

**Stormwater Management & Design Strategies for
Swanton Wind Project**

As a project that will result in greater than one acre of new or redeveloped impervious surface, *Swanton Wind* is subject to jurisdiction under the VT DEC Stormwater Management Rule (Environmental Protection Rules, Chapter 18). This Rule is implemented through the technical and design standards of the Vermont Stormwater Management Manual (VSWMM). These standards include Water Quality, Groundwater Recharge, Channel Protection, Overbank Flood Protection, and Extreme Flood Protection. Permits may be obtained in the form of an individual permit or under a general permit.

We anticipate the proposed stormwater management plan for *Swanton Wind* will combine conventional and alternative stormwater treatment practices (STPs). The use of stormwater wet ponds, level spreaders, and vegetative disconnections will be the primary means of managing stormwater runoff from the site. The location, type, and number of STPs to be used on the project will be determined as the entire site design moves forward. This will be done in concert with recommendations from the project team environmental consultants in regards to wetlands, streams, rare species, and other environmental resource areas. Our goal will be to provide the maximum amount of treatment of stormwater runoff possible while minimizing tree cutting and impacts to environmental resources. At this stage, we have generally identified potential STP sites such as natural low spots for wet ponds and areas of gentler slopes that will be suitable for level spreaders and vegetative disconnections. The following is a summary of the anticipated stormwater management practices to be employed at *Swanton Wind*:

- Wet Ponds

Wet ponds are practices that have a permanent pool of water, and some elements of a shallow marsh equivalent to retain the entire water quality volume. The permanent pools provide an opportunity for sediment to settle out prior to discharge, while the marshy areas provide vegetative uptake of nutrients such as nitrogen and phosphorus. Ponds may also be used to provide channel protection volume as well as overbank and extreme flood attenuation.

- Level Spreaders
The level spreaders purpose is to return concentrated stormwater runoff to sheet flow as it enters the vegetated buffer area. As stormwater runoff travels over the buffer area, vegetation slows the runoff and traps particulate pollutants. Each level spreader has been designed in a location to provide a minimum of 150 feet of vegetated buffer on slope less than 30%. The level spreaders flowing to vegetated buffers are presumed to meet water quality and groundwater recharge requirements for the areas flowing to them.
- Disconnection of Non-Rooftop Runoff Credit
Credit is given for practices than disconnect surface impervious cover runoff by directing it to pervious areas where it is either infiltrated into the soil or filtered by overland flow. The credit can be obtained by grading the site to promote overland vegetative filtering. Vegetative disconnections provide an opportunity to treat and disperse stormwater “at the source” rather than collecting it in pipes and larger treatment practices.

The following is a summary of Vermont State Stormwater Management Manual stormwater treatment standards and how we propose to meet them for the *Swanton Wind* project.

- Water Quality Treatment Standard (WQTS)
The objective of the WQTS is to capture 90% of the annual storm events and to remove 80% of the average annual post development total suspended solids load (TSS), and 40% of the total phosphorus (TP) load. Pending legislation will call for a “zero net increase” in phosphorus loading for projects in the Lake Champlain watershed.

For the *Swanton Wind* project we will be proposing a combination of Wet Ponds and Level Spreaders to meet Water Quality standards.

- Channel Protection Treatment Standard
The objective of the Channel Protection Treatment Standards is to protect streams fro degradation by providing storage of the channel protection volume (CPv) by means of 12 to 24 hours of extended detention storage for

the one year, 24 hour storm event. (12 hours for coldwater fish habitat, 24 hours for warm water fish habitat).

The *Swanton Wind* project will utilize Wet Ponds to meet Channel Protection standards. Controlled outlet structures featuring low flow orifices installed in the ponds will enable the ponds to provide 12 or 24 hour detention as needed.

- Groundwater Recharge Treatment Standard

The objective of the Groundwater Recharge Treatment Standard is to maintain the average annual recharge rate in order to preserve existing water table elevations. Recharge volume (Rev) is determined as a function of annual predevelopment recharge for a give soil group, average annual rainfall volume, and amount of impervious cover at a site.

For the *Swanton Wind* project Groundwater Recharge standards will be met via level spreaders and vegetative disconnections.

- Overbank Flood Protection Treatment Standard

The objective of the Overbank Flood Protection Treatment Standard is to maintain the post development peak discharge rate at or below the pre development peak discharge rate for the 10 year, 24 hour storm event.

