Town of Hartford

Stormwater Infrastructure Mapping Project

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VTDEC – CLEAN WATER INITIATIVE PROGRAM, WATERSHED MANAGEMENT DIVISION

https://dec.vermont.gov/water-investment/cwi/solutions/developed-lands/idde

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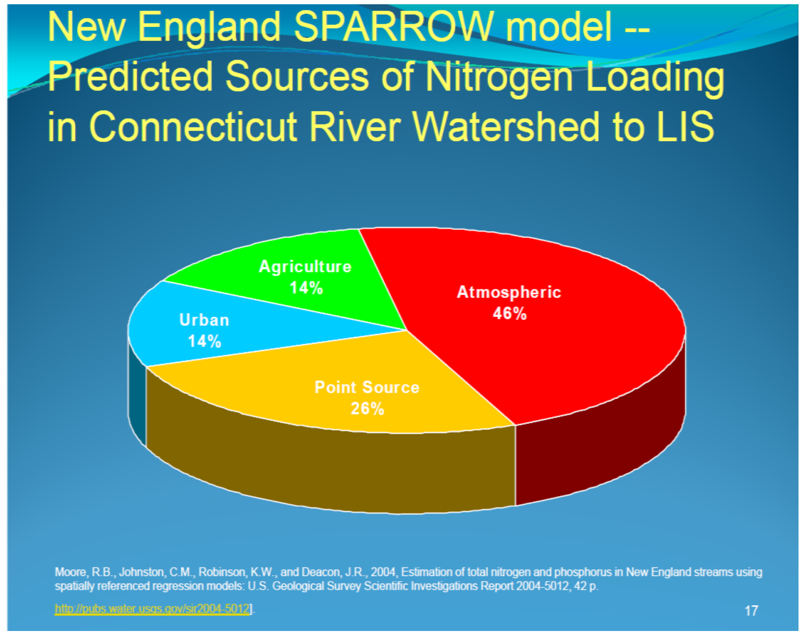
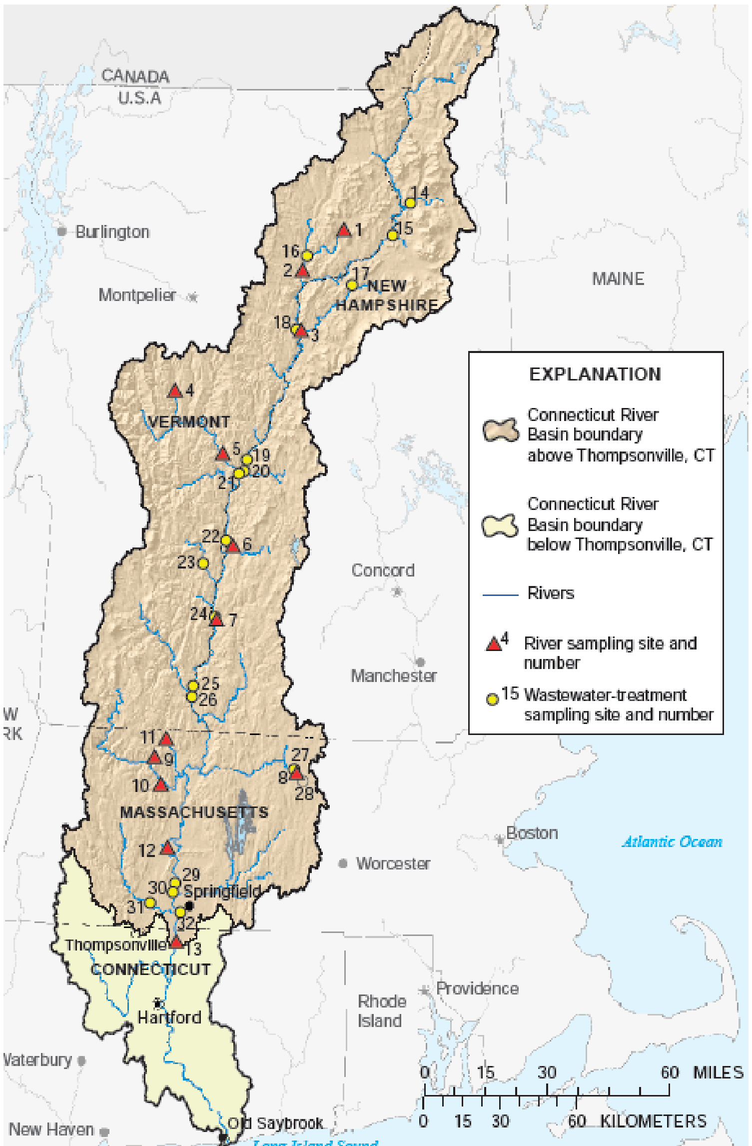
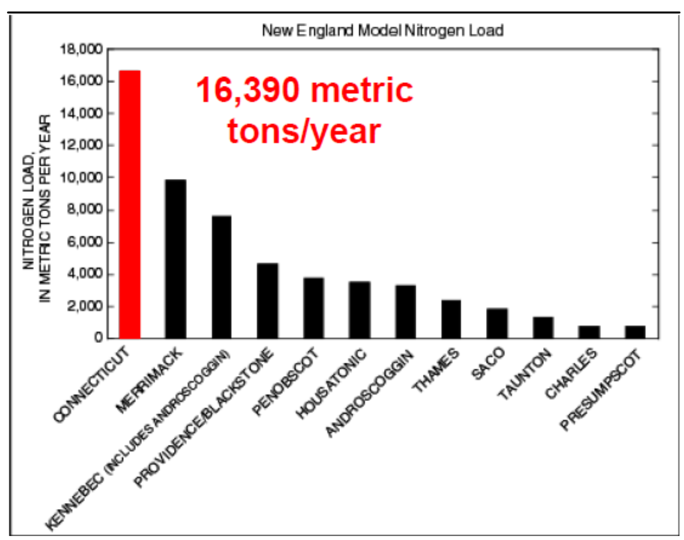
Long Island Sound – Connecticut River Watershed Nitrogen Overview



- This figure shows the modeled nitrogen loading contribution per year from the Connecticut River basin to the Long Island Sound.



- This map shows an overview of the extent of the Connecticut River watershed including areas of Vermont, New Hampshire, Massachusetts, and Connecticut.



- This graph shows the breakdown of the modeled nitrogen load from the Connecticut River watershed to the Long Island Sound from various sources.

- Above figure taken from USGS – *Assessment of Total Nitrogen in the Upper Connecticut River Basin in New Hampshire, Vermont, and Massachusetts, Dec 2002 – Sept 2005*. http://pubs.usgs.gov/sir/2006/5144/pdf/sir2006-5144.pdf

- Above figures taken from EPA/USGS – *Application of NHDPlus for SPARROW nutrient modeling of the Northeastern and Mid-Atlantic Region of the US* http://www.awra.org/orlando2010/presentations/Session22/ NHDPlus_SPARROW_AWRA20100330-good.pdf

Overview

This stormwater infrastructure mapping project was completed for the municipality by the Agency of Natural Resources Ecosystems Restoration program to supplement the existing drainage data collected by the town and with the intention of providing a tool for planning, maintenance, and inspection of the stormwater infrastructure.

The GIS maps and geodatabase are meant to provide an overall picture and understanding of the connectivity or connectedness of the storm system on both public and private properties in order to raise the awareness of the need for regular maintenance. The generation and transport of nonpoint source pollution increases with increasing connectivity of a drainage system. Having an understanding of the connectedness of the system is also a valuable tool for hazardous material spill planning and prevention. Knowledge of the extent of the system is also essential for the detection and elimination of illicit discharges. Outfall locations and system connectedness data are used as a base for locating illicit or illegal discharges of non-stormwater to the municipal storm system and tracing them up to the source. Knowledge of which areas of the sewer service area have combined stormwater and sewer systems can better assist the municipality in planning and implementing combined sewer separation projects. Knowledge of the layout and extent of the stormwater system can inform options for cleaning up existing polluted stormwater discharges. This project provides information and guidance for potential retrofit treatment locations and opportunities. Knowledge of where storm drains are located can also assist municipalities and residents with emergency preparedness for large rainfall events (i.e. Tropical Storm or Hurricanes) or spring snowmelt runoff events. By keeping storm drains clean, clear and open a good deal of localized flooding could be prevented. Finally, by providing a more thorough understanding of the system it is the hope that this project could be the basis for a local stormwater ordinance or be used to help enhance an existing stormwater management program.

Project Summary

The principal goal of this project was to develop up to date municipal drainage maps. These drainage maps were created showing the paths that stormwater runoff travels from where it falls on impervious surfaces such as parking lots, roads, and rooftops, to the outfall points in various receiving waters. These maps show the stormwater infrastructure including features like pipes, manholes, catchbasins, and swales within a municipality. Data sources included data collected from field work, a mapping grade Trimble GPS unit, available state permit plans, record drawings, town plans, WWMD plans, existing GIS data from contractors, and the input and guidance of knowledgeable members from the municipalities.

A second goal of this project was to establish potential locations for Best Management Practice (BMP) stormwater retrofit sites. These are sites where stormwater treatment structures could be added and where they would be most cost effective and efficient for sediment and phosphorus or nitrogen removal. In order to develop a retrofit site list, drainage area subwatersheds were delineated around the drainage networks. Determining how the stormwater infrastructure was connected was necessary in determining the subwatershed drainage areas within the town.

Delineating the drainage areas was done using the stormwater infrastructure maps, along with satellite imagery, a Digital Elevation Model (DEM), and USGS topographic maps. These data sources were used to approximate where the land area within each municipality was draining to; as well as where the high points were that divided the sub-drainage areas. The completed maps show the drainage coverage for essentially the entire municipality, but with a focus on areas with greater concentrations of impervious cover.

Impervious cover layers were created by either hand digitization or by using a method of raster pixel calculation (with ArcGIS spatial analyst extension) to create a vegetation index from the National Agricultural Imagery Program (NAIP) 08 orthophotos. The area which contrasted with the vegetation represents impervious surfaces and was then modified with buffered water and roads layers to make it more accurate. A more detailed explanation of this process is available in a separate document. The impervious layer was used to calculate the percent of each delineated drainage area that would generate stormwater runoff. The percentage of impervious surface number for each subwatershed was then adjusted with a connectivity rating. A rating was assigned to each drainage area polygon describing how directly connected the impervious surfaces within that subwatershed are to the receiving water. By adjusting the percent impervious area numbers with this connectivity rating the effective impervious area (EIA) was established for each subwatershed (*Sutherland, 1995*). This effective impervious number is a more accurate description of the amount of runoff produced by each of the subwatersheds because it helps to take factors such as infiltration into account.

After the effective impervious numbers were calculated for the subwatersheds the Simple Method was used to estimate the annual sediment (TSS) and phosphorus (TP) or Nitrogen (TN) loads generated by each subwatershed. The Simple method uses information which includes the adjusted impervious value, average annual rainfall for the location, total subwatershed area, and a given pollutant concentration value to calculate an annual load for various pollutants (*Schueler,1987*). Pollutant loads estimated by the Simple Method in this project are planning level estimates and are meant to give a general idea of the amounts of sediment or nutrient wash-off produced by each subwatershed for prioritization purposes. Subwatersheds were then prioritized, using the loading calculations as well as other criteria, and given Action List numbers ranging from 1 to 3 (one being the highest priority). The Action List number depends both upon loading values and feasibility of potential retrofit treatment options. Potential retrofit options listed in the TARGET maps are based on field observations and not on actual availability of land or willingness of landowner.

Water Quality Volume (WQv – the amount of storage needed to treat stormwater from a 0.9 inch storm) and Channel Protection Volume (CPv – the volume of storage that is needed to hold and slowly release stormwater for a 2.1inch rain event) were also calculated for delineated subwatershed areas. CPv calculations are only applicable if the receiving water is not a large body of water and is therefore susceptible to channel erosion. These numbers were used in the retrofit recommendation process because the volume of water to be treated was a key factor in determining the type of retrofit.

Project References

Schueler, T. 1987. Technical Documentation of a Simple Method for Estimating Urban Storm Pollutant Export. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. Appendix A.

Schueler, T. et.al., 2007. Urban Stormwater Retrofit Practices, Version 1.0. Manual 3, Center for Watershed Protection, August 2007.

Sutherland, R. 1995. Methodology for Estimating the Effective Impervious Area of Urban Watersheds. Technical Note 58 – Pervious Area Management. Watershed Protection Techniques. Vol. 2, No. 1

***All data was created in an ArcGIS 10 Geodatabase format and is available from VTDEC.**

Subwatershed Data

Tables showing calculations and Priority drainage area retrofit possibilities

This is a key showing the abbreviations of the different stormwater treatment structures or practices listed in the calculation sheets.

