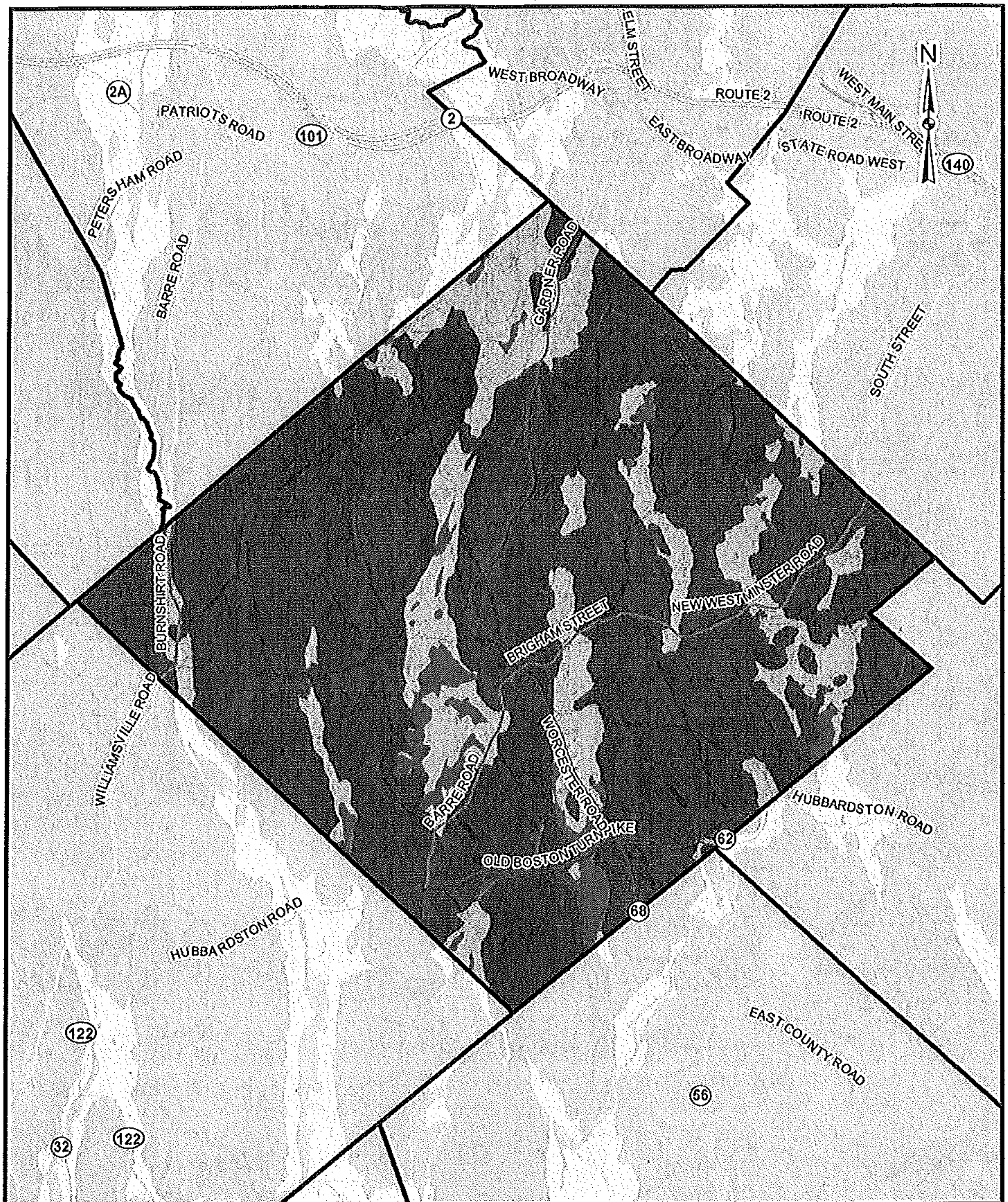


FIGURE 4
Hubbardston, MA

Surficial Geology

Towns
Sand and Gravel
Till or Bedrock
Floodplain Alluvium

Miles
0 0.5 1 2 3

Weston&Sampson

along Gardner Road and Main Street. There is, however, a significant amount of sand and gravel in the southern part of the project area along Worcester Road, south of Brigham Street. There are four vacant parcels along Worcester Road that may be suitable for the siting of the wastewater treatment facility. They are:

- Parcel 08-C-011 – approximately 32 acres
- Parcel 08-C-059 – approximately 3 acres
- Parcel 10-006 – approximately 8 acres
- Parcel 11-A-168 – approximately 7 acres

The parameters that should be used to evaluate sites for suitability are as follows:

- Land Area – The land area to site a facility would have be a minimum of 1 acre. Larger land areas are preferred because they will allow for reserve/open areas around the site.

- Proximity to Service Area – The proximity to the service area is important so the raw wastewater does not have to be conveyed significant distances prior to treatment.

- Proximity to Disposal Site(s) – The proximity to disposal sites is important to minimize the distance that the effluent must be pumped. However, more efficient pumps can be utilized to pump effluent than raw sewage therefore having a location that is closer to disposal is not as significant as the proximity to the service areas.

- Ownership – Town-owned land is preferential. Otherwise, private land or use thereof will have to be obtained by the Town for use as a facility site.

- Proximity to Residential Areas – The preferred siting of a treatment facility is away from developed residential areas. Even though treatment facilities can be designed and constructed to be aesthetically pleasing and non-odorous, preferential selection would be given to sites that are located away from residential areas.

- Minimal Adverse Construction Impacts – This parameter deals with the impacts that the construction of such a facility would have on the site and streets within the area. Areas that are tightly situated within existing developments would have higher impacts.

- Environmental Impacts – This parameter deals with the impacts that construction and operation of the facility would have on the surrounding environment.

Additional field investigations will be necessary to confirm the optimum area for subsurface disposal. For the time being, the Hubbardston Highway Department site will be considered for effluent disposal based on the assumption that an adequate effluent disposal site of sufficient size can be sited on this parcel.

Centralized Wastewater Treatment Screening

This alternative involves the connection to a centralized wastewater treatment system. As with a decentralized system, this option requires some form of a wastewater collection system to transport flows to a neighboring treatment plant. There are existing wastewater treatment plants that serve Templeton and Gardner. The town of Rutland, however, is the nearest neighboring town with a municipal sewer system. The town of Rutland is connected to the Upper Blackstone Wastewater Treatment Facility in Millbury, MA. Therefore, as discussed herein, this alternative would involve conveying flows from the project area to the town of Rutland. The nearest connection to the Rutland municipal sewer collection system is along Glenwood Road which is over 6 ½-miles from the southern portion of the project area. This alternative would eliminate the need for a local treatment plant and discharge site, however it would require a significant length of sewer pipe at a substantial cost and an Inter-Municipal Agreement (IMA) between the two towns. Due to the excessive amount of sewer required to connect to the Rutland system, this alternative does not appear to be a feasible option for the project area.

COLLECTION SYSTEM LAYOUT ALTERNATIVES

As discussed above, all of the "off-site" alternatives for wastewater management that have been identified require the conveyance of wastewater from each property to a decentralized or centralized location for further treatment prior to effluent disposal. This section of the report compares the various layout alternatives for conveying flows from the project area.

The major factors affecting collection system design are topography and cost. A conventional gravity sewer relies on a steady decrease in elevation to convey wastewater from a higher elevation to a lower elevation. When grades or excavation depths become excessive or cost prohibitive, mechanical means are typically introduced to lift wastewater flows from a lower elevation to a higher one. As detailed above, this can be accomplished by either running gravity sewers to a central pumping station at a common low point and discharging through a dedicated force main or through the use of multiple pumps at various elevations and locations, pumping into a common low-pressure sewer.

As part of this study, no topographic survey or soil explorations have been performed. Preliminary estimated costs have been developed for all viable alternatives for purposes of comparison and for use in making final recommendations.

Typically, the first exercise performed in determining the most appropriate sewer technology is to develop a profile of the proposed sewer route. Since no topographic survey has been performed for the project area, available USGS data (10-foot contours) has been utilized to estimate the direction of flow, as well as site visits to the project area.

