TOWN OF RANDOLPH
10% DESIGNS WITH COSTS & ENGINEERING
STORMWATER PROJECT

RANDOLPH,
VERMONT

NARRATIVE
DECEMBER 19, 2018

Prepared for:
Town of Randolph, Vermont
Two Rivers-Ottauquechee Regional Commission

Prepared by:
Otter Creek Engineering, Inc.
404 East Main Street
East Middlebury, VT 05740
P: (802) 382-8522

This page blank

I. Intent

The following narratives and supporting documents are intended to provide information to project stakeholders by which identified stormwater retrofit projects can be prioritized. Information contained can also be utilized to seek funding for implementation. This narrative presents recommended stormwater treatment practices as outlined in the Vermont Stormwater Management Manual (2017) and Best Management Practices (BMPs) that could address water quality and flow related impacts resulting from stormwater runoff that currently flows with little or no treatment to waters of the State. There are likely other potential retrofit sites and BMPs that can be implemented throughout the Town and study watersheds. Project stakeholders sought to direct the focus of this project on a select number of watersheds, some of which had retrofit sites previously identified by Vermont Department of Environmental Conservation (VTDEC). This narrative and the recommendations made within were made without the benefit of a topographic survey or soils investigations that could lead to differing conclusions. Due to the early conceptual nature of the investigations and recommendations, cost estimates are presented as "order of magnitude" costs including an appropriate contingency. Where possible, unit pricing was obtained from manufacturer quotes, recent project bids, and Vermont Agency of Transportation unit price index. Pricing for the acquisition of land is not considered in the budgets presented.

II. Project Background

Otter Creek Engineering was contracted by Two Rivers-Ottauquechee Regional Commission (TRORC) in partnership with the Town of Randolph to investigate stormwater retrofit opportunities within selected watersheds in the Town. The project scope included site investigations, the preparation of site data reports, and the preparation of this narrative text which is intended to present identified projects, their constraints and associated costs to implement. A majority of the watersheds reviewed did not have retrofit locations identified by VTDEC. In those locations, site investigations sought to identify areas where the adverse effects of uncontrolled stormwater runoff (e.g. erosion, sediment deposition, etc.) were evident. In most instances, treatment practices or other BMPs were proposed to manage runoff from all or a portion of the watershed. In the process of completing the project, data from the following sources was utilized:

- Vermont Department of Environmental Conservation, Ecosystem Restoration Section, Watershed Management Division, Town of Randolph, Stormwater Infrastructure Mapping Project, March 2015.
- Vermont Agency of Natural Resources, Natural Resources Atlas, < http://anrmaps.vermont.gov/websites/anra5/>
- United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey, < https://websoilsurvey.sc.egov.usda.gov >
- Vermont Agency of Natural Resources, 2017 Vermont Stormwater Management Manual Rule and Design Guidance, July 1, 2017.
- Site visits performed by Otter Creek Engineering on November 8, 2018.

The following watersheds with numbering as designated in the VTDEC Stormwater Infrastructure Mapping Project were investigated for potential stormwater retrofit sites:

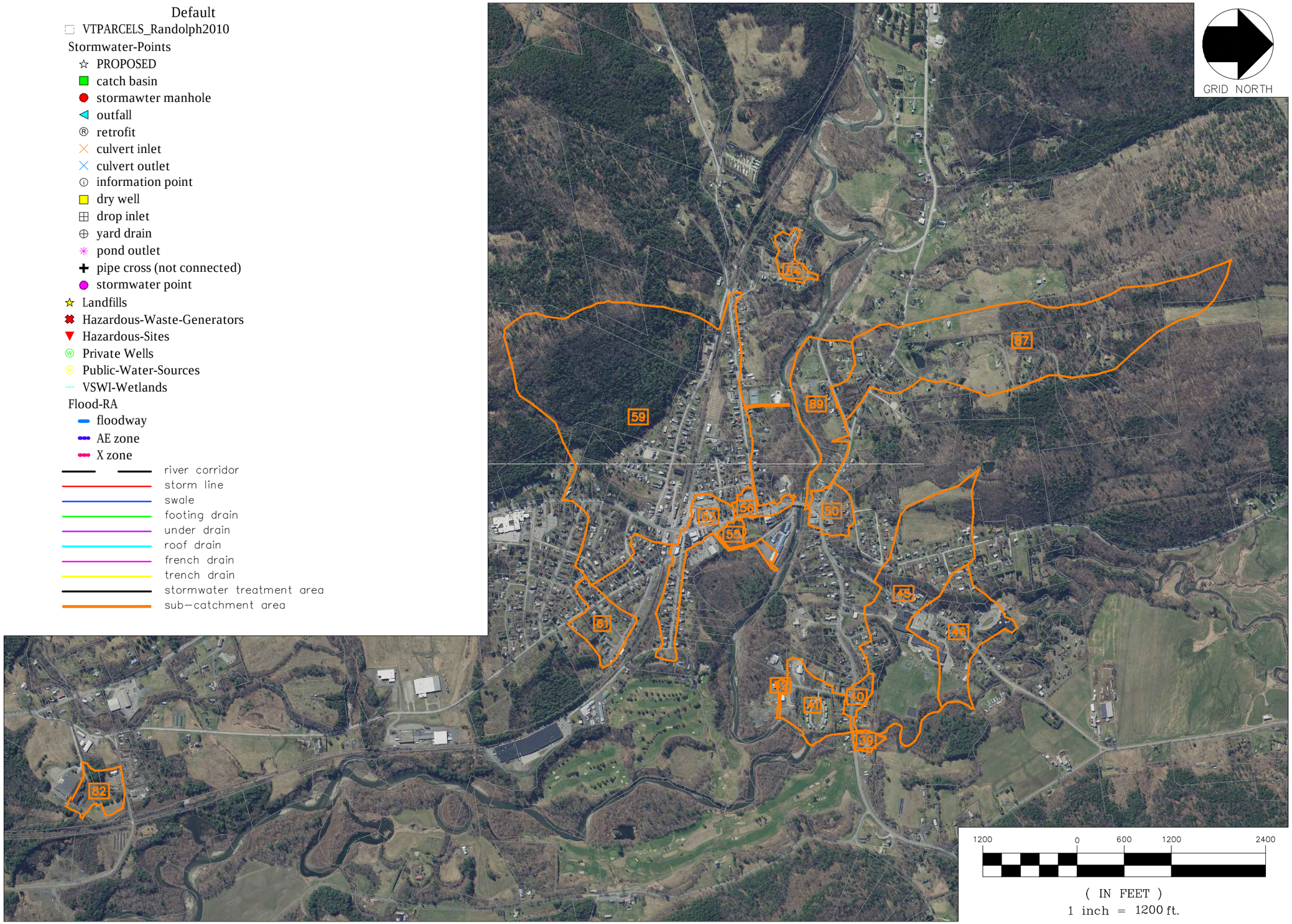
Watershed #'s 39, 40, 41, 42, 45, 46, 50, 53, 55, 56, 59, 61, 82, 84, 87, and 89. Refer to mapping attached which depicts location of watersheds.

The Engineering Services budget provided with the Cost Estimates includes topographic survey, base mapping, soils evaluation and testing (where necessary), preparation of final plans and specifications, and three site visits during construction (9 hours total). Generally, the cost of an excavator and operator to dig soils test pits is paid directly by the owner. For budgeting purposes, the cost estimates provided include the value to retain a contractor in the Engineering Services fee, where appropriate. The estimated cost for an excavator and operator per day used in the estimate is $800.

In addition, while permitting of projects within the mapped floodplain/Flood Plain Overlay District is possible, the scope of information that may be required for a project will vary. For those projects within or adjacent to the Flood Plain Overlay District, we have assumed a level of permit review/approval will be necessary. Our budget includes a $1,200 base fee to prepare and submit permit application materials to the Town. This does not include nor anticipate any work within the mapped floodway.

Our engineering services budget does not include time associated with soliciting bids for construction as this service and how it is performed is often a function of the funding source. Our budget anticipates that bid phase services would be performed and managed by the Owner.

For sites that require land acquisition, a value has not been included in the cost estimates provided due to the inherent variability in costs from site to site. Further project development will need to account for and reflect this cost as part of the overall project budget.



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=1200'
PROJECT NO.:	923.001

TITLE:
RANDOLPH
SUB-WATERSHEDS

SKETCH NO.
A

REF. DRAWING:

TABLE OF CONTENTS

WATERSHED #39: VT 66 at Ayers Brook

WATERSHED #40: VT 66 at Hedding Dr.

WATERSHED #41: Village Circle at WWTF

WATERSHED #45: Randolph Union High School

WATERSHED #46: Randolph Elementary School and Hargrace Dr. & Forest St.

WATERSHED #50: Mountain Ave.

WATERSHED #53: Prince St.

WATERSHED #53: United States Post Office

WATERSHED #55: Randolph House

WATERSHED #56: N. Main St.

WATERSHED #59: Recreation Fields South

WATERSHED #61: Pearl St.

WATERSHED #82: Old Foundry

WATERSHED #84: Lincoln St.

WATERSHED #87: Bingham Hill

WATERSHED #89: Recreation Fields North

WATERSHED #39:

Description:
The watershed based on VTDEC stormwater infrastructure mapping is approximately 1.8 acres in size and 22.7% Impervious (0.4 acres). The contributing area consists of a portion of State Route 66, a municipal pumping station, a residential property, and a commercial property, each set on approximately a half acre site. The surface cover is predominantly vegetated with lawn areas adjacent to the roadway and shrub and mixed wooded area adjacent Ayers Brook. The watershed is relatively flat (0 to 3 percent slopes) and is designated as Hydrologic Soil Group 'B' indicating that underlying soils have a moderate infiltration rate. Water flow is primarily to the west and north. A roadside ditch and culvert convey flows from the road and south side of the developed parcels to the west where flows discharge from a steep bank directly into Ayers Brook.

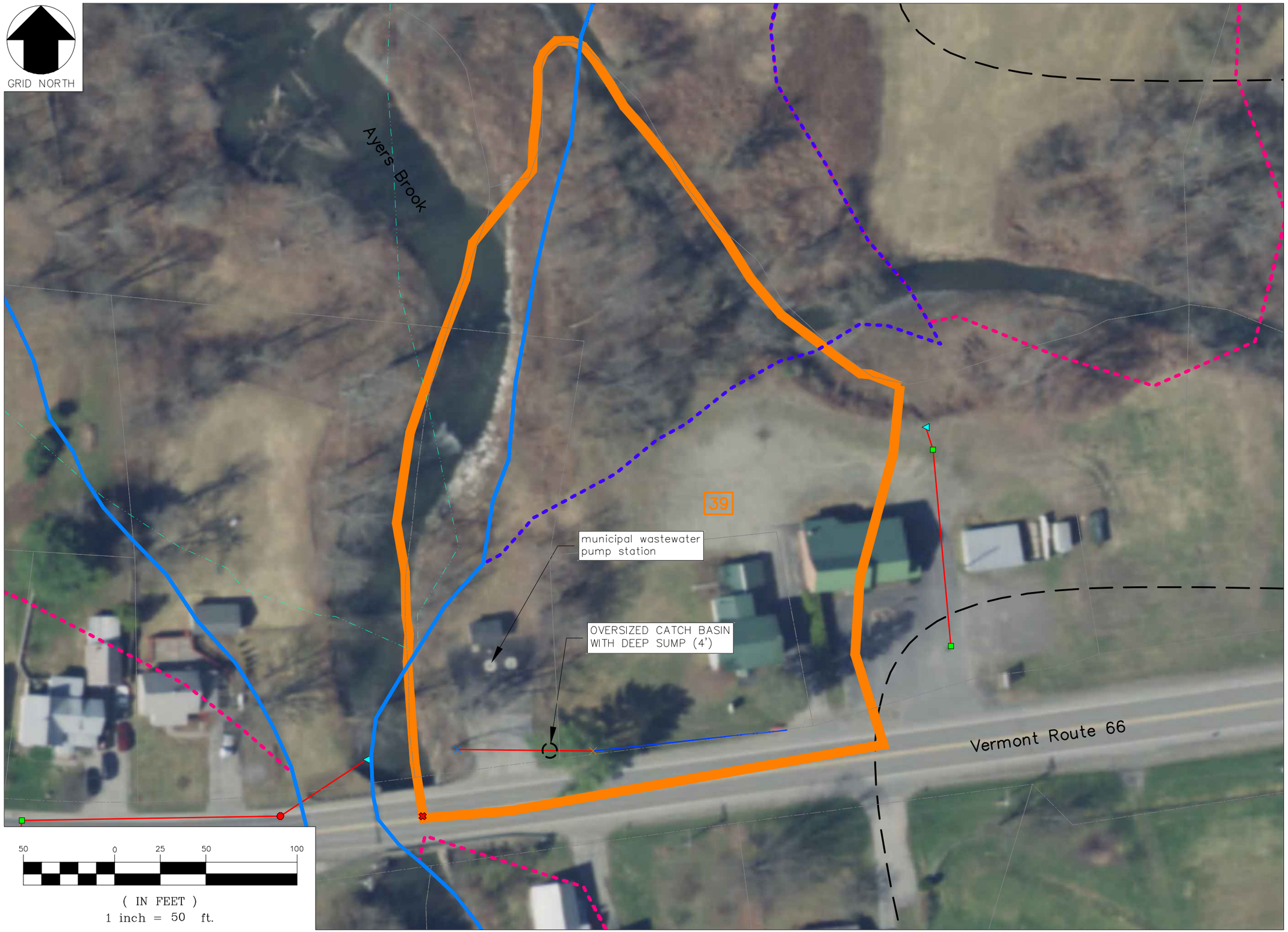
Retrofit:
Capturing and treating the runoff from the entire watershed and contributing impervious surfaces requires added ditching on private property to collect flows that otherwise sheet flow to the receiving stream. Runoff that is collected in the existing condition is comprised of roughly less than half the mapped impervious surface (0.2 acres). Due to the relatively small contributing area, treatment practices targeted water quality related retrofits versus the flow based controls. For this particular site, available land that was practical in the sense of not requiring purchase was the land currently utilized by a municipal pumping station. Due to the proximity of the State Route 66, installation of a treatment practice within the roadway right-of-way was not considered. The recommended practice is the installation of proprietary sediment removal systems or vault-type filtering practices. In this instance, an oversized catch basin located along the culvert piping conveying flows was considered. Installation of a deep sump catch basin with hooded outlet could provide an improvement to water quality by removing the larger sediment coming from the State Route. The practice recommended does not provide for infiltration or attenuation of peak runoff events.

WATERSHED #39:

Watershed #39					
Preliminary Opinion of Project Cost					
Item No.	Description	Unit Quantity		Unit Cost	Total Cost
1	Catch Basin	1	EA	$ 5,000	$ 5,000
2	Excavation and backfill	1	LS	$ 4,000	$ 4,000
3	Installation & Interconnection	1	LS	$ 1,250	$ 1,250
4	Surface Restoration	1	LS	$ 1,000	$ 1,000
5	Mobilization / Demobilization	1	LS	$ 1,000	$ 1,000
6	EPSC Measures (3.5%)	1	LS	$ 429	$ 429
7	General Conditions (5%)	1	LS	$ 613	$ 613
				Subtotal of Construction Cost	$ 13,291
				Enginering Services	$ 2,500
				Contingency (25%)	$ 3,948
				Total Estimated Project Cost	**$ 19,739**

Notes:

1) Catch basin with 4-foot deep sump
2) Surface Restoration includes topsoil, seed, and mulch
3) Erosion Prevention and Sedminent Control (EPSC) based on % of overall cost.
4) General Conditions includes necessary bonds, insurance, site maintenance.



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

RANDOLPH, VERMONT

DATE ISSUED:	12/12/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:

SUB-WATERSHED #39 TREATMENT

SKETCH NO.

10A

REF. DRAWING:

Map Scale: 1:929 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	B	0.6	13.9%
Ha	Hadley very fine sandy loam	B	1.9	48.9%
Wo	Winooski very fine sandy loam	C	1.5	37.1%
Totals for Area of Interest			**4.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #40:

Description:
The watershed as mapped by VTDEC is approximately 2.9 acres and 30.0% impervious surfaces (0.87 acres). The contributing area consists of a portion of State Route 66, Hedding Drive, and residential properties ranging in size from half acre to acre size lots. The surface cover is primarily grassed lawn area associated with the residential lots with a wooded buffer along Ayers Brook. Impervious surfaces in the watershed are made up of the residential rooftop and drives and the sidewalk and curbed roadway along Route 66. Soils within the watershed are primarily classified as Agawam fine sandy loam with slopes of 0 to 3%. The associated Hydrologic Soil Group 'B' designation indicates that the soils has a moderate infiltration rate. Water flow is primarily to the east. Stormwater runoff from the residential portions of the watershed primarily flow overland ultimately infiltrating or entering into Ayers Brook. Runoff from the paved surfaces along and adjacent to Route 66 are collected within the catch basins and collection piping network and convey flows to the east where runoff is discharged adjacent to the streambank into Ayers Brook.

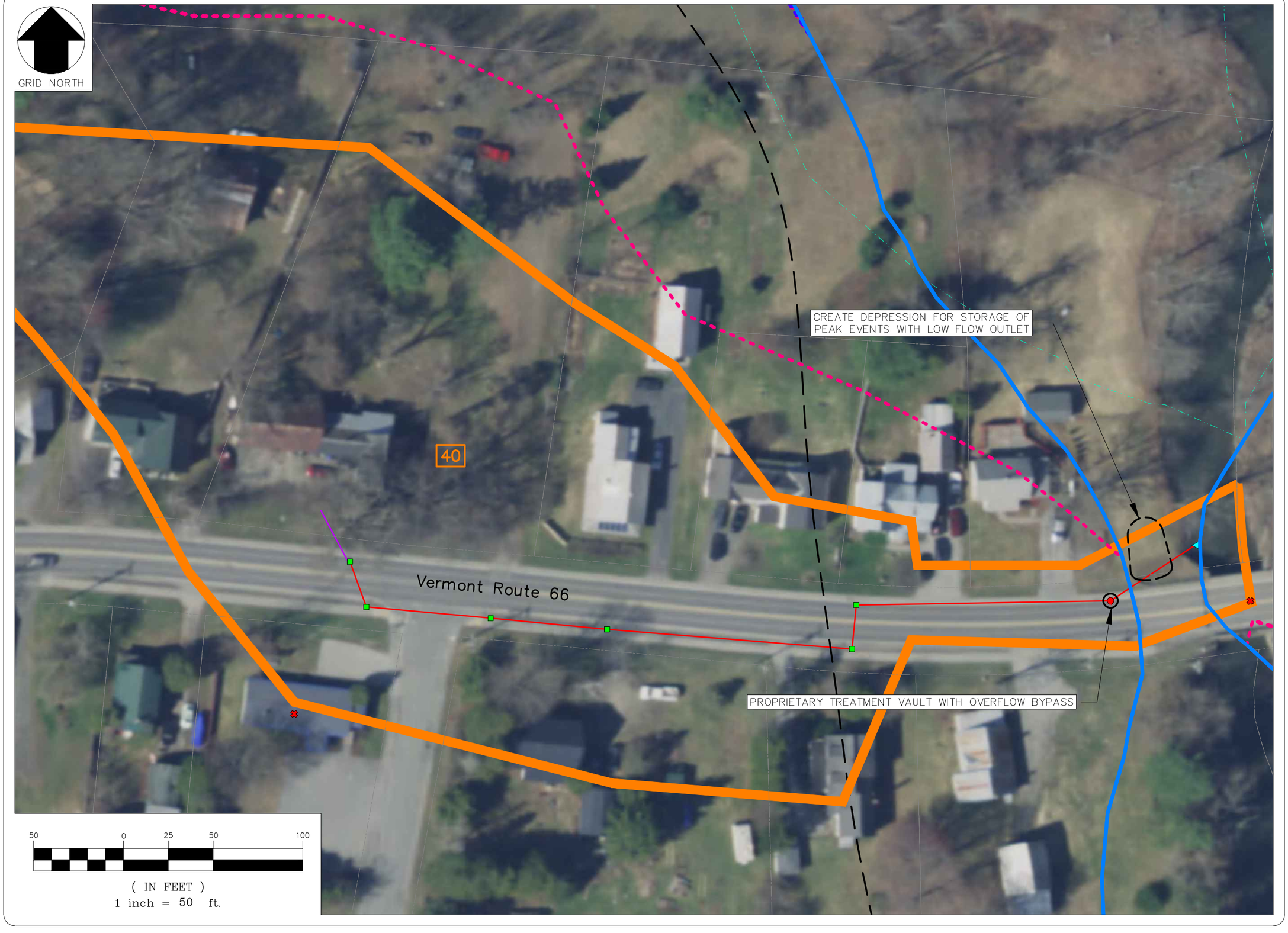
Retrofit:
Capturing and treatment of the entire watershed and contributing impervious surfaces requires modifications to collect runoff that otherwise flows unconcentrated across the watershed. The presence of the collection system draining impervious surface along Route 66 lends itself to an in-line or end of the pipe treatment practice with the potential of treating water from 0.75 acres of impervious surfaces with a 1.5 acre watershed draining to the system. An end of the pipe treatment would likely require obtaining additional land from a private homeowner adjacent to Ayers Brook. In addition, a constructed treatment practice, while feasible, would need to be within the mapped floodway/flood hazard area and require permitting through the Town. Flows during a Water Quality (WQ) storm event of 1-inch of rain fall depth could be accommodated and treated within a proprietary treatment practice installed in line with the collection system in place of an existing drainage manhole. The proprietary filtering system such as a "Jellyfish Filter" as manufactured by Contech or similar, could provide effective treatment. Additionally, redirecting the collection system outfall pipe to an excavated depression on private land adjacent to the brook could provide flow retention from this watershed. The proprietary filtering practice is limited as it does not allow for recharge of runoff nor does it attenuate flows. The suggested depression downstream of the filter could serve to infiltrate flows and attenuate larger storm events. Confirmation of the collection system invert elevations and overall collection system profile would be necessary prior to proceeding with further design. Landowner discussion for work on private property should be had and approved prior to progressing with a design in which a treatment practice or excavated basin is considered.

WATERSHED #40:

Watershed #40					
Preliminary Opinion of Project Cost					
Item No.	Description	Unit Quantity		Unit Cost	Total Cost
1	"Jellyfish" Concrete Treatment Unit	1	LS	$ 50,000	$ 50,000
2	Installation of Treatment Unit	1	LS	$ 17,500	$ 17,500
3	Roadway Trench Patch & Curbing	1	LS	$ 5,000	$ 5,000
4	New Outfall w/ Stone Stabilization	1	LS	$ 2,000	$ 2,000
5	Site Excavation	1	LS	$ 10,000	$ 10,000
6	Dry Pond Outlet	1	LS	$ 1,500	$ 1,500
7	Traffic Control & Signage	1	LS	$ 2,500	$ 2,500
8	Mobilization / Demobilization	1	LS	$ 2,500	$ 2,500
9	EPSC Measures (3.5%)	1	LS	$ 3,185	$ 3,185
10	General Conditions (5%)	1	LS	$ 4,550	$ 4,550
				Subtotal of Construction Cost	$ 98,735
				Engineering Services	$ 7,500
				Contingency (25%)	$ 26,559
				Total Estimated Project Cost	**$ 132,794**

Notes:

1) "Jellyfish" structure is the cost of the unit delivered, but not installed.
2) Trench Patch includes initial demo and removal.
3) 8-inch outlet with beehive grate.
4) Site excavation includes cost berm materials and create dry pond.
5) Traffic Control and Signage will be required for this location.
6) General Conditions includes necessary bonds, insurance, site maintenance.



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

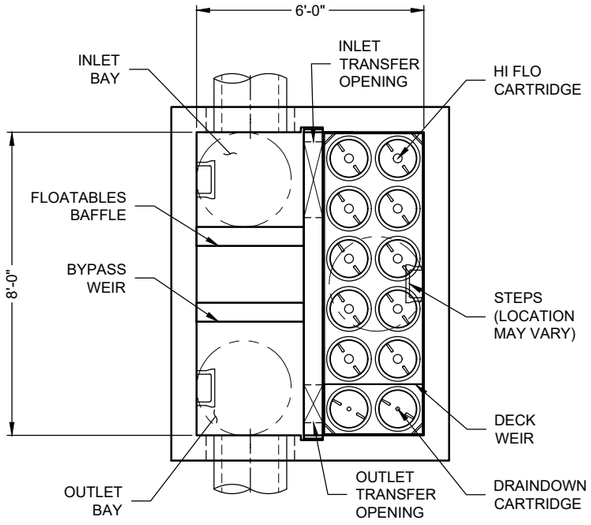
TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

DATE ISSUED:	12/12/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED #40 TREATMENT

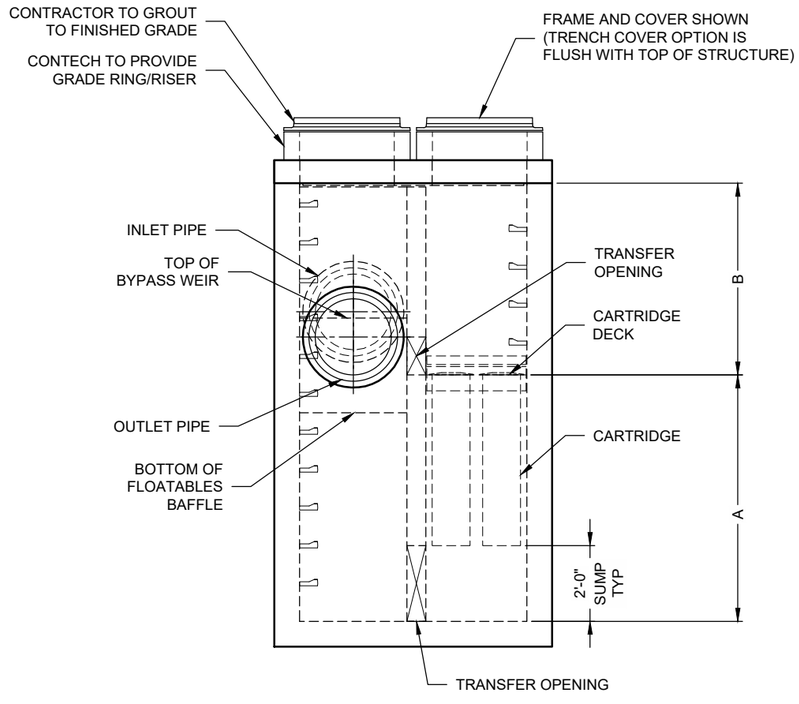
SKETCH NO.
10B

REF. DRAWING:



PLAN VIEW

(TOP SLAB NOT SHOWN FOR CLARITY)



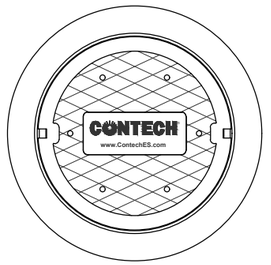
ELEVATION VIEW

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE LENGTH AND THE NUMBER OF CARTRIDGES. THE STANDARD PEAK DIVERSION STYLE WITH PRECAST TOP SLAB IS SHOWN. ALTERNATE OFFLINE VAULT AND/OR SHALLOW ORIENTATIONS ARE AVAILABLE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD

CARTRIDGE SELECTION

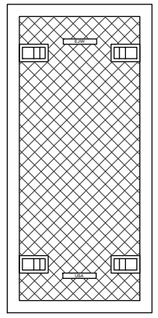
CARTRIDGE LENGTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (A)	6'-6"	5'-4"	4'-3"	3'-3"
FLOW RATE HI-FLO / DRAINDOWN (CFS) (PER CART)	0.178 / 0.089	0.133 / 0.067	0.089 / 0.045	0.049 / 0.025
MAX. TREATMENT (CFS)	1.96	1.47	0.98	0.54
DECK TO INSIDE TOP (MIN) (B)	5.00	4.00	4.00	4.00



FRAME AND COVER

(DIAMETER VARIES)

N.T.S.



24"

TRENCH COVER

(LENGTH VARIES)

N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED (HF / DD)	*
CARTRIDGE LENGTH	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

SEE GENERAL NOTES 6-7 FOR INLET AND OUTLET HYDRAULIC AND SIZING REQUIREMENTS.

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES:

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE. www.ContechES.com
3. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 OR PER APPROVING JURISDICTION REQUIREMENTS, WHICHEVER IS MORE STRINGENT, ASSUMING EARTH COVER OF 0' - 10', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE CONTECH LOGO.
5. STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857, ASTM C-918, AND AASHTO LOAD FACTOR DESIGN METHOD.
6. OUTLET PIPE INVERT IS EQUAL TO THE CARTRIDGE DECK ELEVATION.
7. THE OUTLET PIPE DIAMETER FOR NEW INSTALLATIONS IS RECOMMENDED TO BE ONE PIPE SIZE LARGER THAN THE INLET PIPE AT EQUAL OR GREATER SLOPE.
8. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT).
D. CARTRIDGE INSTALLATION, BY CONTECH, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

Jellyfish Filter

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

JELLYFISH JFPD0806 STANDARD DETAIL PEAK DIVERSION CONFIGURATION

Filtration as a Stormwater Management Strategy

Stormwater regulations are increasingly calling for more robust treatment levels. In addition to the removal of suspended solids, many regulations now require best management practices to remove significant amounts of nutrients, metals, and other common pollutants found in stormwater runoff. Meeting these regulations often requires the use of a filtration solution.

Low Impact Development (LID) and Green Infrastructure (GI) are complimented by filtration solutions. Benefits of LID and GI systems include retaining runoff and aesthetic appeal. Keeping LID and GI sites free from fine sediments, oils, trash, and debris while functioning as designed can be time consuming and costly.

As a result, the practice of combining LID and GI with filtration is becoming more common. Providing a single point of maintenance promotes proper system functionality and increases the aesthetic appeal by removing unsightly trash and debris.

A Jellyfish Filter Curb Inlet pretreats runoff entering a bioretention system

The Jellyfish® Filter - Setting New Standards in Stormwater Treatment

The Jellyfish Filter is a stormwater quality treatment technology featuring high surface area and high flow rate membrane filtration at low driving head. By incorporating pretreatment with light-weight membrane filtration, the Jellyfish Filter removes floatables, trash, oil, debris, TSS, fine silt-sized particles, and a high percentage of particulate-bound pollutants; including phosphorus and nitrogen, metals and hydrocarbons.

The high surface area membrane cartridges, combined with up flow hydraulics, frequent backwashing, and rinsable/reusable cartridges ensures long-lasting performance.

The Jellyfish Filter.

Jellyfish® Filter Features and Benefits

FEATURES	BENEFITS
1. High surface area, high flow rate membrane filtration	1. Long-lasting and effective stormwater treatment
2. Highest design treatment flow rate per cartridge (up to 80 gpm (5 L/S)	2. Compact system with a small footprint, lower construction cost
3. Low driving head (typically 18 inches (457 mm) or less)	3. Design Flexibility, lower construction cost
4. Lightweight cartridges with passive backwash	4. Easy maintenance and low life-cycle cost
5. 3rd party verified field performance per TARP Tier II protocol	5. Superior pollutant capture with confidence

Jellyfish® Filter Applications

- Urban development
- Highways, airports, seaports, and military installations
- Commercial and residential development, infill and redevelopment, and stormwater quality retrofit applications
- Pretreatment for Low Impact Development (LID), Green Infrastructure (GI), infiltration, and rainwater harvesting and reuse systems
- Industrial sites

A Jellyfish Filter pretreats a bioretention/ bioswale system at a commercial site in Ontario, Canada.

