Town of Woodstock

Stormwater Infrastructure Mapping Project

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VTDEC – CLEAN WATER INITIATIVE PROGRAM, WATERSHED MANAGEMENT DIVISION

dec.vermont.gov/watershed/cwi/manage/idde

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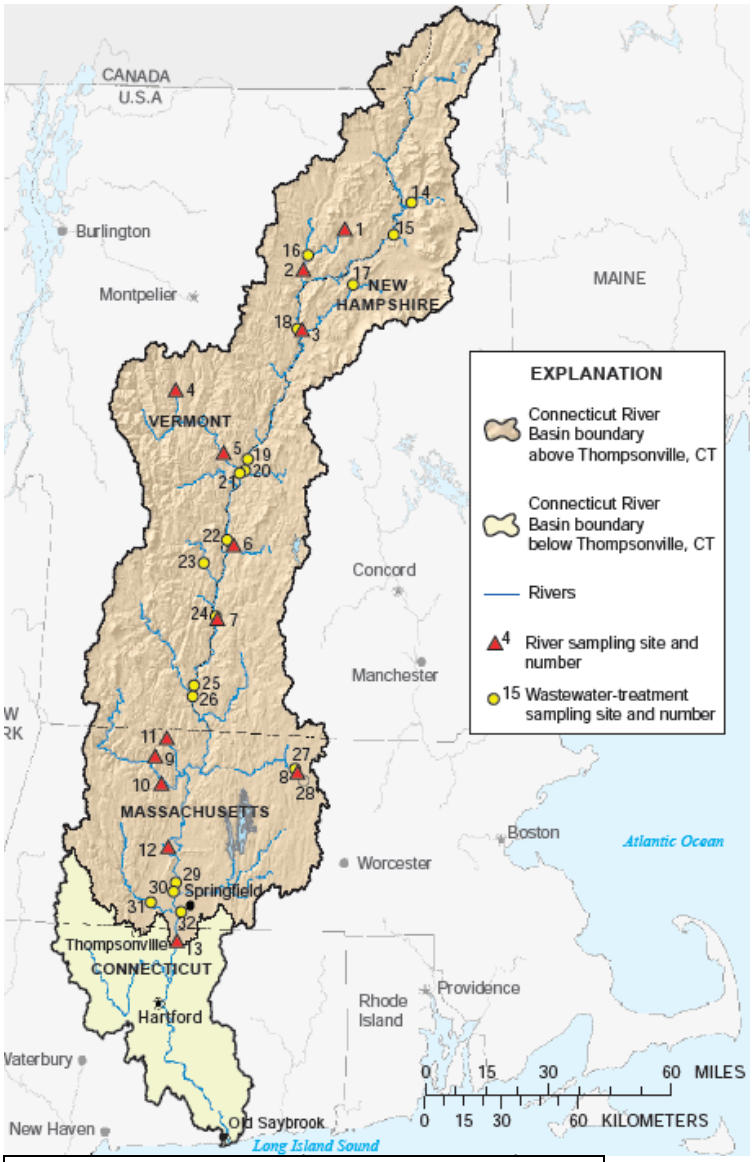
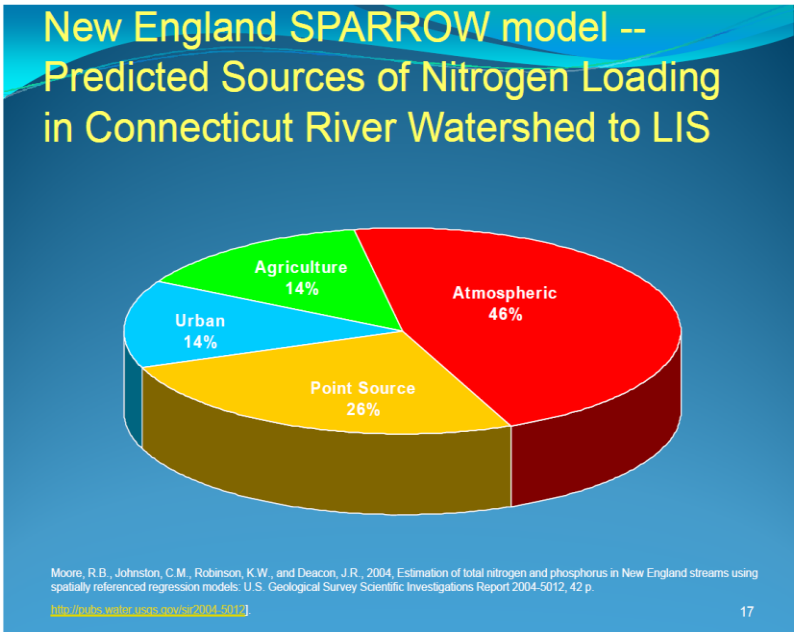
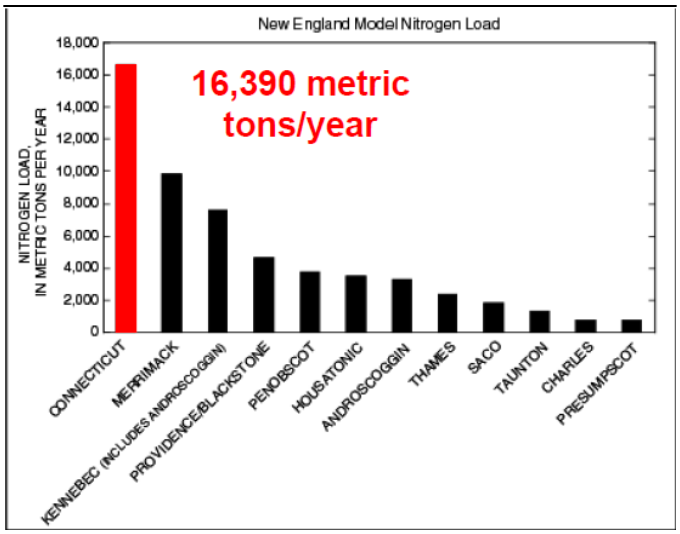
Long Island Sound – Connecticut River Watershed Nitrogen Overview



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



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



- 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 Clean Water Implementation Program.

The GIS maps and geodatabase are meant to provide an overall picture of the connectivity or connectedness of the storm system on both public and private properties in order to raise the public's awareness of the impact of stormwater runoff and the need for regular system maintenance. The generation and transport of nonpoint source pollution increases with increasing connectivity of a drainage system. Knowledge of the geographic extent of the system is also essential for the detection and elimination of illicit wastewater discharges that can be found in the stormwater system. Outfall locations and system connectedness data are used as a basis for locating illicit or illegal discharges of non-stormwater to the municipal storm system and tracing them to the source. Having an understanding of the connectedness of the system is also a valuable tool for hazardous material spill planning and prevention. 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. Documentation 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. Awareness of where storm drains are located can also assist municipalities and residents with emergency preparedness for large rainfall events (i.e. Tropical Storms or Hurricanes) or spring snowmelt runoff events. By keeping storm drains clean and clear a great deal of localized flooding can be prevented. Finally, by providing a more thorough understanding of the system this project could be the basis for a local stormwater ordinance or be used to help create or enhance a municipal 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.

Act 64 Municipal Roads General Permit (MRGP)

The 2015 Vermont Legislature adopted Act 64 which will require all municipalities to address stormwater runoff from all existing municipal roads. The time line for adopting this general permit is as follows: December 2016 – Draft general permit available for public review, January-December 2017 public comment and review, January 2018 final general permit issued; municipalities must file notice of intents to comply with the permit, currently proposed for summer-fall 2018. The permit will likely require:

- An evaluation of municipal roads to see if they meet new MRGP standards. Road segments that can impact waterways will be prioritized for remediation.
- Municipal development of a road stormwater management plan which will include a prioritization of road remediation efforts, capital budget, and implementation schedule
- Implementation schedule and the municipality's transportation capital plan

Towns will submit annual reports to DEC documenting progress in road BMP implementation and MRGP compliance. This infrastructure report and the mapping information

contained in it can be used by municipalities to develop the plan for the directly connected paved with catchbasin segments of municipal roadways. A graphical estimate of which roads meet this criterion is shown in the map(s) on the following page. While the general permit requirements for directly connected paved roads with catchbasins is currently under discussion and not final it is very likely these road segments will need to have more frequent cleaning activities and outfall erosion repair. As with other classes of roads covered by this permit the municipality should first check the maps provided. It is suggested (although not currently required) that the following steps be taken to check the maps to determine what road segments will require municipal attention for cleaning or erosion repair:

1. Using the provided maps and/or data as a guide confirm that these sections of roads are paved, have catch basins, and the discharge pipe from those catchbasins is directly discharging to waters of the state (include any outfall within 500 linear feet of surface waters).

2. For those sections of directly connected roads use two calibrated rods and measure the catch basin depth to the outlet pipe invert and the depth to the floor of the sump, subtract the difference and record which catch basins have at least a 12" sump between the sump floor and the invert. These basins and the main storm line(s) between them will likely be required to be cleaned in the future under the general permit.

3. If you do not already do so, you must prepare a street sweeping log book, and include in the log book at a minimum, the street names for the directly connected paved with catchbasin sections and record the month and year each these road sections are swept and the type of sweeper used (brush, vacuum, regenerative air, or high efficiency).

4. Using the maps locate the outfall and note any level of erosion present in the outfall and/or the 500 foot or less long swale between the pipe outlet and waters of the state.

