Town of Northfield

Stormwater Infrastructure Mapping Project

June 2019

VTDEC – CLEAN WATER INITIATIVE PROGRAM, WATERSHED MANAGEMENT DIVISION

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

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Overview

This stormwater infrastructure mapping project was completed for the municipality by the Agency of Natural Resources Clean Water Initiative 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. They can be used to: (1) 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, (2) as a valuable tool for hazardous material spill planning and prevention, (3) 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, (4) better assist the municipality in planning and implementing combined stormwater-sewer separation projects, (5) inform options for cleaning up existing polluted stormwater discharges; this report provides information and guidance for potential retrofit treatment locations and opportunities, (6) 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, and (7) 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 using the best available 4 band imagery (2016 NAIP). 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 0.9-1.0-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.**

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 hydrologically connected existing municipal roads. In January 2018 the final general permit was issued; municipalities must file a notice of intent to comply with the permit by July 31, 2018. As part of this permit all municipalities will be required, as explained below, to evaluate connected road segments with catch basin served infrastructure to determine compliance with MRGP Standards by December 31, 2020 as part of their road erosion inventory. The permit will require:

- Municipalities to develop road stormwater management plans. These plans will include a comprehensive (1) Road Erosion Inventory (REI) of hydrologically-connected road segments and (2) an Implementation Table.
- The inventory will include an evaluation of municipal hydrologically-connected road segments to determine if they meet the MRGP standards.
- Those road segments that do not currently meet MRGP standards and that can impact waterways will be prioritized for remediation within the Implementation Table. DEC has developed an Implementation Table-excel spread sheet template for this purpose.

Municipalities will submit annual reports to DEC due on April 1st starting in 2019. The Annual Reports will document progress in upgrading roads to meet MRGP standards. Municipalities will be able to use the spread sheet, mentioned above, for annual compliance reporting requirements. This report and the mapping information contained in it can be used by municipalities to develop the plan for the paved road segments with catchbasins that are hydrologically directly connected. The map(s) and data provided with this report indicate where these road segments outfalls are located using the best available mapping information DEC has to date. The MRGP standard for paved roads with catch basins is that any outfalls that are eroded will have to be stabilized with practices such as stone aprons, culvert headwalls, and stone-lined ditches. As with other classes of roads covered by this permit the municipality should first check the maps provided. DEC suggests municipalities take the following steps to check the maps and/or data provided to determine what outfalls will require municipal attention for erosion repair:

1. Using the provided maps and/or data as a guide confirm that the road draining to this outfall is paved, has at least two catch basins or drop inlets, and the discharge pipe from those catchbasins is directly discharging to waters of the state. Include any outfall from these road segments that discharges within 500 linear feet of surface waters.

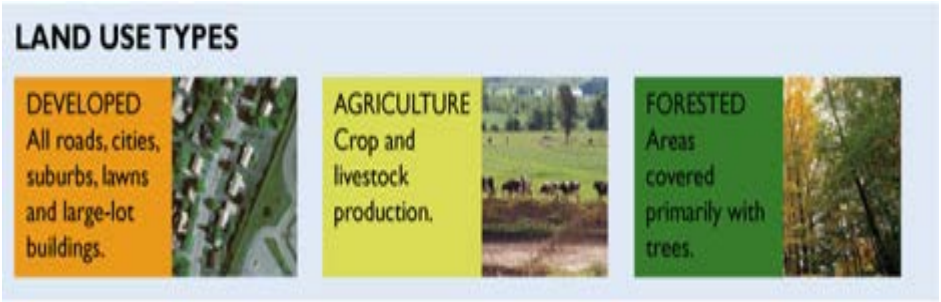
2. Using the maps locate the outfall and note any level of erosion present in the outfall and/or in the 500 foot or less long swale between the pipe outlet and waters of the state.

3. Prepare a list of all outfalls with notes pertaining to the erosion using the Guidance and Field Sheet or the i-phone application.
   Inventory Guidance:
   http://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Permitinformation/MunicipalRoads/sw_MRGP_PavedRoadsWithCathBasins_REI-Supplement.pdf

   Field Sheet (use form C only):
   http://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Permitinformation/MunicipalRoads/sw_MRGP_RoadErosionInventory.pdf

   i-phone application: Please contact Ryan Knox at Ryan.Knox@vermont.gov

Main Lake and Winooski River Nonpoint Phosphorus Overview



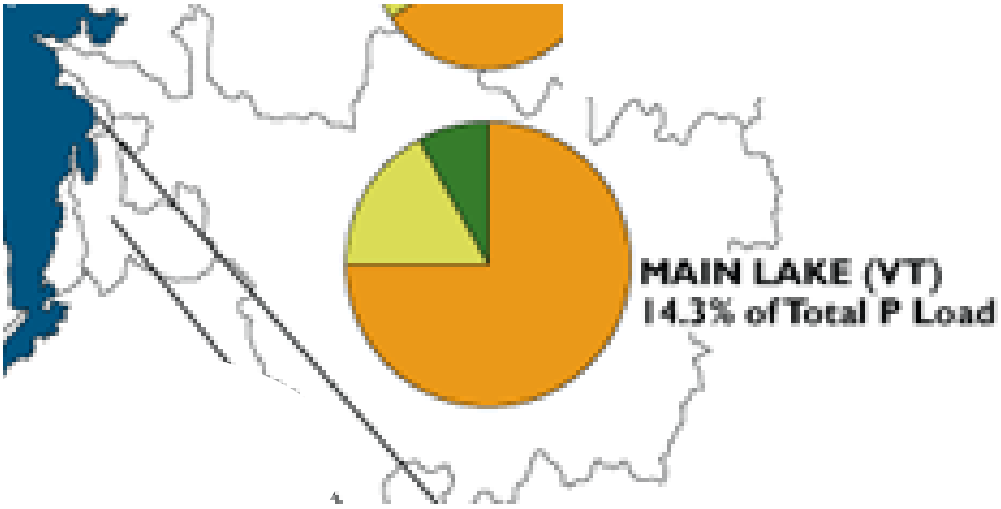
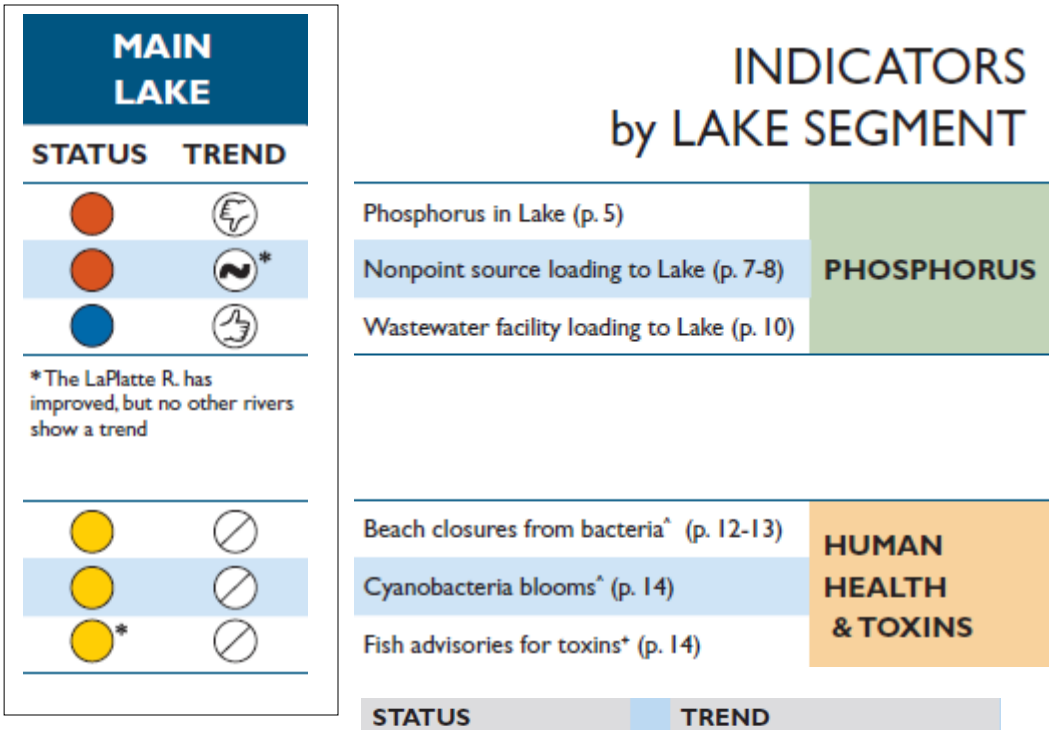


Figure shows the breakdown of contributions from developed, agricultural and forested land sources in the Main Lake-Winooski River Watershed to Total Phosphorus loading of the Main Lake, VT side.



* Figures taken from Lake Champlain Basin Program – *State of the Lake and Ecosystem Indicators Report (2012).* http://sol.lcbp.org/

Subwatershed Data

Tables showing calculations and Priority drainage area retrofit possibilities

This is a key showing the abbreviations of the different funding programs listed in the calculation sheets.

Abbreviation Key	
Code	**Funding Program**
BR	Better Roads-VTrans
ERP/CWIP	VTDEC Clean Water Initiative Program
LCBP	Lake Champlain Basin Program
LISF	Long Island Sound Futures Fund
SRF	Clean Water State Revolving Loan Fund
VTrans	Vermont Agency of Transportation Alternatives or Municipal Highway and Stormwater Mitigation Programs

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 or Raingarden
BS	Buffer Strip (25' Min.)
CB	Catch Basin
CBI	Catch Basin Insert
CD	Check Dam
CR or ESRD	Impervious Disconnection Credits
DP/DS	Dry Pond or Dry Swale
DW	Drywell
EDP (EDPMP)	Extended Detention Pond (with Micropool)
GS	Grass Swale
IB/ IG	Infiltration Basin or Infiltration Gallery
MOD	Modifications/upgrade to 2017 SW Standards
OF	Overland Flow
OGF	Organic Filter
PA/PC/PV	Pervious Asphalt or Pervious Concrete or Pervious Pavers
POP	Pocket Pond
PP	Perforated Pipe or Underdrain
PS	Pump Station
RDD	Roof Drain Disconnect
RR/RS	Rock Riprap or Rock Swale
SB	Sedimentation Basin
SF	Sand Filter (aka Surface Sand Filter)
SS or VS	Swirl Separator
SWPPP	Stormwater Pollution Prevention Plan
TT	Treatment Tank
WL/WP/WS	Wetland (Constructed) or Wet Pond or Wet Swale (aka Bioswale)

Northfield - 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.)	Phosphorus Load with Current Reductions (lbs.)	Phosphorus Load with Priority Action (lbs.)
1 Northfield	1	Linear infiltration gallery along upper Davis Avenue above Dickinson St	IG/GS/CB/WP		179.1	5.1	14341	1434	39.84	3.98
2 Northfield	2	Infiltration basin at bottom of Moody Lane	IB/CB/GS		115.3	2.7	8237	824	22.88	2.29
3 Northfield	1	Infiltration basin west of Route 12	IB/CB		13.0	24.4	2739	274	7.61	0.76
4 Northfield			GS		19.4	6.4	1661	1661	4.61	4.61
5 Northfield			CB/OF		13.8	21.8	2599	2599	7.22	7.22
6 Northfield			CB/OF		7.9	26.4	1797	1797	4.99	4.99
7 Northfield	2	Fix erosion at outfall	CB/OF/GS		16.6	22.8	3258	2280	9.05	7.24
8 Northfield			CB		4.7	22.2	906	906	2.52	2.52
9 Northfield			CB		5.4	21.7	1009	1009	2.80	2.80
10 Northfield			CB		2.9	25.4	626	626	1.74	1.74
11 Northfield			GS/CB		79.9	10.0	8317	8317	23.10	23.10
12 Northfield			CB/GS		20.6	19.8	3528	3528	9.80	9.80
13 Northfield			CB		4.8	12.2	567	567	1.57	1.57
14 Northfield	1	Bioretention or infiltration basin in front of shopping center	BRA/CB		6.6	50.5	3915	391	10.87	1.09
15 Northfield			GC/EDMP/WP/CB/ SB	3428-9015, 3428-9010	2.8	39.6	536	536	1.99	1.99
16 Northfield			SWPPP/GS/SB	4758-9003, 3428-9010	6.9	24.2	715	715	2.65	2.65
17 Northfield	2	Underground Sand filter for Dogwood Glen Drive	SF/GS/CB	3573-9010	79.2	13.4	9863	5721	27.40	23.29
18 Northfield			GS/CB		21.0	9.7	2932	2932	8.14	8.14
19 Northfield			GS/CB		99.7	8.9	9770	9770	27.14	27.14
21 Northfield			OF		3.5	44.2	1465	1465	4.07	4.07
22 Northfield	1	Infiltration basin to be built behind 230 Union Brook Rd.	CB		31.4	31.2	8610	861	23.92	2.39
23 Northfield			BRA/CB		5.3	68.6	3993	3993	11.09	11.09
24 Northfield	2	Infiltration basin east of Carpenter Street.Combine with DA #25	IB/CB	4525-9003	11.8	37.2	5109	511	14.19	1.42
25 Northfield	2	Combine with DA #24	IB/CB		9.4	53.0	4949	495	13.75	1.37
26 Northfield			CB/GS		8.9	12.6	1067	1067	2.96	2.96
27 Northfield	1	Underground detention basin and swirl separator. Combine with DA #28 and DA# 3000	SB-VS/CB		10.1	41.5	4887	977	13.58	8.15
28 Northfield	1	Underground detention basin and swirl separator. Combine with DA #27 and DA #3000	SB-VS/CB/GS	5299-9003	3.3	34.2	219	44	0.61	0.36
29 Northfield			CB		4.0	73.1	3546	3546	9.85	9.85
30 Northfield			CB/GS		8.1	26.7	1858	1858	5.16	5.16
31 Northfield			CB/GS		15.8	24.6	3334	3334	9.26	9.26
32 Northfield			CB/GS		59.7	4.3	4593	4593	12.76	12.76
33 Northfield			GS		0.9	1.5	60	60	0.17	0.17
34 Northfield			CB		0.3	35.1	123	123	0.34	0.34
35 Northfield			DW/CB		15.8	20.8	2838	1987	7.88	5.52
36 Northfield			GS/CB		4.0	29.3	1027	1027	2.85	2.85
37 Northfield			OF		2.5	31.1	678	678	1.88	1.88
38 Northfield	1	Remove combined sewer catchbasin from system	CB/GS		18.9	10.9	2067	1551	5.74	4.31
39 Northfield			CB/OF		18.0	11.1	1989	1989	5.52	5.52
40 Northfield	2	Linear infiltration basin along roadway	IB/GS/CB		26.2	4.3	2463	246	6.84	0.68
41 Northfield			CB/GS	3181-9010	3.1	72.3	1996	1996	5.54	5.54
42 Northfield			CB/GS/SB	3181-9010	3.7	35.0	936	936	2.60	2.60
43 Northfield			GS		4.6	44.5	1939	1939	5.38	5.38
44 Northfield			CB/GS/BRA/SB/GS/DW		13.8	54.6	1164	1164	9.70	9.70
45 Northfield			CB		2.0	65.7	1726	1726	4.80	4.80
46 Northfield			CB/GS		11.1	33.7	5181	5181	14.39	14.39
47 Northfield			CB/GS/IG	6890-9015	15.6	56.7	3861	3861	10.72	10.72
48 Northfield			CB		2.3	22.4	434	434	1.21	1.21