A catch basin Jellyfish Filter is installed in a commercial development in Virginia.

A Jellyfish Filter provides treatment at an Industrial Park in Lake Tahoe, Nevada.

Jellyfish® Filter Field Performance Test Results

POLLUTANT OF CONCERN	% REMOVAL
Total Trash	99%
Total Suspended Solids (TSS)	89%
Total Phosphorus (TP)	59%
Total Nitrogen (TN)	51%
Total Copper (TCu)	>80%
Total Zinc (TZn)	>50%
Turbidity (NTU)	<15%

Sources:
TARP II Field Study – 2012 JF 4-2-1 Configuration
MRDC Floatables Testing – 2008 JF6-6-1 Configuration

The pleated tentacles of the Jellyfish Filter provide a large surface area for pollutant removal.

Jellyfish® Filter Approvals

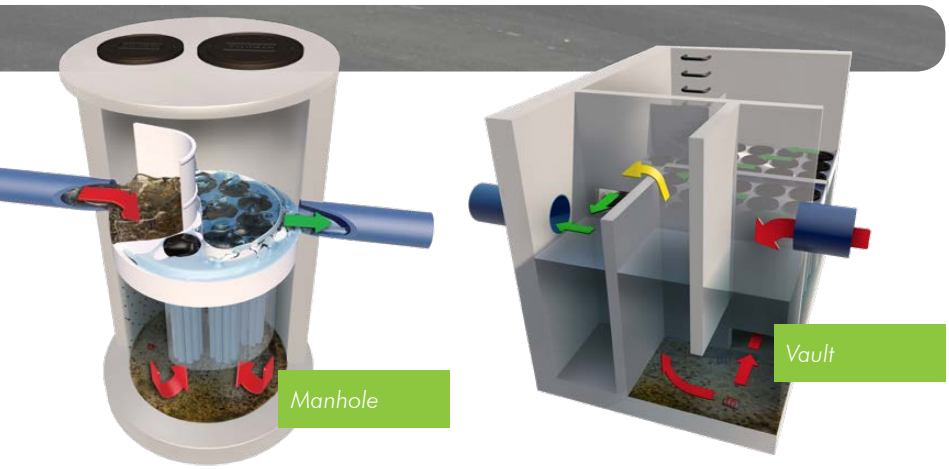
The Jellyfish Filter is approved through numerous state and federal verification programs, including:

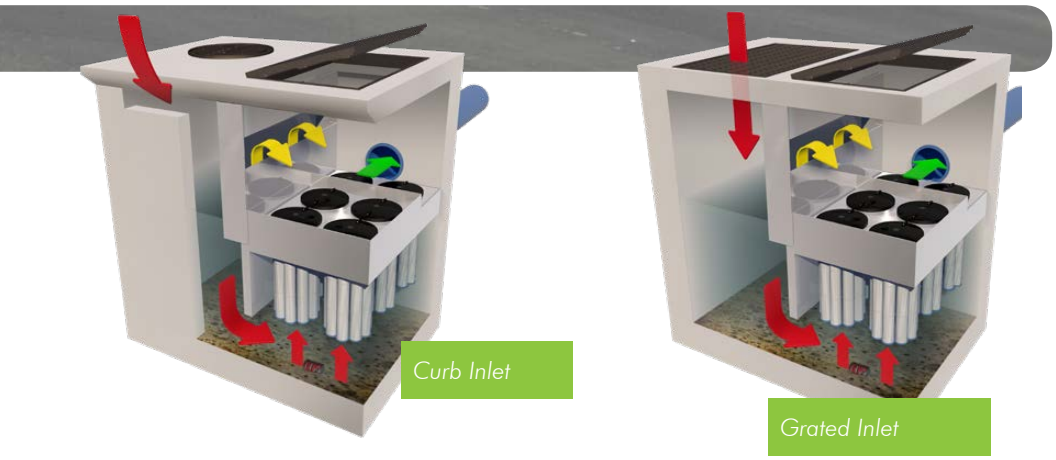
- New Jersey Corporation for Advanced Technology (NJCAT) – Field Performance Verification per TARP Tier II Protocol
- Washington State Department of Ecology (TAPE –CULD)
- Maryland Department of the Environment (MD DOE)
- Texas Commission on Environmental Quality (TCEQ)
- Virginia Department of Environmental Quality (VA DEQ)
- New York Department of Environmental Conservation (DEC)
- City of Denver
- Los Angeles County
- Canada ISO 14034 Environmental Management – Environmental Technology Verification (ETV)
- Ontario Ministry of the Environment – New Environmental Technology Evaluation (NETE) – Certification

Learn more at www.ContechES.com/jellyfish

Jellyfish® Filter Configurations

The Jellyfish Filter is available in a variety of configurations. Typically, 18 inches (457 mm) of driving head is designed into the system. For low drop sites, the designed driving head can be less.





Lightweight Jellyfish Filter Configurations

Custom configurations include Jellyfish Filter tanks made from fiberglass for site specific applications.

A Jellyfish Filter was constructed from fiberglass to reduce the weight of the system, allowing for a suspended installation above an underground parking structure. The reduced weight eliminated the need for structural changes, and suspending the Jellyfish resulted in no loss of parking space, maximizing real-estate value.

Jellyfish® Filter Maintenance

Inspection and maintenance activities for the Jellyfish Filter typically include:

- Visual inspection of deck, cartridge lids, and maintenance access wall.
- Vacuum extraction of oil, floatable trash/debris, and sediment from manhole sump.
- External rinsing and re-installing of filter cartridges.
- Replacement of filter cartridge tentacles as needed. Cartridge replacement intervals vary by site; replacement is anticipated every 2-5 years.

The Jellyfish Filter tentacle is light and easy to clean.

Jellyfish® Filter Inspection and Maintenance Video

Inspecting and maintaining the Jellyfish Filter is easier than you may think. Watch the Jellyfish inspection and maintenance video at **www.ContechES.com/jellyfish**

VERMONT

Vermont Department of Environmental Conservation
Watershed Management Division
Main Building, Second Floor
One National Life Drive
Montpelier, VT 05620-3522

Agency of Natural Resources

(phone) 802-828-1535

June 25, 2018

Contech Engineered Solutions, LLC
9025 Centre Pointe Drive, Suite 400
West Chester, OH 45069
Attn: Derek M. Berg

Dear Mr. Berg:

The Stormwater Program has reviewed the Jellyfish® Filter as an alternative stormwater treatment practice through the evaluation process in Section 4.4.1 of the 2017 Vermont Stormwater Management Manual (VSMM).

Based on our review, we believe that Contech Engineered Solutions, LLC has provided the Stormwater Program with testing data showing that the system provides total phosphorus and total suspended solids removal efficiency sufficient to meet or exceed the standards in the Vermont Stormwater Management Manual as a stand-alone Tier 3 Practice.

Please be advised that this letter serves as preliminary approval and does not constitute a final act or decision of the Secretary. Final approval of the use of the Jellyfish® Filter, or other alternative practice, is project specific and is necessarily done through the issuance of an operational stormwater permit, until such time that the Vermont Stormwater Management Manual is formally revised to include the practice.

In developing permit conditions for any project relying on the Jellyfish® Filter, the Stormwater Program is likely to include the following permit conditions and application requirements:

1) The Jellyfish® Filter must be designed, assembled, installed, operated, and maintained according to the specifications of Contech Engineered Solutions, Inc.

2) The system must be designed to accommodate 100% treatment of the requisite water quality volume through sizing for the peak rate of the water quality storm without bypass.

As part of this preliminary approval, the product will be listed on the Vermont Department of Environmental Conservation's Alternative Practices website at http://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/Alt-STPs.

Until such a time that the practice is incorporated into the VSMM through rulemaking, projects utilizing the practice that are subject to operational stormwater permitting require an individual permit application.

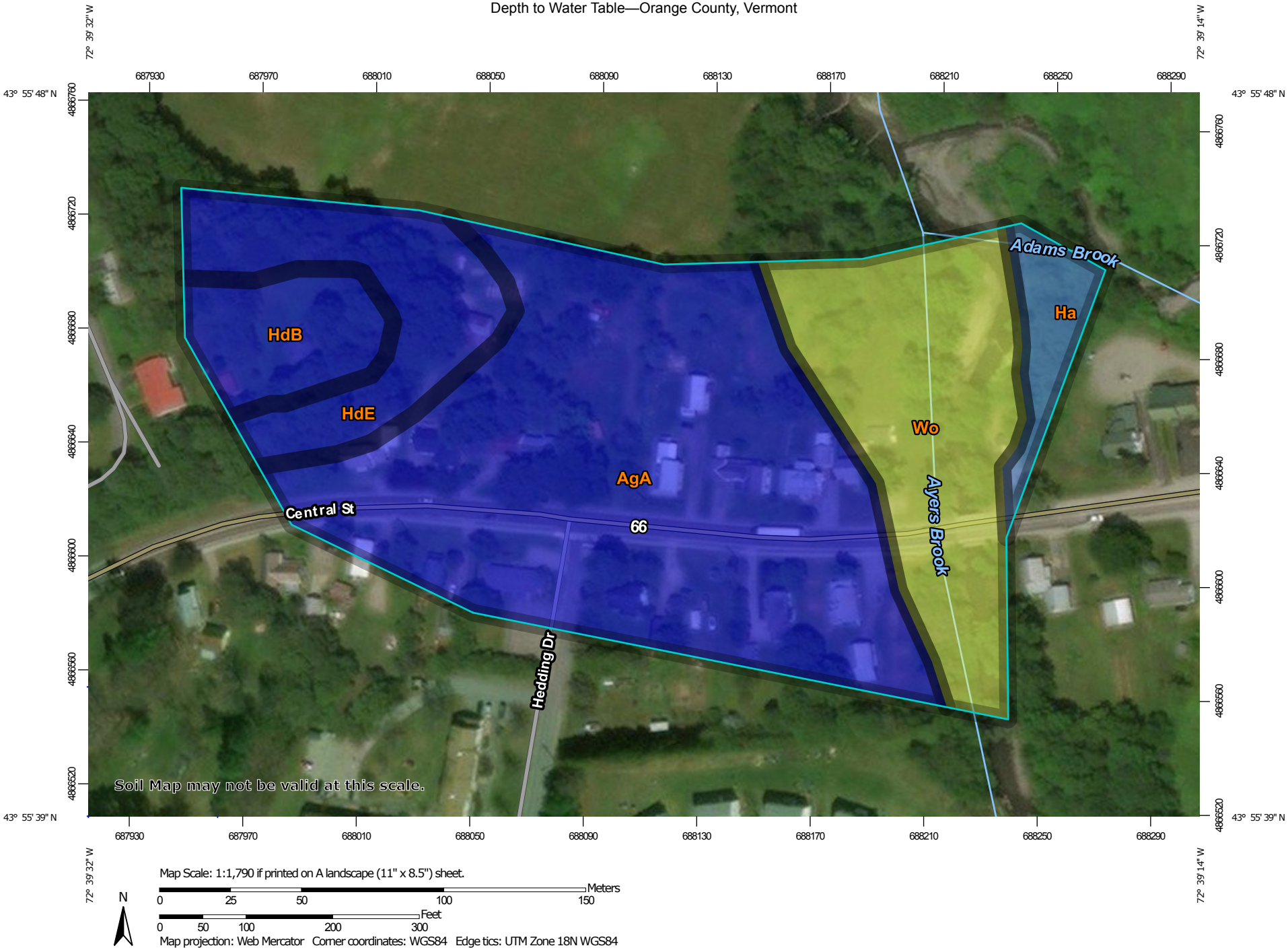
If local jurisdictions or other parties request a copy of a letter from VT DEC verifying preliminary practice approval, please use this letter for that purpose.

Thank you for your interest in providing alternatives to the stormwater design community in Vermont. If you have any questions concerning this preliminary approval, please contact the Stormwater Program.

Sincerely,

Kevin Burke, Environmental Analyst
Vermont DEC – Stormwater Program

Depth to Water Table—Orange County, Vermont



Map Scale: 1:1,790 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	>200	5.4	53.6%
Ha	Hadley very fine sandy loam	153	0.4	4.1%
HdB	Hartland silt loam, 0 to 8 percent slopes	>200	0.7	7.0%
HdE	Hartland silt loam, 25 to 50 percent slopes	>200	1.4	13.4%
Wo	Winooski very fine sandy loam	69	2.2	21.9%
Totals for Area of Interest			**10.1**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Hydrologic Soil Group—Orange County, Vermont

Map Scale: 1:1,790 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	B	5.4	53.6%
Ha	Hadley very fine sandy loam	B	0.4	4.1%
HdB	Hartland silt loam, 0 to 8 percent slopes	B	0.7	7.0%
HdE	Hartland silt loam, 25 to 50 percent slopes	B	1.4	13.4%
Wo	Winooski very fine sandy loam	C	2.2	21.9%
Totals for Area of Interest			**10.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #41:

Description:
The watershed as mapped by VTDEC is 13.7 acres with 33.9% impervious surfaces (4.64 acres). The contributing area is comprised of a portion of Hedding Drive, the Village Circle residential development, a commercial property of approximately 2 acres, and a portion of the town highway garage property. Surface cover is predominantly grassed within the residential area and paved for the commercial area. The watershed is relatively flat with slopes of 0 to 8%. Based on soils data, the existing soils are classified as Hadley very fine sandy loam, Hydrologic Soil Group 'B' designation and have a depth to groundwater of 153 centimeters (60 inches). Runoff primarily flows overland from west to east across the watershed before discharging into Ayers Brook or the Third Branch of the White River. A portion of the Village Circle area is collected in a small closed drainage system that daylights flows south of the residences in a lawn area. Without an identified retrofit site, investigations centered on areas where collected runoff could be effectively treated at the end of pipe locations. A small collection system captures runoff from the drive and portions of residential rooftops within the Village Circle area. The collected runoff is then discharged via a partially submerged outfall pipe where it is directed across grassed lawn ultimately flowing to the nearby receiving stream.

Retrofit:
Capturing and treatment of the entire watershed and contributing impervious surfaces requires modifications to collect runoff that otherwise flow unconcentrated across the watershed. The presence of the collection system draining the Village Circle area lends itself to an end of the pipe treatment practice in this location. The practice could potentially treat approximately 0.7 acres of impervious surface from a 1.7 acre subwatershed. The location could accommodate the installation of a dry swale, infiltration basin, bioretention, or filtering system provided the depth to groundwater elevation is confirmed and soils infiltration testing is performed. Since existing ground cover in the area is grassed, a dry swale treatment practice seems to be the best fit for this area. Early preliminary calculations indicate that a dry swale treatment practice with an area of 335 square feet would be necessary to accommodate the Water Quality Volume (0.058 acre-feet) from this area. This assumes a sand filter bed with depth of 2 feet and a drain time of 1.75 days. The overland flow of runoff from impervious surfaces across vegetated areas may also provide the necessary pretreatment without the need for constructing a sediment forebay or similar pretreatment practice. Dry swales designed for infiltration provide water quality, recharge and credit towards runoff reduction if designed for larger storms.

While a specific treatment practice was not identified for the portion of the watershed coming off the Town Garage property, there are opportunities to improve water quality. Due to the close proximity of material stockpiles and gravel parking to the adjacent river, we suggest: Moving material stockpiles and gravel parking back away from the river where possible and installing plantings to restore the riparian buffer; consider paving/stabilizing parking areas and installing a stone diaphragm along the downhill edge to trap sediment; place material stockpiles under cover to reduce the potential for discharging pollutants.

WATERSHED #41:

Watershed #41					
Preliminary Opinion of Project Cost					
Item No.	Description	Unit Quantity		Unit Cost	Total Cost
1	Excavate Dry Swale	30	CY	$ 30	$ 900
2	Furnish & Install Filter Bed Material	25	CY	$ 75	$ 1,875
3	Surface Restoration	1	LS	$ 2,000	$ 2,000
4	Stone Check Dam	1	LS	$ 750	$ 750
5	Mobilization / Demobilization	1	LS	$ 1,250	$ 1,250
6	General Conditions (5%)	1	LS	$ 339	$ 339
				Subtotal of Construction Cost	$ 7,114
				Engineering Services	$ 3,200
				Contingency (25%)	$ 2,578
				Total Estimated Project Cost	**$ 12,892**

Notes:

1) Estimated dry swale area is 335 square feet.

2) Surface restoration includes topsoil, seed and mulch.

3) General Conditions includes necessary bonds, insurance, site maintenance.

Version: 11/15/18

Project Name:	**Randolph Mini Stormwater**
Discharge Point:	**Watershed #41**
Dry Swale #	**1**

Dry Swale (4.3.2)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	1.500	0.000	1.500
2	New Impervious (acres)	0.700	0.000	0.700
3	Redeveloped Impervious	0.000	0.000	0.000
		WQ_V for credit	WQ_V not for credit	Total WQ_V
4	WQ_V to practice	0.0588	0.0000	0.0588

Modified CN for WQ (1.0") storm: 93

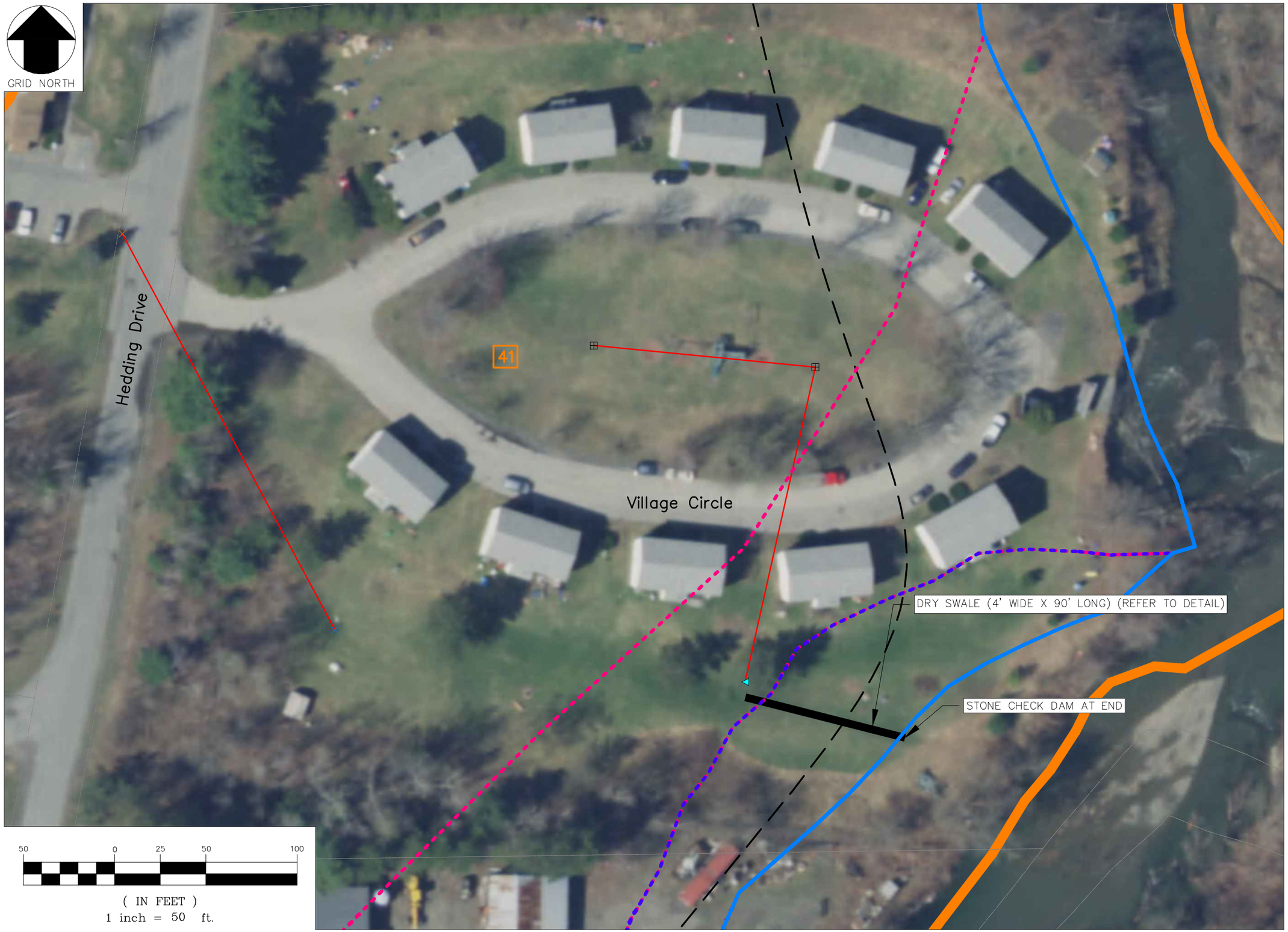
5	Designed to Infiltrate?	(●) Yes ( ) No
6*	Design Volume for Infiltration T_V (acre-feet)	0.0588 ← Tv value to enter on the Standards Compliance Workbook for this practice unless practice has under drain, then use answer to Question 36
7	Designed to Infiltrate >WQ_V?	( ) n/a ( ) No ( ) Yes

Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.2.1)	Response	Attachment location
8	Is the maximum longitudinal slope of the swale ≤5% without check dams or similar grade controls or ≤6% with grade controls?	(●) Yes ( ) No	
9*	Is the SHGWT at or below the bottom of the practice?	( ) Yes ( ) No	
10*	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	( ) Yes ( ) No	

	Conveyance (4.3.2.2)	Response	Attachment location
11	Has an underdrain been provided? (required if the underlying soils have an infiltration rate of less than 0.2 inches per hour)	( ) Yes ( ) No	
12*		( ) Yes ( ) No	
13	Is the peak velocity for the 1-year storm non-erosive (3.5-5 fps)?	( ) Yes ( ) No	



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

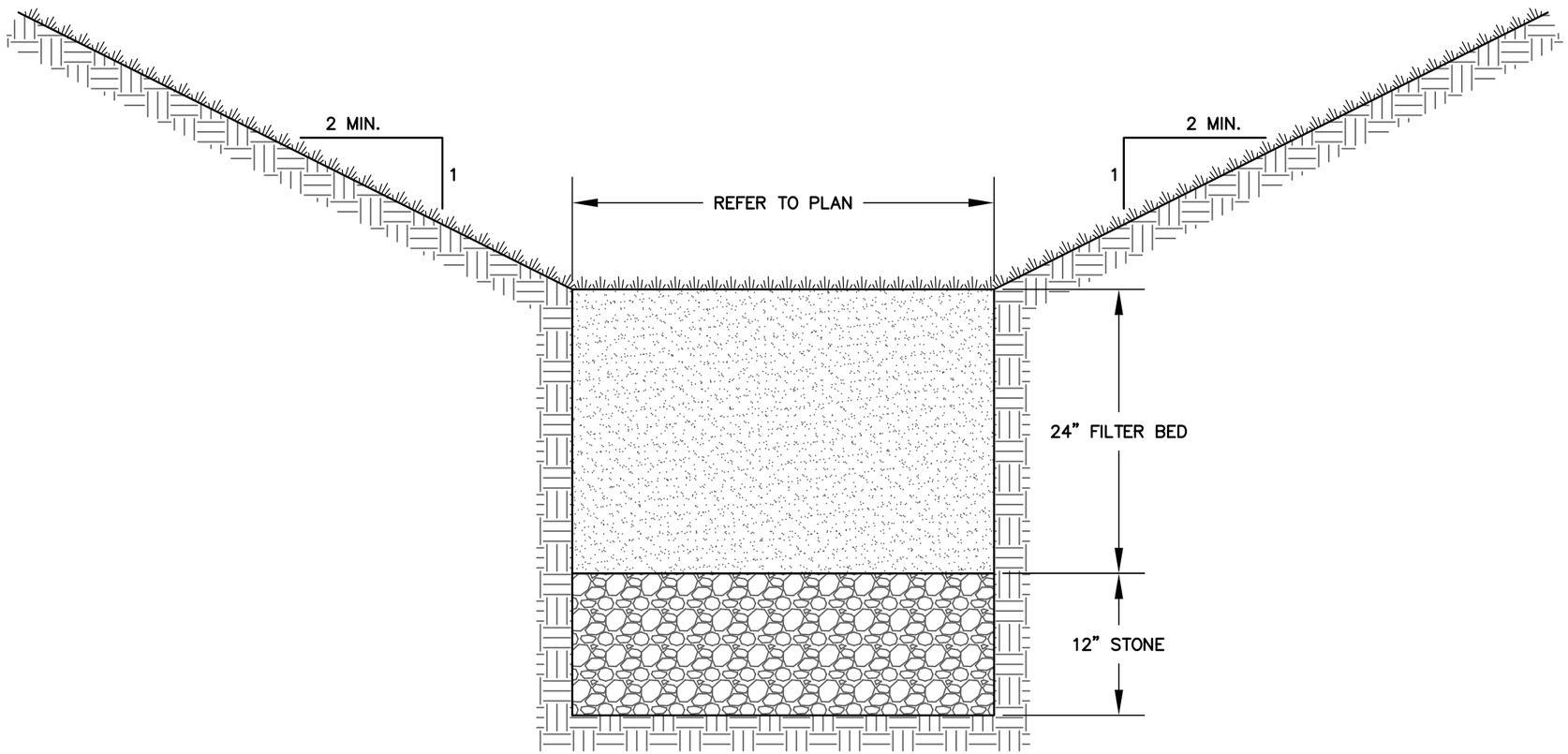
TITLE:

SUB-WATERSHED #41 TREATMENT

SKETCH NO.

8A

REF. DRAWING:



NOTE:
CHANNEL SLOPE SHALL BE 4% MAX.

DRY SWALE DETAIL

NOT TO SCALE

OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

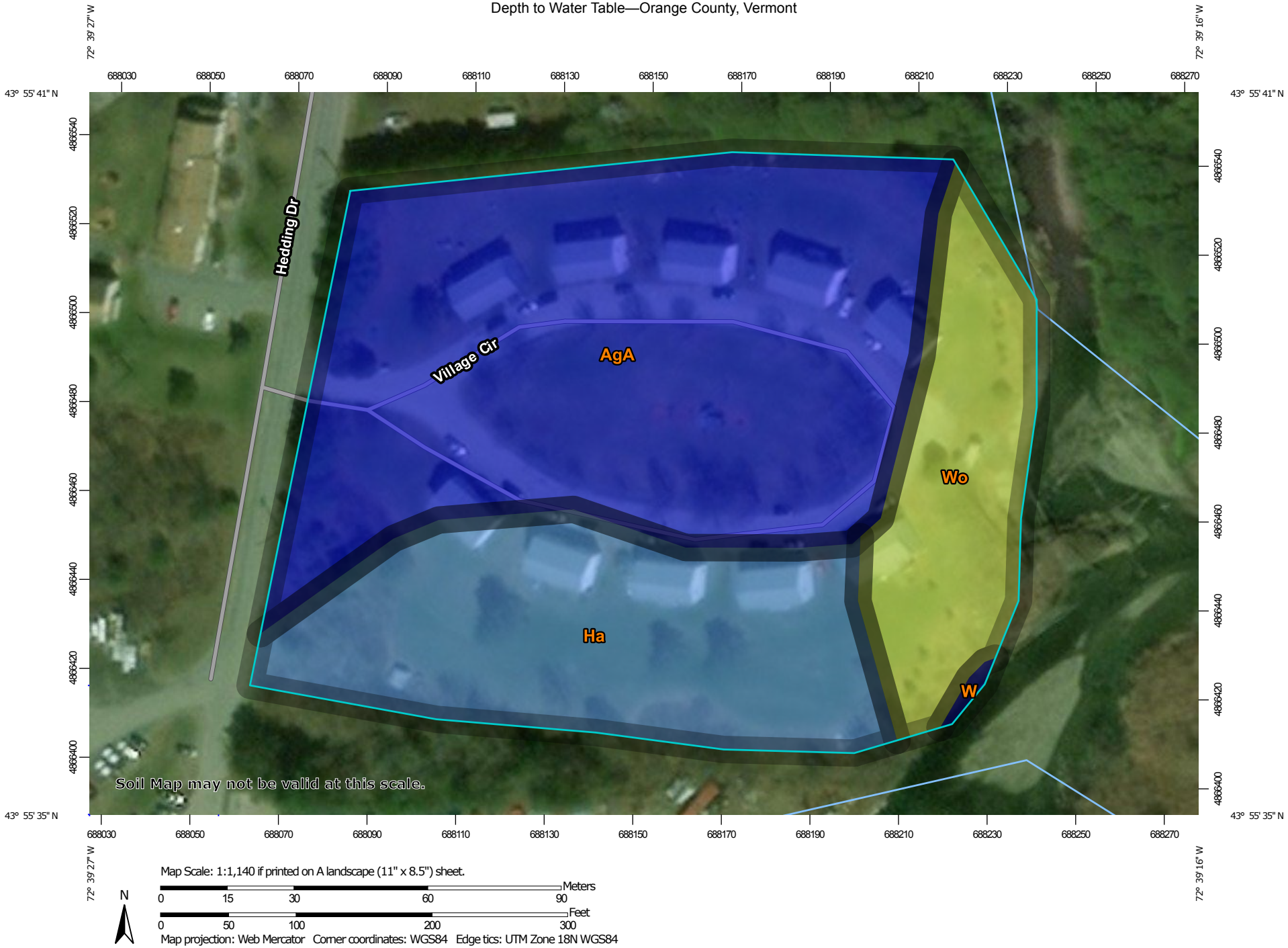
DATE ISSUED:	12/10/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	SHOWN
PROJECT NO.:	923.001

TITLE:
DRY SWALE DETAIL

SKETCH NO.
8A-1

REF. DRAWING:

Depth to Water Table—Orange County, Vermont



Map Scale: 1:1,140 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	>200	2.8	56.1%
Ha	Hadley very fine sandy loam	153	1.4	28.3%
W	Water	>200	0.0	0.2%
Wo	Winooski very fine sandy loam	69	0.8	15.4%
Totals for Area of Interest			**5.1**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

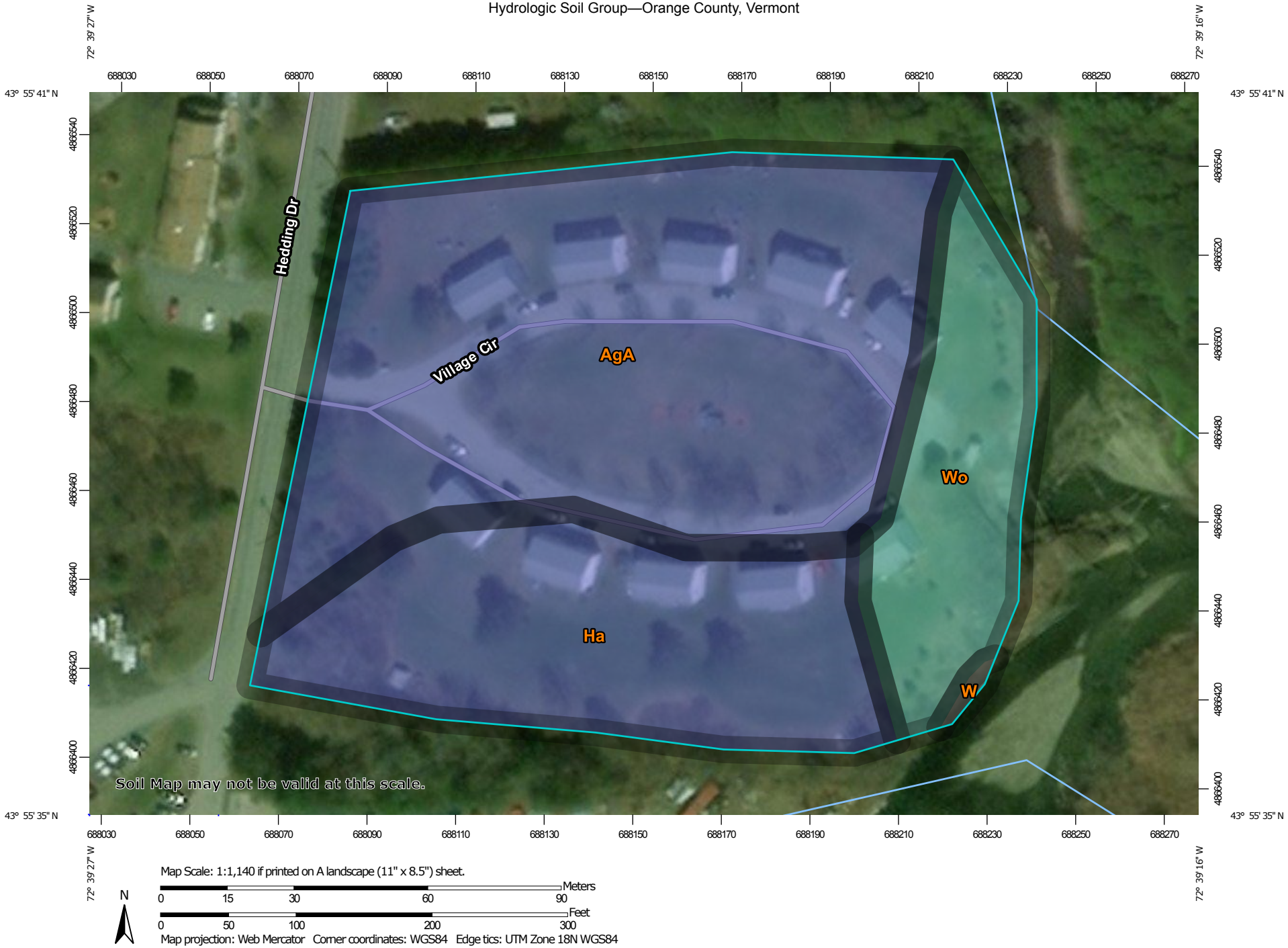
Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Hydrologic Soil Group—Orange County, Vermont



Map Scale: 1:1,140 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	B	2.8	56.1%
Ha	Hadley very fine sandy loam	B	1.4	28.3%
W	Water		0.0	0.2%
Wo	Winooski very fine sandy loam	C	0.8	15.4%
Totals for Area of Interest			**5.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #42:

Description:
Watershed as mapped by VTDEC is approximately 0.7 acres and is noted as 86.2% impervious surfaces (0.6 acres). The contributing area is comprised of a section of Hedding Drive and the Town's wastewater treatment plant and Highway Department. Impervious surfaces associated with the wastewater plant have been permitted under General Permit #7075-9015 and receive treatment via a grassed swale. Since this watershed was recently permitted in accordance with the 2002 Stormwater Manual a retrofit treatment practice for this watershed was not identified/recommended.

