

PHOSPHORUS SOURCE IDENTIFICATION REPORT
AUGUST 2022

TOWN OF BURLINGTON

PRODUCED AS PART OF MS4 PERMIT REQUIREMENTS

Background: The Nutrient Pollution Problem

Nitrogen and phosphorous are naturally occurring plant fertilizers or “nutrients.” When land is developed, and storm drain systems are installed, the amount of nitrogen and phosphorous discharged to local streams, ponds and wetlands increases significantly relative to natural stream conditions. In the urban environment, nitrogen and phosphorous come from a variety of sources including organic debris such as fallen leaves, animal and pet waste, lawn and agricultural fertilizers, malfunctioning sewers and septic systems, and atmospheric deposition from car exhaust, among other sources.

Some of these sources also occur in the natural environment. However, in the urban environment the prevalence of paved and impervious areas coupled with the availability of storm drain collection systems allows street runoff containing excess nutrient pollution to be very quickly collected and conveyed to the nearest waterbody, generally with little or no treatment—bypassing the natural processes such as soil filtration and infiltration that would capture and recycle nutrients before they reached waterways in an undeveloped landscape.

As a result, nutrient pollution from polluted stormwater runoff has become a major source of pollution across the country. Nutrient pollution increases undesirable plant and algae growth in waterways, which can be highly toxic to humans and wildlife and reduce oxygen levels in the water. This, in turn, impedes recreation and creates chronic challenges for aquatic life, sometimes leading to fish kills. In freshwater waterways phosphorous is generally the primary pollutant of concern, while nitrogen becomes the primary concern once freshwater rivers flow into saltwater estuaries and bays.

Background: Regulatory Context

Under the federal and state clean water acts, the Massachusetts Department of Environmental Protection (MassDEP) is charged with establishing water quality standards and determining whether waterways meet these designated standards. MassDEP publishes its Integrated List of Waters, also referred to as the 303d Impaired Waters List, identifying waters that do not meet standards. These waterways are referred to as being “impaired” or “water quality limited” based on one or more causes which may include nitrogen, phosphorous, “nutrient/eutrophication biological indicators” or in some cases turbidity or transparency. MassDEP is also charged with preparing waterbody-specific cleanup plans for nutrient pollution known as Total Maximum Daily Loads or TMDLs. The Mystic River Watershed, one of the 3 watersheds in Burlington, has received an Alternative TMDL.

The Town of Burlington (“the Town”) is subject to the requirements of US Environmental Protection Agency’s (EPA’s) 2016 Massachusetts Small MS4 General Permit. One of the requirements of this permit is that communities discharging stormwater to waterways that are listed by MassDEP as impaired for phosphorous or nitrogen, or that flow into impaired waterways, and for which a total maximum daily load does not exist, shall prepare a Nutrient Source Identification Report as detailed in Appendix H of the permit. This report has been developed to satisfy this requirement of the permit.

The nutrient source identification report must be prepared in permit year 4 (year ending June 30, 2022) and submitted with the Year 4 annual report (due late September 2022). The requirements include (excerpt from EPA 2016 MS4 Permit Appendix H):

1. Calculation of total MS4 area draining to the water quality limited water segments or their tributaries, incorporating updated mapping of the MS4 and catchment delineations produced pursuant to part 2.3.4.6;
2. All screening and monitoring results pursuant to part 2.3.4.7.b., targeting the receiving water segment(s);
3. Impervious area and DCIA for the target catchment;
4. Identification, delineation and prioritization of potential catchments with high phosphorous loading;
5. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during redevelopment.

MS4 Permit Appendix H Applicability

The Town lies at the headwater of 3 watersheds, the Ipswich, Shawsheen and Mystic Rivers, all of which are either impaired for phosphorus or flow into another water body that is impaired for phosphorous. Stream segments in Town are also impaired for Dissolved Oxygen or E. Coli as see in Table 1.

Therefore, this report has been prepared in accordance with the guidelines in sections I.1.b and II.1.b of Appendix H of the 2016 Massachusetts Small MS4 General Permit.

The status of receiving waters in the Town is summarized in Table 1 below.

Table 1. Receiving waters Town of Burlington

Waterbody segment that receives flow from the MS4	Number of outfalls into receiving water segment	Chloride	Chlorophyll-a	Dissolved Oxygen/DO Saturation	Nitrogen	Oil & Grease/PAH	Phosphorus	Solids/TSS/Turbidity	E. coli	Enterococcus	Other pollutant(s) causing impairments
Vine Brook (MA83-06 in Burlington)	117	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Long Meadow Brook (MA83-11 in Burlington)	31	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sandy Brook (MA83-13 in Burlington)	35	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Shawsheen River (MA83-17 outside Burlington)	61	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Lubbers Brook (MA92-05 outside Burlington)	36	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Ipswich River (MA92-06 outside Burlington)	29	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mercury in fish tissue
Sawmill Brook	54	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Maple Meadow Brook (MA92-04 outside Burlington)	12	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Halls Brook Tributary	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cummings Brook Tributary (MA71-10 outside Burlington)	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Little Brook	35	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> </					

Data Sources and Analytical Methods

The data sets used to complete this work are listed in Table 2.

Table 2. Data sources.

Data Set	Source
Burlington Town Line	Town Geodatabase
Burlington water shed and sub-watersheds	Town GIS files and MassGIS
Hydric Soils Layer	WSS
Soils from MassGIS	MassGIS
Spring 2019 Aerial photographs	MassGIS
2016 Landuse Data	MassGIS
Impervious Surface	MassGIS

Impervious area is the portion of the Town that is paved, covered by buildings, or otherwise rendered unable to absorb water naturally due to development. Impervious area for the town was calculated using the MassGIS 2016 Land Cover/Land Use data layer which was published in 2019. This data layer maps impervious and pervious land cover by land use type based on aerial photography and other data sources. A shapefile showing land-use on impervious surfaces was overlaid on the town's stream catchment data layer. This, in turn, was overlaid with the Town's data layer for outfall catchment areas (the area draining to each town-owned stormwater discharge point) to estimate total areas and total impervious area discharging to or upstream of nutrient-impaired waterways, as well as to estimate impervious area for each stormwater outfall catchment. The soil data layer from MassGIS and hydrologic soil grouping from WSS were also added.

Directly connected impervious area (DCIA), also referred to as “effective impervious cover,” is the amount of impervious area that is directly connected to the storm drain system. Most land in the Town was developed before the creation of modern requirements to capture, clean, slow down, and recharge stormwater runoff using stormwater control measures (SCMs). However, many new development and redevelopment projects constructed in recent years have required the installation or upgrade of SCMs, such that today some properties have no SCMs, some have SCMs that meet some modern standards, and some have SCMs that are fully compliant with modern standards. Because site-specific information about the existence of specific SCMs is not available at the parcel level, an estimate of DCIA or effective impervious cover is used to approximate the average level of SCMs installed across the watershed. Estimating DCIA can yield a more specific pollutant loading estimate for a given area. DCIA was estimated based on land use categories following EPA guidance.

To estimate the pollutant loads for phosphorus in each catchment, estimated pollutant loading rates for different combinations of land use type, land cover type, and soil type were applied in accordance with

guidance in the EPA 2016 MS4 Permit. The individual loading rates for these unique subsections were summed based on catchment, which produced an overall estimated catchment pollutant loading rate.

Burlington is a wholly MS4-community, so all regulated, town-owned catchments were included in all calculations.

