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November 3, 2018

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Board of Public Works
392 Mill Street Extension
Lancaster, MA 01523

**COMMUNITY DEVELOPMENT
AND PLANNING**

Re: Water Use Projection

Dear Board Members:

You have asked for our opinion of the expected demand on the water supply in advance of several major housing projects approved or pending for the Town of Lancaster. Your intent is to plan for the eventual service of these facilities. We offer the following evaluation of population growth, water demand and the projected demand based upon potential growth.

Based upon the Town Census (Street Listing) from 2018 and 2005, there has been a net reduction of 600 people served by the Lancaster Municipal Water System. Please reference the appended Population Change by Street attached. This list provides the count of persons expected to be on the water system.

- There is a trend for population reduction in the developed areas of town. This is likely due to family size reduction and empty nesters purchasing homes.
- Recent development at Blue Heron and the buildout of Eagle Ridge have added to the population, also with expected small family size.
- Now vacant residences and dorms in the Atlantic Union College campus have reduced the population served.
- The annual census for 2018 received an 84% return rate resulting in an undercount of the service population. The actual population served should be estimated at 16% higher than the street list count.

The population reduction and efforts toward leak detection and conservation have led to a slight downward trend in the average daily withdrawal from Wells 1 and 2.

The water use projection attached in Table 1 provides a summary of the major residential projects currently under construction or study within municipal service area. The projection results in the expected source withdrawal demand based upon the following inputs:

- The base population has been held with flat growth as a conservative approach despite a recent declining trend as a conservative capacity planning approach.
- The projected build out is based upon the expected number of bedrooms and an average population of 1.2 persons per bedroom

- The full build out is spread the next 3 to 8 years based upon the project type
- We have allowed 62 gallons per person per day based upon the average of the past 3 years of residential metered water sales divided by the adjusted 2018 system population
- A 0.18 MGD demand is added to the residential demand for unaccounted for water and commercial demands. This is based upon the average difference between residential sales and source demand for the past three years.

The historical source demand and the projected demand are provided on Figure 1. Upon buildout of the pending residential projects, the expected average source demand will be 0.58 MGD. The system is currently operating under its Water Management Act (WMA) permitted volume of 0.53 MGD. This is the registered volume of the Town. An additional 0.10 MGD is allowed prior to a WMA permit violation. The system can provide water to the pending residential projects without violating the Water Management Act.

An increase in the Water Management permitted withdrawal volume is contingent on the Town reducing its unaccounted for water percentage and possibly the average daily per capita volume. Future WMA permits will be tied to offsetting mitigation projects such as sewer infiltration reduction, groundwater recharge and similar offsets.

Based upon the Assessor Records (Tax Cards) there are 5,752 bedrooms currently served by the Lancaster Municipal Water System. Please reference the appended Population Change by Street attached. To estimate the potential service requirements of the system, the combined bedroom count of the existing system is added to the bedroom count of the proposed residential projects for a total of 6,428. At 1.2 persons per bedroom and 62 gallons per capita per day, the full residential demand is 0.48 MGD and the source demand is 0.66 MGD

At 16 annual average operating hours per day and 950 gallons per minute, the system has the pumping and well yield capacity to provide an average daily volume of 0.91 MGD. The existing wells and pumping equipment have the capacity to meet the full buildout of the existing service area and the pending residential developments.

The water system has the capacity to serve the proposed developments with the following considerations:

- The system is permitted to exceed the WMA by 0.10 MGD to a total of 0.63 MGD. While the projected withdrawals are below this value, low precipitation/high demand summer seasons may cause the Town to exceed this value.
- Conservation and similar water use reduction plans should be incorporated in to new residential and commercial developments
- Water use offsets (sewer infiltration reduction, groundwater recharge credits and other mitigation steps) should be sought from new developments to be applied to future WMA applications
- The Town's efforts to reduce its unaccounted for water volume should be continued.

A permit condition of approval should be applied to pending and future residential projects requiring direct mitigation of the proposed annual demand from the completed work. The mitigation should be in the form of

- recharge of storm water to the groundwater above and beyond that required by current stormwater management regulations
- recharge of treated wastewater to groundwater or
- removal of the infiltration or inflow of groundwater in to the municipal sewer system.