Based on this information, it appears that the majority of the project area can be served by gravity sewers. It appears that one central pump station will also be necessary at the low point of the area. A small portion of the project may require low-pressure sewers. Figure 5 presents the proposed layout of the wastewater collection system.

Worcester Road

There is an existing 6-inch polyvinyl chloride (PVC) gravity sewer located in Worcester Road which conveys the wastewater flow from the existing school, police station, library and town offices to the shared septic tank and leaching field located on Parcel 08-C-033. This gravity sewer starts at the intersection of Elm Street, Worcester Road and Main Street. The topography of Worcester Road allows gravity flow for the entire stretch within the project area. The size of the existing gravity sewer, however, is not sufficient for the additional flows. As previously mentioned, the potential location of the decentralized wastewater treatment facility is the Hubbardston Highway Department parcel, located opposite the existing effluent disposal site along Worcester Road. Ultimately all wastewater flow from the entire project area would need to be conveyed to this location. Therefore, the size of the existing sewer would be inadequate by current standards. At a minimum, the existing 6-inch pipe would need to be increased to an 8-inch pipe in Worcester Road. The approximate length of gravity sewer in Worcester Road, from its intersection with Elm Street to the Hubbardston Highway Department, is 6,100 linear feet (lf). The lower portion of Worcester Road from the Hubbardston Highway Department to the southern extent of the project area may require approximately 800 lf of low-pressure sewer to convey wastewater flows to the Highway Department site.

Gardner Road and Main Street

Based on the existing topography, the majority of Gardner Street appears to be able to flow by gravity to a low spot located at its intersection with Williamsville Road and Main Street. A central pump station would be installed at this low spot to serve Gardner Road as well as Main Street. Based on our observations, it appears that the pump station could be installed on the town-owned fire station parcel located at #38/40 Main Street (Parcel 05-C-083). The site appears to have available land to site the pump station. Wastewater flow would then be pumped to the gravity sewer in Worcester Road and to the potential decentralized wastewater facility location at the Hubbardston Highway Department.

It appears that gravity sewer can be installed in Gardner Road from its intersection with High Street to the central pump station location. The approximate length of this gravity sewer in Gardner Road is 4,900 lf. Based on the existing topography, the upper portion of Gardner Road from its intersection with High Street to the northern extent of the project limit would likely require low-pressure sewer to serve the 11 parcels in this area. The approximate length of this low-pressure sewer is 2,300 lf.

Based on the topography, Main Street is relatively flat. However, based on our observations, it appears that it should be able to flow by gravity from its intersection with

LOW-PRESSURE GRAVITY
FORCE MAIN
PUMP STATION
WWTF

FIGURE 5
TOWN OF HUBBARDSTON, MASSACHUSETTS
SEWER AND WATER FEASIBILTY STUDY

PROPOSED WASTEWATER COLLECTION SYSTEM LAYOUT

SCALE: 1"=1,600'

O:\Hubbardston MA\Sewer&Water Study 2110314\Figure 5 updated.dwg

Elm Street to the potential pump station location at the Hubbardston Fire Station. The approximate length of the gravity sewer in Main Street is 1,750 lf. It would also be necessary to install a force main from the pump station to the gravity sewer in Worcester Road. The approximate length of the force main is 1,900 lf.

The following table presents a summary of the proposed wastewater collection system.

Table 2
Approximate Lengths of the Proposed Wastewater Collection System

STREET	GRAVITY (LF)	LOW-PRESSURE (LF)	FORCE MAIN (LF)	TOTAL (LF)
Gardner Road	4,900	2,300	-	7,200
Main Street	1,750	-	1,900	3,650
Worcester Road	6,100	800	-	6,900
TOTAL	**12,750**	**3,100**	**1,900**	**17,750**

COST SUMMARY

This section of the report includes planning level costs for each of the investigated alternatives:

- Title 5 repairs/upgrades
- Decentralized wastewater treatment
- Centralized wastewater treatment.

Title 5 Repairs/Upgrades

Historic repair costs have been utilized to develop the planning period costs for Title 5 repairs/upgrades. As discussed earlier in this report, this alternative was used as a "baseline" to evaluate the long-term capital and operations/maintenance costs of other alternatives.

Based on our experience, the cost of repair/upgrades to existing septic systems to be in compliance with current Title 5 regulations could range from $30,000 to $40,000. Therefore, for the purposes of this analysis, it was assumed that every property within the project area would require a conventional Title 5 repair/upgrade at an average cost of $35,000. It was also assumed that each "developable single-family home lot would require a new conventional Title 5 compliant septic system at the same average cost of $35,000. It is estimated that, if the entire project area were left to rely on Title 5 systems (133 properties), the overall capital cost to bring these systems into compliance would be approximately $4,655,000. For the purposes of this report, an annual maintenance cost of $500 will be assumed; therefore the total annual operation and maintenance costs borne by the individual property owners would be approximately $66,500.

Decentralized Wastewater Treatment

In order to prepare a preliminary budget level opinion of probable construction and operation and maintenance costs for the decentralized wastewater treatment alternative, the following assumptions were made:

- The collection system will be comprised of gravity sewers and low-pressure sewers located in Gardner Road and Main Street with one pump station required to convey flows to Worcester Road.

- The collection system will be comprised of gravity sewers and low-pressure sewers in Worcester Road.

- The project area requires approximately 17,750 lf of collection system pipeline (gravity, low-pressure and force main) to front all of the properties in the project area.

- The proposed pump station will be sited in the vicinity of the Hubbardston Fire Station on Main Street.

- The wastewater flows will be conveyed from the pump station site to the gravity sewer in Worcester Road which flows to a wastewater treatment facility and effluent disposal site at #64 Worcester Road, the Hubbardston Highway Department.

The cost for construction of the collection system has been estimated at $200 per foot of gravity sewer, $135 per foot of low-pressure sewer, $75 per foot of force main sewer, and $250,000 for each pump station. Based on the assumed quantities detailed above and in Table 2, the collection system will consist of approximately 12,750 lf of gravity sewer, approximately 3,100 lf of low-pressure sewer, approximately 1,900 linear feet of force main, and one pump station, resulting in an estimated collection system construction cost of approximately $3.4 million.

The cost of a 69,000 gpd packaged wastewater treatment plant permitted, designed and constructed under current local and DEP requirements, in accordance with requirements for municipally designed and constructed facilities, has been estimated between $2 million and $3 million, not including any land acquisition costs since it has been assumed to be sited on town-owned land.

Cost of additional required services were assumed as a percentage of the estimated construction cost as follows:

- Limited additional wastewater planning for Massachusetts Environmental Policy Act approval, final design (including detailed hydrogeological investigations, gro

(MEPA) undwater modeling, and permitting in addition to typical design services) at 15%.

- Construction services at 15%.

- Contingency at 10%.

This information is summarized as follows:

Table 3
Approximate Opinion of Probable Cost for Decentralized Wastewater Treatment Alternative

DESCRIPTION	COST ($)
Collection System	$3,400,000
Treatment Facility w/ Groundwater Discharge	$2,500,000
Construction Subtotal:	$5,900,000
Additional Services (40% of Subtotal)	$2,360,000
TOTAL:	$8,260,000

It should be noted that additional planning will likely be required for DEP and MEPA approval.

Operation and maintenance costs will be the responsibility of the users. Based on similar wastewater treatment facilities and collection systems in Massachusetts similar to the system identified above, it is estimated that the total annual operation and maintenance costs will be approximately $50,000 per year. These costs assume privatization of the wastewater treatment and collection system operation and maintenance. The costs also assume that state and local regulations apply.

Centralized Wastewater Treatment

In order to prepare a preliminary budget level opinion of probable construction and operation and maintenance costs for the centralized wastewater treatment alternative, the following assumptions were made:

- The collection system will consist of the same system as presented above for decentralized wastewater treatment.

- The project area requires approximately 17,750 lf of collection system pipeline (gravity, low-pressure and force main) to front all of the properties in the project area.

- One proposed pump station will be sited in the vicinity of the Hubbardston Fire Station on Main Street.

- Instead of a treatment facility located on the Hubbardston Highway Department property, a second pump station would be installed at this location to convey the wastewater flow via force main to the existing gravity sewer system in Rutland.

- The wastewater flows from Hubbardston will be conveyed approximately 6.5 miles (36,250 lf) from the pump station site to the nearest existing gravity sewer system in Rutland.