For a more detailed description of the analytical methods used for this project, please refer to the Appendix Methods.

Total Area Draining to Water Quality Limited Segments

The total area of the Town is approximately 7,616 acres (3082 hectares), all of which is in the urbanized MS4-regulated area. Since the whole Town is located in either the Shawsheen, Ipswich or Mystic River watersheds and drainage flows either directly to waters that are impaired for phosphorus or waters that are listed as impaired for a cause in which phosphorous pollution is a factor, this report included all areas of the town in the phosphorus loading evaluation. Table 3 below shows how much of the Town is located in each watershed.

Table 3. Summary of area draining to each watershed.

Watershed	Watershed area (ha)
Mystic	487 (1,203 ac)
Ipswich	939 (2,320 ac)
Shawsheen	1,656 (4,092 ac)

Impervious Area and Directly Connected Impervious Area

Table 4 below summarizes the total impervious area (IA) and estimated DCIA in the Town. The DCIA area was found by calculating the percentage impervious area per catchment, applying the Sutherland Equation to get the percentage DCIA and then converting to area (hectares). It is also important to note that most of the impervious area in the Town is not owned or maintained by the Town, but by private parties or other public agencies.

Table 4. Summary of Impervious Area and DCIA

	Mystic	Ipswich	Shawsheen	Total
Impervious Area (hectares)	169 (418 ac)	194 (479 ac)	465 (1,149 ac)	826 (2,046 ac)
Estimated DCIA (hectares)	46 (114 ac)	96 (237 ac)	197 (487 ac)	339 (838 ac)

Table 5 to 7 show the impervious land uses and DCIA across the three watersheds.

Table 5. Impervious land use and DCIA in the Mystic Watershed

Water shed	Subwater shed	Impervious Surface Land-use	Imp. land use Area (ha)	% imp. Area	DCIA from % IA	DCIA (ha)	
Mystic	202	Commercial and Industrial	0.03	0.03	0.00	0.00	
		Residential - multi-family	15.62	14.85	10.19	10.71	
		Residential- single family	4.88	4.64	1.00	1.05	
		Right-of-way	8.70	8.28	2.38	2.50	
		Open land	0.01	0.01	0.00	0.00	
		Unknown	0.00	0.00	0.00	0.00	
		tax exempt	1.87	1.78	0.24	0.25	
		mixed use	0.03	0.03	0.00	0.00	
subtotals			31.14	29.62	13.81	14.52	
2182	2182	Commercial and Industrial	0.00	0	0	0	
		Residential - multi-family	0.20	1.11	0.45	0.08	
		Residential- single family	1.73	9.37	2.87	0.53	
		Right-of-way	1.25	6.74	1.75	0.32	
		Open land	0.00	0	0	0.00	
		Unknown	0.00	0	0	0.00	
		tax exempt	0.00	0	0	0.00	
		mixed use	0.00	0	0	0.00	
subtotals			3.18	17.22	5.07	0.94	
2464	2464	Commercial and Industrial	74.23	20.67	9.40	33.75	
		Residential - multi-family	5.26	1.47	0.63	2.27	
		Residential- single family	23.50	6.54	1.67	6.01	
		Right-of-way	43.34	12.07	4.19	15.06	
		Open land	1.68	0.47	0.03	0.11	
		Unknown	0.00	0.00	0.00	0.00	
		tax exempt	6.83	1.90	0.26	0.94	
		mixed use	0.91	0.25	0.01	0.05	
subtotals			155.76	43.38	16.21	58.20	
Totals			190.08	90.22	35.09	73.65	

Table 6. Impervious land use and DCIA in the Shawsheen Watershed

Water shed	Subwater shed	Impervious Surface Land-use	Imp. land use Area (ha)	% imp. Area	DCIA from % IA	DCIA (ha)	
Shawsheen	925	Commercial and Industrial	182.07	13.66	5.05	67.29	
		Residential - multi-family	24.86	1.87	0.85	11.27	
		Residential- single family	61.53	4.62	0.99	13.22	
		Right-of-way	104.03	7.80	2.18	29.06	
		Open land	11.17	0.84	0.08	1.02	
		Unknown	0.00	0.00	0.00	0.00	
		tax exempt	40.09	3.01	0.52	6.95	
		mixed use	2.25	0.17	0.01	0.09	
subtotals			426.00	31.96	9.67	128.90	
1479	1479	Commercial and Industrial	1.97	8.91	2.66	0.59	
		Residential - multi-family	0.00	0.00	0.00	0.00	
		Residential- single family	0.14	0.64	0.05	0.01	
		Right-of-way	0.45	2.03	0.29	0.06	
		Open land	0.14	0.64	0.05	0.01	
		Unknown	0.00	0.00	0.00	0.00	
		tax exempt	0.00	0.00	0.00	0.00	
		mixed use	0.00	0.00	0.00	0.00	
subtotals			2.70	12.23	3.05	0.67	
1407	1407	Commercial and Industrial	2.11	0.73	0.06	0.18	
		Residential - multi-family	0.20	0.07	0.02	0.05	
		Residential- single family	36.29	12.51	4.42	12.84	
		Right-of-way	26.91	9.28	2.83	8.20	
		Open land	0.27	0.09	0.00	0.01	
		Unknown	0.00	0.00	0.00	0.00	
		tax exempt	2.13	0.74	0.06	0.18	
		mixed use	0.43	0.15	0.01	0.02	
subtotals			68.35	23.56	7.40	21.46	
Totals			497.04	67.75	20.12	151.04	

Table 6. Impervious land use and DCIA in the Ipswich Watershed

Watershed	Subwatershed	Impervious Surface Land-use	Imp. land Area (ha)	% imp. Area	% DCIA	DCIA (ha)	
Ipswich	719	Commercial and Industrial	0.16	0.12	0.00	0.01	
		Residential - multi-family	0.04	0.03	0.01	0.01	
		Residential- single family	17.71	13.20	4.80	6.44	
		Right-of-way	11.36	8.47	2.47	3.31	
		Open land	0.04	0.03	0.00	0.00	
		Unknown	0.00	0.00	0.00	0.00	
		tax exempt	1.97	1.47	0.18	0.24	
		mixed use	0.00	0.00	0.00	0.00	
subtotals			31.28	23.31	7.45	9.99	
Ipswich	626	Commercial and Industrial	12.49	2.76	0.46	2.07	
		Residential - multi-family	1.64	0.36	0.12	0.53	
		Residential- single family	49.31	10.88	3.59	16.27	
		Right-of-way	33.14	7.32	1.98	8.96	
		Open land	0.14	0.03	0.00	0.00	
		Unknown	0.09	0.02	0.00	0.00	
		tax exempt	4.83	1.07	0.11	0.50	
		mixed use	0.04	0.01	0.00	0.00	
subtotals			101.68	22.44	6.26	28.34	
Ipswich	1655	Commercial and Industrial	0.04	0.02	0.00	0.00	
		Residential - multi-family	0.22	0.13	0.03	0.06	
		Residential- single family	10.42	5.88	1.43	2.53	
		Right-of-way	8.30	4.68	1.01	1.80	
		Open land	0.19	0.11	0.00	0.01	
		Unknown	0.00	0.00	0.00	0.00	
		tax exempt	7.57	4.27	0.88	1.57	
		mixed use	0.01	0.01	0.00	0.00	
subtotals			26.76	15.10	3.36	5.95	
Ipswich	2253	Commercial and Industrial	0	0	0	0	
		Residential - multi-family	0.08	0.07	0.02	0.0	
		Residential- single family	12.33	11.96	4.13	4.3	
		Right-of-way	8.50	8.24	2.37	2.4	
		Open land	0.01	0.01	0.00	0.0	
		Unknown	0.00	0.00	0.00	0.0	
		tax exempt	0.13	0.12	0.00	0.0	
		mixed use	0.83	0.80	0.07	0.1	
subtotals			21.87	21.21	6.59	6.8	
			181.58	82.07	23.66	51.09	

Estimated Nutrient Loading from Catchments

The impervious surface land uses for each subwatershed were gleaned from the MassGIS interactive system. Using estimates of phosphorus loading from the different land-use types courtesy of the EPA, we calculated the phosphorus loading across each watershed and subwatershed.