The mitigation should be on a gallon for gallon basis within the same sub-basin as the municipal withdrawals (Sustainable Water Management Initiative [SWMI] Sub Basin 11001). That sub-basin is generally the Nashua River South Branch to the Wachusett Dam, including the Goodridge Brook tributary.

Very truly yours,

HALEY AND WARD, INC.



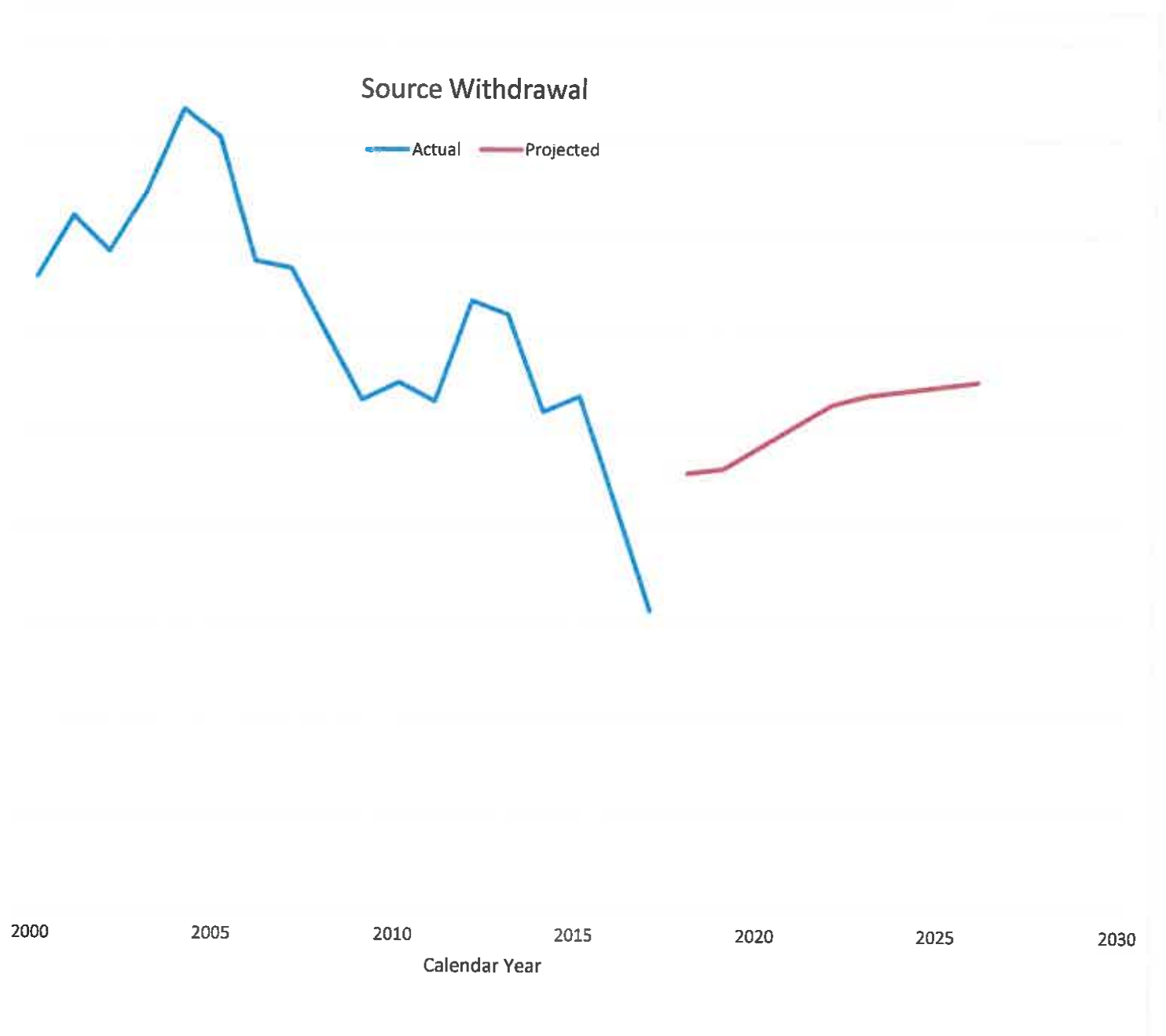
Scott A. Miller, P.E.