Northfield - Subwatershed Prioritization and Recommendations									
Watershed Number	Action List	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Phosphorus or Nitrogen Removal Per Pound (based on annual nutrient load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
1 Northfield	1	0.81	FALSE	$210,000	$16	$5,857	CWIP,SRF,LCBP	406	$186,622
2 Northfield	2	0.47	FALSE	$157,500	$21	$7,648	CWIP,SRF,LCBP	233	$107,191
3 Northfield	1	0.15	FALSE	$168,000	$68	$24,530	CWIP,SRF,LCBP	77	$35,648
4 Northfield	0	0.09	FALSE				CWIP,SRF,LCBP	47	$21,617
5 Northfield	0	0.15	FALSE				CWIP,SRF,LCBP	74	$33,825
6 Northfield	0	0.10	FALSE				CWIP,SRF,LCBP	51	$23,385
7 Northfield	2	0.18	FALSE		$10	$5,526	CWIP,SRF,LCBP	92	$42,390
8 Northfield	0	0.05	FALSE				CWIP,SRF,LCBP	26	$11,793
9 Northfield	0	0.06	FALSE				CWIP,SRF,LCBP	29	$13,124
10 Northfield	0	0.04	FALSE				CWIP,SRF,LCBP	18	$8,140
11 Northfield	0	0.47	FALSE				CWIP,SRF,LCBP	235	$108,225
12 Northfield	0	0.20	FALSE				CWIP,SRF,LCBP	100	$45,912
13 Northfield	0	0.03	FALSE				CWIP,SRF,LCBP	16	$7,372
14 Northfield	1	0.22	FALSE				CWIP,SRF,LCBP	111	$50,942
15 Northfield	0	0.05	0.12				CWIP,SRF,LCBP	25	$11,630
16 Northfield	0	0.07	0.18				CWIP,SRF,LCBP	34	$15,517
17 Northfield	2	0.56	FALSE		$43	$43,798	CWIP,SRF,LCBP	279	$128,352
18 Northfield	0	0.17	FALSE				CWIP,SRF,LCBP	83	$38,149
19 Northfield	0	0.55	0.98				CWIP,SRF,LCBP	276	$127,142
21 Northfield	0	0.08	FALSE				CWIP,SRF,LCBP	41	$19,059
22 Northfield	1	0.49	FALSE				CWIP,SRF,LCBP	244	$112,037
23 Northfield	0	0.25	FALSE				CWIP,SRF,LCBP	126	$57,731
24 Northfield	2	0.29	FALSE	$264,410	$58	$20,702	CWIP,SRF,LCBP	145	$66,480
25 Northfield	2	0.28	FALSE				CWIP,SRF,LCBP	140	$64,405
26 Northfield	0	0.06	FALSE				CWIP,SRF,LCBP	30	$13,883
27 Northfield	1	0.28	FALSE	$200,000	$34.95	$19,011	CWIP,SRF,LCBP	138	$63,598
28 Northfield	1	0.01	FALSE						
29 Northfield	0	0.20	0.32				CWIP,SRF,LCBP	100	$46,143
30 Northfield	0	0.11	0.24				CWIP,SRF,LCBP	53	$24,183
31 Northfield	0	0.19	FALSE				CWIP,SRF,LCBP	94	$43,391
32 Northfield	0	0.26	FALSE				CWIP,SRF,LCBP	130	$59,767
33 Northfield	0	0.00	FALSE				CWIP,SRF,LCBP	2	$785
34 Northfield	0	0.01	FALSE				CWIP,SRF,LCBP	3	$1,604
35 Northfield	1	0.16	FALSE				CWIP,SRF,LCBP	80	$36,931
36 Northfield	0	0.06	FALSE				CWIP,SRF,LCBP	29	$13,361
37 Northfield	0	0.04	FALSE				CWIP,SRF,LCBP	19	$8,819
38 Northfield	1	0.12	FALSE		$10	$3,483	CWIP,SRF,LCBP	58	$26,902
39 Northfield	0	0.11	FALSE				CWIP,SRF,LCBP	56	$25,878
40 Northfield	2	0.14	FALSE	$127,492	$58	$20,702	CWIP,SRF,LCBP	70	$32,055
41 Northfield	0	0.14	FALSE				CWIP,SRF,LCBP	71	$32,462
42 Northfield	0	0.07	FALSE				CWIP,SRF,LCBP	33	$15,220
43 Northfield	0	0.11	FALSE				CWIP,SRF,LCBP	55	$25,227
44 Northfield	0	0.33	FALSE				CWIP,SRF,LCBP	165	$75,719
45 Northfield	0	0.10	FALSE				CWIP,SRF,LCBP	49	$22,466
46 Northfield	0	0.29	FALSE				CWIP,SRF,LCBP	147	$67,423
47 Northfield	0	0.40	0.97				CWIP,SRF,LCBP	199	$91,347
48 Northfield	0	0.02	0.06				CWIP,SRF,LCBP	12	$5,647

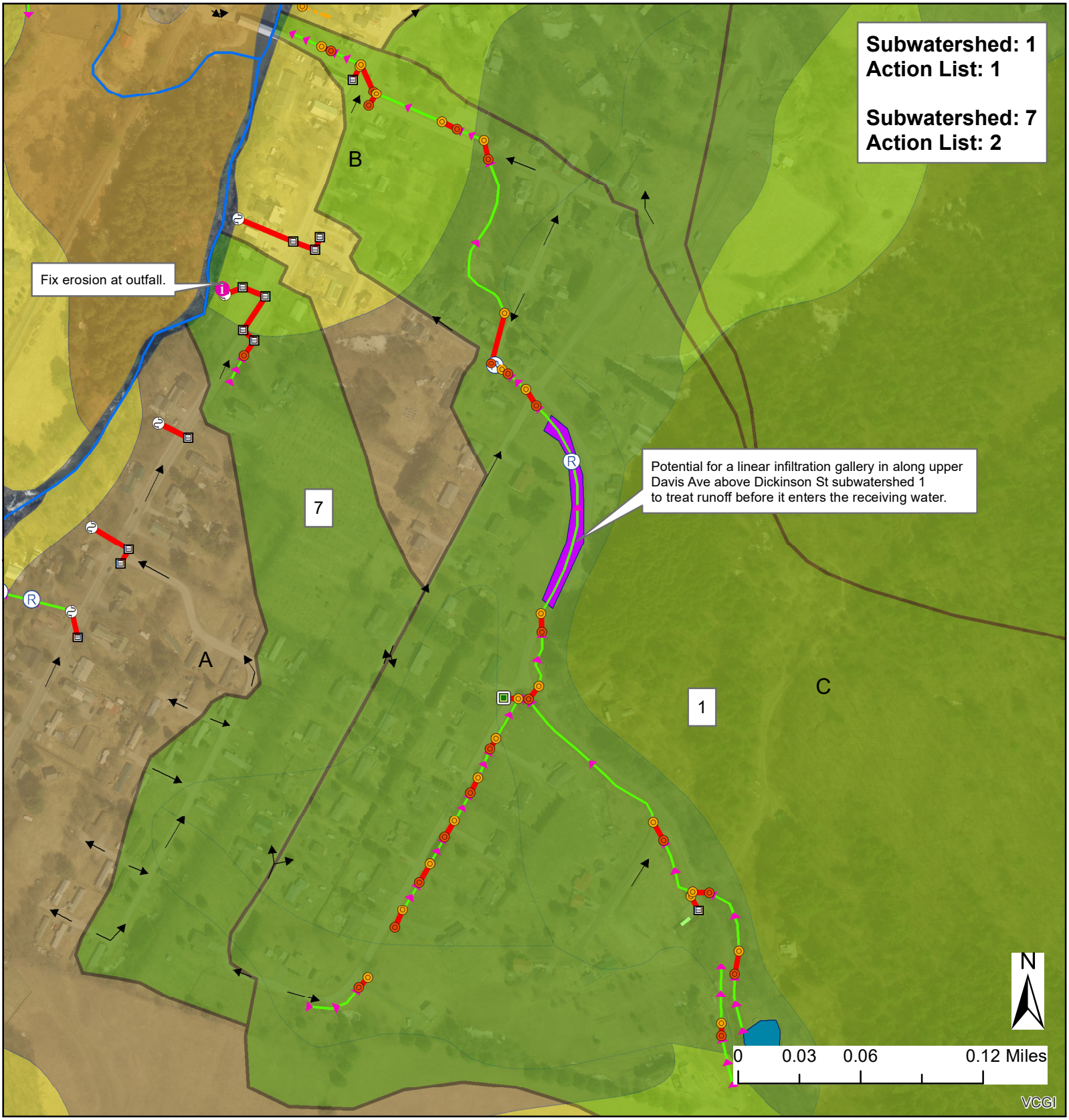
Northfield - Subwatershed Prioritization and Recommendations										
Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs.)	Sediment Load with Priority Action (lbs.)	Phosphorus Load with Current Reductions (lbs.)	Phosphorus Load with Priority Action (lbs.)
49 Northfield	2	Infiltration basin at outfall.	IB/CB/GS/WP		38.5	11.5	4341	434	12.06	1.21
51 Northfield			GS/SWPPP	5003-9003	29.5	26.3	6703	6703	18.62	18.62
52 Northfield	2	Bioretention at outfall on west side	BRA/CB/GS		1.6	28.5	391	39	1.09	0.11
53 Northfield			GS		201.5	4.8	15872	15872	44.09	44.09
54 Northfield			BRA/GW/CB	6586-INDS/ 6586-9015.1	91.4	2.8	1229	1229	6.83	6.83
55 Northfield	2	Infiltration basin at outfall.	IB/CB		2.8	86.5	2961	296	8.22	0.82
56 Northfield			CB		8.7	28.1	2130	2130	5.92	5.92
57 Northfield			IG/IB/BS/GS/CB	5617-9015.1	5.9	58.1	277	277	0.77	0.77
58 Northfield			IB/CB/GS/SB	4092-9010	4.1	30.6	146	146	1.22	1.22
59 Northfield			CB/GS		2.3	30.1	613	613	1.70	1.70
60 Northfield	2	Infiltration gallery near outfall at bottom of access road	IG/IB/CB/GS/SB	5617-9010	18.6	41.2	3006	1503	8.35	4.18
61 Northfield			CB/IB		5.8	38.9	142	142	0.40	0.40
62 Northfield			CB/GS/IB	5617-9010	2.6	55.6	113	113	0.31	0.31
63 Northfield	2	Infiltration basin at outfall. Combine with DA #64 and DA #67.	IB/CB/DW/OF/GS/ URB	3832-9010, 4210-INDS.1	28.3	51.3	6913	3457	19.56	9.78
64 Northfield	2	Combine with DA #63	DW/GS		5.1	27.2	239	239	1.99	1.99
65 Northfield			IB/GS		57.2	7.8	5287	5287	14.69	14.69
66 Northfield			CB/GS		5.4	19.9	938	938	2.60	2.60
67 Northfield	2	Combine with DA #63	IB/CB		2.9	18.3	457	457	1.27	1.27
68 Northfield			CB/GS		115.9	1.3	7890	7890	21.92	21.92
69 Northfield			GS		14.0	11.1	1552	1552	4.31	4.31
70 Northfield			GS		31.1	7.8	2877	2877	7.99	7.99
71 Northfield			GS		37.7	14.4	4955	4955	13.76	13.76
72 Northfield			GS		141.2	2.3	9931	9931	27.59	27.59
73 Northfield			GS		19.5	8.4	1858	1858	5.16	5.16
74 Northfield			GS		4.4	7.7	409	409	1.14	1.14
75 Northfield			CB/GS		11.7	17.0	1746	1746	4.85	4.85
76 Northfield			GS		4.5	19.4	765	765	2.12	2.12
77 Northfield			GS		60.3	5.5	4926	4926	13.68	13.68
78 Northfield	2	Infiltration basin in island in front of 974 US Route 12 S	IB/GS/CB		126.2	5.9	10501	6301	29.17	17.50
79 Northfield			GS		33.0	5.1	2638	2638	7.33	7.33
80 Northfield			CB/GS		49.1	6.2	4147	4147	11.52	11.52
81 Northfield			CB		20.5	9.8	2108	2108	5.85	5.85
82 Northfield			CB		12.8	12.5	1526	1526	4.24	4.24
83 Northfield			GS		5.3	16.9	788	788	2.19	2.19
84 Northfield			GS		29.8	11.2	3311	3311	9.20	9.20
85 Northfield	2	Infiltration basin at swale outfall	IB/GS		20.6	11.2	2286	229	6.35	0.63
3000 Northfield	1	Underground detention basin and swirl separator. Combine with DA #27 and DA #28. Separate combined sewer from storm.	SB-VS/CB	5299-9003	3.8	47.9	2047	409	5.69	0.85
3001 Northfield	3	Combined sewer-storm. Separate and provide stormwater treatment for separated water on side streets.	GS/CB		53.5	15.1	6930	3465	20.26	10.13