Again, the cost for construction of the collection system has been estimated at $200 per foot of gravity sewer, $135 per foot of low-pressure sewer, $75 per foot of force main sewer, and $250,000 for each pump station. Based on the assumed quantities detailed above and in Table 2, the collection system will consist of approximately 12,750 lf of gravity sewer, approximately 3,100 lf of low-pressure sewer, approximately 36,250 linear feet of force main, and two pump stations, resulting in an estimated collection system construction cost of approximately $6.2 million.

As with the decentralized alternative, the cost of additional required services were assumed as a percentage of the estimated construction cost as follows:

- Limited additional wastewater planning for DEP approval, final design (including capacity analysis on Rutland sewer system and permitting in addition to typical design services) at 15%.

- Construction services at 15%.

- Contingency at 10%.

This information is summarized as follows:

Table 4
Approximate Opinion of Probable Cost for
Centralized Wastewater Treatment Alternative

DESCRIPTION	COST ($)
Collection System	$6,200,000
Additional Services (40% of Subtotal)	$2,480,000
TOTAL:	$8,680,000

It should be noted that additional capital costs typically associated with IMAs have not been included in the projected cost of this alternative. Typically, there is an upfront capital cost to secure capacity within the neighboring treatment plant which in this case is the Upper Blackstone Wastewater Treatment Facility. Based on this information, the cost of this alternative could be significantly higher than presented above in Table 4.

The majority of the operation and maintenance (O&M) costs for this alternative will be the user fees paid to Rutland. Current fees could range from $75,000 to $100,000 per year depending on the amount of wastewater flow from Hubbardston. Assuming another $50,000 per year in O&M on the local Hubbardston collection system brings the total estimated annual O&M to between $125,000 and $150,000.

Table 5 presents an overall cost summary of the alternatives.

Table 5
Overall Cost Summary of the Alternative

OPTION	CONSTRUCTION	ANNUAL O&M
Title 5 Repairs/Upgrades	$4,655,000	$66,500
Decentralized Wastewater System	$8,260,000	$50,000
Centralized Wastewater System	$8,680,000	$125,000

FUNDING OPTIONS

There are several ways that the Town of Hubbardston can fund wastewater infrastructure projects. One way is through the Massachusetts State Revolving Loan Fund (SRF) sometimes called the Clean Water State Revolving Fund (CWSRF) Loan program which is administered by the Division of Municipal Services of the Department of Environmental Protection (DEP). This program provides subsidized loans to municipalities for various wastewater management projects including all the alternatives previously discussed in this report. The current interest rate of the subsidized loan is 2% for a term of 20 years. A Project Engineering Report (PER) is required to be considered for this program. The PER is discussed in more detail in the recommendations section of the report.

The Community Development Block Grant (CDBG) program can be another option to fund wastewater management in Hubbardston. It is a federally funded, very competitive grant program through the Department of Housing and Urban Development (HUD). It is designed to help small cities and towns meet a broad range of community development needs including construction or repair of sewer lines. Municipalities such as Hubbardston with a population of under 50,000 that do not receive CDBG funds directly from the HUD can apply for this funding. For a sewer construction project to be eligible for funding, it would need to benefit low and moderate-income persons. The town would need to conduct an income survey of the homes that will be affected by the infrastructure project to show that more than 51% of the residents are income eligible. CDBG grants range from $100,000 to $800,000 for infrastructure projects and can take at least several months to prepare (often times longer).

Funding is also available under the new "MassWorks Infrastructure Program." This program provides funding options for municipalities seeking public infrastructure funding to support economic development. The Program represents an administrative consolidation of the following six grant programs:

- Public Works Economic Development (PWED) Grants
- Community Development Action Grant (CDAG)
- Growth District Imitative (GDI) Grants
- Massachusetts Opportunity Relocation and Expansion Program (MORE)
- Small Town Rural Assistance Program (STRAP)
- Transit Oriented Development (TOD) Grant Program

The MassWorks Infrastructure Program provides grant funding for the construction, reconstruction and expansion of publicly owned infrastructure including, but not limited to sewers, utility extensions, streets, roads, curb-cuts, parking facilities, water treatment systems, and pedestrian and bicycle access. Eligible public infrastructure must be located on public land or on public leasehold, right-of-way, or easement. The project must be procured in accordance with Massachusetts General Laws c.30B, c.30 §39M, c.149, and c.7.

In each year, there will be a set-aside of funds available only for projects in small, rural communities, such as Hubbardston, with a population of 7,000 or less. The grant program shall also provide for commercial and residential transportation and infrastructure development, improvements and various capital investment projects under the Growth Districts Initiative established by the Executive Office of Housing and Economic Development.

The MassWorks Infrastructure Program is administered by the Executive Office of Housing and Economic Development, in cooperation with the Department of Transportation and Executive Office for Administration and Finance.

Primary funding rounds will open September 1st annually and decisions will be rendered approximately six weeks after the close of the application period. MassWorks Infrastructure Program applications will be available no later than May for the September funding round in that calendar year. The MassWorks Infrastructure Program may hold a second annual funding round to consider additional projects, and the availability of a second round will be announced as soon as the determination is made. Only those projects that are prepared to proceed to construction during the upcoming construction season should apply for consideration.

Communities with a population of 7,000 or less are eligible to apply for design/engineering costs along with a construction grant. In that case, the project must be able to complete design/engineering in a period that allows the project to advance to construction during the upcoming construction season.

In addition to these funding options for municipalities, there is also a program called the "MassHousing Septic Repair Loan" which is for individual home owners to pay for sewage disposal systems repairs or sewer connections. The loan program is only available for income eligible owner-occupied homes with failing septic systems. Depending on the household income the rates can be as low as 0% interest rate.

Table 6
MassHousing Septic Repair Loan Interest Rates for Hubbardston

Household income FAMILY SIZE	Household income 1-2 PERSONS	Household income 3 OR MORE
0% LOAN	$23,000	$26,000
3% LOAN	$46,000	$52,000
5% LOAN	$92,000	$104,000

*Source MassHousing "Homeowner Septic Repair Loan Program"

RECOMMENDATIONS

The recommended alternative to wastewater collection, treatment, and disposal in the center of town is a decentralized wastewater treatment system. As shown above, this alternative is a more cost-effective and technologically sound collection system for conveying wastewater from the properties located within the project area than the option of a centralized wastewater system. Several assumptions have been made as part of this initial Water and Sewer Feasibility Study, which should be further confirmed with field investigations and a more detailed report, such as a PER.

Recommended Plan of Action

The primary focus for moving this project forward remains finding a site that can accept and treat a sufficient volume of treated wastewater effluent. The conceptual layout previously outlined assumes that the Hubbardston Highway Department site at #64 Worcester Road is a viable site, but this still needs to be confirmed through additional hydrogeologic investigations. Understanding that the project is currently in the conceptual stage and any projections of schedule and timeframe are subject to wide variations, the remaining tasks to be considered in bringing the project to completion, with anticipated schedules and timeframes, are as follows:

- Town Meeting Authorization of Planning Funding - April 2012
- Site Screening/Hydrogeologic Investigations – Summer 2012
- Project Engineering Report (PER) – Fall 2012
- Town Meeting Authorization of Design Funding – April 2013

- MEPA Process – April thru July 2013
- Final Design and Permitting – July 2013 thru July 2014
- Submittal of Project Evaluation Form (PEF) – August 2013
- Groundwater Discharge Permit – September 2013 thru September 2014
- SRF Application (if necessary) – October 2014
- Town Meeting Authorization of Construction Funding – April 2014
- Public Bid/Award Process – January thru April 2015
- Construction – May 2015 thru December 2016

Town Meeting Authorizations

In order to move forward with the project, town meeting authorization will be required for additional wastewater planning. The town will need to appropriate money at the 2012 Annual Town Meeting for the site screening, hydrogeologic investigations, and Project Engineering Report (PER) tasks. In order to move beyond the PER phase of the project, additional town meeting authorizations will be required. With the conceptual design completed through the PER process, the town will be equipped with the information they need to appropriate monies for design and permitting of the project, including the MEPA process and the ground water discharge permit, at the 2013 Annual Town Meeting. Subsequent to that, sufficient progress should be made during 2013 such that anticipated construction costs will be available for consideration at the 2014 Annual Town Meeting.