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

Woodstock - 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.)
14 Woodstock	1	Combine with 15. Treatment tank or swirl separator in riverbank park.	OF/GS/CB/WP/TT-VS		718.94	3.2	52,658	21,063	438.8	307.2
15 Woodstock	1	Combine with 14.	OF/GS/CB/TT-VS		39.68	25.5	8,736	3,494	72.8	51.0
44 Woodstock	1	Infiltration basin or swale on south side of Vail Field	CB/GS/IB	3565-9010	42.42	9.7	4,334	867	36.1	7.2
69 Woodstock	1	Raingardens in parking lot opposite 99 Senior Lane	CB/GS	3684-9010	1272.07	2.2	89,146	71,317	742.9	594.3
37 Woodstock	2	Add Wet Pond in Golf Course fairway near outfall	CB/GS/WP		75.03	7.0	6,625	1,325	55.2	33.1
51 Woodstock	2	Constructed Wetland or Pond next to Billings Farm Parking lot	CB/GS/WP		14.08	20.1	3,390	678	28.2	16.9
3 Woodstock	3	Wet pond in headwaters to reduce residential flooding	GS/WP		54.51	1.0	3,678	2,207	30.6	24.5
65 Woodstock	3	Bioretention in front of 965 W Woodstock Rd	CB/GS/BRA		2.81	71.2	2,430	1,823	20.3	15.2
1 Woodstock			CB/GS		12.75	23.6	2,591	2,591	21.6	21.6
2 Woodstock			CB/GS		49.86	6.6	4,304	4,304	35.9	35.9
4 Woodstock			OF/GS/DW		69.33	3.5	4,627	4,627	38.6	38.6
5 Woodstock			GS/CB/OF		24.89	8.9	2,441	2,441	20.3	20.3
6 Woodstock			CB/OF		259.20	3.1	18,899	18,899	157.5	157.5
7 Woodstock			OF/GS	4052-9010	118.11	2.6	8,403	8,403	70.0	70.0
8 Woodstock			CB/GS/OF		150.69	4.9	11,933	11,933	99.4	99.4
9 Woodstock			CB/GS		105.91	1.5	7,258	7,258	60.5	60.5
10 Woodstock			CB/GS/OF		67.32	9.0	6,619	6,619	55.2	55.2
11 Woodstock			CB/GS/OF	3576-9010	20.92	14.6	2,221	2,221	18.5	18.5
12 Woodstock			GS/CB/PS		3.12	54.2	2,002	2,002	16.7	16.7

Woodstock - Subwatershed Prioritization and Recommendations

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
14 Woodstock	2.98	2.56		$350,000	$9.50	$2,282	CWIP,SRF	1490	$685,232
15 Woodstock	0.49	FALSE					CWIP,SRF	247	$113,676
44 Woodstock	0.25	0.45	$224,328		$65	$7,763	CWIP,SRF	123	$56,403
69 Woodstock	5.04	3.03		$20,000	$1	$135	CWIP,SRF	2522	$1,160,046
37 Woodstock	0.37	FALSE	$114,300		$22	$5,176	CWIP,SRF	187	$86,215
51 Woodstock	0.19	FALSE	$58,478		$22	$5,176	CWIP,SRF	96	$44,109
3 Woodstock	0.21	0.06		$40,000	$27	$6,526	CWIP,SRF	104	$47,856
65 Woodstock	0.14	0.22		$5,000	$8	$988	CWIP,SRF	69	$31,622
1 Woodstock	0.15	0.33					CWIP,SRF	73	$33,720
2 Woodstock	0.24	FALSE					CWIP,SRF	122	$56,002
4 Woodstock	0.29	FALSE					CWIP,SRF	145	$66,902
5 Woodstock	0.14	FALSE					CWIP,SRF	69	$31,761
6 Woodstock	1.07	FALSE					CWIP,SRF	535	$245,930
7 Woodstock	0.48	0.33					CWIP,SRF	238	$109,347
8 Woodstock	0.68	FALSE					CWIP,SRF	338	$155,278
9 Woodstock	0.41	FALSE					CWIP,SRF	205	$94,444
10 Woodstock	0.37	FALSE					CWIP,SRF	187	$86,126
11 Woodstock	0.16	FALSE					CWIP,SRF	79	$36,129
12 Woodstock	0.11	FALSE					CWIP,SRF	57	$26,047

Woodstock - 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.)
13 Woodstock			CB/GS/OF		42.48	11.9	6,772	6,772	56.4	56.4
17 Woodstock			OF		4.73	37.9	1,630	1,630	13.6	13.6
19 Woodstock			OF		3.79	23.3	760	760	6.3	6.3
20 Woodstock			CB		1.25	75.4	1,154	1,154	9.6	9.6
21 Woodstock			CB		5.32	39.2	2,424	2,424	20.2	20.2
22 Woodstock			CB/OF		2.24	24.9	656	656	5.5	5.5
23 Woodstock			CB		0.46	72.1	405	405	3.4	3.4
24 Woodstock			CB/DW		2.35	46.5	1,045	1,045	8.7	8.7
25 Woodstock			CB		22.55	21.7	4,207	4,207	35.1	35.1
26 Woodstock			CB		4.00	78.6	4,013	4,013	33.4	33.4
27 Woodstock			GS/OF/CB		401.07	0.6	26,807	26,807	223.4	223.4
28 Woodstock			CB		8.76	15.9	1,242	1,242	10.4	10.4
29 Woodstock			CB/GS/WP		39.82	10.9	4,339	4,339	36.2	36.2
30 Woodstock			CB/GS/WP		189.71	0.6	12,678	12,678	105.7	105.7
31 Woodstock			CB/GS/OF		107.48	2.7	7,691	7,691	64.1	64.1
32 Woodstock			CB/GS/OF	3045-9010	48.00	11.2	4,571	4,571	38.1	38.1
33 Woodstock			CB/GS/WP		28.03	2.7	1,737	1,737	15.3	15.3
34 Woodstock			OF/CB		18.10	0.1	1,200	1,200	10.0	10.0
35 Woodstock			CB/WP		6.75	0.0	268	268	3.0	3.0
36 Woodstock			CB/WP		5.06	0.0	201	201	2.2	2.2
38 Woodstock			GS/OF		119.75	8.1	11,228	11,228	93.6	93.6
39 Woodstock			CB		6.38	46.3	3,458	3,458	28.8	28.8
40 Woodstock			CB		3.27	65.5	2,578	2,578	21.5	21.5
41 Woodstock			CB	3448-9010	4.96	66.6	3,545	3,545	29.5	29.5
42 Woodstock			CB		3.49	65.4	2,953	2,953	24.6	24.6
43 Woodstock			CB	3448-9010	1.02	53.5	642	642	5.3	5.3
45 Woodstock			CB/VS	3448-9010	2.73	41.5	366	366	5.3	5.3
46 Woodstock			CB		10.78	41.0	5,143	5,143	42.9	42.9
47 Woodstock			CB		23.61	25.0	6,929	6,929	57.7	57.7
48 Woodstock			OF/GS/CB		17.71	14.3	2,318	2,318	19.3	19.3
49 Woodstock			CB/PP/GS		9.03	21.7	1,689	1,689	14.1	14.1
50 Woodstock			CB/WP		62.11	4.6	4,277	4,277	35.6	35.6
52 Woodstock			DW/CB/OF		2.77	27.5	554	554	4.6	4.6
53 Woodstock			CB/GS		4.47	17.4	955	955	8.0	8.0
54 Woodstock			CB/GS		27.73	10.7	3,000	3,000	25.0	25.0
55 Woodstock			CB/GS		140.92	6.1	11,899	11,899	99.2	99.2
56 Woodstock			DW/CB/OF		94.29	3.9	7,115	7,115	59.3	59.3
57 Woodstock			CB/OF		13.63	9.2	1,355	1,355	11.3	11.3
58 Woodstock			CB		11.92	13.6	2,090	2,090	17.4	17.4
59 Woodstock			CB		5.65	18.9	1,294	1,294	10.8	10.8
60 Woodstock			CB/OF		11.06	35.0	3,459	3,459	28.8	28.8
61 Woodstock			CB/GS	3056-9010	92.06	3.5	6,464	6,464	53.9	53.9
62 Woodstock			CB/GS		10.89	19.3	1,824	1,824	15.2	15.2

Woodstock - Subwatershed Prioritization and Recommendations

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
13 Woodstock	0.38	FALSE					CWIP,SRF	192	$88,124
17 Woodstock	0.09	FALSE					CWIP,SRF	46	$21,215
19 Woodstock	0.04	FALSE					CWIP,SRF	22	$9,893
20 Woodstock	0.07	FALSE					CWIP,SRF	33	$15,016
21 Woodstock	0.14	FALSE					CWIP,SRF	69	$31,549
22 Woodstock	0.04	FALSE					CWIP,SRF	19	$8,541
23 Woodstock	0.02	FALSE					CWIP,SRF	11	$5,271
24 Woodstock	0.06	FALSE					CWIP,SRF	30	$13,600
25 Woodstock	0.24	FALSE					CWIP,SRF	119	$54,742
26 Woodstock	0.23	FALSE					CWIP,SRF	114	$52,215
27 Woodstock	1.52	FALSE					CWIP,SRF	758	$348,832
28 Woodstock	0.07	FALSE					CWIP,SRF	35	$16,162
29 Woodstock	0.25	FALSE					CWIP,SRF	123	$56,469
30 Woodstock	0.72	FALSE					CWIP,SRF	359	$164,980
31 Woodstock	0.44	FALSE					CWIP,SRF	218	$100,078
32 Woodstock	0.26	FALSE					CWIP,SRF	129	$59,478
33 Woodstock	0.11	FALSE					CWIP,SRF	55	$25,115
34 Woodstock	0.07	FALSE					CWIP,SRF	34	$15,615
35 Woodstock	0.03	FALSE					CWIP,SRF	13	$5,822
36 Woodstock	0.02	FALSE					CWIP,SRF	9	$4,364
38 Woodstock	0.64	FALSE					CWIP,SRF	318	$146,112
39 Woodstock	0.20	FALSE					CWIP,SRF	98	$45,005
40 Woodstock	0.15	FALSE					CWIP,SRF	73	$33,552
41 Woodstock	0.20	FALSE					CWIP,SRF	100	$46,133
42 Woodstock	0.17	FALSE					CWIP,SRF	84	$38,429
43 Woodstock	0.04	FALSE					CWIP,SRF	18	$8,349
45 Woodstock	0.05	FALSE					CWIP,SRF	26	$11,905
46 Woodstock	0.29	FALSE					CWIP,SRF	145	$66,921
47 Woodstock	0.39	FALSE					CWIP,SRF	196	$90,164
48 Woodstock	0.13	FALSE					CWIP,SRF	66	$30,158
49 Woodstock	0.10	FALSE					CWIP,SRF	48	$21,977
50 Woodstock	0.24	FALSE					CWIP,SRF	121	$55,650
52 Woodstock	0.03	FALSE					CWIP,SRF	16	$7,208
53 Woodstock	0.05	FALSE					CWIP,SRF	27	$12,425
54 Woodstock	0.17	FALSE					CWIP,SRF	85	$39,044
55 Woodstock	0.67	FALSE					CWIP,SRF	337	$154,840
56 Woodstock	0.40	FALSE					CWIP,SRF	201	$92,591
57 Woodstock	0.08	FALSE					CWIP,SRF	38	$17,629
58 Woodstock	0.12	FALSE					CWIP,SRF	59	$27,195
59 Woodstock	0.07	FALSE					CWIP,SRF	37	$16,833
60 Woodstock	0.20	FALSE					CWIP,SRF	98	$45,014
61 Woodstock	0.37	FALSE					CWIP,SRF	183	$84,110
62 Woodstock	0.10	FALSE					CWIP,SRF	52	$23,736