Northfield - Subwatershed Prioritization and Recommendations									
Watershed Number	Action List	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Phosphorus or Nitrogen Removal Per Pound (based on annual nutrient load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
49 Northfield	2	0.25	0.49	$224,677	$58	$20,702	CWIP,SRF,LCBP	123	$56,490
51 Northfield	0	0.38	FALSE				CWIP,SRF,LCBP	190	$87,219
52 Northfield	2	0.02	FALSE	$3,814	$11	$3,904	CWIP,SRF,LCBP	11	$5,085
53 Northfield	0	0.90	1.06				CWIP,SRF,LCBP	449	$206,542
54 Northfield	0	0.35	0.29				CWIP,SRF,LCBP	174	$79,970
55 Northfield	2	0.17	FALSE	$153,241	$58	$20,702	CWIP,SRF,LCBP	84	$38,529
56 Northfield	0	0.12	FALSE				CWIP,SRF,LCBP	60	$27,722
57 Northfield	0	0.16	FALSE				CWIP,SRF,LCBP	78	$36,018
58 Northfield	0	0.04	FALSE				CWIP,SRF,LCBP	21	$9,498
59 Northfield	0	0.03	FALSE				CWIP,SRF,LCBP	17	$7,981
60 Northfield	2	0.28	FALSE	$129,654	$86	$31,053	CWIP,SRF,LCBP	142	$65,198
61 Northfield	0	0.08	FALSE				CWIP,SRF,LCBP	40	$18,538
62 Northfield	0	0.06	FALSE				CWIP,SRF,LCBP	32	$14,676
63 Northfield	2	0.72	1.60	$525,000	$152	$53,684	CWIP,SRF,LCBP	362	$166,593
64 Northfield	0	0.07	0.15				CWIP,SRF,LCBP	34	$15,544
65 Northfield	0	0.30	0.49				CWIP,SRF,LCBP	150	$68,797
66 Northfield	0	0.05	0.12				CWIP,SRF,LCBP	27	$12,202
67 Northfield	0	0.03	0.06				CWIP,SRF,LCBP	13	$5,943
68 Northfield	0	0.45	0.17				CWIP,SRF,LCBP	223	$102,673
69 Northfield	0	0.09	0.17				CWIP,SRF,LCBP	44	$20,193
70 Northfield	0	0.16	0.27				CWIP,SRF,LCBP	81	$37,437
71 Northfield	0	0.28	0.60				CWIP,SRF,LCBP	140	$64,474
72 Northfield	0	0.56	0.35				CWIP,SRF,LCBP	281	$129,231
73 Northfield	0	0.11	0.18				CWIP,SRF,LCBP	53	$24,176
74 Northfield	0	0.02	0.04				CWIP,SRF,LCBP	12	$5,320
75 Northfield	0	0.10	FALSE				CWIP,SRF,LCBP	49	$22,716
76 Northfield	0	0.04	FALSE				CWIP,SRF,LCBP	22	$9,955
77 Northfield	0	0.28	FALSE				CWIP,SRF,LCBP	139	$64,103
78 Northfield	2	0.59	FALSE	$210,000	$50	$17,998	CWIP,SRF,LCBP	297	$136,648
79 Northfield	0	0.15	FALSE				CWIP,SRF,LCBP	75	$34,323
80 Northfield	0	0.23	FALSE				CWIP,SRF,LCBP	117	$53,970
81 Northfield	0	0.12	FALSE				CWIP,SRF,LCBP	60	$27,426
82 Northfield	0	0.09	FALSE				CWIP,SRF,LCBP	43	$19,852
83 Northfield	0	0.04	FALSE				CWIP,SRF,LCBP	22	$10,254
84 Northfield	0	0.19	FALSE				CWIP,SRF,LCBP	94	$43,084
85 Northfield	2	0.13	FALSE	$210,000	$102	$36,753	CWIP,SRF,LCBP	65	$29,741
3000 Northfield	1	0.12	FALSE				CWIP,SRF,LCBP	61	$28,045
3001 Northfield	3	0.41	0.89	$200,000	$58	$19,739	CWIP,SRF,LCBP	206	$94,931

Target Maps

Showing Priority Action List Drainage Areas

And Potential Retrofit Locations



Northfield, VT

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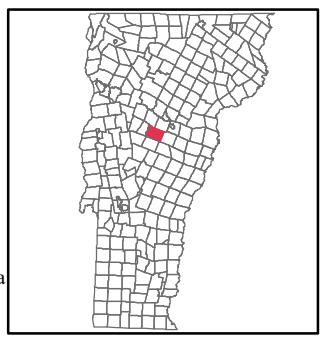

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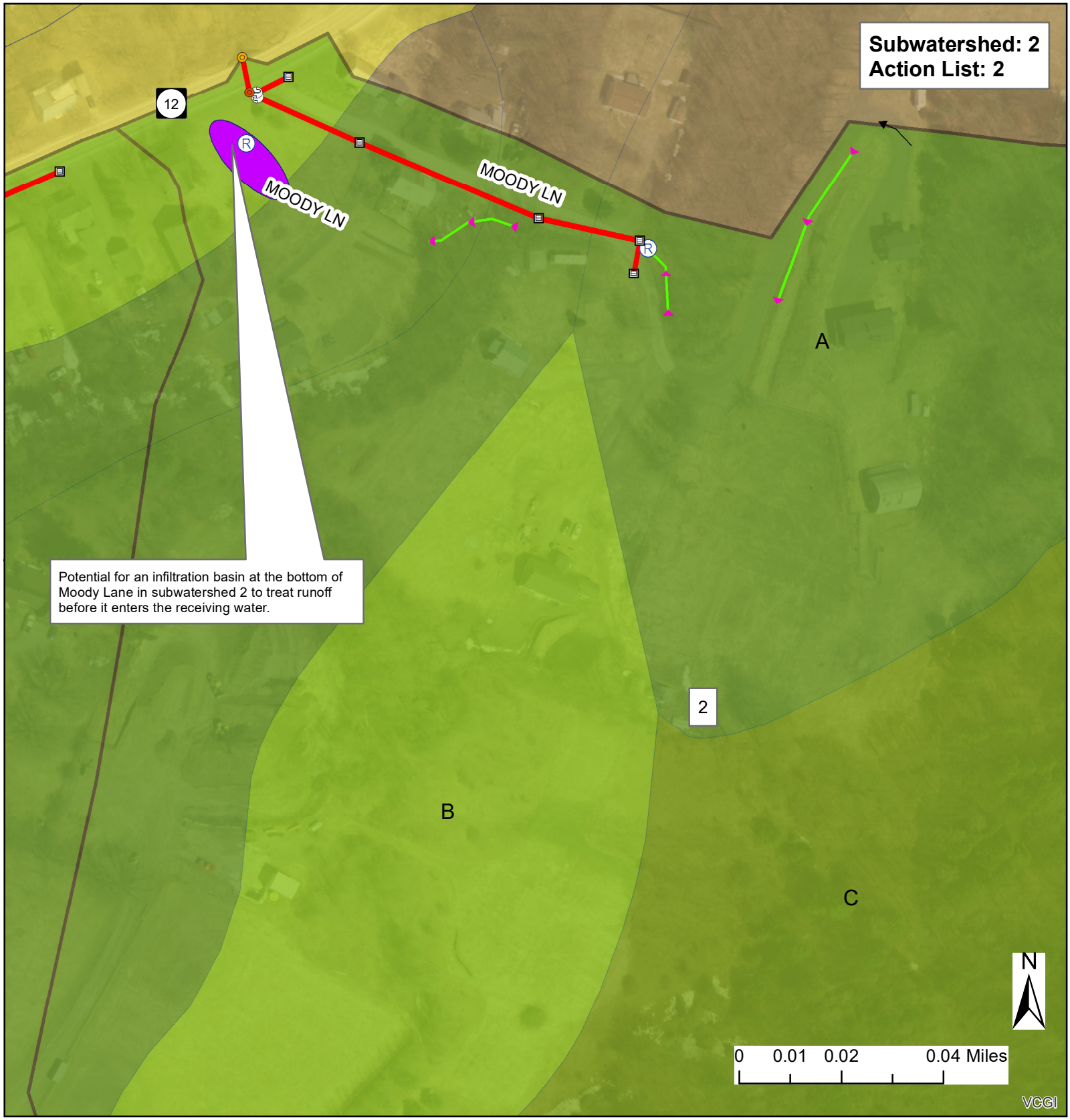

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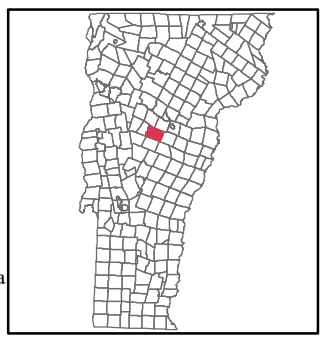

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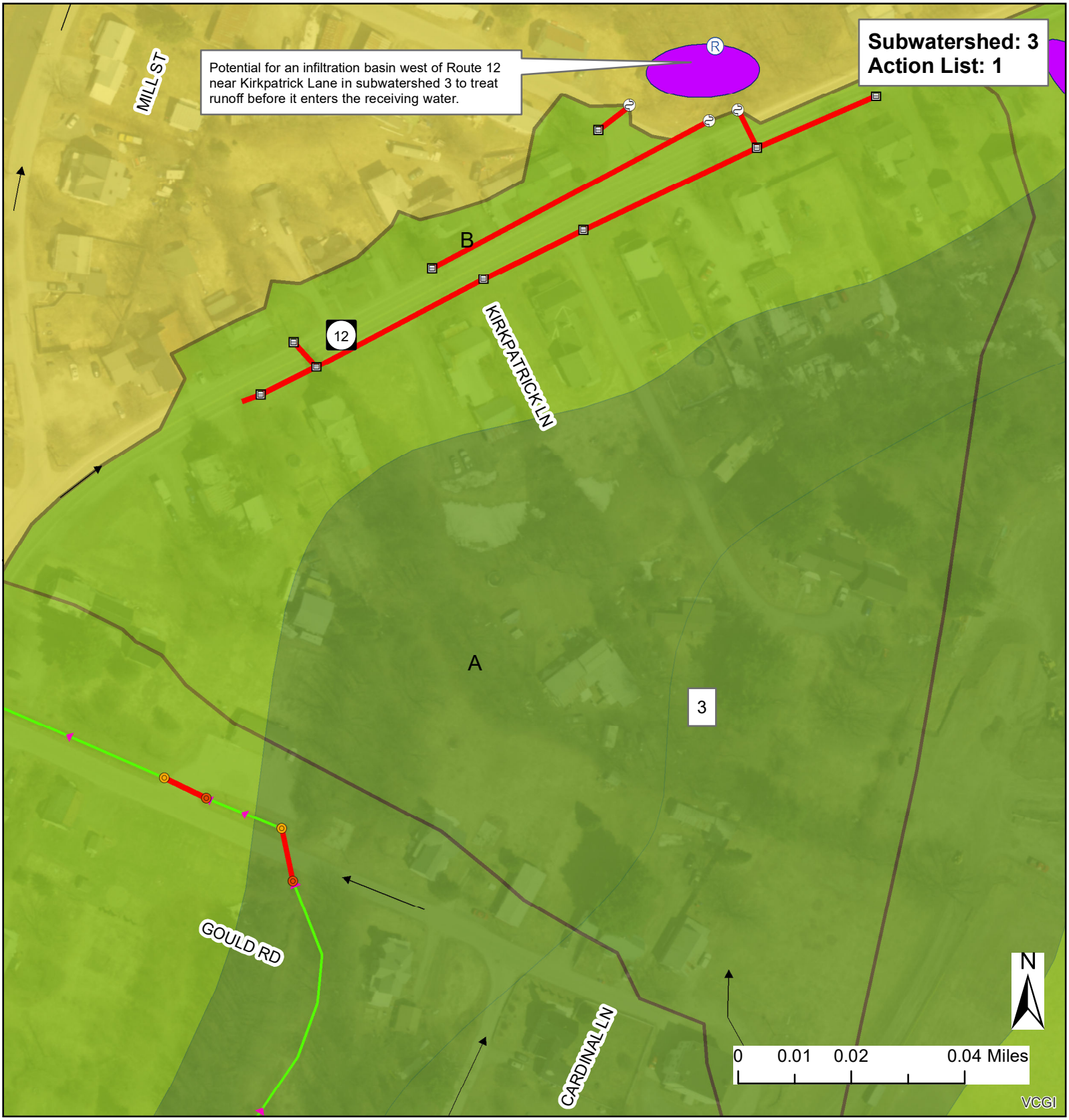