Site Screening/Hydrogeologic Investigations

As discussed herein, no site screening or soil explorations have been performed as part of this study. Once a site or sites have been identified, preliminary borings should be performed to determine the feasibility of subsurface conditions for the disposal of treated wastewater effluent. The next step is to perform additional hydrogeological investigations to define the final design capacity that can be permitted under DEP's Ground Water Discharge permit process.

The initial step in this process is the development and submittal of a hydrogeologic work plan for DEP approval. This work plan will include test pits, percolation tests, shallow and deep observation wells, and a load scale test. Results of this testing will allow the development of a ground water flow model to predict final design flows and potential mounding impacts. All findings will be documented in a summary report.

PER Completion

In order to be considered for SRF funding and/or to navigate the MEPA process, some form of a Project Engineering Report (PER) is required. The hydrogeologic investigations discussed above also provide critical information for the final PER. The major tasks under the PER are as follows:

- Wastewater needs analysis

- Further evaluation of possible regional solutions (Rutland)
- Wastewater System Conceptual Design (based on results of hydrogeological investigations) & Estimated Costs
- Cost Allocation/Financing Alternatives
- Identification of Regulatory Issues
- Meetings/Public Participation

MEPA Process

With the PER complete and funding in place for final design and permitting of the project, the next step in getting authorization to construct the project is the Massachusetts Environmental Policy Act (MEPA) process. Based on the MEPA thresholds (see MEPA Regulations Section 11.03) it appears as though the best approach for this project is to submit an expanded Environmental Notification Form (ENF). Hopefully, an Environmental Impact Report (EIR) will not be required but if it is, it is assumed that it will be a single EIR.

It is anticipated that the MEPA process would commence in May 2013, upon completion of the PER and appropriation of necessary funding. The expanded ENF process can take anywhere from two to six months to navigate. If an EIR is determined to be required, this could add another six months or more to the process.

Final Design and Permitting

Assuming the MEPA process proceeds at a reasonable pace, initial comments from the MEPA unit could be secured as early as July 2013 and the project could proceed to final design and permitting at that time. Final permits would be secured by the Summer of 2014.

PEF Submittal

Understanding that the town might seek financial assistance for construction of the project through the State Revolving Fund (SRF) loan program of the DEP, a PEF submittal is the first step in that process. The PEF basically provides criteria to justify the environmental need for the project. PEF applications are typically due by mid- to late-August each year.

SRF Application

If the project were to qualify for SRF funding, the anticipation would be to have the final design (plans and specifications) ready for submittal with the SRF application in October 2014. SRF approval would be secured by the end of 2014.

Groundwater Discharge Permit

Submittal of a groundwater discharge permit requires completion of a significant portion of the treatment process design, including a detailed site plan, the actual infiltration system, a hydraulic profile of the process, and process flow diagram. Assuming that the design commences in July 2013 as discussed above, it is possible that the groundwater discharge permit process could commence in September 2013, with the hope of securing the actual permit by September 2014.

Bidding & Construction

It is not uncommon for projects of this nature to be divided into two separate construction contracts, one for the collection system and the other for the treatment system. Based on timeframes discussed above, it is anticipated that the advertising and bidding process could commence in January 2015 and continue through April 2015. Construction would commence in the spring of 2015 and continue through the end of 2016.

Preliminary/Conceptual Estimated Costs

Below is a further breakdown of the preliminary costs for a decentralized wastewater system. Please note that at the current conceptual stage of this project, there are a multitude of assumptions that could ultimately result in a wide variation in the cost of the project. At this time, based on the information discussed herein, our initial conceptual cost estimate is as follows:

Table 7
Estimated Costs for Engineering and Construction

DESCRIPTION	ESTIMATED COST
Hydrogeological Investigations	$75,000
PER	$50,000
MEPA Process (not including an EIR)	$75,000
Groundwater Discharge Permit	$75,000
Final Contract Documents (including permits & SRF)	$600,000
Collection System	$3,400,000
WWTF/SAS System	$2,500,000
Engineering Construction Services	$885,000
Police Details	$400,000
Land/Legal/Other	$200,000
TOTAL ESTIMATED COST TO COMPLETE:	**$8,260,000**

WATER SUPPLY ANALYSIS

To determine the feasible water supply options for the project area, an estimation of the existing and projected future water demands (in gallons per day (gpd)) is required. The following explanation details how these estimates and projections were calculated.

Existing Demand

Chapter 2 of the Massachusetts Department of Environmental Protection's "Guidelines for Public Water System's" states that "The system, including the water source and treatment facilities, shall be designed for maximum day demand at the design year." It also states that in respect to distribution systems, "all service connections shall have a minimum residual water pressure at street level of at least 20 pounds per square inch under all design conditions of flow." Current basis for system design in Massachusetts also must take into account the provisions of the Water Management Act. As of the writing of this document, the Act regulates withdrawals in excess of 100,000 gpd. However, it notes that this threshold volume may be adjusted downward at the discretion of the DEP in the future in order to protect the waters of the Commonwealth. Therefore, utilizing the following engineering practices for planning purposes is warranted.

Based on the information presented in the preceding section (Wastewater Flow Analysis) and as presented in Table 1, Title 5 wastewater flows for the project area were calculated. It is common engineering practice to use the Title 5 wastewater design flows as the basis for the peak water supply demand. Based on these estimates, the current existing wastewater flows for the project area are approximately 45,200 gpd, therefore the current peak water supply demand would also be equal to approximately 45,200 gpd for the entire project area.

Projected Build out Demand

Considering that the Title 5 wastewater design flows calculated in the previous section can be used as a surrogate for the peak water supply demand, the projected full build out water demand (as presented in Table 1) is approximately 68,800 gpd (48 gpm).

WATER SUPPLY ALTERNATIVES

This section identifies potential long-term water management alternatives for the properties within the project area. The alternatives investigated were:

- Alternative 1 – Individual Supplies
- Alternative 2 – Public Water Supply (Surface Water or Groundwater)
- Alternative 3 – Interconnection to Nearby Communities

This section includes a preliminary screening of the identified alternatives as well as a screening of potential water infrastructure needed for those sources of supply.

Alternative 1 – Individual Supplies

Currently, the entire project area is served primarily by individual drinking water supply wells. In addition, six low capacity public water supply systems are currently permitted as public water supplies by the Massachusetts Department of Environmental Protection (DEP). These public water supplies are listed in Table 8 below and are shown on Figure 6. Using the Interim Wellhead Protection Area Radius, the permitted rate of each of the withdrawals was determined and is listed in Table 8.