Abbreviation Key	
Code	**Structure Type**
BB	Baffle Box
BFCB	Baffled Catchbasin
BRA	Bioretention Area (aka Bioretention Filter)
BS	Buffer Strip (25' Min.)
CB	Catch Basin
CBI	Catch Basin Insert
CD	Check Dam
DI	Drop Inlet
DP	Dry Pond
DS	Dry Swale
DW	Drywell
EDP	Extended Detention Pond with Micropool (aka Micropool Extended Detention Basin)
GR	Green Roof
GS	Grass Swale (aka Open Channel)
IB	Infiltration Basin
IG	Infiltration Gallery
IP	Infiltration Pipe
OF	Overland Flow
OGF	Organic Filter
PA/PC	Pervious Asphalt or Pervious Concrete
POP	Pocket Pond
PP	Perforated Pipe
RDD	Roof Drain Disconnect
RR	Rock Riprap
RS	Riprap Swale
SB	Sediment Basin
SF	Sand Filter (aka Surface Sand Filter)
SS/VS	Swirl Separator
ST	Septic Tank
SWPPP	Stormwater Pollution Prevention Plan
TT	Treatment Tank
WL	Wetland (Constructed)
WP	Wet Pond (Retention)
WS	Wet Swale

Hartford - Subwatershed Prioritization and Recommendations

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Nitrogen Load with Current Reductions (lbs)	Nitrogen Load with Priority Action (lbs)
7 Hartford	1	Upgrade pond to infiltration basin at 54 Palmer Ct. Combine with 8.	OF/GS/WP		49.6	8.7	2,533	1,140	28.1	11.3
8 Hartford	1	Combine with 7	CB/WP		7.4	35.8	1,220	549	13.6	5.4
18 Hartford	1	Upgrade pond to infiltration basin.	CB/GS/WP	4760-9003, 5146-9003, 3150-9010, 3150-9015, 6533-9003	22.9	49.5	5,895	2,653	65.5	26.2
32 Hartford	1	Bioretention in cul de sac of Perkins Place	BRA/OF/CB/	3294-9010, 3563-9010	147.4	16.4	21,429	19,286	178.6	169.6
41 Hartford	1	Repair eroded outfall at 1297 Hartford Ave	CB/DW/GS	5364-9010	149.5	19.6	25,405	20,324	211.7	190.5
70 Hartford	1	Wet pond at park entrance	WP/CB/DW		71.9	37.0	30,864	6,173	257.2	154.3
72 Hartford	1	Add a sediment forebay to pond	CB/WP		20.9	15.5	398	398	10.0	10.0
90 Hartford	1	For upper 1/2 of drainage: wet pond on VA Hospital entrance road and wet pond below upper VA parking lot.	WP/CB/EDP/GS/SB/IG	6133-9015, 6133-INDS, 3119-9010, 3003-9010, 3005-9010	112.3	36.7	22,366	15,656	226.3	192.4
3000d Hartford	1	Bioretention in open lot at 120 South Main St	BRA/CB		0.9	85.3	947	189	7.9	3.2
46 Hartford	2	Swirl Separator at outfall	VS/CB/GS/IB/VS	6997-9015	86.0	39.0	39,045	23,427	325.4	244.0
57 Hartford	2	Bioretention at 75 Pine St	BRA/BRA/CB	7063-INDS	57.8	25.6	6,409	5,768	71.2	67.6
58 Hartford	2	Swirl Separator at outfall	VS/CB/GS		8.8	71.2	7,588	4,553	63.2	47.4
76 Hartford	2	Swirl Separator behind 165 N Main St. Fix erosion at outfall.	RR/VS/CB/GS		58.4	40.8	27,696	16,618	230.8	173.1
103 Hartford	2	Bioretention basin to treat Rte 5 runoff in island in front of 50 Woodstock Rd	IB/CB/GS		42.2	28.0	13,739	2,748	114.5	45.8
101 Hartford	3	Infiltration basin north of 1013 N Main St	IB/CB/GS/IG/VS/ SWPPP	3824-9010, 4763-9003	67.2	35.2	27,484	1,374	229.0	45.8
121 Hartford	3	Infiltration basin at corner of Byron Hill Rd and Rte 14	GS,CB,EDP, SWPPP	5220-9015, 5029-9003, 4224-9015, 6367-9003, 6015-9015	312.1	8.3	15,653	10,957	173.9	147.8
1 Hartford			CB/EDP/GS	5489-9015	4.3	16.3	83	83	2.1	2.1
2 Hartford			CB/SB/GS	3691-9010	3.6	40.6	710	710	7.9	7.9
3 Hartford			CB/GS/OF	3696-9010	1.4	57.5	446	446	5.0	5.0
4 Hartford			OF/GS	5947-9010	3.7	24.9	398	398	4.4	4.4
5 Hartford			OF/CB/GS/ SWPPP	3068-9010, 3020-9010, 5113-9003	8.4	50.1	2,188	2,188	24.3	24.3
6 Hartford			OF/GS/DW/CB/ SWPPP	3853-9010, 3406-9010, 3406-INDS, 4895-9010, 4072-9003	39.2	18.6	3,175	3,175	35.3	35.3
9 Hartford			GS/CB/OF		39.5	4.5	3,061	3,061	25.5	25.5
10 Hartford			CB/URB/SF	3601-9010	2.8	54.6	235	235	5.9	5.9

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Nitrogen Removal Per Pound (based on annual nitrogen load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
7 Hartford	0.24	0.47		$50,000	$24.22	$2,000.00	ERP,SRF	119	$54,934
8 Hartford	0.12	0.29					ERP,SRF	58	$26,452
18 Hartford	0.56	1.25		$75,000	$23	$1,908	ERP,SRF	278	$127,858
32 Hartford	1.21	2.66		15,000	NA	NA	ERP,SRF	606	$278,846
41 Hartford	1.44	3.23		$10,000	$1.51	$190	ERP,SRF	719	$330,594
70 Hartford	1.75	FALSE	532,458		$22	$5,176	ERP,SRF	873	$401,625
72 Hartford	0.11	FALSE		$1,000	NA	NA	ERP,SRF	56	$25,905
90 Hartford	1.81	4.54	275,614		$21	$4,059	ERP,SRF	904	$415,784
3000d Hartford	0.05	FALSE	12,324		$16	$2,603	ERP,SRF	27	$12,324
46 Hartford	2.21	FALSE	508,093		$33	$6,246	ERP,SRF	1105	$508,093
57 Hartford	0.60	FALSE		$5,000	NA	NA	ERP,SRF	302	$138,993
58 Hartford	0.43	FALSE	98,740		$33	$6,246	ERP,SRF	215	$98,740
76 Hartford	1.57	FALSE	360,404		$33	$6,246	ERP,SRF	783	$360,404
103 Hartford	0.78	1.30	178,780		$16	$2,603	ERP,SRF	389	$178,780
101 Hartford	1.55	2.60	1,422,449		$54	$7,763	ERP,SRF	777	$357,644
121 Hartford	1.48	FALSE		$20,000	NA	NA	ERP,SRF	738	$339,494
1 Hartford	0.02	0.08					ERP,SRF	12	$5,428
2 Hartford	0.07	0.16					ERP,SRF	33	$15,394
3 Hartford	0.04	0.09					ERP,SRF	21	$9,677
4 Hartford	0.04	0.10					ERP,SRF	19	$8,637
5 Hartford	0.21	0.46					ERP,SRF	103	$47,455
6 Hartford	0.30	0.80					ERP,SRF	150	$68,855
9 Hartford	0.17	0.19					ERP,SRF	87	$39,830
10 Hartford	0.07	0.17					ERP,SRF	33	$15,269

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11 Hartford			CB/PP/GS	3601-9010	1.9	41.2	104	104	2.6	2.6
12 Hartford			GS/OF/WP	3082-9010	30.6	11.3	499	499	12.5	12.5
13 Hartford			CB/GS/EDP	3082-9010	10.8	46.5	2,536	2,536	28.2	28.2
14 Hartford			GS/OF		5.9	7.5	538	538	4.5	4.5
15 Hartford			OF/CB		14.6	21.8	2,740	2,740	22.8	22.8
16 Hartford			OF/GS		5.2	51.9	2,661	2,661	22.2	22.2
17 Hartford			OF/GS	3228-9010	1.4	70.9	638	638	7.1	7.1
19 Hartford			CB/GS/EDP	3362-9010	10.9	46.8	3,037	3,037	30.7	30.7
20 Hartford			CB/EDP	3113-9010	12.8	39.1	2,780	2,780	28.1	28.1
21 Hartford			CB		2.2	37.4	742	742	6.2	6.2
22 Hartford			OF/GS		4.3	33.6	1,281	1,281	10.7	10.7
23 Hartford			CB/OF		1.9	58.7	1,125	1,125	9.4	9.4
24 Hartford			GS/OF	3529-9010	25.2	21.3	2,304	2,304	25.6	25.6
25 Hartford			CB/GS	7088-INDS	3.6	45.5	224	224	5.6	5.6
26 Hartford			GS/CB/OF		89.4	34.4	27,454	27,454	228.8	228.8
27 Hartford			CB/OF		22.2	23.4	4,481	4,481	37.3	37.3
28 Hartford			CB/GS/OF		7.9	32.5	2,273	2,273	18.9	18.9
29 Hartford			CB/GS		1.7	34.3	531	531	4.4	4.4
30 Hartford			OF/GS		3.5	36.0	1,128	1,128	9.4	9.4
31 Hartford			GS/IB/DW		3.7	15.1	17	17	0.6	0.6
33 Hartford			CB/OF		90.0	9.2	8,970	8,970	74.8	74.8
34 Hartford			OF/CB		112.4	6.4	9,629	9,629	80.2	80.2
35 Hartford			CB/OF		47.1	18.6	7,629	7,629	63.6	63.6
36 Hartford			OF		20.9	31.0	5,679	5,679	47.3	47.3
37 Hartford			CB/DW/GS		46.5	18.4	7,478	7,478	62.3	62.3
38 Hartford			CB/GS/URB/DW/ OF		61.9	27.3	9,807	9,807	91.9	91.9
39 Hartford					6.2	92.4	412	412	3.4	3.4
40 Hartford			CB		5.8	41.5	2,217	2,217	18.5	18.5
42 Hartford			CB/GS/OF		260.1	4.7	20,406	20,406	170.1	170.1
43 Hartford			GS		28.3	18.6	4,572	4,572	38.1	38.1
44 Hartford			GS	6545-9015	43.1	22.0	8,176	8,176	68.1	68.1
45 Hartford			CB/GS/EDP	3050-9010, 3812-9010, 6545-9015	109.5	22.0	10,334	10,334	114.8	114.8
47 Hartford			CB		12.1	11.6	1,376	1,376	11.5	11.5
48 Hartford			CB/GS		103.8	8.8	10,104	10,104	84.2	84.2
49 Hartford			CB		27.9	23.5	7,716	7,716	64.3	64.3
50 Hartford			IG/CB/OF	7079-INDS	5.9	37.8	2,032	2,032	16.9	16.9
51 Hartford			IG/CB/OF	7079-INDS	16.7	41.8	6,500	6,500	54.2	54.2
52 Hartford			CB/GS		20.1	31.0	5,472	5,472	45.6	45.6
53 Hartford			CB		5.8	34.7	1,800	1,800	15.0	15.0
54 Hartford			CB		2.4	68.2	2,000	2,000	16.7	16.7
55 Hartford			CB		2.8	67.6	2,291	2,291	19.1	19.1
56 Hartford			CB		1.3	81.1	1,337	1,337	11.1	11.1
59 Hartford			CB/GS	6800-INDS	3.6	35.4	585	585	6.5	6.5
60 Hartford			CB/DW/GS		117.8	19.5	19,863	19,863	165.5	165.5
61 Hartford			OF/GS		42.0	6.6	3,632	3,632	30.3	30.3
62 Hartford			CB/GS		32.8	8.2	3,087	3,087	25.7	25.7
63 Hartford			IG/EDP/GS	3925-9015	91.4	8.8	8,916	8,916	74.3	74.3
64 Hartford			GS/CB/OF	1-0798	47.7	17.1	5,746	5,746	53.9	53.9
65 Hartford			CB		5.0	38.9	2,263	2,263	18.9	18.9
66 Hartford			OF		35.0	5.8	2,905	2,905	24.2	24.2
67 Hartford			GS		61.8	4.1	4,719	4,719	39.3	39.3