Permit Number 7075-9015
Project ID Number BR95-0050

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AUTHORIZATION TO DISCHARGE UNDER
GENERAL PERMIT 3-9015

A determination has been made that the applicant:

Town of Randolph
C/o Town Manager
Drawer B
Randolph, VT 05060

Impervious Area: .71 acres

meets the criteria necessary for inclusion under General Permit 3- 9015. Hereinafter the named applicant shall be referred to as the permittee. Subject to the conditions of General Permit No. 3-9015, the permittee is authorized to discharge stormwater from Randolph Treatment Facility Upgrade located on Hedding Drive in Randolph, Vermont to the Third Branch of the White River.

Manner of Discharge:

Stormwater runoff from rooftops, access drives and parking areas via nonrooftop disconnection and sheetflow to a grass channel to the Third Branch of the White River.

Design: This project shall be constructed and operated in accordance with the site plans and details designed by Dubois & King Inc. (Sheets C2, C3 & C14, all dated May 2013; and all supporting information).

By reference, the above noted plans are made part of this authorization.

Compliance with General Permit 3-9015 and this Authorization
The permittee shall comply with this authorization and all the terms and conditions of General Permit 3-9015, including the payment of annual operating fees to the Department. A billing statement for such fees will be sent to the permittee each year. The first year's statement is enclosed. Any permit non-compliance, including a failure to pay the annual operating fee, constitutes a violation of 10 V.S.A. Chapter 47 and may be grounds for an enforcement action or revocation of this authorization to discharge.

Transferability
This authorization to discharge is not transferable to any person except in compliance with Part VI.D. of General Permit 3-9015. A copy of General Permit 3-9015 is available from the Department via the internet at
http://www.anr.state.vt.us/dec/waterq/stormwater/docs/sw_3-9015-finalpermit.pdf

Changes to Permitted Development
In accordance with Part V.G. of General Permit 3-9015, the permittee shall notify the Department of any planned development or facility expansions or changes that may result in new or increased stormwater discharges. The Department shall determine the appropriateness of continued inclusion under General Permit 3-9015 by the modified development or facility.

Annual Inspection and Report
The stormwater collection, treatment and control system shall be properly operated. The permittee shall submit an annual inspection report on the operation, maintenance and condition of the stormwater collection, treatment and control system. The inspection shall be conducted between the conclusion of spring snow melt and June 15th of each year and the inspection report shall be submitted to the Secretary by July 15th of each year, or by July 30th if performed by a utility or municipality pursuant to a duly adopted stormwater management ordinance. The inspection report shall note all problem areas and all measures taken to correct any problems and to prevent future problems.

Restatement of Compliance
An initial statement of compliance, signed by a designer, must be submitted to the Stormwater Management Program no later than 6 months following completion of construction of the stormwater management system. Then, every 5 years, the permittee shall submit to the Department a written statement signed by a designer that the stormwater collection, treatment and control system authorized herein is properly operating and maintained. The first re-statement of compliance is due November 14, 2018. Failure to submit a designer's restatement of compliance shall constitute a violation of General Permit 3-9015 and may result in the revocation of this authorization to discharge. Forms for completing this requirement are available on the Stormwater Management Program's website.

Recording in Land Records: The permittee shall record a one-page notice of issuance of this discharge permit in the local land records within fourteen (14) days of issuance of this authorization to discharge on the form provided by the Secretary, per §18-312 of Stormwater Management Rule. The permittee shall provide a copy of the recording to the Stormwater Management Program within fourteen (14) days of the permittee's receipt of the copy of the recording from the local land records.

Renewable Energy Projects – Right to Appeal to Public Service Board:
Any appeal of this decision must be filed with the clerk of the Vermont Public Service Board pursuant to 10 V.S.A. §8506 within 30 days of the date of this decision. The appellant must file with the Clerk an original and six copies of its appeal. The appellant shall provide notice of the filing of an appeal in accordance with 10 V.S.A. §8504(c)(2), and shall also serve a copy of the Notice of Appeal on the Vermont Department of Public Service. For information, see the Rules and General orders of the Public Service Board available on line at www.psb.vermont.gov. The address for the Public Service Board is 112 State Street Montpelier, Vermont 05620-2701 (Tel. #802-828-2358).

All Other Projects – Right to Appeal to the Environmental Court
Pursuant to 10 V.S.A. Chapter 220, any appeal of this decision must be filed with the clerk of the Environmental Court within 30 days of the date of the decision. The

appellant must attach to the Notice of Appeal the entry fee of $250.00, payable to the state of Vermont. The Notice of Appeal must specify the parties taking the appeal and the statutory provision under which each party claims party status; must designate the act or decision appealed from; must name the Environmental Court; and must be signed by the appellant or their attorney. In addition, the appeal must give the address or location and description of the property, project or facility with which the appeal is concerned and the name of the applicant or any permit involved in the appeal. The appellant must also serve a copy of the Notice of Appeal in accordance with Rule 5(b)(4)(B) of the Vermont Rules for Environmental Court Proceedings. For further information, see the Vermont Rules for Environmental Court Proceedings, available on line at www.vermontjudiciary.org. The address for the Environmental Court is 2418 Airport Road, Suite 1, Barre, VT 05641 (Telephone #802-828-1660).

Effective Date and Expiration Date of this Authorization

This authorization to discharge shall become effective on November 14, 2013 and shall continue until November 14, 2023. The permittee shall reapply for coverage at least sixty (60) days prior to November 14, 2023.

Dated this 14th day of November, 2013.

David K. Mears, Commissioner
Department of Environmental Conservation

By Padraic Monks

Padraic Monks, Stormwater Program Manager
Stormwater Management Program

WATERSHED #45:

Description:
The watershed as mapped by VTDEC is 61.2 acres in size with 16.3% impervious surfaces (9.97 acres). Watershed #45 is designated as "Action List #2" in the DEC stormwater infrastructure mapping project report. Land use is primarily residential on ¾ acre lots, a farm field lies at the west of the watershed, and the Randolph Union High School campus occupies the remainder. The contributing area is relatively flat (0 to 3% slopes) open farm field at the upper western portion of the watershed. This then transitions to residential homes on 0.75 acre lots along Elm Street. A steep wooded area separates the upper watershed from the residential homes along Forest Street and Randolph Union High School. Based on soils mapping, the existing soils in the area of the identified retrofit site are classified as Agawam fine sandy loam, Hydrologic Soil Group 'B' designation, and have a depth to groundwater of more than 200 centimeters (6.5 feet). Runoff from the upper portion of the watershed (Elm Street area) flows overland to the east, southeast. Water that does not infiltrate flows down the steep wooded area and is then likely intercepted by existing catch basins and closed drainage piping along Forest Street. Flows are then routed by pipe and daylight into open grassed swales that lie at the rear of the high school. Ultimately, runoff flows across a grassed area and athletic fields to the receiving stream, Ayers Brook. Runoff appears to infiltrate or flow at low velocities across grassed surfaces to the receiving stream with no noted adverse impacts. The retrofit area was identified by VTDEC as part of the mapping project. A portion of the area being considered for retrofit is within the mapped floodplain and river corridor.

Retrofit:
The configuration of this watershed, with collection piping and open channels, appears to direct a majority of the runoff to the location of an identified retrofit. This enables the potential for most of the runoff from the watershed to be treated. Similar to other watersheds being reviewed, end of the pipe treatment serves to be an effective arrangement for treatment. For this watershed, we approximate that most or all of the watershed could pass through a treatment practice in this location, resulting in close to 10 acres of impervious surface being treated. Approximately 15 acres of the watershed, which is comprised of the school athletic fields flows overland to the receiving stream and would not flow through a treatment practice in this location. As the land is open and currently being used as athletic fields there is land available for treatment practices.

Since the end of pipe/swale is located on school property coordination and discussions related to ownership, access, maintenance and costs are the first step in determining whether a practice in this location can move forward. Provided there is support for a practice in this location, proposed treatment practices should consider possible constraints resulting from work within or nearly adjacent to the floodplain and implications associated with local permitting of a project within the Flood Hazard Area.

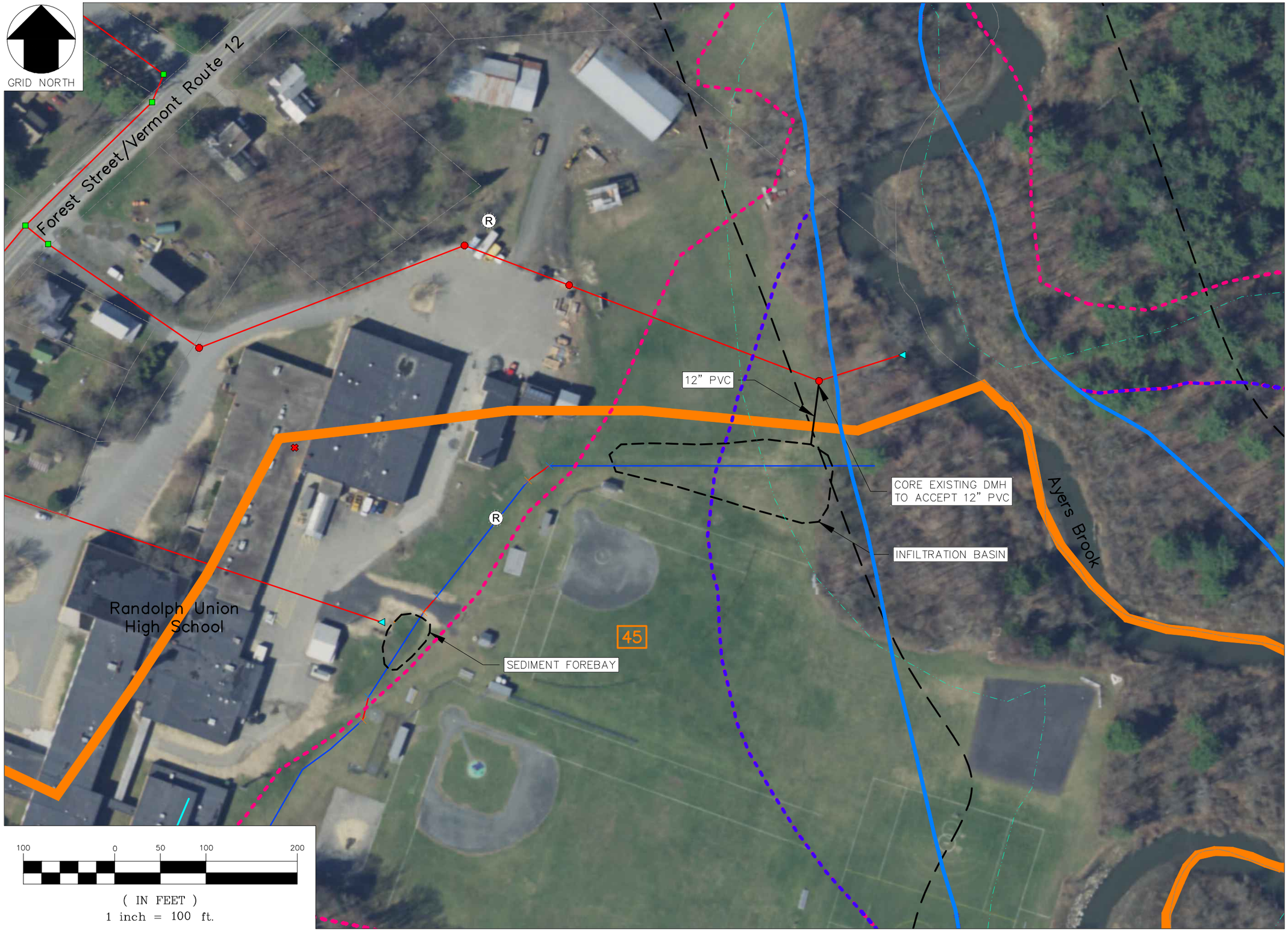
The location could accommodate the installation of a dry swale, infiltration basin, bioretention, or filtering system provided the depth to groundwater elevation is confirmed and soils infiltration testing is performed. Since existing ground cover in the area is grass, an infiltration basin treatment practice seems to be the best fit for this area. An infiltration basin can be constructed relatively easily with slight excavation and gradual berming of material.

Calculations based on a conservative infiltration rate of 5 inches/hour (Ksat rate = 10 in/hr) yielded a basin size of approximately 35,000 cubic feet or 1300 cubic yards.

Watershed #45							
Preliminary Opinion of Project Cost							
Item No.	Description	Unit Quantity		Unit Cost		Total Cost	
1	Mass Excavation (Earthwork)	1	LS	$	13,000	$	13,000
2	Outlet Pipe	60	LF	$	60	$	3,600
3	Interconnect to Existing Manhole	1	LS	$	1,250	$	1,250
4	Surface Restoration	1	LS	$	2,750	$	2,750
5	Mobilization / Demobilization	1	LS	$	1,750	$	1,750
6	EPSC Measures (3.5%)	1	LS	$	782	$	782
7	General Conditions (5%)	1	LS	$	1,118	$	1,118
					Subtotal of Construction Cost	$	24,250
					Engineering Services	$	5,000
					Contingency (25%)	$	7,312
					Total Estimated Project Cost	**$**	**36,562**

Notes:

1) Mass excavation volume is assumed based on the preliminary size of the treatment practice.
2) Outlet piping includes cost for 12-inch outlet with beehive grate.
3) Surface restoration includes topsoil, seed and mulch.
4) Mass excavation includes cost to berm materials and infiltration basin.
5) General Conditions includes necessary bonds, insurance, site maintenance.



OTTER CREEK
ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=100'
PROJECT NO.:	923.001

TITLE:

SUB-WATERSHED
#45
TREATMENT

SKETCH NO.

2A

REF. DRAWING:

Depth to Water Table—Orange County, Vermont

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	>200	7.9	88.3%
HdE	Hartland silt loam, 25 to 50 percent slopes	>200	0.0	0.0%
Wo	Winooski very fine sandy loam	69	1.0	11.7%
Totals for Area of Interest			**8.9**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December


72° 39' 36" W
72° 39' 17" W
43° 55' 56" N
43° 55' 47" N
687820
687860
687900
687940
687980
688020
688060
688100
688140
688180
688220
4867000
4866960
4866920
4866880
4866840
4866800
4866760
Wo
AgA
HdE
Ayers Brook
Soil Map may not be valid at this scale.
Map Scale: 1:1,940 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 25 50 100 150
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	B	7.9	88.3%
HdE	Hartland silt loam, 25 to 50 percent slopes	B	0.0	0.0%
Wo	Winooski very fine sandy loam	C	1.0	11.7%
Totals for Area of Interest			**8.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

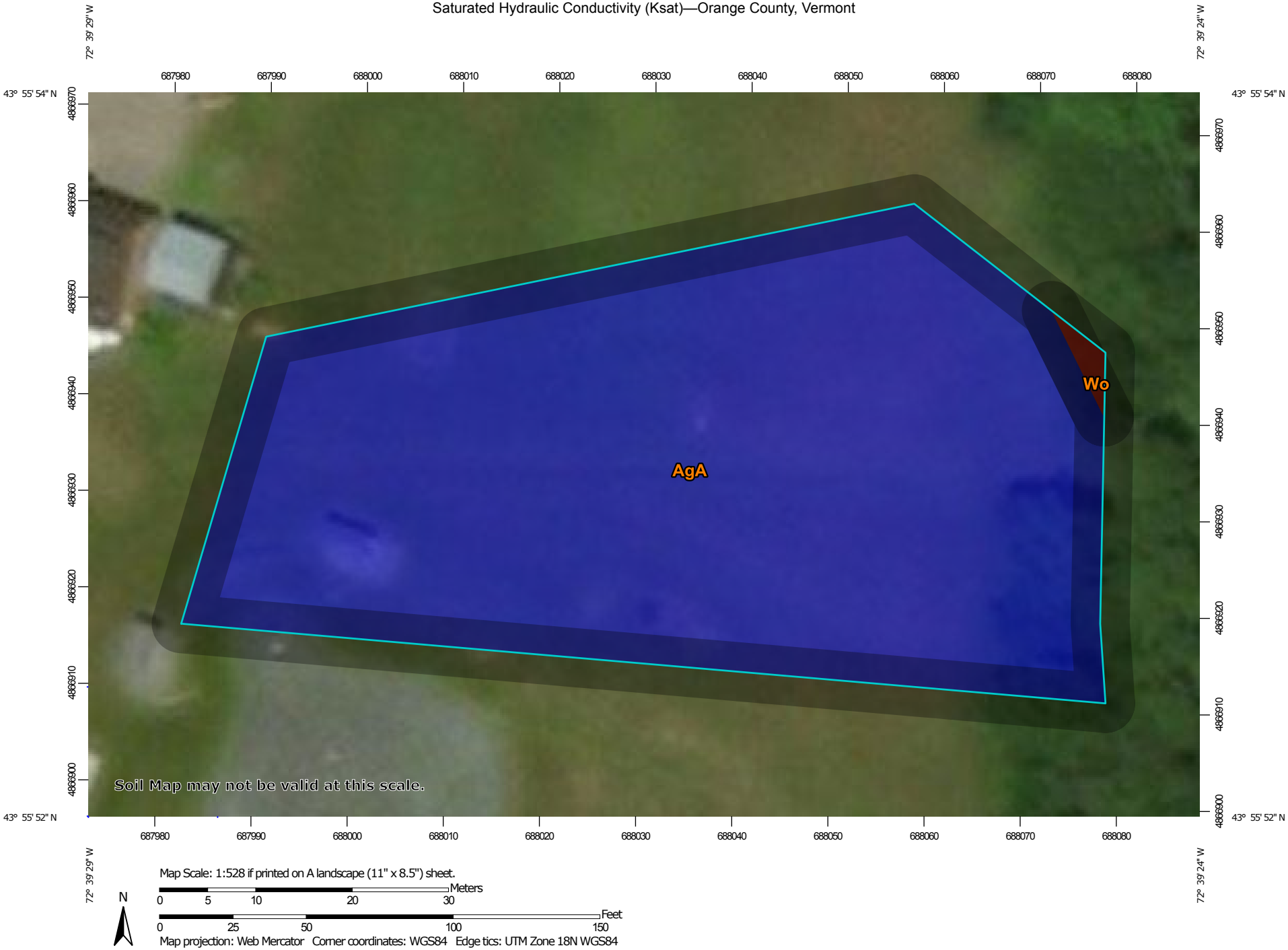
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher


72° 39' 29" W
72° 39' 24" W
43° 55' 54" N
43° 55' 52" N
687980
687990
688000
688010
688020
688030
688040
688050
688060
688070
688080
4866970
4866960
4866950
4866940
4866930
4866920
4866910
4866900
AgA
Wo
Soil Map may not be valid at this scale.
Map Scale: 1:528 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 5 10 20 30
Feet
0 25 50 100 150
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 9.1722

> 9.1722 and <= 77.6364

Not rated or not available

Soil Rating Lines

<= 9.1722

> 9.1722 and <= 77.6364

Not rated or not available

Soil Rating Points

<= 9.1722

> 9.1722 and <= 77.6364

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	77.6364	0.9	99.5%
Wo	Winooski very fine sandy loam	9.1722	0.0	0.5%
Totals for Area of Interest			**0.9**	**100.0%**

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Rating Options

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Slowest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 0

Bottom Depth: 72

Units of Measure: Inches

WATERSHED #46:

Description:
The watershed as mapped by VTDEC is 24.5 acres in size and approximately 37.8 % impervious surfaces (9.26 acres). The watershed is designated as "Action List #2" in the DEC stormwater infrastructure mapping project report. The contributing area is comprised of approximately ten residential homes; four along Hargrace Drive and the remainder lie along Forest Street. A larger area of impervious surfaces associated with the Randolph Elementary School is located at the northern edge of the watershed. The residential homes along Elm Street sit on a terraced landform that is separated from lands adjacent to Forest Street by a band of woods. Soils in the area of the identified retrofit site are classified as Agawam fine sandy loam, Hydrologic Soil Group 'B' designation and have a depth to groundwater of more than 200 centimeters (6.5 feet). Runoff from the upper portion of the watershed (Elm Street area) flows overland to the southeast where it is likely intercepted by existing catch basins and a closed drainage system that similarly collects flows from the Elementary School. The combined flows are conveyed via pipe through the Union High School property and then discharge to Ayers Brook. The depth of the collection system limits the potential for daylighting runoff or the use of surface based stormwater treatment practices. Runoff from the watershed flows untreated and unmanaged through the watershed and to the receiving stream.

Retrofit:
The configuration of this watershed, with collection piping and open channels, appears to direct a majority of the runoff to the location of the identified retrofit. This enables the potential for most of the runoff from the watershed to be treated. We approximate that close to 10 acres of impervious surface drains to the location of the potential retrofit.

The land for the potential retrofit is open and currently being used by the school as athletic fields. Since the land is owned by the Union School District coordination and discussions related to ownership, access, maintenance and costs are the first step in determining whether a practice in this location is feasible. Provided there is support, proposed treatment practices should consider possible constraints resulting from work within or nearly adjacent to the flood plain and implications associated with local permitting of a project within the Flood Plain Overlay District.

The location could accommodate the installation of a proprietary treatment or pretreatment structure or subsurface storage or off-line infiltration chamber. Testing to determine the groundwater elevation and soils infiltration testing should be performed to confirm preliminary assumptions. For this watershed we propose installation of a flow diversion manhole to divert runoff from the Water Quality Storm to hydrodynamic separator for pretreatment and then on to a subsurface infiltration basin. The subsurface treatment basin will have overflow pipe that will be connected back to the main collection line and serve as an emergency overflow should the infiltration chamber be overwhelmed. We anticipate that implementation would provide water quality, recharge and credit towards runoff reduction, if designed for larger storms.

A subsurface infiltration basin could be constructed using prefabricated components that can be assembled on site. Size and layout configuration for this site need to be confirmed by the manufacturer during further design development. For underground chamber construction, a

$ 6.25/cubic foot of treatment volume unit costs was used in estimating the practice costs based on information from the Center for Watershed Protection and Charles River Watershed Association. The volume of the subsurface practice was conservatively calculated at 35,000 cubic feet.

Watershed #46

Preliminary Opinion of Project Cost

Item No.	Description	Unit Quantity		Unit Cost	Total Cost
1	Mass Excavation (Earthwork)	1	LS	$ 32,500	$ 32,500
2	Diversion Manhole	1	LS	$ 10,000	$ 10,000
3	Hydrodynamic Separator	1	LS	$ 45,000	$ 45,000
4	Site Piping	100	LF	$ 60	$ 6,000
5	Chamber with Installation	1	LS	$ 218,000	$ 218,000
6	Drain Manhole	1	LS	$ 6,000	$ 6,000
7	Core existing manhole	1	LS	$ 2,250	$ 2,250
8	Surface Restoration	1	LS	$ 3,500	$ 3,500
9	Mobilization / Demobilization	1	LS	$ 5,000	$ 5,000
10	EPSC Measures (3.5%)	1	LS	$ 11,489	$ 11,489
11	General Conditions (5%)	1	LS	$ 16,413	$ 16,413

Subtotal of Construction Cost	$ 356,151
Technical Services	$ 30,000
Contingency (25%)	$ 96,538
Total Estimated Project Cost	**$ 482,689**

Notes:

1) Mass excavation is based on three weeks of construction
2) Diversion manhole includes the structure, installation and backfill.
3) Hydrodynamic separator includes thee structure, installation and backfill.
4) Surface restoration includes topsoil, seed and mulch.
5) General Conditions includes necessary bonds, insurance, site maintenance.

Version: 1/25/2018

Project Name:	**Randolph**
Discharge Point:	**46**
Infiltration Practice #	**46**

Infiltration (4.3.3)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	24.500	0.000	24.500
2	New Impervious (acres)	9.260	0.000	9.260
3	Redeveloped Impervious	0.000	0.000	0.000
		WQ_V for credit	WQ_V not for credit	Total WQ_V
4	WQ_V to practice	0.7966	0.0000	0.7966

Modified CN for WQ (1.0") storm: 92

5 Design Volume for Infiltration ($T_{V)}$): 0.0000 ← Tv value to enter on the Standards Compliance Workbook for this practice

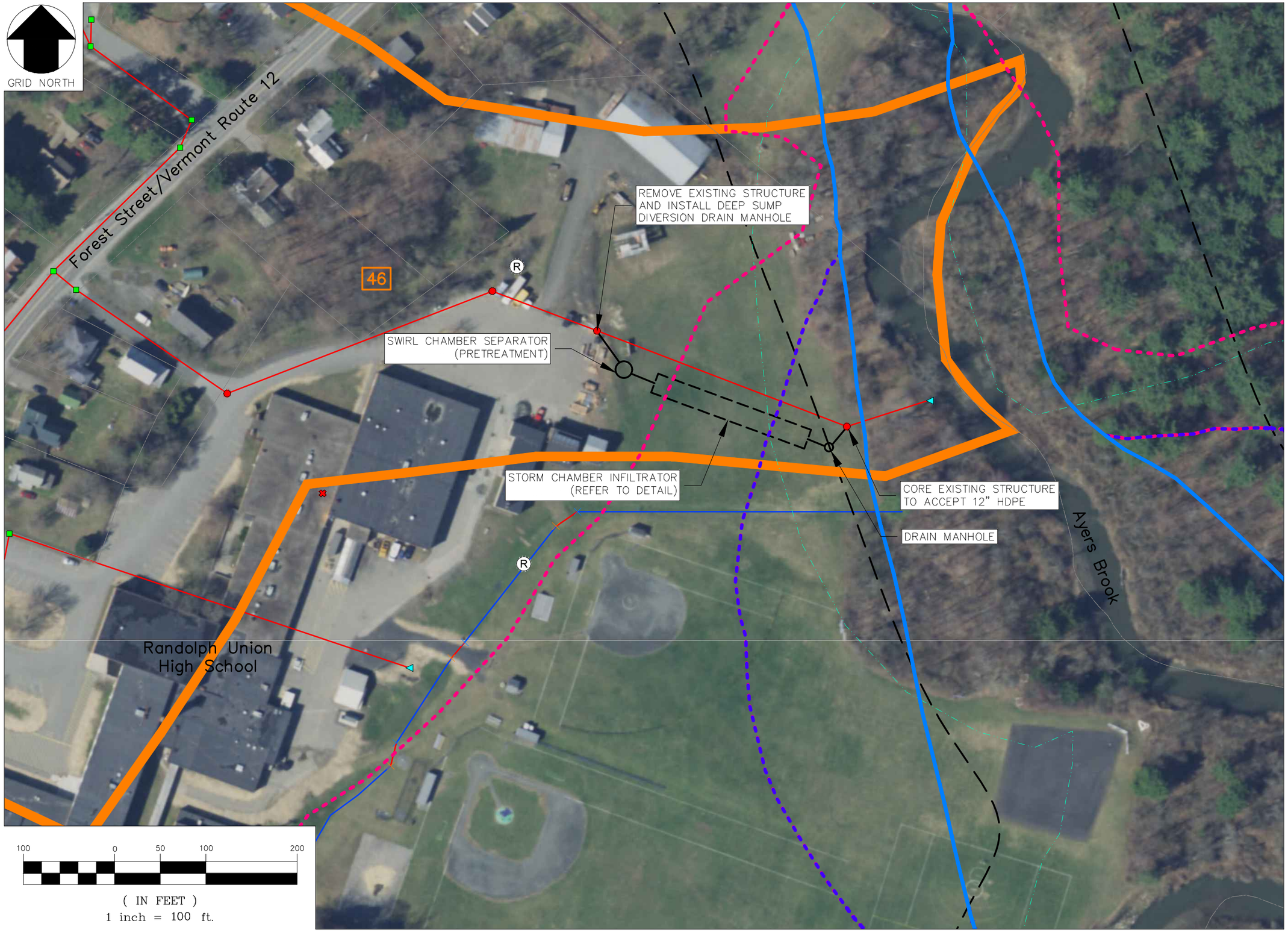
6 Practice Type:
- (●) Infiltration Basin
- ( ) Infiltration Trench
- ( ) Infiltration Chambers
- ( ) Drywell(s)

Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.3.1)	**Response**	**Attachment location**
7	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	( ) Yes ( ) No	
8*	Is the seasonal high groundwater table (SHGWT) separated at least three (3) feet vertically from the bottom of the practice?	( ) Yes ( ) No	
9	Has a groundwater mounding analysis been performed if the practice is designed to infiltrate >1 year storm and the SHGWT <4 feet?	( ) Yes ( ) No	
10	Have the proper setback requirements for groundwater source protection been observed? (Section 4.3.3.1)	( ) Yes ( ) No	
11	Has the practice been placed so that it will not cause intrusion problems for down-gradient structures? (Section 4.3.3.1)	( ) Yes ( ) No	
12	Is the site free from subsurface contamination or prior approval obtained from the Agency? (If approval is required based on prior contamination, include	( ) Yes ( ) No	
13*	Is the basin designed with side slopes of 2:1 or flatter?	( ) Yes ( ) No	

	Conveyance (4.3.3.2)	**Response**	**Attachment location**



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

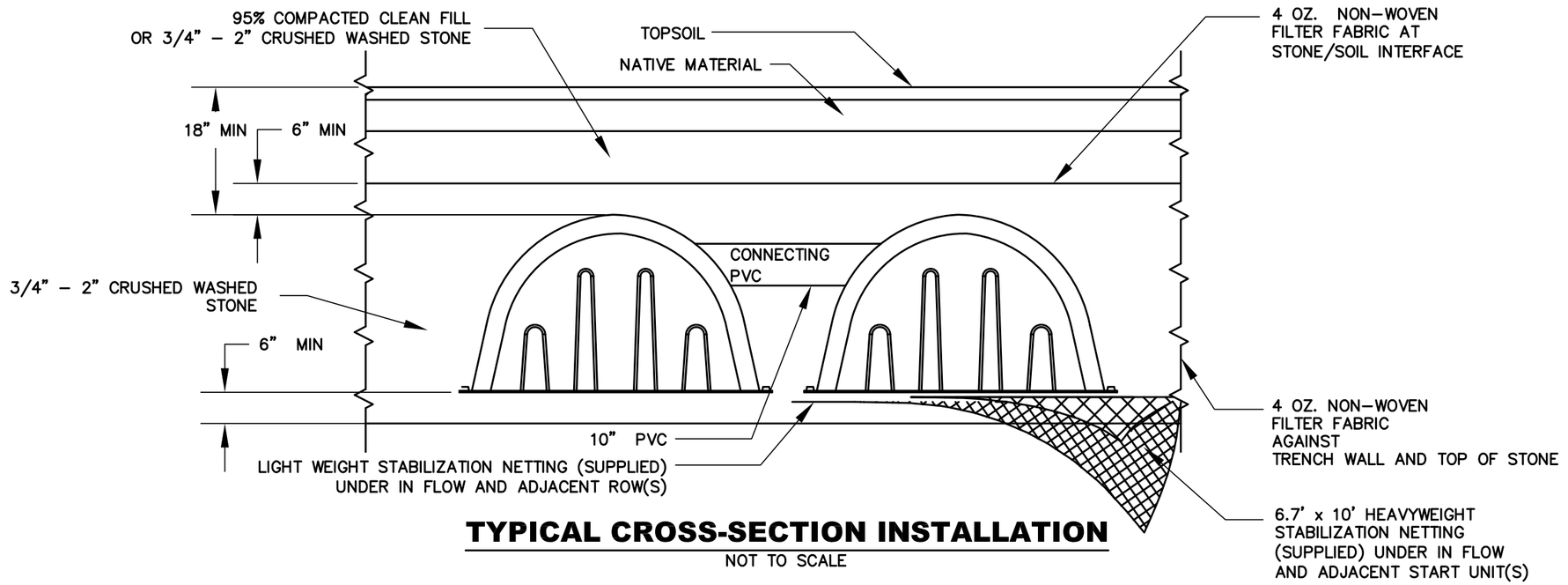
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=100'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED #46 TREATMENT

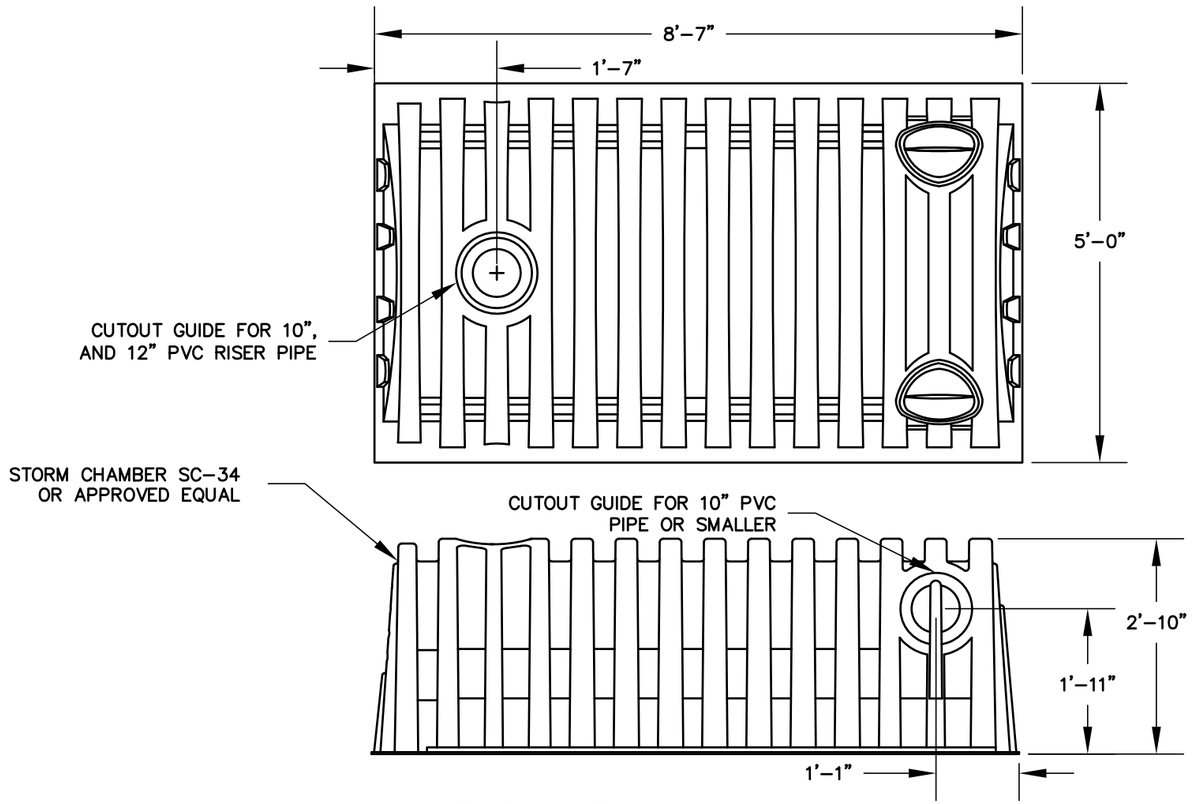
SKETCH NO.
2B

REF. DRAWING:



TYPICAL CROSS-SECTION INSTALLATION

NOT TO SCALE



STORM CHAMBER DETAIL

NOT TO SCALE

OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	SHOWN
PROJECT NO.:	923.001

TITLE:
STORM CHAMBER DETAIL

SKETCH NO.
2B-1

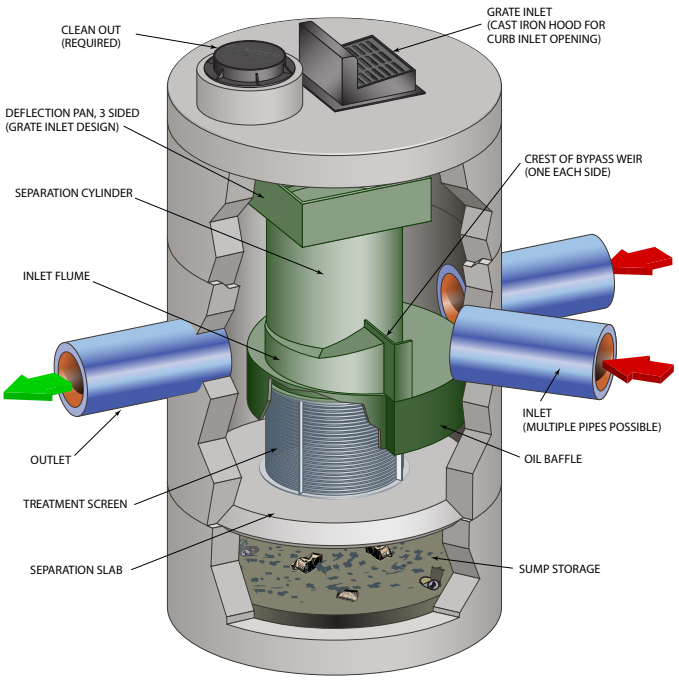
REF. DRAWING:

Continuous Deflective Separation - CDS®

Superior Stormwater Trash and Sediment Removal

The CDS is a swirl concentrator hybrid technology that uses continuous deflective separation – a combination of swirl concentration and indirect screening to screen, separate and trap debris, sediment, and hydrocarbons from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material debris 2.4 mm or larger, without binding. CDS retains all captured pollutants, even at high flow rates, and provides easy access for maintenance.

CDS is used to meet trash Total Maximum Daily Load (TMDL) requirements, for stormwater quality control, inlet and outlet pollution control, and as pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and a variety of green infrastructure practices.



Learn more about the CDS system at www.ContechES.com/CDS ❖ ❖ ❖

CDS® Approvals

CDS has been verified by some of the most stringent stormwater technology evaluation organizations in North America, including:

- Washington State Department of Ecology
- New Jersey Department of Environmental Protection
- Canadian Environmental Technology Verification (ETV)
- California Statewide Trash Amendments Full Capture System Certified*

Performance Claim Verified by the Canadian ETV Program

** The CDS System has been certified by the California State Water Resources Control Board as a Full Capture System provided that it is sized to treat the peak flow rate from the region specific 1-year, 1-hour design storm, or the peak flow capacity of the corresponding storm drain, whichever is less.*

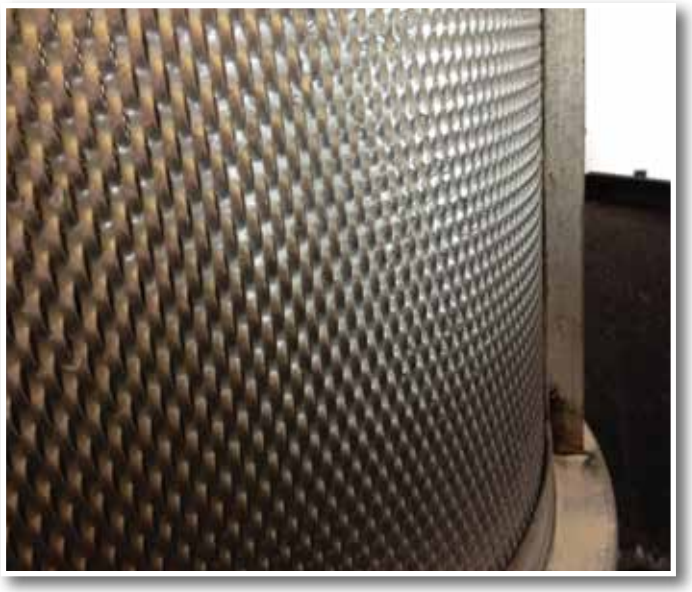
CDS® Features & Benefits

Feature	Benefit
1. Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger	1. Superior pollutant removal
2. Self-cleaning screen	2. Ease of maintenance
3. Isolated storage sump eliminates scour potential	3. Excellent pollutant retention
4. Internal bypass	4. Eliminates the need for additional structures
5. Multiple pipe inlets and 90-180° angles	5. Design flexibility
6. Numerous regulatory approvals	6. Proven performance

The CDS® Screen

Traditional approaches to trash control typically involve "direct screening" that can easily become clogged, as trash is pinned to the screen as water passes through. Clogged screens can lead to flooding as water backs up.

The design of the CDS screen is fundamentally different. Flow is introduced to the screen face which is louvered so that it is smooth in the downstream direction. The effect created is called "Continuous Deflective Separation." The power of the incoming flow is harnessed to continually shear debris off the screen and to direct trash and sediment toward the center of the separation cylinder.

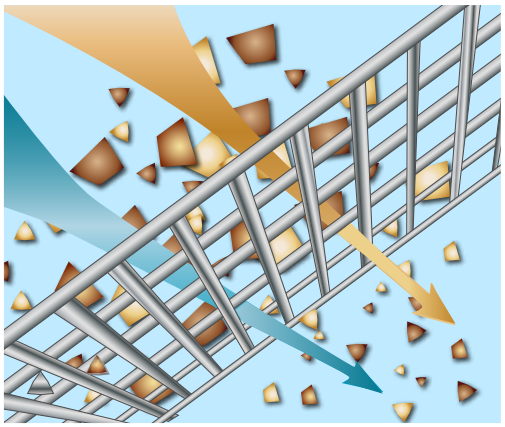


Key Features:

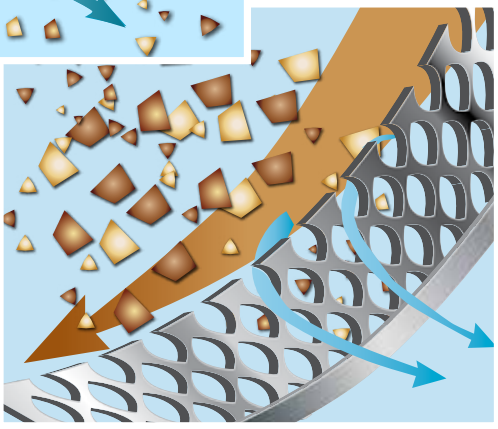
Self-Cleaning Screening Technology

- CDS Screen captures neutrally buoyant materials missed by other separator systems.
- Screen is hydraulically designed to be self-cleaning.
- Runoff entering the separation cylinder must pass through the screen prior to discharge, eliminating potential for scouring previously captured trash at high flow rates.

The CDS Screen – Self-Cleaning Screening Technology ❖ ❖ ❖



Direct Screening – particles that are larger than the aperture size of the screen can cause clogging, resulting in flooding if not maintained frequently.



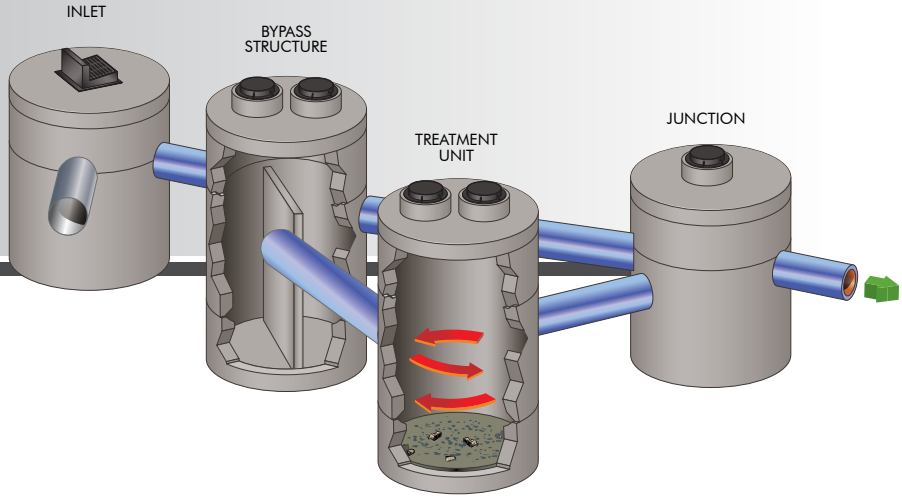
Continuous Deflective Separation Indirect Screening – water velocities within the swirl chamber continually shear debris off the screen to keep it clean.

CDS® Configuration - One System that Can Do It All!

The CDS effectively treats stormwater runoff while reducing the number of structures on your site.

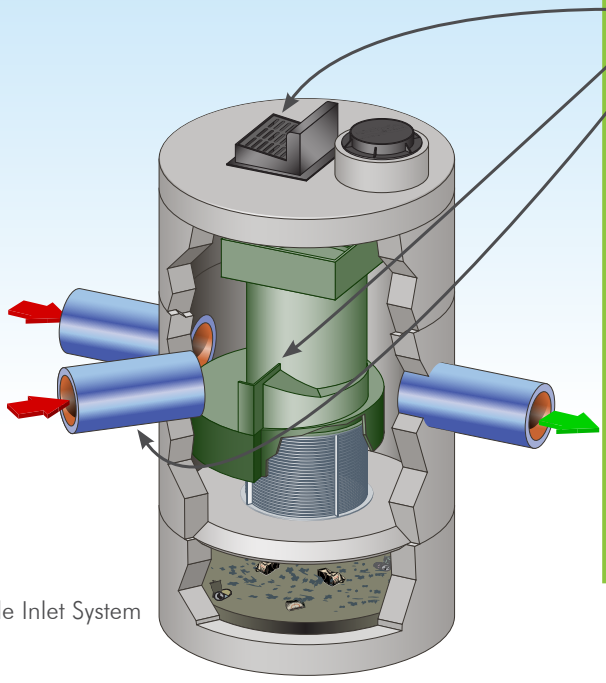
WHY GO THROUGH ALL THIS?

TRADITIONAL STORMWATER TREATMENT SITE DESIGN



ONE SYSTEM CAN DO IT ALL!

- Inline, offline, grate inlet, and drop inlet configurations available
- Internal and external peak bypass options available



CDS® Multiple Inlet System

Save Time, Space, and Money with CDS®

- Grate inlet option available
- Internal bypass weir
- Accepts multiple inlets at a variety of angles
- Advanced hydrodynamic separator
- Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger
- Indirect screening capability keeps screen from clogging
- Retention of all captured pollutants, even at high flows
- Performance verified by NJCAT, WA Ecology, and ETV Canada

CDS® Applications

CDS is commonly used in the following stormwater applications:

- Stormwater quality control – trash, debris, sediment, and hydrocarbon removal
- Urban retrofit and redevelopment
- Inlet and outlet protection
- Pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and Low Impact Development designs.

CDS provides trash control.

CDS pretreats a bioswale.

CDS pretreats a rainwater harvesting cistern.

CDS standalone system removes trash and sediment.

CDS® Models and Capacities

	CDS MODEL	Treatment Flow Rates[1]			Estimated Maximum Peak Conveyance Flow[3] (cfs)/(L/s)	Minimum Sump Storage Capacity[4] (yd^3)/(m^3)	Minimum Oil Storage Capacity[4] (gal)/(L)
		75 microns (cfs)/(L/s)	125 microns[2] (cfs)/(L/s)	Trash & Debris (cfs)/(L/s)			
PRECAST	CDS2015-4	0.5 (14.2)	0.7 (19.8)	1.0 (28.3)	10 (283)	0.9 (0.7)	61 (232)
	CDS2015-5	0.5 (14.2)	0.7(19.8)	1.0 (28.3)	10 (283)	1.5 (1.1)	83 (313)
	CDS2020-5	0.7 (19.8)	1.1 (31.2)	1.5 (42.5)	14 (396)	1.5 (1.1)	99 (376)
	CDS2025-5	1.1 (31.2)	1.6 (45.3)	2.2 (62.3)	14 (396)	1.5 (1.1)	116 (439)
	CDS3020-6	1.4 (39.6)	2.0 (56.6)	2.8 (79.3)	20 (566)	2.1 (1.6)	184 (696)
	CDS3025-6	1.7 (48.1)	2.5 (70.8)	3.5 (99.2)	20 (566)	2.1 (1.6)	210 (795)
	CDS3030-6	2.0 (56.6)	3.0 (85.0)	4.2 (118.9)	20 (566)	2.1 (1.6)	236 (895)
	CDS3035-6	2.6 (73.6)	3.8 (106.2)	5.3 (150.0)	20 (566)	2.1 (1.6)	263 (994)
	CDS4030-8	3.1 (87.7)	4.5 (127.4)	6.3 (178.3)	30 (850)	5.6 (4.3)	426 (1612)
	CDS4040-8	4.1 (116.1)	6.0 (169.9)	8.4 (237.8)	30 (850)	5.6 (4.3)	520 (1970)
	CDS4045-8	5.1 (144.4)	7.5 (212.4)	10.5 (297.2)	30 (850)	5.6 (4.3)	568 (2149)
	CDS5640-10	6.1 (172.7)	9.0 (254.9)	12.6 (356.7)	50 (1416)	8.7 (6.7)	758 (2869)
	CDS5653-10	9.5 (268.9)	14.0 (396.5)	19.6 (554.8)	50 (1416)	8.7 (6.7)	965 (3652)
	CDS5668-10	12.9 (365.1)	19.0 (538.1)	26.6 (752.9)	50 (1416)	8.7 (6.7)	1172 (4435)
	CDS5678-10	17.0 (481.2)	25.0 (708.0)	35.0 (990.7)	50 (1416)	8.7 (6.7)	1309 (4956)
	CDS9280-12	27.2 (770.2)	40.0 (1132.7)	56.0 (1585.7)	Offline	16.8 (12.8)	N/A
	CDS9290-12	35.4 (1002.4)	52.0 (1472.5)	72 (2038.8)		16.8 (12.8)	
	CDS92100-12	42.8 (1212.0)	63.0 (1783.9)	88 (2491.9)		16.8 (12.8)	
CAST-IN-PLACE	CDS150134-22	100.7 (2851.5)	148.0 (4190.9)	270 (7645.6)		56.3 (43.0)	
	CDS200164-26	183.6 (5199.0)	270.0 (7645.6)	378.0 (10703.8)		78.7 (60.2)	
	CDS240160-32	204 (5776.6)	300.0 (8495.1)	420.0 (11893.0)		119.1 (91.1)	
	Additional Cast-in-Place models available upon request.						

1. Alternative PSD/D_{50} sizing is available upon request.
2. 125 micron flows are based on the CDS Washington State Department of Ecology approval for 80% removal of a particle size distribution (PSD) having a mean particle size (D_{50}) of 125 microns.
3. Estimated maximum peak conveyance flow is calculated using conservative values and may be exceeded on sites with lower inflow velocities and sufficient head over the weir.
4. Sump and oil capacities can be customized to meet site needs.

CDS® Maintenance

Systems vary in their maintenance needs, and the selection of a cost-effective and easy-to-access treatment system can mean a huge difference in maintenance expenses for years to come.

A CDS unit is designed to minimize maintenance and make it as easy and inexpensive as possible to keep our systems working properly.

Most CDS units can easily be cleaned in 30 minutes.

Inspection

Inspection is the key to effective maintenance. Pollutant deposition and transport may vary from year to year and site to site. Semi-annual inspections will help ensure that the system is cleaned out at the appropriate time. Inspections should be performed more frequently where site conditions may cause rapid accumulation of pollutants.

Recommendations for CDS Maintenance

The recommended cleanout of solids within the CDS unit's sump should occur at 75% of the sump capacity. Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection and cleanout of the separation chamber and sump, and another allows inspection and cleanout of sediment captured and retained behind the screen. A vacuum truck is recommended for cleanout of the CDS unit and can be easily accomplished in less than 30 minutes for most installations.

DYOHDS™ Tool

Design Your Own Hydrodynamic Separator

Features

- Choose from three HDS technologies - CDS®, Vortechs® and VortSentry® HS
- Site specific questions ensure the selected unit will comply with site constraints
- Unit size based on selected mean particle size and targeted removal percentage
- Localized rainfall data allows for region specific designs
- PDF report includes detailed performance calculations, specification and standard drawing for the unit that was sized

DYO Project design made easy.

Design Your Own (DYO) Hydrodynamic Separator online at www.ContechES.com/dyohds

Depth to Water Table—Orange County, Vermont

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	>200	7.9	88.3%
HdE	Hartland silt loam, 25 to 50 percent slopes	>200	0.0	0.0%
Wo	Winooski very fine sandy loam	69	1.0	11.7%
Totals for Area of Interest			**8.9**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December


72° 39' 36" W
72° 39' 17" W
43° 55' 56" N
43° 55' 47" N
687820
687860
687900
687940
687980
688020
688060
688100
688140
688180
688220
4867000
4866960
4866920
4866880
4866840
4866800
4866760
Wo
AgA
HdE
Ayers Brook
Soil Map may not be valid at this scale.
Map Scale: 1:1,940 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 25 50 100 150
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	B	7.9	88.3%
HdE	Hartland silt loam, 25 to 50 percent slopes	B	0.0	0.0%
Wo	Winooski very fine sandy loam	C	1.0	11.7%
Totals for Area of Interest			**8.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #50:

Description:
The watershed as mapped by VTDEC is 6.7 acres in size and approximately 41.5 % impervious surfaces (2.78 acres). The contributing area is comprised of some single family homes on an upper portion of the watershed along Mountain Ave and then drops down to the multifamily residential homes, a convenience store, and a fire department building along Central Street. From Central Street, the land drops off steeply before reaching the Third Branch of the White River. Soils in the area of the proposed retrofit site are Merrimac fine sandy loam. Runoff from the upper portion of the watershed (Mountain Ave. area) flows overland south and down the steep (25 to 50% slope) wooded hillside toward Central Street where it is then collected by a catch basin and a closed drainage system that routes flows to the hillside above the river where it is daylighted. Private land ownership and the steep slopes limit the potential options for at grade stormwater treatment practices. Runoff from the watershed flows untreated and unmanaged through the watershed and to the receiving stream.

Retrofit:
The configuration of this watershed, with collection piping directs a portion of the watershed's impervious area to a possible location for a retrofit. We approximate that 1.7 acres of impervious surface drains to the location of the potential retrofit.

The land for the potential retrofit is within the town road right-of-way and adjacent to the Cumberland Farms convenience store.

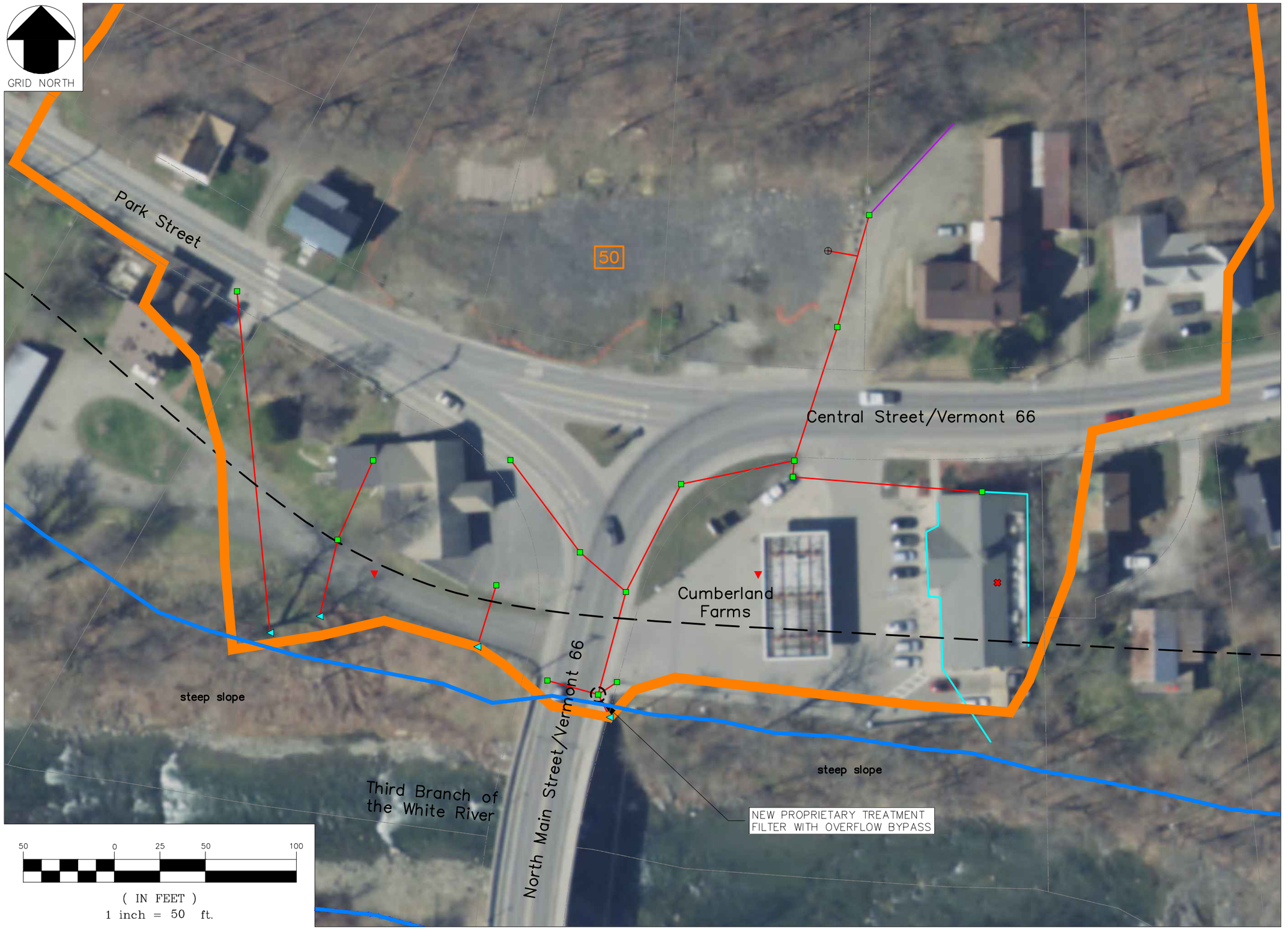
For this watershed, due to the limited availability of space, the adjacent use as gas station, unknown subsurface soil conditions and the high traffic area, we propose installation of a proprietary treatment system with internal high flow bypass. We anticipate that implementation of this practice would provide water quality treatment to runoff from this watershed. This type of treatment practice does not provide recharge or flow attenuation. If these factors are a priority, subsurface storage type systems would be necessary.

WATERSHED #50:

Watershed #50					
Preliminary Opinion of Project Cost					
Item No.	Description	Unit Quantity		Unit Cost	Total Cost
1	Excavation (Earthwork)	1	LS	$ 10,400	$ 10,400
2	Proprietary Treatment System	1	LS	$ 70,000	$ 70,000
3	Installation	1	LS	$ 7,000	$ 7,000
4	Surface Restoration	1	LS	$ 8,000	$ 8,000
5	Mobilization / Demobilization	1	LS	$ 5,000	$ 5,000
6	EPSC Measures	1	LS	$ 750	$ 750
7	General Conditions (5%)	1	LS	$ 5,020	$ 5,020
				Subtotal of Construction Cost	$ 106,170
				Engineering Services	$ 5,000
				Contingency (25%)	$ 27,793
				Total Estimated Project Cost	**$ 138,963**

Notes:

1) Excavation is based prep for treatment vault and backfill (1 week)
2) Proprietary treatment pricing based on estimate from supplier
3) Site restoration includes pavement, curb and sidewalk replacement.
4) General Conditions includes necessary bonds, insurance, site maintenance.



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

RANDOLPH, VERMONT

DATE ISSUED:	12/12/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

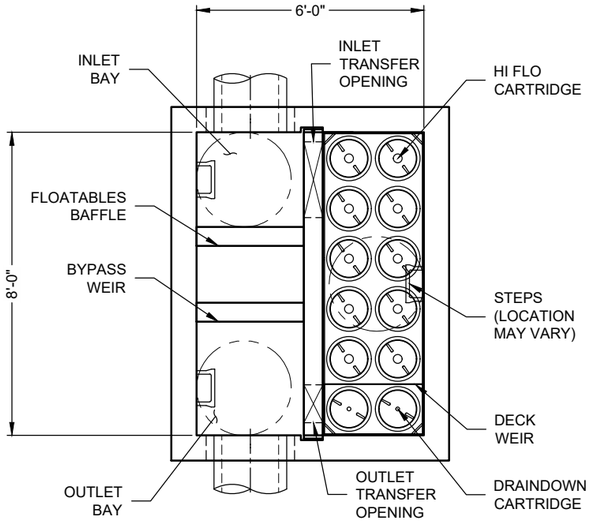
TITLE:

SUB-WATERSHED #50 TREATMENT

SKETCH NO.