President

Table 1

Project	Jones Crossing	Poras	Goodridge Apt	Goodridge SFH	Population	Residential Demand	Total Withdrawal
ts	32	16	136	64			
Bedrooms	96	64	260	256		MGD	MGD
Persons/BR	1.2	1.2	1.2	1.2		gpcd	add
Population	115	77	312	307		62	0.18
Buildout (years)	5	5	3	8			
					5,628	0.35	0.53
	23	15			5,667	0.35	0.53
	23	15	104	38	5,847	0.36	0.54
	23	15	104	38	6,028	0.37	0.55
	23	15	104	38	6,209	0.38	0.56
	23	15		38	6,286	0.39	0.57
				38	6,324	0.39	0.57
				38	6,363	0.39	0.57
				38	6,401	0.39	0.58
				38	6,439	0.40	0.58
					6,439	0.40	0.58
					6,439	0.40	0.58

Figure 1



Population Served by Lancaster Town Water

	2018	2005	Growth (Shrink)	Tax Card Bedrooms
BARNES CT	10	14	(4)	12
BEACH AVE	-	-	-	-
BEACH POINT RD	46	53	(7)	51
BENNETT LN	18	26	(8)	23
BIGELOW GDNS	80	77	3	-
BIGELOW RD	29	25	4	38
BLANCHFLOWER LN	-	-	-	-
BLUE HERON DR	40	-	40	-
BOGAN AVE	-	-	-	-
BOLTON RD	98	117	(19)	105
BOLTON STATION RD	53	68	(15)	54
BRADBURY RD	17	17	-	16
BRAZAO LN	20	13	7	21
BRIAN RD	-	-	-	-
BROCKELMAN RD	38	48	(10)	50
BULL HILL RD	24	34	(10)	32
BURBANK LN	50	59	(9)	65
BUTTONWOOD LN	3	4	(1)	6
BUTTRICK LN	5	6	(1)	7
CARLETON PL	13	6	7	11
CARTER ST	39	56	(17)	61
CENTER BRIDGE RD	58	68	(10)	76
CHACE HILL RD	73	77	(4)	83
CHARLOTTE ST	18	22	(4)	24
CHISHOLM TRL	-	-	-	-
CLEVERLY COVE RD	-	-	-	-
COLE FARM RD	11	9	2	9
COLONY LN	23	27	(4)	25
CONNOR LN	24	28	(4)	21
CREAMERY RD	7	3	4	6
CRESCENT ST	8	8	-	12
DAIRY RD	5	26	(21)	-
DEERSHORN RD	43	59	(16)	49
DEVONSHIRE WAY	32	-	32	51
DEWEY ST	6	5	1	-
DONELLE WAY	-	-	-	-
EVELYN PL	-	-	-	-
FAIRVIEW HL	7	7	-	14
FARM LAND LN	33	39	(6)	42
FARNSWORTH WAY	20	23	(3)	24
FIRE RD 1	-	-	-	-
FIRE RD 3	-	-	-	-
FIRE RD 3A	-	-	-	-
FIRE RD 6	-	-	-	-

Population Served by Lancaster Town Water

	2018	2005	Growth (Shrink)	Tax Card Bedrooms
FIRE RD 7	-	-	-	-
FIRE RD 10	-	-	-	-
FIRE RD 11	-	-	-	-
FIRE RD 12	-	-	-	-
FIRE RD 53	-	-	-	-
FITCH RD	37	35	2	45
FORT POND INN RD	-	-	-	-
FORT POND LN	-	-	-	-
FORT POND RD	-	-	-	-
FULLER AVE	11	12	(1)	-
GARRISON GRV	9	17	(8)	15
GEORGE HILL RD	147	149	(2)	194
GORHAM AVE	2	2	-	3
GOSS LN	73	55	18	78
GRANT WAY	-	-	-	-
HARKINS ST	2	1	1	-
HARVARD RD	115	121	(6)	124
HEMLOCK LN	32	39	(7)	32
HERITAGE LN	12	16	(4)	20
HIGH ST EXT	125	131	(6)	172
HIGHFIELD DR	45	57	(12)	62
HIGHLAND ST	9	14	(5)	16
HILL TOP RD	-	-	-	-
HOLIDAY LN	-	-	-	-
HUNTER LN	-	-	-	-
IVY CT	11	13	(2)	12
IVY DR	38	37	1	39
KALEVA RD	-	-	-	-
KELLY DR	22	23	(1)	27
KILBOURN RD	42	45	(3)	41
KINNEAR AVE	-	-	-	-
LANGEN RD	103	115	(12)	150
LAWSON AVE	-	-	-	-
LEE ST	70	100	(30)	96
LINDSEY WAY	2	-	2	3
LUNENBURG RD	9	7	2	10
MAGNOLIA AVE	44	37	7	56
MAIN ST	472	759	(287)	763
MAPLE ST	6	6	-	-
MARY CATHERINE DR	66	58	8	76
MAYFLOWER DR	3	3	-	5
MAYNARD ST	5	7	(2)	6
MEDITATION LN	-	-	-	-
MILL ST (p)	137	163	(26)	189