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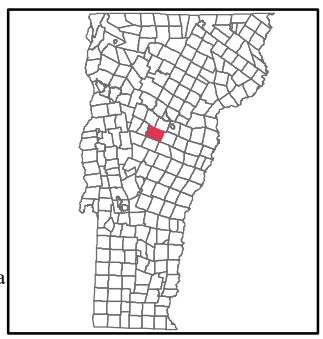

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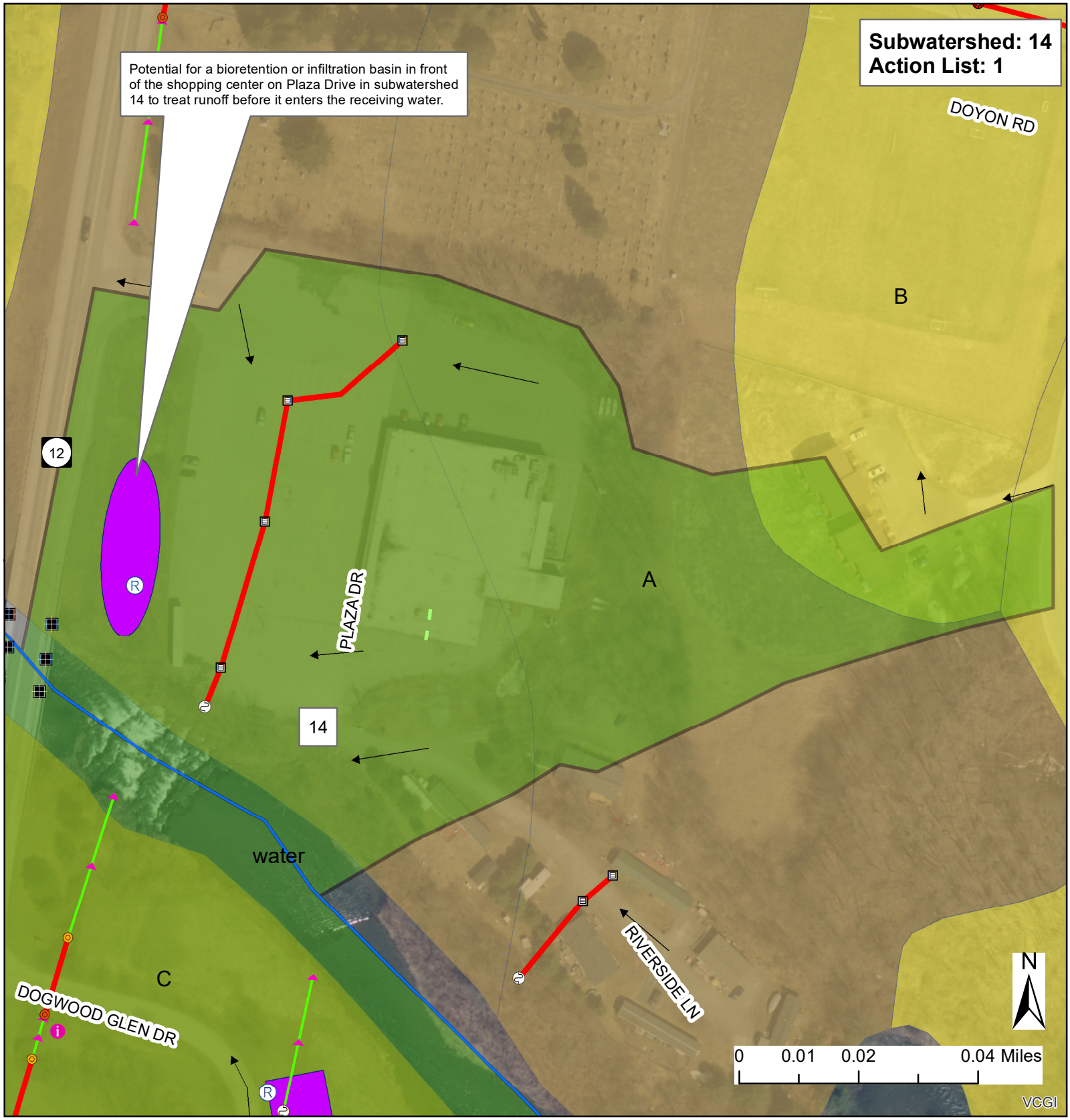

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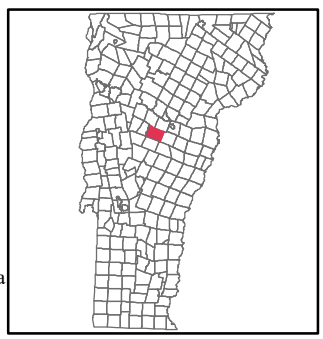

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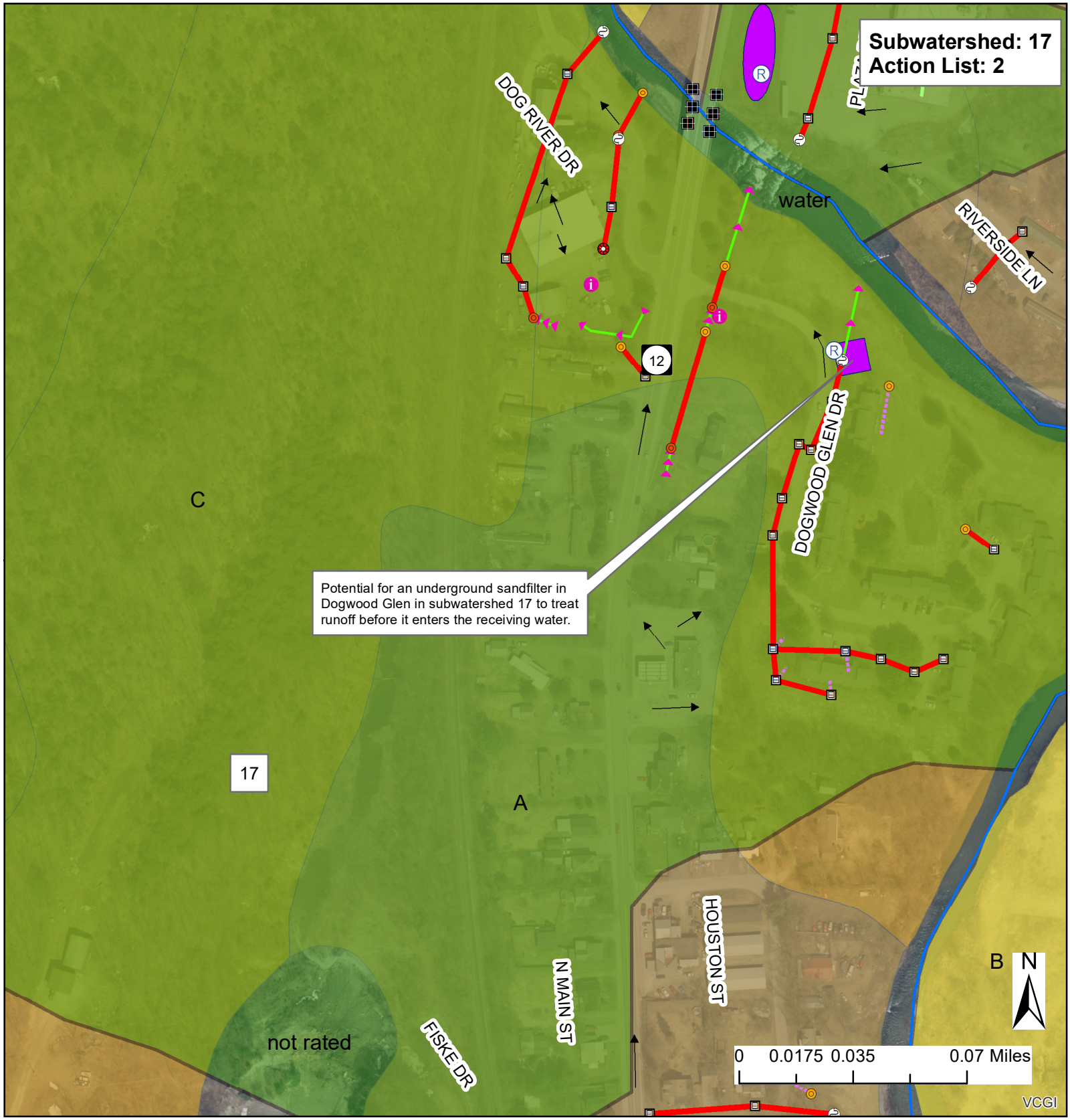

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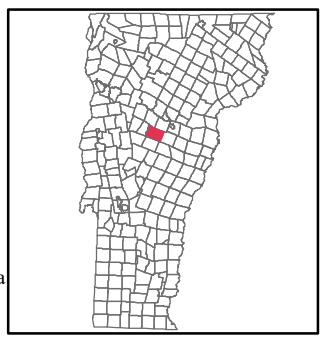

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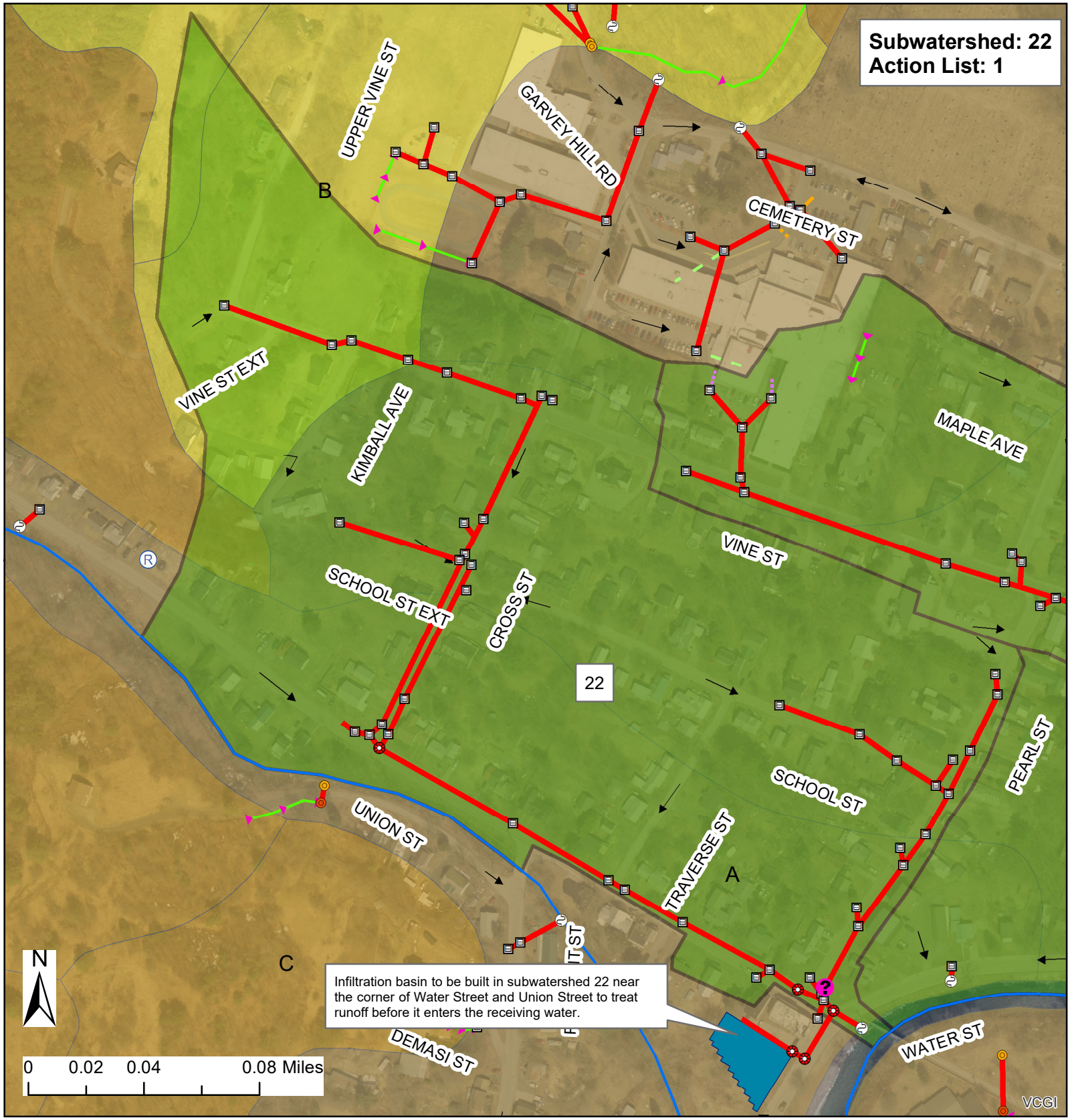