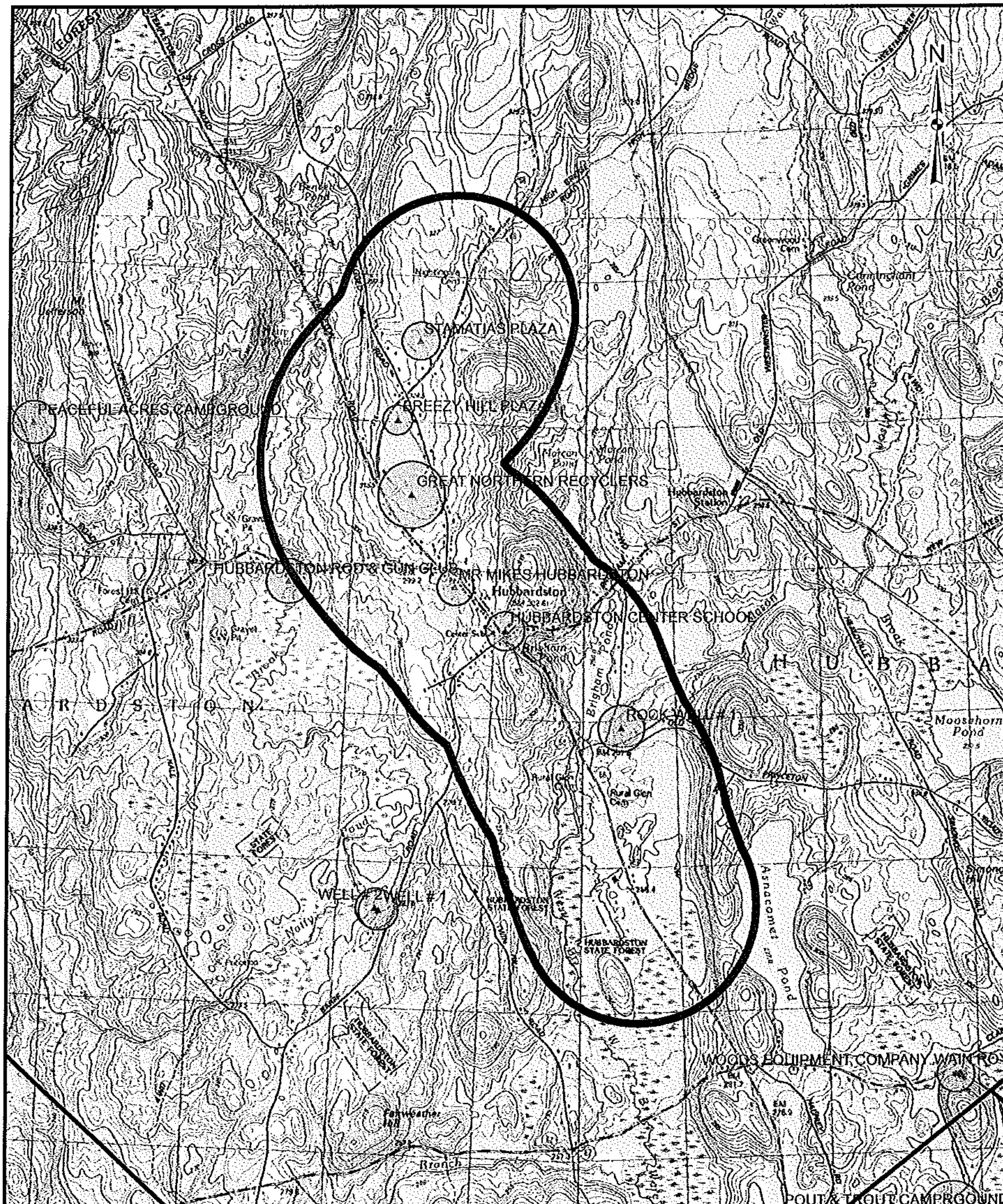
Table 8
Public Water Supplies in Study Area

SOURCE ID	SITE NAME	PWS TYPE	WITHDRAWAL RATE (GPM)
2140010-01G	Rock Well #1	Community Groundwater Well	4
2140007-01G	Great Northern Recyclers	Non-Transient Non-community	11
2140016-01G	Stamatias Plaza	Transient Non-Community	<1
2140015-02G	Breezy Hill Plaza	Non-Transient Non-community	<1
2140014-02G	Mr. Mikes	Transient Non-Community	<1
2140004-01G	Center School	Non-Transient Non-community	1

Comparing the permitted rates of withdrawal to the water demand indicates that none of the existing public water supplies are capable of providing the current and future water demand. This however does not necessarily mean that the wells in Table 8 are not capable of producing the required 48 gpm, simply that the wells are supplying the demand that the owner requires. A review of land area surrounding each of the public water supplies reveals that sufficient land area is not available for a Zone I sanitary protective area required by the DEP.

Although the individual source of supply is the cheapest alternative, it does not provide for fire flow, typically has water quality concerns (metals), and does not provide for redundancy in the event of a well failure.

Alternative 2a – Public Surface Water Supply Source



Study Area

PUBLIC WATER SUPPLIES

- ▲ Community Ground Water
- ▲ Community Surface Water
- ▲ Surface Distribution Site
- ▲ Non-Transient Non-Community
- ▲ Transient Non-Community
- ▲ Proposed Well

IWPAs

FIGURE 6
Hubbardston, MA

Existing Public Water Supplies & Associated Interim Wellhead Protection Areas

0 0.5 1 Miles

Weston&Sampson.

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Many of the surrounding communities have long established surface water reservoirs serving the community. In order to identify a feasible candidate for a water supply reservoir, an understanding of a potential site's contributing drainage basin area, storage capacity of the reservoir, precipitation and evapotranspiration rates, and streamflow contributions must be known. Often times, impoundments (dams) will be required to be constructed to achieve the desired storage capacity.

Drinking water regulations have been established to protect the health of customers consuming the public water supply. Surface water supplies generally have to meet more regulations and follow more guidelines than groundwater sources. The following list summarizes the major drinking water rules and the major components included in each rule.

Surface Water Treatment Rule (SWTR) and Interim Enhanced Surface Water Treatment Rule (IESWTR)

- Applies to public water systems supplied by surface water or groundwater under the direct influence (GWUDI) of surface water.
- IESWTR is an amendment to the SWTR that applies to systems that serve at least 10,000 people.
- WTP must achieve a 99 percent (2-log) removal of Cryptosporidium, 99.9 percent (3-log) removal of Giardia cysts and 99.99 percent (4-log) removal of viruses.
- Disinfectant residuals entering the distribution system have to be monitored continuously and cannot be less than 0.2 mg/L for more than 4 hours.
- Combined filter effluent turbidity must be measured at least once every four hours, and turbidity levels must be less than or equal to 0.3 NTU for at least 95 percent of the measurements per month with no turbidity samples exceeding 1 NTU at any time.
- Established disinfection contact time (CT) requirements based on water temperature, pH, and inactivation requirements for various disinfectants including ozone, chlorine, chlorine dioxide, and chloramines.
- Requires that disinfection profiling be conducted by any system whose one year running annual average of TTHMs or HAA5 levels are greater than or equal to 80 percent of the MCLs. The 80 percent thresholds for TTHMs and HAA5 are 64 μg/L and 48 μg/L, respectively.

Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)

- Applies to public water systems supplied by surface water or groundwater under the direct influence (GWUDI) of surface water.
- Rule provided additional public health protection from Cryptosporidium requiring systems to monitor their source water to determine potential additional treatment requirements for Cryptosporidium.
- Systems serving greater than 10,000 people must conduct two years of sampling for Cryptosporidium, turbidity, and E. Coli. Sampling is used to classify water

system into one of four different treatment categories called bins. Additional treatment may be required based on which bin a system is assigned.

Stage 1 Disinfection Byproduct Rule (Stage 1 DBPR)

- Applies to all public water systems.
- Set the MCL for TTHM at 80 µg/L and for HAA5 at 60 µg/L based on the running annual average (RAA) of quarterly samples.
- At least 25 percent of samples must be taken at locations with a maximum residence time within the distribution system; the remaining 75 percent of samples are collected at locations with an average residence time.
- Established requirements for Total Organic Carbon (TOC) removal from surface water and GWUDI systems using conventional treatment based on the RAA monthly raw water alkalinity and percent removals.

Stage 2 Disinfection Byproduct Rule (Stage 2 DBPR)

- Applies to all public water systems, but the number of required sampling locations is greater for surface water or GWUDI public water supplies.
- Requires water systems to meet "locational" running annual averages (LRAA) of 80 µg/L for TTHM and 60 µg/L for HAA5.
- Requires water system suppliers to conduct Initial Distribution System Evaluations (IDSE) to select new Stage 2 DBPR compliance monitoring locations that more accurately represent peak disinfection byproducts in the distribution system.

Total Coliform Rule (TCR)

- Applies to all public water systems.
- Established MCLs for the presence of total coliforms in drinking water. Systems must not find coliforms in more than five percent of the samples collected each month.
- The number of monthly samples collected are based on the population served.
- Each total coliform positive routine sample must be tested for the presence of fecal coliforms or E.coli.
- If any routine sample is total coliform positive, at least three repeat samples must be collected and analyzed for total coliforms. Repeat samples follow the same requirements of the initial routine samples.

The requirements of the rules and regulations were considered when evaluating the Town's future water supply alternatives as some regulations may make certain alternatives more difficult to implement. As a result of the aforementioned water quality regulations, this alternative requires extensive capital costs associated with water quality treatment in addition to the long term operations and maintenance costs once in operation. Additionally, the DEP has not issued a new permit for a surface water supply source in approximately 30 years, therefore this option was not considered further as an alternative for this project.

Alternative 2b – Public Groundwater Supply Source

The most common method of providing a municipal drinking water supply in New England is by locating a groundwater supply. This source water provides many benefits with respect to water quality, cost of treatment, and availability. Considering the subject area, two sources are available in including an overburden (sand and gravel) aquifer deposit and a fractured bedrock aquifer. These two will be treated separately in the following discussion.

