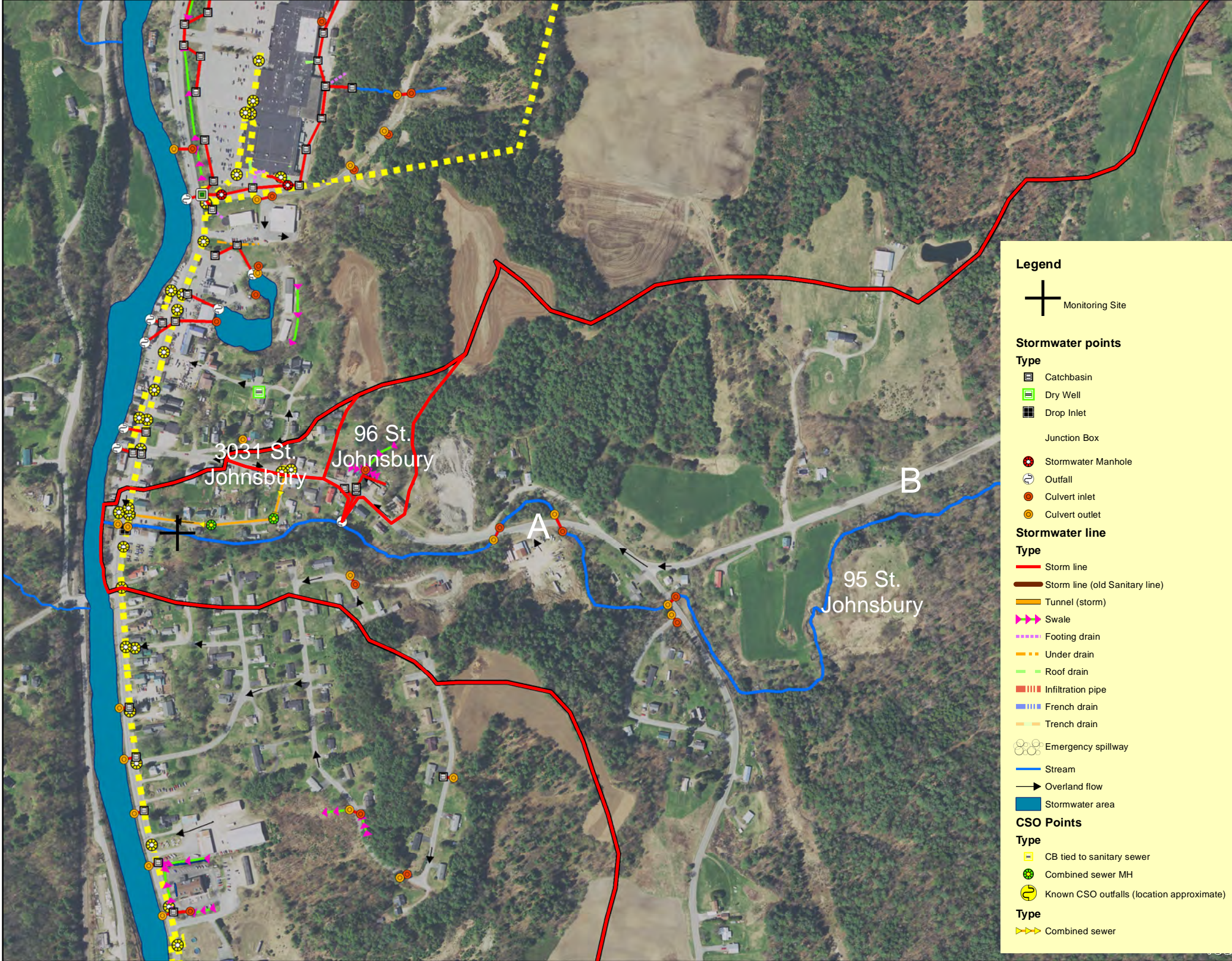


Roberts Brook, St. Johnsbury, Vermont

Roberts Brook in St. Johnsbury Vermont has been found to be stressed by stormwater runoff as measured by the biology and chemistry of the stream. There are a number of significant discharges to the stream from the developed lands of St Johnsbury Center. The largest discharge to the stream is the Drainage Area 95 which drains the upper watershed between the Town gravel yard and upper Spaulding Rd. In addition there is combined sewer basin connected to the Town sanitary sewer which should be removed and replaced with a dry well or infiltration gallery. The recommended course of action for rural stormwater and sediment impacted streams is to install road best management practices and provide treatment for surface runoff if possible. A map showing the location of the discharges and possible retrofit locations is provided. A cost estimate (excluding land costs) for one of the controls is provided.