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Nitrogen Removal Per Pound (based on annual nitrogen load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
11 Hartford	0.03	0.09					ERP,SRF	15	$6,738
12 Hartford	0.14	0.38					ERP,SRF	71	$32,446
13 Hartford	0.24	0.55					ERP,SRF	120	$55,011
14 Hartford	0.03	0.05					ERP,SRF	15	$6,998
15 Hartford	0.16	0.35					ERP,SRF	78	$35,655
16 Hartford	0.15	0.30					ERP,SRF	75	$34,626
17 Hartford	0.06	0.11					ERP,SRF	30	$13,829
19 Hartford	0.25	0.56					ERP,SRF	123	$56,451
20 Hartford	0.22	0.55					ERP,SRF	112	$51,681
21 Hartford	0.04	0.09					ERP,SRF	21	$9,653
22 Hartford	0.07	0.16					ERP,SRF	36	$16,663
23 Hartford	0.06	0.12					ERP,SRF	32	$14,641
24 Hartford	0.22	0.59					ERP,SRF	109	$49,967
25 Hartford	0.06	FALSE					ERP,SRF	32	$14,570
26 Hartford	1.55	FALSE					ERP,SRF	777	$357,258
27 Hartford	0.25	0.57					ERP,SRF	127	$58,305
28 Hartford	0.13	0.28					ERP,SRF	64	$29,582
29 Hartford	0.03	0.07					ERP,SRF	15	$6,913
30 Hartford	0.06	0.14					ERP,SRF	32	$14,676
31 Hartford	0.02	0.06					ERP,SRF	10	$4,525
33 Hartford	0.51	0.91					ERP,SRF	254	$116,731
34 Hartford	0.54	0.79					ERP,SRF	272	$125,296
35 Hartford	0.43	FALSE					ERP,SRF	216	$99,271
36 Hartford	0.32	FALSE					ERP,SRF	161	$73,907
37 Hartford	0.42	FALSE					ERP,SRF	212	$97,314
38 Hartford	0.69	FALSE					ERP,SRF	347	$159,516
39 Hartford	0.02	FALSE					ERP,SRF	12	$5,360
40 Hartford	0.13	0.26					ERP,SRF	63	$28,846
42 Hartford	1.15	1.35					ERP,SRF	577	$265,541
43 Hartford	0.26	0.58					ERP,SRF	129	$59,490
44 Hartford	0.46	1.04					ERP,SRF	231	$106,389
45 Hartford	0.97	2.64					ERP,SRF	487	$224,122
47 Hartford	0.08	FALSE					ERP,SRF	39	$17,906
48 Hartford	0.57	1.00					ERP,SRF	286	$131,483
49 Hartford	0.44	FALSE					ERP,SRF	218	$100,409
50 Hartford	0.11	0.25					ERP,SRF	57	$26,440
51 Hartford	0.37	0.77					ERP,SRF	184	$84,590
52 Hartford	0.31	FALSE					ERP,SRF	155	$71,212
53 Hartford	0.10	FALSE					ERP,SRF	51	$23,427
54 Hartford	0.11	FALSE					ERP,SRF	57	$26,021
55 Hartford	0.13	FALSE					ERP,SRF	65	$29,812
56 Hartford	0.08	FALSE					ERP,SRF	38	$17,395
59 Hartford	0.06	FALSE					ERP,SRF	28	$12,690
60 Hartford	1.12	FALSE					ERP,SRF	562	$258,481
61 Hartford	0.21	0.30					ERP,SRF	103	$47,269
62 Hartford	0.17	FALSE					ERP,SRF	87	$40,175
63 Hartford	0.50	FALSE					ERP,SRF	252	$116,026
64 Hartford	0.41	0.90					ERP,SRF	203	$93,465
65 Hartford	0.13	0.21					ERP,SRF	64	$29,450
66 Hartford	0.16	FALSE					ERP,SRF	82	$37,804
67 Hartford	0.27	0.28					ERP,SRF	133	$61,404

Hartford - Subwatershed Prioritization and Recommendations

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Nitrogen Load with Current Reductions (lbs)	Nitrogen Load with Priority Action (lbs)
68 Hartford			CB/EDP/GS	3888-9015	83.1	21.3	1,999	1,999	50.0	50.0
69 Hartford			CB/PA/SWPPP	5024-9003, 5024-9015	9.4	47.0	1,491	1,491	21.7	21.7
74 Hartford			CB/GS		10.5	31.9	2,965	2,965	24.7	24.7
75 Hartford			CB/GS		7.1	40.2	2,645	2,645	22.0	22.0
77 Hartford			DW/CB	3231-9010	3.5	89.9	2,943	2,943	27.6	27.6
78 Hartford			CB/VS		4.9	85.1	4,260	4,260	39.9	39.9
79 Hartford			CB		1.3	89.7	1,445	1,445	12.0	12.0
80 Hartford			CB/GS/EDP/IB	5496-9010, 5860-9010	22.5	55.3	2,264	2,264	47.2	47.2
81 Hartford			CB/DW		40.7	49.9	16,712	16,712	169.1	169.1
82 Hartford			GS/SB/CB		2.0	74.9	1,107	1,107	11.2	11.2
83 Hartford			CB/GS		2.2	66.9	1,796	1,796	15.0	15.0
84 Hartford			CB/SB/GS/SWPPP	4633-9003	17.3	48.8	7,912	7,912	74.2	74.2
85 Hartford			CB/GS		3.3	77.1	3,077	3,077	25.6	25.6
86 Hartford			DW/GS/CB	4709-9010	54.9	15.1	6,752	6,752	59.4	59.4
87 Hartford			CB/GS/WP	3994-9015	6.9	53.7	562	562	14.0	14.0
88 Hartford			OF/CB/WP	3994-9015	170.7	6.8	14,906	14,906	124.2	124.2
89 Hartford			OF/WP		212.3	2.7	3,035	3,035	75.9	75.9
91 Hartford			CB/EDP/GS	6133-9015	6.3	48.9	440	440	11.0	11.0
92 Hartford			CB/OF		30.5	27.3	7,208	7,208	60.1	60.1
93 Hartford			GS/EDP/GR/CB	6133-9015	193.0	13.5	19,366	19,366	181.6	181.6
94 Hartford			CB		3.0	56.4	2,002	2,002	16.7	16.7
95 Hartford			GS/CB		3.8	21.6	712	712	5.9	5.9
96 Hartford			CB		1.0	59.4	716	716	6.0	6.0
97 Hartford			CB/GS		28.5	8.7	2,759	2,759	23.0	23.0
98 Hartford			GS		28.8	2.8	2,071	2,071	17.3	17.3
99 Hartford			GS/WP		11.3	13.6	724	724	8.0	8.0
100 Hartford			OF		47.2	10.6	5,069	5,069	42.2	42.2
102 Hartford			CB/GS/EDP	3104-9015	2.6	65.1	295	295	7.4	7.4
104 Hartford			CB/OF		26.5	19.9	4,556	4,556	38.0	38.0
105 Hartford			DW		3.0	55.3	844	844	7.7	7.7
106 Hartford			CB/OF		2.1	40.9	799	799	6.7	6.7
107 Hartford			OF		10.9	26.4	2,487	2,487	20.7	20.7
108 Hartford			OF		28.2	34.4	8,652	8,652	72.1	72.1
109 Hartford			OF/CB		16.0	30.2	4,223	4,223	35.2	35.2
110 Hartford			CB/GS		24.6	13.5	3,097	3,097	25.8	25.8
111 Hartford			CB/GS/OF		21.0	26.5	4,805	4,805	40.0	40.0
112 Hartford			OF		18.7	8.1	1,751	1,751	14.6	14.6
113 Hartford			GS/OF		52.1	8.3	4,927	4,927	41.1	41.1
114 Hartford			CB/EDP/GS/ SWPPP	4246-9015, 4793-9003	137.4	19.8	16,501	16,501	167.0	167.0
115 Hartford			CB/GS		331.1	7.2	29,533	29,533	246.1	246.1
116 Hartford			OF		25.5	13.1	3,141	3,141	26.2	26.2
117 Hartford			CB/GS/OF		22.3	54.0	12,028	12,028	100.2	100.2
118 Hartford			CB/GS		186.2	14.5	24,550	24,550	204.6	204.6
119 Hartford			GS/CB/OF/BRA/ EDP/WP	3349-9010, 5230-9015, 6327-9015, 6393-9015	1365.7	4.4	59,112	59,112	656.8	656.8
120 Hartford			CB/GS	7321-9015	1088.3	4.0	82,386	82,386	686.6	686.6
122 Hartford			GS/CB		48.1	12.9	5,851	5,851	48.8	48.8
123 Hartford			GS/CB/EDP/CB	4455-9010	204.8	6.4	11,120	11,120	112.5	112.5

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Nitrogen Removal Per Pound (based on annual nitrogen load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
68 Hartford	0.57	FALSE					ERP,SRF	283	$130,093
69 Hartford	0.21	FALSE					ERP,SRF	105	$48,501
74 Hartford	0.17	0.37					ERP,SRF	84	$38,590
75 Hartford	0.15	0.32					ERP,SRF	75	$34,420
77 Hartford	0.21	FALSE					ERP,SRF	104	$47,864
78 Hartford	0.30	FALSE					ERP,SRF	151	$69,292
79 Hartford	0.08	FALSE					ERP,SRF	41	$18,803
80 Hartford	0.64	1.37					ERP,SRF	320	$147,317
81 Hartford	1.35	2.23					ERP,SRF	675	$310,673
82 Hartford	0.09	0.16					ERP,SRF	45	$20,576
83 Hartford	0.10	0.16					ERP,SRF	51	$23,366
84 Hartford	0.56	0.93					ERP,SRF	280	$128,704
85 Hartford	0.17	0.28					ERP,SRF	87	$40,040
86 Hartford	0.42	FALSE					ERP,SRF	212	$97,630
87 Hartford	0.16	0.40					ERP,SRF	79	$36,552
88 Hartford	0.84	1.27					ERP,SRF	422	$193,973
89 Hartford	0.86	0.62					ERP,SRF	429	$197,502
91 Hartford	0.12	0.34					ERP,SRF	62	$28,627
92 Hartford	0.41	FALSE					ERP,SRF	204	$93,791
93 Hartford	1.37	2.87					ERP,SRF	685	$315,012
94 Hartford	0.11	0.19					ERP,SRF	57	$26,055
95 Hartford	0.04	FALSE					ERP,SRF	20	$9,262
96 Hartford	0.04	FALSE					ERP,SRF	20	$9,316
97 Hartford	0.16	FALSE					ERP,SRF	78	$35,904
98 Hartford	0.12	FALSE					ERP,SRF	59	$26,946
99 Hartford	0.07	FALSE					ERP,SRF	34	$15,711
100 Hartford	0.29	0.55					ERP,SRF	143	$65,963
102 Hartford	0.08	0.18					ERP,SRF	42	$19,197
104 Hartford	0.26	0.58					ERP,SRF	129	$59,287
105 Hartford	0.09	FALSE					ERP,SRF	43	$19,972
106 Hartford	0.05	FALSE					ERP,SRF	23	$10,400
107 Hartford	0.14	FALSE					ERP,SRF	70	$32,367
108 Hartford	0.49	FALSE					ERP,SRF	245	$112,582
109 Hartford	0.24	FALSE					ERP,SRF	119	$54,951
110 Hartford	0.18	0.37					ERP,SRF	88	$40,298
111 Hartford	0.27	FALSE					ERP,SRF	136	$62,525
112 Hartford	0.10	FALSE					ERP,SRF	50	$22,790
113 Hartford	0.28	FALSE					ERP,SRF	139	$64,110
114 Hartford	1.33	FALSE					ERP,SRF	667	$306,746
115 Hartford	1.67	2.61					ERP,SRF	835	$384,305
116 Hartford	0.18	FALSE					ERP,SRF	89	$40,877
117 Hartford	0.68	FALSE					ERP,SRF	340	$156,517
118 Hartford	1.39	2.96					ERP,SRF	695	$319,472
119 Hartford	5.57	6.57					ERP,SRF	2787	$1,282,019
120 Hartford	4.66	4.75					ERP,SRF	2331	$1,072,083
122 Hartford	0.33	FALSE					ERP,SRF	166	$76,140
123 Hartford	0.90	FALSE					ERP,SRF	449	$206,710