Table 7 shows calculated phosphorus loading estimates from both pervious and impervious surfaces for each watershed.

Table 7. Phosphorus loads from pervious and impervious surfaces in each watershed.

Watershed	Impervious Surface Area (ha)	Pervious Surface Area (ha)	Impervious Surface (%)	P Load from Impervious Surfaces (kg/year)	P Load from Pervious Soils (kg/year)	Total P Load (kg/year)
Mystic	190	293	39.4	372	63	435
Ipswich	181	689	20.1	396	192	588
Shawsheen	497	1148	30.2	960	246	1206
Burlington	868	2130	29	1728	501	2229

Table 8 breaks down the land use categories associated with impervious surfaces within each watershed and subwatershed and provides estimates of the phosphorus produced per year from each land use. Figure 1 illustrates the phosphorus produced in the DCIA, which goes to the MS4 and shows that the highly built up and commercial-heavy Vine Brook subcatchments of the Shawsheen watershed have the highest Phosphorus loading while less-dense residential pockets at the northern edge of the town and near Mill Pond and close to the Woburn line are lowest. Figure 2 illustrates the phosphorus produced throughout town. Interestingly, in this one Phosphorus loads in the Mystic watershed are higher than in Figure 1, while Phosphorus loads in part of the Ipswich watersheds are slightly lower.

Table 8. Phosphorus loading by impervious land use category

Watershed	Subwatershed	Impervious Surface Land-use	Area (ha)	P Load (kg/ha/year)	P Load (kg/year)	DCIA (ha)	P load DCIA (kg/ha/year)
Mythic	202	Commercial and Industrial	0.03	2	0.07	0.00	0.00
		Residential - multi-family	15.62	2.6	40.60	9.01	27.86
		Residential- single family	4.88	2.2	10.73	0.34	2.31
		Right-of-way	8.70	1.5	13.05	0.81	3.76
		Open land	0.01	1.7	0.01	0.00	0.00
		Unknown	0.00		0.00	0.00	0.00
		tax exempt	1.87	2	3.73	0.08	0.50
		mixed use	0.03	2.2	0.08	0.00	0.00
		total	31.14		68.27	10.24	34.42
Ipswich	2182	Commercial and Industrial	0.00	2	0	0.00	0
		Residential - multi-family	0.20	2.6	0.53	0.05	0.22
		Residential- single family	1.73	2.2	3.81	0.07	1.17
		Right-of-way	1.25	1.5	1.87	0.04	0.49

		Open land	0.00	1.7	0.00	0.00	0.00
		Unknown	0.00		0.00	0.00	0.00
		tax exempt	0.00	2	0.00	0.00	0.00
		mixed use	0.00	2.2	0.00	0.00	0.00
			3.18		6.21	0.17	1.87
2464	Commercial and Industrial	74.23	2	148.47	20.23	67.51	
	Residential - multi-family	5.26	2.6	13.69	2.44	5.91	
	Residential- single family	23.50	2.2	51.70	3.60	13.23	
	Right-of-way	43.34	1.5	65.01	9.02	22.59	
	Open land	1.68	1.7	2.86	0.07	0.20	
	Unknown	0.00		0.00	0.00	0.00	
	tax exempt	6.83	2	13.66	0.56	1.88	
	mixed use	0.91	2.2	2.01	0.03	0.10	
	total	155.8		297.39	35.96	111.41	
		190.1			46.37	147.70	
Shawsheen	Commercial and Industrial	182.07	2	364.15	77.69	134.58	
	Residential - multi-family	24.86	2.6	64.64	15.74	29.29	
	Residential- single family	61.53	2.2	135.37	15.26	29.08	
	Right-of-way	104.03	1.5	156.04	33.55	43.59	
	Open land	11.17	1.7	18.99	1.18	1.74	
	Unknown	0.00		0.00	0.00	0.00	
	tax exempt	40.09	2	80.17	8.03	13.90	
	mixed use	2.25	2.2	4.94	0.11	0.20	
					151.5		
	total	426.00		824.30	6	252.39	
1479	Commercial and Industrial	1.97	2	3.93	0.34	1.17	
	Residential - multi-family	0.00	2.6	0.00	0.00	0.00	
	Residential- single family	0.14	2.2	0.31	0.01	0.03	
	Right-of-way	0.45	1.5	0.67	0.04	0.10	
	Open land	0.14	1.7	0.24	0.01	0.02	
	Unknown	0.00		0.00	0.00	0.00	
	tax exempt	0.00	2	0.00	0.00	0.00	
	mixed use	0.00	2.2	0.00	0.00	0.00	
	total	2.70		5.16	0.39	1.31	
1407	Commercial and Industrial	2.11	2	4.22	0.38	0.359	
	Residential - multi-family	0.20	2.6	0.51	0.14	0.12	
	Residential- single family	36.29	2.2	79.84	26.85	28.24	
	Right-of-way	26.91	1.5	40.36	17.14	12.29	
	Open land	0.27	1.7	0.47	0.02	0.01	
	Unknown	0.00		0.00	0.00	0.00	
	tax exempt	2.13	2	4.27	0.38	0.37	
	mixed use	0.43	2.2	0.95	0.03	0.04	

Phosphorus Source Identification Report

Burlington

		total	68.35	130.62	44.95	41.43
				196.9		
			497.04		0	295.13
Ipswich	719	Commercial and Industrial	0.16	2	0.32	0.01
		Residential - multi-family	0.04	2.6	0.10	0.02
		Residential- single family	17.71	2.2	38.96	9.16
		Right-of-way	11.36	1.5	17.05	4.71
		Open land	0.04	1.7	0.06	0.00
		Unknown	0.00		0.00	0.00
		tax exempt	1.97	2	3.94	0.34
		mixed use	0.00	2.2	0.00	0.00
		total	31.28		60.43	14.22
						19.63
626		Commercial and Industrial	12.49	2	24.98	5.42
		Residential - multi-family	1.64	2.6	4.25	1.78
		Residential- single family	49.31	2.2	108.48	42.53
		Right-of-way	33.14	1.5	49.71	23.44
		Open land	0.14	1.7	0.23	0.01
		Unknown	0.09		0.00	0.00
		tax exempt	4.83	2	9.67	1.31
		mixed use	0.04	2.2	0.09	0.00
		total	101.68		197.41	74.48
						55.77
1655		Commercial and Industrial	0.04	2	0.08	0.00
		Residential - multi-family	0.22	2.6	0.58	0.16
		Residential- single family	10.42	2.2	22.93	4.13
		Right-of-way	8.30	1.5	12.44	2.93
		Open land	0.19	1.7	0.33	0.01
		Unknown	0.00		0.00	0.00
		tax exempt	7.57	2	15.14	2.56
		mixed use	0.01	2.2	0.03	0.00
		total	26.76		51.53	9.80
						11.55
2253		Commercial and Industrial	0	2	0	0.00
		Residential - multi-family	0.08	2.6	0.20	0.04
		Residential- single family	12.33	2.2	27.12	5.32
		Right-of-way	8.50	1.5	12.75	3.04
		Open land	0.01	1.7	0.02	0.00
		Unknown	0.00		0.00	0.00
		tax exempt	0.13	2	0.26	0.01
		mixed use	21.04	2.2	46.30	11.86
		total	180.75		86.64	20.27
						34.01
					118.7	
					7	104.03
Town Total			867.88		362.0	546.86

Town Owned Land and Drain Structures overlaid on Phosphorus Content by SubBasin in Burlington, MA.