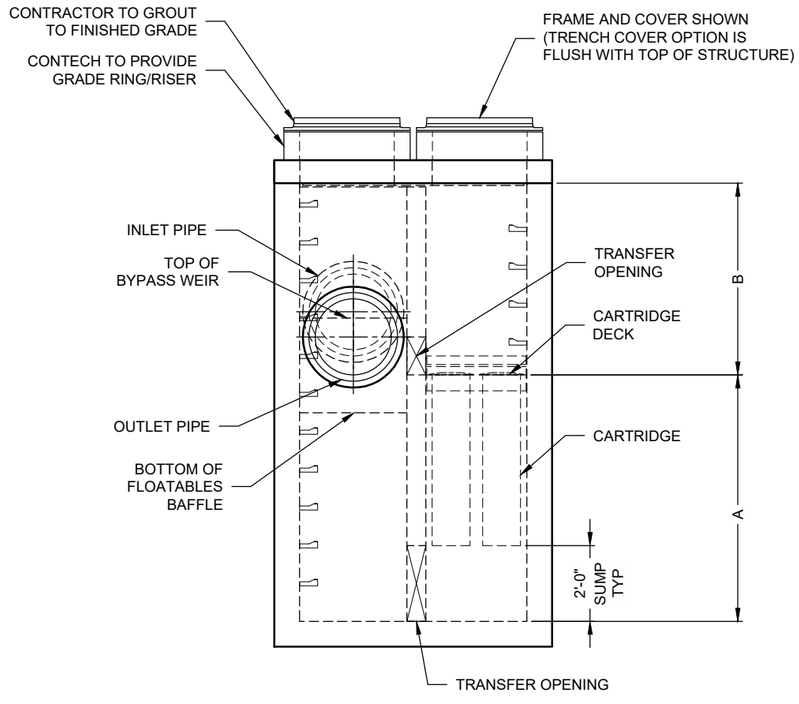
7A

REF. DRAWING:



PLAN VIEW

(TOP SLAB NOT SHOWN FOR CLARITY)



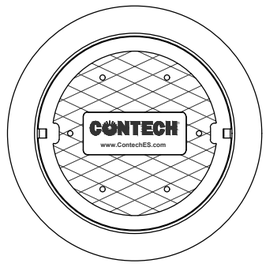
ELEVATION VIEW

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE LENGTH AND THE NUMBER OF CARTRIDGES. THE STANDARD PEAK DIVERSION STYLE WITH PRECAST TOP SLAB IS SHOWN. ALTERNATE OFFLINE VAULT AND/OR SHALLOW ORIENTATIONS ARE AVAILABLE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD

CARTRIDGE SELECTION

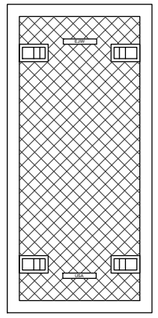
CARTRIDGE LENGTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (A)	6'-6"	5'-4"	4'-3"	3'-3"
FLOW RATE HI-FLO / DRAINDOWN (CFS) (PER CART)	0.178 / 0.089	0.133 / 0.067	0.089 / 0.045	0.049 / 0.025
MAX. TREATMENT (CFS)	1.96	1.47	0.98	0.54
DECK TO INSIDE TOP (MIN) (B)	5.00	4.00	4.00	4.00



FRAME AND COVER

(DIAMETER VARIES)

N.T.S.



24"

TRENCH COVER

(LENGTH VARIES)

N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED (HF / DD)	*
CARTRIDGE LENGTH	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

SEE GENERAL NOTES 6-7 FOR INLET AND OUTLET HYDRAULIC AND SIZING REQUIREMENTS.

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES:

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE. www.ContechES.com
3. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 OR PER APPROVING JURISDICTION REQUIREMENTS, WHICHEVER IS MORE STRINGENT, ASSUMING EARTH COVER OF 0' - 10', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE CONTECH LOGO.
5. STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857, ASTM C-918, AND AASHTO LOAD FACTOR DESIGN METHOD.
6. OUTLET PIPE INVERT IS EQUAL TO THE CARTRIDGE DECK ELEVATION.
7. THE OUTLET PIPE DIAMETER FOR NEW INSTALLATIONS IS RECOMMENDED TO BE ONE PIPE SIZE LARGER THAN THE INLET PIPE AT EQUAL OR GREATER SLOPE.
8. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT).
D. CARTRIDGE INSTALLATION, BY CONTECH, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

Jellyfish Filter

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

JELLYFISH JFPD0806 STANDARD DETAIL PEAK DIVERSION CONFIGURATION

Filtration as a Stormwater Management Strategy

Stormwater regulations are increasingly calling for more robust treatment levels. In addition to the removal of suspended solids, many regulations now require best management practices to remove significant amounts of nutrients, metals, and other common pollutants found in stormwater runoff. Meeting these regulations often requires the use of a filtration solution.

Low Impact Development (LID) and Green Infrastructure (GI) are complimented by filtration solutions. Benefits of LID and GI systems include retaining runoff and aesthetic appeal. Keeping LID and GI sites free from fine sediments, oils, trash, and debris while functioning as designed can be time consuming and costly.

As a result, the practice of combining LID and GI with filtration is becoming more common. Providing a single point of maintenance promotes proper system functionality and increases the aesthetic appeal by removing unsightly trash and debris.

A Jellyfish Filter Curb Inlet pretreats runoff entering a bioretention system

The Jellyfish® Filter - Setting New Standards in Stormwater Treatment

The Jellyfish Filter is a stormwater quality treatment technology featuring high surface area and high flow rate membrane filtration at low driving head. By incorporating pretreatment with light-weight membrane filtration, the Jellyfish Filter removes floatables, trash, oil, debris, TSS, fine silt-sized particles, and a high percentage of particulate-bound pollutants; including phosphorus and nitrogen, metals and hydrocarbons.

The high surface area membrane cartridges, combined with up flow hydraulics, frequent backwashing, and rinsable/reusable cartridges ensures long-lasting performance.

The Jellyfish Filter.

Jellyfish® Filter Features and Benefits

FEATURES	BENEFITS
1. High surface area, high flow rate membrane filtration	1. Long-lasting and effective stormwater treatment
2. Highest design treatment flow rate per cartridge (up to 80 gpm (5 L/S)	2. Compact system with a small footprint, lower construction cost
3. Low driving head (typically 18 inches (457 mm) or less)	3. Design Flexibility, lower construction cost
4. Lightweight cartridges with passive backwash	4. Easy maintenance and low life-cycle cost
5. 3rd party verified field performance per TARP Tier II protocol	5. Superior pollutant capture with confidence

Jellyfish® Filter Applications

- Urban development
- Highways, airports, seaports, and military installations
- Commercial and residential development, infill and redevelopment, and stormwater quality retrofit applications
- Pretreatment for Low Impact Development (LID), Green Infrastructure (GI), infiltration, and rainwater harvesting and reuse systems
- Industrial sites

A Jellyfish Filter pretreats a bioretention/ bioswale system at a commercial site in Ontario, Canada.

A catch basin Jellyfish Filter is installed in a commercial development in Virginia.

A Jellyfish Filter provides treatment at an Industrial Park in Lake Tahoe, Nevada.

Jellyfish® Filter Field Performance Test Results

POLLUTANT OF CONCERN	% REMOVAL
Total Trash	99%
Total Suspended Solids (TSS)	89%
Total Phosphorus (TP)	59%
Total Nitrogen (TN)	51%
Total Copper (TCu)	>80%
Total Zinc (TZn)	>50%
Turbidity (NTU)	<15%

Sources:
TARP II Field Study – 2012 JF 4-2-1 Configuration
MRDC Floatables Testing – 2008 JF6-6-1 Configuration

The pleated tentacles of the Jellyfish Filter provide a large surface area for pollutant removal.

Jellyfish® Filter Approvals

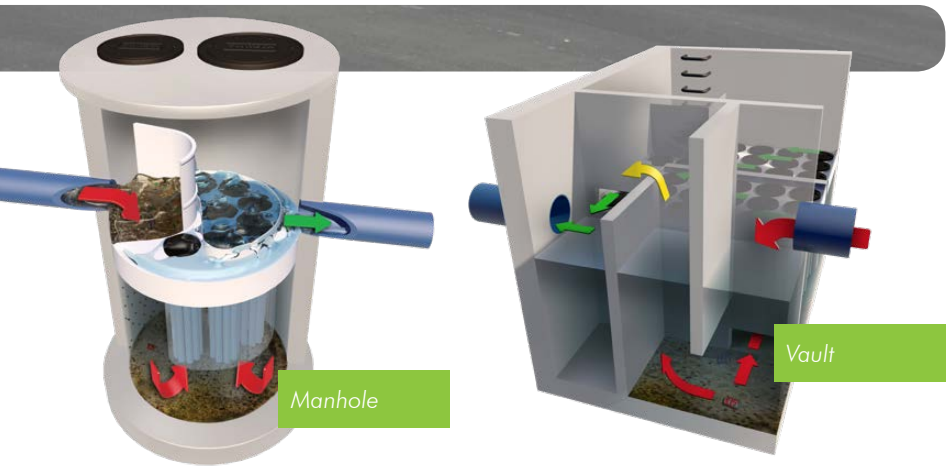
The Jellyfish Filter is approved through numerous state and federal verification programs, including:

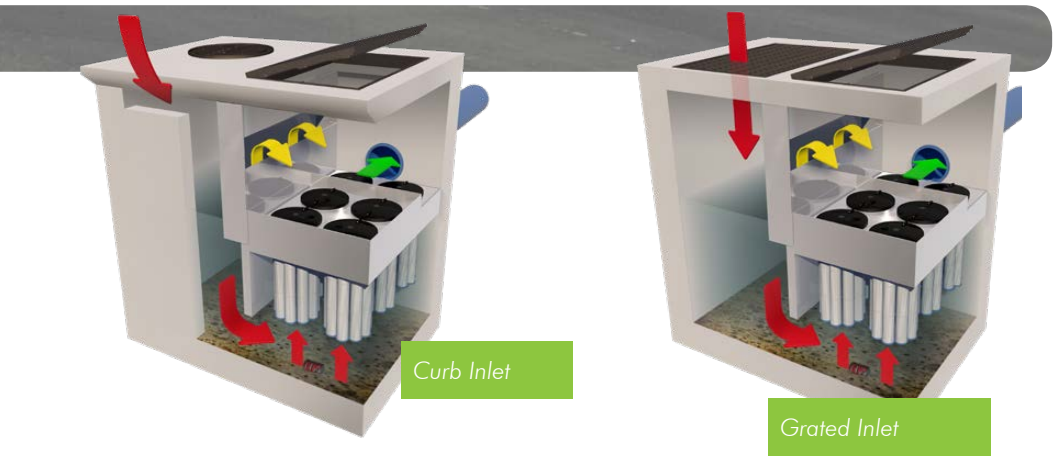
- New Jersey Corporation for Advanced Technology (NJCAT) – Field Performance Verification per TARP Tier II Protocol
- Washington State Department of Ecology (TAPE –CULD)
- Maryland Department of the Environment (MD DOE)
- Texas Commission on Environmental Quality (TCEQ)
- Virginia Department of Environmental Quality (VA DEQ)
- New York Department of Environmental Conservation (DEC)
- City of Denver
- Los Angeles County
- Canada ISO 14034 Environmental Management – Environmental Technology Verification (ETV)
- Ontario Ministry of the Environment – New Environmental Technology Evaluation (NETE) – Certification

Learn more at www.ContechES.com/jellyfish

Jellyfish® Filter Configurations

The Jellyfish Filter is available in a variety of configurations. Typically, 18 inches (457 mm) of driving head is designed into the system. For low drop sites, the designed driving head can be less.





Lightweight Jellyfish Filter Configurations

Custom configurations include Jellyfish Filter tanks made from fiberglass for site specific applications.

A Jellyfish Filter was constructed from fiberglass to reduce the weight of the system, allowing for a suspended installation above an underground parking structure. The reduced weight eliminated the need for structural changes, and suspending the Jellyfish resulted in no loss of parking space, maximizing real-estate value.

Jellyfish® Filter Maintenance

Inspection and maintenance activities for the Jellyfish Filter typically include:

- Visual inspection of deck, cartridge lids, and maintenance access wall.
- Vacuum extraction of oil, floatable trash/debris, and sediment from manhole sump.
- External rinsing and re-installing of filter cartridges.
- Replacement of filter cartridge tentacles as needed. Cartridge replacement intervals vary by site; replacement is anticipated every 2-5 years.

The Jellyfish Filter tentacle is light and easy to clean.

Jellyfish® Filter Inspection and Maintenance Video

Inspecting and maintaining the Jellyfish Filter is easier than you may think. Watch the Jellyfish inspection and maintenance video at **www.ContechES.com/jellyfish**

VERMONT

Vermont Department of Environmental Conservation
Watershed Management Division
Main Building, Second Floor
One National Life Drive
Montpelier, VT 05620-3522

Agency of Natural Resources

(phone) 802-828-1535

June 25, 2018

Contech Engineered Solutions, LLC
9025 Centre Pointe Drive, Suite 400
West Chester, OH 45069
Attn: Derek M. Berg

Dear Mr. Berg:

The Stormwater Program has reviewed the Jellyfish® Filter as an alternative stormwater treatment practice through the evaluation process in Section 4.4.1 of the 2017 Vermont Stormwater Management Manual (VSMM).

Based on our review, we believe that Contech Engineered Solutions, LLC has provided the Stormwater Program with testing data showing that the system provides total phosphorus and total suspended solids removal efficiency sufficient to meet or exceed the standards in the Vermont Stormwater Management Manual as a stand-alone Tier 3 Practice.

Please be advised that this letter serves as preliminary approval and does not constitute a final act or decision of the Secretary. Final approval of the use of the Jellyfish® Filter, or other alternative practice, is project specific and is necessarily done through the issuance of an operational stormwater permit, until such time that the Vermont Stormwater Management Manual is formally revised to include the practice.

In developing permit conditions for any project relying on the Jellyfish® Filter, the Stormwater Program is likely to include the following permit conditions and application requirements:

1) The Jellyfish® Filter must be designed, assembled, installed, operated, and maintained according to the specifications of Contech Engineered Solutions, Inc.

2) The system must be designed to accommodate 100% treatment of the requisite water quality volume through sizing for the peak rate of the water quality storm without bypass.

As part of this preliminary approval, the product will be listed on the Vermont Department of Environmental Conservation's Alternative Practices website at http://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/Alt-STPs.

Until such a time that the practice is incorporated into the VSMM through rulemaking, projects utilizing the practice that are subject to operational stormwater permitting require an individual permit application.

If local jurisdictions or other parties request a copy of a letter from VT DEC verifying preliminary practice approval, please use this letter for that purpose.

Thank you for your interest in providing alternatives to the stormwater design community in Vermont. If you have any questions concerning this preliminary approval, please contact the Stormwater Program.

Sincerely,

Kevin Burke, Environmental Analyst
Vermont DEC – Stormwater Program

Map Scale: 1:1,460 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MeB	Merrimac fine sandy loam, 3 to 8 percent slopes	0.5	5.7%
MeC	Merrimac fine sandy loam, 8 to 15 percent slopes	5.2	62.6%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	2.2	26.1%
W	Water	0.0	0.4%
Wo	Winooski very fine sandy loam	0.4	5.2%
Totals for Area of Interest		**8.3**	**100.0%**

WATERSHED #53 (PRINCE STREET):

Description:
The watershed as mapped by VTDEC is 15.1 acres in size and 69.3% impervious surfaces (10.46 acres). The contributing area to the location of the identified retrofit site, along the west side of Prince Street, encompasses nearly all of the impervious area within the watershed. The watershed is comprised of much of Randolph's downtown area and residential properties along Randolph Avenue. Soils are predominantly mapped as Merrimac fine sandy loam, on slopes of 0 to 3 percent, and Hydrologic Soil Group 'A' designation indicating that the soils are well draining and have a high infiltration rate. Runoff flows overland across the watershed prior to entering into a substantive drainage collection system that collects water from the downtown area and Randolph Ave. Soils in the location of the identified retrofit are Merrimac fine sandy loam with 25 to 50 percent slopes and Hadley very fine sandy loam, Hydrologic Soil Group 'B' designation. Runoff from this watershed flows untreated and unmanaged to the Third Branch of the White River.

Retrofit:
Based on preliminary calculations a proposed retrofit in this location is feasible. However, given the size of the contributing watershed at this point, treatment of the entire water quality storm in this location is not feasible due to available land. Our calculations for water quality volume yield a volume of approximately 0.8 acre feet (34,800 cf). A sediment forebay and infiltration practice sized to accommodate this volume will not fit within the footprint of land available. Alternatively, a practice sized to accommodate a portion of the water quality volume may be possible in this location.

The site of the potential retrofit appears to be on property owned by the Randolph House apartments or within the Town right-of-way. Discussions related to ownership, access, maintenance and costs are the first step in determining if a practice in this location is practical moving forward.

For this location, due to size limitations we recommend installation of an infiltration basin sized to accommodate a third of the total water quality volume (10,400 cf). The system is proposed for the west side of Prince Street. Work would involve the installation of a diversion manhole to direct a portion of the water quality storm event (1-inch storm) to a forebay (40ft x 40ft x 4ft) on the uphill side of the drive that serves Randolph House. Flows would then be conveyed via pipe to the infiltration basin (3,500 sf x 1.5 ft deep) with an overflow outlet pipe that would be connected back in to the collection system. We anticipate that implementation of this practice would provide treatment to a portion of the water quality and recharge volume requirement for the watershed. Onsite soils testing and verification of the soil infiltration rate and depth to groundwater is needed at this site. This type of treatment practice does not provide flow attenuation.

WATERSHED #53 (PRINCE STREET):

Watershed #53 (Prince Street)							
Preliminary Opinion of Project Cost							
Item No.	Description	Unit Quantity		Unit Cost		Total Cost	
1	Mass Excavation (Earthwork - Forebay	250	CY	$	20	$	5,000
2	Diversion Manhole	1	LS	$	7,500	$	7,500
3A	Piping to Filter Bed	14	LF	$	50	$	700
3B	Piping to Forebay	80	LF	$	60	$	4,800
4	Outlet & Piping to Collection System	1	LS	$	5,500	$	5,500
5	Surface Restoration	1	LS	$	2,750	$	2,750
6	Mobilization / Demobilization	1	LS	$	2,500	$	2,500
7	EPSC Measures (3.5%)	1	LS	$	1,006	$	1,006
8	General Conditions (5%)	1	LS	$	1,438	$	1,438
					Subtotal of Construction Cost	$	31,194
					Technical Services	$	7,500
					Contingency (25%)	$	9,673
					Total Estimated Project Cost	**$**	**48,367**

Notes:

1) Mass excavation for Forebay assumes 40-ft x 40-ft x 4-ft deep.
2) Diversion manhole includes the structure, installation and backfill.
3) Site restoration includes topsoil, seed and mulch.
4) General Conditions includes necessary bonds, insurance, site maintenance.

Version: 1/25/2018

Project Name:	**Randolph**
Discharge Point:	**53**
Infiltration Practice #	**53 Prince St**

Infiltration (4.3.3)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	15.100	0.000	15.100
2	New Impervious (acres)	10.000	0.000	10.000
3	Redeveloped Impervious	0.000	0.000	0.000
		WQ_V for credit	WQ_V not for credit	Total WQ_V
4	WQ_V to practice	0.8129	0.0000	0.8129

Modified CN for WQ (1.0") storm: 96

5 Design Volume for Infiltration ($T_{V)}$): 0.0000 ← Tv value to enter on the Standards Compliance Workbook for this practice

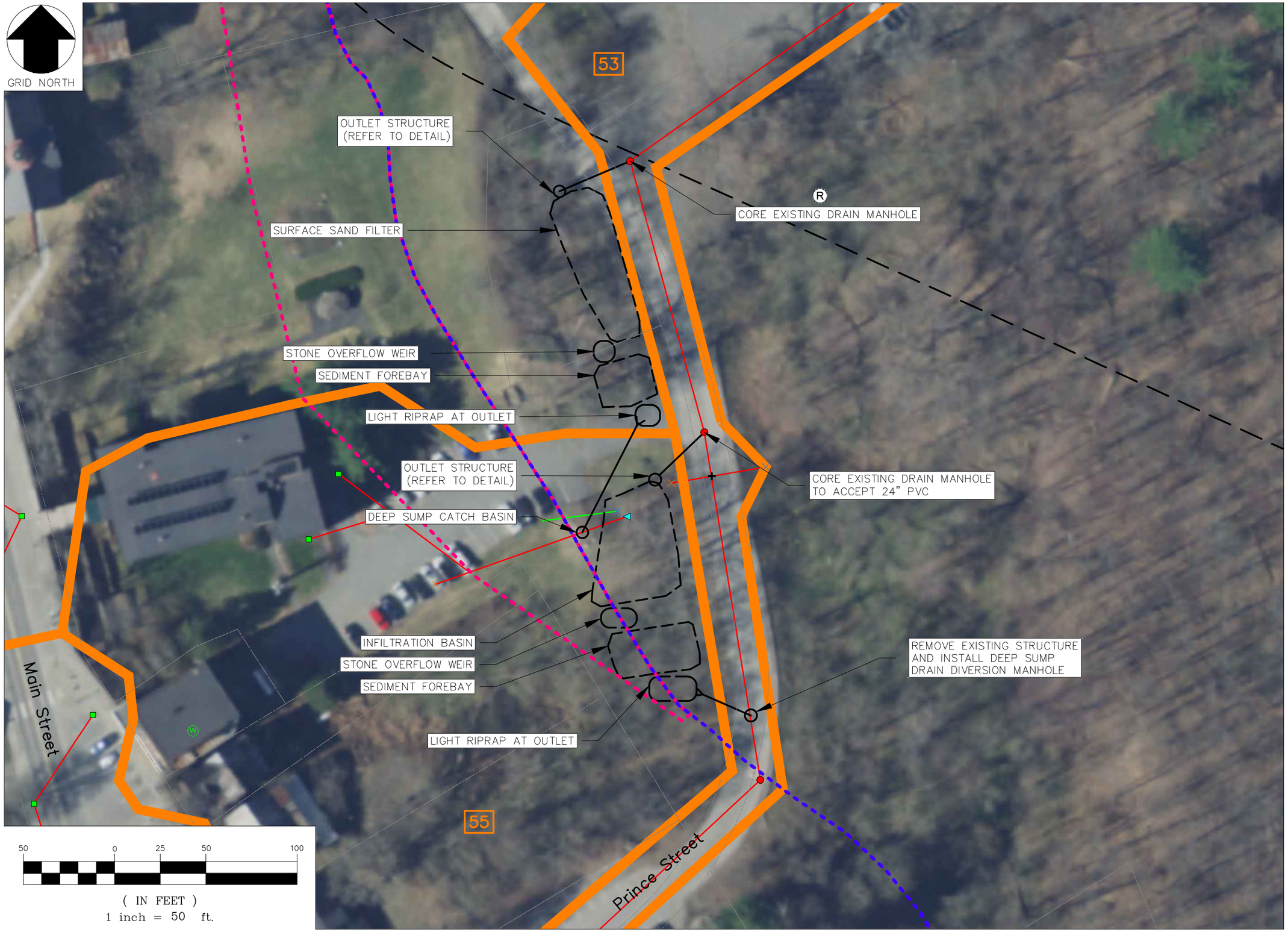
6 Practice Type:
- (●) Infiltration Basin
- ( ) Infiltration Trench
- ( ) Infiltration Chambers
- ( ) Drywell(s)

Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.3.1)	**Response**	**Attachment location**
7	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	( ) Yes ( ) No	
8*	Is the seasonal high groundwater table (SHGWT) separated at least three (3) feet vertically from the bottom of the practice?	( ) Yes ( ) No	
9	Has a groundwater mounding analysis been performed if the practice is designed to infiltrate >1 year storm and the SHGWT <4 feet?	( ) Yes ( ) No	
10	Have the proper setback requirements for groundwater source protection been observed? (Section 4.3.3.1)	( ) Yes ( ) No	
11	Has the practice been placed so that it will not cause intrusion problems for down-gradient structures? (Section 4.3.3.1)	( ) Yes ( ) No	
12	Is the site free from subsurface contamination or prior approval obtained from the Agency? (If approval is required based on prior contamination, include	( ) Yes ( ) No	
13*	Is the basin designed with side slopes of 2:1 or flatter?	( ) Yes ( ) No	

Conveyance (4.3.3.2)	**Response**	**Attachment location**



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED #53 & #55 TREATMENT

SKETCH NO.
3B

REF. DRAWING:

Depth to Water Table—Orange County, Vermont

Map Scale: 1:780 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
Ha	Hadley very fine sandy loam	153	0.6	71.3%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	>200	0.3	28.7%
Totals for Area of Interest			**0.9**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Hydrologic Soil Group—Orange County, Vermont

Map Scale: 1:780 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ha	Hadley very fine sandy loam	B	0.6	71.3%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	A	0.3	28.7%
Totals for Area of Interest			**0.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #53 (POST OFFICE):

Description:
The watershed as mapped by VTDEC is 15.1 acres in size and 69.3% impervious surfaces (10.46 acres). The contributing area to the location of the identified retrofit site adjacent to the post office is approximately 0.12 acres in size. The site is relatively flat and drains to the east into a catch basin and closed drainage system that routes flows off site. Soils in the location of the proposed retrofit are Merrimac fine sandy loam on 0 to 3 percent slopes and a depth to water table of more than 6.5 feet. Merrimac soil is designated as Hydrologic Soil Group 'A' soils which are well draining and have a high infiltration rate. Runoff flows overland across paved parking and grassed lawn before entering into a catch basin. The catch basin appears to be on land owned by the United States Post Office. Runoff from this portion of the watershed flows untreated and unmanaged to the receiving stream.

Retrofit:
We approximate that 0.09 acres of impervious surface drains to the location of the potential retrofit.

The land for the retrofit is on private property (U.S. Postal Service) and on Town owned land. Discussions related to ownership, access, maintenance and costs are the first step in determining if a practice in this location is practical moving forward.

For this retrofit site, we recommend installation of a bioretention area to treat runoff from the post office parking lot. We anticipate that implementation of this practice would provide water quality, recharge and credit towards runoff reduction if designed for larger storms. This type of treatment practice does not provide flow attenuation.

WATERSHED #53 (POST OFFICE):

Watershed #53 (Post Office)							
Preliminary Opinion of Project Cost							
Item No.	Description	Unit Quantity		Unit Cost		Total Cost	
1	Earthwork	25	CY	$	20	$	500
2	Filter Bed (furnish & install)	25	CY	$	60	$	1,500
3	Outlet Modification	1	LS	$	800	$	800
4	Surface Restoration	1	LS	$	800	$	800
5	Mobilization / Demobilization	1	LS	$	500	$	500
6	General Conditions (5%)	1	LS	$	205	$	205
					Subtotal of Construction Cost	$	4,305
					Technical Services	$	2,200
					Contingency (25%)	$	1,626
					Total Estimated Project Cost	**$**	**8,131**

Notes:

1) Earthwork is based on 20-ft x 10-ft x 3-ft deep.

2) Surface restoration includes topsoil, seed, loam and plantings.

3) General Conditions includes necessary bonds, insurance, site maintenance.

Version: 11/15/2018

Project Name:	**Randolph**
Discharge Point:	**53**
Bioretention #	**Post Office**

Bioretention (4.3.1)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	0.120	0.000	0.120
2	New Impervious (acres)	0.090	0.000	0.090
3	Redeveloped Impervious	0.000	0.000	0.000
		WQ_V for credit	WQ_V not for credit	Total WQ_V
4	WQ_V to practice	0.0073	0.0000	0.0073

Modified CN for WQ (1.0") storm: 97

5	Designed to Infiltrate?	◯ Yes ◯ No
6*	Design Volume for Infiltration T_V (acre-feet)	0.0000
7	Designed to Infiltrate >WQ_V?	◯ n/a ◯ No ◯ Yes

Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.1.1)	Response	Attachment location
8*	Is the SHGWT at or below the bottom of the practice?	◯ Yes ◯ No	
9*	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	◯ Yes ◯ No	
10*		◯ Yes ◯ No	

	Conveyance (4.3.1.2)	Response	Attachment location
11	Has an underdrain been provided? (required if the underlying soils have an infiltration rate of less than 0.2 inches per hour)	◯ Yes ◯ No	
12*		◯ Yes ◯ No	
13	Have the outfalls and the conveyance to the discharge point been designed/protected to avoid erosive velocities?	◯ Yes ◯ No	

14	Has the practice either been designed as offline for the WQ_V or T_V, or a non-erosive outlet for the 10 year storm event been provided?	◯ Yes ◯ No	

	Pre-Treatment (4.3.1.3)	Response	Attachment location
15	Has pretreatment been provided for non-rooftop runoff?	◯ Yes ◯ No	
16	What type of pretreatment is being used?	☐ Swale ☐ Forebay (25% WQv) ☐ Proprietary ☐ Filter Strip ☐ Deep Sump Catch Basins	

	Treatment (4.3.1.4)	Response	Attachment location
17	Does site plan specify a bioretention mix consisting of sand or loamy sand by USDA classification (85-88% sand, 8-12% silt, and 0-2% clay) and 3-5% organic matter in the form of compost?	◯ Yes ◯ No	

	Treatment Volume Calculation - Bioretention without Underdrain		Response	Attachment location
18*	What is the Water Quality Volume that the Bioretention filter bed will be sized to treat?		**0.0073**	
19	What is the depth of the filter bed? (2-4 feet)	d_f (ft)	**2**	
20	What is the coefficient of permeability of the filter media?	k (ft/day)	**1**	
21	What is the average height of water above the filter bed?	h_f (ft)	**0.5**	
22	What is the design filter bed drain time? (≤2 days)	t_f (days)	**2**	
23*	Required minimum surface area of the filter bed	Af (ft^2)	**126**	
24	Design filter bed area	Af (ft^2)	**200**	
25	Is the Bioretention storage volume, including the storage volume above the filter bed, volume in any upstream pre-treatment practice, as well as within the filter media, > 75% of the design WQv or Tv (as applicable)?		◯ Yes ◯ No	

	Treatment Volume Calculation- Bioretention with Underdrain		Response	Attachment location
26*		A_f (ft^2)	**200**	
27*	Underdrain not used (Question 10). This section not required.	(ft)	**0**	
28*		porosity	**0**	
29*			**0**	**ft^3**
30*			**0.0000**	**ac-ft**

	Landscaping (4.3.1.5)	Response	Attachment location
31	Does the site plan specify a landscaping plan that ensures dense and vigorous vegetation over the contributing pervious drainage areas and the practice?	◯ Yes ◯ No	

Attachment location: Indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

GRID NORTH

Town of Randolph
Municipal Building

RAIN GARDEN/
BIORETENTION AREA

MODIFY CATCH BASIN
FRAME AND COVER

contributing drainage area

53

U.S. Post
Office

Summer Street

Kelly Way

North Main Street

Salisbury Street

50 0 25 50 100

(IN FEET)
1 inch = 50 ft.