Woodstock - 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.)
63 Woodstock			GS/CB		17.03	13.4	2,121	2,121	17.7	17.7
64 Woodstock			GS/CB		25.90	12.1	3,020	3,020	25.2	25.2
66 Woodstock			CB/WP/GS		82.74	5.1	6,624	6,624	55.2	55.2
67 Woodstock			GS/WP		252.67	2.7	16,974	16,974	141.5	141.5
68 Woodstock			CB/GS/WP		408.32	2.1	28,568	28,568	238.1	238.1
70 Woodstock			CB/GS/WP/IG	6861-9015	39.24	9.0	596	596	5.0	5.0
71 Woodstock			CB/GS		17.99	17.2	2,718	2,718	22.7	22.7
72 Woodstock			CB/GS/OF		10.39	14.6	1,380	1,380	11.5	11.5
73 Woodstock			CB/GS/EDP	5685-9015	34.98	10.2	550	550	13.8	13.8
74 Woodstock			CB/DW/GS		23.29	43.8	9,600	9,600	80.0	80.0
75 Woodstock			CB/VS/OGF/TT	4175-9015	3.07	56.0	270	270	6.8	6.8
76 Woodstock			GS/OF		8.41	25.8	1,874	1,874	15.6	15.6
77 Woodstock			CB		11.54	14.1	1,494	1,494	12.4	12.4
78 Woodstock			GS/OF		14.17	8.8	1,379	1,379	11.5	11.5
79 Woodstock			GS/CB		134.19	5.9	11,192	11,192	93.3	93.3
80 Woodstock			OF		2.33	55.7	1,310	1,310	10.9	10.9
95 Woodstock			GS/WP/CB		30.01	14.1	3,889	3,889	32.4	32.4
81 Woodstock			DW/CB/OF		6.49	5.2	481	481	4.0	4.0
82 Woodstock			GS		18.58	11.7	2,123	2,123	17.7	17.7
83 Woodstock			OF		22.48	4.4	1,737	1,737	14.5	14.5
84 Woodstock			CB/GS		9.47	68.2	6,999	6,999	58.3	58.3
85 Woodstock			GS		3.92	55.8	2,210	2,210	18.4	18.4
86 Woodstock			GS/OF		37.69	6.2	3,195	3,195	26.6	26.6
87 Woodstock			CB/GS		56.78	11.5	6,398	6,398	53.3	53.3
88 Woodstock			CB/GS		4.24	19.2	982	982	8.2	8.2
89 Woodstock			OF		52.13	4.0	3,944	3,944	32.9	32.9
90 Woodstock			GS/OF		19.94	15.9	2,834	2,834	23.6	23.6
91 Woodstock			CB/GS/WP		7.66	35.8	1,677	1,677	14.0	14.0
92 Woodstock			OF		7.79	17.0	1,165	1,165	9.7	9.7
93 Woodstock			GS		16.38	24.6	3,470	3,470	28.9	28.9
94 Woodstock			GS/WP		10.85	6.3	154	154	3.9	3.9

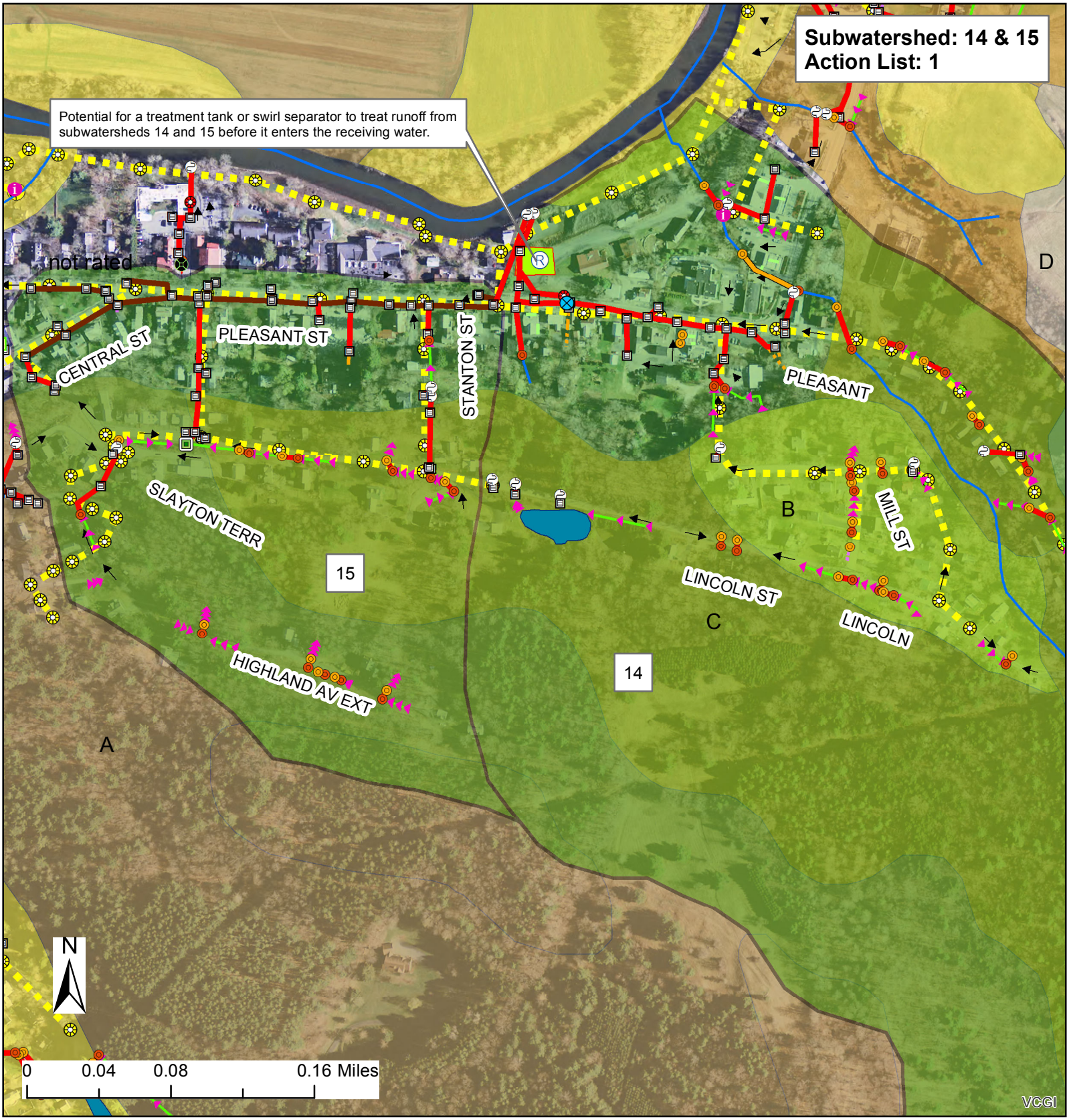
Woodstock - Subwatershed Prioritization and Recommendations

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
63 Woodstock	0.12	FALSE					CWIP,SRF	60	$27,599
64 Woodstock	0.17	FALSE					CWIP,SRF	85	$39,301
66 Woodstock	0.37	0.47					CWIP,SRF	187	$86,202
67 Woodstock	0.96	0.76					CWIP,SRF	480	$220,887
68 Woodstock	1.62	0.95					CWIP,SRF	808	$371,755
70 Woodstock	0.17	FALSE					CWIP,SRF	84	$38,776
71 Woodstock	0.15	FALSE					CWIP,SRF	77	$35,375
72 Woodstock	0.08	FALSE					CWIP,SRF	39	$17,960
73 Woodstock	0.16	FALSE					CWIP,SRF	78	$35,807
74 Woodstock	0.54	1.12					CWIP,SRF	272	$124,919
75 Woodstock	0.08	0.19					CWIP,SRF	38	$17,582
76 Woodstock	0.11	FALSE					CWIP,SRF	53	$24,382
77 Woodstock	0.08	FALSE					CWIP,SRF	42	$19,440
78 Woodstock	0.08	FALSE					CWIP,SRF	39	$17,944
79 Woodstock	0.63	FALSE					CWIP,SRF	317	$145,639
80 Woodstock	0.07	0.14					CWIP,SRF	37	$17,049
95 Woodstock	0.22	FALSE					CWIP,SRF	110	$50,607
81 Woodstock	0.03	FALSE					CWIP,SRF	14	$6,256
82 Woodstock	0.12	FALSE					CWIP,SRF	60	$27,623
83 Woodstock	0.10	FALSE					CWIP,SRF	49	$22,600
84 Woodstock	0.40	FALSE					CWIP,SRF	198	$91,078
85 Woodstock	0.13	FALSE					CWIP,SRF	63	$28,755
86 Woodstock	0.18	FALSE					CWIP,SRF	90	$41,572
87 Woodstock	0.36	FALSE					CWIP,SRF	181	$83,258
88 Woodstock	0.06	FALSE					CWIP,SRF	28	$12,784
89 Woodstock	0.22	0.23					CWIP,SRF	112	$51,324
90 Woodstock	0.16	FALSE					CWIP,SRF	80	$36,885
91 Woodstock	0.09	FALSE					CWIP,SRF	47	$21,826
92 Woodstock	0.07	FALSE					CWIP,SRF	33	$15,163
93 Woodstock	0.20	FALSE					CWIP,SRF	98	$45,153
94 Woodstock	0.04	FALSE					CWIP,SRF	22	$10,032

Target Maps

Showing Priority Action List Drainage Areas

And Potential Retrofit Locations



Woodstock, VT

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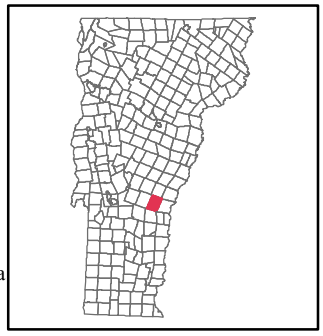