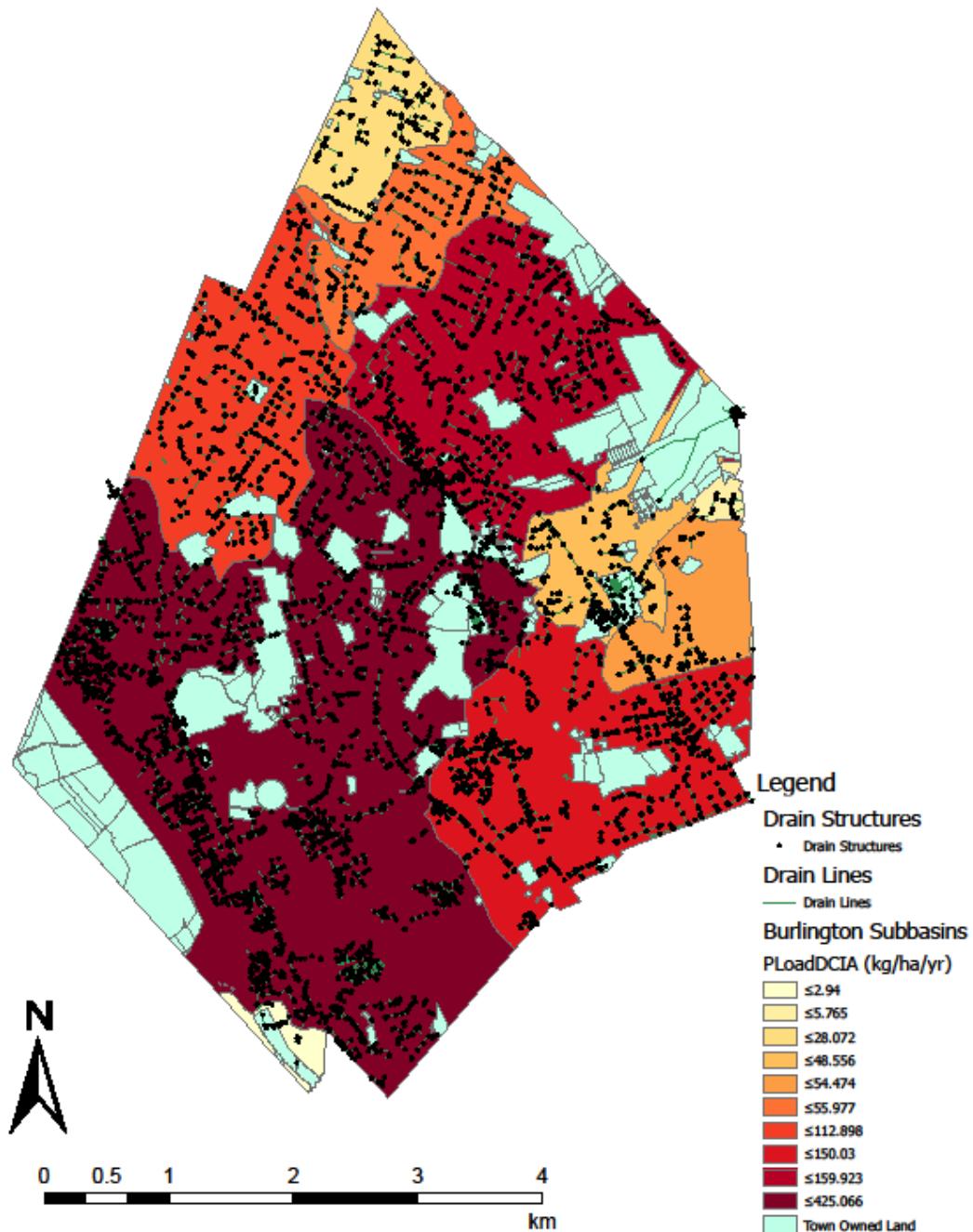


Figure 1. Phosphorus production to DCIA in Burlington by subcatchment and showing drainage system

Town Owned Land and Drain Structures overlaid on Phosphorus Content by SubBasin in Burlington, MA. (total P Load in kg/yr)