Addressing the large discharges of stormwater to the brook will prevent the stream from becoming declared stormwater impaired on the state of Vermont's 303d list of impaired waters. It will reduce bacteria to the Passumpsic River which downstream is currently listed as impaired for bacteria. It will also reduce nitrogen currently being discharged to the Connecticut River and Long Island Sound.













Legend





 Monitoring Site

Stormwater points





- Type**
-  Catchbasin
 -  Dry Well
 -  Drop Inlet
 -  Junction Box
 -  Stormwater Manhole
 -  Outfall
 -  Culvert inlet
 -  Culvert outlet

Stormwater line

- Type**
-  Storm line
 -  Storm line (old Sanitary line)
 -  Tunnel (storm)
 -  Swale
 -  Footing drain
 -  Under drain
 -  Roof drain
 -  Infiltration pipe
 -  French drain
 -  Trench drain

-  Emergency spillway
-  Stream
-  Overland flow
-  Stormwater area

CSO Points

- Type**
-  CB tied to sanitary sewer
 -  Combined sewer MH
 -  Known CSO outfalls (location approximate)
 - Type**
 -  Combined sewer



Macroinvertebrate Site Summary - River/Stream

Roberts Brook

Parallels Roberts Brook Rd neat Route 5 within 100ft.

St. Johnsbury, VT (44.45500, -72.01546)

Stream Type: Small High Gradient

Macroinvertebrate Community Metrics

Macroinvertebrate Community Assessments are based primarily on eight metrics of the Macroinvertebrate community. These include metrics of abundance, species richness, and indexes of Sensitive to tolerant species ratios. (For More Details)

Date	Density	Richness	EPT Richness	PMA-O	B.I.	Oligo.	EPT/EPT + Chiro	PPCS-F	Community Assessment
9/8/2005	483	43.0	18.0	51.9	3.69	4.66	0.71	0.41	● Good
9/5/2006	611	45.0	16.0	60.9	4.00	0.79	0.55	0.59	● Good
Scoring Guideline for a SHG Stream of Water Quality Class B(2)									
	≥ 300	≥ 27	≥ 16	≥ 45	≤ 4.5	≤ 12	≥ 0.45	≥ 0.4	Full Support
	≥ 250	≥ 26	≥ 15	≥ 40	≤ 4.65	≤ 14.5	≥ 0.43	≥ 0.35	Indeterminate
	< 250	< 26	< 15	< 40	> 4.65	> 14.5	< 0.43	< 0.35	Non-Support



Monitoring Site Summary - River/Stream

Roberts Brook

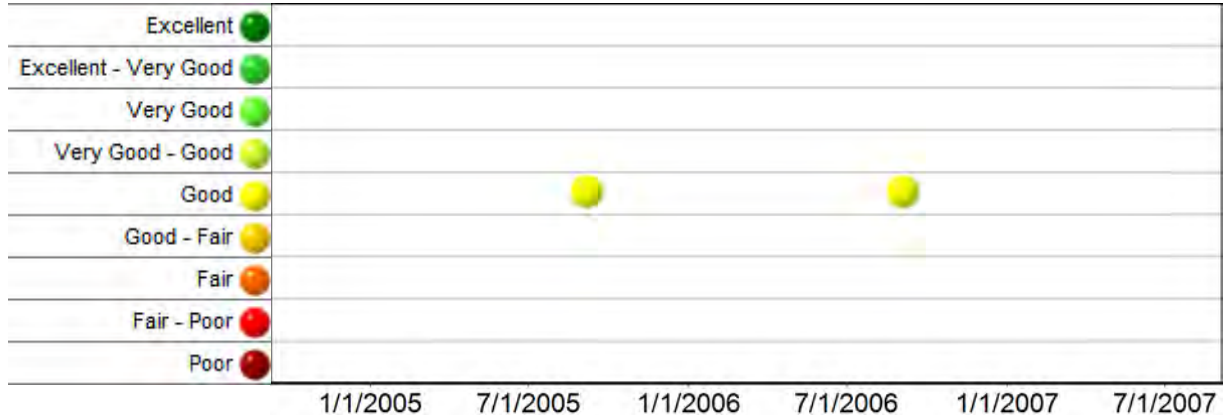
River Mile: 0.1

Parallels Roberts Brook Rd neat Route 5 within 100ft.