The *Swanton Wind* project will utilize Wet Ponds to meet Overbank Flood Protection standards. Controlled outlet structures featuring low flow orifices installed in the ponds will slow peak flow release rates to at or below pre development levels

- Extreme Flood Protection Treatment Standard

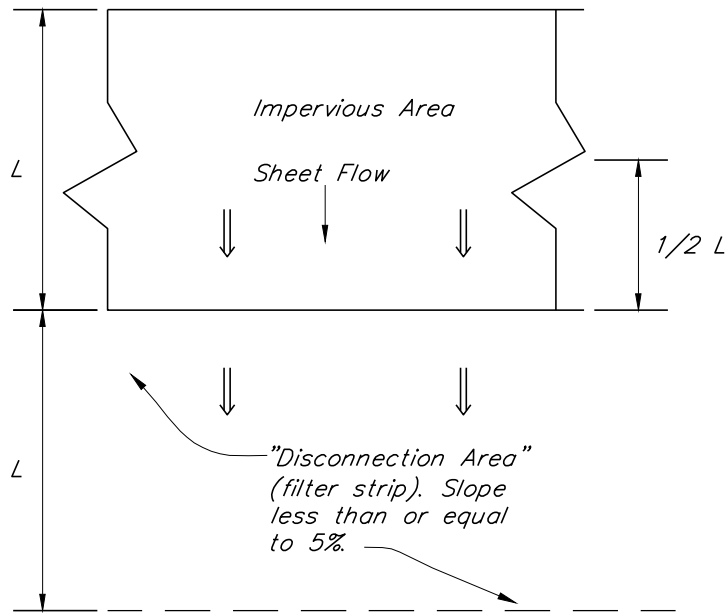
The objective of the Extreme Flood Protection Treatment Standard is to maintain the post development peak discharge rate at or below the pre development peak discharge rate for the 100 year, 24 hour storm event. This standard is to prevent flood damage from infrequent but very large storm events, maintain the boundaries of the pre-development 100 year flood plain, and protect the physical integrity of STPs.

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Swanton Wind Stormwater Management and Design Strategies

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The *Swanton Wind* project will utilize Wet Ponds to meet Extreme Flood Protection standards. Controlled outlet structures featuring low flow orifices installed in the ponds will slow peak flow release rates to at or below pre development levels