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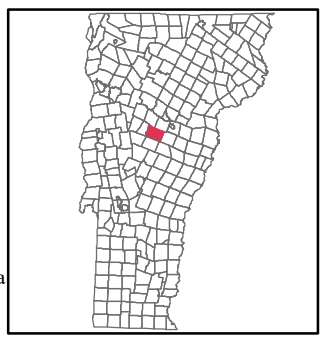

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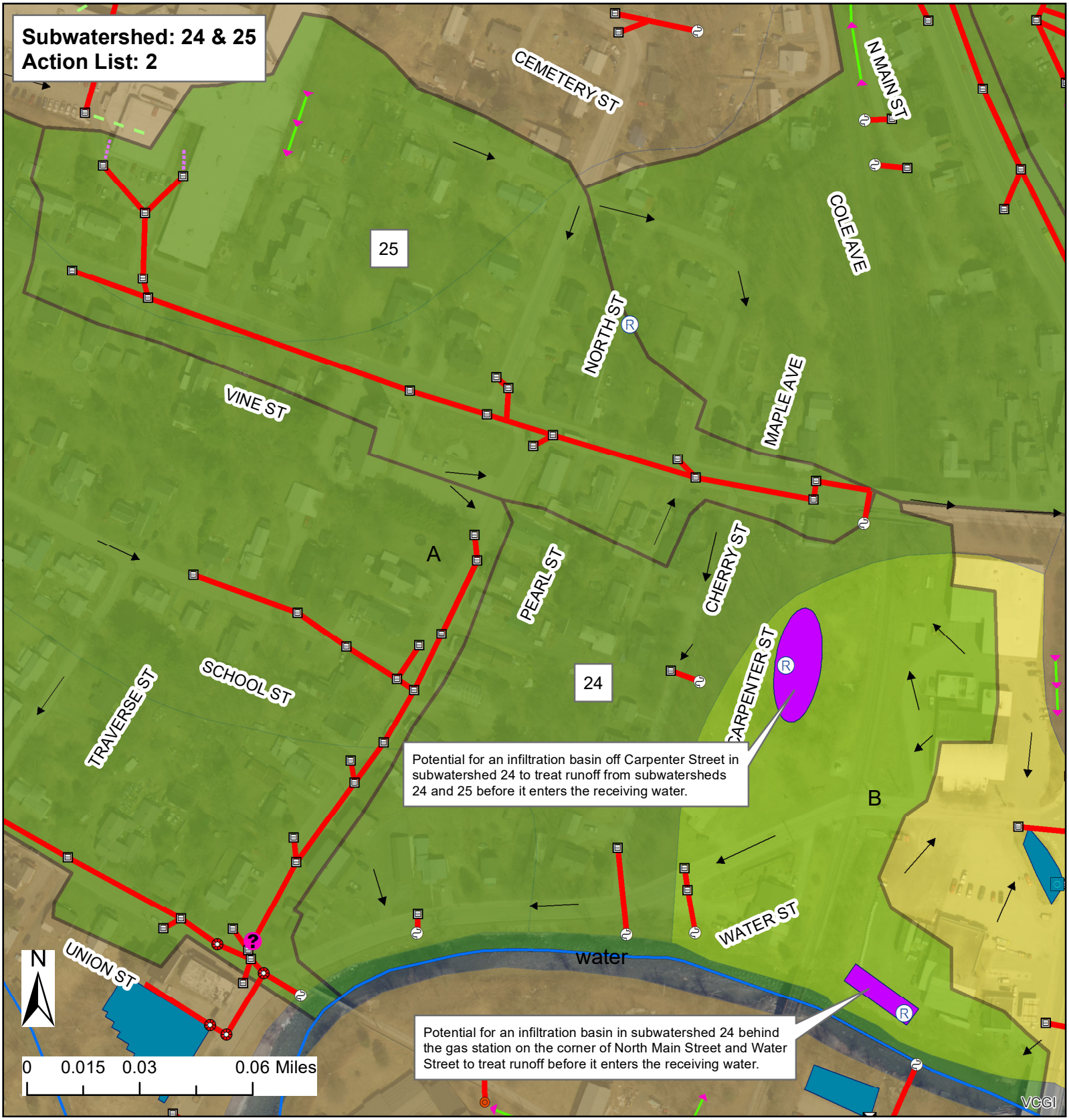

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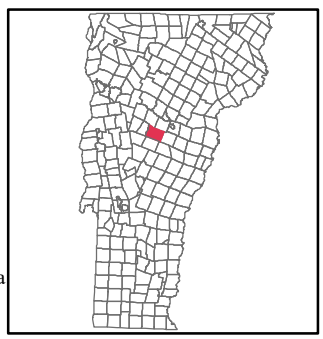

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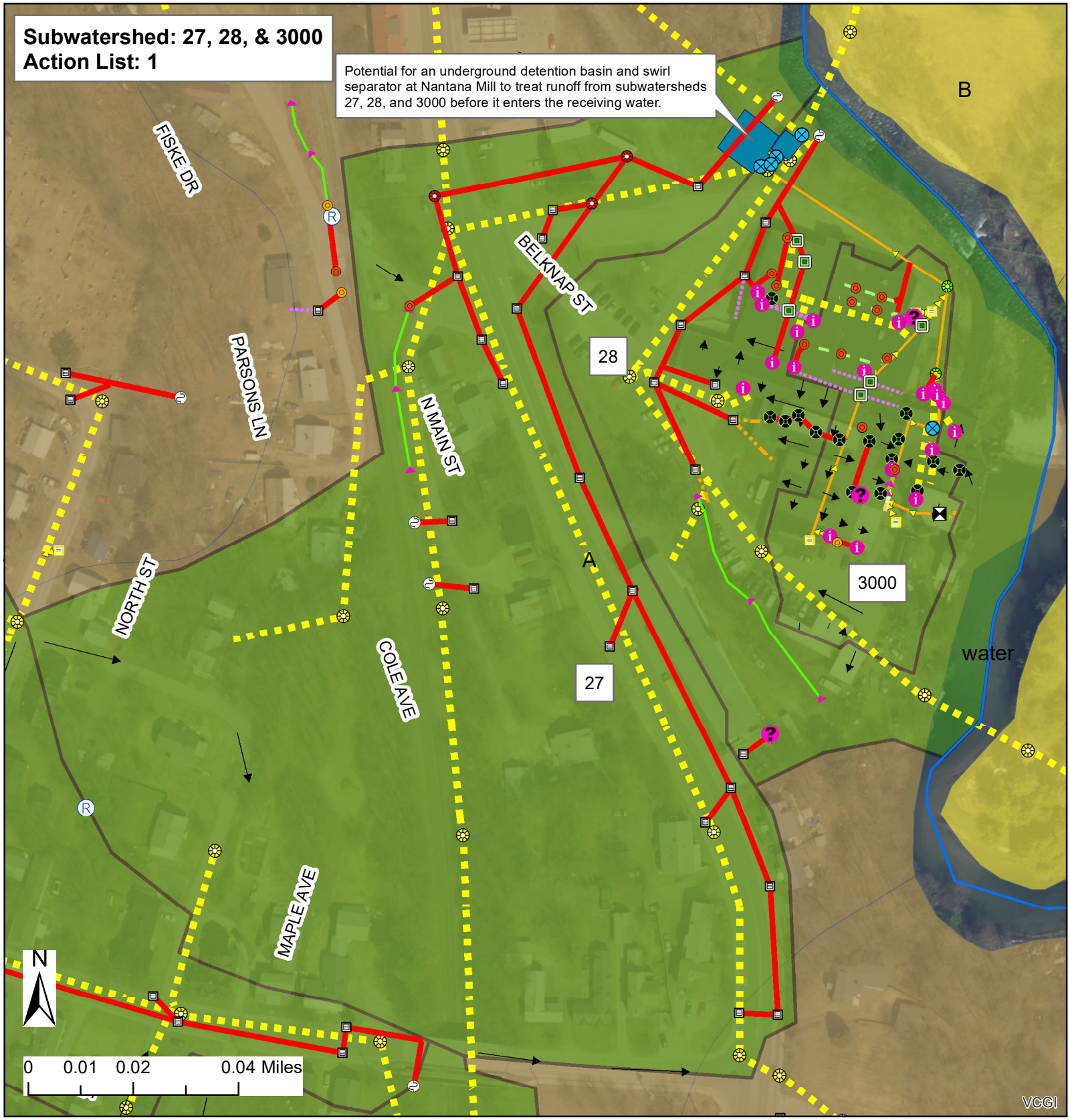

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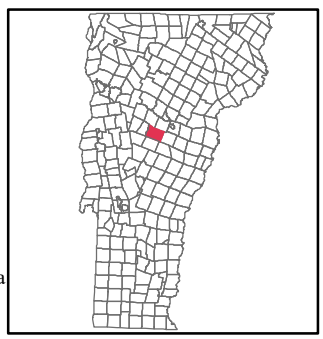

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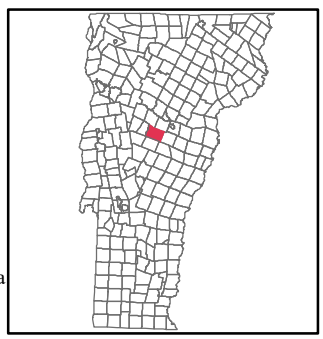

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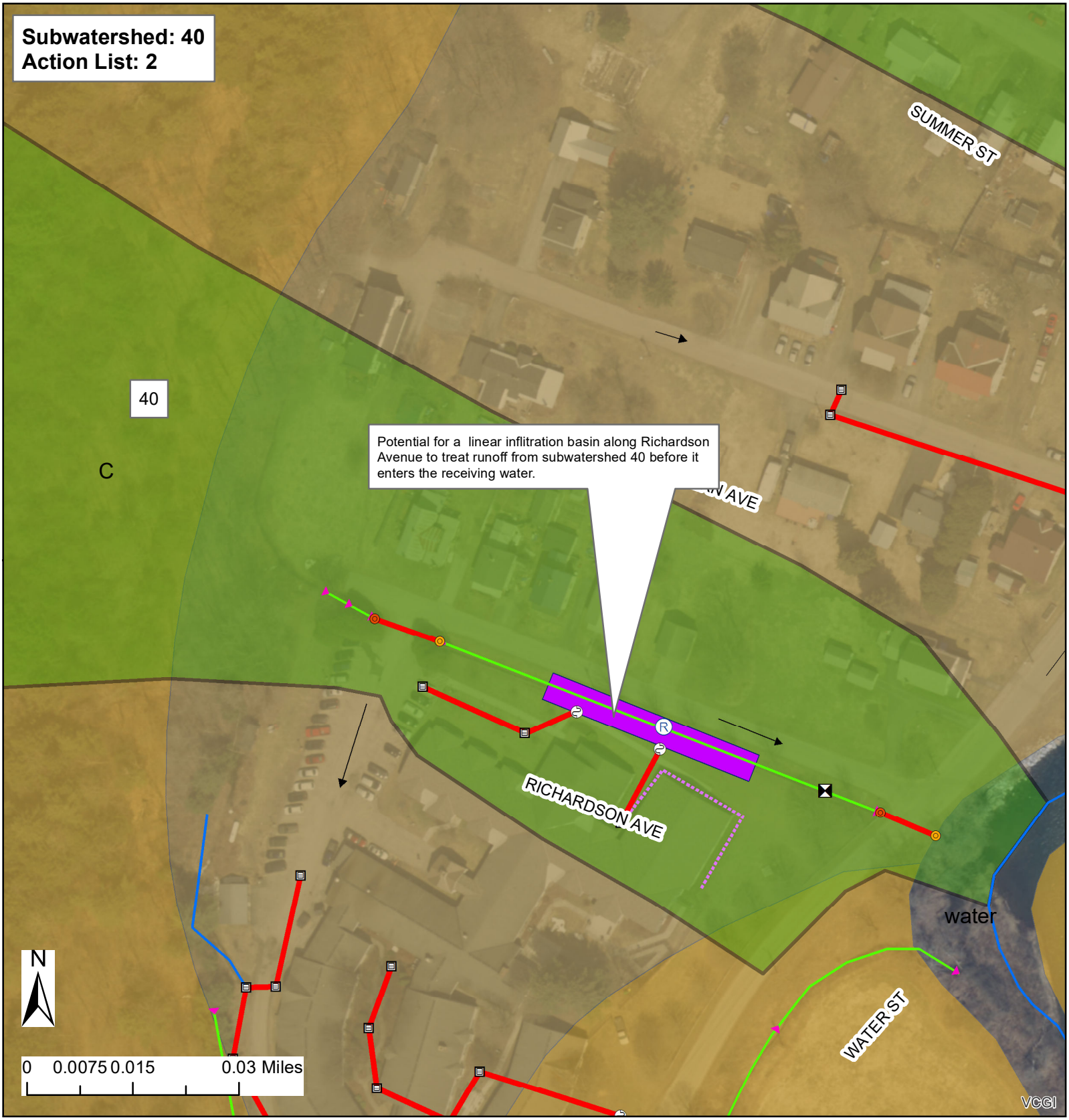