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Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 3/9/2016
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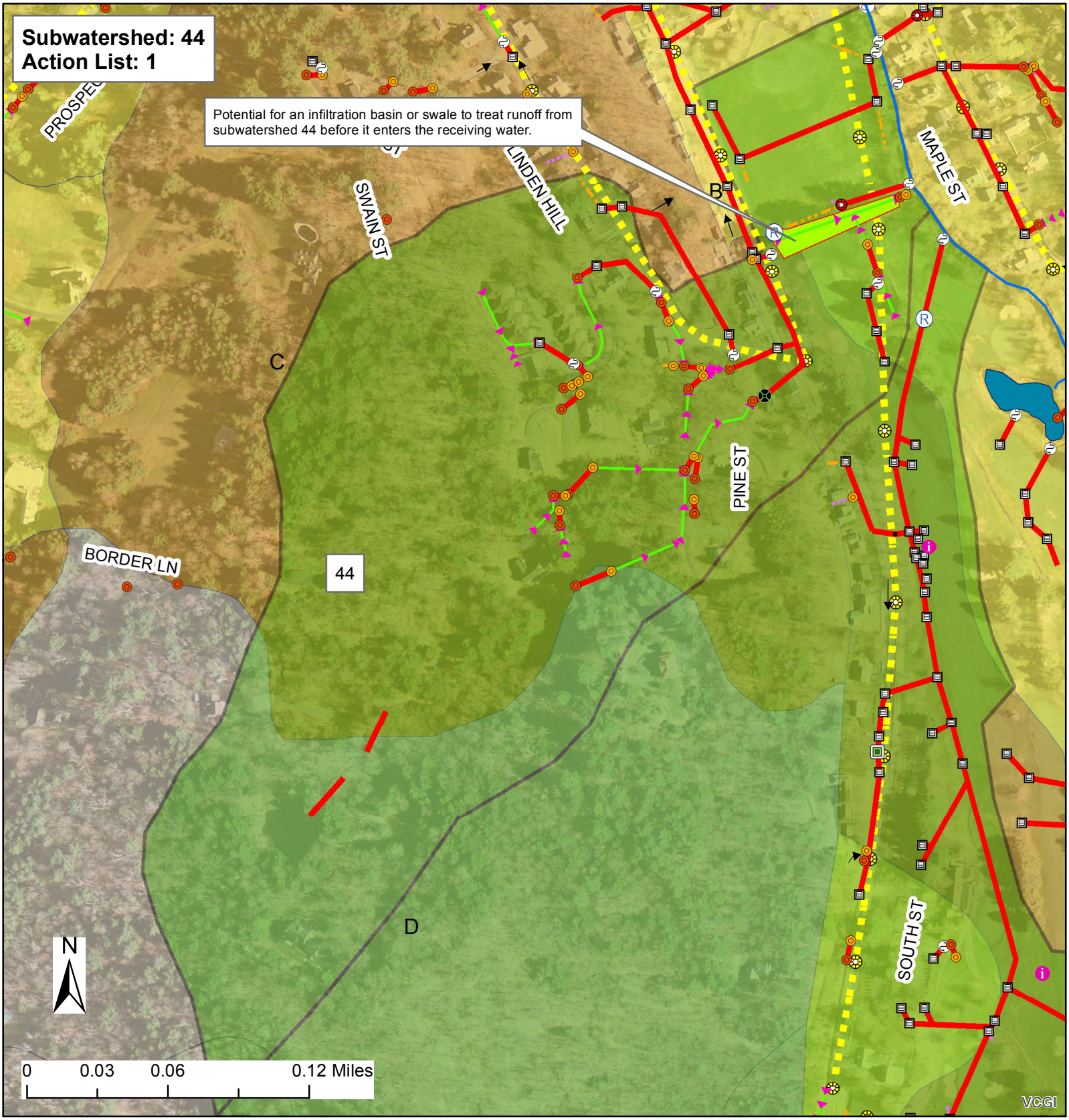

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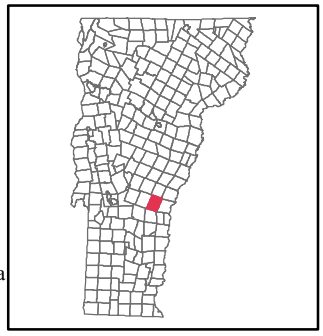

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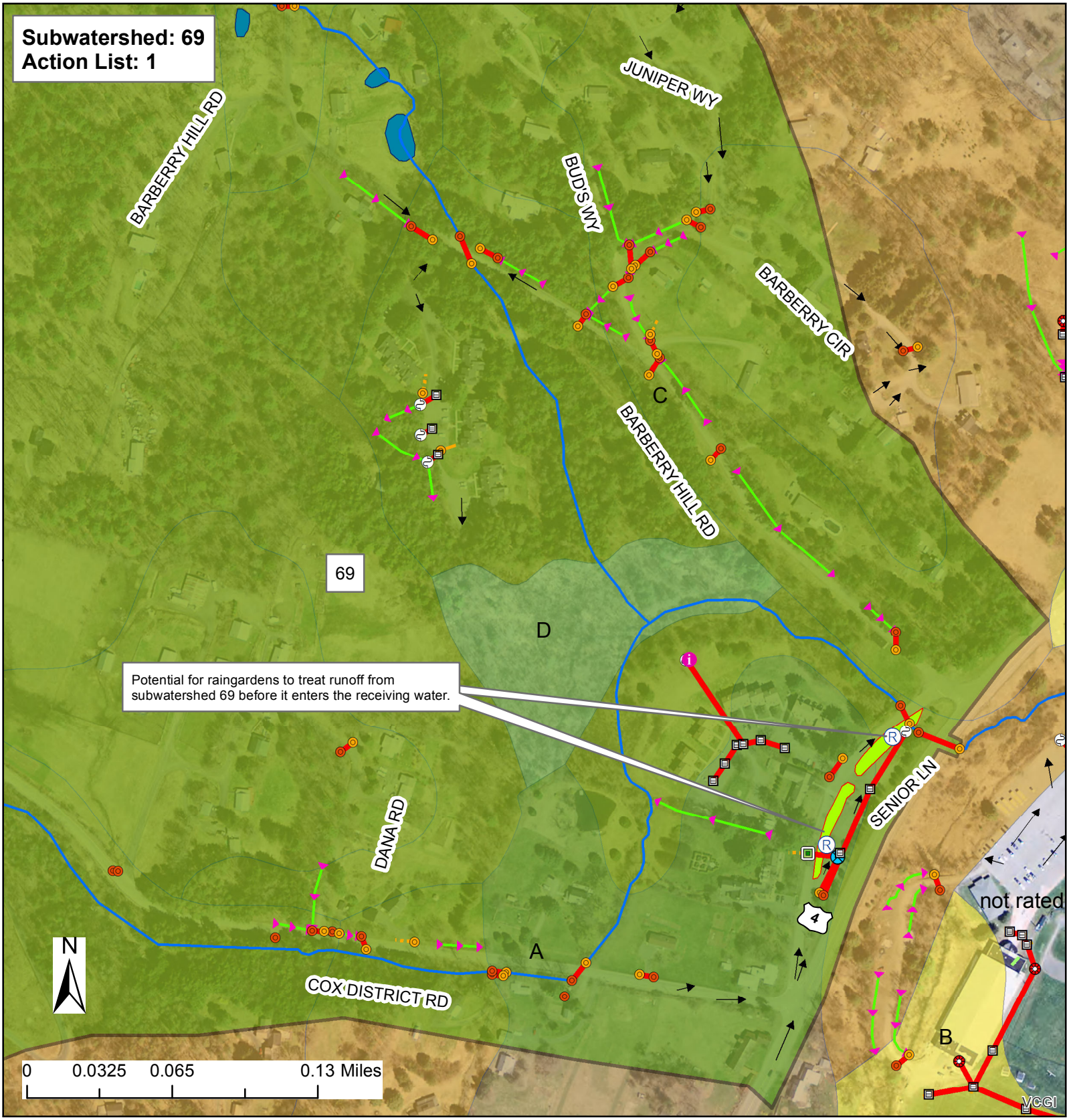

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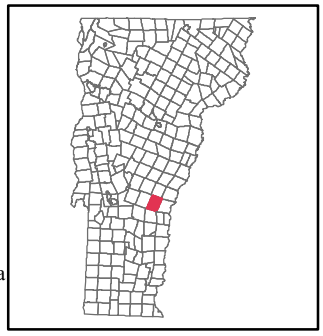

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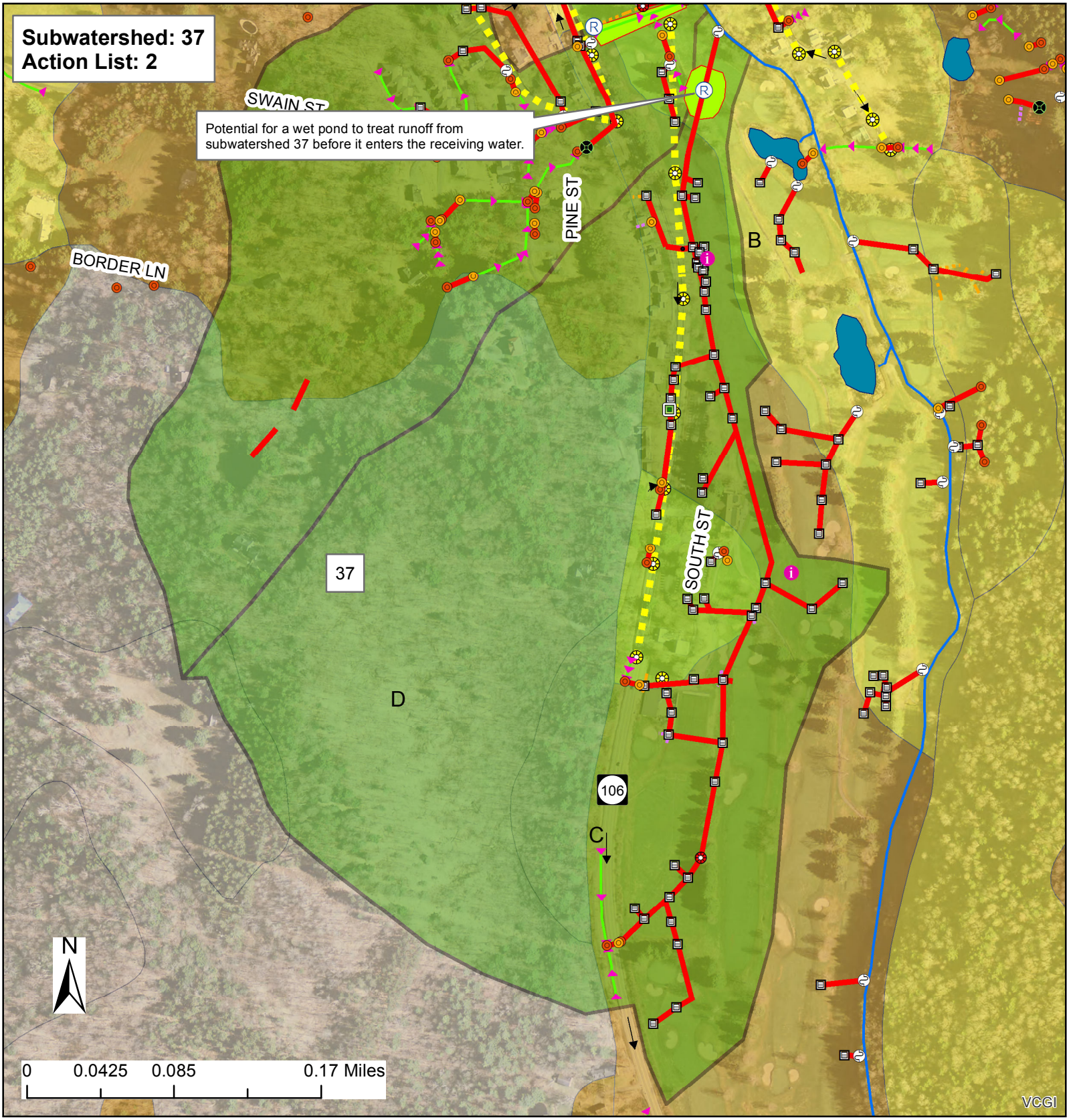