Hartford - Subwatershed Prioritization and Recommendations

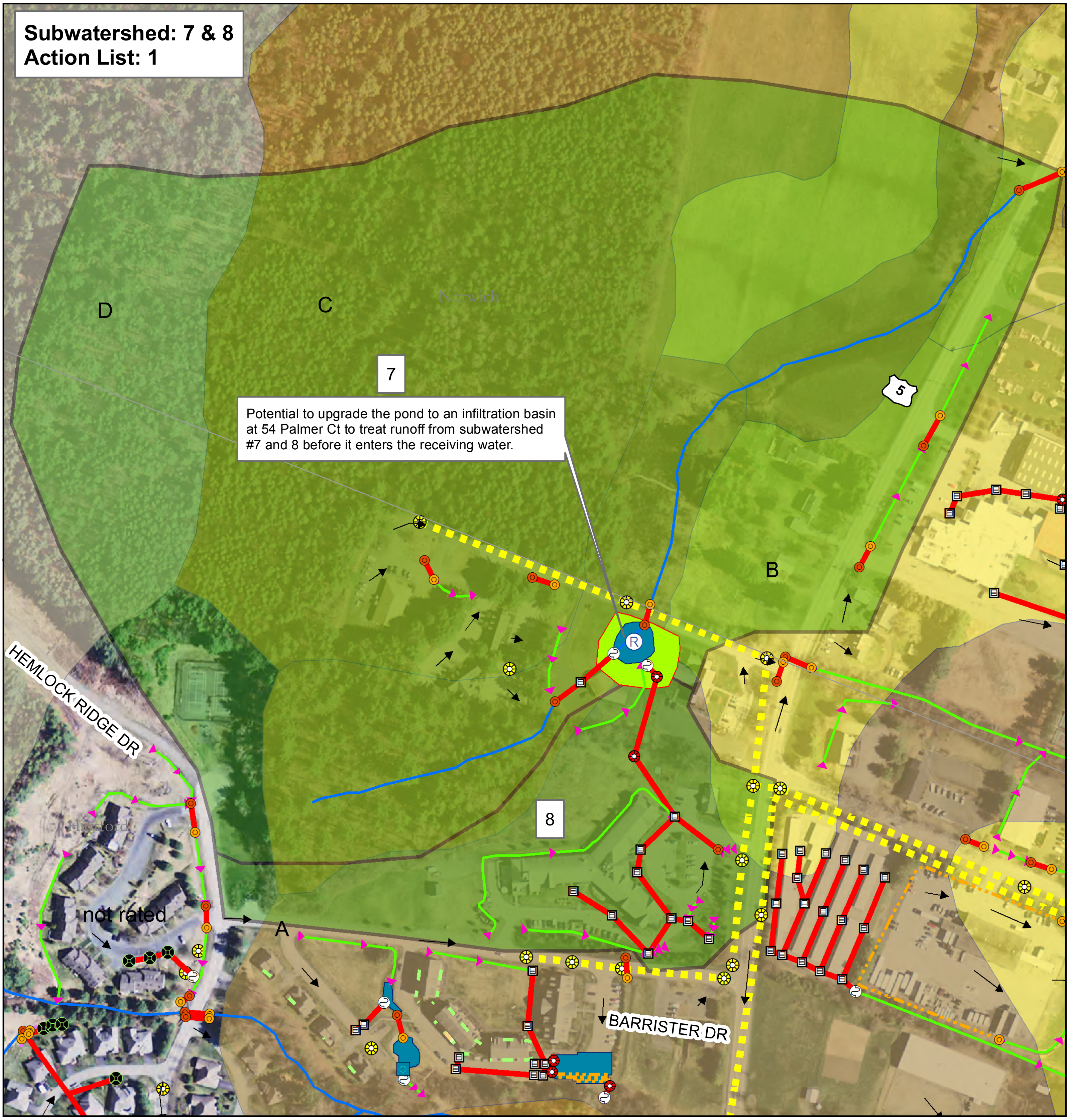
Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Nitrogen Load with Current Reductions (lbs)	Nitrogen Load with Priority Action (lbs)
124 Hartford			GS/OF		124.4	6.9	10,921	10,921	91.0	91.0
125 Hartford			GS/OF/WP		194.0	5.2	15,590	15,590	129.9	129.9
126 Hartford			GS/CB/OF/WP	3256-9010	37.0	14.7	1,665	1,665	24.3	24.3
127 Hartford			CB/GS		23.4	18.5	3,778	3,778	31.5	31.5
128 Hartford			CB/GS	3256-9010	68.8	13.1	8,455	8,455	70.5	70.5
129 Hartford			CB/GS		14.7	23.8	3,017	3,017	25.1	25.1
130 Hartford			CB/EDP/GS		4.5	9.5	70	70	1.7	1.7
131 Hartford			CB/GS	3025-9010	11.4	25.0	1,224	1,224	13.6	13.6
132 Hartford			OF/CB/GS/ SWPPP		365.3	5.6	30,062	30,062	250.5	250.5
133 Hartford			GS/CB/WP	4282-9010	208.6	14.4	21,889	21,889	205.2	205.2
134 Hartford			GS/CB/OF		137.2	7.6	12,531	12,531	104.4	104.4
135 Hartford			OF		71.6	1.6	4,911	4,911	40.9	40.9
136 Hartford			GS/EDP/CB	5523-9015	22.7	30.8	816	816	20.4	20.4
137 Hartford			GS/CB		11.6	31.6	3,233	3,233	26.9	26.9
138 Hartford			GS/OF		28.8	6.8	2,523	2,523	21.0	21.0
139 Hartford			OF		71.7	8.6	6,911	6,911	57.6	57.6
140 Hartford			GS		4.4	21.4	820	820	6.8	6.8
141 Hartford			OF/GS/CB		28.0	11.0	3,081	3,081	25.7	25.7
142 Hartford			GS		95.6	7.2	8,560	8,560	71.3	71.3
143 Hartford			GS/OF		273.4	10.5	29,298	29,298	244.2	244.2
144 Hartford			GS/OF/CB		134.6	6.8	11,743	11,743	97.9	97.9
145 Hartford			GS		19.2	9.7	1,958	1,958	16.3	16.3
146 Hartford			CB/GS		1.4	72.9	1,094	1,094	9.1	9.1
147 Hartford			CB/GS		1.3	56.6	765	765	6.4	6.4
148 Hartford			GS/OF/WP	5736-9015	829.4	6.1	69,810	69,810	581.8	581.8
149 Hartford			OF/WP		40.7	6.6	1,910	1,910	21.2	21.2
150 Hartford			OF		13.3	4.5	1,031	1,031	8.6	8.6
151 Hartford			CB/DW/GS	3227-9010	96.4	6.4	4,482	4,482	49.8	49.8
152 Hartford			GS/WP		526.7	5.7	26,127	26,127	290.3	290.3
153 Hartford			CB/OF		26.9	25.2	7,946	7,946	66.2	66.2
154 Hartford			CB/OF		49.5	10.5	5,288	5,288	44.1	44.1
155 Hartford			CB/GS/EDP	3600-9015	6.3	32.9	247	247	6.2	6.2
156 Hartford			GS/OF		78.0	11.2	8,649	8,649	72.1	72.1
157 Hartford			OF/GS		238.7	6.9	21,030	21,030	175.3	175.3
158 Hartford			CB/DW/OF	5741-9015	10.0	57.9	2,783	2,783	30.9	30.9
159 Hartford			CB/SB		1.4	67.4	575	575	6.4	5.8
160 Hartford			CB	3706-9010	2.9	81.3	2,703	2,703	22.5	22.5
161 Hartford			CB		5.1	21.4	946	946	7.9	7.9
162 Hartford			DW		4.0	23.6	402	402	4.5	4.5
163 Hartford			OF		28.1	20.0	4,867	4,867	40.6	40.6
164 Hartford			OF/GS	4530-9003	135.7	9.4	13,630	13,630	113.6	113.6
165 Hartford			GS/CB		47.5	8.1	4,455	4,455	37.1	37.1
166 Hartford			EDP/CB/GS/OF	6895-9015, 3551-9010	466.7	7.1	41,539	41,539	346.2	346.2
167 Hartford			IB/GS/OF	4151-9015	111.4	14.1	7,298	7,298	81.1	81.1
168 Hartford			GS/OF/CB/SWPPP	5029-9003	25.3	18.5	3,266	3,266	30.6	30.6
3000a Hartford			CB/OF		3.4	40.8	1,276	1,276	10.6	10.6
3000b Hartford			CB/GS		7.4	56.2	4,233	4,233	35.3	35.3
3000e Hartford			CB		2.8	55.3	1,558	1,558	13.0	13.0
3000f Hartford			CB		0.1	99.2	97	97	0.8	0.8
3000g Hartford			CB		4.3	19.0	705	705	5.9	5.9
3000h Hartford			CB		0.4	56.9	247	247	2.1	2.1
3000i Hartford			CB		5.8	12.0	665	665	5.5	5.5

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Nitrogen Removal Per Pound (based on annual nitrogen load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
124 Hartford	0.62	0.94					ERP,SRF	309	
125 Hartford	0.88	1.11					ERP,SRF	441	
126 Hartford	0.24	0.60					ERP,SRF	118	
127 Hartford	0.21	FALSE					ERP,SRF	107	
128 Hartford	0.48	FALSE					ERP,SRF	239	
129 Hartford	0.17	FALSE					ERP,SRF	85	
130 Hartford	0.02	FALSE					ERP,SRF	10	
131 Hartford	0.12	FALSE					ERP,SRF	58	
132 Hartford	1.70	2.27					ERP,SRF	850	
133 Hartford	1.55	FALSE					ERP,SRF	774	
134 Hartford	0.71	FALSE					ERP,SRF	355	
135 Hartford	0.28	FALSE					ERP,SRF	139	
136 Hartford	0.23	FALSE					ERP,SRF	115	
137 Hartford	0.18	FALSE					ERP,SRF	91	
138 Hartford	0.14	FALSE					ERP,SRF	71	
139 Hartford	0.39	FALSE					ERP,SRF	196	
140 Hartford	0.05	0.10					ERP,SRF	23	
141 Hartford	0.17	0.34					ERP,SRF	87	
142 Hartford	0.48	0.76					ERP,SRF	242	
143 Hartford	1.66	3.17					ERP,SRF	829	
144 Hartford	0.66	FALSE					ERP,SRF	332	
145 Hartford	0.11	FALSE					ERP,SRF	55	
146 Hartford	0.06	FALSE					ERP,SRF	31	
147 Hartford	0.04	FALSE					ERP,SRF	22	
148 Hartford	3.95	5.55					ERP,SRF	1975	
149 Hartford	0.18	FALSE					ERP,SRF	90	
150 Hartford	0.06	FALSE					ERP,SRF	29	
151 Hartford	0.42	0.68					ERP,SRF	211	
152 Hartford	2.46	3.32					ERP,SRF	1232	
153 Hartford	0.45	FALSE					ERP,SRF	225	
154 Hartford	0.30	FALSE					ERP,SRF	150	
155 Hartford	0.07	0.23					ERP,SRF	35	
156 Hartford	0.49	0.96					ERP,SRF	245	
157 Hartford	1.19	1.82					ERP,SRF	595	
158 Hartford	0.26	FALSE					ERP,SRF	131	
159 Hartford	0.05	FALSE					ERP,SRF	27	
160 Hartford	0.15	0.26					ERP,SRF	76	
161 Hartford	0.05	0.12					ERP,SRF	27	
162 Hartford	0.04	0.10					ERP,SRF	19	
163 Hartford	0.28	0.62					ERP,SRF	138	
164 Hartford	0.77	1.40					ERP,SRF	386	
165 Hartford	0.25	0.42					ERP,SRF	126	
166 Hartford	2.35	3.66					ERP,SRF	1175	
167 Hartford	0.69	FALSE					ERP,SRF	344	
168 Hartford	0.23	FALSE					ERP,SRF	115	
3000a Hartford	0.07	FALSE					ERP,SRF	36	
3000b Hartford	0.24	FALSE					ERP,SRF	120	
3000e Hartford	0.09	FALSE					ERP,SRF	44	
3000f Hartford	0.01	FALSE					ERP,SRF	3	
3000g Hartford	0.04	FALSE					ERP,SRF	20	
3000h Hartford	0.01	FALSE					ERP,SRF	7	
3000i Hartford	0.04	FALSE					ERP,SRF	19	

Target Maps

Showing Priority Action List Drainage Areas

And Potential Retrofit Locations



Hartford, VT

DEC Stormwater Infrastructure Mapping Project

This map shows high priority subwatersheds which are ranked by connectedness, percent of impervious cover, field observations, and potential retrofit measures and locations.