St. Johnsbury, VT (44.45500, -72.01546)

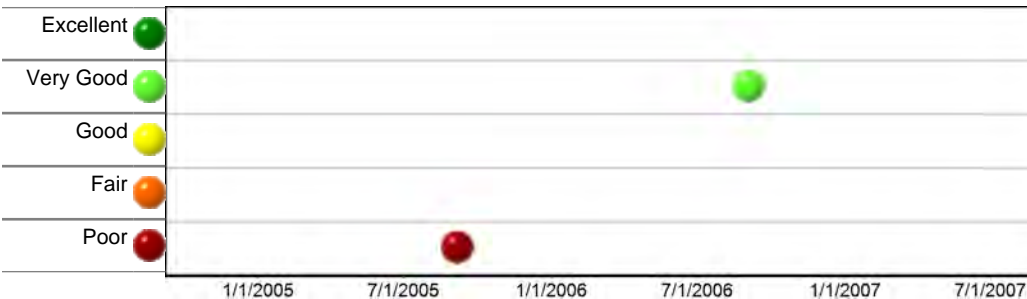
Macroinvertebrate Assessment

Macroinvertebrate population Assessments are a measure of the biological integrity of the macroinvertebrate community and an indicator of the health of the aquatic biota. (For More Details)



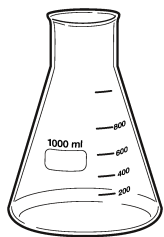
Fish Assessment

Fish populations provide a measurement of the general health of the aquatic biota. Since fish occupy the top of the food web their population integrates the conditions of lower community types. (For More Details)



Water Quality Measurements

Chemical and physical parameters provide a "snapshot" of current conditions and are used to detect changes in water quality and to make determinations about a waterbody and its watershed. (For More Details)



Characteristic	Description	Trend	Max	Mean	Min
Chloride (mg/L)	At elevated values mostly from deicing	●	34.0	34.0	34.0
Conductivity (umho/cm)		●-----●	474.0	457.3	441.0
Nitrogen (mg/L)	Nutrient that may fuel algae blooms	●-----●	0.5	0.5	0.5
pH	Acidity	●-----●	8.2	8.1	8.0
Phosphorus (ug/L)	Nutrient that may fuel algae blooms	●-----●	10.3	8.8	7.3
Turbidity (NTU)	Measure of suspended sediment	●-----●	0.6	0.4	0.2

Habitat Observations

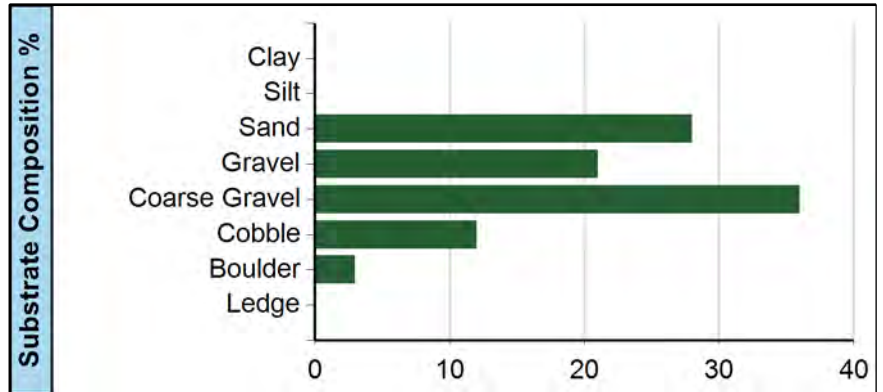
Observations on the physical condition of the waterbody can be useful in determining the habitat type present and if watershed stressors have degraded its ability to support a healthy community of aquatic biota. (For More Details)