OTTER CREEK
ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

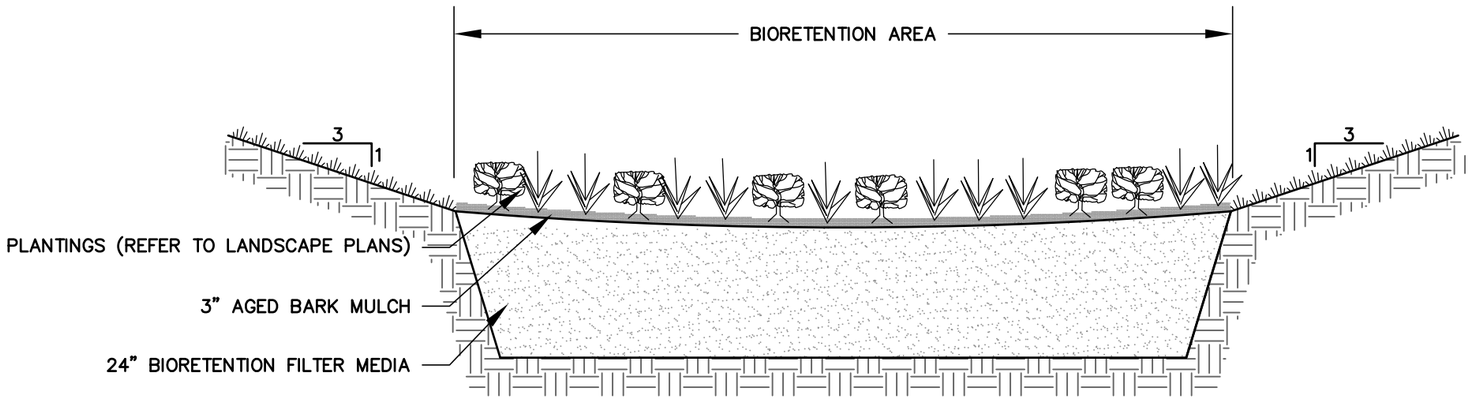
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED
#53
TREATMENT

SKETCH NO.
3A

REF. DRAWING:



BIORETENTION SECTION

NOT TO SCALE

OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	SHOWN
PROJECT NO.:	923.001

TITLE:
BIORETENTION AREA DETAIL

SKETCH NO.
3A-1

REF. DRAWING:

Depth to Water Table—Orange County, Vermont

Map Scale: 1:455 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 20 40 80 120

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Lines

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Points

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
MeA	Merrimac fine sandy loam, 0 to 3 percent slopes	>200	0.7	100.0%
Totals for Area of Interest			**0.7**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

WATERSHED #55 (RANDOLPH HOUSE):

Description:
The watershed as mapped by VTDEC is 2.0 acres in size and 35.0% impervious surfaces (0.7 acres). Nearly the entire watershed contributes to the location of the identified retrofit site. The contributing watershed is relatively flat but transitions to a steeper slope in the area of the proposed retrofit. The soil in the location of the identified retrofit are Hadley very fine sandy loam with a depth of approximately 5 feet to the water table. Hadley soil is designated as Hydrologic Soil Group 'B' designation which indicates the soil has a moderate infiltration rate when thoroughly wet. Runoff flows overland across paved parking or from a small closed drainage system serving the Randolph House parking lot. Flows then enter a depression adjacent to the drive off Prince Street before they are conveyed across Prince Street into the adjacent conservation area and ultimately to the Third Branch of the White River. Runoff from the watershed flows untreated and unmanaged to the receiving stream.

Retrofit:
We approximate that 0.7 acres of impervious surface drains to the site of the potential retrofit.

The land for the retrofit is on private property and on Town owned land. Discussions related to ownership, access, maintenance and costs are the first step in determining if a practice in this location is practical moving forward.

For this retrofit site, we recommend installation of a surface sand filter to treat the water quality volume (0.06 ac-ft) from the contributing watershed. A filter was chosen in this instance due to the potential for groundwater in this location. The retrofit site is proposed at the downhill side of the access drive to Randolph House. Work would involve installation of a new drain manhole to direct flows to a newly constructed sediment forebay (20ft x 20ft x 4 ft). Runoff would then be routed to the filter bed (40ft x 40ft x 2ft) with an overflow pipe connected to a closed drainage system that conveys flows to the receiving stream. We anticipate that implementation of this practice would provide water quality, recharge and credit towards runoff reduction if designed for larger storms. Onsite soils testing and verification of the soil infiltration rate and depth to groundwater is needed at this site. This type of treatment practice does not provide flow attenuation.

WATERSHED #55 (RANDOLPH HOUSE):

Watershed #55 (Randolph House)							
Preliminary Opinion of Project Cost							
Item No.	Description	Unit Quantity		Unit Cost		Total Cost	
1	Mass Excavation (Earthwork - Forebay	60	CY	$	20	$	1,200
2	Filter Bed Installation	90	CY	$	30	$	2,700
3	Drain Manhole	1	LS	$	4,500	$	4,500
4A	Piping to Filter Bed	14	LF	$	50	$	700
4B	Piping to Forebay	60	LF	$	60	$	3,600
5	Outlet & Piping to Collection System	80	LF	$	60	$	4,800
6	Surface Restoration	1	LS	$	1,500	$	1,500
7	Mobilization / Demobilization	1	LS	$	1,500	$	1,500
8	EPSC Measures (3.5%)	1	LS	$	718	$	718
9	General Conditions (5%)	1	LS	$	1,025	$	1,025
			Subtotal of Construction Cost			$	22,243
			Engineering Services			$	6,500
			Contingency (25%)			$	7,186
			Total Estimated Project Cost			**$**	**35,928**

Notes:

1) Mass excavation for Forebay assumes 20-ft x 20-ft x 4-ft deep.
2) Filter bed assumes 40-ft x 40-ft x 2-ft deep bed
3) Diversion manhole includes the structure, installation and backfill.
4) Surface restoration includes topsoil, seed and mulch; and trench paving.
5) General Conditions includes necessary bonds, insurance, site maintenance.

Version: 1/25/2018

Project Name:	**Randolph**
Discharge Point:	**55 Randolph House**
Filter #	**55**

Filters (4.3.4)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	2.000	0.000	2.000
2	New Impervious (acres)	0.700	0.000	0.700
3	Redeveloped Impervious	0.000	0.000	0.000
		WQ_V for credit	WQ_V not for credit	Total WQ_V
4	WQ_V to practice	0.0608	0.0000	0.0608

Modified CN for WQ (1.0") storm: 91

5	Designed to Infiltrate?	◯ Yes ◯ No
6*	Design Volume for Infiltration T_V (acre-feet)	0.0000
7	Designed to Infiltrate >WQ_V?	◯ n/a ◯ No ◯ Yes

Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.4.1)	Response	Attachment location
8*	Is the SHGWT at or below the bottom of the practice?	◯ Yes ◯ No	
9*	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	◯ Yes ◯ No	

	Conveyance (4.3.4.2)	Response	Attachment location
10	Has an underdrain been provided? (required if the underlying soils have an infiltration rate of less than 0.2 inches per hour)	◯ Yes ◯ No	
11*		◯ Yes ◯ No	
12	Have the outfalls and the conveyance to the discharge point been designed/protected to avoid erosive velocities?	◯ Yes ◯ No	
13	Is the practice unlined unless the presence of a stormwater hotspot or other site constraint has been discussed with ANR?	◯ Yes ◯ No	

	Pre-Treatment (4.3.4.3)	Response	Attachment location
14	Has pretreatment been provided for non-rooftop runoff?	◯ Yes ◯ No	
15	What type of pretreatment is being used?	☐ Swale ☐ Forebay (25% WQv) ☐ Proprietary ☐ Filter Strip ☐ Deep Sump Catch Basins	

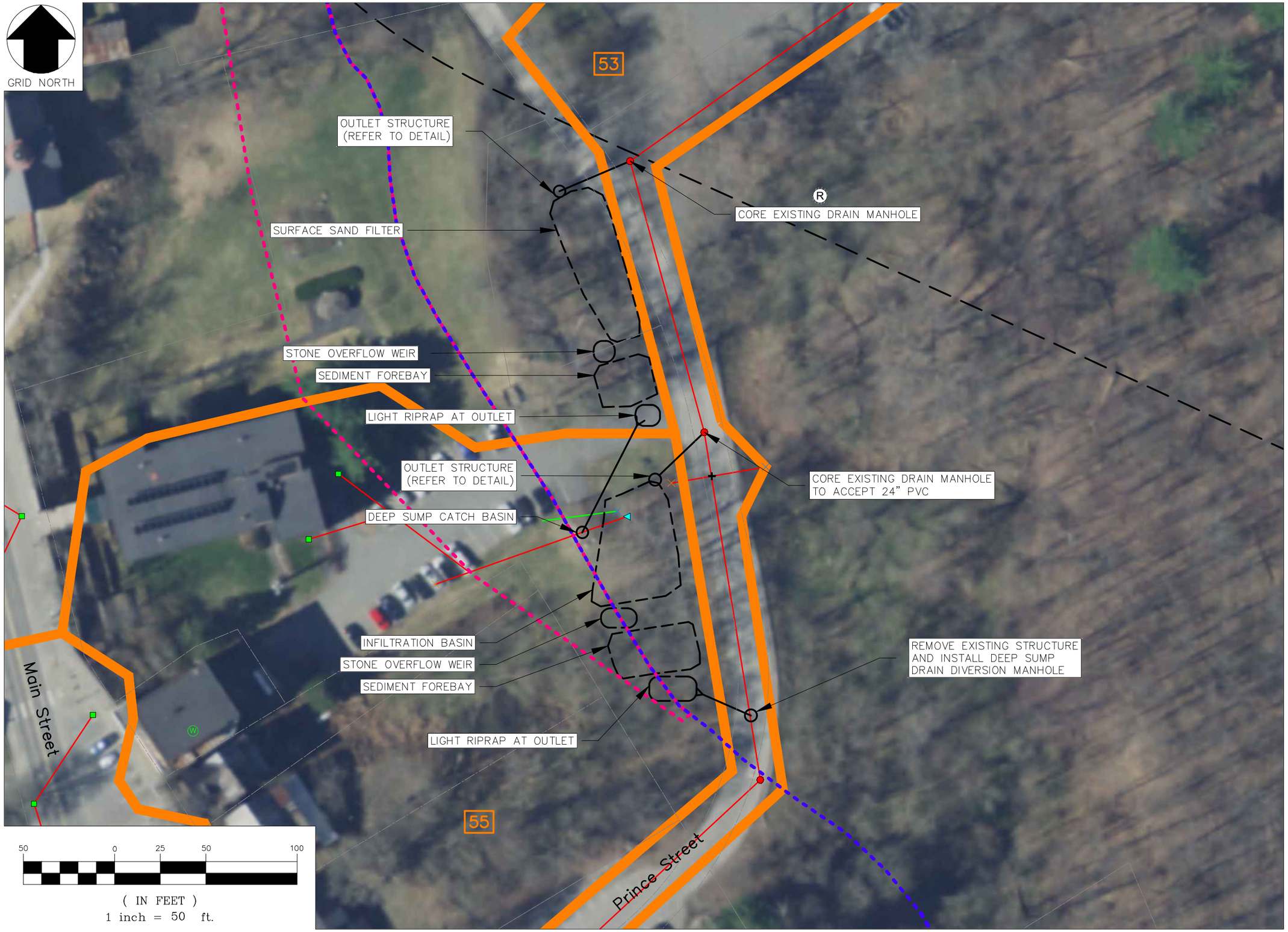
	Treatment (4.3.4.4)	Response	Attachment location
16	Does the site plan specify a filter media consisting of medium sand (ASTM C-33 concrete sand) or an approved equivalent?	◯ Yes ◯ No	
17	Does the filter bed have a minimum depth of 18 inches or 12 inches for perimeter filters?	◯ Yes ◯ No	

	Treatment Volume Calculation - Filter without Underdrain		Response	Attachment location
18*	What is the Water Quality Volume that the Filter bed will be sized to treat?		**0.0608**	
19	What is the depth of the filter bed? (2-4 feet)	d_f (ft)	**2**	
20	What is the coefficient of permeability of the filter media?	k (ft/day)	**1**	
21	What is the average height of water above the filter bed?	h_f (ft)	**1**	
22	What is the design filter bed drain time? (≤2 days)	t_f (days)	**1.25**	
23*	Required minimum surface area of the filter bed	Af (ft^2)	**1413**	
24	Design filter bed area	Af (ft^2)	**1600**	
25	Is the Filter storage volume, including the storage volume above the filter bed, volume in any upstream pre-treatment practice, as well as within the filter media, > 75% of the design WQv or Tv (as applicable)?		◉ Yes ◯ No	

	Treatment Volume Calculation- Bioretention with Underdrain		Response	Attachment location
26*		A_f (ft^2)	**1600**	
27*	Underdrain not used (Question 10). This section not required.	(ft)	**0**	
28*		porosity	**0**	
29*			**0**	**ft^3**
30*			**0.0000**	**ac-ft**

	Landscaping (4.3.1.5)	Response	Attachment location
31	Does the site plan specify a landscaping plan that ensures dense and vigorous vegetation over the contributing pervious drainage areas and the practice?	◯ Yes ◯ No	

Attachment location: Indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED #53 & #55 TREATMENT

SKETCH NO.
3B

REF. DRAWING:

Depth to Water Table—Orange County, Vermont

Map Scale: 1:780 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
Ha	Hadley very fine sandy loam	153	0.6	71.3%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	>200	0.3	28.7%
Totals for Area of Interest			**0.9**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Hydrologic Soil Group—Orange County, Vermont

Map Scale: 1:780 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ha	Hadley very fine sandy loam	B	0.6	71.3%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	A	0.3	28.7%
Totals for Area of Interest			**0.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #56:

Description:
The watershed as mapped by VTDEC is 3.7 acres in size and 75.6% impervious surfaces (2.8 acres). Nearly the entire watershed drains to the location of the identified retrofit site. The contributing watershed is made up of the business and commercial area along the north portion of North Main Street. Impervious surfaces in the form of roads, rooftops and sidewalks make up a majority of the cover in the watershed. The contributing watershed is relatively flat. Soils in the watershed and at the location of the proposed retrofit are Merrimac fine sandy loam on 0 to 3 percent slopes with a depth to the water table of more than 6.5 feet. Merrimac soil is designated as Hydrologic Soil Group 'A' soils which are well draining and have a high infiltration rate. Runoff drains to the north where it is collected in a series of catch basins along North Main Street. Collection pipe then conveys flows to daylight within town owned land that lies within a portion of Prince Street which circles off and below the North Main Street Bridge. From the collection system, runoff flows down a steep embankment to a shallow depression then through a culvert with headwall before it reaches the receiving stream. Runoff from this portion of the watershed flows untreated and unmanaged to the receiving stream.

Retrofit:
We approximate that 2.7 acres of impervious surface drains to the location of the potential retrofit.

The land for the retrofit is on Town owned land.

For this retrofit site, the land available for a treatment practice is limited due to the adjacent slopes and roadway. We propose installation of a hydrodynamic separator to pretreat runoff prior to releasing it to an infiltration basin preliminarily sized to accommodate the water quality volume of 0.22 ac-ft. The existing outlet will be modified to serve as an overflow for larger storm events. Onsite soils testing and verification of the soil infiltration rate and depth to groundwater is needed at this site. This type of treatment practice provides limited flow attenuation.

WATERSHED #56:

Watershed #56					
Preliminary Opinion of Project Cost					
Item No.	Description	Unit Quantity		Unit Cost	Total Cost
1	Hydrodynamic Separator	1	LS	$ 30,000	$ 30,000
2	Earthwork (including regrading)	355	CY	$ 20	$ 7,100
3	Outlet modifications	1	LS	$ 4,000	$ 4,000
4	Surface Restoration	1	LS	$ 1,500	$ 1,500
5	Mobilization / Demobilization	1	LS	$ 2,000	$ 2,000
6	EPSC Measures (3.5%)	1	LS	$ 1,561	$ 1,561
7	General Conditions (5%)	1	LS	$ 2,230	$ 2,230
				Subtotal of Construction Cost	$ 48,391
				Technical Services	$ 5,000
				Contingency (25%)	$ 13,348
				Total Estimated Project Cost	**$ 66,739**

Notes:

1) Hydrodynamic Separator (Model CDS2025-5)
2) Earthwork assumes 2,600 square feet of restoration.
3) Site restoration includes topsoil, seed and mulch.
4) General Conditions includes necessary bonds, insurance, site maintenance.

Version: 1/25/2018

Project Name:	**Randolph**
Discharge Point:	**56**
Infiltration Practice #	**56**

Infiltration (4.3.3)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	3.700	0.000	3.700
2	New Impervious (acres)	2.700	0.000	2.700
3	Redeveloped Impervious	0.000	0.000	0.000
		WQ_V for credit	WQ_V not for credit	Total WQ_V
4	WQ_V to practice	0.2179	0.0000	0.2179

Modified CN for WQ (1.0") storm: 97

5 Design Volume for Infiltration ($T_{V)}$): 0.0000 ← Tv value to enter on the Standards Compliance Workbook for this practice

6 Practice Type:
- (●) Infiltration Basin
- ( ) Infiltration Trench
- ( ) Infiltration Chambers
- ( ) Drywell(s)

Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.3.1)	**Response**	**Attachment location**
7	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	( ) Yes ( ) No	
8*	Is the seasonal high groundwater table (SHGWT) separated at least three (3) feet vertically from the bottom of the practice?	( ) Yes ( ) No	
9	Has a groundwater mounding analysis been performed if the practice is designed to infiltrate >1 year storm and the SHGWT <4 feet?	( ) Yes ( ) No	
10	Have the proper setback requirements for groundwater source protection been observed? (Section 4.3.3.1)	( ) Yes ( ) No	
11	Has the practice been placed so that it will not cause intrusion problems for down-gradient structures? (Section 4.3.3.1)	( ) Yes ( ) No	
12	Is the site free from subsurface contamination or prior approval obtained from the Agency? (If approval is required based on prior contamination, include	( ) Yes ( ) No	
13*	Is the basin designed with side slopes of 2:1 or flatter?	( ) Yes ( ) No	

	Conveyance (4.3.3.2)	**Response**	**Attachment location**

14	Have the outfalls and the conveyance to the discharge point been designed/protected to avoid erosive velocities?	◯ Yes ◯ No	
15	Is the practice designed to completely dewater the treatment volume (T_V) within 48 hours after the storm event?	◯ Yes ◯ No	
16	If the practice is designed to infiltrate <1 year storm and runoff is delivered by the main conveyance system, has it been designed as an off-line practice?	◯ Yes ◯ No	

	Pre-Treatment (4.3.3.3)		**Response**	**Attachment location**
17	Has pretreatment been provided for non-rooftop runoff?		◯ Yes ◯ No	
18	What type of pretreatment is being used?	☐ Swale ☑ Forebay ☐ Proprietary ☐ Filter Strip ☐ Deep Sump Catch Basins		
19*	Is the infiltration rate (fc) greater than or less than 2 inches per hour?		◯ ≤ 2 in/hr ◯ > 2 in/hr	
20*	Is the forebay sized to hold at least 50% of the WQv?		◯ Yes ◯ No	
21*	Is the forebay separated at least three (3) feet from the SHGWT or located over impermeable soils?		◯ Yes ◯ No	

	Treatment (4.3.2.4)		**Response**	**Attachment location**
22	Has direct access been provided to the practice for maintenance and rehabilitation?		◯ Yes ◯ No	
23*			◯ Yes ◯ No	
24	What is the treatment volume provided by the STP?	**T_V (ac-ft)**		

Treatment Volume (T_V) for infiltration practices may be calculated using the equations provided as design guidance in Section 4.3.3.5 OR by demonstrating infiltration of the T_V using TR-20 or an approved equavalent.

	Landscaping (4.3.2.5)	**Response**	**Attachment location**
31	Does the site plan specify a landscaping plan that ensures dense and vigorous vegetation over the contributing pervious drainage areas and the practice?	◯ Yes ◯ No	

Attachment location: Indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

OTTER CREEK
ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

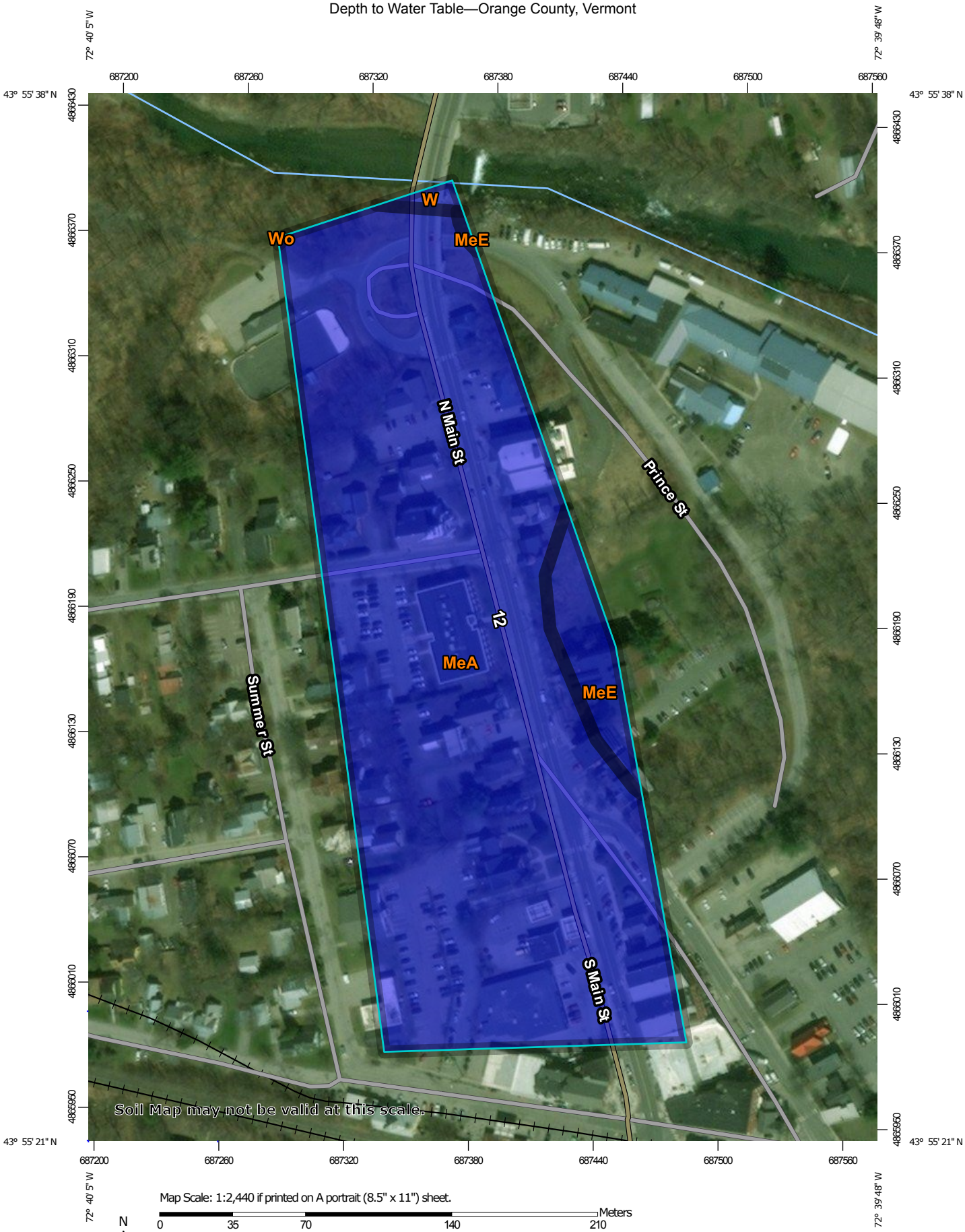
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED
#56
TREATMENT

SKETCH NO.
3C

REF. DRAWING:



Map Scale: 1:2,440 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
MeA	Merrimac fine sandy loam, 0 to 3 percent slopes	>200	11.9	94.3%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	>200	0.6	5.0%
W	Water	>200	0.1	0.6%
Wo	Winooski very fine sandy loam	69	0.0	0.0%
Totals for Area of Interest			**12.6**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

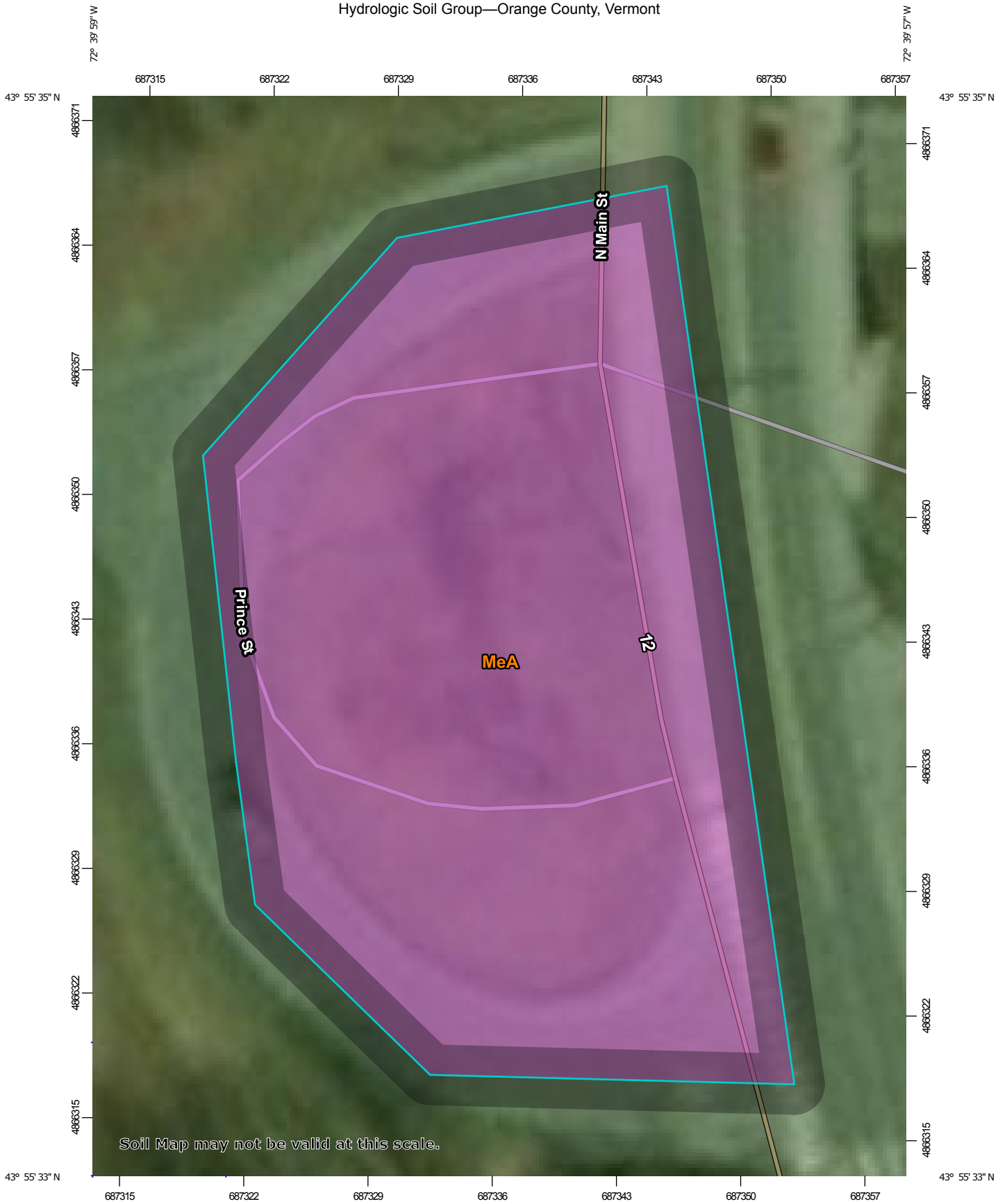
Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December



Map Scale: 1:295 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 4 8 16 24

Feet: 0 10 20 40 60

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MeA	Merrimac fine sandy loam, 0 to 3 percent slopes	A	0.3	100.0%
Totals for Area of Interest			**0.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #59:

Description:
The watershed as mapped by VTDEC is 167.9 acres in size and approximately 21.1 % impervious surfaces (35.4 acres). The watershed is designated as "Action List #1" in the DEC stormwater infrastructure mapping project report. The contributing area is approximately 40% wooded hillside with the remainder being residential properties in the downtown. Soils in the area of the identified retrofit site are classified as Hadley very fine sandy loam, Hydrologic Soil Group 'B' designation and have a depth to groundwater of 153 centimeters (5 feet). Runoff from the upper portion of the wooded watershed flows north to the residential areas where it is then collected by existing catch basins and a closed drainage system that then conveys flows within a trunk line collection system which outfalls at the bank adjacent to the Third Branch of the White River. The depth of the collection system at the lower end of the watershed is approximately 4 feet deep. The depth of the existing collection system limits the potential for daylighting runoff or the use of surface based stormwater treatment practices. Additionally, the depth of the collection system places any proposed treatment practice at or just above the water table based on mapping. Runoff from the watershed flows untreated and unmanaged through the watershed and to the receiving stream.

Retrofit:
Based on preliminary calculations, given the size of the contributing watershed at the site of the recommended treatment practice, treatment of the entire water quality storm is not feasible due to available land. Our calculations for water quality volume yield a volume of approximately 3.3 acre-feet (143,000 cf). A sediment forebay and infiltration practice sized to accommodate this volume will not fit within the footprint of land available. In addition, at the retrofit location installation of a treatment practice that provides suitable separation to groundwater is not likely.

The land for the potential retrofit is open and currently being used by the Town as recreation fields.

At this time and based on data collected, we do not recommend installation of a stormwater retrofit in the location as identified by VTDEC. We suggest exploring alternatives within the watershed that will break the contributing area down into more manageable components thereby reducing the flows and volumes that need to be treated.

Cost:

$ T.B.D.	Retrofit not identified/proposed.
$ T.B.D.	**Total Estimated Project Cost**

VTDEC COMMENT: Town may want to consider calculating a WQv based on the first flush from the immediate 10-20 acres of impervious drainage that is directly connected by the drainage system. A bypass would be necessary. This just seems like a very good site for a retrofit if it is not in the floodplain.