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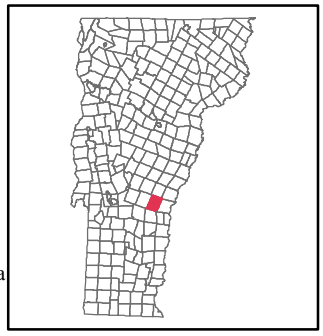

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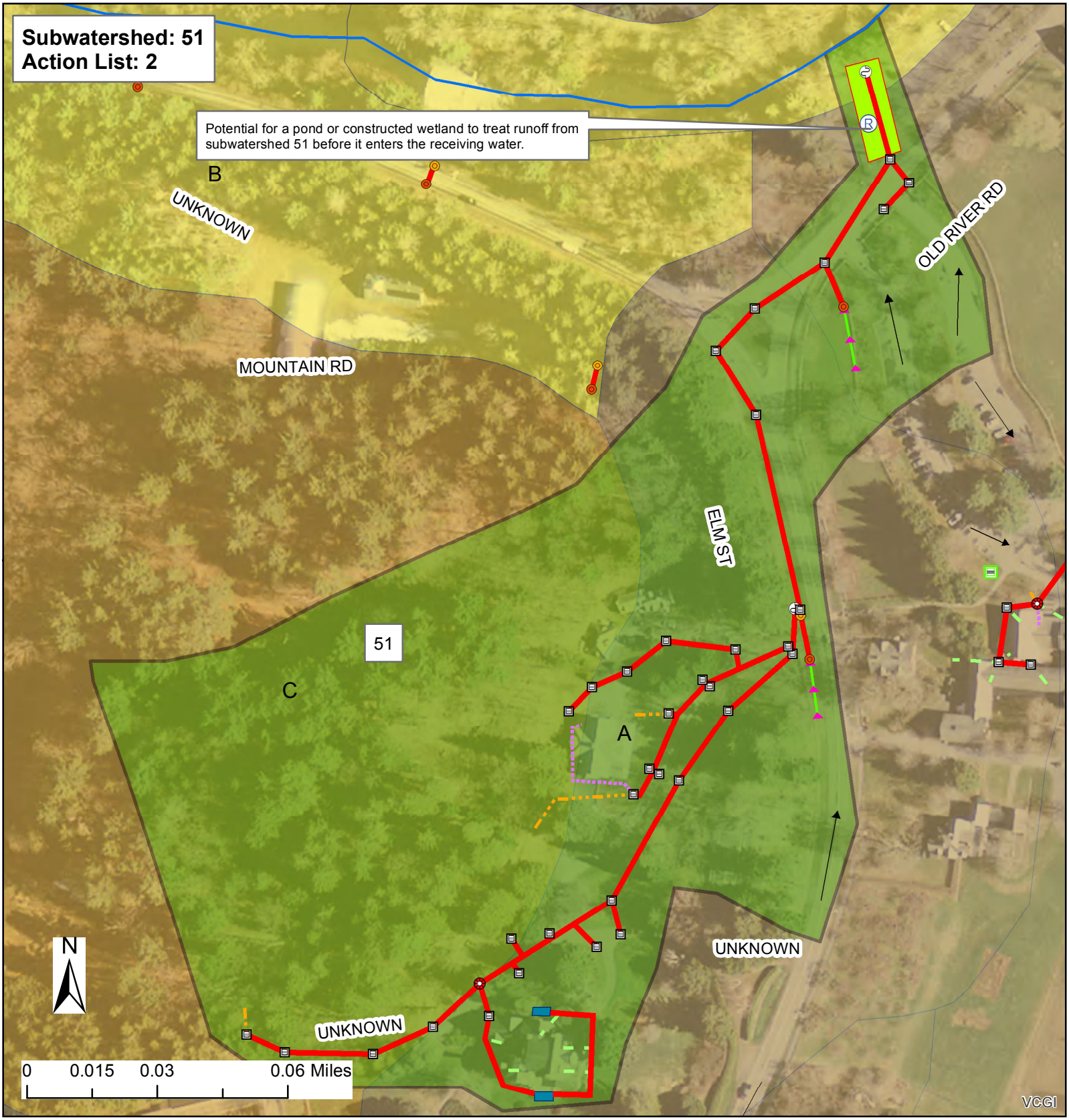

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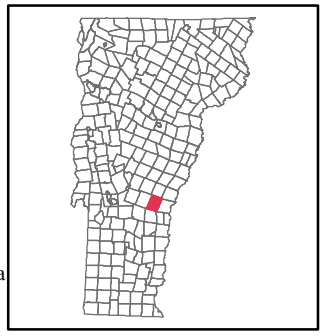

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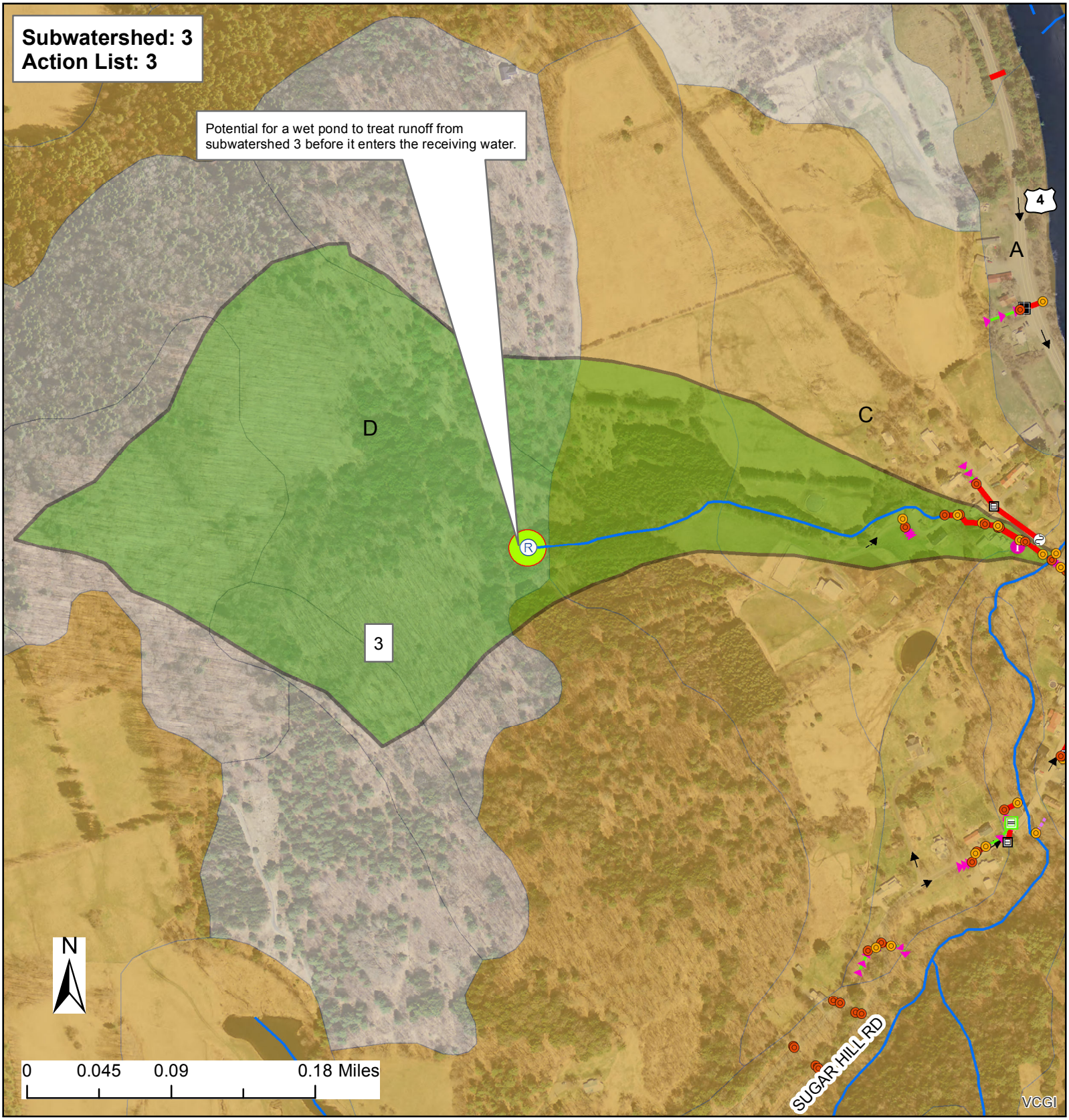

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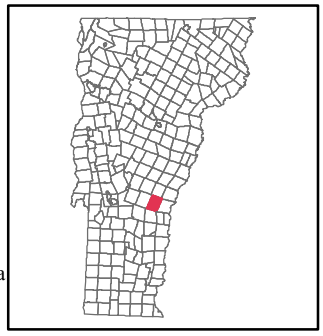