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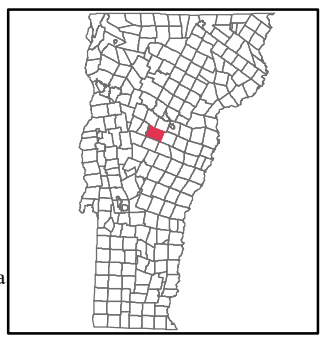

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DEC - WSMD - Clean Water Initiative Program
Plotted Date: 6/28/2019
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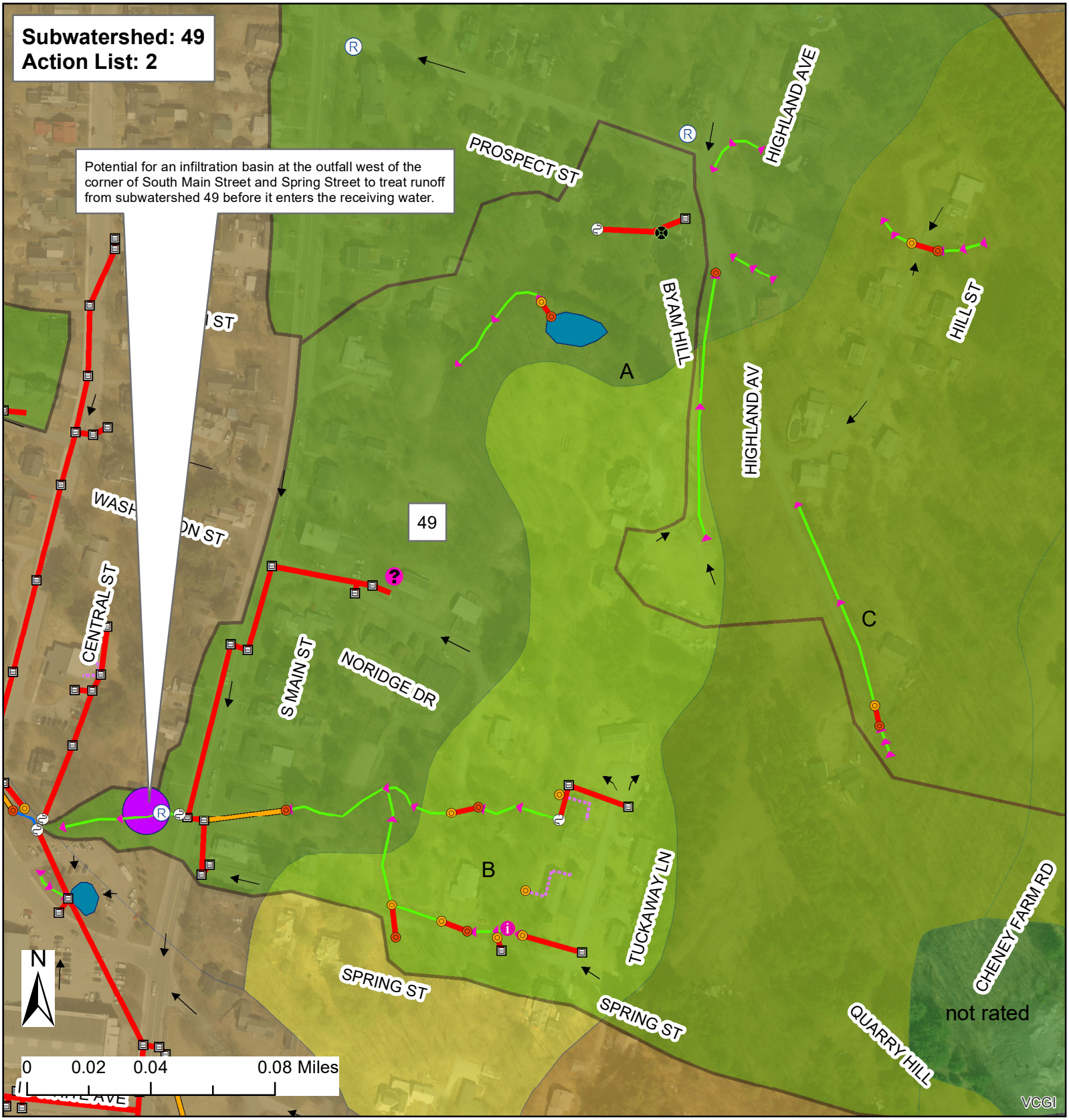

Northfield, VT

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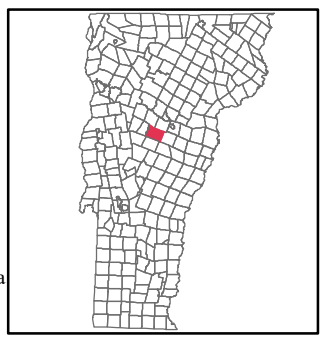

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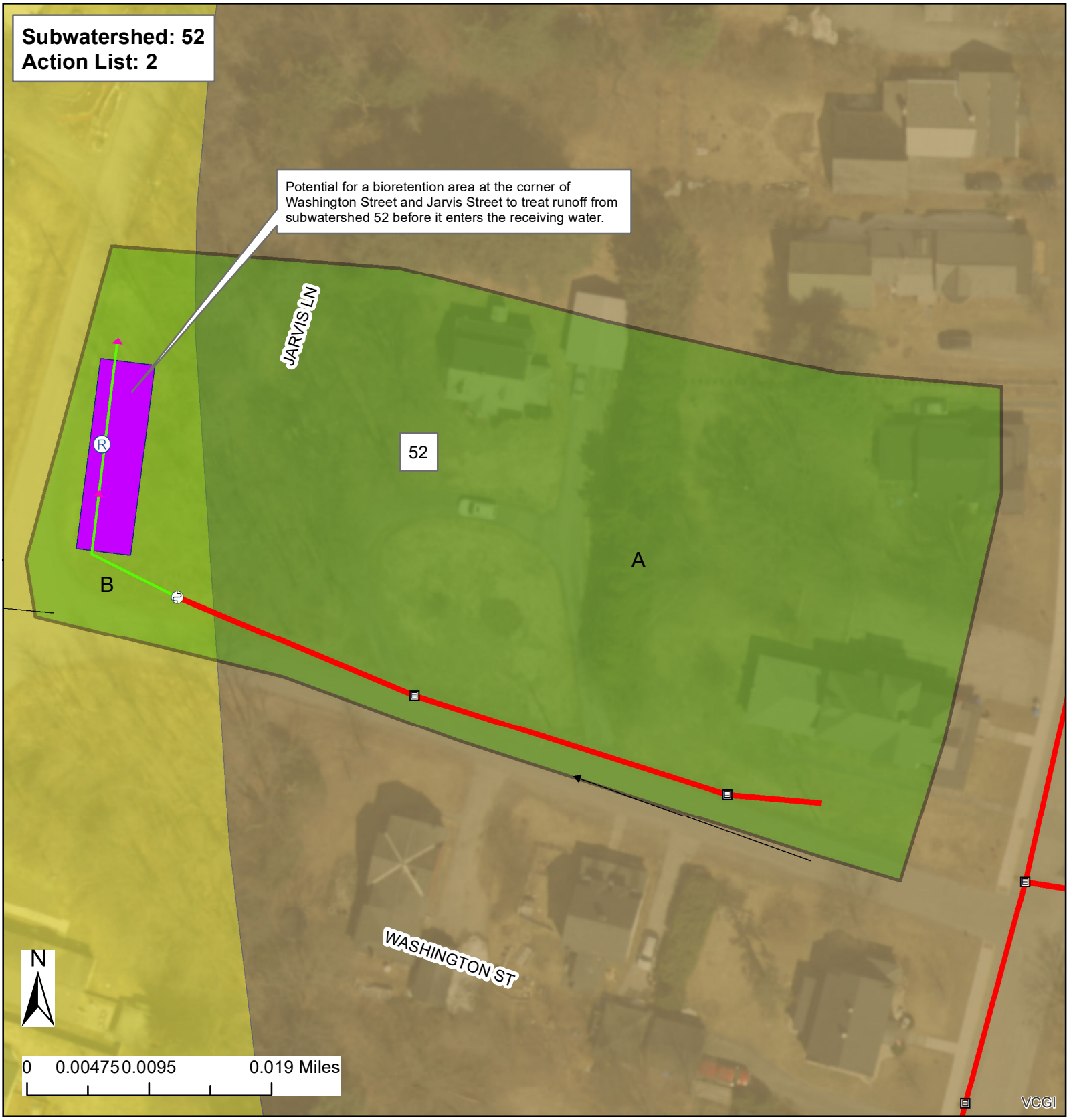

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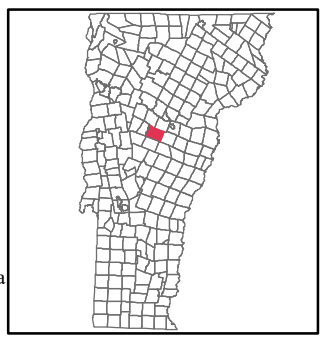

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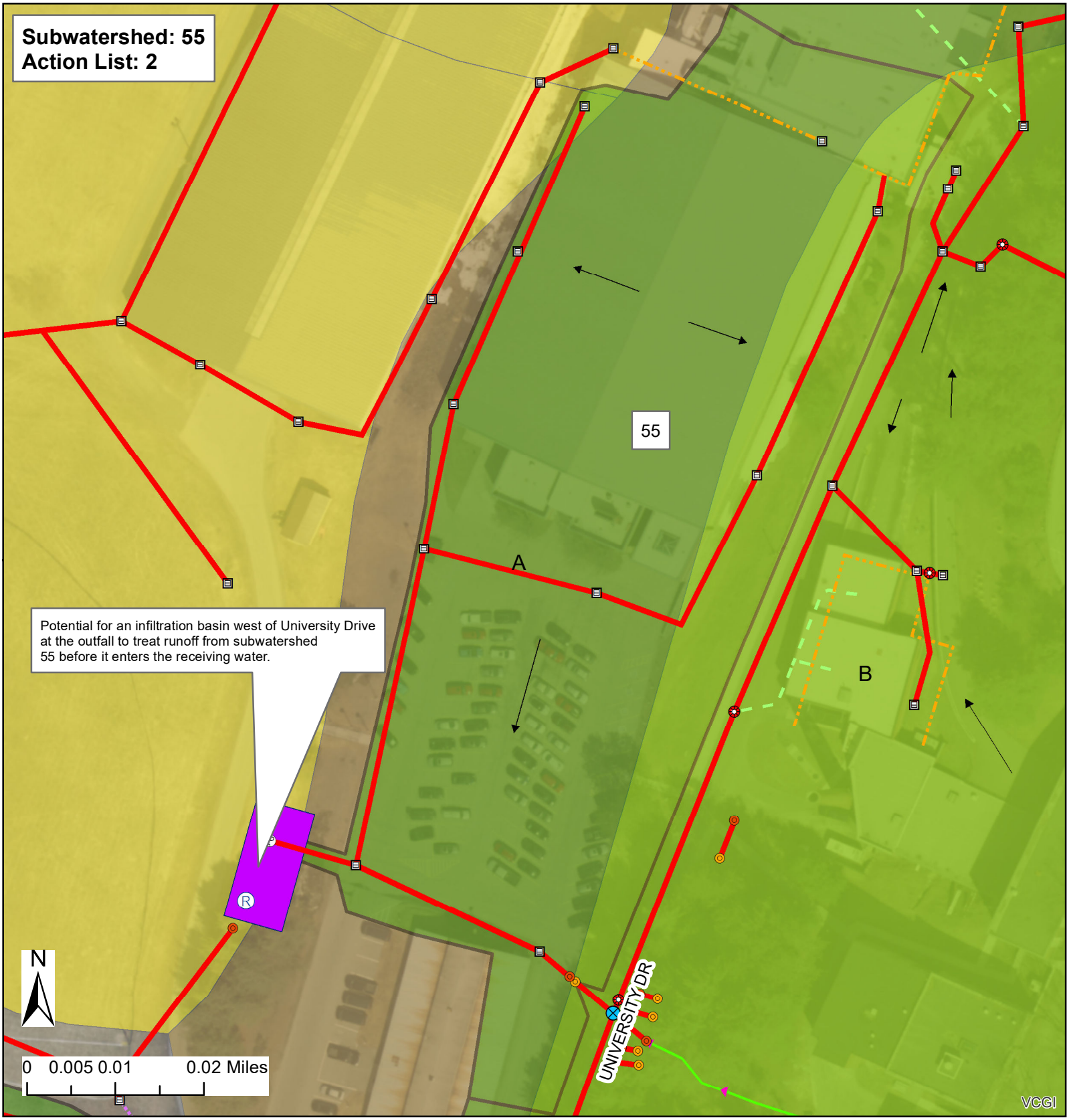

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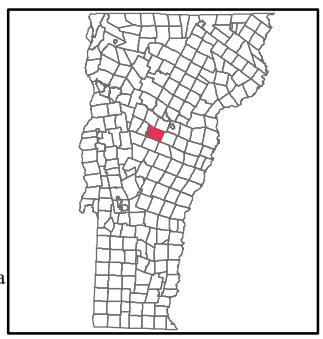