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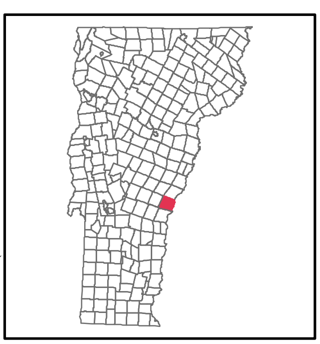


VERMONT

Stormwater points

- Pipe Cross (not connected)
- Catchbasin
- Dry Well
- Drop Inlet
- Grate/Curb Inlet
- Yard drain
- CB tied to sanitary sewer
- Junction Box
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Pond outlet structure
- Treatment feature (see notes)
- Retrofit
- Unknown Point
- Information Point

Stormwater line

- Storm line
- Storm line (old Sanitary line)
- Tunnel (storm)
- Combined sewer
- Sanitary line
- Swale
- Footing drain
- Under drain
- Roof drain
- Infiltration pipe
- French drain
- Trench drain
- Emergency spillway
- Stream
- Overland flow

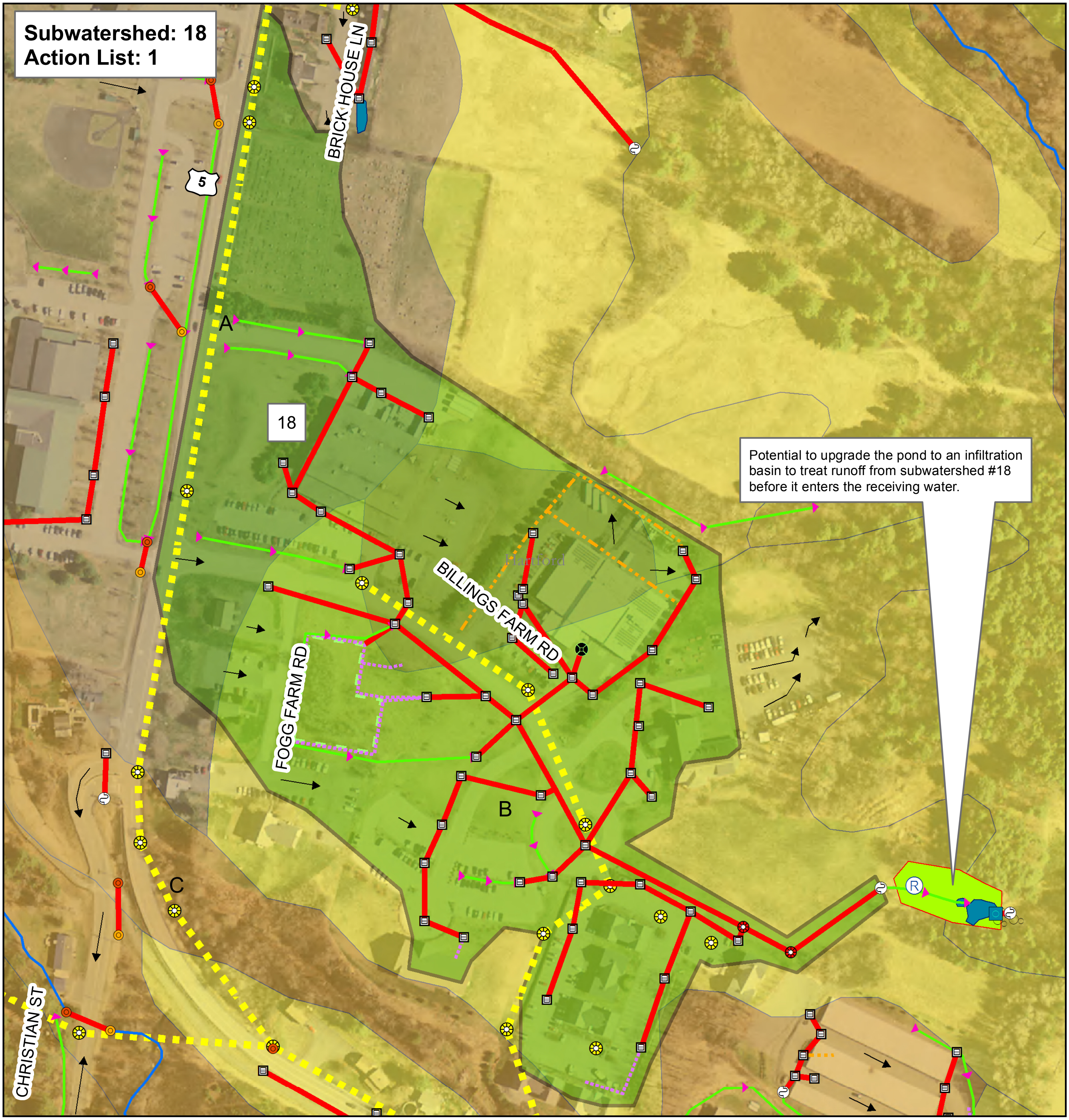
NRCS - Soils

- A
- B
- C
- D

SubwatershedID

- Priority Subwatershed
- Stormwater Treatment Area
- Potential Stormwater Treatment Area

Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 2/18/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI 2011 .5m



Hartford, VT

DEC Stormwater Infrastructure Mapping Project

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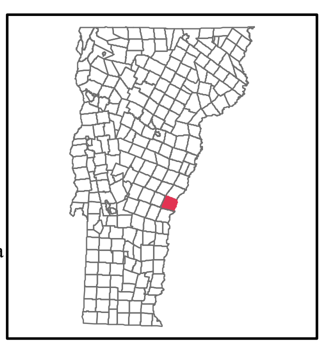

VERMONT

Stormwater points

- Pipe Cross (not connected)
- Catchbasin
- Dry Well
- Drop Inlet
- Grate/Curb Inlet
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SubwatershedID

- Priority Subwatershed
- Stormwater Treatment Area
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Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
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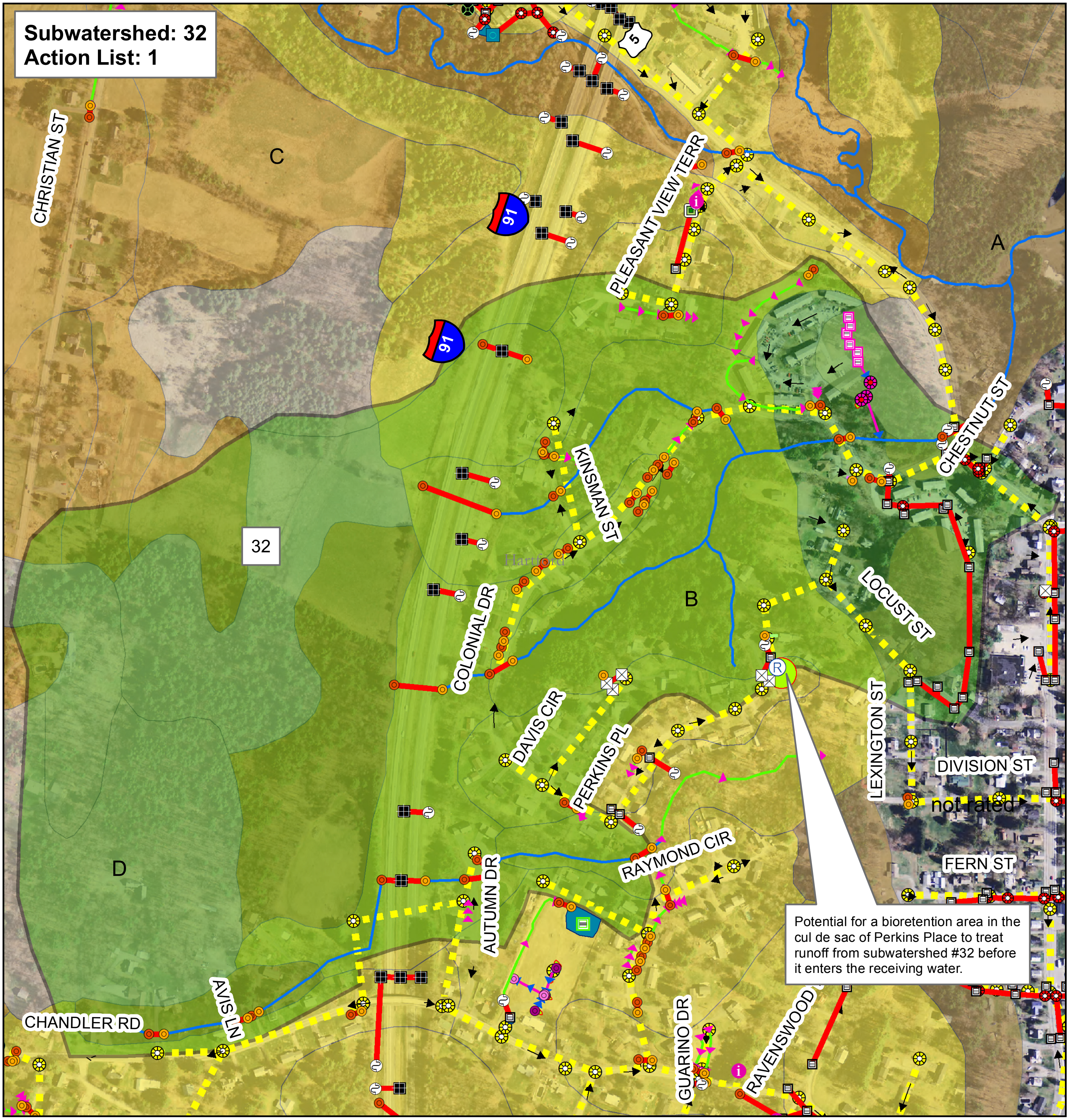

Hartford, VT

DEC Stormwater Infrastructure Mapping Project

This map shows high priority subwatersheds which are ranked by connectedness, percent of impervious cover, field observations, and potential retrofit measures and locations.

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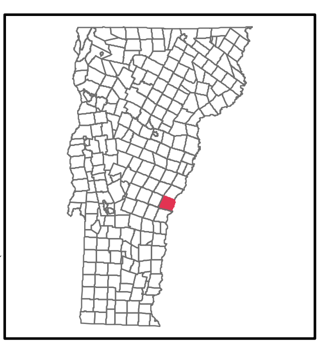
VERMONT



Stormwater points

- Pipe Cross (not connected)
- Catchbasin
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NRCS - Soils

- A
- B
- C
- D

SubwatershedID

- Priority Subwatershed
- Stormwater Treatment Area
- Potential Stormwater Treatment Area

Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 2/18/2015
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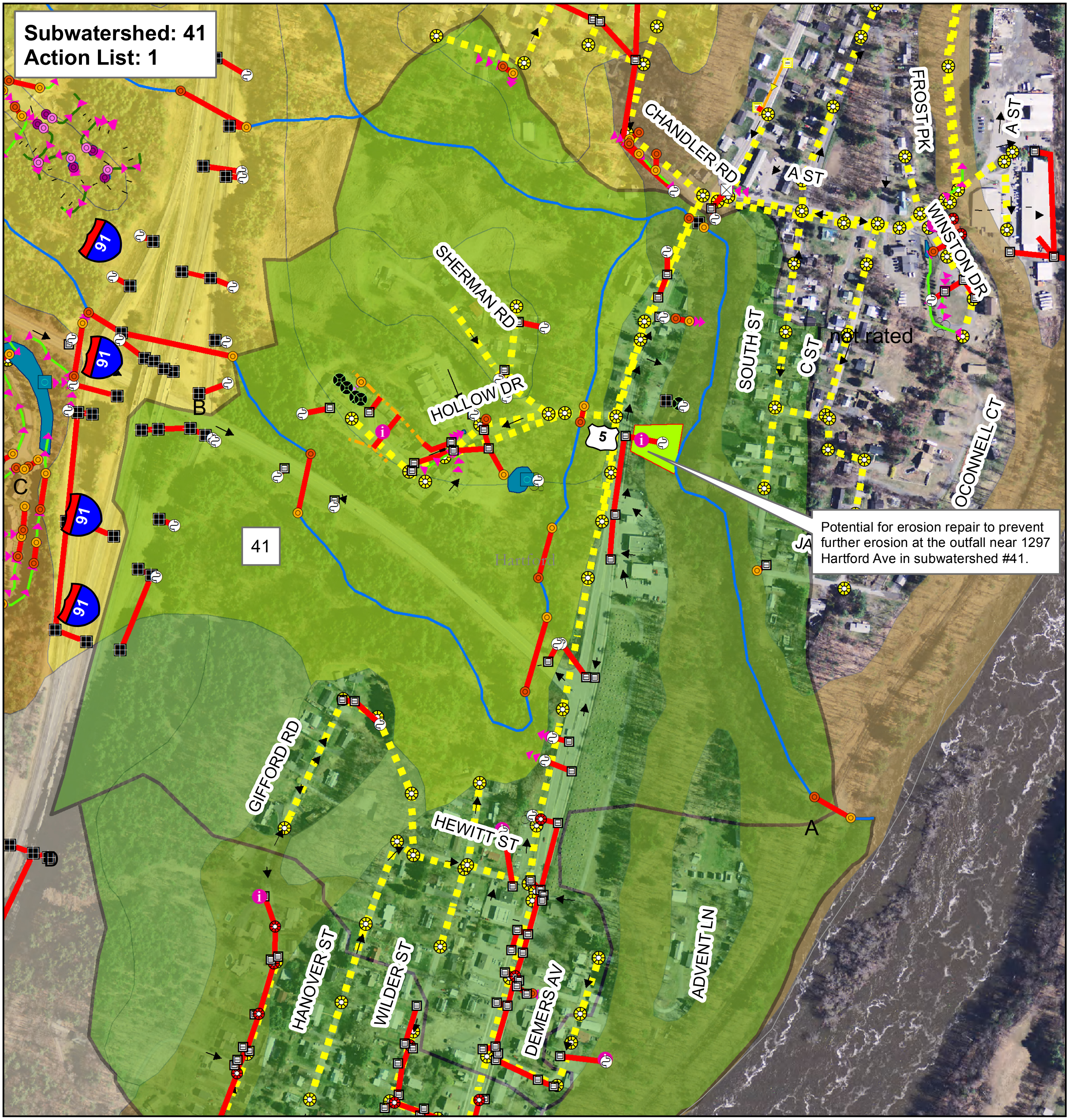

Hartford, VT

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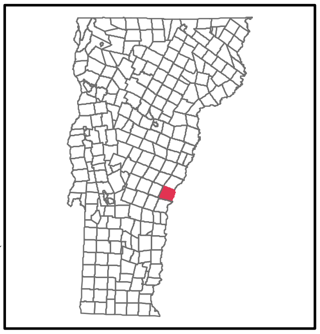