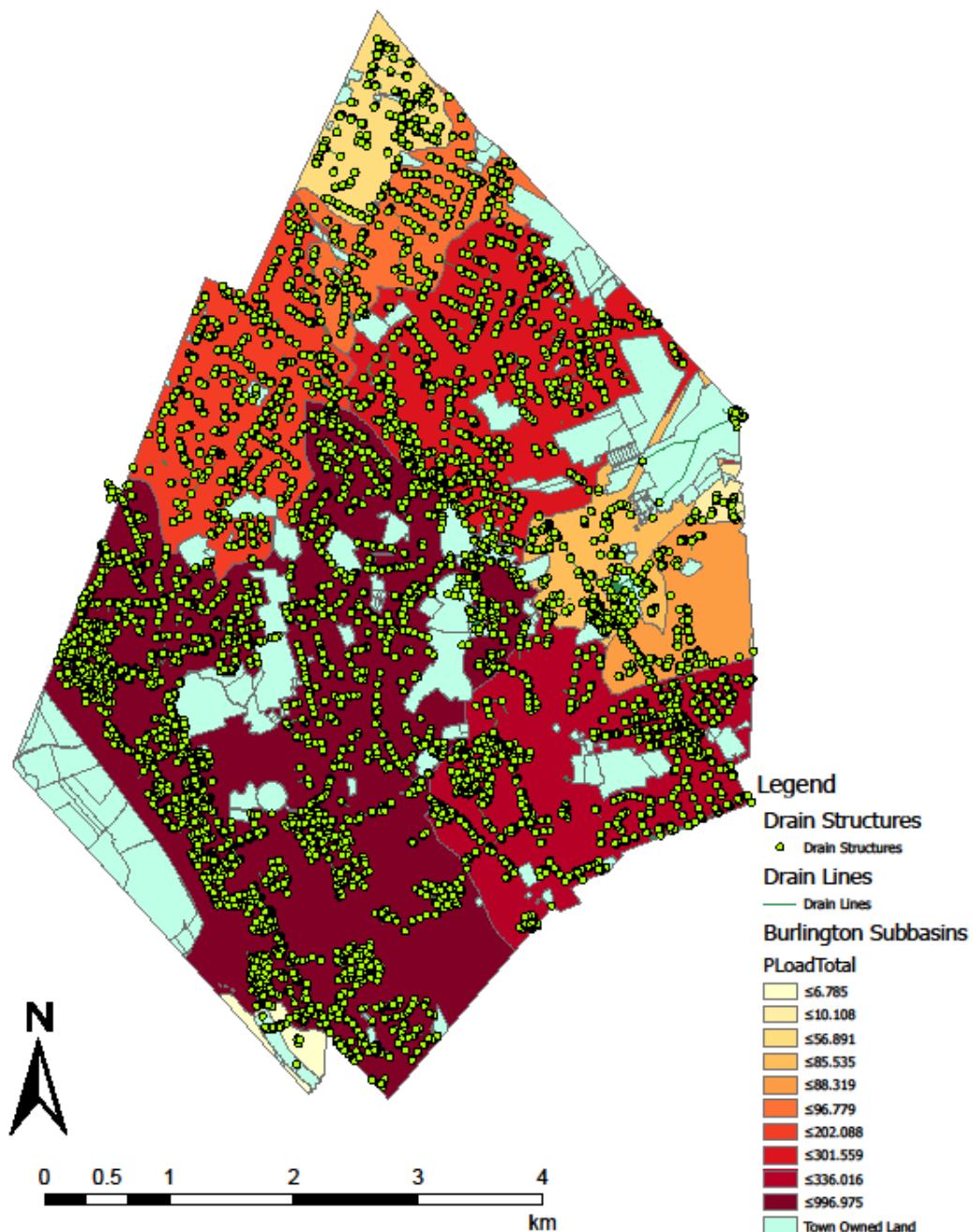


Figure 2. Total Phosphorus production in Burlington by subcatchment and showing drainage system

Outfall Screening Results

As part of the 2016 MS4 permit requirements, all outfalls with flow during dry weather events were sampled and tested for various parameters. Table 9 provides a summary of the screening results. There were some *E. coli* samples that had above-threshold results but investigations demonstrated that there did not appear to be illicit connections and the result were attributed to animal waste as raccoons and other wildlife were seen entering and exiting the storm drain system. Other slightly elevated results were attributed to sampling standing water rather than outfall flow. No results were attributed to an illicit connection.

Table 9. Burlington Dry Weather Outfall Screening Results

Asset Id	CUL29	CUL31	CUL56	CUL116	CUL148	CUL171	CUL173	CUL199	CUL200	CUL249
Address Number	236	58	116	20	11	19	335	26	23	7
Street Name	Fox Hill Rd	Donald Rd	Drake Road	Gibson St	Alicine Ln	Ellen Rd	Cambridge St	Francis Wyman Rd	Arnold Terrace	Sewall St
Date	7/30/2020	7/30/2020	7/16/2020	7/16/2020	7/30/2020	8/6/2020	7/30/2020	7/30/2020	7/16/2020	7/30/2020
E. Coli or Fecal Coliform Result	487	85	139.1	14.6	328	2098	231	52	20.1	246
Surfactants Result (mg per L)	<0.12	<0.12	<0.12	0.14	<0.12	<0.12	<0.12	0.19	<0.12	NS
Ammonia (mg per L)	NS	NS	0	0	NS	NS	NS	0	NS	
Free Chlorine (mg per L)	0.09	0.01	0.12	0	0.04	0.03	0.02	0.04	0.14	NS
Total Chlorine (mg per L)	0.05	0.02	0.18	0	0.05	0.01	0.04	0.09	0.18	NS
Conductivity (umhos per cm)	499.7	554	237.9	659	557	177	740	902	445.9	NS
Salinity (ppt)	0.24	0.27	0.11	0.32	0.27	0.08	0.36	0.44	0.21	NS
Dissolved Oxygen (mg per L)	6.49	4.72	8.28	4.79	2.48	3.03	7.73	1.87	7.83	NS
Temperature (F)	71.8	68.9	70	69.3	67.6	66.09	73	70.5	67.1	NS
Asset Id	CUL201	CUL202	CUL219	CUL237	CUL237	CUL243	CUL249	CUL438	CUL603	
Address Number	9	3	17	28	28	28	8	7	33	10
Street Name	Edgemont Ave	Dale St	Terry Ave	Skelton Rd	Skelton Rd	Skelton Rd	Cedar St	Sewall St	Fieldstone Dr	McCarthy Dr
Date	7/7/2020	6/23/2020	6/23/2020	7/3/2018	7/16/2020	8/6/2020	7/30/2020	7/13/2020	7/16/2020	8/6/2020
E. Coli or Fecal Coliform Result	8664	13.4	26.5	93.4	579.4	231	109	NS	110	10
Surfactants Result (mg per L)	0.13	<0.12	<0.12	0.1	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Ammonia (mg per L)	0.5	0	0.25	0	0.25	NS	NS	0	0	NS
Free Chlorine (mg per L)	0.01	0.01	0.12	0	0.01	0.01	0.01	0	0	0.04
Total Chlorine (mg per L)	0.06	0	0.14	0.03	0.03	0	0.05	0.02	0.21	0.06
Conductivity (umhos per cm)	874	1265	2704	806	710	697	676	618.6	515.3	934
Salinity (ppt)	0.43	0.64	1.41	0.46	0.35	0.34	0.33	0.3	0.25	0.46
Dissolved Oxygen (mg per L)	2.41	8.67	1.26	9.05	8.93	7.54	7.09	5.08	9.03	9.66
Temperature (F)	64.8	57.6	59.7	64.22	66.4	68.9	64.8	55.2	61	62.6
Asset Id	CUL267	CUL271	CUL281	CUL286	CUL302	CUL316	CUL326	CUL396		
Address Number	12	8	22	46	57 - 77	10	15	54	135	
Street Name	Old Colony Rd	Fred st	Daniel Dr	Greenwood Burlington Mall R	2nd Ave	Belmont Rd	Francis Wyman Rd	S Bedford St		
Date	6/23/2020	7/13/2020	7/7/2020	7/7/2020	7/13/2020	7/7/2020	7/13/2020	7/7/2020	8/6/2020	
E. Coli or Fecal Coliform Result	3.1	<0.10	73	52	10	<10	10	285	279	
Surfactants Result (mg per L)	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	
Ammonia (mg per L)	0	0	0	0	0	0	0	0.25	NS	
Free Chlorine (mg per L)	0.03	0.05	0	0.09	0.05	0.01	0.02	0.06	0.05	
Total Chlorine (mg per L)	0.07	0.13	0.02	0.14	0.03	0.01	0.05	0.12	0.1	
Conductivity (umhos per cm)	2288	821	642	657	2533	1573	367	305.4	2334	
Salinity (ppt)	1.18	0.4	0.31	0.32	1.31	0.8	0.18	0.15	1.2	
Dissolved Oxygen (mg per L)	10.06	7.14	9.48	9.12	8.06	9.14	8.17	7.44	8.12	
Temperature (F)	55	68.5	62.2	63.7	70.3	59.9	61	61.7	69.3	
Asset Id	CUL534	CUL550	CUL563	CUL594	DStr2603	DStr2603	DStr3386	DStr3386	DStr3829	DStr3829
Address Number	24	4	13	15	55	55	29	29	5	5
Street Name	Michael Dr	Sheldon St	Susan Ave	Gloria Circle	Bedford St	Bedford St	Dolores Dr	Dolores Dr	Wildwood St	Wildwood St
Date	7/30/2020	7/21/2020	7/21/2020	7/13/2020	6/23/2020	7/30/2020	7/21/2020	8/6/2020	7/21/2020	8/6/2020
E. Coli or Fecal Coliform Result	32.3	20	63	85	>2419.6	52	563	52	487	1046
Surfactants Result (mg per L)	<0.12	<0.12	0.19	<0.12	<0.12	<0.12	0.12	<0.12	<0.12	<0.12
Ammonia (mg per L)	0	0	0	0	0	NS	0	NS	0	NS
Free Chlorine (mg per L)	0.1	0.03	0.06	0	0.09	0.03	0.07	NS	NS	0.06
Total Chlorine (mg per L)	0.19	0.05	0.06	0.04	0	0.08	0.06	NS	NS	0.05
Conductivity (umhos per cm)	586	554	850	519.2	1415	600	453.8	284.7	691	216.6
Salinity (ppt)	0.28	0.27	0.42	0.25	0.71	0.29	0.22	0.14	0.34	0.11
Dissolved Oxygen (mg per L)	7.67	6.94	2.01	6.66	9.68	7.65	6.4	6.27	1.2	1.23
Temperature (F)	66.6	64.2	69.4	72.7	56.8	63.1	68.5	72.5	66.4	71.4