Version: 1/25/2018

Project Name:	**Randolph**
Discharge Point:	**59**
Infiltration Practice #	**59**

Infiltration (4.3.3)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	167.900	0.000	167.900
2	New Impervious (acres)	35.400	0.000	35.400
3	Redeveloped Impervious	0.000	0.000	0.000
		WQ_V for credit	WQ_V not for credit	Total WQ_V
4	WQ_V to practice	3.3546	0.0000	3.3546

Modified CN for WQ (1.0") storm: 88

5 Design Volume for Infiltration ($T_{V)}$): 0.0000 ← Tv value to enter on the Standards Compliance Workbook for this practice

6 Practice Type:
- (●) Infiltration Basin
- ( ) Infiltration Trench
- ( ) Infiltration Chambers
- ( ) Drywell(s)

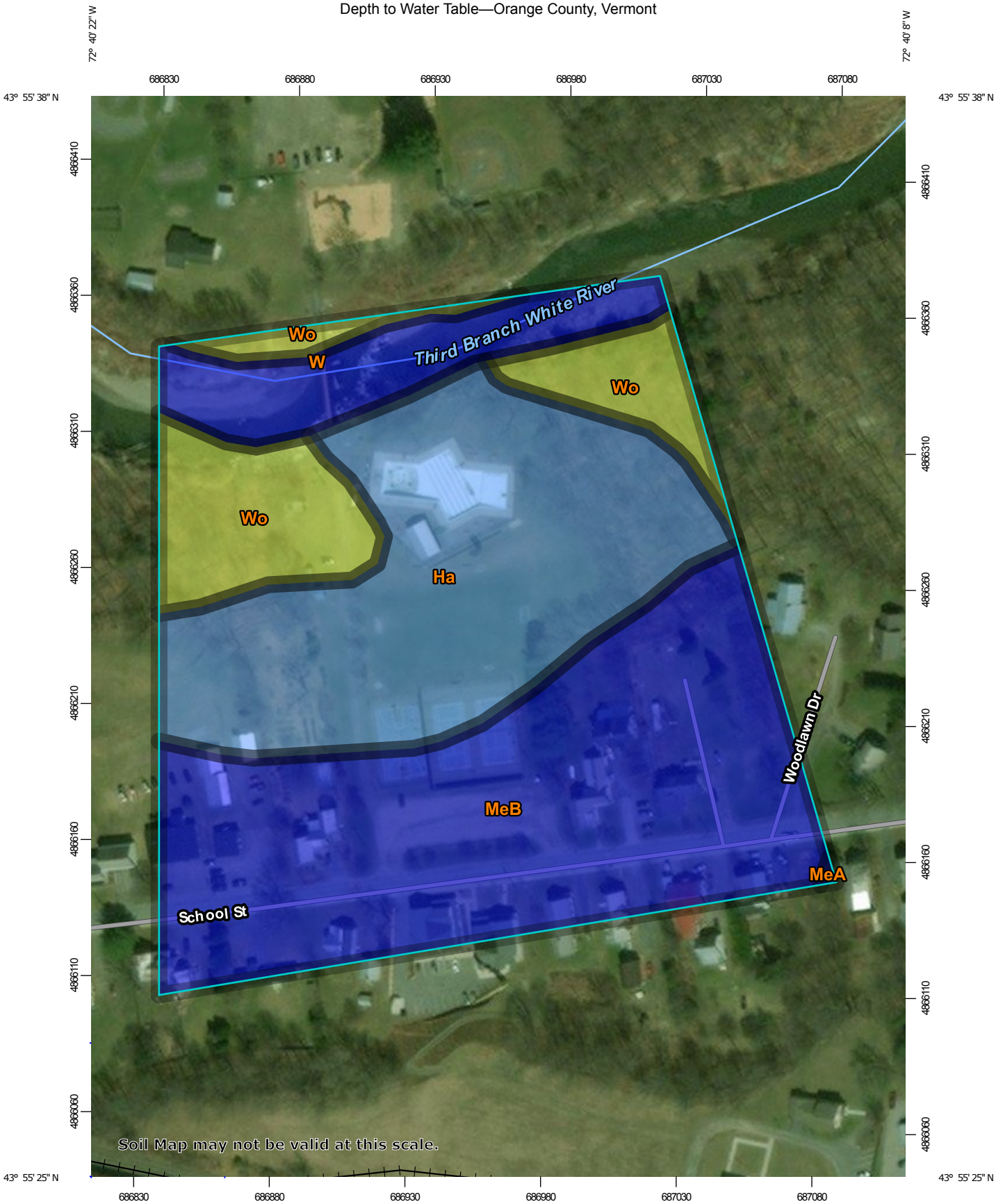
Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.3.1)	**Response**	**Attachment location**
7	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	( ) Yes ( ) No	
8*	Is the seasonal high groundwater table (SHGWT) separated at least three (3) feet vertically from the bottom of the practice?	( ) Yes ( ) No	
9	Has a groundwater mounding analysis been performed if the practice is designed to infiltrate >1 year storm and the SHGWT <4 feet?	( ) Yes ( ) No	
10	Have the proper setback requirements for groundwater source protection been observed? (Section 4.3.3.1)	( ) Yes ( ) No	
11	Has the practice been placed so that it will not cause intrusion problems for down-gradient structures? (Section 4.3.3.1)	( ) Yes ( ) No	
12	Is the site free from subsurface contamination or prior approval obtained from the Agency? (If approval is required based on prior contamination, include	( ) Yes ( ) No	
13*	Is the basin designed with side slopes of 2:1 or flatter?	( ) Yes ( ) No	

	Conveyance (4.3.3.2)	**Response**	**Attachment location**

Depth to Water Table—Orange County, Vermont



Map Scale: 1:1,930 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
Ha	Hadley very fine sandy loam	153	4.3	33.9%
MeA	Merrimac fine sandy loam, 0 to 3 percent slopes	>200	0.0	0.1%
MeB	Merrimac fine sandy loam, 3 to 8 percent slopes	>200	5.4	42.9%
W	Water	>200	1.1	9.0%
Wo	Winooski very fine sandy loam	69	1.8	14.1%
Totals for Area of Interest			**12.7**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Map Scale: 1:1,930 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ha	Hadley very fine sandy loam	4.3	33.9%
MeA	Merrimac fine sandy loam, 0 to 3 percent slopes	0.0	0.1%
MeB	Merrimac fine sandy loam, 3 to 8 percent slopes	5.4	42.9%
W	Water	1.1	9.0%
Wo	Winooski very fine sandy loam	1.8	14.1%
Totals for Area of Interest		**12.7**	**100.0%**

WATERSHED #61:

Description:
The watershed as mapped by VTDEC is 10.8 acres in size and 28.9% impervious surfaces (3.1 acres). We estimate that a portion of the watershed (2 acres) does not drain to the proposed retrofit site. The contributing watershed is made up primarily of residential properties. The contributing watershed slopes from west to east. Soils in the watershed are made up of Merrimac fine sandy loam and Windsor loamy sand. Merrimac soil is designated as Hydrologic Soil Group 'A' soils which are well draining and have a high infiltration rate. Runoff drains to the east where it is collected in piping and roadside ditches. A series of catch basins then collects flow and routes it to the south end of Pearl Street. Runoff from this portion of the watershed flows untreated and unmanaged; however, there does not appear to be any nearby receiving streams or wetland areas based on mapping and visual observations. It also appears that at the outfall runoff naturally infiltrates to the ground.

Retrofit:
We approximate that roughly 9 acres of the watershed drain to the retrofit location.

The land for the retrofit is within the Town right-of-way. Possible improvements on adjacent land would be on private land.

For this watershed, there appears to be little degradation to water quality in the existing condition. For improvements, we suggest installation of a pretreatment practice to limit fine sediment from clogging or slowing the infiltration rate of existing soils. In addition, it is not clear whether or not the Town has rights or owns the land to which the collection system discharges. We recommend further investigations to determine ownership and, if necessary, enter into discussions to obtain the necessary rights at this outfall to protect it from development and allow it to remain and serve as a natural infiltration area. We anticipate that implementation of this retrofit will provide minimal benefit to water quality discharged from this watershed.

WATERSHED #61:

Watershed #61							
Preliminary Opinion of Project Cost							
Item No.	Description	Unit Quantity		Unit Cost		Total Cost	
1	Earthwork (Sediment Forebay)	225	CY	$	20	$	4,500
2	Riprap at Outlet	1	LS	$	1,500	$	1,500
3	Surface Restoration	1	LS	$	750	$	750
4	Mobilization / Demobilization	1	LS	$	750	$	750
5	EPSC Measures (3.5%)	1	LS	$	263	$	263
6	General Conditions (5%)	1	LS	$	375	$	375
					Subtotal of Construction Cost	$	8,138
					Engineering Services	$	2,500
					Contingency (25%)	$	2,659
					Total Estimated Project Cost	**$**	**13,297**

Notes:

1) Sediment Forebay is assumed to be 50% of WQv, 45-ft x 45-ft x 3-ft deep.
2) Rip Rap Outlet assumes one dump truck load.
3) Limited EPSC Measures, based on size and scope of project.
4) General Conditions includes necessary bonds, insurance, site maintenance.

Version: 1/25/2018

Project Name:	**Randolph**
Discharge Point:	**61**
Filter #	**61**

Filters (4.3.4)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	9.000	0.000	9.000
2	New Impervious (acres)	3.000	0.000	3.000
3	Redeveloped Impervious	0.000	0.000	0.000
		WQ_V for credit	WQ_V not for credit	Total WQ_V
4	WQ_V to practice	0.2625	0.0000	0.2625

Modified CN for WQ (1.0") storm: 91

5	Designed to Infiltrate?	◯ Yes ◯ No
6*	Design Volume for Infiltration T_V (acre-feet)	0.0000
7	Designed to Infiltrate >WQ_V?	◯ n/a ◯ No ◯ Yes

Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.4.1)	**Response**	**Attachment location**
8*	Is the SHGWT at or below the bottom of the practice?	◯ Yes ◯ No	
9*	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	◯ Yes ◯ No	

	Conveyance (4.3.4.2)	**Response**	**Attachment location**
10	Has an underdrain been provided? (required if the underlying soils have an infiltration rate of less than 0.2 inches per hour)	◯ Yes ◯ No	
11*		◯ Yes ◯ No	
12	Have the outfalls and the conveyance to the discharge point been designed/protected to avoid erosive velocities?	◯ Yes ◯ No	
13	Is the practice unlined unless the presence of a stormwater hotspot or other site constraint has been discussed with ANR?	◯ Yes ◯ No	

	Pre-Treatment (4.3.4.3)		Response	Attachment location
14	Has pretreatment been provided for non-rooftop runoff?		◯ Yes ◯ No	
15	What type of pretreatment is being used?	☐ Swale ☐ Forebay (25% WQv) ☐ Proprietary ☐ Filter Strip ☐ Deep Sump Catch Basins		

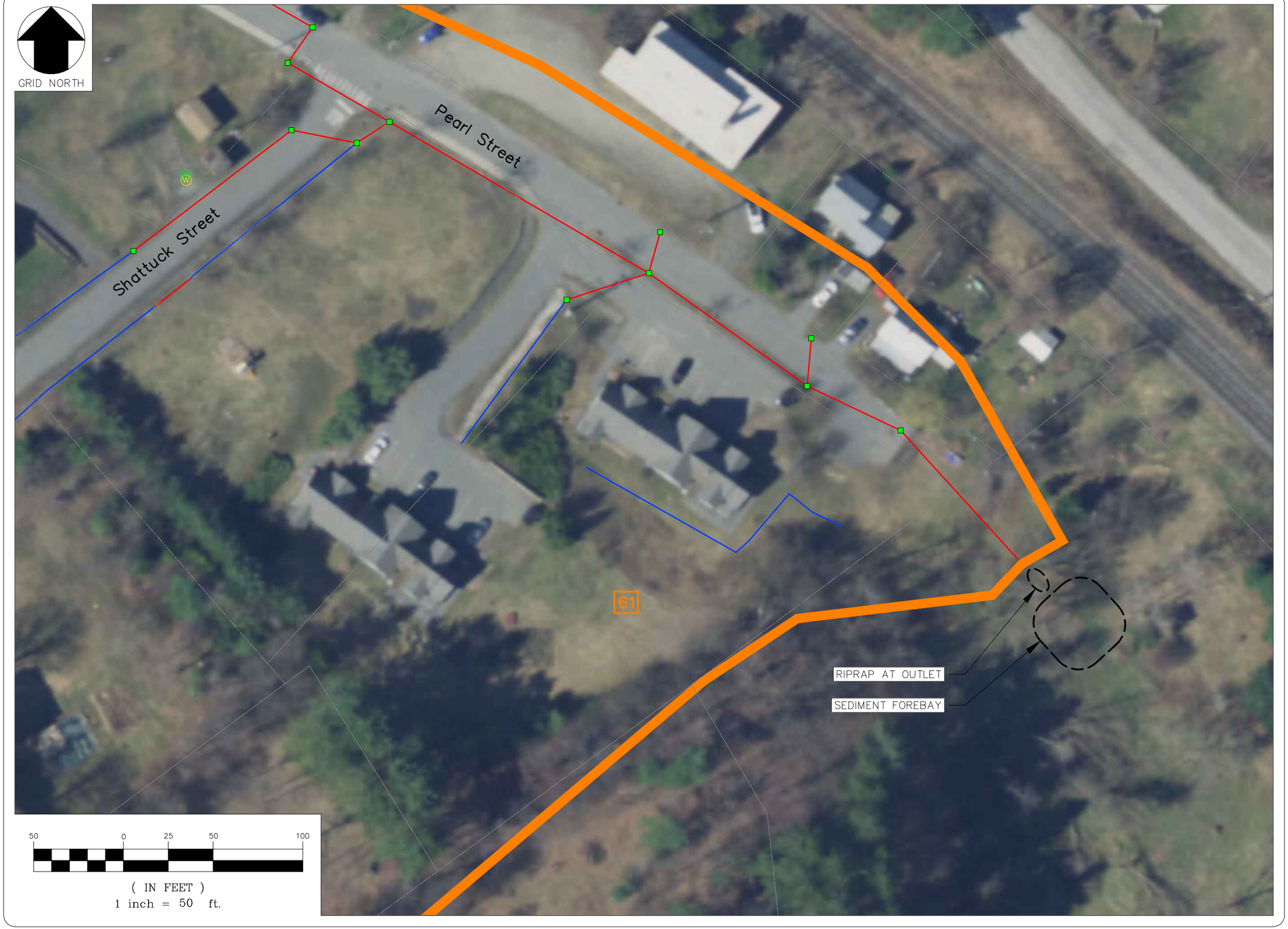
	Treatment (4.3.4.4)	Response	Attachment location
16	Does the site plan specify a filter media consisting of medium sand (ASTM C-33 concrete sand) or an approved equivalent?	◯ Yes ◯ No	
17	Does the filter bed have a minimum depth of 18 inches or 12 inches for perimeter filters?	◯ Yes ◯ No	

	Treatment Volume Calculation - Filter without Underdrain		Response	Attachment location
18*	What is the Water Quality Volume that the Filter bed will be sized to treat?		**0.2625**	
19	What is the depth of the filter bed? (2-4 feet)	d_f (ft)	**0**	
20	What is the coefficient of permeability of the filter media?	k (ft/day)	**1**	
21	What is the average height of water above the filter bed?	h_f (ft)	**0**	
22	What is the design filter bed drain time? (≤2 days)	t_f (days)	**0**	
23*	Required minimum surface area of the filter bed	Af (ft^2)		
24	Design filter bed area	Af (ft^2)		
25	Is the Filter storage volume, including the storage volume above the filter bed, volume in any upstream pre-treatment practice, as well as within the filter media, > 75% of the design WQv or Tv (as applicable)?		◉ Yes ◯ No	

	Treatment Volume Calculation- Bioretention with Underdrain		Response	Attachment location
26*		A_f (ft^2)	**0**	
27*	Underdrain not used (Question 10). This section not required.	(ft)	**0**	
28*		porosity	**0**	
29*			**0**	**ft^3**
30*			**0.0000**	**ac-ft**

	Landscaping (4.3.1.5)	Response	Attachment location
31	Does the site plan specify a landscaping plan that ensures dense and vigorous vegetation over the contributing pervious drainage areas and the practice?	◯ Yes ◯ No	

Attachment location: Indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.



OTTER CREEK ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:

SUB-WATERSHED #61 TREATMENT

SKETCH NO.

4A

REF. DRAWING:

Hydrologic Soil Group—Orange County, Vermont

Map Scale: 1:1,860 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MeA	Merrimac fine sandy loam, 0 to 3 percent slopes	A	3.3	33.9%
MeC	Merrimac fine sandy loam, 8 to 15 percent slopes	A	5.9	61.1%
WnE	Windsor loamy sand, 25 to 60 percent slopes	A	0.5	5.0%
Totals for Area of Interest			**9.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #82:

Description:
The watershed based on VTDEC stormwater infrastructure mapping is approximately 7.4 acres in size and 35.4% impervious surfaces (2.6 acres). VTDEC did not identify a potential retrofit within this watershed. The contributing area consists of a portion of the Vermont Castings Foundry and the Town Transfer Station on Landfill Road. ANR mapping indicates the Vermont Castings Foundry is covered under an Operational Stormwater Permit as well as Multi-Sector Permit for discharges from industrial activities. The predominant soil type within the watershed is Merrimac fine sandy loam (0 to 3 percent slopes) with a depth to the water table of more than 200 cm (6.5 ft), and is further designated as Hydrologic Soil Group 'A' indicating that underlying soils have a high infiltration rate. Water flow is primarily to the north and east. A number of open channels direct flow through the watershed. There does not appear to be any nearby receiving streams or wetland areas based on mapping and visual observations. ANR mapping shows the presence of a well and wetlands project on the Foundry property. Any proposed infiltrative stormwater practice will need to be installed outside the isolation zone of this well. It also appears that runoff within the watershed naturally infiltrates to the ground in the existing condition.

Retrofit:
We approximate that the entire watershed drains to the location of the recommended retrofit.

The land for the retrofit is on property owned by Vermont Castings. Discussions related to ownership, access, maintenance and costs are the first step in determining if a practice in this location is practical moving forward.

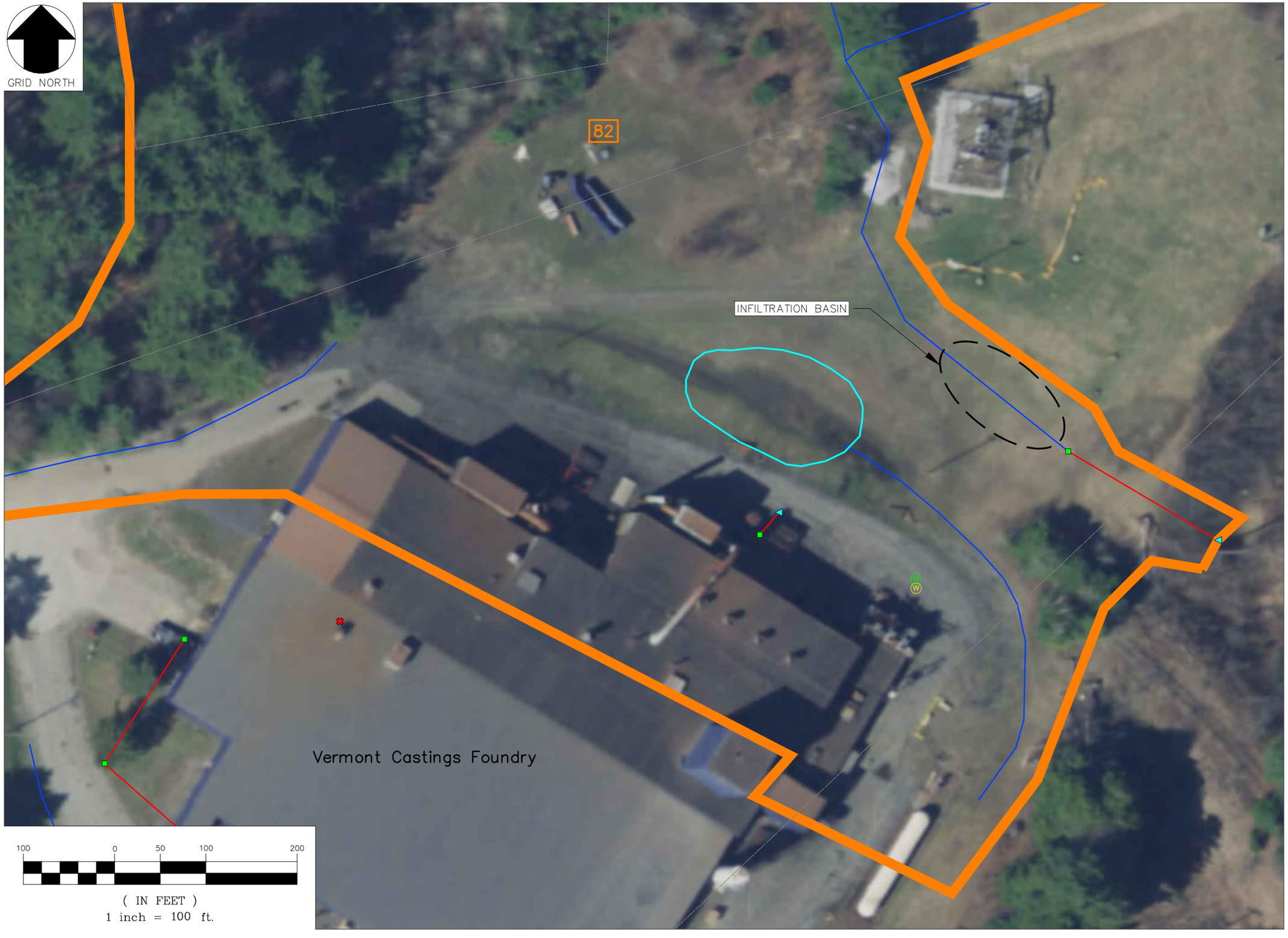
For this watershed, there appears to be little degradation in water quality in the existing condition. We presume that the existing grassed channels are suitable for pretreatment of runoff. For this site, we recommend construction of an infiltration basin to infiltrate flows that are not infiltrated in the existing condition and oversizing it to allow for the attenuation of larger storm events. Our calculations for water quality yield a volume of approximately 0.23 acre feet (9,800 cf). We suggest performing grading to berm existing materials and create a basin with an overflow for extreme runoff events. Onsite soils testing and verification of the soil infiltration rate and depth to groundwater is needed at this site prior to final design. We anticipate that implementation of this retrofit will provide minimal benefit to water quality discharged from this watershed.

WATERSHED #82:

Watershed #82							
Preliminary Opinion of Project Cost							
Item No.	Description	Unit Quantity		Unit Cost		Total Cost	
1	Mass Excavation (infiltration basin)	330	CY	$	20	$	6,600
2	Riprap stabilized overflow weir	1	LS	$	1,250	$	1,250
3	Surface Restoration	1	LS	$	2,500	$	2,500
4	Mobilization / Demobilization	1	LS	$	2,500	$	2,500
5	EPSC Measures (3.5%)	1	LS	$	450	$	450
6	General Conditions (5%)	1	LS	$	643	$	643
					Subtotal of Construction Cost	$	13,942
					Engineering Services	$	3,500
					Contingency (25%)	$	4,361
					Total Estimated Project Cost	**$**	**21,803**

Notes:

1) Mass excavation is based on 100-ft x 30-ft x 3-ft deep for infiltration basin / dry pond.
2) Rip Rap Outlet assumes one dump truck load.
3) Surface restoration includes topsoil, seed, and mulch.
4) General Conditions includes necessary bonds, insurance, site maintenance.



OTTER CREEK
ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION

RANDOLPH VILLAGE STORMWATER

RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED
#82
TREATMENT

SKETCH NO.
9A

REF. DRAWING:

Version: 1/25/2018

Project Name:	**Randolph**
Discharge Point:	**82**
Infiltration Practice #	**82**

Infiltration (4.3.3)

	Practice Drainage Area	For Permit Coverage	Not for Permit Coverage	Total to Practice
1	Total Area (acres)	7.400	0.000	7.400
2	New Impervious (acres)	2.600	0.000	2.600
3	Redeveloped Impervious	0.000	0.000	0.000

		WQ_V for credit	WQ_V not for credit	Total WQ_V		
4	WQ_V to practice	0.2258	0.0000	0.2258	Modified CN for WQ (1.0") storm	91

5 Design Volume for Infiltration ($T_{V)}$: 0.0000 ← Tv value to enter on the Standards Compliance Workbook for this practice

6 Practice Type:
- (●) Infiltration Basin
- ( ) Infiltration Trench
- ( ) Infiltration Chambers
- ( ) Drywell(s)

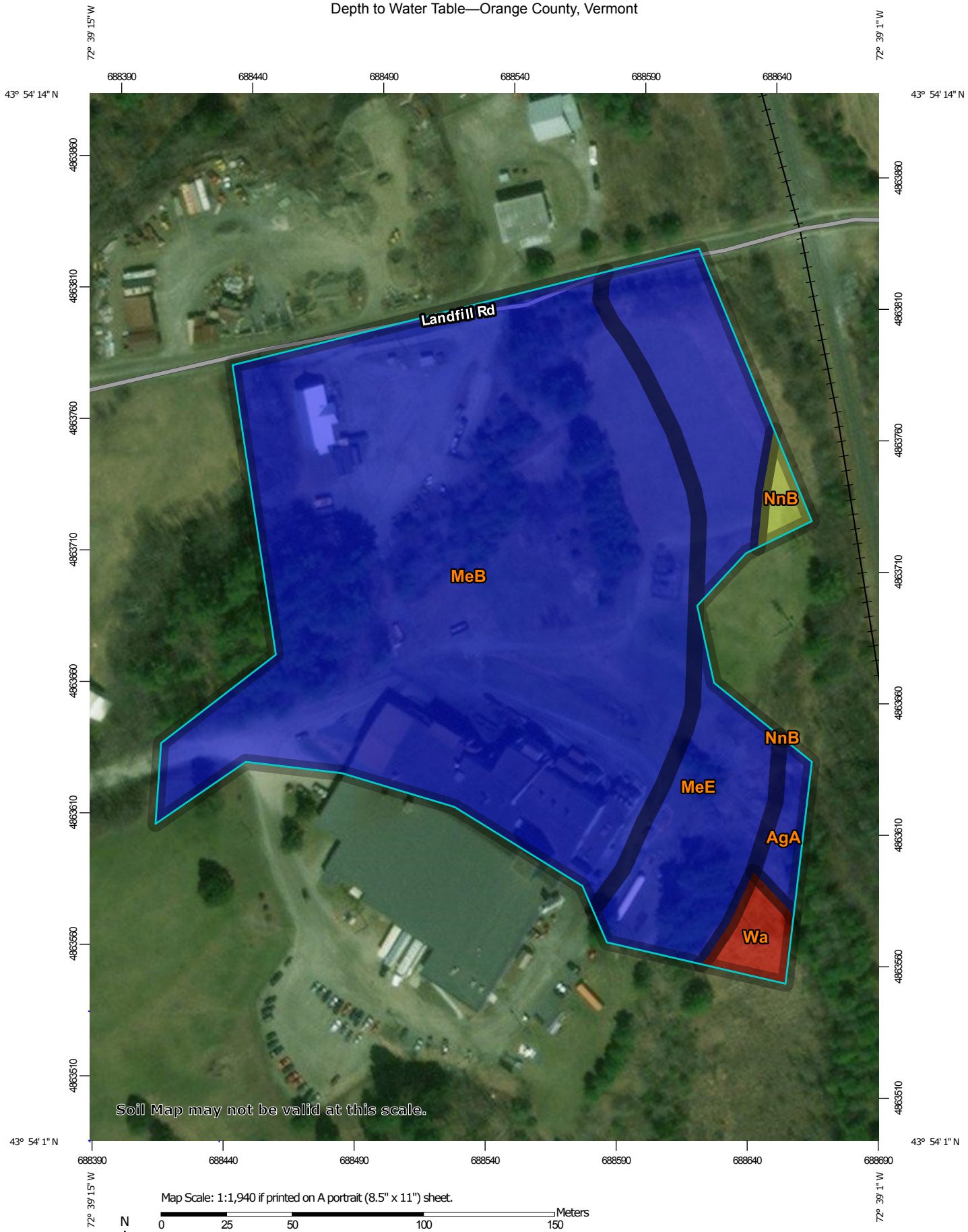
Note: If the practice is designed to infiltrate the WQ_V, then $T_V = WQ_V$. Designers may use the Practice Drainage Area Runoff Calculator (second tab) for calculation of practice-specific runoff volumes for other treatment standards. Sizing of the filter bed area/swale bottom need to consider the desired treatment volume (see treatment section). Some design requirements will change based on the size of storm the practice is designed to treat.

** Questions preceded by an asterix (*) may change based on previously entered values*

	Feasibility (4.3.3.1)	**Response**	**Attachment location**
7	Has the infiltration rate (fc) of the underlying soil been confirmed to be at least 0.2 inches per hour by the soil testing requirements in Section 4.3.3.2?	( ) Yes ( ) No	
8*	Is the seasonal high groundwater table (SHGWT) separated at least three (3) feet vertically from the bottom of the practice?	( ) Yes ( ) No	
9	Has a groundwater mounding analysis been performed if the practice is designed to infiltrate >1 year storm and the SHGWT <4 feet?	( ) Yes ( ) No	
10	Have the proper setback requirements for groundwater source protection been observed? (Section 4.3.3.1)	( ) Yes ( ) No	
11	Has the practice been placed so that it will not cause intrusion problems for down-gradient structures? (Section 4.3.3.1)	( ) Yes ( ) No	
12	Is the site free from subsurface contamination or prior approval obtained from the Agency? (If approval is required based on prior contamination, include	( ) Yes ( ) No	
13*	Is the basin designed with side slopes of 2:1 or flatter?	( ) Yes ( ) No	

Conveyance (4.3.3.2)	**Response**	**Attachment location**

Depth to Water Table—Orange County, Vermont



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	>200	0.2	1.8%
MeB	Merrimac fine sandy loam, 3 to 8 percent slopes	>200	7.9	74.9%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	>200	2.1	20.2%
NnB	Ninigret fine sandy loam, 0 to 8 percent slopes	66	0.1	1.1%
Wa	Walpole fine sandy loam	15	0.2	1.9%
Totals for Area of Interest			**10.5**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Hydrologic Soil Group—Orange County, Vermont

Map Scale: 1:1,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	B	0.2	1.8%
MeB	Merrimac fine sandy loam, 3 to 8 percent slopes	A	7.9	74.9%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	A	2.1	20.2%
NnB	Ninigret fine sandy loam, 0 to 8 percent slopes	C	0.1	1.1%
Wa	Walpole fine sandy loam	A/D	0.2	1.9%
Totals for Area of Interest			**10.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Permit Number: 4412-9015

PIN: BR95-0054

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AUTHORIZATION TO DISCHARGE UNDER
GENERAL PERMIT 3-9015

A determination has been made that the applicant(s):

Vermont Casting
c/o Robert A. Wright
62 Vermont Casting Road
Bethel, VT 05032

Impervious Area: 0.18 acres

meets the criteria necessary for inclusion under General Permit 3-9015. Hereinafter the named applicant shall be referred to as the permittee. Subject to the conditions of General Permit No. 3-9015, the permittee is authorized to discharge stormwater from the Vermont Castings Foundry project located at 1131 Beanville Road in Randolph, Vermont to the class II wetland leading to the Third Branch of the White River.

Manner of Discharge:

Stormwater runoff from foundry expansion and re-developed rooftops via sheet flow to grass channels discharging to a wetland tributary to the Third Branch of the White River.

Design:

This project shall be constructed and operated in accordance with the site plans and details designed by DuBois & King, Inc. (Sheet 1, "Existing Conditions Site Plan", dated 06/2015
Sheet 2, "Proposed Site Plan", dated 09/2015, last revised 4/21/2016
Sheet 3, "Details", dated 09/2015; and all supporting information.)

By reference, the above noted plans are made part of this authorization.

Compliance with General Permit 3-9015 and this Authorization

The permittee shall comply with this authorization and all the terms and conditions of General Permit 3-9015, including the payment of annual operating fees to the Department. A billing statement for such fees will be sent to the permittee each year. The first year's statement is enclosed. Any permit non-compliance, including a failure to pay the annual operating fee, constitutes a violation of 10 V.S.A. Chapter 47 and may be grounds for an enforcement action or revocation of this authorization to discharge.

