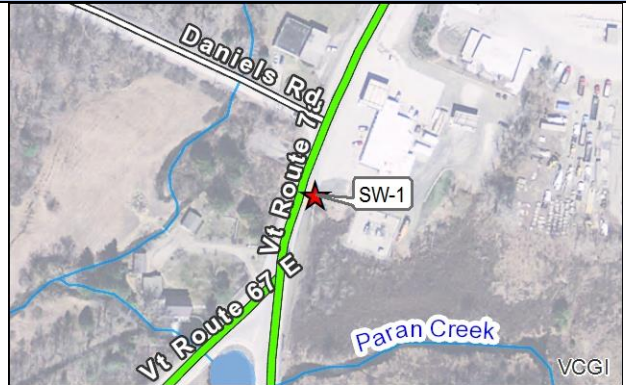


APPENDIX D

Problem Area Summary Sheets (8½"x11")

Project: SW-1 **Problem Area Summary**

Date Observed:	10/17/2018
Location:	Paulin Inc. / Green Mountain Power Parking Lot
Latitude:	42.9501 N
Longitude:	-73.2112 W
Land Ownership:	VTrans / Green Mountain Power



Site Description: Stormwater infrastructure from Route 7A, Green Mountain Power infrastructure, and the Paulin Inc. gas station parking lot drain to the adjacent wetland/stream drainage. The outfall pipe is corroded and collapsing.



Photo 1: Collapsed stormwater infrastructure outfall with silty runoff from connected impervious.



Photo 2: Impervious areas draining to the outfall and open space where a BMP could be installed.

BMP Description: Repair the existing outfall pipe. Evaluate SHGWT and consider installing an underground sand filter with a capacity of 75% of WQv to treat runoff. Special considerations may be needed for hydrocarbons associated with the gas station runoff.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	1	1	4	16 (High)

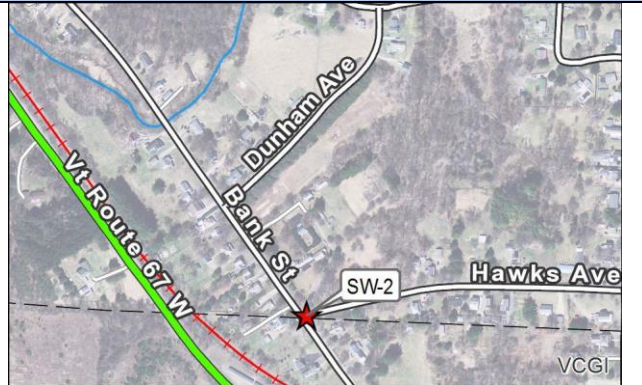
Additional Project Benefits Description: The project connects to existing stormwater infrastructure, is located in a high visibility area, and has the potential to reduce thermal pollution and peakflow by treating approximately 1 acre of impervious runoff.

Project Comments: The project is assigned a high priority due to the potential to treat runoff from up to an acre of impervious and its direct connection to surface waters. The project will likely require additional permitting due to its location adjacent to a wetland/stream drainage. **Total project costs vary based on the acreage of impervious draining to the sand filter. For 1 acre of impervious treated, we estimate that total project costs may be in the range of \$50,000 - \$75,000.**



Project: SW-2	Problem Area Summary
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Date Observed:	10/18/2018
Location:	Hawks Avenue & Bank Street
Latitude:	42.9337 N
Longitude:	-73.2472 W
Land Ownership:	Town



Site Description: Runoff from the southwest portion of Hawks Avenue neighborhood and approximately 225 feet of Bank Street enters a catch basin on the south side of the road near the intersection with bank street. The storm drain network continues down northwest along Bank Street, with approximately 4 more catch basins receiving runoff.



Photo 1: Beginning of the storm drain network at the intersection of Hawks Avenue and Bank Street

BMP Description: Evaluate SHGWT and infiltration rates. Soils mapping suggests the soils are very suitable for infiltration treatment (Hydrologic Soil Group A). Consider installing off-line underground infiltration features alongside each catch basin in the storm drain network (approximately 5) with appropriate pretreatment.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	1	2	4	16 (High)

Additional Project Benefits Description: The project connects to existing stormwater infrastructure, is located in a high visibility area, and has the potential to reduce thermal pollution and peakflow by treating up to 1 acre of impervious runoff.

Project Comments: The project is assigned a high priority due to the potential to treat runoff from up to an acre of impervious which drains through the stormwater infrastructure to a nearby stream. The project should not require any additional permitting. **Total project costs vary based on the number of infiltration features installed. We estimate total project costs may be between \$40,000 - \$60,000.**

Project: SW-3 **Problem Area Summary**

Date Observed:	10/18/2018
Location:	116 Twitchell Hill Road
Latitude:	42.9454 N
Longitude:	-73.2237 W
Land Ownership:	Town & Private



Site Description: A steep section of the Twitchell Hill Road neighborhood drains via a paved ditch to a grass-lined swale. Runoff drains to a stream channel approximately 300 feet to the east.



Photo 1: Twitchell Hill Road, with paved ditches draining the left side of the road.



Photo 2: Existing swale along the driveway of 116 Twitchell Hill Road.




BMP Description: Widen the swale and install outlet control, such as a concrete riser. Install check dams in the swale to slow and infiltrate water.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	1	3	2	15 (Moderate)

Additional Project Benefits Description: The project improves upon an existing BMP and has the potential to reduce thermal pollution and peakflow by treating up to 1 acre of impervious runoff.