Retrofit and Redevelopment Opportunities

Since dry-weather sampling did not indicate high levels of ammonia or other subjects of concern, catchments and facilities in Burlington were prioritized based primarily on phosphorus loading estimates. Other factors such as the soil types, quantity of impervious surfaces on site, location with respect to environmental justice populations and waterbodies with a TMDL were used to weight the scores of each municipally-owned building or facility in Burlington, as summarized in Table 10 and as shown in Appendix B. Table 10 is a list of the top scoring facilities in Burlington, all of which are in subcatchments with higher than the mean production of Phosphorus, and all of which are being prioritized for retrofitting.

Based on the phosphorus loading estimates and weighting factors and, taking into account the Town's expected Capital outlays in the near future, MS4 Committee members have proposed retrofit options for each of the top five ranked facilities that will be evaluated in the next year for feasibility and cost. These are shown in Table 10. These include two schools, Francis Wyman and Pine Glen, two parks, Simonds and TRW, and three municipal buildings sharing parking lots in the town center.

Table 10. Burlington-owned facilities ranked highest for potential retrofits

Name	Address	Building/Facility Type	Total (out of 50)	Possible retrofit
Town Hall Complex (Hall, Annex & Fire Station)	21-29 Center Street	Office Building	35	infiltrate the parking lot into subsurface infiltration
Francis Wyman Elementary	41 Terrace Hall Ave	School	50	infiltrate right near to subsurface infiltration
Pine Glen Elementary	1 Pine Glen Way	School	40	drain northern parking lot into the field via a swale or some other feature
Simonds Park	10 Bedford Street	Bathroom / Snack Bar/ House	38	infiltrate the lower parking lot using subsurface infiltration
TRW Playground	26 Mall Rd	Playground / Athletic Field	40	drain to an infiltration trench or similar

It should be noted that town rights-of-way were not included in the scoring matrix, but they are often highly desirable sites for retrofitting as stormwater control measures and retrofits including gravel trenches will be included in future projects to upgrade roads and sidewalks in Burlington.

APPENDIX A
PHOSPHORUS LOAD CALCULATIONS

Phosphorus Source Identification Report

Burlington

Watershed	Subwatershed	Impervious surface (Ha)	Impervious Surface (%)	P Load from Impervious Surfaces (kg/year)	P Load from Pervious soils (kg/year)	P load impervious surfaces using DCIA (kg/ha/year)	Total P Load (kg/year)	Total P Load using DCIA (kg/year)
Mystic	202	31.14		68.270	20.05	34.425	88.319	54.474
	2182	3.18		6.212	3.90	1.869	10.108	5.765
	2464	155.76	?	297.394	38.62	111.407	336.016	150.030
	total	190.08	36.47	371.876	62.57	147.70	434.44	210.27
Shawsheen	925	426.00		824.301	172.67	252.392	996.975	425.066
	1479	2.70		5.156	1.63	1.314	6.785	2.943
	1407	68.35		130.618	71.47	41.428	202.088	112.898
	total	497.04	30.15	960.075	245.77	295.134	1205.848	540.907
Ipswich	719	31.28		60.429	36.35	19.627	96.779	55.977
	626	101.68		197.408	104.15	55.772	301.559	159.923
	1655	26.76		51.529	37.01	11.551	88.535	48.556
	2253	180.75		86.642	14.82	34.011	101.457	48.826
	total	340.47	37.72	396.008	192.32	120.961	588.330	313.282
	total						2228.62	1064.46