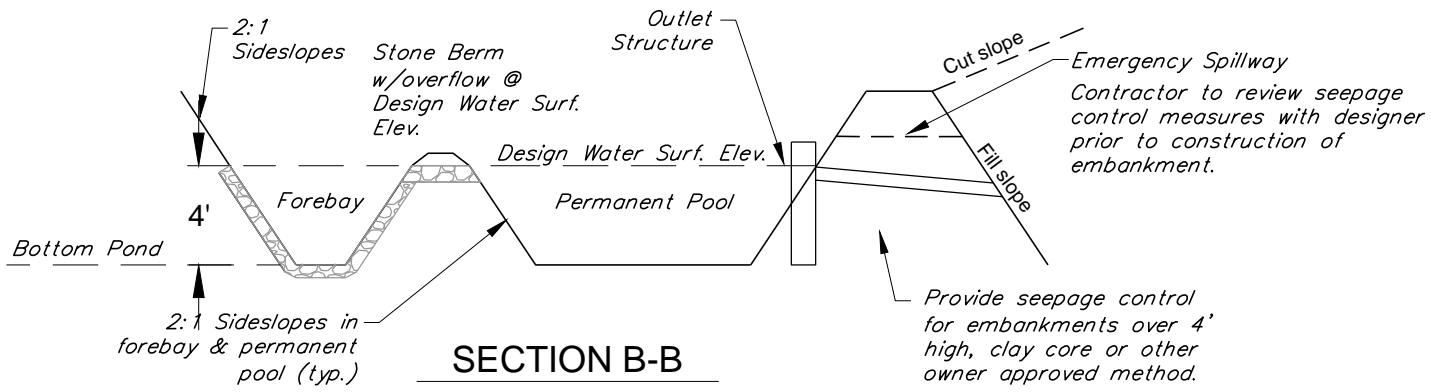
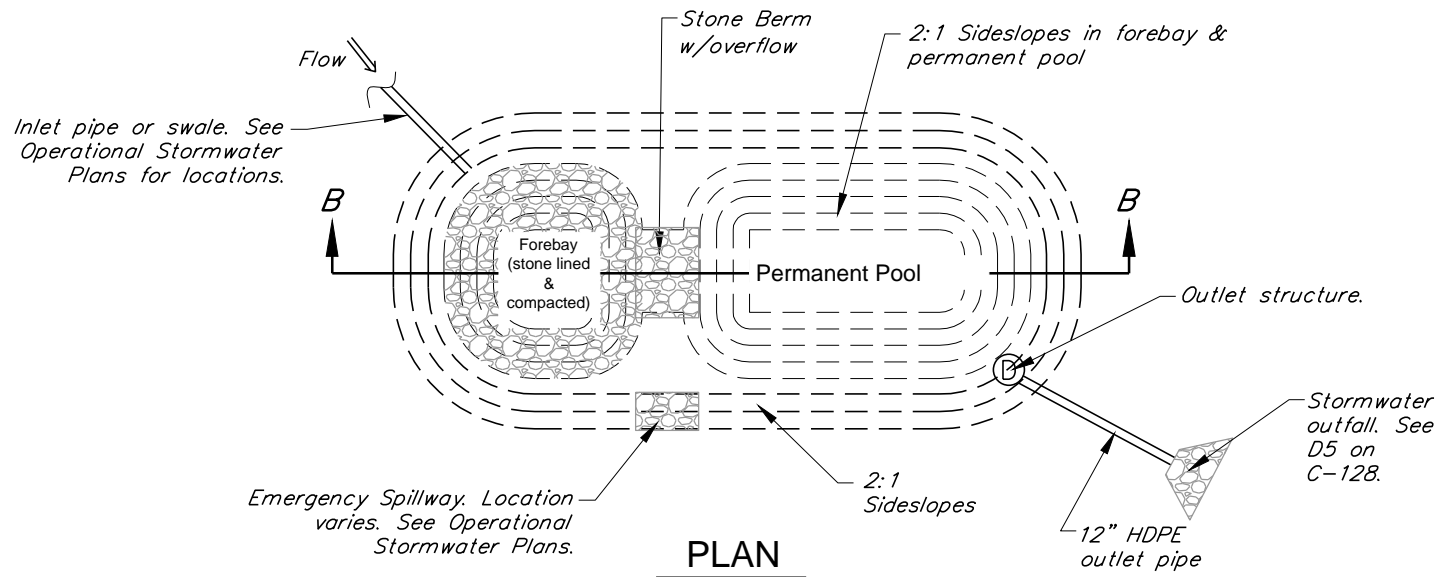
Notes:

1. The maximum contributing impervious flow path length (L) shall be 75 feet or less.
2. The entire disconnection shall be pervious and on a slope less than or equal to 5%.
3. The length of the disconnection area must be equal or greater to the contributing rooftop length.

Disconnection of Non-Rooftop Runoff Schematic


N.T.S.

 Krebs & Lansing Consulting Engineers, Inc. 164 Main Street, Suite 201 Colchester, VT 05446 T: (802) 878-0375 F: (802) 878-9618 klengineers@comcast.net KrebsandLansing.com	Project: Swanton Wind	Sketch No.:
	Location: Swanton, Vermont	
DRAWN BY: SWH	(Fill in below if sketch modifies an existing Plan or Detail)	Scale: n.t.s.
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	Sheet No.:	
	Detail: Not Applicable	



Schematic Stormwater Wet Pond Details

N.T.S.