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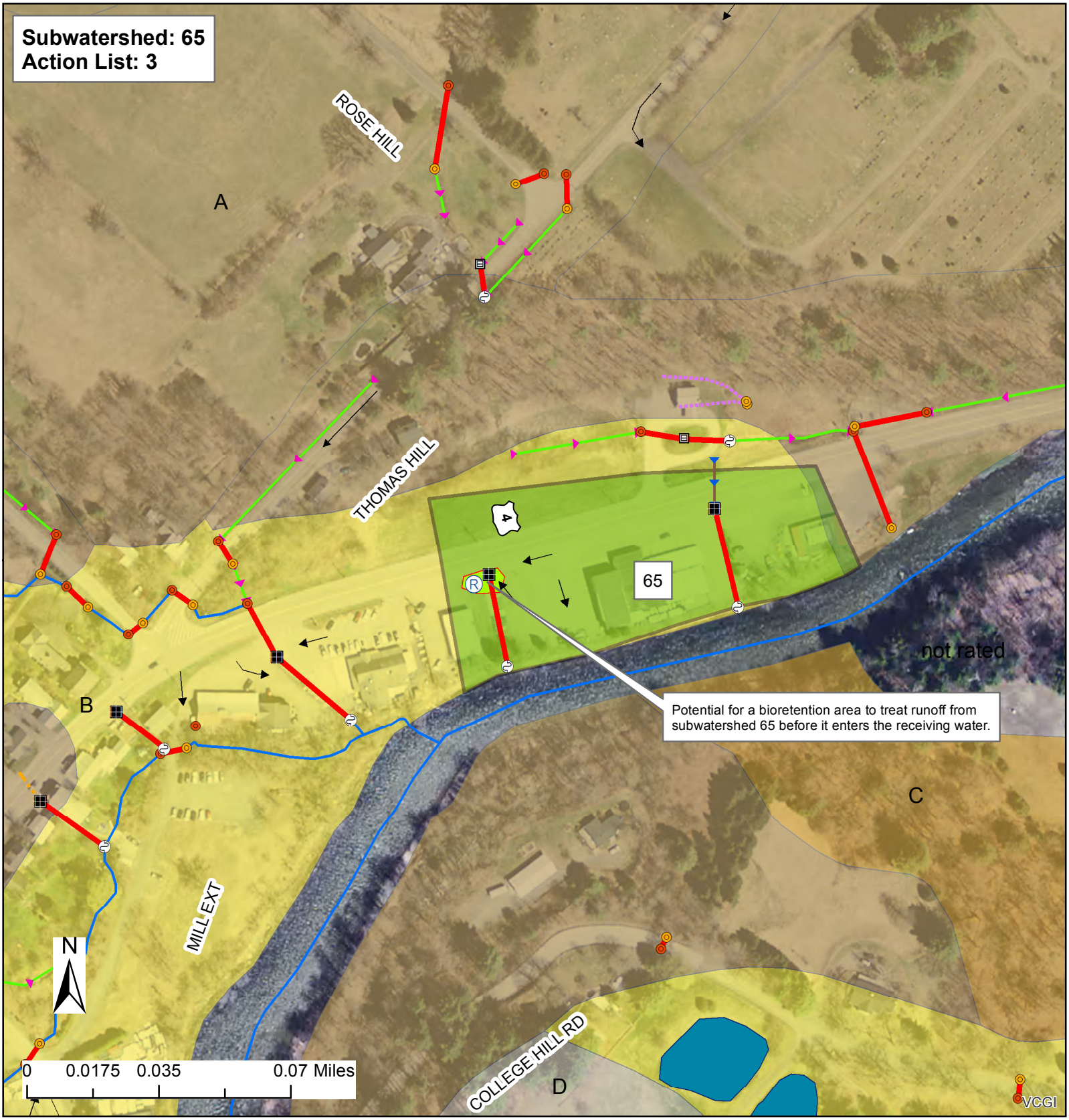

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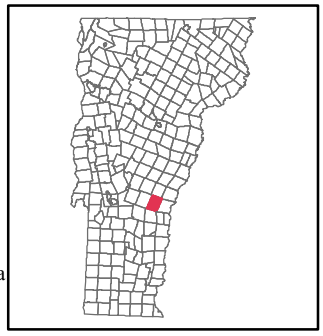

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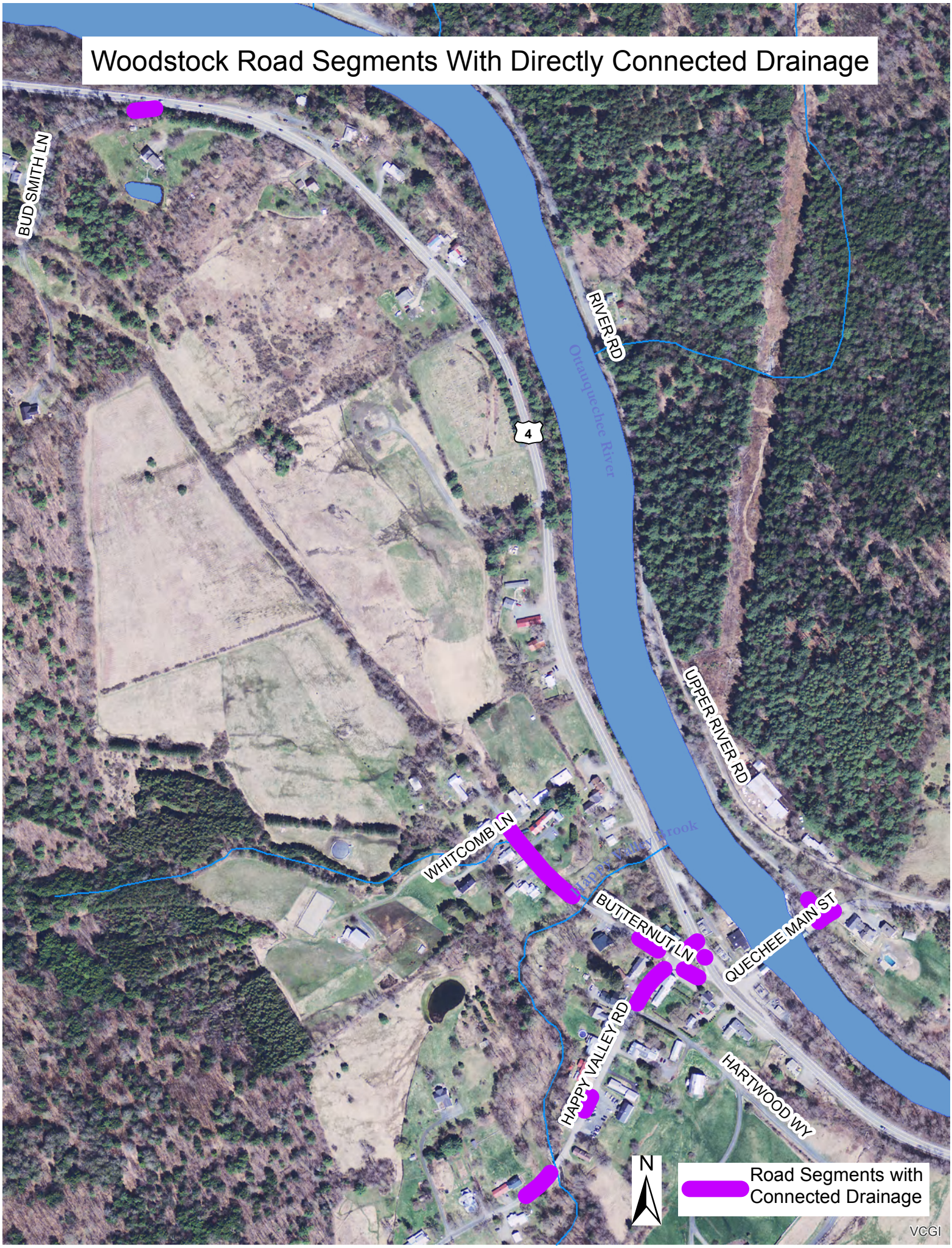
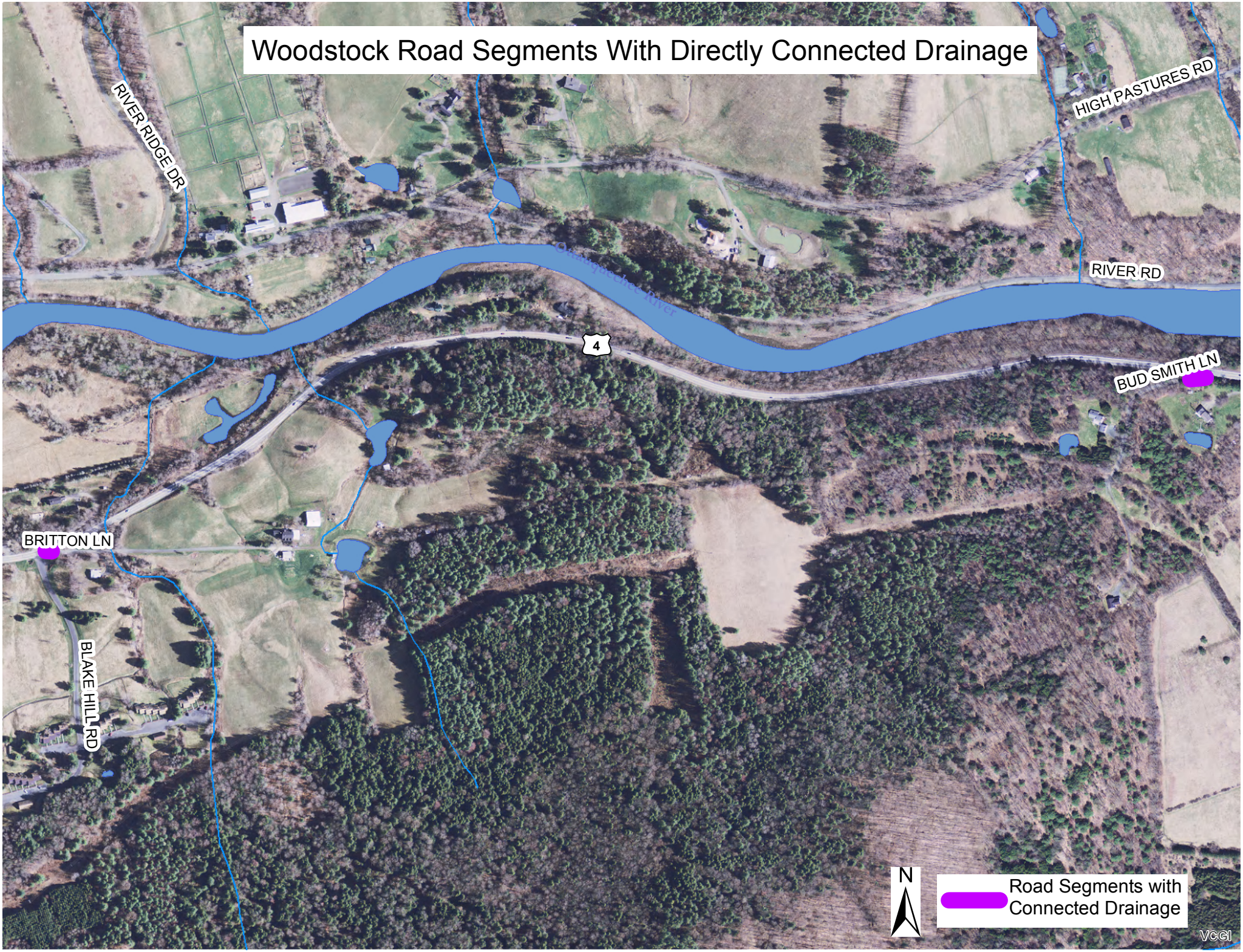
Connected Roads