Phosphorus Source Identification Report

Burlington

Watershed	Subwatershed	HSG	Area (m ²)	Area (ha)	P Load Export (kg/ha/year)	P Load Export (kg/year)	Impervious Surface Land-use	Area (sq meters)	Area (ha)	P Load (kg/ha/year)	P Load (kg/year)	area (ac)	DCIA (ha)	P load (kg/ha/year)	DCIA	% imp. Area	% IA	DCIA (ha)	DCIA (ac)
Mystic	202	unknown	245757.04	24.58	--		Commercial and Industrial	326.43	0.03	2	0.065	0.08	0.00	0.001	0.03	0.001	0.001	0.001	0.001
		A	79147.48	7.91	0.03	0.24	Residential - multi-family	156156.19	15.62	2.6	40.601	38.59	9.01	27.859	14.85	10.192	10.715	26.476	
		A/D	48108.49	4.81	0.22	1.06	Residential- single family	48764.97	4.88	2.2	10.728	12.05	0.34	2.311	4.64	0.999	1.050	2.595	
		B	116076.48	11.61	0.13	1.51	Right-of-way	87019.78	8.70	1.5	13.053	21.50	0.81	3.755	8.28	2.381	2.504	6.186	
		B/D	247734.28	24.77	0.27	6.69	Open land	76.58	0.01	1.7	0.013	0.02	0.00	0.000	0.01	0.000	0.000	0.000	
		C	132218.01	13.22	0.24	3.17	Unknown	0	0.00		0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		C/D	10576.72	1.06	0.325	0.34	tax exempt	18667.62	1.87	2	3.734	4.61	0.08	0.498	1.78	0.237	0.249	0.615	
		D	171663.4	17.17	0.41	7.04	mixed use	347.58	0.03	2.2	0.076	0.09	0.00	0.001	0.03	0.001	0.001	0.002	
		total	1051281.9	105.13	0.41	20.05 total		311359.15	31.14		68.270	76.94	10.24	34.425	29.62	13.811	14.519	35.876	
	2182	unknown	4306.12	4.31	--		Commercial and Industrial	0	0.00	2	0	0.00	0.00	0	0	0	0	0	0
		A	36440.81	3.64	0.03	0.11	Residential - multi-family	2049.47	0.20	2.6	0.533	0.51	0.05	0.22	1.11	0.453	0.08	0.21	
		A/D	903.38	0.09	0.22	0.02	Residential- single family	17321.43	1.73	2.2	3.811	4.28	0.07	1.17	9.37	2.869	0.53	1.31	
		B	0	0.00	0.13	0.00	Right-of-way	12455.7	1.25	1.5	1.688	3.08	0.04	0.49	6.74	1.750	0.32	0.80	
		B/D	202.1	0.02	0.27	0.01	Open land	0	0.00	1.7	0.000	0.00	0.00	0	0	0	0.00	0.00	
		C	30692.56	3.01	0.24	0.72	Unknown	0	0.00		0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		C/D	0	0.00	0.325	0.00	tax exempt	0	0.00	2	0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		D	74121.1	7.41	0.41	3.04	mixed use	0	0.00	2.2	0.000	0.00	0.00	0.000	0	0	0.00	0.000	
		total	146066.07	18.48		3.90 total		31826.6	3.18		6.212	7.86	0.17	1.869	17.22	5.071482	0.94	2.32	
	2464	unknown	155778.09	155.78	--		Commercial and Industrial	742245.96	74.23	2	148.469	183.43	20.23	67.505	20.67	9.399	33.75	83.403	
		A	921089.01	92.18	0.03	2.77	Residential - multi-family	52659.73	5.26	2.6	13.886	13.01	2.44	5.910	1.47	0.633	2.27	5.617	
		A/D	73441.09	7.34	0.22	1.62	Residential- single family	234991.67	23.50	2.2	51.698	58.07	3.60	13.225	6.54	1.674	6.01	14.854	
		B	136366.47	13.64	0.13	1.77	Right-of-way	433414.40	43.34	1.5	65.012	107.10	9.02	22.586	12.07	4.193	15.06	37.207	
		B/D	23241.77	2.32	0.27	6.28	Open land	16794.84	1.68	1.7	2.855	4.15	0.07	0.195	0.47	0.032	0.11	0.284	
		C	40581.05	4.06	0.24	0.97	Unknown	0.09	0.00		0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		C/D	64628.68	6.46	0.325	2.10	tax exempt	68303.24	6.83	2	13.661	16.88	0.56	1.884	1.90	0.262	0.94	2.328	
		D	563847.69	56.38	0.41	23.12	mixed use	9145.55	0.91	2.2	2.012	2.26	0.08	0.102	0.25	0.013	0.05	0.114	
		total	3590913.85	359.09		38.62 total		1557635.48	155.76		297.394	384.89	35.96	111.407	43.38	16.207	58.20	143.806	
			4788261.82										45.37	147.70	90.21	35.089	73.654	181.998	
Shawsheen	925	unknown	4853121.19	485.31	--		Commercial and Industrial	1820732.76	182.07	2	364.147	449.90	77.69	134.583	13.66	5.048	67.29	166.277	
		A	2225528.71	222.55	0.03	6.68	Residential - multi-family	248616.6	24.86	2.6	64.640	61.43	15.74	29.289	1.87	0.845	11.27	27.836	
		A/D	466566.33	46.66	0.22	10.26	Residential- single family	615035.99	61.53	2.2	135.367	152.04	15.26	29.084	4.62	0.992	13.22	32.666	
		B	947141.79	94.71	0.13	12.31	Right-of-way	1040258.55	104.03	1.5	156.039	257.05	33.55	43.591	7.80	2.180	29.06	71.808	
		B/D	1644109.01	164.41	0.27	44.39	Open land	111720.88	11.17	1.7	18.993	27.61	1.18	1.739	0.84	0.077	1.02	2.527	
		C	1758808.17	175.88	0.24	42.21	Unknown	0	0.00		0.000	0.00	0.00	0.000	0.00	0.000	0.00	0.000	
		C/D	234125.34	23.41	0.325	7.61	tax exempt	400871.32	40.09	2	80.174	99.06	8.03	13.904	3.01	0.522	6.95	17.178	
		D	1200220.49	120.02	0.41	49.21	mixed use	24584.38	2.25	2.2	4.941	5.55	0.11	0.203	0.17	0.007	0.09	0.228	
		total	13329621.03	1332.96		172.67 total		4259964.63	426.00		824.301	1052.64	151.56	252.392	31.96	9.670	128.90	318.521	
	1479	unknown	99544.55	9.95	--		Commercial and Industrial	19659.61	1.97	2	3.932	4.86	0.34	1.174	8.91	2.661	0.587	1.450	
		A	52390.31	5.24	0.03	0.16	Residential - multi-family	0	0.00	2.6	0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		A/D	22066.71	2.21	0.22	0.49	Residential- single family	1419.71	0.14	2.2	0.312	0.35	0.01	0.025	0.64	0.052	0.011	0.028	
		B	29560.73	2.96	0.13	0.38	Right-of-way	4484.45	0.45	1.5	0.673	1.11	0.04	0.096	2.03	0.290	0.064	0.158	
		B/D	17029.32	1.70	0.27	0.46	Open land	1408.26	0.14	1.7	0.239	0.35	0.01	0.019	0.64	0.051	0.011	0.028	
		C	0	0.00	0.24	0.00	Unknown	0.04	0.00		0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		C/D	0	0.00	0.325	0.00	tax exempt	0	0.00	2	0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		D	34671.3	0.35	0.41	0.14	mixed use	0	0.00	2.2	0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		total	220591.62	22.06		1.63 total		26972.07	2.70		5.156	6.66	0.39	1.314	12.23	3.053	0.673	1.664	
	1407	unknown	23212.86	2.32	--		Commercial and Industrial	21082.01	2.11	2	4.216	5.21	0.38	0.359	0.73	0.062	0.180	0.444	
		A	341251.31	34.13	0.03	1.02	Residential - multi-family	1980.75	0.20	2.6	0.515	0.49	0.14	0.120	0.07	0.016	0.046	0.114	
		A/D	111599.57	11.16	0.22	2.46	Residential- single family	362895.7	36.29	2.2	79.837	85.67	2.85	28.238	12.51	4.425	12.835	31.716	
		B	100337.8	10.03	0.13	1.30	Right-of-way	269080.84	26.91	1.5	40.362	66.49	17.14	12.293	9.28	2.825	8.195	20.250	
		B/D	61685.6	6.17	0.27	1.67	Open land	2736.75	0.27	1.7	0.465	0.68	0.02	0.014	0.09	0.003	0.008	0.021	
		C	1345633.98	134.56	0.24	32.30	Unknown	0	0.00		0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		C/D	573805.93	57.38	0.325	18.65	tax exempt	21348.33	2.13	2	4.270	5.28	0.38	0.366	0.74	0.063	0.183	0.453	
		D	343346.35	34.33	0.41	14.08	mixed use	4328.67	0.43	2.2	0.952	1.07	0.03	0.037	0.15	0.006	0.017	0.041	
		total	2900873.4	290.09		71.47 total		683454.05	68.35		130.618	168.88	44.95	41.428	23.56	7.399	21.465	53.040	
Ipswich	719	unknown	57156.08	5.72	--		Commercial and Industrial	1593.12	0.16	2	0.319	0.39	0.01	0.011	0.12	0.004	0.005	0.014	
		A	25325.25	2.53	0.03	0.08	Residential - multi-family	374.74	0.04	2.6	0.097	0.09	0.01	0.019	0.03	0.005	0.007	0.018	
		A/D	0	0.00	0.22	0.00	Residential- single family	177112.1	17.71	2.2	38.965	43.76	9.16	14.158	13.20	4.797	6.435	15.902	
		B	97787.11	9.78	0.13	1.27	Right-of-way	113640.56	11.36	1.5	17.046	28.08	4.71	4.961	8.47	2.465	3.307	8.173	
		B/D	118468.2	11.85	0.27	3.20	Open land	364.89	0.04	1.7	0.062	0.09	0.00	0.001	0.03	0.000	0.001	0.001	
		C	625565.37	62.56	0.24	15.01	Unknown	0	0.00		0.000	0.00	0.00	0.000	0.00	0.000	0.000	0.000	
		C/D	37324.7	3.73	0.325	1.21	tax exempt	19702.12	1.97	2	3.940	4.87	0.34	0.478	1.47	0.178	0.239	0.590	
		D	37925.73	37.99	0.41	15.58	mixed use	0	0.00	2.2	0.000</								