Observation Date: 9/5/2006

Habitat Type: Riffle

Embeddedness Estimated %: 62.5

Canopy %: 75



Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Effective Impervious Area	Projected Sediment Load (lbs)	Current BMP Sediment Reduction Credit	Sediment Load with Current Reductions (lbs.)	Priority Action Sediment Reduction Credit	Sediment Load with Priority Action (lbs.)	Projected Nitrogen Load (lbs.)	Current BMP Phosphorus or Nitrogen Reduction Credit	Nitrogen Load with Current Reductions (lbs.)	Priority Action Phosphorus or Nitrogen Reduction Credit	Nitrogen Load with Priority Action (lbs.)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Phosphorus or Nitrogen Removal Per Pound (based on annual nutrient load)
95 St. Johnsbury	1	Implement Lackey Hill PR-05 (A) and PR-06 (B) projects in SWMP	RR/OF		1102.4	0.47	79260	0%	79260	15%	67371	660.50	0.00	660	8%	610.96	4.48	3.41	NA		NA	NA
96 St. Johnsbury			GS/CB		4.4	3.58	480	0%	480	0%	480	4.00	0.00	4	0%	4.00	0.03	0.05				
3031 St. Johnsbury	1	Replace combined sewer basin with separated basin and dry well or infiltration gallery	DW-IG/CB/OF		1.6	17.81	442	0%	442	90%	44	3.68	0.00	4	90%	0.37	0.03	0.06	\$4,315.00	5000	\$4,328	\$5,823