Project Comments: The project is assigned a moderate priority due to the potential to treat runoff from up to an acre of impervious draining to the existing swale before draining to a nearby stream. The project should not require any additional permitting. **We estimate that total project costs may be between \$10,000 and \$15,000.**

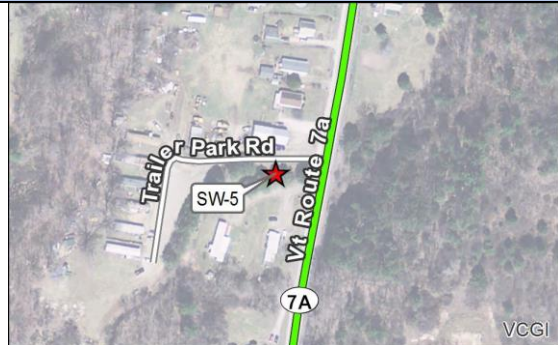


Project: SW-4		Problem Area Summary		
Date Observed:	10/18/2018			
Location:	Route 67 at Bernstein Display			
Latitude:	42.9464 N			
Longitude:	-73.2172 W			
Land Ownership:	TFB Realty LLC / Bernstein Display			
<p>Site Description: Runoff from VT 67, the industrial area where Bernstein Display is located, and associated driveways/parking lots drains to stormwater infrastructure and Paron Creek.</p>				
				
<p>Photo 1: Route 67 and some of the impervious associated with the TFB Realty LLC property. The green space north of Route 67 may serve as an alternate location for a treatment feature.</p>		<p>Photo 2: Parking lot and a portion of the green space where a treatment feature could be installed.</p>		
<p>BMP Description: Install a treatment feature, such as an infiltration basin or gravel wetland, in green space east of the parking lot or north of 67. Evaluate soils and SHGWT to determine whether an infiltration feature is possible. Consider diverting stormwater from the storm drains to treat runoff before reaching the stream channel.</p>				
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	0	1	4	15 (Moderate)
<p>Additional Project Benefits Description: The project connects to existing stormwater infrastructure, is located in a high visibility area, and has the potential to reduce thermal pollution and peakflow by treating over 1 acre of impervious runoff.</p>				
<p>Project Comments: The project is assigned a moderate priority due to the potential to treat runoff from over an acre of impervious and its direct connection to surface waters. The project may require additional permitting due to its location near Paron Creek. Total project costs vary based on the acreage of impervious draining to the feature. We estimate that total project costs may be in the range of \$50,000 - \$75,000.</p>				



Project: SW-5	Problem Area Summary
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Date Observed:	10/18/2018
Location:	Route 7A & Trailer Park Road
Latitude:	42.9402 N
Longitude:	-73.2102 W
Land Ownership:	Harrington Trailer Park LLC



Site Description: The existing swale receives runoff from Route 7A, Trailer Park Road, and the Phil Harrington Construction Co. This is the location of a priority drainage area retrofit identified by VTDEC in the 2018 Shaftsbury Stormwater Report, draining Subwatershed 18 (Action List # 1).



Photo 1: Trailer Park Road/Harrington Construction Company parking lot and existing swale. **Photo 2:** The existing swale viewed from Route 7A.

BMP Description: There is approximately 2 feet of relief between the swale inlet and the downstream wetland, and hydric soils were observed starting at the approximate midpoint of the feature. Therefore, depth to season high water table is likely not appropriate for an infiltration treatment practice. Due to the large drainage area of this project (approximately 46 acres with 10% impervious), a first-flush treatment feature could be designed to treat a portion of the WQv while fitting in the available space. An interim option may be to install check dams in the swale to slow and infiltrate water. Reduce mowing frequency in the swale and level the construction company parking lot to reduce concentrated flow to the swale.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	1	5	1	15 (Moderate)

Additional Project Benefits Description: The project improves upon an existing BMP to improve runoff treatment from over 1 acre of impervious.

Project Comments: The project is assigned a moderate priority due to improve treatment of runoff from over 1 acre of impervious that drains to an existing BMP. **Total project costs vary based on the size and type of treatment feature selected to fit in the available space.**

Project: SW-7 **Problem Area Summary**

Date Observed:	10/18/2018
Location:	Route 7A & Bank of Bennington ATM
Latitude:	42.9512 N
Longitude:	-73.2107 W
Land Ownership:	Route 7A & WM. E. Dailey Inc.



Site Description: This was identified as a possible retrofit opportunity in VTDEC stormwater infrastructure mapping (Subwatershed 28). Stormwater runoff from the west side Route 7A and the Bank of Bennington ATM drains through a stable grass ditch to an adjacent wetland. The WM. E. Dailey Inc. entrance and east side of Route 7A drains to existing stormwater infrastructure, along with the Paulin Inc. parking lot, to SW-1. There is minimal space for stormwater treatment at the SW-1 outfall.



Photo 1: Wetland and green space southeast of the ATM.



Photo 2: Route 7A and WM. E. Dailey entrance. The eastern portion of this currently drains south to stormwater infrastructure but may be rerouted.

BMP Description: Explore this project in conjunction with SW-1. A portion of the drainage area from VT 7A and the WM. E. Dailey parking lot that enters stormwater infrastructure to the south, may be rerouted by installing a deep sump catch basin and underground infiltration or detention under the east shoulder, with an outlet to the wetland across the street. Stormwater treatment on the west side of the road may be improved through installation of a treatment feature, such as a gravel wetland.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	0	2	4	15 (Moderate)

Additional Project Benefits Description: The project connects to existing stormwater infrastructure, is located in a high visibility area, and has the potential to reduce thermal pollution and peakflow by treating up to 1 acre of impervious runoff.

Project Comments: The project is assigned a moderate priority due to the potential to treat runoff from up to an acre of impervious draining to a wetland. The project will likely require additional permitting due to its location adjacent to a wetland. **We expect project costs to vary based on the acreage of impervious draining to the treatment feature and the feature selected.**



Project: SW-8 **Problem Area Summary**

Date Observed:	10/18/2018
Location:	Town Garage/Town Offices Parking Lot
Latitude:	42.9464 N
Longitude:	-73.2096 W
Land Ownership:	Town



Site Description: A dry well receives a large portion of runoff from the existing Town Garage and Town Office properties. Both properties have gravel driveways and parking areas and the runoff flows to the dry well with no pretreatment, increasing the risk it will clog over time. The remaining runoff runs west along Buck Hill Road toward Route 7A drainage infrastructure.



Photo 1: Runoff from rooftops and the gravel drive flows to a dry well along Buck Hill Road.



Photo 2: Particulates from the gravel drive flowing to the dry well (top left) may reduce its function.