APPENDIX B

SCORING MATRIX TO IDENTIFY PRIORITY MUNICIPAL PROPERTIES FOR RETROFITTING

Name	Address	Building/Facility Type	Responsible Depart(s)	soil group (0-5)	Drain to TMDL (5 or 0)	EJ area (5 or 0)	Imperv >1ac	30 if >mean P and or 5 if <mean P of 55	Total out of 50
Municipal Buildings									
Town Hall	29 Center Street	Office Building	DPW/Rec	5	0	0	0	30	35
Town Hall Annex	25 Center Street	Office Building	DPW/Rec	5	0	0	0	30	35
Carpenter House	1 Dearborn Road	Vacant Property	DPW	5	0	0	0	30	35
33 Center Street	33 Center Street	Office Building	DPW	5	0	0	0	30	35
Library	22 Sears Street	Library	DPW	5	0	0	0	30	35
Grandview Farm	55 Center Street	Meeting Space	DPW	5	0	0	0	30	35
Human Services and Recreation	61 Center Street	Office and Recreation Space	DPW	5	0	0	2.5	5	12.5
Burlington Historical Museum	13 Bedford Street	Museum	DPW	1	0	0	0	30	31
DPW/Rec Maintenance Building	10 Great Meadow Road	Maintenance Facility	DPW	5	5	0	5	30	45
Ice Palace Rink	36 Ray Avenue	Skating Rink	DPW	5	0	0	5	15	25
DPW Highway Garage	1-3 Great Meadow Road	Maintenance Garage	DPW	5	5	0	5	30	45
Salt Shed	38 Grant Avenue	Salt Storage	DPW	5	0	0	0	30	35
Water Garage and Main Office	2 Great Meadow Road	Office (?) and Equipment Storage	DPW	5	5	0	0	30	40

Phosphorus Source Identification Report

Burlington

Vine Brook Water Treatment Plant	171 Middlesex Turnpike	Water Treatment Facility	DPW	5	5	0	0	30	40
Mill Pond Water Treatment Plant	70 Winter Street	Water Treatment Facility	DPW	5	5	0	5	30	45
School Buildings and Facilities									
Mount Hope	3 McGinnis Way	School	DPW	4	5	0	0	30	39
West School	121 Francis Wyman Road	School	DPW DPW/Rec/ School Custodians and Facilities	2	0	5	0	15	22
Burlington High	123 Cambridge St	School	DPW/Rec/ School Custodians and Facilities	5	5	0	5	30	45
Marshall Simonds Middle	114 Winn St	School	DPW/Rec/ School Custodians and Facilities	5	0	5	5	5	20
Memorial Elementary	119 Winn St	School	DPW/Rec/ School Custodians and Facilities	5	0	5	5	5	20
Francis Wyman Elementary	41 Terrace Hall Ave	School	DPW/Rec/ School Custodians and Facilities	5	5	5	5	30	50
Fox Hill Elementary	252 Fox Hill Road	School	DPW/Rec/ School Custodians and Facilities	2	0	0	5	15	22
Pine Glen Elementary	1 Pine Glen way	School	DPW/Rec/ School Custodians and Facilities	5	0	0	5	30	40

Fire and Safety

Police Headquarters	45 Center Street	Police Station	DPW	5	0	0	0	30	35
Fire Department Main Station	21 Center Street	Fire Station	Fire/DPW	5	0	0	0	30	35
Fire Department Station 2	114 Terrace Hall Avenue	Fire Station	Fire/DPW	4	5	5	5	30	49

Parks and Open Spaces

Simonds Park	10 Bedford Street	Bathroom / Snack Bar/ House Bathroom /	P & R	3	0	0	5	30	38
Rahanis Playground	84 Mill Street / 2 Patriot Rd	Playground / Athletic Fields	P & R	3	0	0	0	30	33
Regan Playground	14 Sumpter Rd	Playground / Athletic Field	P & R	3	0	0	0	15	18
Veterans Playground	110 Willmington Rd	Playground / Athletic Field	P & R	5	0	0	0	5	10
TRW Playground	26 Mall Rd	Playground / Athletic Field Maitn Garages / Players Theater /	P & R	5	5	0	0	30	40
Overlook Park	1 Overlook Ave	Playground	P & R	3	3	0	5	30	43
Wildmere Playground	19 Wildmere Ave	Playground	P & R	5	3	0	0	30	38

Phosphorus Source Identification Report

Burlington

		20 Pathwoods									
Pathwoods Tot Lot	Ave	Playground	P & R	3	0	0	0	30	33		
Town Common	2 Bedford St	Bandstand	Selectmen / P & R	4	0	0	0	30	34		
Marvin Field	100 South Bedford	Athletic Field	P & R	0	5	0	0	30	35		
Rotary Field	110 South Bedford	Athletic Field	P & R	0	5	0	0	30	35		
Wildwood Park	114-116 Bedford St	Playground / Athletic Field	P & R	3	5	5	0	25	38		
Mary PC Cummings Park	25 Blanchard Rd 142 Bedford St / 256 Middlesex Tpk.	Athletic Field	P & R	3	5	0	0	30	38		
Mitre Corp.		Athletic Fields (maintain don't own)	P & R	5	5	0	0	30	40		

Cemeteries

Chestnut Hill Cemetery & Office	52 Bedford Street	Cemetery	DPW/Rec	5	5	5	0	30	45
Pine Haven Cemetery, Office & Chapel	84 Bedford Street	Cemetery	DPW/Rec	5	5	5	0	30	45

Other

Shawsheen River Diversion Station	99 Cook Street Billerica, MA	Water Pump Facility	DPW
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Phosphorus Source Identification Report

Burlington

Terrace Hall Ave Pump Station	112 Terrace Hall Avenue	Sewer Pump Station	DPW	5	5	5	0	30	45	
Wilmington Road Pump Station	87 Wilmington Road	Sewer Pump Station	DPW	5	0	0	0	5	10	
Francis Wyman Road Pump Station	26A Francis Wyman	Sewer Pump Station	DPW	1	0	0	0	15	16	
Belmont Rd Pump Station	13A Belmont Road	Sewer Pump Station	DPW	5	0	0	0	30	35	
Westwood St Pump Station	D30A Westwood Street	Sewer Pump Station	DPW	1	0	0	0	15	16	
Brookside Ln Pump Station	9A Brookside Lane	Sewer Pump Station	DPW	4	0	0	0	5	9	
Douglas Ave Pump Station	29 Douglas Avenue	Sewer Pump Station	DPW	4	0	0	0	30	34	
Lucaya Cir Pump Station	8 Lucaya Circle	Sewer Pump Station	DPW	4	0	0	0	30	34	
Grandview Ave Pump Station	12 Grandview Avenue	Sewer Pump Station	DPW	3	0	0	0	5	8	
Bedford St Pump Station	152 Bedford Street	Sewer Pump Station	DPW	5	0	0	0	30	35	
Partridge Ln Pump Station	12 Partridge Lane	Sewer Pump Station	DPW	5	5	0	0	30	40	
Town Line Rd Pump Station	24 Town Line Road	Sewer Pump Station	DPW	1	0	0	0	30	31	
Keans Rd Pump Station	42 Keans Road	Sewer Pump Station	DPW	5	5	0	0	30	40	
Lexington St Pump Station	130? Lexington Street	Sewer Pump Station	DPW	5	5	0	0	30	40	