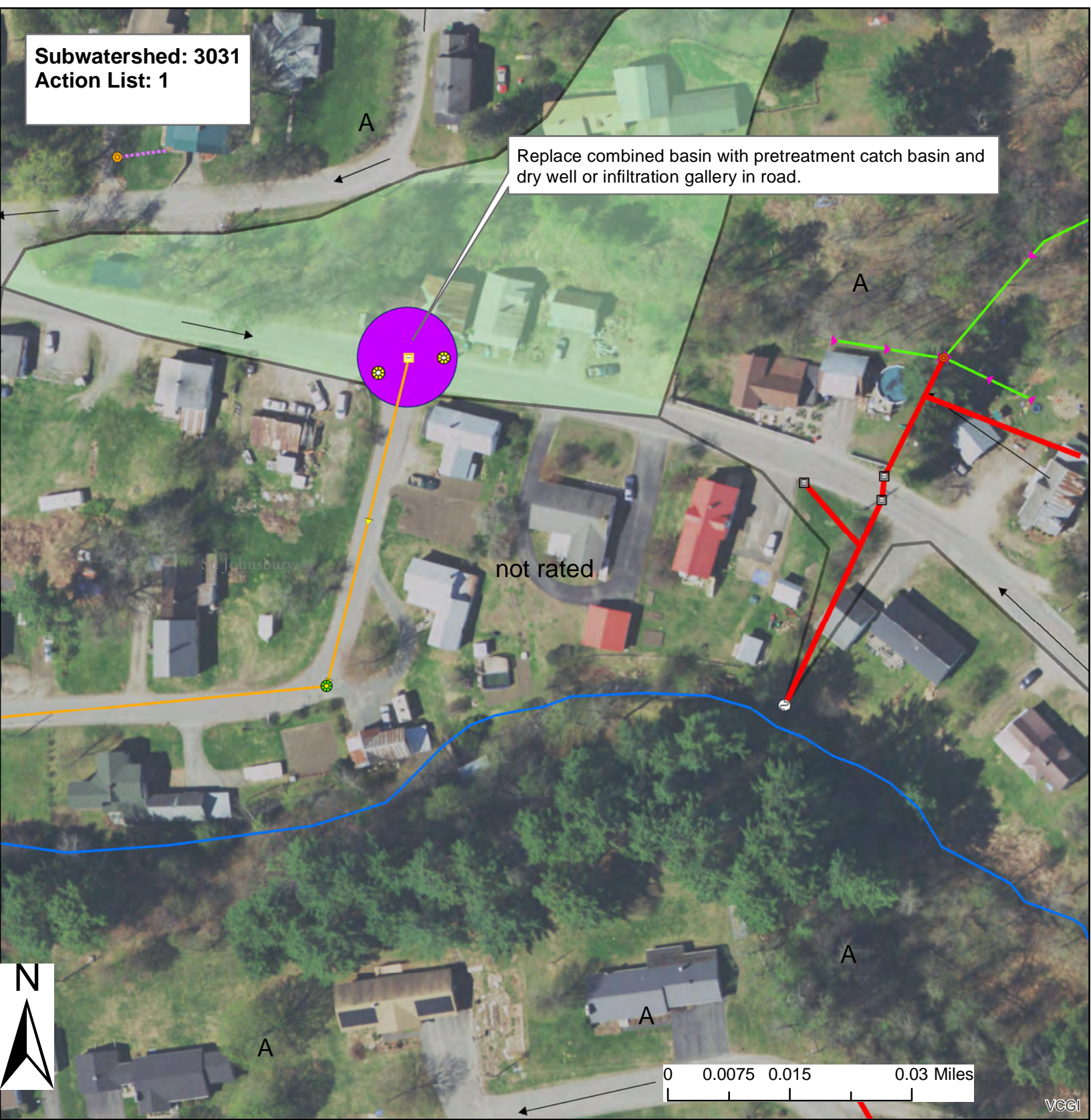
Target Maps

*Showing Priority Action List
Drainage Areas*

And Potential Retrofit Locations

Subwatershed: 3031
Action List: 1

Replace combined basin with pretreatment catch basin and dry well or infiltration gallery in road.

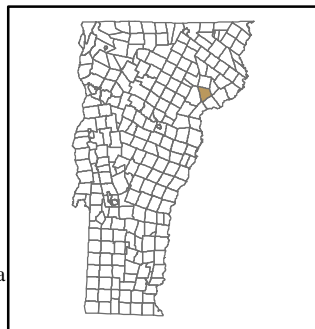


St. Johnsbury, VT

DEC Stormwater Infrastructure Mapping Project

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

The data shown on this map is only as accurate as the available sources and field observations allowed and should be used as a basic planning level tool only.



Stormwater points

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

Stormwater line

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

SubwatershedID

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


NRCS Soils

A

Creator: Jim Pease, David Ainley
 DEC - WID - Clean Water Initiative Program
 Plotted Date: 10/15/2021
 Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survey
 Imagery Source: VCGI Best Available Imagery

VCGI

Problem Area Data Sheet

Problem Area ID: PR-05	Latitude: 44.271720	Longitude: -72.003495
Watershed: <hr/> Passumpsic River		
Location: <hr/> 1569 Breezy Hill Rd		
Problem Type: <hr/> Erosion		
Identification Source: <hr/> SWMP field work		
Ownership: <hr/> Town		
Classification: <hr/> 4		

Date of Field Data Collection: April 5, 2016

Description of Observed Conditions:
 Unmanaged stormwater runoff from roadway concentrates where Breezy Hill Rd crosses Roberts Brook (Passumpsic River tributary) and is causing gully erosion and general embankment instability.

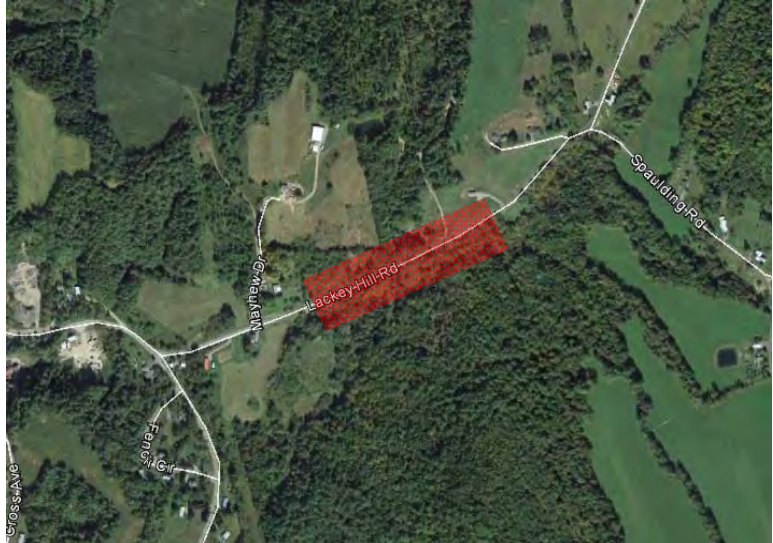
Field Photos



Photo 1: Series of small gullies caused by road runoff

Photo 2: Area of overbank flow and previous stabilization efforts

Problem Area Data Sheet

Problem Area ID: PR-06	Latitude: 44.271817	Longitude: -72.001880
Watershed: <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> Passumpsic River		
Location: <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> Lackey Hill Rd		
Problem Type: <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> Erosion		
Identification Source: <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> SWMP field work		
Ownership: <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> Town		
Classification: <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> 5		

Date of Field Data Collection: April 5, 2016

Description of Observed Conditions:
 Unstable ditches, turnouts and cross-culverts are resulting in significant erosion and visibly more turbid water in Roberts Brook between Spaulding Rd and Breezey Hill Rd. Opportunity to bring overly-wide section of road back to standard width and establish properly shaped ditches, with stone-lining and check dams as needed.