Roads potentially connected to waters of the state

Woodstock Road Segments With Directly Connected Drainage




Woodstock Road Segments With Directly Connected Drainage
RIVER RIDGE DR
HIGH PASTURES RD
RIVER RD
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BRITTON LN
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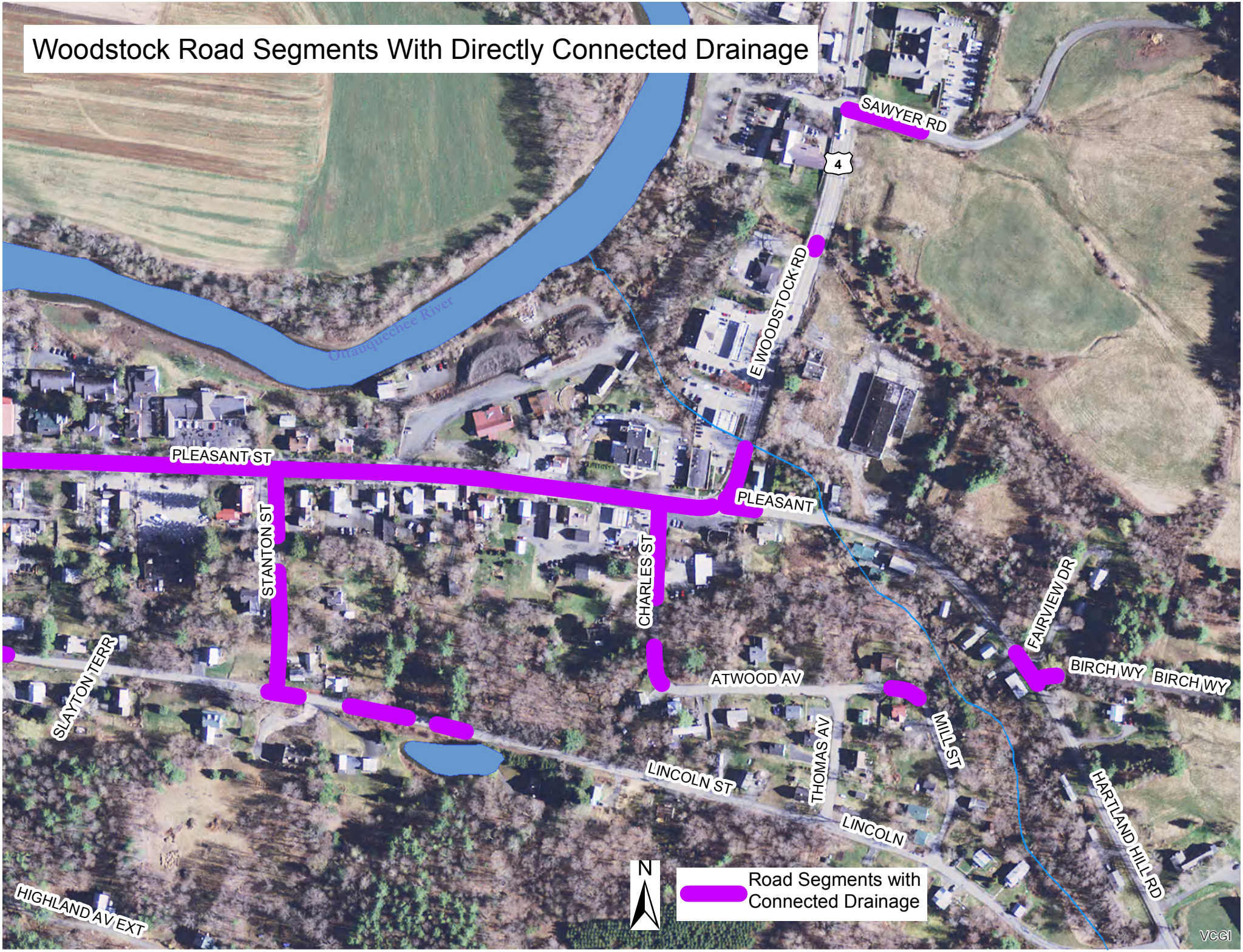
Road Segments with Connected Drainage
VCGI

Woodstock Road Segments With Directly Connected Drainage



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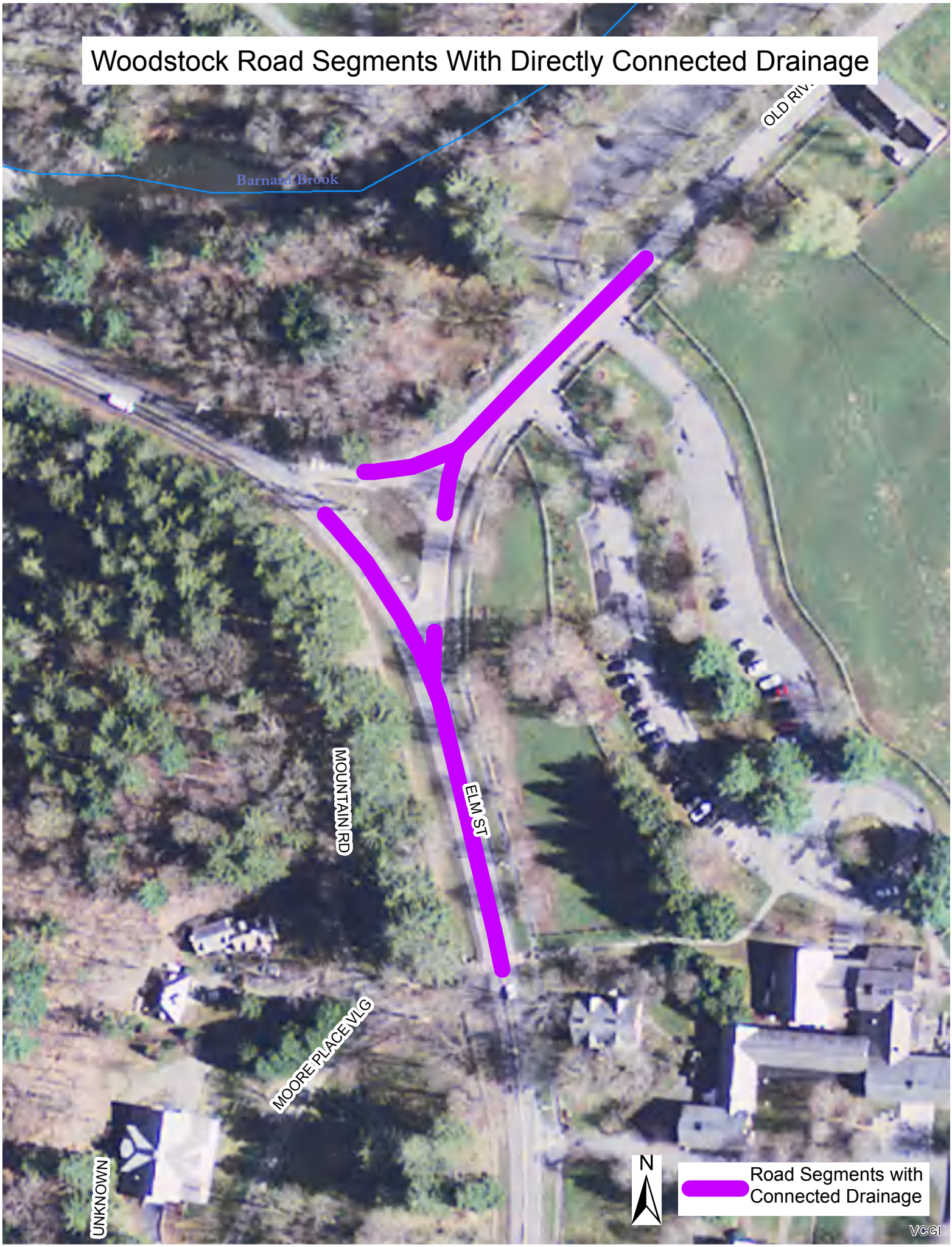

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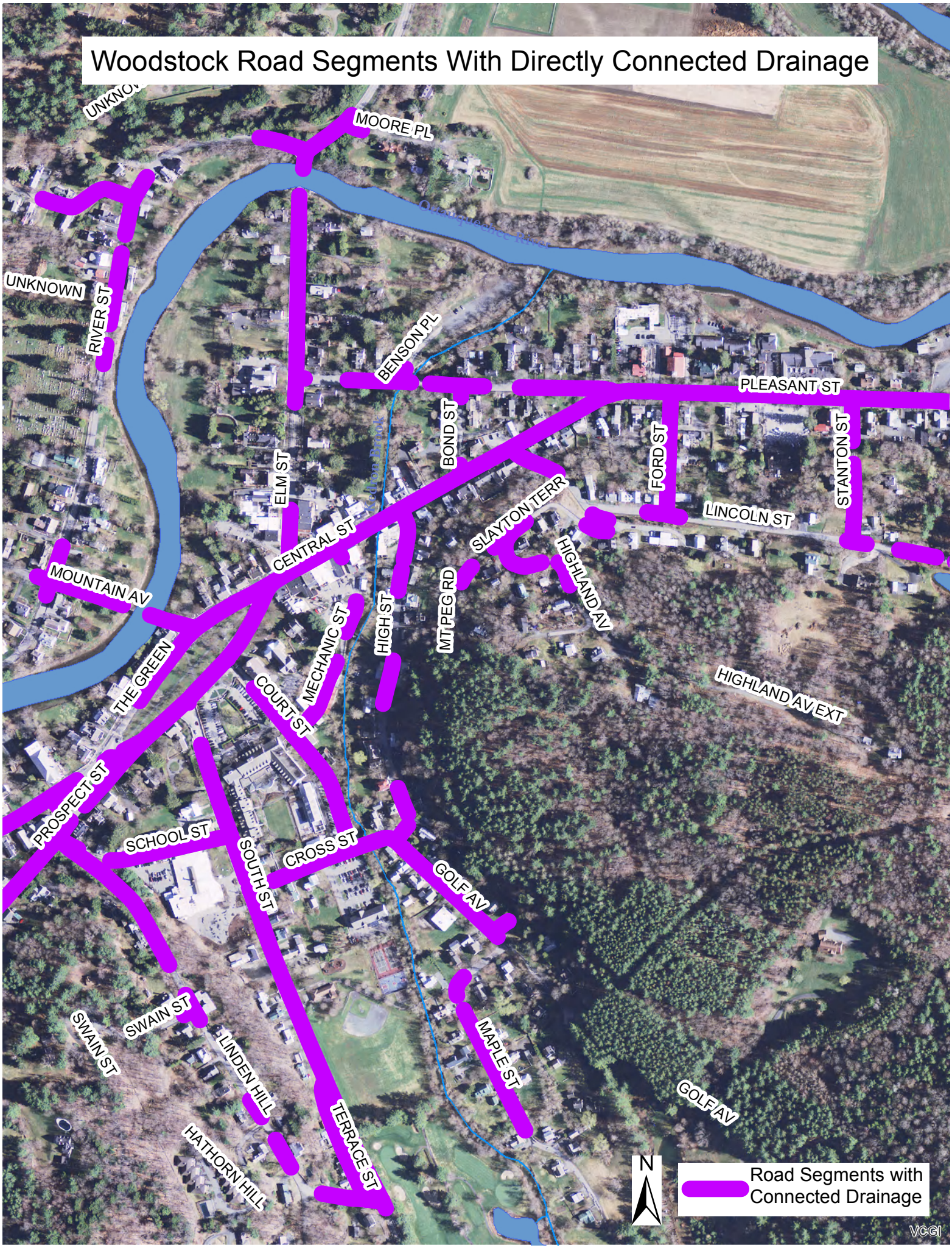