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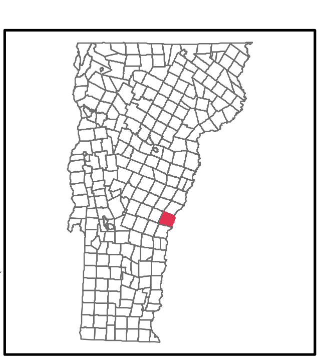

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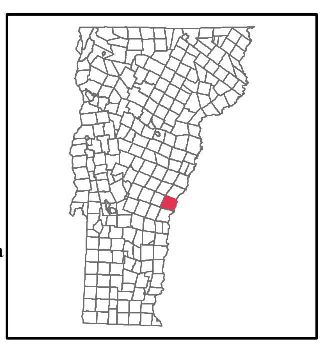

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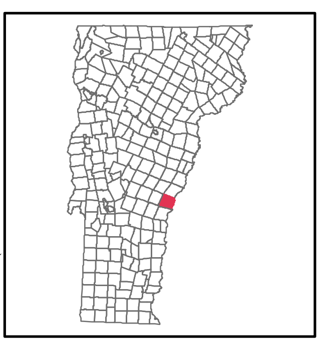

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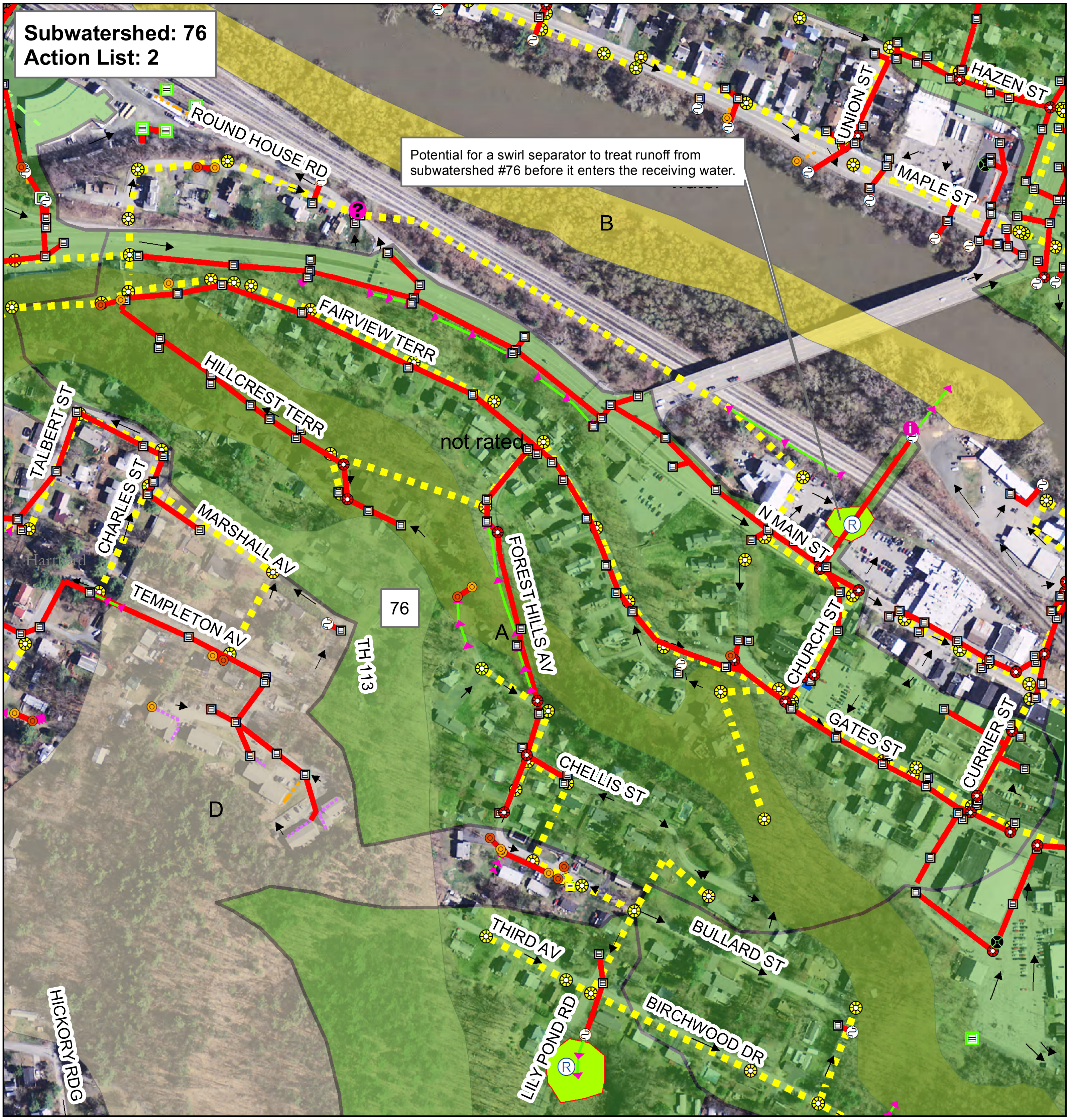

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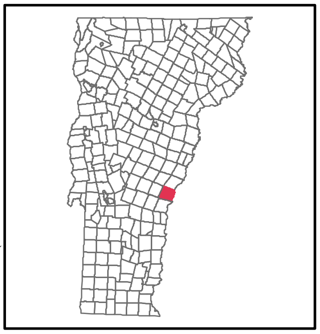

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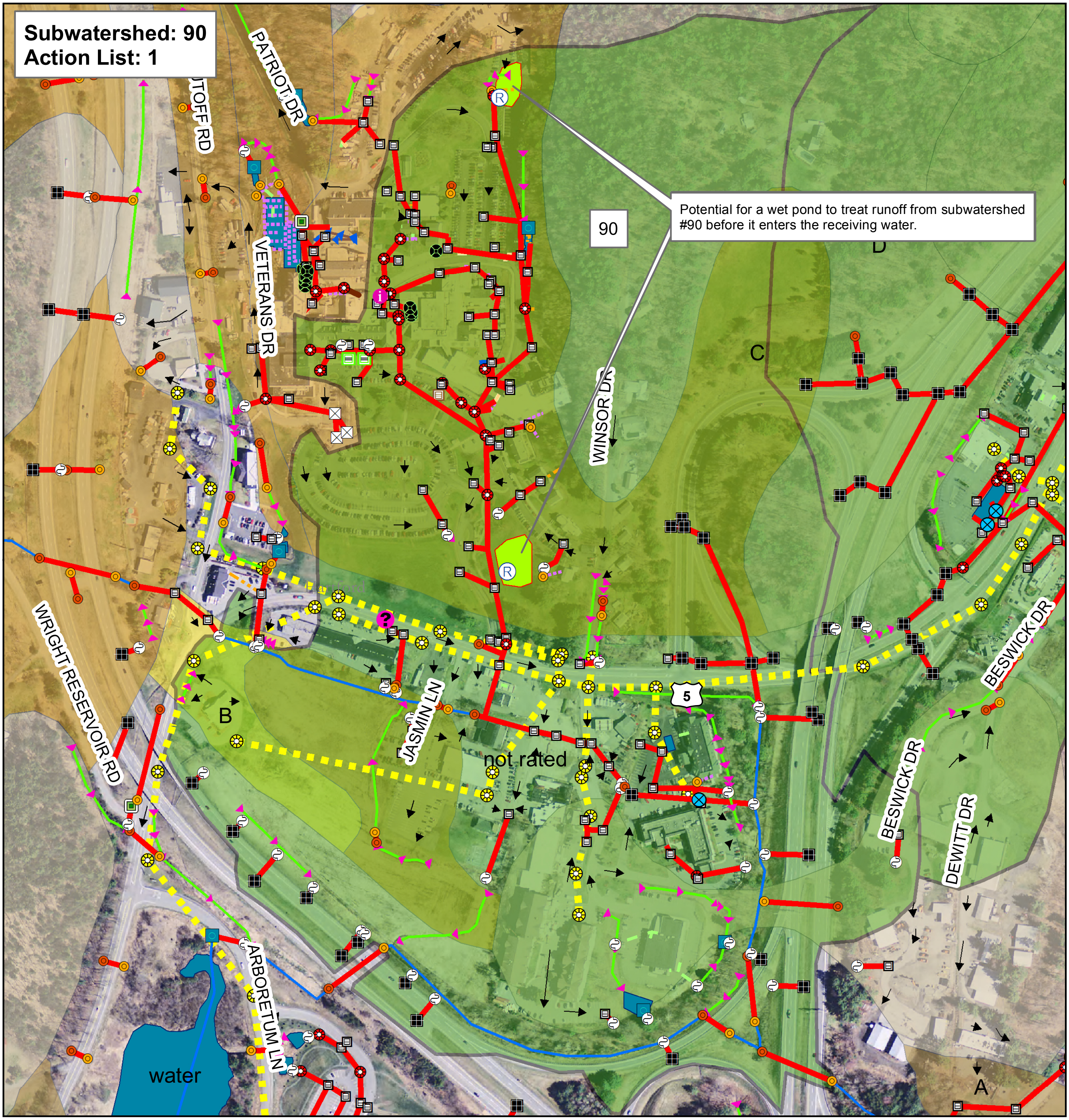

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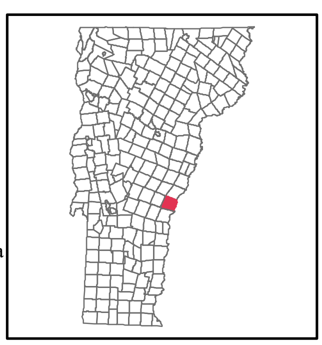

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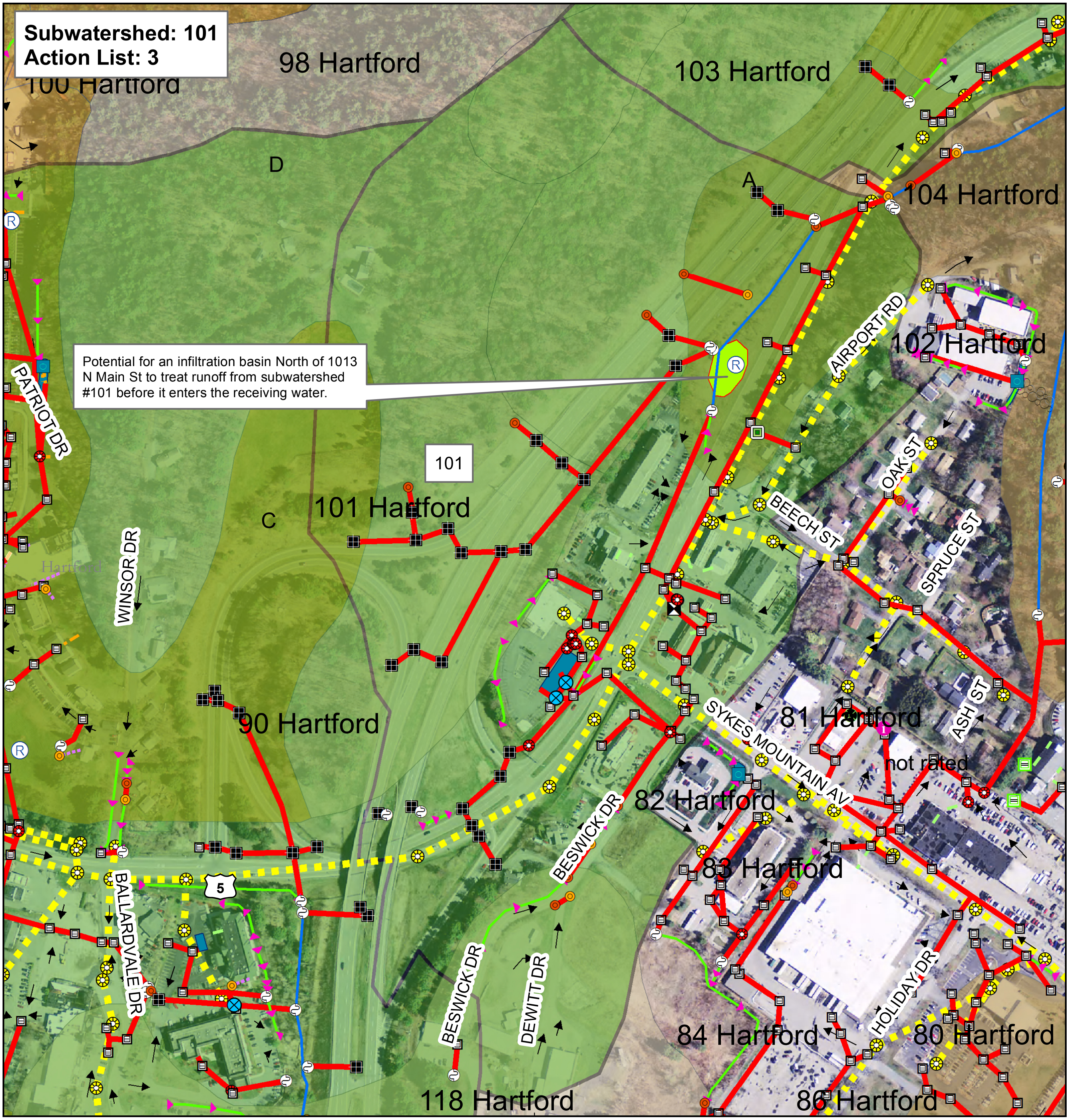