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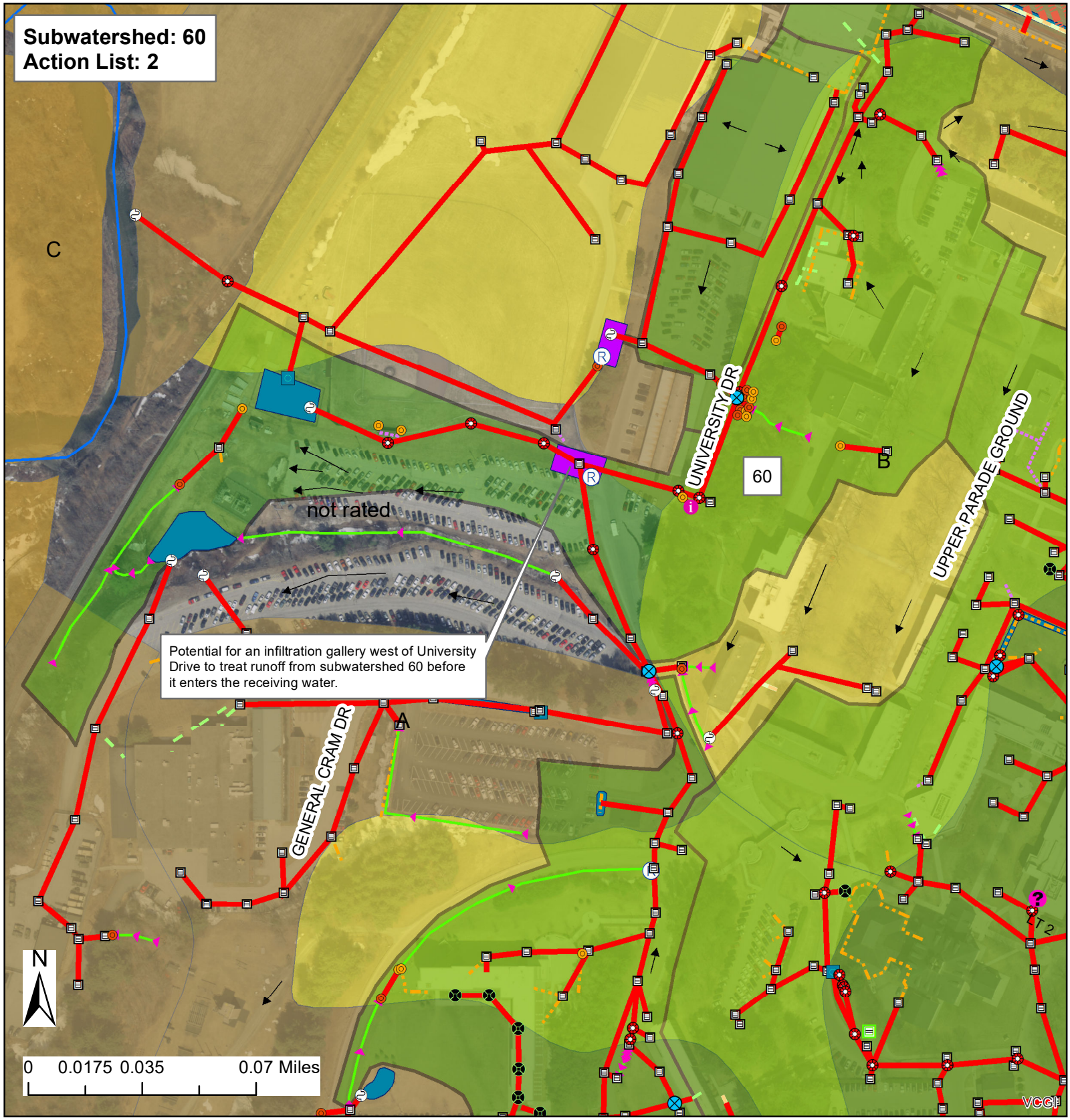

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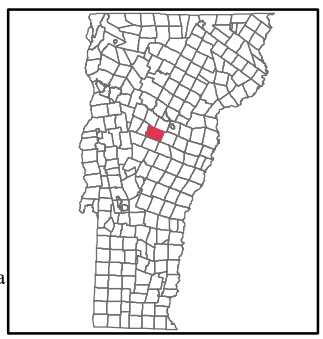

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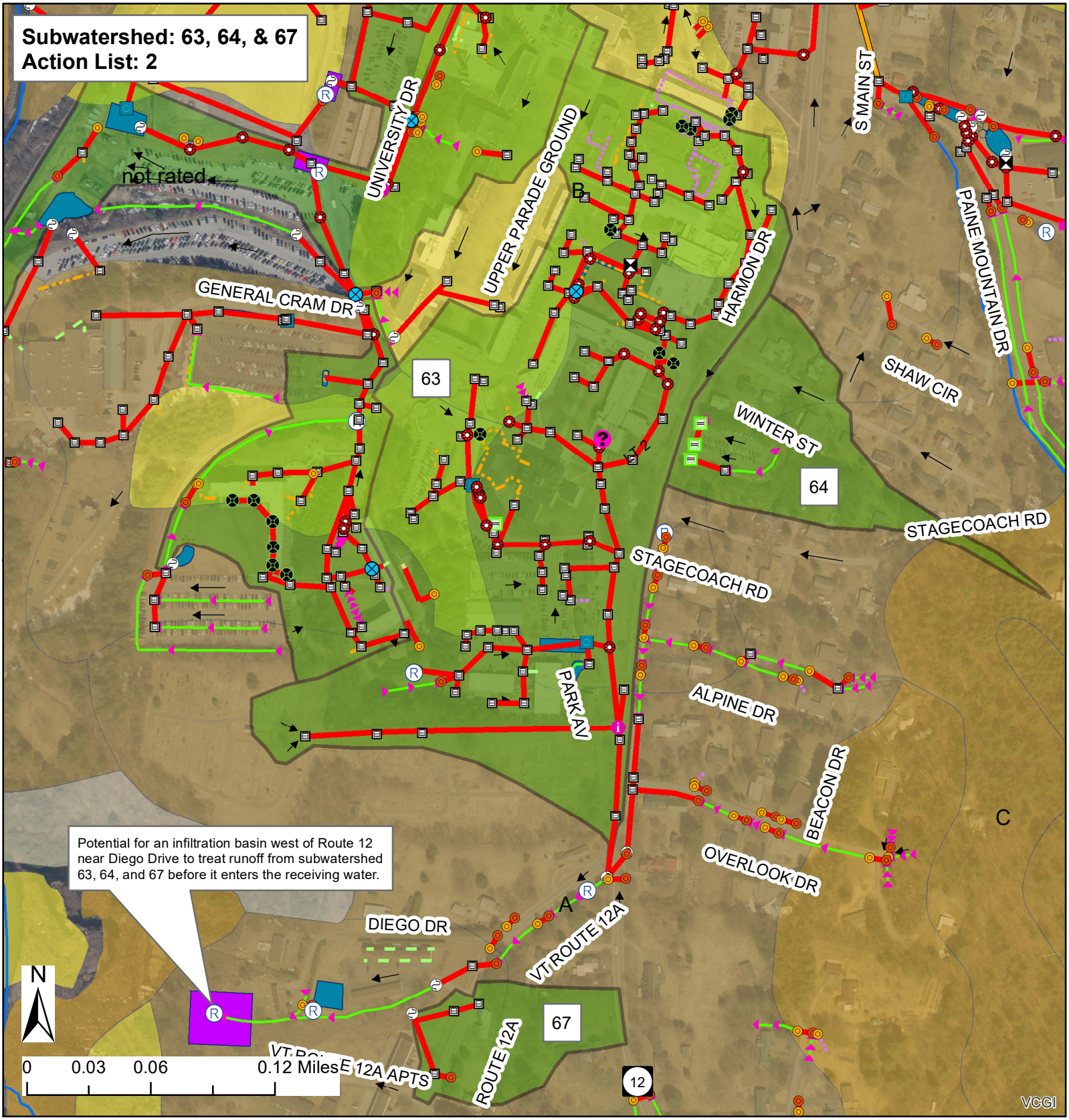

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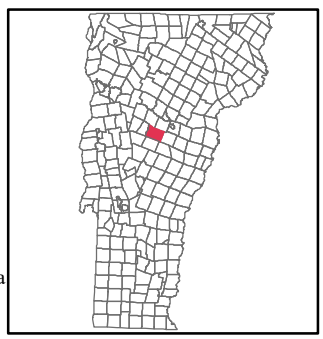

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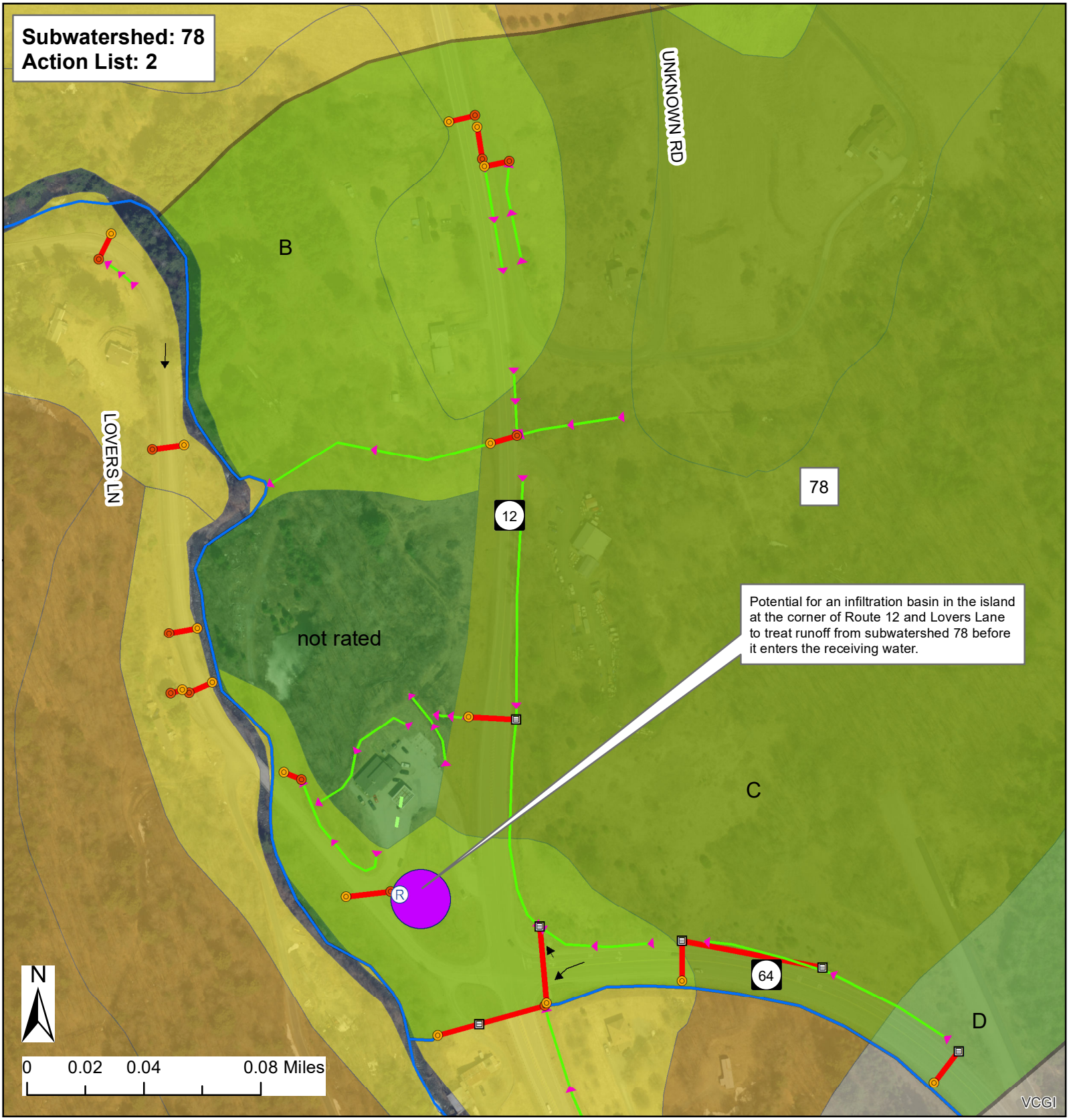

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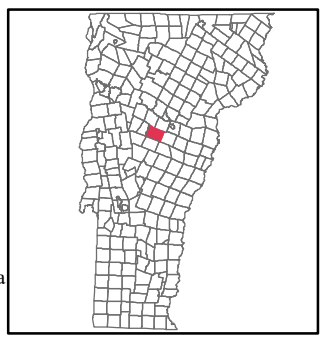