Field Photos

	
Photo 1: Erosion at driveway culvert outlet	Photo 2. Unstable turn-out along southside of Lackey Hill

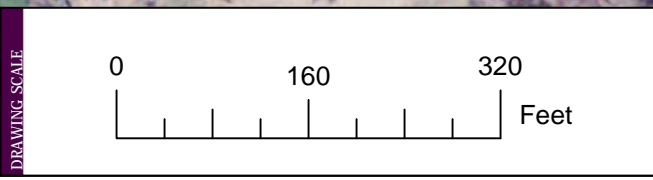
File: O:\Proj\15\WMA\15-215 St. Johnsbury SWMP\CADD\Almshouse Road and Lackey Hill\mshouse_Lackey.dwg



CONSTRUCTION NOTES:

1. CULVERT AND TURNOUT LOCATIONS ARE APPROXIMATED - LOCATIONS SHALL BE CONFIRMED AND/OR APPROVED BY AN ENGINEER IN THE FIELD
2. ALL STONE SECTIONS TO BE CONSTRUCTED TO A THICKNESS OF 18 INCHES USING 3-6-INCH STONE
3. ROADWAY TO BE NARROWED TO 24-FT WHILE RETAINING THE EXISTING CENTERLINE
4. ROADWAY TO BE GRADED TO ALLOW SHEET FLOW TO THE SOUTH THROUGH THE 4-FT VEGETATED BUFFER
5. TURNOUTS TO BE CLEANED AFTER SNOW MELT IN THE SPRING, BEFORE SNOW FALL IN AUTUMN, AND AS NEEDED AS GENERAL MAINTENANCE AND IN RESPONSE TO LARGE STORM EVENTS
6. DITCHES STEEPER THAN 5% SHALL BE STONE-LINED TO A THICKNESS OF 18" PER "STONE-LINED DITCH DETAIL"