BMP Description: Explore potential for a pretreatment feature in the green space in front of the Town Office to treat runoff from the rooftops and gravel parking lots. An aesthetically appealing vegetated pretreatment feature may be possible in this high visibility area, but a deep sump catch basin is also an option if space and utilities require a lower profile feature. Pipe pretreated runoff to existing dry well.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
5	2	4	2	13 (Moderate)

Additional Project Benefits Description: The project would be located in a high visibility area and provide an educational opportunity to raise awareness regarding stormwater in the Town.

Project Comments: The project is assigned a moderate priority due to the potential to treat runoff from up to an acre of impervious in a high visibility location located on town property. The project should not require any additional permitting. **We estimate that total project costs may be between \$10,000 and \$15,000.**



Project: SW-10		Problem Area Summary		
Date Observed:	10/18/2018			
Location:	Shaftsbury Recreation Center			
Latitude:	42.9486 N			
Longitude:	-73.2006 W			
Land Ownership:	Town			
<p>Site Description: Runoff from Howard Park Road and the gravel parking lot drains to a stream to the south and a grassy area to the north adjacent to the tennis court. This appears to be a chronic problem area due to water pooling in the parking lot and erosion of the entrance to the fields from parking lot runoff.</p>				
<p>Photo 1: Gravel parking area at Howard Park with pooled water at in a low-lying area.</p>		<p>Photo 2: Green space where runoff could be directed to a treatment feature.</p>		
<p>BMP Description: Grade parking lot so as much of the runoff as possible flows north. The combined impervious area of the parking lot and tennis courts is approximately 0.8 acres. Install a treatment feature, such as an infiltration basin or gravel wetland, in green space west of the tennis court. Evaluate soils and SHGWT to determine whether an infiltration feature is possible. Reduce mowing alongside the stream east of Howard Park Road to slow flow and treat runoff.</p>				
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	3	1	4	17 (High)
<p>Additional Project Benefits Description: The project would be located in a high visibility area and provide an educational opportunity to raise awareness regarding stormwater in the Town. The project would address a chronic problem area and reduce peak flows in the adjacent stream.</p>				
<p>Project Comments: The project is assigned a high priority due to the potential to treat runoff from up to an acre of impervious in a high visibility location located on town property. The project may require wetlands permitting from VT ANR if it is determined the area is in a wetland buffer. We estimate that total project costs may be in the range of \$40,000 - \$60,000, with costs varying based on the acreage of impervious draining to the treatment feature and the feature selected.</p>				



Project: SW-11 **Problem Area Summary**

Date Observed:	10/18/2018
Location:	Shaftsbury State Park
Latitude:	43.0217 N
Longitude:	-73.1795 W
Land Ownership:	State of Vermont



Site Description: Runoff from lawn, rooftops, and paved paths east of the lake drain to the shoreline. Runoff from the gravel parking lot east of the lawn also drains toward the lake.



Photo 1: A paved path and grassed picnic area at the State Park.



Photo 2: Lakeside picnic area with the State Park parking area in the background.

BMP Description: Adopt lakeshore BMPs. Install treatment feature for parking lot runoff such as a rain garden or bioretention basin in the green space west of the lake. Consider installing pervious pavement where possible. Replace paved paths to the lake with infiltration step paths.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	1	2	2	13 (Moderate)

Additional Project Benefits Description: The project would be located in a high visibility area and provide an educational opportunity to raise awareness regarding stormwater and lakeshore BMPs.

Project Comments: The project is assigned a moderate priority due to the potential to treat runoff from up to an acre of impervious in a high visibility location located on state property. Projects beyond reconstruction of impervious areas with no change in footprint and creation of a 6-foot wide footpath will require shoreland permitting from VT ANR. **Project costs vary based on the BMPs selected with pervious steps or a rain garden constructed by a VYCC crew or equivalent being relatively low cost and pervious pavement or an engineered bioretention basin being higher cost options.**



Project: RD-1 **Problem Area Summary**

Date Observed:	10/17/2018
Location:	Jack Cross Road
Latitude:	43.0150 N
Longitude:	-73.1770 W
Land Ownership:	Town



Site Description: Approximately 250 feet of road lacks ditches on both sides, causing erosion of the roadway. Gravel is deposited at the drop-inlet to a driveway culvert at #209 Jack Cross Road, which frequently clogs the culvert. The clogged culvert causes runoff to travel down the driveway toward the house. Stone walls on either side of the road may make it difficult to install ditches in some areas. This road segment ranked 13th (top 2%) in the water quality prioritization based on REI data.



Photo 1: A stretch of Jack Cross Road with no ditches.



Photo 2: Water flows down the roadway to a driveway culvert with a grated inlet that requires frequent unclogging.

BMP Description: Install stone-lined ditches on both sides of the road where possible. Grade the road to direct water to a new ditch on the southwest side of the road opposite the house as much as possible. Install a cross culvert at the bottom of the bend (the bottom of the steep slope).


WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
6	3	2	2	13 (Moderate)

Additional Project Benefits Description: This project is located in a chronic problem area, requiring frequent maintenance to keep the driveway culvert functioning so runoff does not flow down the driveway toward the house.

Project Comments: The project is assigned a moderate priority due to the potential to address a chronic problem area for road maintenance. This project may require additional permitting through the Vermont Division for Historic Preservation if stone walls are to be disturbed in the construction process. **We estimate that total project costs may be between \$15,000 and \$25,000.**



Project: RD-2	Problem Area Summary
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Date Observed:	11/9/2018	
Location:	Cross Hill Road (East)	
Latitude:	43.9618 N	
Longitude:	-73.2572 W	
Land Ownership:	Town	

Site Description: A stretch of Cross Hill Road lacks adequate drainage for approximately 600 feet. Some runoff is directed to an unstable turnout. The downslope area south of the road is a good location to disperse runoff. Runoff from the north side of the road flows through an unstable ditch, which crosses to a ditch on the south side of the road that drains directly to a nearby stream. The area around the stream is low-lying and a frequent maintenance issue due to standing water and potholes. This area includes a road segment ranked 10th (top 2%) in the water quality prioritization based on REI data.