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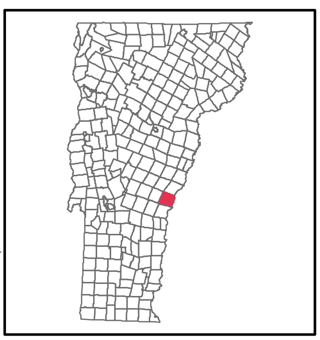

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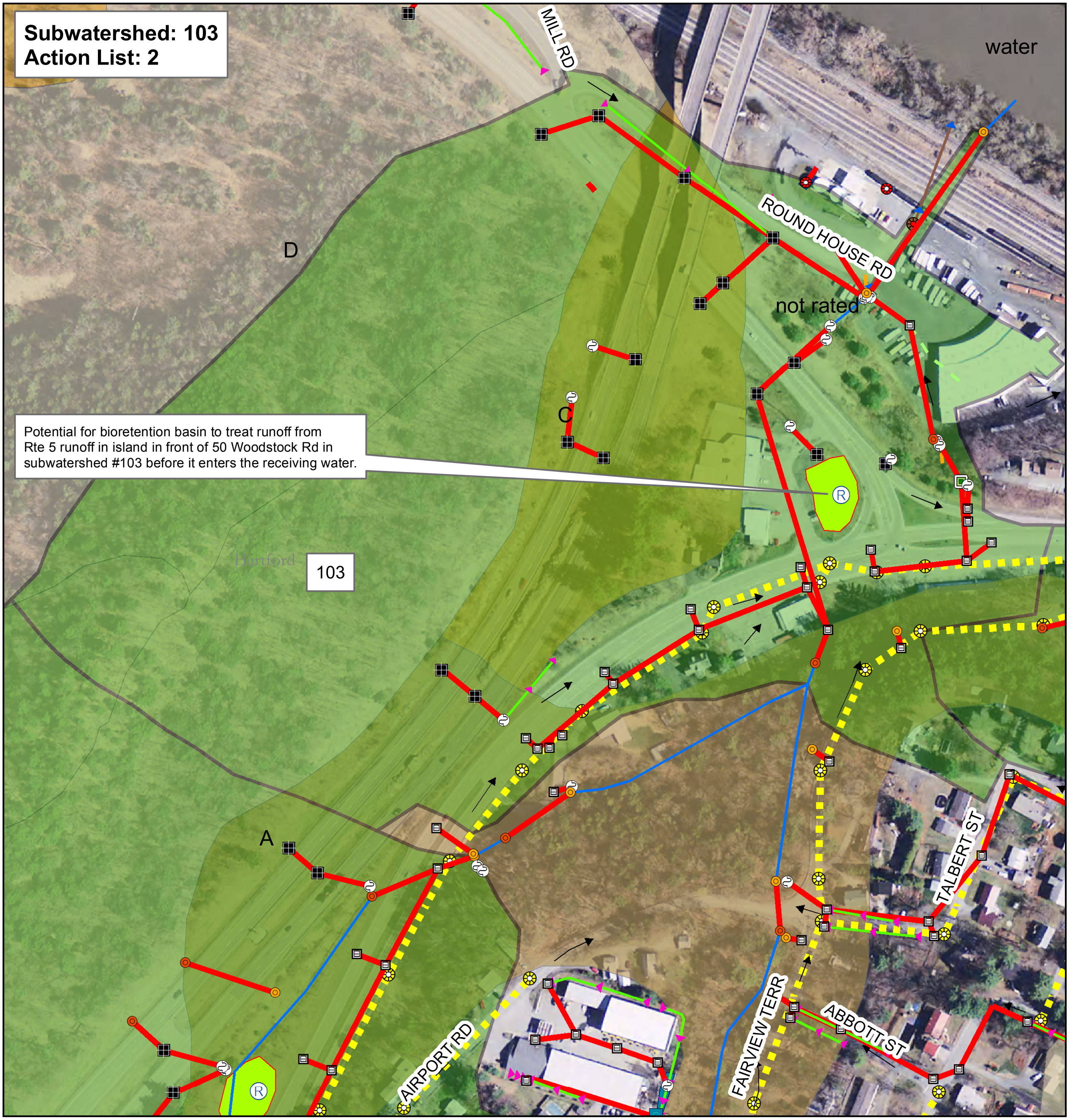

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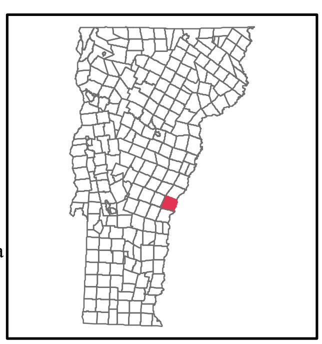

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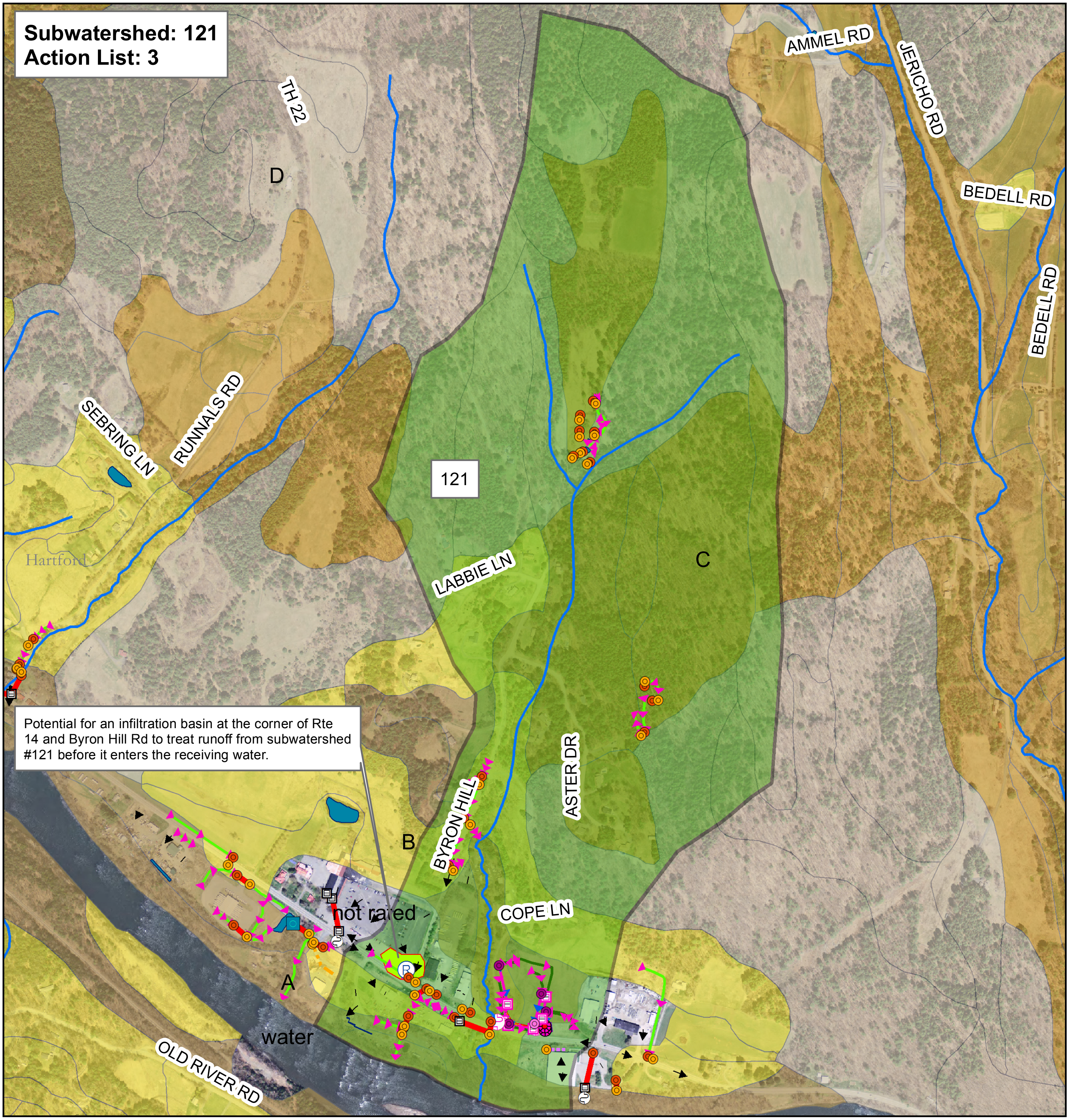

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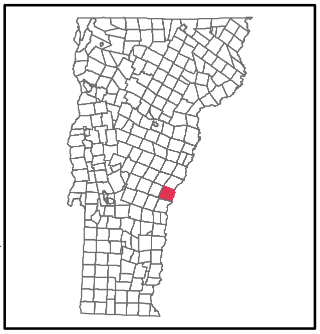

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Spill Control

and

Vermont Hazardous Waste Management Regulations

Have a spill control plan for accidental spills at municipal facilities and on municipal streets

These stormwater infrastructure maps show the connectivity of the stormwater system for the municipality as accurately as it could be determined with the collected and existing data. In the event of a spill this can be a valuable tool for controlling spills and in spill response.

Towns should be equipped with suitable equipment to contain and clean up spills of hazardous materials. Accidental spills of materials can be sources of runoff pollution if not addressed appropriately. If possible Towns should be prepared to address spills on municipal streets while at the same time contacting the state Waste Management Division. DPW managers should be aware of all applicable requirements and should contact regulatory authorities if requirements are not known.

All spills should be cleaned up immediately after they occur. For municipal facilities the creation of a site specific spill control and response plan in combination with spill response training for designated on-site personnel can be effective in dealing with accidental spills and preventing the contamination of soil, water, and runoff. Preparation of a spill containment, control, and countermeasures (SPCC) plan might be required to meet regulatory requirements (e.g., requirements regarding storage of specified chemicals above certain volume thresholds).

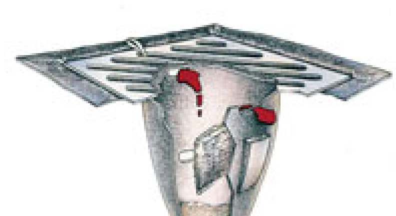
Even if a formal plan is not required, preparing one is a good idea. In general, an SPCC plan should include guidance to site personnel on the following:

— Proper notification when a spill occurs;
— Site responsibility with respect to addressing the cleanup of a spill;
— Stopping the source of a spill;
— Cleaning up a spill;
— Proper disposal of materials contaminated by the spill;
— Location of spill response equipment programs; and
— Training for designated on-site personnel.

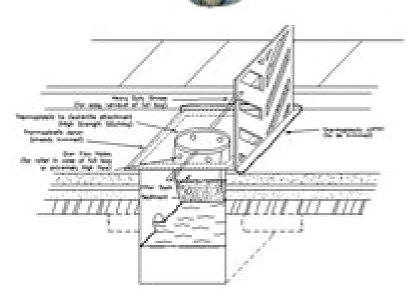
A periodic spill “fire drill” should be conducted to help prepare Town personnel in the event of a spill.

Spill Prevention and Response Measures

Catch Basin Inserts



Catch Basin Inserts (Drain Guards / Sediment Traps) protect our rivers and streams by capturing sediment, debris, oil and grease at storm water catch basins. Catch Basin Inserts are an economical and effective method to protect you from costly clean-up work.



The standard filter material is a non-woven geotextile with built-in overflow ports for cases of abnormally high water flow or over-filled filter bags. Catch Basin Inserts are available with a replaceable 5” x 15” oil absorbent boom that floats to absorb any oil, gas or diesel entering a storm water catch basin.

Urethane Drain Protector

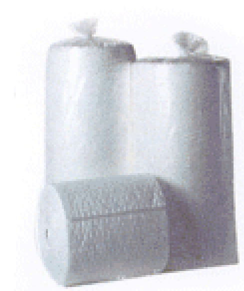
Urethane Drain Protectors are positive sealing drain covers that ensure spills do not enter drains. Drain Protectors are environmentally safe and resistant to chemicals, solvents and hydrocarbons. After use, the Drain Protector can be washed and stored in its tube storage container.

Absorbent Socks

Absorbent socks are flexible tubes used to contain and clean-up spilled fluids. Socks are widely used in industrial applications and are ideal for Spill Kits. Fast spreading spills are quickly stopped with a sock.

Drums & Intermediate Bulk Containers (IBC's)

New and reconditioned steel drums are ideal for storing solid and liquid waste. Poly drums available for durable outdoor storage or for building your own spill kits. Steel and poly drums are available in both tight-head (TH) and full open-head styles (FOH).