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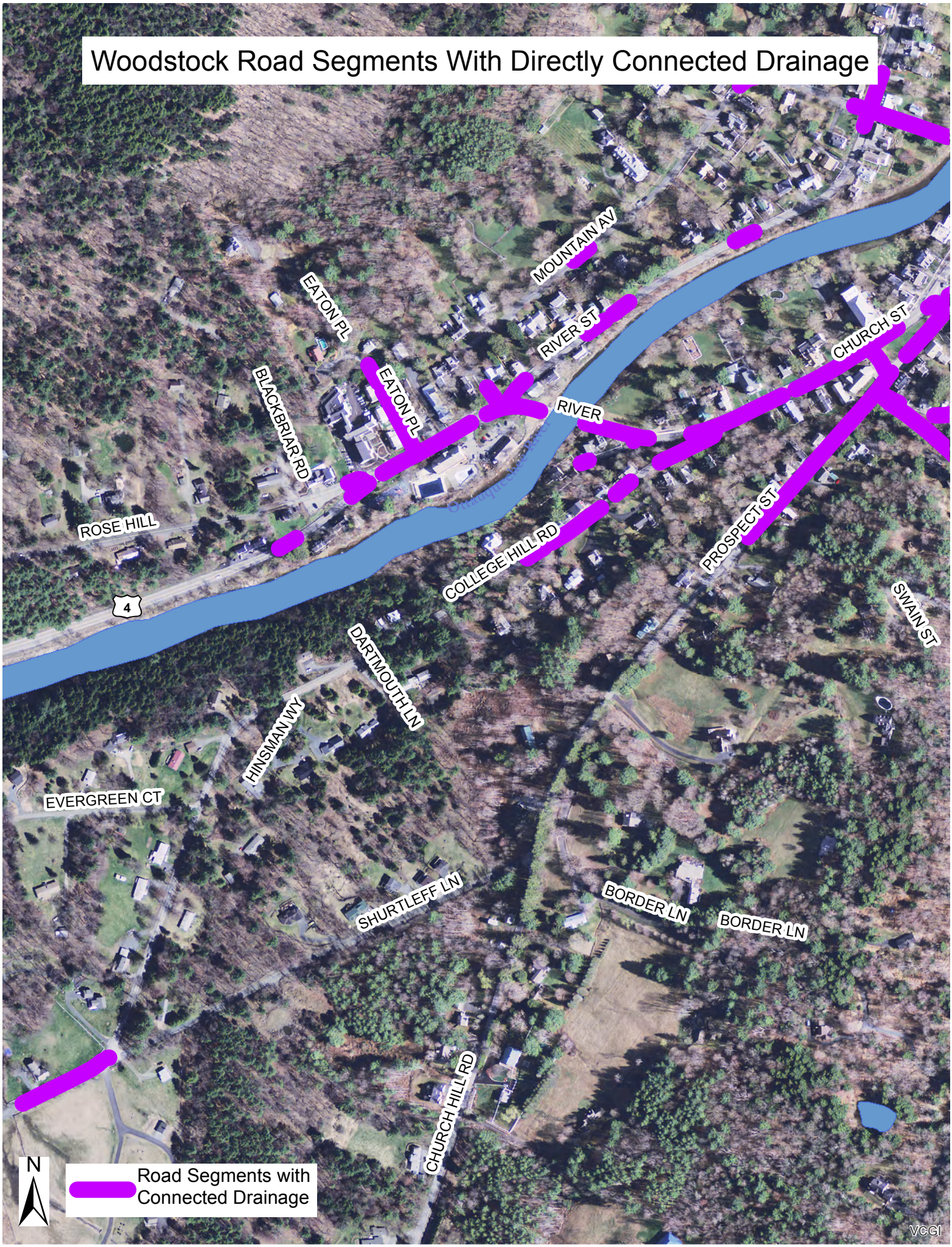

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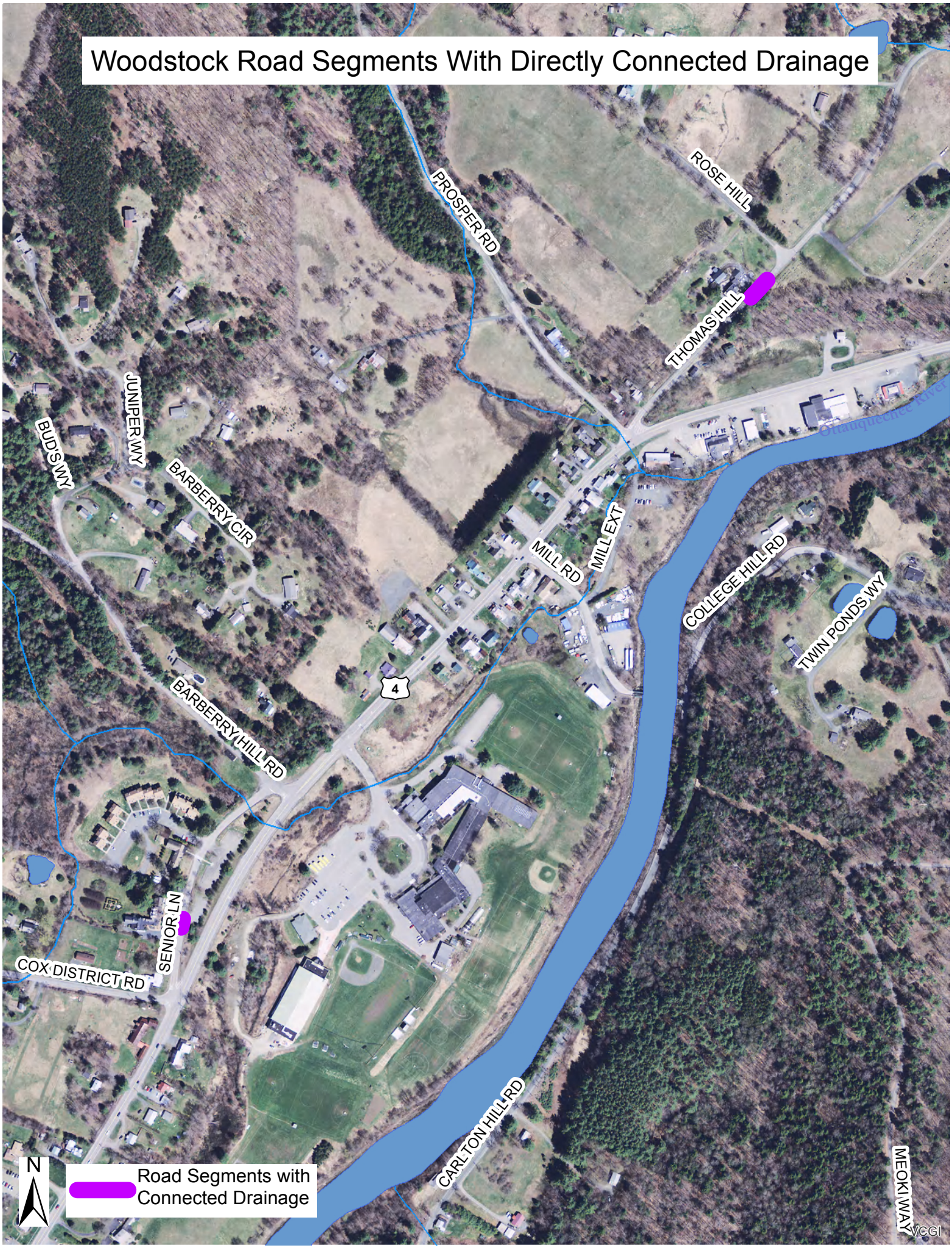


Woodstock Road Segments With Directly Connected Drainage

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:

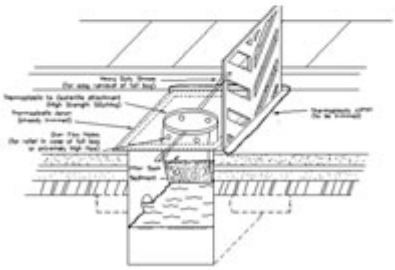
— Proper notification when a spill occurs;
— Site responsibility with respect to addressing the cleanup of a spill;
— Stopping the source of a spill;
— Cleaning up a spill;
— Proper disposal of materials contaminated by the spill;
— Location of spill response equipment programs; and
— Training for designated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

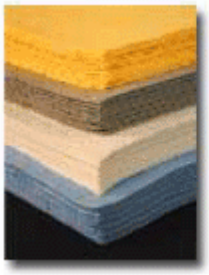
Absorbent socks are flexible tubes used to contain and clean-up spilled fluids. Socks are widely used in industrial applications and are ideal for Spill Kits. Fast spreading spills are quickly stopped with a sock.

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.