Photo 1: An unstable turnout on the south side of the road.



Photo 2: Section of Cross Hill Road without ditches or a stable turnout.

BMP Description: Install stone in northern ditches. Improve existing turnouts on the south side of the road and install a couple more up the hill to reduce the amount of runoff reaching this area. Install a cross culvert before the driveway of the proposed house to send flow into the forested area to the south.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	3	2	2	15 (Moderate)

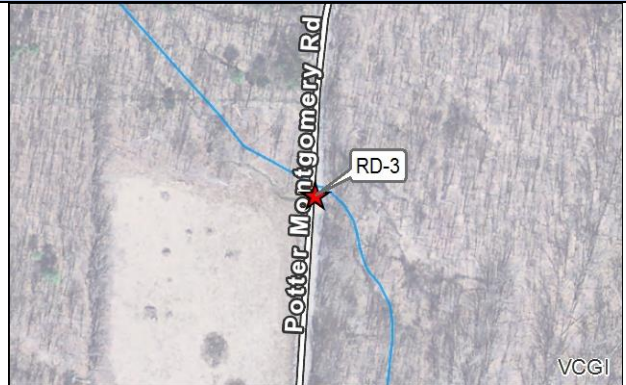
Additional Project Benefits Description: This project would address a chronic problem area for road maintenance including seasonal drainage problems that may be improved by dispersing flow upslope.

Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion on a stretch of road that drains directly to a stream crossing. The project should not require any additional permitting. **We estimate that total project costs may be between \$20,000 and \$30,000 depending largely on the volume of material needed to raise the road grade and whether it can be sourced from nearby (such as excavation work associated with RD-10).**



Project: RD-3 **Problem Area Summary**

Date Observed:	10/17/2018
Location:	Potter Montgomery Road
Latitude:	42.9969 N
Longitude:	-73.1655 W
Land Ownership:	Town



Site Description: Approximately 300 feet of road lacks ditches on both sides, causing severe erosion of the roadway that drains directly to a stream. Resizing and stabilization recommendations for the culvert are described in the C-4 problem area summary sheet. This area includes road segments ranked 2nd (top 1%) and 21st (top 4%) in the water quality prioritization based on REI data.



Photo 1: Runoff flowing down Potter Montgomery Road is causing severe erosion of the roadway.



Photo 2: The runoff is eroding a conveyance to the adjacent stream.

BMP Description: Install stone-lined ditches on both sides of the road with a stone-lined conveyance to the stream.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	2	3	1	15 (Moderate)

Additional Project Benefits Description: This project would address a chronic problem area for road maintenance.

Project Comments: The project is assigned a moderate priority due to the potential to reduce high sediment loads from erosion of the roadway and embankment that drains directly to a stream. The project should not require any additional permitting. **We estimate that total project costs may be between \$15,000 and \$20,000.**



Project: RD-7 **Problem Area Summary**

Date Observed:	10/17/2018
Location:	Airport Road
Latitude:	42.9686 N
Longitude:	-73.1907 W
Land Ownership:	Town



Site Description: Grader berms along approximately 250 feet of the northern side of Airport Road concentrate flow, causing severe erosion of the road and driveway that extends to the adjacent wetland. This road segment ranked 248th (top 46%) in the water quality prioritization based on REI data.



Photo 1: Erosion of the driveway due to concentrated flow from Airport Road.



Photo 2: Erosion of Airport Road and the adjacent driveway.

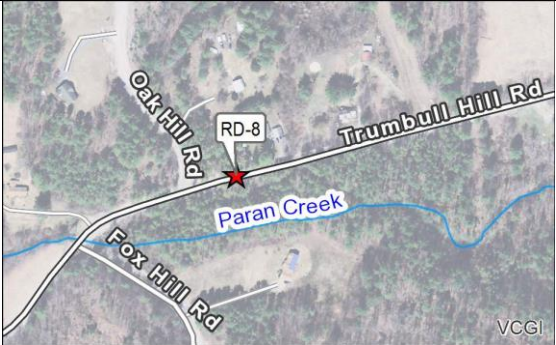


BMP Description: Remove grader berms. Install a stone-lined turnout/conveyance before the driveway.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
5	2	5	1	13 (Moderate)

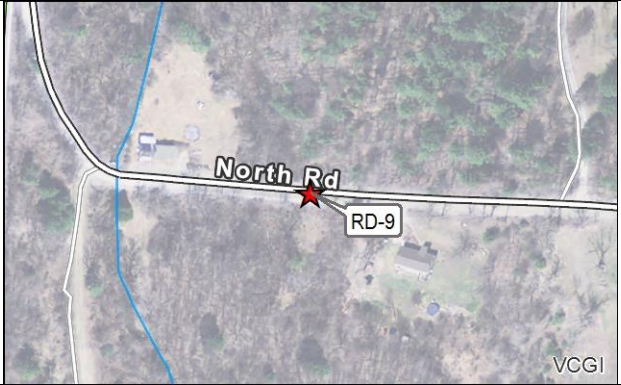


Additional Project Benefits Description: This project would address a chronic problem area for road maintenance.