Surficial Deposits: A municipal well has to be located in permeable material with adequate saturated thickness and sufficient long-term recharge. Sand and gravel deposits hydraulically coupled to surface water bodies are the first choice for municipal aquifers in the Northeast. With such aquifers, recharge is furnished not only by precipitation on the sand and gravel itself, but also by induced infiltration from an adjacent pond, lake, stream, or river.

Bedrock: Municipal wells in crystalline bedrock of the region must be located where the bedrock is sufficiently fractured to be permeable, and where there is a good source of recharge to such fractures. While the fractured bedrock is the permeable medium in which a well can be located, it is the overlying glacial sediments that provide the ground water storage, which sustains the yield of the well. Direct hydraulic coupling with surface water bodies is not desired in the case of fractured bedrock wells, but indirect coupling through glacial deposits is beneficial.

Given these fundamental hydrogeologic requirements, the general technical approach used by Weston & Sampson typically includes the following steps:

1.) Interpretation of aerial photographs and topographic maps to delineate:
   a. Permeable glacial deposits
   b. Pre-glacial bedrock channels potentially filled by sand and gravel
   c. Bedrock fracture zones (Fracture Trace Analysis)
   d. Hydraulic coupling among glacial deposits, bedrock fractures, and surface water
   e. Primary and secondary recharge areas
   f. Wetlands and floodplains where well construction is restricted

2.) On-site inspection and mapping to determine:
   a. Validity of remote sensing interpretations
   b. Detailed hydrogeologic information to improve well site selection
   c. Potential for groundwater contamination within area of contribution

d. Interpretation of water quality data incorporation of natural groundwater quality considerations (radon, iron, manganese, etc.) into water supply development strategies
e. Physical access to potential well sites for test drilling
f. Availability of electric power (3-phase is preferred for pump motors)
g. Likely availability of land for purchase at reasonable cost
h. Engineering practicality

3.) Geophysical investigations for identification of:
a. Saturated thickness and general texture of glacial deposits
b. Depth to bedrock
c. Depth to the water table
d. Bedrock fracture locations
e. Specific test well locations

The first step in the typical sequence of events is to identify one or more potential well site(s) that warrant further examination. These must not only be hydrogeologically favorable, but also suitable within all the practical constraints while including an awareness of nearby contaminant threats and potential water quality issues. Engineering and Town input is needed to properly recognize and evaluate the practical constraints.

Step two is to complete geophysical investigations if they are needed to pinpoint test well locations. For sand and gravel formations, various geophysical techniques can be used to determine depth to bedrock, saturated thickness, and general texture of the underlying materials. Drilling where the depth to bedrock is too shallow is not cost effective. Often times, geophysical investigations can reveal shallow bedrock conditions at less cost than installing a test well. In the case of bedrock formations, geophysics is used to improve our interpretations of aerial photographs and topographic maps.

Fracture-trace analysis is a photogrammetric technique for mapping fractures in bedrock. The technique uses stereoscopic aerial photographs that enable mapping of fractures that lie buried by overburden sediments. Weston & Sampson commonly uses fracture-trace analysis to locate high-yielding fracture zones in bedrock for development of municipal or industrial water wells.

Alternative 3 – Interconnections

Securing a sustainable, reliable, interconnection with one or more of the surrounding towns is another option for the Town. This option will save the Town money on the costs of water supply investigation, permitting, and the capital costs associated with water treatment, and infrastructure improvements. In addition, long term operations and maintenance costs are also reduced. Potential water suppliers will be discussed in the next section; however this alternative is considered to be a) a substantial capital cost to construct the distribution line b) would leave the Town beholden to another community for their water supply and c) would involve permitting associated with an interbasin transfer of water.

SCREENING OF ALTERNATIVES

This section provides a screening of the water supply alternatives discussed above and analyzes their potential effectiveness in addressing the problems within the project area.

Individual Supplies

This alternative relies on the continued use of individual supplies and small public water supply systems to provide the demand needed to supply the water needs of the town. If the project area were to be built out, additional supplies would be required to be developed and permitted (depending on the use). Although this alternative does not provide the same environmental benefit, nor does it encourage growth within the region or supply fire flows, it was used as a "baseline" to evaluate the long-term capital and operations/maintenance costs of other alternatives.

Public Water Supply

Public water supplies provide a benefit to the community from a water quality perspective, a growth perspective, and a safety perspective. Typically a public water supply will provide a higher level of treatment than a standard homeowner well

As mentioned previously, sand and gravel deposits are the first choice for municipal aquifers in the Northeast. In addition, considering a demand of approximately 48 gpm, a Zone I protective radius was calculated to be 376-feet for a total land area of approximately 10 acres. A cursory review of the project area was conducted in an effort to understand whether a Public Water Supply is feasible within the study area under consideration. Using existing information available from the Massachusetts Office of Geographic Information (MassGIS), parcels that met the following criteria were selected:

- > 10 acres (for Zone I protective radius)
- Overlying mapped sand and gravel deposits

The resultant four properties are shown on Figure 7 and are tabulated below.

Table 9
Favorable Town Owned Parcels for Water Supply

MAP	LOT	ADDRESS	BOOK / PAGE	AREA (AC)
8-C	*11*	*WORCESTER RD*	*18194/ 381*	*37.79*
8-C	33	WORCESTER RD	Not Available	20.38
11-A	1	WORCESTER RD	19184/ 377	36.81
11-A	168	WORCESTER RD	20837/ 137	10.39