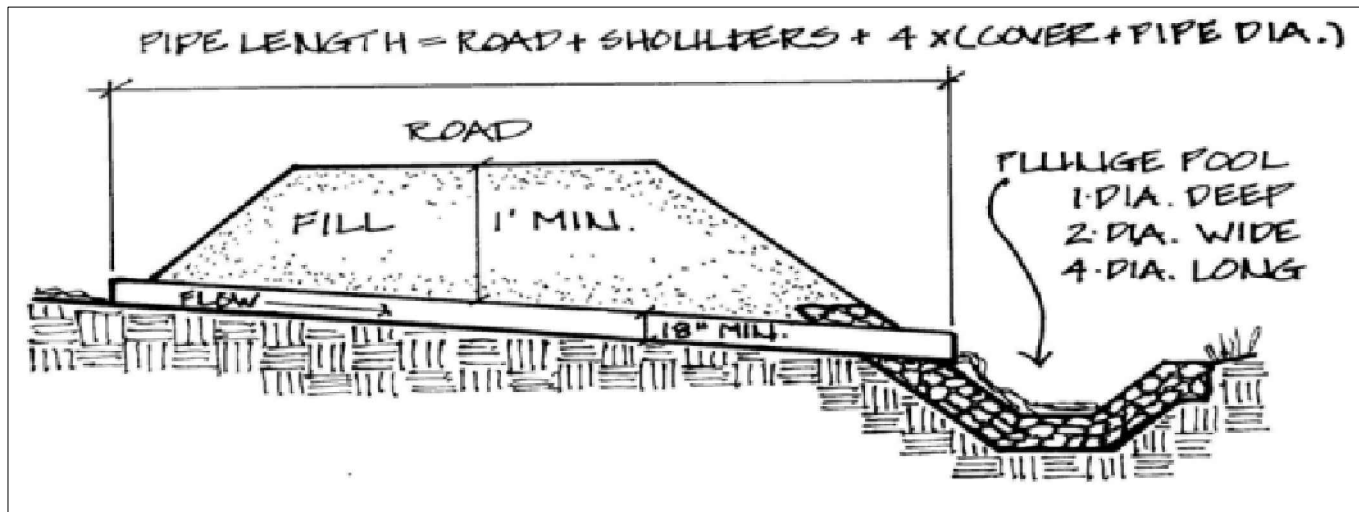
#	Date	Drwn	Chk'd	App'd	Description



STONE ENVIRONMENTAL
 535 Stone Cutters Way / Montpelier / VT / 05602 / USA
 802.229.4541 / info@stone-env.com / www.stone-env.com

SAINT JOHNSBURY SWMP
PR-06 LACKEY HILL ROAD
 STORMWATER IMPROVEMENTS LAYOUT
 SAINT JOHNSBURY VERMONT

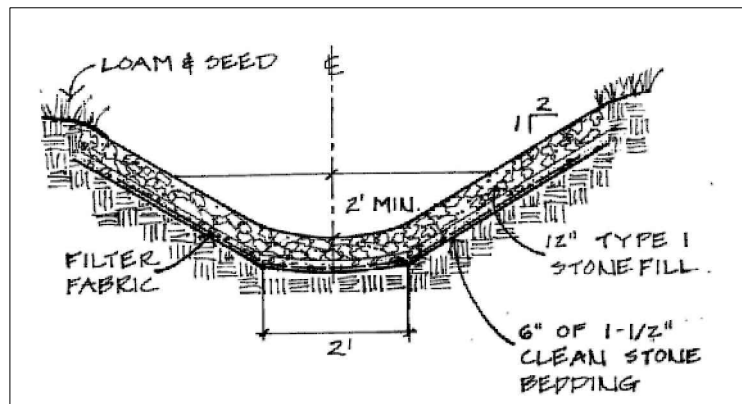
D-2
(1)