Project Comments: The project is assigned a moderate priority due to the potential to reduce a sediment source to a floodplain wetland and the relatively low cost of the project. **We estimate that total project costs may be between \$1,500 and \$3,000.**



Project: RD-8		Problem Area Summary		
Date Observed:	11/9/2018			
Location:	Trumbull Hill Road			
Latitude:	42.9711 N			
Longitude:	-73.1833 W			
Land Ownership:	Town			
<p>Site Description: An approximately 1,200-foot stretch of road lacks adequate drainage, causing the formation of a secondary ditch on the north side of the road that extends west to Paran Creek. Grader berms prevent drainage on the south side of the road, where runoff concentrates and drains via a poor conveyance to Paran Creek near the stream crossing. This area includes a road segment ranked 14th (top 3%) in the water quality prioritization based on REI data.</p>				
				
<p>Photo 1: Runoff is eroding the roadway and bypassing an existing turnout on Trumbull Hill Road near the Oak Hill Road intersection.</p>		<p>Photo 2: Runoff on the south side of the road drains via a poor conveyance directly into Paran Creek.</p>		
<p>BMP Description: Install turnouts on the south side of the road and on the north side of the road at the intersection with Oak Hill Road to enhance drainage. Install approximately 450' of ditch on the north side of the road with cross culverts east of each driveway and 400' of ditch on the south side of the road draining to a sediment trap in the forest.</p>				
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
11	3	2	1	17 (High)
<p>Additional Project Benefits Description: This project would address a chronic problem area for road maintenance.</p>				
<p>Project Comments: The project is assigned a high priority due to high sediment loads from erosion of the roadway and embankment that directly impacts Paran Creek. The project should not require any additional permitting. We estimate that total project costs may be between \$40,000 and \$60,000.</p>				

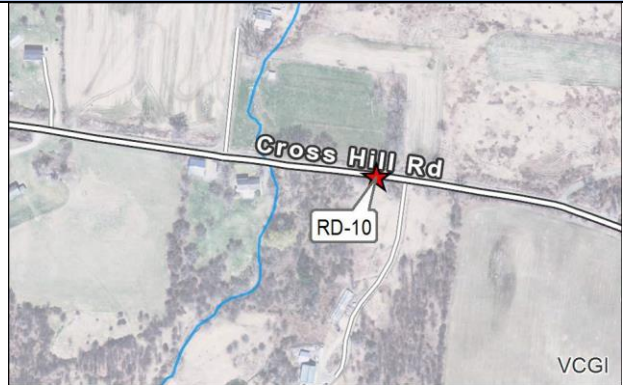


Project: RD-9		Problem Area Summary		
Date Observed:	10/17/2018			
Location:	North Road			
Latitude:	42.9657 N			
Longitude:	-73.2063 W			
Land Ownership:	Town			
<p>Site Description: Unstable drainage ditches are eroding, depositing large quantities of road material in a wetland on the north side of North Road. This road segment ranked 8th (top 1%) in the water quality prioritization based on REI data.</p>				
				
<p>Photo 1: Water flowing over the roadway is eroding road materials into the wetland.</p>		<p>Photo 2: Road gravel in the wetland adjacent to North Road.</p>		
<p>BMP Description: Deepen approximately 300' of ditch and stabilize with stone. Install a sediment trap on the north side of the road, east of the wetland to prevent road materials from entering wetland.</p>				
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
7	2	4	0	13 (Moderate)
<p>Additional Project Benefits Description: N/A</p>				
<p>Project Comments: The project is assigned a moderate priority due to the potential to mitigate a large sediment source to a wetland. The project may require VT ANR wetlands permitting for a sediment trap built in the wetland buffer. We estimate that total project costs may be between \$7,000 and \$12,000.</p>				



Project: RD-10 **Problem Area Summary**

Date Observed:	10/17/2018, 11/9/2018
Location:	Cross Hill Road (West)
Latitude:	42.9628 N
Longitude:	-73.2662 W
Land Ownership:	Town



Site Description: Approximately 3,000 feet of road has drainage issues, including a severely eroded stretch of road and ditch approximately 800 feet long that drains directly to a stream. The ditches west of the stream receive runoff from tile drains in the farm field to the north, which contributes to wet road conditions. This area includes two Very High Priority REI segments ranked 92nd (top 17%) in the water quality prioritization based on REI data.



Photo 1: Formation of a secondary ditch due to a grader berm on the north side of the road.



Photo 2: Water pools on the roadway, partially due to runoff from tile drains that are piped into the ditch.

BMP Description: Remove grader berms, enlarge ditches where needed, and stabilize ditches with stone and vegetation. Install cross-culverts and turnouts to reduce the amount of flow in the existing ditch. Coordinate with the farmer to install a stone-armored access to the fields.

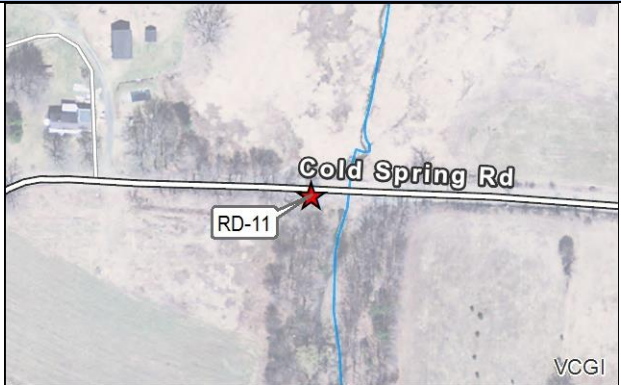
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
13	3	1	2	19 (High)

Additional Project Benefits Description: This project would address a chronic problem area for road maintenance including seasonal flooding of the road.

Project Comments: The project is assigned a high priority due to the potential to reduce a large source of nutrients and sediment to a nearby stream. The project should not require any additional permitting. **We estimate that total project costs may be between \$90,000 and \$110,000 with \$50,000 - \$60,000 to perform work east of the stream and \$40,000 - \$50,000 to perform work west of the stream.**



Project: RD-11	Problem Area Summary
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Date Observed:	10/17/2018	
Location:	Cold Spring Road	
Latitude:	42.9527 N	
Longitude:	-73.2597 W	
Land Ownership:	Town	

Site Description: Approximately 240 feet of road has unstable drainage ditches on both sides. These extend directly into the downslope stream, which crosses the road to the east of the ditch. This area includes a road segment ranked 123rd (top 23%) in the water quality prioritization based on REI data.



Photo 1: Unstable ditches along Cold Spring Road west of the stream crossing.