Population Served by Lancaster Town Water

	2018	2005	Growth (Shrink)	Tax Card Bedrooms
MILL ST CT	13	14	(1)	-
MILL ST EXT	182	198	(16)	240
MOFFETT ST	64	67	(3)	68
MT LAUREL LN	-	-	-	-
MYLES STANDISH RD	7	9	(2)	12
NARROW LN	45	79	(34)	69
NECK RD	122	147	(25)	167
NICHOLAS DR	144	23	121	156
NORTH MAIN ST	-	-	-	-
OETMAN WAY	25	-	25	35
OLD COMMON RD	74	94	(20)	91
OLD COUNTY RD	40	44	(4)	54
OLD HICKORY RD	31	39	(8)	37
OLD LUNENBURG RD	-	-	-	-
OLD UNION TPKE	-	-	-	-
ORCHARD ST	6	2	4	6
OTIS ST	29	35	(6)	40
PACKARD ST	53	81	(28)	66
PAINE ST	7	6	1	13
PARKER RD	113	133	(20)	154
PERRY RD	-	-	-	-
PILGRIM RD	8	7	1	11
PINE HILL RD	1	3	(2)	-
PLYMOUTH DR	16	12	4	15
PONAKIN RD	73	107	(34)	108
POULIN DR	28	35	(7)	34
PRESCOTT ST	61	82	(21)	107
PUBLIC RD	8	15	(7)	11
RED TAIL WAY	47	-	47	-
REDSTONE HILL RD	-	-	-	-
RIGBY RD	33	34	(1)	43
RIVER TER	-	-	-	-
ROSS LN	24	25	(1)	-
RUNAWAY BROOK RD	-	-	-	-
RUSSELL LN	8	6	2	10
SANDY RIDGE RD	-	-	-	-
SAWYER ST	17	17	-	13
SCHUMACHER RD	16	21	(5)	22
SETTLER'S PATH	75	90	(15)	88
SEVEN BRIDGE RD	38	55	(17)	48
SHANNON WAY	23	24	(1)	25
SHASTA DR	15	26	(11)	23
SHIRLEY RD	52	67	(15)	60
SILVER ST	18	20	(2)	26

Population Served by Lancaster Town Water

	2018	2005	Growth (Shrink)	Tax Card Bedrooms
SOUTH MEADOW RD	161	187	(26)	184
SPEC POND AVE	-	-	-	-
SQUIRE SHALER LN	33	45	(12)	43
STAGECOACH RD	-	-	-	-
STERLING RD	150	157	(7)	166
STERLING ST	78	80	(2)	21
STILL RIVER RD	-	-	-	-
SYLVAN RD	63	62	1	71
TURNER LN	-	-	-	-
VINCENT AVE	-	-	-	-
WHITCOMB DR	38	52	(14)	57
WHITE POND RD	-	-	-	-
WHITE TAIL LN	29	41	(12)	44
WILLOW ST	2	-	2	-
WINSLOW ST	31	33	(2)	35
WINSOR RD	20	24	(4)	31
WOODLAND MEADOW DR	22	28	(6)	21
WOODRUFF RD	2	4	(2)	5
WOODS LN	-	-	-	-
YELLOW BIRCH LN	11	-	11	-
Water System Population	4,756	5,376	(620)	5752
Town Population	5,952	6,601	(1,240)	0.83
% of Population served	80%	81%		