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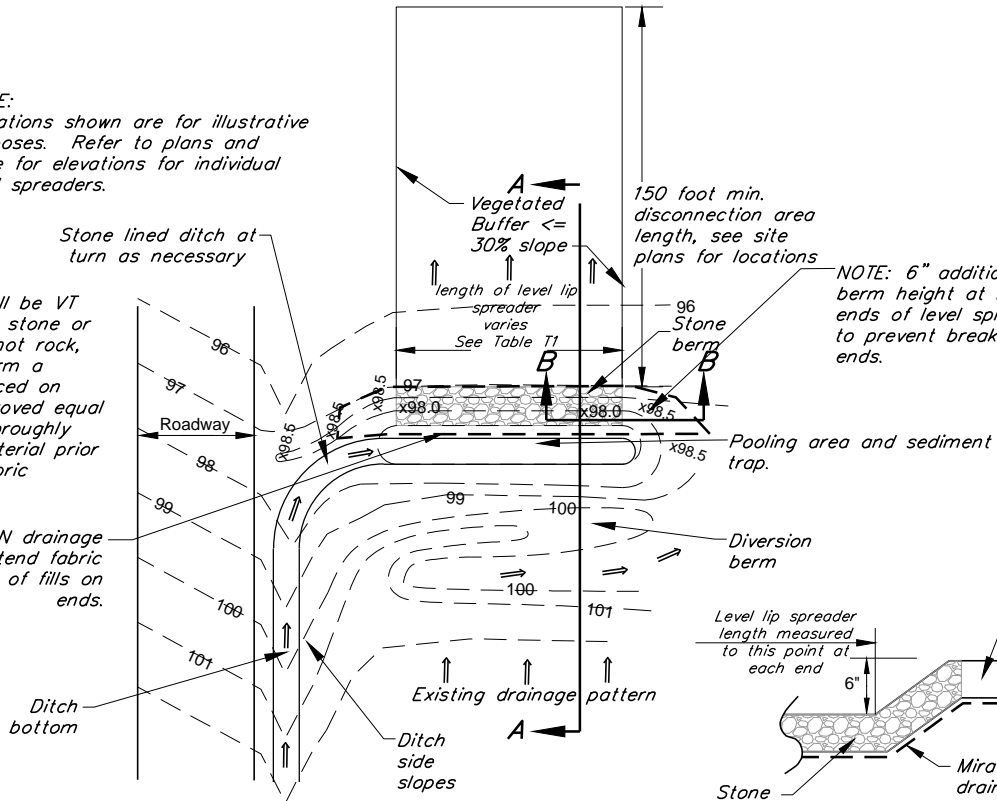
NOTE:
Elevations shown are for illustrative purposes. Refer to plans and table for elevations for individual level spreaders.

The stone used shall be VT AOT 706.04 Type 1 stone or approved on site shot rock, placed so as to form a compact mass, placed on Mirafi 160N or approved equal drainage fabric. Thoroughly compact native material prior to placement of fabric.

Mirafi 160N drainage fabric. Extend fabric under limits of fills on ends.

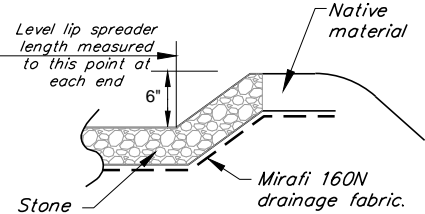
Ditch bottom

Stone lined ditch at turn as necessary



PLAN

NOTE: 6" additional berm height at both ends of level spreader to prevent breakout at ends.

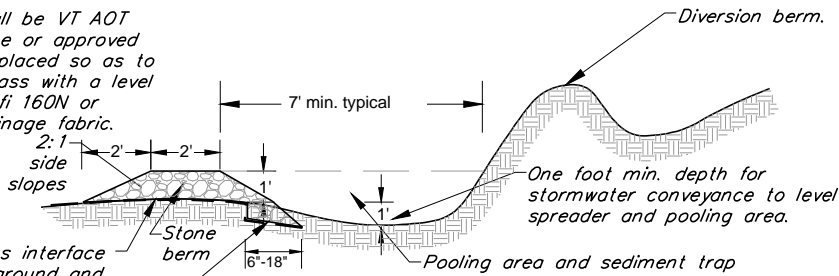


SECTION B-B
Typical End Condition

The stone used shall be VT AOT 706.04 Type 1 stone or approved on site shot rock, placed so as to form a compact mass with a level lip, placed on Mirafi 160N or approved equal drainage fabric.

Maintain continuous interface between existing ground and drainage fabric.

Fill voids as necessary at any location to prevent concentrated flow under fabric or through berm or pool sidewalls.




Mirafi 160N drainage fabric. Key fabric min. 6-18" into existing ground, and 9-12" below existing grade on downslope side of berm.

NOTE: Fabric may be eliminated in areas where level spreader is constructed directly on, and entirely of, blasted rock.

SECTION A-A

Level Lip Spreader Detail

N. T. S.

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