BMP Description: Stabilize the drainage ditches with stone. Install turnouts to field and forest to the north and south of the road respectively to filter flow before it reaches the stream.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	2	3	0	13 (Moderate)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to reduce a sediment source that drains directly to a stream crossing. The project should not require any additional permitting. **We estimate that total project costs may be between \$10,000 and \$15,000.**



Project: RD-15 **Problem Area Summary**

Date Observed:	10/18/2018
Location:	Laclair Road
Latitude:	42.9733 N
Longitude:	-73.2450 W
Land Ownership:	Town



Site Description: Approximately 200 feet of ditch on the north side of the road is unstable. The unstable ditch extends east where it enters a stream via poor eroding conveyance. This Very High Priority REI segment ranked 1st in the water quality prioritization based on REI data.



Photo 1: Rilling along road edge.



Photo 2: Eroded channel down to stream.

BMP Description: Install a cross culvert so that water drains to the field south of the road. Install stone in existing ditch and grade road to direct water into ditch. Line the existing conveyance with stone.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	2	4	0	14 (Moderate)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to reduce a sediment source that drains directly to a stream crossing. The project should not require any additional permitting. **We estimate that total project costs may be between \$7,000 and \$12,000.**



Project: RD-16 **Problem Area Summary**

Date Observed:	11/9/2018
Location:	Sally Gannon & Murphy Hill Road
Latitude:	42.9822 N
Longitude:	-73.2692 W
Land Ownership:	Town



Site Description: The two-entrance intersection at Sally Gannon Road and approximately 800 feet of Murphy Hill Road to the north have inadequate road drainage, causing water to pool on the roadway and erosion of the roadside ditch. Ditches on Murphy Hill road are somewhat undersized and unstable. The northern extent of the project area includes ditch work on a Murphy Hill Road segment ranked 7th (top 1%) in the water quality prioritization based on REI data.



Photo 1: Intersection with Murphy Hill Road, viewed from Sally Gannon Road.



Photo 2: Unstable ditches along Murphy Hill Road.




BMP Description: Install single entrance to Sally Gannon Road, removing the second entrance. Reduce amount of water making it to the intersection by improving the ditch to the east and west. Add cross culvert west of the intersection and a sediment trap near the intersection.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	3	6 (Already Funded)	2	19 (High)

Additional Project Benefits Description: This project would address a chronic problem area for road maintenance including seasonal flooding of the road.

Project Comments: The project is assigned a high priority due to the potential to mitigate a sediment source to a nearby stream and address a chronic problem area in an area where funds are already allocated to do work. This project should not require any additional permitting. **Most of the recommended ditch work was completed in 2019. The site should be monitored for further drainage concerns to determine whether additional funding is needed.**



Project: RD-17		Problem Area Summary		
Date Observed:	10/18/2018			
Location:	Shaftsbury Hollow Road			
Latitude:	43.0214 N			
Longitude:	-73.2355 W			
Land Ownership:	Town			
<p>Site Description: This road area has two poor conveyances to Little White Creek. One is located where Shaftsbury Hollow Road becomes Class 4 and is turned out toward the stream causing sediment to build up on the bank and enter the stream. The second is approximately 50 feet to the east where a culvert conveys a tributary under Shaftsbury Hollow Road. The culvert headers are severely eroded. This road segment ranked 4th (top 1%) in the water quality prioritization based on REI data.</p>				
				
<p>Photo 1: Road runoff is contributing to erosion of the tributary culvert header.</p>		<p>Photo 2: Eroded conveyance to Little White Creek near the transition between Class 3 and Class 4 road on Shaftsbury Hollow Road.</p>		
<p>BMP Description: Install a sediment trap between the Class 4 road and stream and stabilize the conveyance with stone. Stabilize the culvert headers with stone.</p>				
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	2	5	0	15 (Moderate)
<p>Additional Project Benefits Description: N/A</p>				
<p>Project Comments: The project is assigned a moderate priority due to the potential to reduce a sediment source to Little White Creek and the relatively low cost of the project. The project may require additional permitting for work in the river corridor and/or floodplain. We estimate that total project costs may be between \$2,000 and \$7,000.</p>				



Project: RD-18 **Problem Area Summary**

Date Observed:	10/18/2018
Location:	Granger Hollow Road
Latitude:	42.9981 N
Longitude:	-73.2658 W
Land Ownership:	Town



Site Description: Water runs down approximately 100' of road, entering Little White Creek at the culvert outlet and causing severe erosion of the header and roadway. This road segment ranked 209th (top 39%) in the water quality prioritization based on REI data.



Photo 1: Eroded embankment at the Little White Creek crossing.



Photo 2: Runoff concentrates along Granger Hollow Road, eroding the area near the guardrail.

BMP Description: Remove grader berm and deepen ditch so water can exit roadway before culvert. Stabilize conveyance with stone. Stabilize the road embankment as needed.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
6	2	5	0	13 (Moderate)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to the potential to reduce a sediment source to Little White Creek and the relatively low cost of the project. The project may require additional permitting for work in the river corridor and/or floodplain. **We estimate that total project costs may be between \$2,000 and \$7,000 depending the quantity of stone required to armor the conveyance and embankment.**



Project: RD-20 **Problem Area Summary**

Date Observed:	6/21/2018
Location:	Daniels Road, Mountainview Road, Glastenview Road
Latitude:	42.9516 N
Longitude:	-73.2163 W
Land Ownership:	Town



Site Description: Grader berms along approximately 600 feet of Glastenview Road are causing erosion of the roadway. Road gravel is accumulating in the ditch at the intersection with Daniels Road and the Daniels Road ditch is eroded for approximately 300 feet.



Photo 1: Eroded ditch along Daniels Road.



Photo 2: Eroded materials accumulating in the ditch at the intersection of Daniels Road and Glastenview Road.

BMP Description: Remove grader berms. Install stone in eroded ditches as needed. Consider installing a sediment trap with a level spreader at the ditch outlet to settle out particulates and send sheet flow into the wetland.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	3	2	1	16 (High)

Additional Project Benefits Description: The project would address a chronic problem area identified by the Town.