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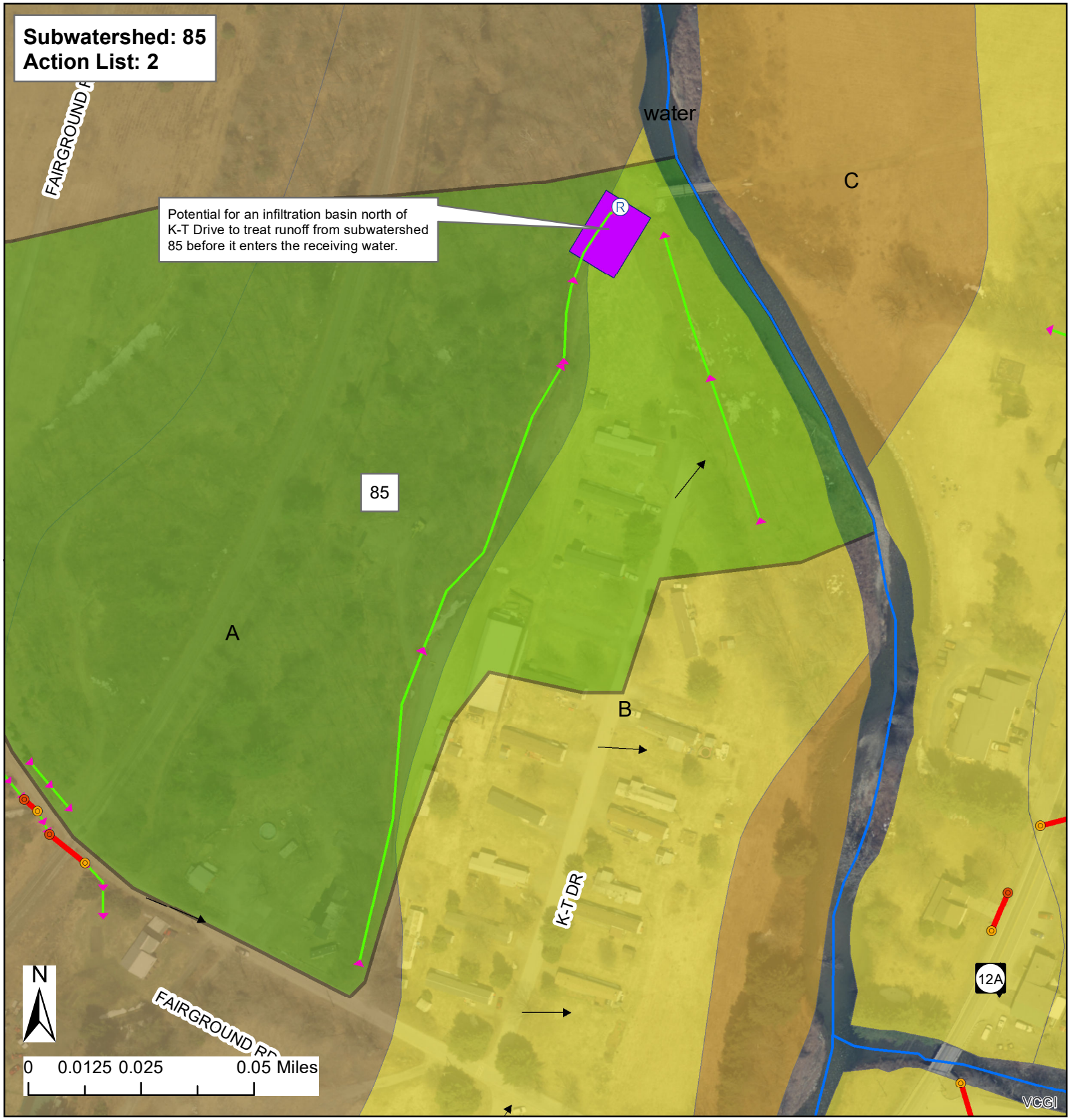

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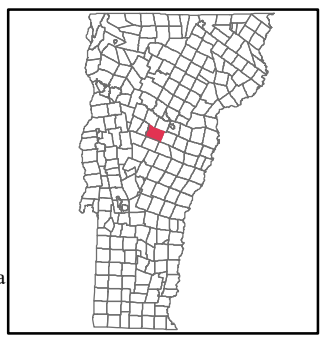

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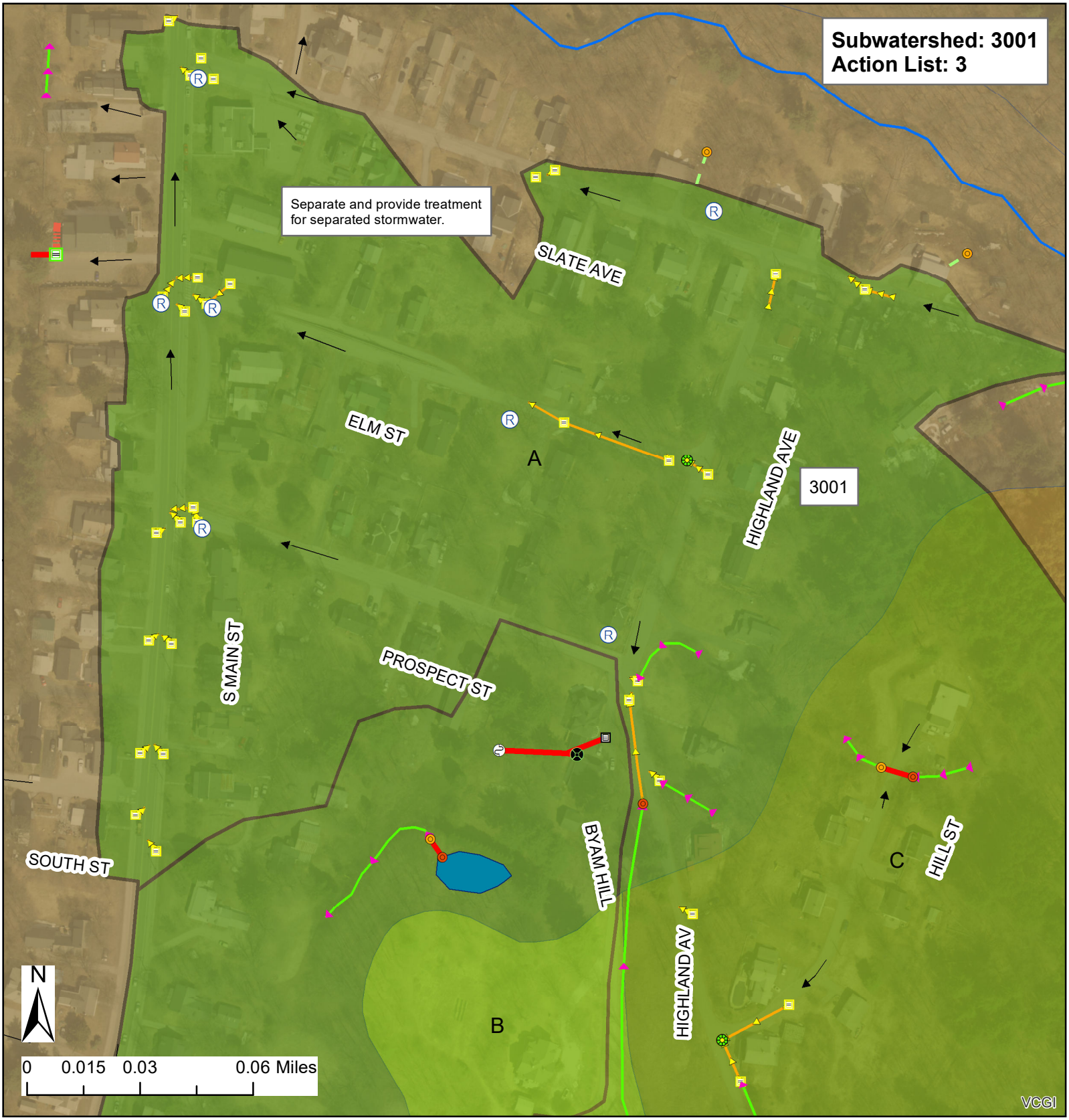

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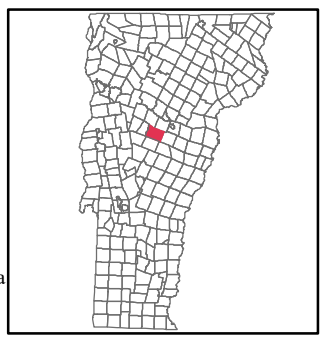

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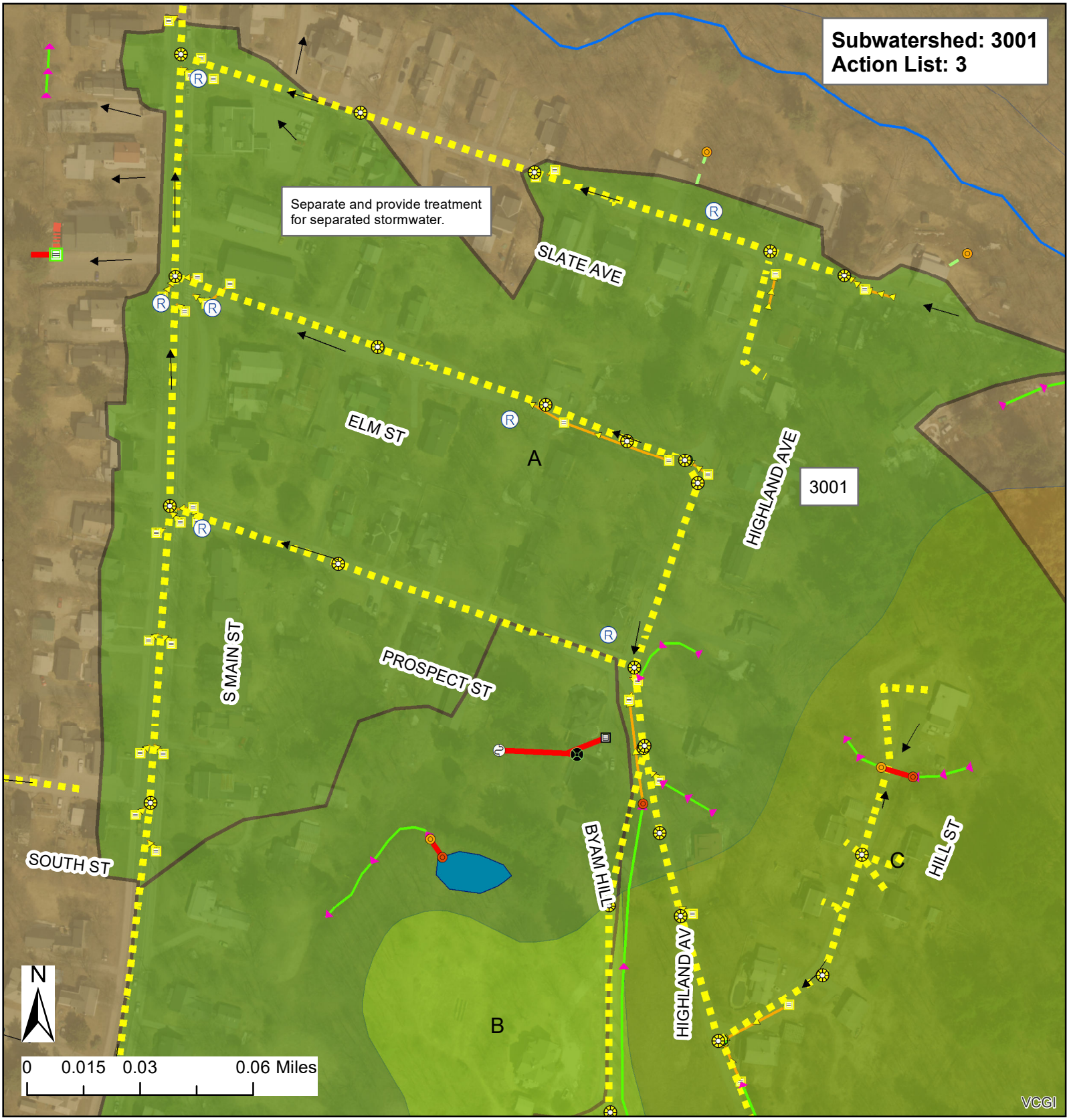

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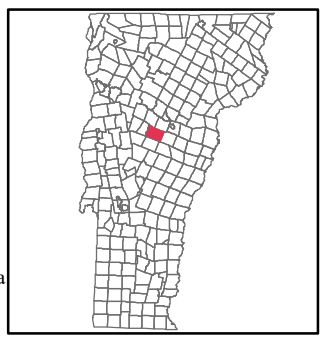

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Spill Control

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:

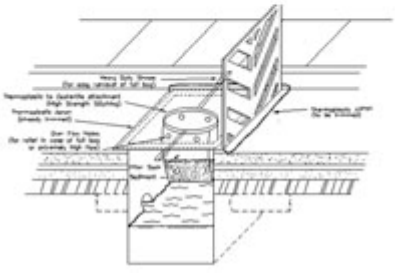
— Proper notification when a spill occurs;
— Site responsibility with respect to addressing the cleanup of a spill;
— Stopping the source of a spill;
— Cleaning up a spill;
— Proper disposal of materials contaminated by the spill;
— Location of spill response equipment programs; and
— Training for designated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

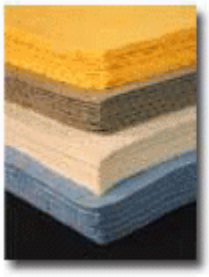
Absorbent socks are flexible tubes used to contain and clean-up spilled fluids. Socks are widely used in industrial applications and are ideal for Spill Kits. Fast spreading spills are quickly stopped with a sock.

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 water or recovered liquid. Rolls can easily be cut to the exact size required.

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.