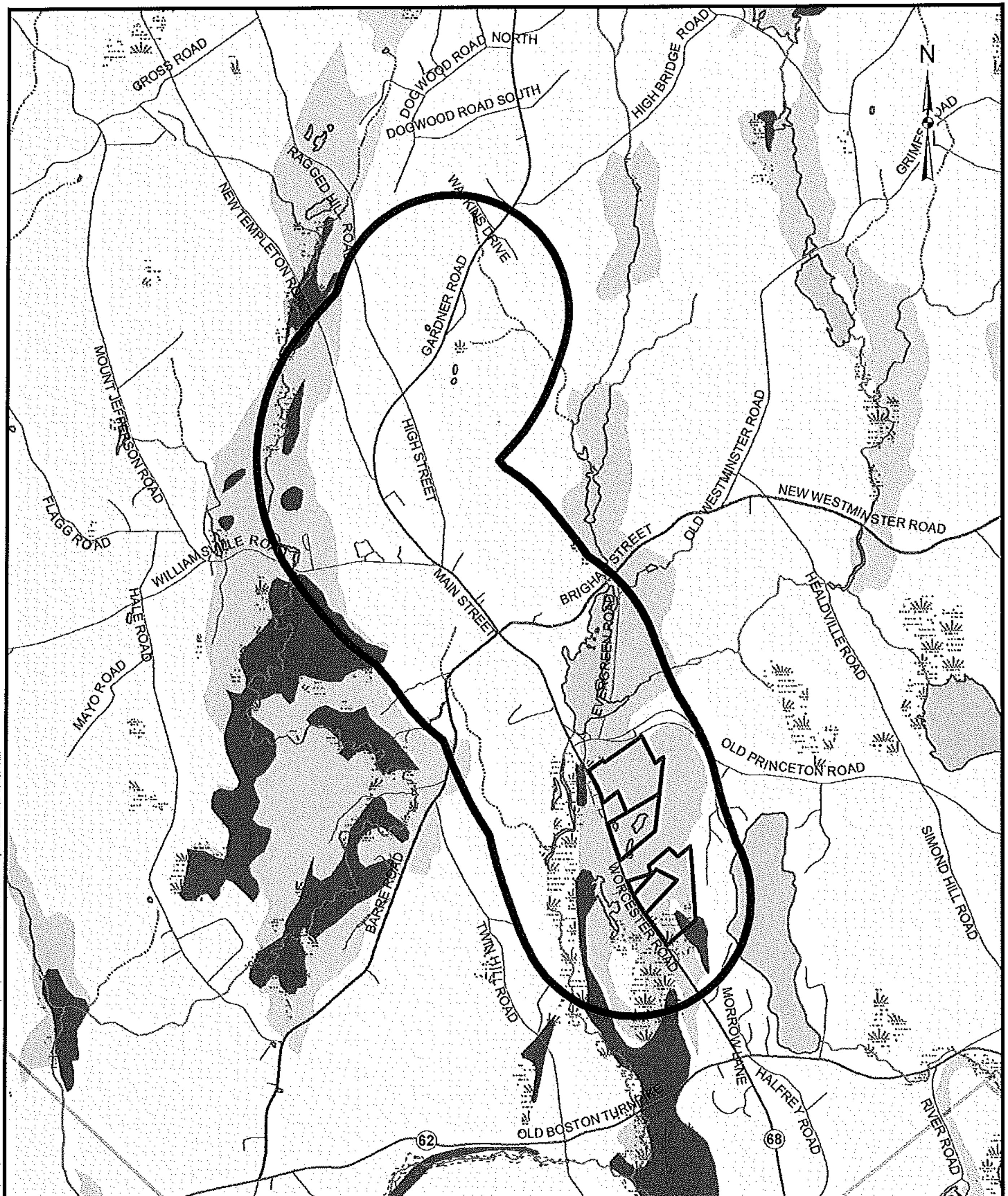


FIGURE 7
Hubbardston, MA

Favorable Town Owned Parcels for Groundwater Development

Parcels Greater Than 10AC with S&G

Surficial Geology (1:250,000)

- Sand and Gravel
- Till or Bedrock
- Sandy Till over Sand
- End Moraine
- Large Sand Deposit
- Fine-Grained Deposit
- Floodplain Alluvium

Study Area

Miles: 0 — 0.5 — 1

Weston&Sampson

Further consideration must be given to any planned wastewater discharge facilities in the vicinity of a proposed groundwater withdrawal to avoid impacts. Typically, a 200 day travel time is considered sufficient distance to filter the groundwater prior to withdrawal for public water supply. Using some basic assumptions about the aquifer properties in the area, a 200 day travel time would translate into a distance of approximately 1,000 feet. From an infrastructure perspective, Lot 11 on Map 8-C (Worcester Rd) is identified as the most favorable location for a public water supply. This site is large enough to accommodate a site specific search for the deepest, most transmissive deposit, a Zone I protective radius, and is close to the main artery when planning on distributing the water throughout the project area.

Interconnections

Our research has determined that of the surrounding communities, Templeton and Barre currently have public groundwater supplies and Rutland, Westminster, and Gardner currently have a public surface water supply source and distribution system (Figure 8). These communities could be approached to determine a) if they have surplus water to sell and b) negotiate a cost for the water. According to the 2010 Massachusetts Water Rate Survey, the aforementioned towns have the following retail rates.

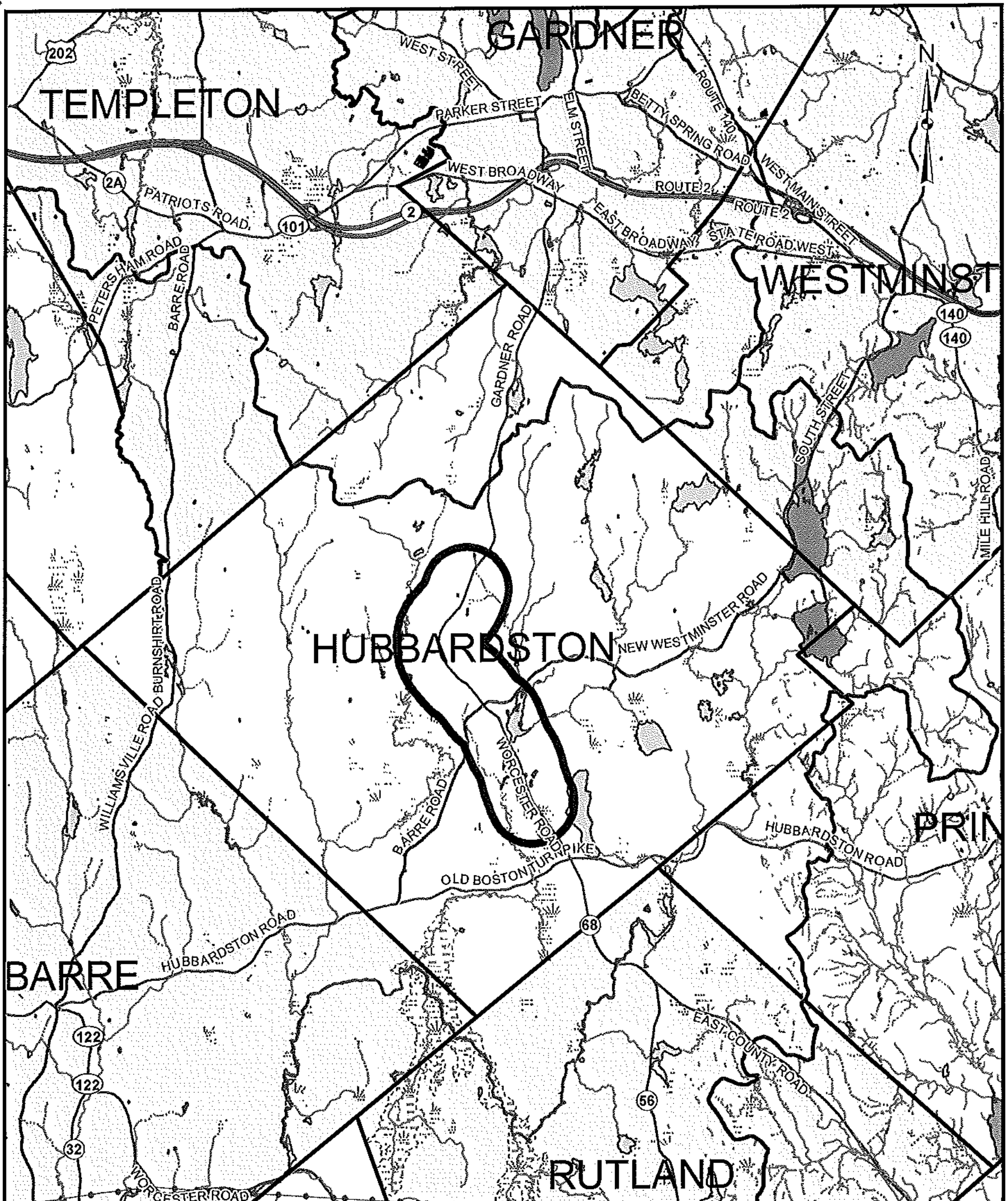
Table 10
Local Retail Water Rates

TOWN	SOURCE TYPE	RETAIL WATER RATE ($/1000 GALS)
Templeton	Groundwater	$6.70
Barre	Groundwater	$6.68
Rutland	Surface Water	$4.49
Westminster	Surface Water(1)	$5.50
Gardner	GW / SW	$5.96

(1) Purchased from Fitchburg

The primarily capital cost associated with this alternative will be the interconnection itself. Considerable distances from the north and south ends of the study area to these potential interconnections may make this alternative too costly to consider further. Disregarding whether local communities have a surplus of water to sell, the closest connection appears to be approximately 30,000 feet to the north to the Snake Pond Well in Gardner. A planning level cost for this connection would be approximately $6 million for the engineering and construction of the distribution main and approximately $500,000 for a pump station.

COST SUMMARY



Towns with PWS
Study Area
Major Basins

FIGURE 8
Hubbardston, MA

Communities with Public Water Supplies

0 2 4 Miles

Weston&Sampson

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This section of the report includes planning level costs for each of the investigated alternatives:

- Individual/Small Community Wells
- Public Groundwater Supply
- Interconnections

Individual / Small Community Wells

Considering that the individual and small community wells are already in place and operating, there is no additional capital cost for these sources. Future sources would however be necessary to supply undeveloped areas and to allow for potential growth. It is estimated, based upon the available developable land, that an additional 43 residential homes and some moderate increase in commercial water would be required at full Town buildout. Assuming, the average cost of a newly installed residential well, pump, and water softener is approximately $15,000, the projected additional cost for individual or small community well systems is $70,000. Annual O&M is quite low and is on the order of $100,000 distributed among the well owners.

As discussed earlier in this report, this alternative was used as a "baseline" to evaluate the long-term capital and operations/maintenance costs of other alternatives.