Project Comments: The project is assigned a high priority due to the potential to reduce a sediment source from a ditch network draining directly to the adjacent wetland. This project should not require any additional permitting. **We estimate that total project costs may be between \$25,000 and \$35,000.**



Project: DC-6	Problem Area Summary
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Date Observed:	10/17/2018
Location:	Meyers Road
Latitude:	42.9618 N
Longitude:	-73.2304 W
Land Ownership:	Town



Site Description: Approximately 300' of eroding ditch extends directly to the stream via a poor conveyance. The stream culvert headers are unstable and eroding. This road segment ranked 37th (top 7%) in the water quality prioritization based on REI data.



Photo 1: Eroding ditch and conveyance.



Photo 2: Eroding culvert header and conveyance at the stream crossing.

BMP Description: Stabilize the culvert headers, conveyance, and ditch with stone.


WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
7	2	4	0	13 (Moderate)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to potential to reduce erosion of sediment directly into the adjacent stream. This project should not require any additional permitting. **We estimate that total project costs may be between \$7,000 and \$12,000.**



Project: DC-7 **Problem Area Summary**

Date Observed:	10/17/2018	
Location:	Rollin Road	
Latitude:	42.9494 N	
Longitude:	-73.2492 W	
Land Ownership:	Town	

Site Description: This culvert has severe header and outlet erosion. This erosion continues for 85' to a nearby stream. This road segment ranked 16th (top 3%) in the water quality prioritization based on REI data.



Photo 1: Severe erosion at the culvert outlet.



Photo 2: Eroded conveyance south of the road.

BMP Description: Stabilize the culvert headers, outlet, and conveyance with stone. Consider installing check dams and a level spreader in the conveyance to slow and disperse flow.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	2	4	0	15 (Moderate)

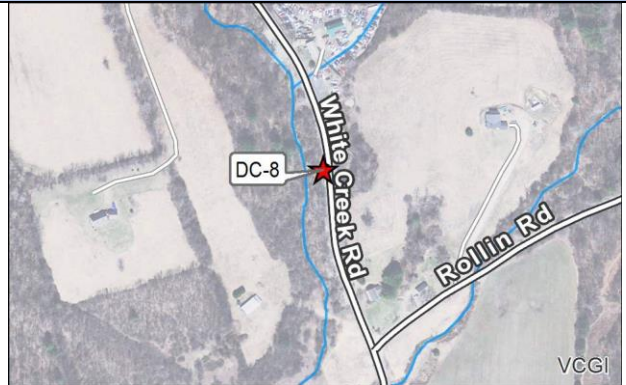
Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion of sediment into the nearby stream. This project should be reviewed for potential wetland/stream permitting needs depending on its proximity to the stream. **We estimate that total project costs may be between \$6,000 and \$11,000.**



Project: DC-8 **Problem Area Summary**

Date Observed:	10/17/2018
Location:	White Creek Road
Latitude:	42.9470 N
Longitude:	-73.2576 W
Land Ownership:	Town



Site Description: The culvert outlet header is severely eroded. The erosion may cause undermining of the paved roadway and clogging of the drainage culvert. This road segment ranked 240th (top 45%) in the water quality prioritization based on REI data.



Photo 1: Eroded road embankment.



Photo 2: Erosion extends to the drainage culvert.

BMP Description: Stabilize the culvert header and road embankment with stone.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
4	2	6	1	13 (Moderate)

Additional Project Benefits Description: Erosion is threatening the existing road infrastructure.

Project Comments: The project is assigned a moderate priority due to the relatively low cost to stabilize erosion and protect road infrastructure. This project should not require any additional permitting. **We estimate that total project costs may be between \$1,000 and \$2,000.**

Project: C-2 **Problem Area Summary**

Date Observed:	10/17/2018
Location:	Harrison Road
Latitude:	43.0077 N
Longitude:	-73.1625 W
Land Ownership:	Town



Site Description: The smooth HDPE culvert conveys a small channel with an approximately 16.5-acre drainage area. The capacity of the 18” culvert is estimated at 13 cfs, a flow that may be exceeded in the 10-year flood event. The culvert headers are eroding, with severe erosion of the road embankment around the culvert outlet.



Photo 1: Harrison Road culvert outlet.



Photo 2: Harrison Road culvert inlet.

BMP Description: Install a larger structure with stone headers. The recommended culvert size for an intermittent stream crossing of comparable drainage area is 24” in diameter. Based on HY-8 modeling, a 24” structure will pass the 25-year flood if the road elevation is raised 1 foot at the crossing. A 30” structure will pass the 25-year flood with no change in road elevation.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	2	4	0	14 (Moderate)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion of sediment into the intermittent stream. This project should not require any additional permitting. **We estimate that total project costs may be between \$2,500 and \$5,000.**



Project: C-3 **Problem Area Summary**

Date Observed:	10/17/2018	
Location:	Glastenbury Road	
Latitude:	43.0038 N	
Longitude:	-73.1551 W	
Land Ownership:	Town	

Site Description: The CMP conveys a small channel with an approximately 71-acre drainage area. The capacity of the 2.2' culvert is estimated at 38 cfs, a flow that may be exceeded in the 25-year flood event. The culvert is in poor condition with a collapsing inlet and the upstream header is eroding.



Photo 1: Erosion at the upstream culvert header.



Photo 2: Perched culvert outlet.

BMP Description: Install a larger structure with stone headers. The recommended culvert size for an intermittent stream crossing of comparable drainage area is 42" in diameter. Based on HY-8 modeling, a 36" structure will pass the 25-year flood and a 42" structure will pass the 100-year flood.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	2	4	0	16 (High)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a high priority due to the potential to reduce erosion of sediment into the intermittent stream. **We estimate that total project costs could be between \$4,000 and \$9,000. Permitting requirements from ANR and/or USACE, such as AOP passage, may make this project more costly.**

Project: C-4 **Problem Area Summary**

Date Observed:	10/17/2018
Location:	Potter Montgomery Road
Latitude:	42.9969 N
Longitude:	-73.1655 W
Land Ownership:	Town



Site Description: The CMP conveys a small channel with an approximately 37-acre drainage area. The capacity of the 24" culvert is estimated at 20 cfs, a flow that may be exceeded in the 10-year flood event. The culvert headers are eroding, with severe erosion of the road embankment around the culvert. See RD-3 problem area sheet for more information on road erosion problems upslope of the culvert.