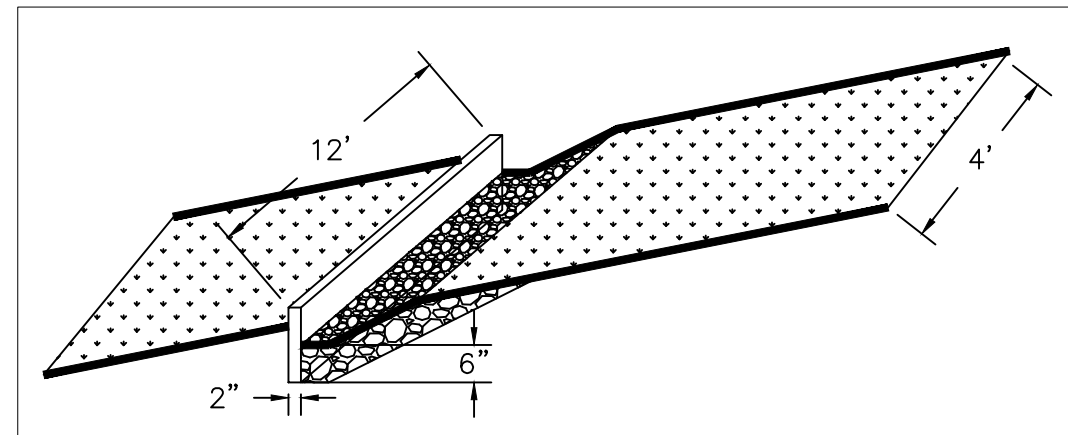
CULVERT CROSS SECTION DETAIL

MATERIALS ESTIMATE

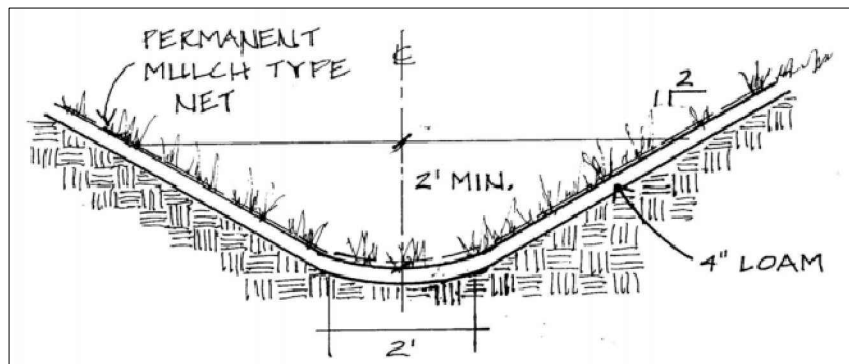
PR-06 LACKEY HILL ROAD STORMWATER IMPROVEMENTS			
ITEM NO.	ITEM	ESTIMATED QUANTITY	UNIT
1	COMMON EXCAVATION	70	CY
2	DITCHING	2250	LF
3	PRESSURE TREATED 2'x12'	60	LF
4	STONE FILL, TYPE 1	104	CY
5	TOP SOIL (4')	112	CY
6	GRASS SEED	1000	SY
7	MULCH	1000	SY



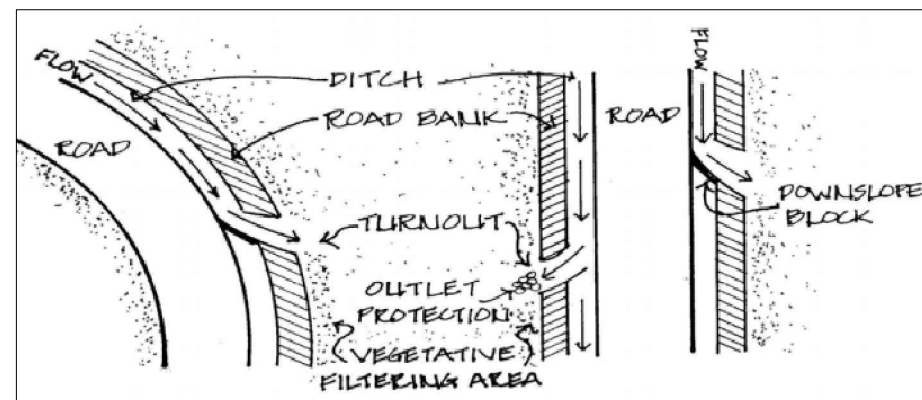
STONE-LINED DITCH DETAIL



TURNOUT AND VEGETATED BUFFER DETAIL



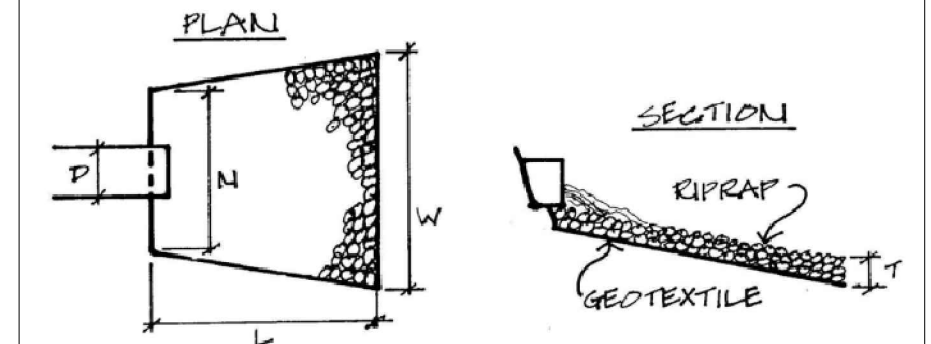
GRASS LINED DITCH DETAIL



TURNOUT DETAIL

Rock Apron Specifications					
Culvert Diameter (D)	Riprap Size	T (in.)	N (ft.)	W (ft.)	L (ft.)
18 inches	(3-12 inch)	18	4.5	14.5	10.0
24 inches	(3-12 inch)	18	6.0	20.0	14.0

D= diameter of culvert
 T= depth of stone in apron
 N= width of apron near culvert
 W= width at downhill end of apron
 L= length of apron



STONE APRON DETAIL

<http://vtrans.vermont.gov/sites/aot/files/highway/2009%20Better%20Backroads%20Manual.pdf>

File: O:\Proj\15\WRM\15-215 St. Johnsbury SWMP\CADD\Almshouse Road and Lackey Hill\Almshouse_Road and Lackey Hill\Almshouse_Lackey.dwg

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SAINT JOHNSBURY SWMP
PR-06 LACKEY HILL ROAD
 STORMWATER DETAILS
 SAINT JOHNSBURY VERMONT

D-2
 (2)