Pads & Rolls

Absorbent pads and rolls made from polypropylene fibers are the most popular form of absorbents on the market. Various types of absorbent pads and rolls can be used for different liquids and site applications.

The most widely used absorbent pads and rolls are oil-only (white) and universal (grey). Pads and rolls are great for spills on land, easily absorbing 20 to 25 times their own weight in recovered liquid. Rolls can easily be cut to the exact size required.

water or

Booms

Linkable Absorbent Booms

Absorbent booms are ideal for containing and cleaning up spills on water. Booms repel water and float even when completely saturated. Absorbent booms are constructed with a strong mesh outer skin encasing non-linting and highly absorbent polypropylene filler. Linkable booms come complete with end rings and clips attached to nylon rope running the length of the boom.

Collection basins
Collection basins are permanent structures in which large spills or contaminated storm water is contained and stored before cleanup or treatment. Collection basins are designed to receive spills, leaks, etc., and to prevent pollutants from being released into the environment. Unlike containment dikes, collection basins can receive and contain materials from many locations across a facility.

Containment diking
Containment dikes are temporary or permanent earth or concrete berms or retaining walls that are designed to hold spills. Diking can be used at any industrial facility, but is most common for controlling large spills or releases from liquid storage and transfer areas. Diking can provide one of the best protective measures against the contamination of storm water because it surrounds the area of concern and keeps spilled materials separated from the storm water outside of the diked area.

Curbing
Similar to containment diking, a curb is a barrier that surrounds an area of concern. Unlike diking, curbing is unable to contain large spills and is usually implemented on a small-scale basis. However, curbing is common at many facilities and in small areas where liquids are handled and transferred.

Granular Absorbents
A variety of granular and powdered absorbents are available for the effective clean-up of spills on streets, construction sites and in repair shops. These products absorb spilled liquids of various kinds to greatly lower the viscosity, aiding in the clean-up of the spill.

Sorbents, Gels, and Foams
Sorbents are compounds that immobilize materials by surface absorption or adsorption in the sorbent bulk. Gelling agents interact with the spilled chemical(s) by concentrating and congealing to form a rigid or viscous material more conducive to a mechanical cleanup. Foams are mixtures of air and aqueous solutions of proteins and surfactant-based foaming agents. The primary purpose of foams is to reduce the vapor concentration above the spill surface, thereby controlling the rate of evaporation.

§ **7-105** EMERGENCY AND CORRECTIVE ACTIONS
(a) Emergency actions
  (1) In the event of a discharge of hazardous waste or a release of a hazardous material, the person in control of such waste or material shall:
    (A) Take all appropriate immediate actions to protect human health and the environment including, but not limited to, emergency containment measures and notification as described below; and
    (B) Take any further clean up actions as may be required and approved by federal, state, or local officials, or corrective actions as specified under **subsection (b)** of this section so that the discharged waste or released material and related contaminated materials no longer present a hazard to human health or the environment.
  (2) Reporting
    (A) All discharges and/or releases that meet any of the following criteria shall be immediately reported to the Secretary by the person or persons exercising control over such waste by calling the Waste Management Division at **(802) 241-3888**, Monday

through Friday, 7:45 a.m. to 4:30 p.m. or the Department of Public Safety, Emergency Management Division at **(800) 641-5005**, 24 hours/day:

(i) A discharge of hazardous waste, or release of hazardous material that exceeds 2 gallons;

(ii) A discharge of hazardous waste, or release of hazardous material that is less than or equal to 2 gallons and poses a potential or actual threat to human health or the environment; or

(iii) A discharge of hazardous waste, or release of hazardous material that equals or exceeds its corresponding reportable quantity under CERCLA as specified under **40 CFR § 302.4.**

Note: Under the Federal Water Pollution Control Act, certain spills of "oil" and/or "hazardous substances" are prohibited and must be reported pursuant to the requirements of **40 CFR Part 110** / Discharge of Oil. Certain spills of hazardous substances must also be reported pursuant to CERCLA. In both cases, the National Response Center must be notified at **(800) 424-8802**. Finally, in addition to federal and state spill reporting, EPCRA requires that spills are also reported to local authorities.

(B) A written report shall be submitted to the Secretary within ten (10) days following any discharge or release subject to **subsection (a)(1)** of this section. The report should be sent to: The Vermont Department of Environmental Conservation, Waste Management Division, 103 South Main Street, Waterbury, VT 05671-0404. The person responsible for submitting the written report may request that it not be submitted for small discharges and/or releases that were reported pursuant to subsection (a)(2)(A) of this section, and that have been entirely remediated within the ten (10) day period immediately following the discharge and/or release

(3) If the discharge or release occurred during transportation, the transporter shall, in addition to notifying the Secretary:

(A) Notify the National Response Center at (800) 424-8802 or (202) 426-2675, if required by **49 CFR § 171.15**; and

(B) Report in writing to the Director, Office of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, D.C. 20590, if required by **49 CFR § 171.16**; and

(C) A water (bulk shipment) transporter who has discharged hazardous wastes must give the same notice as required by **33 CFR § 153.203** for oil and hazardous substances.

(4) If a discharge or release occurs and the Secretary determines that immediate removal of the waste is necessary to protect human health or the environment, the Secretary may authorize its removal by unpermitted transporters without the preparation of a manifest. Such hazardous waste may be transported to a site authorized by the Secretary under the provisions of **§ 7-503** to temporarily accept hazardous waste generated during an emergency cleanup of a discharge or release.

(5) In the case of an explosives or munitions emergency response, if a Federal, State, Tribal or local official acting within the scope of his or her official responsibilities, or an explosives or munitions emergency response specialist, determines that immediate removal of the material or waste is necessary to protect human health or the environment, that official or specialist may authorize the removal of the material or waste by transporters who do not have EPA identification numbers or hold Vermont hazardous waste transportation permits and without the preparation of a manifest. In the case of emergencies involving military munitions, the responding military emergency response specialist's organizational unit must retain records for three years identifying the dates of the response,

the responsible persons responding, the type and description of material addressed, and its disposition.

(6) All clean up debris and residues that are hazardous waste must be transported ultimately to either:

(A) A designated facility;

(B) A person authorized by the Secretary to use such waste if the waste has been delisted pursuant to **§ 7-218**;

(C) Some other location specified and authorized by the Secretary to receive clean up debris and residues if the waste has been delisted pursuant to **§ 7-218**; or

(D) For hazardous waste not defined as hazardous in 40 CFR Part 261 (i.e., waste regulated as hazardous by Vermont), to a facility, that is not a designated facility, located in a state other than Vermont provided the facility can receive such waste under applicable state and local laws, regulations and ordinances.

(b) Corrective actions

(1) If a discharge of hazardous waste, or a release of hazardous material has not been adequately addressed under **subsection (a)(1)(A)** of this section the Secretary may require that the person or persons responsible pursuant to **10 V.S.A. § 6615** complete the following:

(A) Engage the services of an environmental consultant experienced in the investigation and remediation of hazardous waste-contaminated sites; and

(B) Within thirty (30) days from either the date of the discharge/release or the date that the release was discovered if the date of discharge/release is not known, or within a period of time established by an alternative schedule approved by the Secretary, submit for approval by the Secretary a work plan for an investigation of the contaminated site (i.e., site investigation) prepared by the environmental consultant. The site investigation shall define the nature, degree and extent of the contamination; and shall assess potential impacts to human health and the environment (refer to the document titled: "Site Investigation Procedure" which is available from the Secretary upon request); and

(C) Perform the site investigation within either ninety (90) days of receiving written approval of the work plan by the Secretary, or a period of time established by an alternative schedule approved by the Secretary. A report detailing the findings of the site investigation shall be sent to the Secretary for review; and

(D) Within either thirty (30) days from the date of final acceptance of the site investigation report by the Secretary, or a period of time established by an alternative schedule approved by the Secretary, submit a corrective action plan prepared by the environmental consultant (refer to the document titled: "Corrective Action Guidance" which is available from the Secretary upon request); and

(E) Implement the corrective action plan within either ninety (90) days of receiving written approval of the plan by the Secretary, or a period of time established by an alternative schedule approved by the Secretary. The corrective action activity shall continue until the contamination is remediated to levels approved by the Secretary; and

(F) Submit to the Secretary all investigative, corrective action and monitoring reports, and all analytical results related to subsections (b)(1)(C) through (E) of this section, as they become available.

(2) A used or fired military munition is a waste and is potentially subject to corrective action authorities pursuant to 10 V.S.A. § 6615, and the process described by subsection (b)(1) of this section if the munition lands off-range and is not promptly rendered safe or retrieved. Any imminent and substantial threats associated with any remaining material must be addressed. If remedial action is infeasible, the operator of the range must maintain a record of the event for as long as any threat remains. The record must include the type of munition and its location (to the extent the location is known).

§ 7-106 LAND DISPOSAL RESTRICTIONS

(a) Certain hazardous wastes shall not be disposed of in or on the land. **40 CFR Part 268**, which is hereby incorporated by reference, except for 40 CFR §§ 268.5, 268.6, and 268.42(b), identifies those wastes which shall not be land disposed and describes the limited circumstances under which an otherwise prohibited waste may continue to be land disposed. The authority for implementing the CFR sections not incorporated by reference remains with the EPA.

> **Note**: A copy of 40 CFR Part 268 (the Land Disposal Restrictions rule), as incorporated by these regulations, is available from the Secretary upon request.

(b) In addition to the prohibitions of **40 CFR Part 268**, the Secretary may restrict the land disposal of any hazardous waste in the State of Vermont:

(1) Which may present an undue risk to human health or the environment, immediately or over a period of time; or

(2) Which would be incompatible with the **groundwater protection rule and strategy** of chapter 12 of the environmental protection rules.

(c) Dilution of hazardous waste subject to the land disposal restrictions of **40 CFR Part 268** is prohibited pursuant to **40 CFR § 268.3.**

§ 7-107 ENFORCEMENT

(a) Information that the generation, transportation, treatment, storage or disposal of hazardous waste may present an actual or potential threat to human health or the environment, or is a violation of the 10 V.S.A. chapter 159, or these regulations, or any term or condition of certification, order, or assurance, may serve as grounds for an enforcement action by the Secretary, including, but not limited to:

(1) After notice and opportunity for hearing, issuing an order directing any person to take such steps as are necessary to:

(A) Immediately cease and desist any operation or practice;

(B) Correct or prevent environmental damage likely to result from any deficiency in operation or practice;

(C) Suspend or revoke any certification and require temporary or permanent cessation of the operation of such facility;

(2) A request that the Attorney General or appropriate State's Attorney commence an action for injunctive relief, the imposition of penalties and fines provided in **10 V.S.A. § 6612** and other relief as may be appropriate.

(3) An order for reimbursement to any agency of federal, state, or local government from any person whose act caused governmental expenditures under **10 V.S.A § 1283**.

(4) All other powers of enforcement available to the Secretary through **10 V.S.A., chapter 201**.

(b) The hearing by the Secretary identified under **subsection (a)(1)** of this section shall be conducted as a contested case. Pursuant to **10 V.S.A. § 6610(b)**, the Secretary may issue an emergency order without a prior hearing when an ongoing violation presents an immediate threat of substantial harm to the environment or an immediate threat to public health. An emergency order shall be effective upon actual notice to the person against whom the order is issued. Any person to whom an emergency order is issued shall be given the opportunity for a hearing within five (5) business days of the date the order is issued.

(c) Inspections, investigations, and property access **(10 V.S.A. § 8005)**

(1) Inspections and investigations

(A) An investigator may perform routine inspections to determine compliance.

(B) An investigator may investigate upon receipt or discovery of information that an activity is being or has been conducted that may constitute or cause a violation.

(C) An investigator, upon presentation of credentials, may seek permission to inspect or investigate any portion of the property, fixtures, or other appurtenances belonging to or used by a person whose activity is required to be in compliance. The investigator shall state the purpose of the inspection or investigation. An inspection or investigation may include monitoring, sampling, testing, and copying of any records, reports, or other documents relating to the purposes to be served by compliance.

(D) If permission for an inspection or investigation is refused, the investigator may seek an access order from the district or superior court in whose jurisdiction the property is located enabling the investigator to perform the inspection or investigation.

(2) Access orders

(A) If access has been refused, an access order may be sought pursuant to either **10 V.S.A. § 80**05 or **10 V.S.A. § 6609**.

(B) Issuance of an access order shall not negate the Secretary's authority to initiate criminal proceedings in the same matter by referring the matter to the office of the attorney general or a state's attorney.

(d) In an action to enforce these regulations, anyone raising a claim that a certain material is not a hazardous waste, or is exempt from regulation as hazardous waste, must demonstrate that there is a known market or disposition for the material, and that they meet the terms of the exclusion or exemption. Appropriate documentation (such as contracts showing that a second person uses the material as an ingredient in a production process) to demonstrate that the material is not a waste, or is exempt from regulation, must be provided. Owners and operators of facilities claiming that they are actually recycling materials must show that they have the necessary equipment to do so.