Photo 1: Potter Montgomery Road culvert outlet.



Photo 2: Potter Montgomery Road culvert inlet.

BMP Description: Install a larger structure with stone headers. The recommended culvert size for an intermittent stream crossing of comparable drainage area is 36" in diameter. Based on HY-8 modeling, a 36" structure will pass the 100-year flood. Additional cover is needed to protect the structural integrity of the culvert. Some gravel may be sourced from excavation associated with RD-3.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
7	2	4	0	13 (Moderate)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion of sediment into the intermittent stream. **We estimate that total project costs may be between \$5,000 and \$10,000. Permitting requirements from ANR and/or USACE, such as AOP passage, may make this project more costly.**



Project: C-5 **Problem Area Summary**

Date Observed:	10/17/2018
Location:	East Road
Latitude:	42.9859 N
Longitude:	-73.1560 W
Land Ownership:	Town



Site Description: The CMP conveys a small channel with an approximately 121-acre drainage area. The capacity of the 24” culvert is estimated at 31 cfs, a flow that may be exceeded in the 10-year flood event. The culvert headers are eroded as well as the channel downstream of the culvert.



Photo 1: East Road culvert inlet.



Photo 2: East Road culvert outlet.

BMP Description: Install a larger structure with stone headers. The recommended culvert size for an intermittent stream crossing of comparable drainage area is 60” in diameter. Based on HY-8 modeling, a 60” structure will pass the 100-year flood.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	2	2	0	14 (Moderate)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion of sediment into the stream. **We estimate that total project costs may be between \$15,000 and \$20,000. Permitting requirements from ANR and/or USACE, such as AOP passage, will likely make this project more costly.**



Project: C-6 **Problem Area Summary**

Date Observed:	10/18/2018
Location:	Murphy Hill Road
Latitude:	42.9817 N
Longitude:	-73.2688 W
Land Ownership:	Town



Site Description: The CMP conveys a small channel with an approximately 100-acre drainage area. The capacity of the 30" culvert is estimated at 47 cfs, a flow that may be exceeded in the 10-year flood event. The culvert headers are eroded as well as the road embankment and channel downstream of the culvert.



Photo 1: Murphy Hill Road culvert outlet.



Photo 2: Murphy Hill Road culvert inlet.




BMP Description: Install a larger structure with stone headers. The recommended culvert size for an intermittent stream crossing of comparable drainage area is 48-60" in diameter. Based on HY-8 modeling, a 48" structure will pass the 25-year flood.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	2	4	0	15 (Moderate)

Additional Project Benefits Description: N/A


Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion of sediment into the stream. **We estimate that total project costs may be between \$10,000 and \$15,000. Permitting requirements from ANR and/or USACE, such as AOP passage, will likely make this project more costly.**



Project: C-7		Problem Area Summary		
Date Observed:	10/18/2018			
Location:	Granger Hollow Road			
Latitude:	43.0166 N			
Longitude:	-73.2644 W			
Land Ownership:	Town			
<p>Site Description: The CMP conveys a channel with an approximately 280-acre drainage area. The capacity of the 30" culvert is estimated at 33 cfs, a flow that may be exceeded in the 10-year flood event. The culvert headers are eroding, with severe erosion of the road embankment and downstream channel at the culvert outlet.</p>				
				
Photo 1: Granger Hollow Road inlet.		Photo 2: Granger Hollow Road outlet.		
<p>BMP Description: Install a larger structure with stone headers. The recommended culvert size for a stream crossing of comparable drainage area is over 66" in diameter. Based on HY-8 modeling, a 72" round or a 95" by 67" elliptical structure will pass the 25-year flood.</p>				
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	2	2	0	14 (Moderate)
<p>Additional Project Benefits Description: N/A</p>				
<p>Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion of sediment into the stream. We estimate that total project costs may be between \$15,000 and \$20,000. Permitting requirements from ANR and/or USACE, such as AOP passage, will likely make this project more costly.</p>				



Project: C-8	Problem Area Summary
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Date Observed:	10/18/2018	
Location:	Murphy Hill Road	
Latitude:	42.9738 N	
Longitude:	-73.2589 W	
Land Ownership:	Town	

Site Description: The CMP conveys a channel with an approximately 68-acre drainage area. The capacity of the 24" culvert is estimated at 30 cfs, a flow that may be exceeded in the 10-year flood event. There is some erosion of the road embankment at the inlet and outlet.



Photo 1: Murphy Hill Road culvert inlet.



Photo 2: Murphy Hill Road culvert outlet.

BMP Description: Install a larger structure with stone headers. The recommended culvert size for an intermittent stream crossing of comparable drainage area is 42-48" in diameter. Based on HY-8 modeling, a 42" structure will pass the 25-year flood.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	2	4	0	16 (High)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion of sediment into the stream. **We estimate that total project costs may be between \$5,000 and \$10,000. Permitting requirements from ANR and/or USACE, such as AOP passage, may make this project more costly.**



Project: C-9 **Problem Area Summary**

Date Observed:	10/18/2018
Location:	Elm Street
Latitude:	42.9376 N
Longitude:	-73.2483 W
Land Ownership:	Town



Site Description: The CMP conveys a channel with an approximately 179-acre drainage area. The capacity of the 36" culvert is estimated at 30 cfs, a flow that may be exceeded in the 10-year flood event. There is some erosion of the road embankment at the inlet and outlet.



Photo 1:



Photo 2:

BMP Description: Install a larger structure with stone headers. The recommended culvert size for a stream crossing of comparable drainage area is over 66" in diameter. Based on HY-8 modeling, a 72" round or 84" by 60" elliptical structure will pass the 25-year flood.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	2	2	0	14 (Moderate)

Additional Project Benefits Description: N/A

Project Comments: The project is assigned a moderate priority due to the potential to reduce erosion of sediment into the stream. **We estimate that total project costs may be between \$15,000 and \$20,000. Permitting requirements from ANR and/or USACE, such as AOP passage, will likely make this project more costly.**