Public Groundwater Supply

Considering the available sand and gravel deposits within the project area, Weston & Sampson recommends pursuing investigation of a groundwater supply. A groundwater supply requires a hydrogeologic investigation to locate the most favorable deposits. This is followed by testing of aquifer yield and water quality to determine if the source is a) sufficient to supply the demand and b) able to provide high quality water to the public. Once a source is identified that meets the aforementioned criteria, the source must then be permitted through the DEP. Since the proposed withdrawal is less than 100,000 gpd, the permitting is fairly limited and would not require MEPA permitting. To consider a worst case scenario, the costs compiled for this alternative presume that the water will need treatment for iron and manganese.

Interconnections

As mentioned previously, once an agreement can be made with a local municipality with surplus water, the capital costs associated with an interconnection largely reside in the engineering and construction of water main in addition to a pump station. Table 11 below, provides an overall cost summary of the three alternatives discussed herein.

Table 11
Overall Cost Summary of the Alternative

OPTION	CONSTRUCTION	ANNUAL O&M
Individual Wells	$70,000	$100,000
Public Water Supply	$4,100,000 (1)	$150,000
Interconnection	$9,500,000 (2)	$200,000

(1) Includes well, permitting, treatment design and construction and water distribution system.
(2) Includes water distribution system design and construction and a pumping station.

FUNDING OPTIONS

Rural Development

The 1972 Rural Development Act established the Rural Development Insurance Fund under the Department of Agriculture to provide loans for wastewater and drinking water infrastructure. Today, Rural Development's Water and Environmental Programs (WEP) provides loans, grants and loan guarantees for drinking water, sanitary sewer, solid waste and storm drainage facility improvements in rural areas and cities and towns with populations of 10,000 or less. Public entities, non-profit organizations, and recognized Indian tribes may qualify for assistance. Rural Development has a number of funding and loan programs under its WEP umbrella. These include: (1) Direct Water and Waste Disposal Loan Program; (2) Water and Waste Disposal Grant program; and (3) Guaranteed Water and Waste Disposal Loan program.

U.S. Department of Housing and Urban Development

In 1974, the Department of Housing and Urban Development initiated the Community Development Block Grant (CDBG) Program. There are two available funding programs: (1) Community Development Block Grant - Entitlement Communities Grants; and (2) State Administered CDBGs which enable local and state governments to target their own economic development priorities. The rehabilitation of affordable housing has been the largest single use of these grants, with the CDBG program as an important catalyst for job growth and business opportunities for lower income families and neighborhoods. The programs identify a wide range of eligible activities, including the construction of public facilities and improvements, such as water and sewer infrastructure. It is estimated that roughly 10-20 of such block grants are utilized to support water and wastewater infrastructure.

Clean Water State Revolving Fund Program

The Clean Water Act Amendments of 1987 authorized the Clean Water State Revolving Fund (CWSRF) Program, an innovative method of financing for a range of water quality/wastewater environmental projects. Under the program, the EPA provides grants or "seed money" to all 50 states plus Puerto Rico to capitalize state loan funds. The states, in turn, use these funds in addition to a 20% match provided by the states to make low interest rate loans to communities for high priority water quality projects. As money is paid back into the revolving fund, new loans are made to other recipients enabling them to maintain the long-term integrity of their wastewater treatment and collection infrastructure.

Drinking Water State Revolving Fund Program

On a similar path, the Safe Drinking Water Act (SDWA) Amendments of 1996 authorized the Drinking Water State Revolving Fund (DWSRF) Program. Like the CWSRF program, the DWSRF allows states to make low interest loans with capitalization grant dollars and state match funds to public water systems for drinking water related infrastructure projects. By funding these infrastructure projects, the DWSRF program supports the goals of the SDWA by assisting public water systems achieve and maintain compliance with drinking water standards. This, in turn, helps to ensure a safe drinking water supply for the protection of public health nationwide.

RECOMMENDATIONS

The purpose of this planning level study was to determine the feasibility of various water supply options and to assess each option from a cost perspective. If the Town is interested in building out the central area of the town, the recommended alternative to water supply within the study area is a public groundwater supply. As shown herein, this alternative is a more cost effective approach for the Town and it provides added measure of safety (fire flow), health (water quality), and security (redundant water supply). Several assumptions have been made as part of this initial feasibility study which should be further confirmed with field investigations and a more detailed report.

CONCLUSIONS

The Town of Hubbardston has various options for wastewater management and water supply in its Town Center. For wastewater, these options are 1) Title 5 repairs/upgrades, 2) shared septic systems, 3) decentralized wastewater collection, treatment, and disposal, and 4) connection to a centralized wastewater collection system. If the town chooses to proceed with the suggested decentralized wastewater system, a wastewater treatment and effluent disposal site will need to be selected. For water supply the choices are 1) individual supplies 2) public water supply (surface or ground water) and 3) interconnection to nearby communities. If the town chooses to proceed with the suggested groundwater public water supply, a location for groundwater supply will need to be investigated. To move forward with either of these projects, the Town will need to decide on funding alternatives to pursue. Once these decisions are made and the Town sets forth to build a wastewater treatment system and supply public water, Hubbardston will be able to compact development in the Town Center and thus maintain its scenic rural character.

APPENDIX

Scope of Services - MRPC

Project Goal: Assisting in the development of a Town Center Public Sewer and Water Feasibility Study

Tasks

A. Procure an engineering consultant to provide the needed technical assistance to complete the Town Center Sewer and Water Feasibility Study.
B. Create and provide GIS parcel, zoning, soil and topographical maps of Hubbardston to determine appropriate boundaries for public sewer and water services and for the engineering consultant to conduct technical analysis.
C. Obtain tax assessor information from the Community about properties within the determined boundary area to be studied.
D. Investigate funding options for public sewer and water services
E. Complete a 90% draft of the Town Center Sewer and Water Feasibility Report for a 30-day-review by the Community.
F. Complete a final report including improvements and edits as provided by the Community by the contract's deadline.

Meetings

1) MRPC shall prepare and meet with appropriate Town officials at the outset of the project to gather information from the community and discuss parcel boundaries for public sewer and water services.
2) MRPC shall prepare and meet with the Town's designated single point of contact at the project's mid-point.
3) MRPC with the engineering consultant will prepare and present a draft report at one public meeting in the community prior to the projects deadline.

Scope of Services - Engineer

Project Goal: Develop Hubbardston Town Center Public Water and Sewer Feasibility Study

Public Water Study Tasks

1) Meet with MRPC to discuss project area and goals and to obtain available data.
2) Meet with MRPC and Town officials for a kick-off meeting for the project.
3) Estimate current and future water demands based upon population growth projections consistent with current DCR Standards.
4) Conduct a hydrogeologic screening evaluation of the entire town to identify sources of supply for a drinking water source. The study should evaluate surface water sources and aquifer types, size, and potential yield. Each potential source should be evaluated for all potential permit restrictions. Permitting restrictions should include ecologically sensitive contamination threats and impacts to surface water bodies or stream flow.
5) Evaluate economic and engineering feasibility for the development of each potential source of supply identified in task 3.0 above. The economic analysis should include capital costs for infrastructure including buildings, water mains, pumping and treatment. Select a preferred alternative.
6) Prepare a map-level system layout.
7) Evaluate distribution system requirements and public water-supply development requirements for the preferred alternative.
8) Provide data to MRPC which includes project narrative of work performed, system map, public water supply source location, soft and hard project costs and likely timeline.
9) Address comments after Town's review of draft report.
10) Present data for final report to the Town with MRPC at a public meeting.

Public Sewer Study Tasks

1) Meet with MRPC to discuss project area and goals and to obtain available data.
2) Meet with MRPC and Town officials for a kick-off meeting for the project.
3) Estimate current and future flow computations based upon 310 CMR 15, TR-16 and available growth projections.
4) Prepare a map-level collection system layout to include up to three recommended alternatives
5) Evaluate discharging systems and disposal options.
6) Develop a feasibility opinion of probable construction cost for each alternative.
7) Provide data to MRPC which includes project narrative of work performed, collection system map, treatment plant location, soft and hard project costs and likely timeline.
8) Address comments after Town's review of draft report.
9) Present data for final report to the Town with MRPC at a public meeting.