Transferability

This authorization to discharge is not transferable to any person except in compliance with Part VI.D. of General Permit 3-9015. A copy of General Permit 3-9015 is available from the Department via the internet at
http://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/GeneralPermit9015/sw_3-9015_final_signed.pdf

Changes to Permitted Development

In accordance with Part V.G. of General Permit 3-9015, the permittee shall notify the Department of any planned development or facility expansions or changes that may result in new or increased stormwater discharges. The Department shall determine the appropriateness of continued inclusion under General Permit 3-9015 by the modified development or facility.

Annual Inspection and Report

The stormwater collection, treatment and control system shall be properly operated. The permittee shall submit an annual inspection report on the operation, maintenance and condition of the stormwater collection, treatment and control system. The inspection report shall be submitted regardless of whether the project has been constructed. The inspection shall be conducted between the conclusion of spring snow melt and June 15th of each year and the inspection report shall be submitted to the Secretary by July 15th of each year, or by July 30th if performed by a utility or municipality pursuant to a duly adopted stormwater management ordinance. The inspection report shall note all problem areas and all measures taken to correct any problems and to prevent future problems.

Initial Statement of Compliance

An initial statement of compliance, signed by a designer, must be submitted to the Stormwater Management Program no later than 6 months following completion of construction of the stormwater management system. Failure to submit an initial statement of compliance shall constitute a violation of General Permit 3-9015 and may result in the revocation of this authorization to discharge. Forms for completing this requirement are available on the Stormwater Management Program's website.

Recording in Land Records

The permittee shall record a one-page notice of issuance of this discharge permit in the local land records within fourteen (14) days of issuance of this authorization to discharge on the form provided by the Secretary, per §18-312 of Stormwater Management Rule. The permittee shall provide a copy of the recording to the Stormwater Management Program within fourteen (14) days of the permittee's receipt of the copy of the recording from the local land records.

Renewable Energy Projects – Right to Appeal to Public Service Board

Any appeal of this decision must be filed with the clerk of the Vermont Public Service Board pursuant to 10 V.S.A. §8506 within 30 days of the date of this decision. The appellant must file with the Clerk an original and six copies of its appeal. The appellant shall provide notice of the filing of an appeal in accordance with 10 V.S.A. §8504(c)(2), and shall also serve a copy of the Notice of Appeal on the Vermont Department of Public Service. For information, see the Rules and General orders of the Public Service Board available on line at www.psb.vermont.gov. The address for the Public Service Board is 112 State Street Montpelier, Vermont 05620-2701 (Tel. #802-828-2358).

All Other Projects – Right to Appeal to the Environmental Court

Pursuant to 10 V.S.A. Chapter 220, any appeal of this decision must be filed with the clerk of the Environmental Court within 30 days of the date of the decision. The appellant must attach to the Notice of Appeal the entry fee of $250.00, payable to the state of Vermont. The Notice of Appeal must specify the parties taking the appeal and the statutory provision under which each party claims party status; must designate the act or decision appealed from; must name the Environmental Court; and must be signed by the appellant or their attorney. In addition, the appeal must give the address or location and description of the property, project or facility with which the appeal is concerned and the name of the applicant or any permit involved in the appeal. The appellant must also serve a copy of the Notice of Appeal in accordance with Rule 5(b)(4)(B) of the Vermont Rules for Environmental Court Proceedings. For further information, see the Vermont

Rules for Environmental Court Proceedings, available on line at www.vermontjudiciary.org. The address for the Environmental Court is 32 Cherry Street, 2nd Floor Suite 303 Burlington, Vermont 05401 (Tel. # 802-951-1740).

Effective Date and Expiration Date of this Authorization

This authorization to discharge shall become effective on May 24, 2016 and shall continue until May 24, 2021. The permittee shall reapply for coverage at least sixty (60) days prior to May 24, 2021.

Dated Tuesday, May 24, 2016.

Alyssa Schuren, Commissioner
Department of Environmental Conservation

By: Padraic Monks

Padraic Monks, Stormwater Program Manager
Stormwater Management Program

Permit No. 4412-9003.R

STATE OF VERMONT
AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AUTHORIZATION TO DISCHARGE STORMWATER
UNDER MULTI-SECTOR GENERAL PERMIT 3-9003
NPDES VTR 050001

A determination has been made that the applicant (here in after "permittee"):

Vermont Castings Foundry
62 Vermont Castings Road
Bethel, VT 05032

meets the criteria necessary for inclusion under General Permit 3- 9003. Subject to the conditions and eligibility provisions of General Permit No. 3-9003, the permittee is authorized to discharge stormwater from Vermont Castings Foundry located on Beanville Road in Randolph, Vermont to Trout Brook.

1. Effective Date and Expiration Date of this Authorization: This authorization to discharge shall become effective on February 27, 2012 and shall continue until August 4, 2016. The permittee shall reapply for coverage at least one hundred and eighty (180) days prior to August 4, 2016.

2. Compliance with General Permit 3-9003 and this Authorization: The permittee shall comply with this authorization and all the terms, conditions and eligibility provisions of General Permit 3-9003. General Permit 3-9003 contains a number of detailed requirements which are applicable to your facility and your discharge-related activities. These include, but are not limited to, the inspection, monitoring and reporting requirements listed below. Please read and follow the permit carefully to ensure that you remain in compliance with all permit conditions.

3. Inspection Requirement: The permittee shall conduct monthly facility inspections and an annual comprehensive site inspection in accordance with Part 4 of the General Permit. The permittee shall also conduct quarterly visual assessments of stormwater discharges from the facility.

4. Monitoring Requirement: The permittee must conduct quarterly benchmark monitoring at stormwater outfalls for the following parameters, in accordance with Part 6 of the General Permit. Monitoring data must be submitted to the Secretary on a Discharge Monitoring Report (DMR) form no later than 30 days after receipt of laboratory results.

Subsector	SIC Code	Parameter	Monitoring Concentration
Subsector F2. Iron and Steel Foundries	(SIC 3321-3325)	Total Aluminum	0.75 mg/L
		Total Suspended Solids (TSS)	100 mg/L
		Total Copper	Hardness Dependent
		Total Iron	1.0 mg/L
		Total Zinc	Hardness Dependent

5. Annual Reporting: The permittee must prepare an annual report that includes the findings from the annual comprehensive site inspection and any corrective action documentation. The report must be submitted to the Secretary within 45 days of conducting the annual compliance inspection. In no case shall the report be submitted later than October 15 every year.

6. Operating Fees: This discharge is subject to operating fees under 3 V.S.A. §2822. The permittee shall submit payment of annual operating fees to the Department. The first year's statement is enclosed and a billing statement for such fees will be sent to the permittee each year. Any permit non-compliance, including a failure to pay the annual operating fee, constitutes a violation of 10 V.S.A. Chapter 47 and may be grounds for an enforcement action or revocation of this authorization to discharge.

7. Rights to Appeal to the Environmental Court: Pursuant to 10 V.S.A. Chapter 220, any appeal of this decision must be filed with the clerk of the Environmental Court within 30 days of the date of the decision. The Notice of Appeal must specify the parties taking the appeal and the statutory provision under which each party claims party status; must designate the act or decision appealed from; must name the Environmental Court; and must be signed by the appellant or their attorney. In addition, the appeal must give the address or location and description of the property, project or facility with which the appeal is concerned and the name of the applicant or any permit involved in the appeal. The appellant must also serve a copy of the Notice of Appeal in accordance with Rule 5(b)(4)(B) of the Vermont Rules for Environmental Court Proceedings. For further information, see the Vermont Rules for Environmental Court Proceedings, available on line at www.vermontjudiciary.org. The address for the Environmental Court is 2418 Airport Road, Suite 1, Barre, VT 05641 (Tel.# 802-828-1660).

8. Dated at Winooski, VT this 27th day of February, 2012.

David K. Mears, Commissioner
Department of Environmental Conservation

By Padraic Monks
Padraic Monks, Program Manager
Stormwater Management Program

WATERSHED #84:

Description:
The watershed as mapped by VTDEC is 4.2 acres in size and 36.8% impervious surfaces (1.5 acres). We estimate that the entire watershed drains to the outfall of the closed drainage system. The contributing watershed is made up of single family residential properties on 1/3 of an acre lots. The contributing watershed is nearly flat. Soils in the watershed are made up of Merrimac fine sandy loam with slopes of 8 to 15%. Merrimac soil is designated as Hydrologic Soil Group 'A' soils which are well draining and have a high infiltration rate. Runoff drains to the east where it is collected in catch basins adjacent to roadway. The runoff then travels via pipe to the outfall at the top of a steep embankment at the northern end of Lincoln Street. Runoff from this portion of the watershed flows untreated and unmanaged, however, there does not appear to be any adverse effects based on visual observations.

Retrofit:
We approximate that the entire watershed drains to the storm drainage collection system outfall.

The land identified for improvements is within the Town right-of-way and will likely require access and improvements on adjacent private land.

For this watershed, there appears to be little degradation to water quality in the existing condition. For improvements, in this watershed we recommend added stabilization at the outfall of the closed drainage system to limit possible erosion. We anticipate that implementation of this retrofit will provide minimal benefit to water quality discharged from this watershed.

Watershed #84
Preliminary Opinion of Project Cost

Item No.	Description	Unit Quantity		Unit Cost	Total Cost
1	Riprap lined outlet	1	LS	$ 1,250	$ 1,250
2	Mobilization / Demobilization	1	LS	$ 500	$ 500
3	EPSC Measures	1	LS	$ 250	$ 250
				Subtotal of Construction Cost	$ 2,000
				Engineering Services	$ -
				Contingency (25%)	$ 500
				Total Estimated Project Cost	**$ 2,500**

Notes:
1) Riprap lined outlet (10-ft x 6-ft x 1.5-ft deep).
2) Engineering Services not required/necessary.

OTTER CREEK
ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

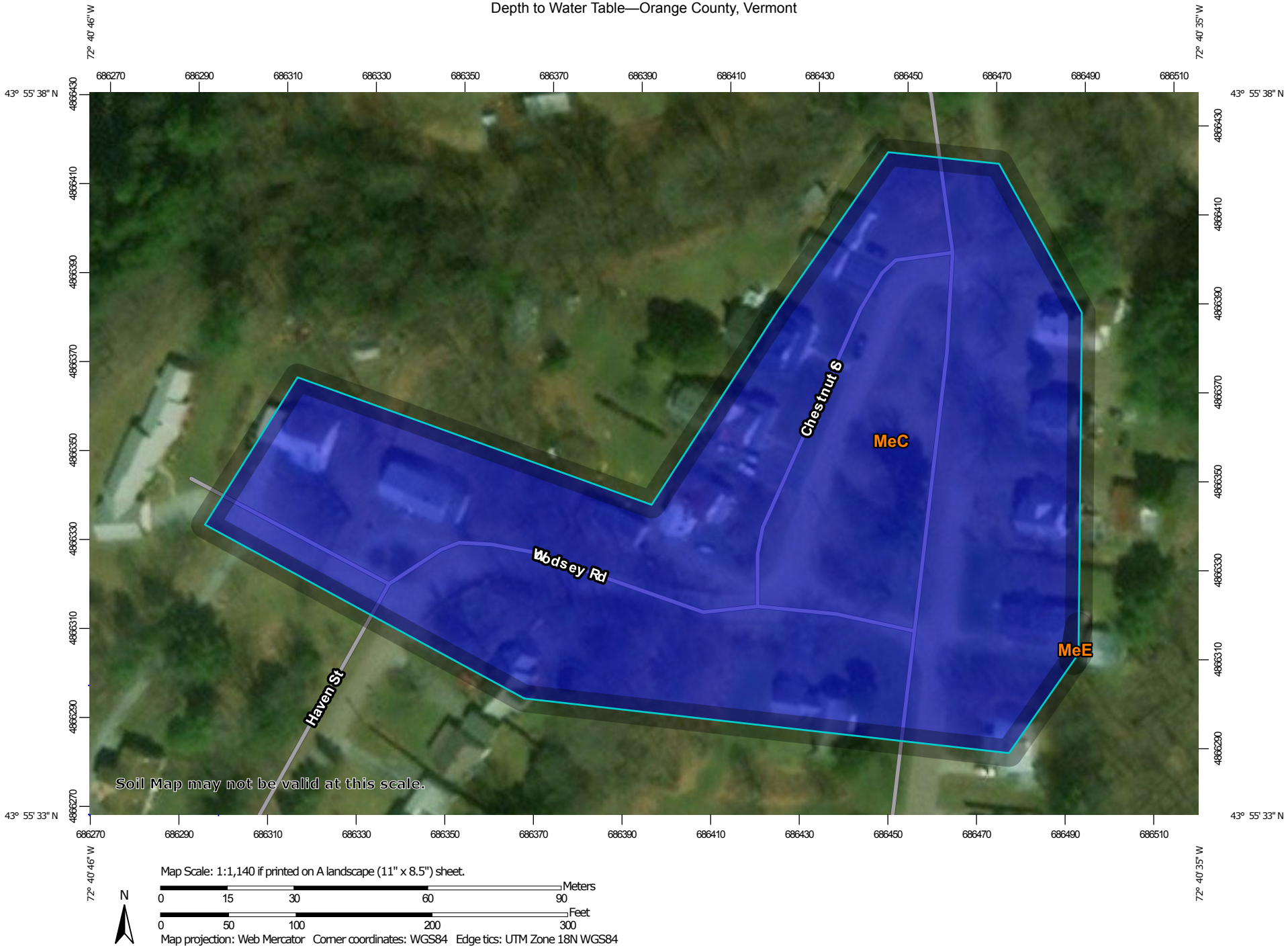
TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED
#84
TREATMENT

SKETCH NO.
6A

REF. DRAWING:



Map Scale: 1:1,140 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
MeC	Merrimac fine sandy loam, 8 to 15 percent slopes	>200	3.6	100.0%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	>200	0.0	0.0%
Totals for Area of Interest			**3.6**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

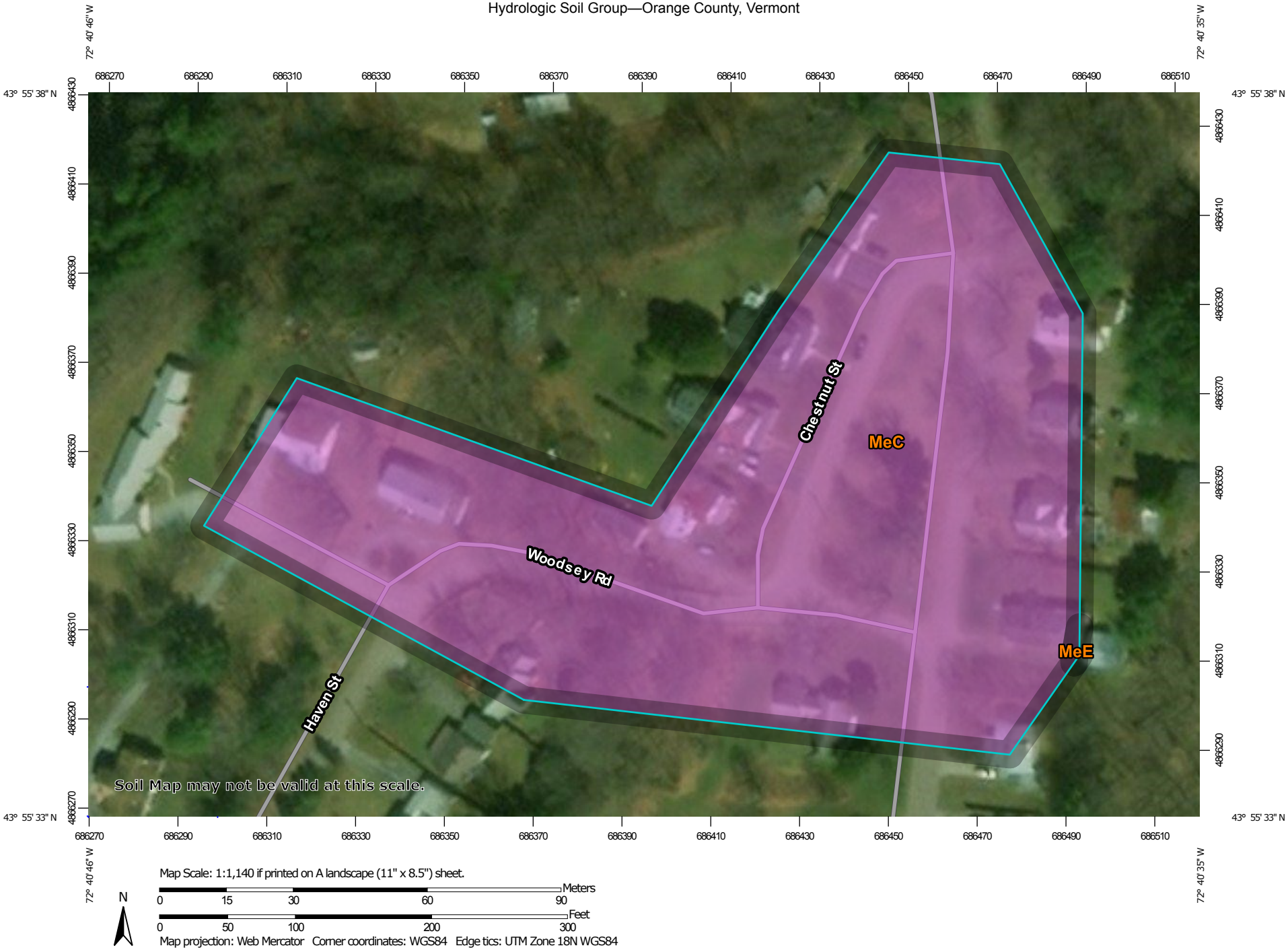
Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December



Map Scale: 1:1,140 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MeC	Merrimac fine sandy loam, 8 to 15 percent slopes	A	3.6	100.0%
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	A	0.0	0.0%
Totals for Area of Interest			**3.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERSHED #87:

Description:
The watershed as mapped by VTDEC is 92.8 acres in size and 7.8% impervious surfaces (7.2 acres). We estimate that approximately 63 acres of the watershed drains via open channel and roadside ditches to a constructed pond adjacent to Bingham Hill Road. The contributing watershed to the pond is comprised of single family residential properties on lots of more than 1 acre. Soils in the watershed are made up of Vershire-Glover-Rock outcrop complex on 8 to 25 percent slopes and Buckland Loam also on 8 to 25 percent slopes. Bingham Hill Road is subject to the State Municipal Roads General Permit and the improvements required by that program. Runoff drains to the south where it concentrates within roadside ditches and a natural drainage that collects within a private pond. Outfall from the pond travels beneath Bingham Hill Road and then back lot down through a steep ravine to the lower portion of the watershed adjacent to Park Street where it passes through a narrow wooded corridor directly to the Third Branch of the White River. Soils in the area of Park Street are mapped as Winooski very fine sandy loam with a depth to water table of 68 centimeters (27 inches). Runoff from this portion of the watershed flows untreated and unmanaged.

Retrofit:
We approximate that a portion of the watershed (63 acres) drains to the existing pond and the entire watershed drains to a narrow wooded corridor adjacent to the Town recreation fields off of Park Street.

The land identified for improvements is at the outfall of the on-stream pond. The land is on private property with a portion extending into the Town right-of-way. Discussions related to ownership, access, maintenance and costs are the first step in determining if a practice in this location is practical moving forward.

For this watershed, we are recommending an improvement to the outfall from the existing on-stream pond. Improvements would entail the widening and stabilization of the channel to slow flows and limit erosion from the outfall. We anticipate that implementation of improvements at the pond outfall will provide minimal benefit to water quality discharged from this watershed.

Additionally, treatment practices were explored for the area on Town land adjacent to Park Street and the Town recreation fields. However, the shallow depth to ground water in this location and analysis using the State's STP selection tool indicated that there were no viable Tier 1 treatment practices for this location. Further investigation into the use of Tier II and Tier III practices was not performed for this site.

WATERSHED #87:

Watershed #87							
Preliminary Opinion of Project Cost							
Item No.	Description	Unit Quantity		Unit Cost		Total Cost	
1	Channel Excavation	100	LF	$	20	$	2,000
2	Riprap lined ditch from on-stream pond	70	CY	$	35	$	2,450
3	Mobilization / Demobilization	1	LS	$	500	$	500
4	EPSC Measures	1	LS	$	250	$	250
					Subtotal of Construction Cost	$	5,200
					Technical Services	$	-
					Contingency (25%)	$	1,300
					Total Estimated Project Cost	**$**	**6,500**

Notes:

1) Channel excavation 4-ft wide x 1.5-ft deep.

2) Engineering Services not required/necessary.

3) Riprap lined ditch 1.5-ft deep x 4-ft wide. (18sf x 100lf)

GRID NORTH

Wallace Hill Road

87

private on-stream pond

OUTLET MODIFICATIONS

RIPRAP LINED CHANNEL
(REFER TO DETAIL)

8'x15' MEDIUM RIPRAP AND OUTLET

Partridge Hill

400 0 200 400 800

(IN FEET)
1 inch = 400 ft.

OTTER CREEK
ENGINEERING

404 East Main Street
P.O. Box 712
East Middlebury, VT 05740
Telephone: 802 382-8522
Fax: 802 382-8640
~
110 Merchants Row
4th Floor, Suite 15
Rutland, VT 05701
Telephone: 802 747-3080
Fax: 802 747-4820
~
E-mail: info@ottercrk.com

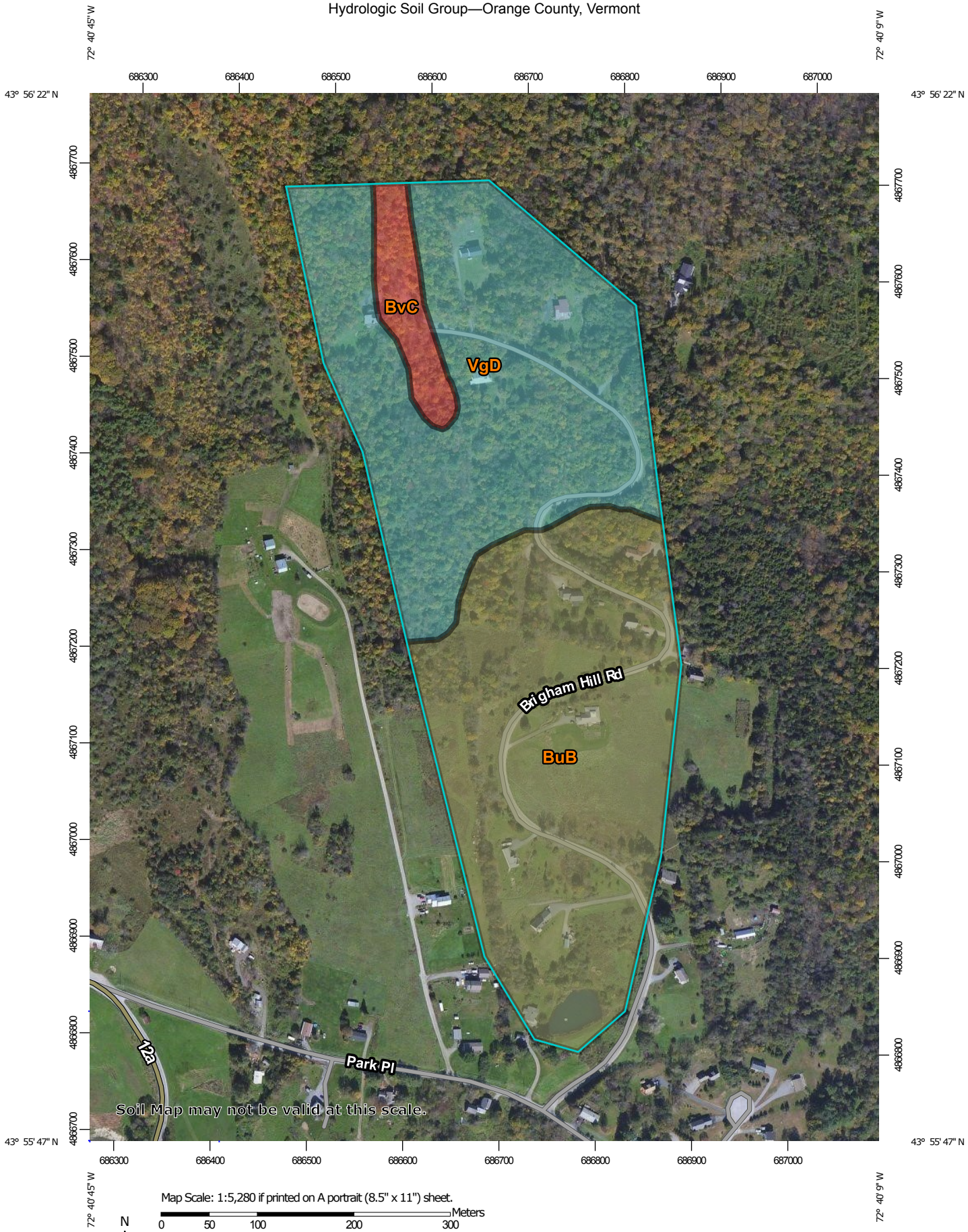
TWO RIVERS-OTTAUQUECHEE REGIONAL COMMISSION
RANDOLPH VILLAGE STORMWATER
RANDOLPH, VERMONT

DATE ISSUED:	12/14/18
DRAWN BY:	RR
CHECKED BY:	BFR
SCALE:	1"=50'
PROJECT NO.:	923.001

TITLE:
SUB-WATERSHED
#87
TREATMENT

SKETCH NO.
5A

REF. DRAWING:



Map Scale: 1:5,280 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 10, 2011—Oct 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BuB	Buckland loam, 3 to 8 percent slopes	C/D	27.6	49.2%
BvC	Buckland loam, 8 to 25 percent slopes, very stony	D	2.7	4.8%
VgD	Vershire-Glover-Rock outcrop complex, 8 to 25 percent slopes	C	25.9	46.1%
Totals for Area of Interest			**56.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

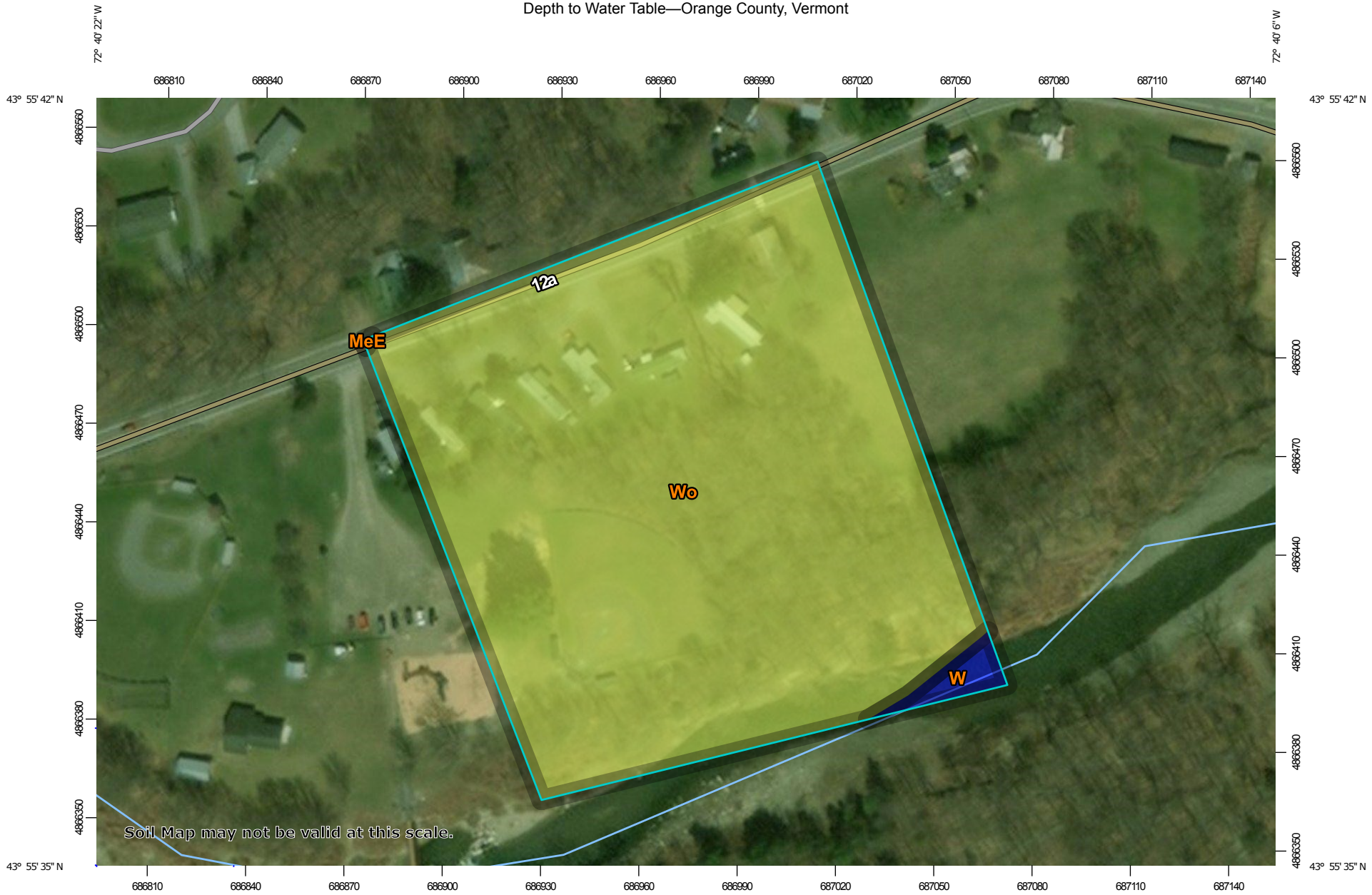
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Depth to Water Table—Orange County, Vermont



Map Scale: 1:1,640 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Vermont
Survey Area Data: Version 21, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2012—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	>200	0.0	0.0%
W	Water	>200	0.1	1.5%
Wo	Winooski very fine sandy loam	69	5.7	98.5%
Totals for Area of Interest			**5.8**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

STP Selection Matrix

Version 5/8/2017

Project Name:	Randolph
Discharge Point:	87 Adjacent to Park St

Step 1: Is the Water Quality Treatment Standard entirely managed with one or more of the following Tier 1 practices?

Infiltration Basins/ Trenches/ Chambers
Drywells
Bioretention (designed to infiltrate)
Filters (designed to infiltrate)
Reforestation[1]
Simple Disconnection
Disconnection to Filter Strips and Vegetated Buffers
Dry Swales (designed to infiltrate)
Permeable Pavement[1]

◯ Yes ◉ No

Proceed to Step 2

1. These practices do not require specific justification due to feasibility limitations

Step 2: Assess the feasibility of using Tier 1 Practices

Complete the matrix below in its entirety for each drainage area.

Tier 1 Practices are available to meet the Water Quality Treatment Standard. If using one of these practices, stop here. If additional site constraints exist other than those listed here, proceed to Step 3.		**Infiltration Basin/ Trench/ Chamber**	**Drywell**	**Bioretention (infiltrating)**	**Simple Disconnection**	**Disconnection to Filter Strips or Vegetated Buffer**	**Dry Swales (infiltrating)**	**Filters (infiltrating)**
Practice Availability for Water Quality Treatment?		Not Feasible	Not Feasible	Not Feasible	Yes	Yes	Not Feasible	Not Feasible
Feasibility Restriction	**Response**	**Practice Availability Based on Restrictions**						
Do underlying soils have an infiltration rate of less than 0.2 inches per hour, as confirmed by field geotechnical tests or are classified as Hydrologic Soil Group D according to the NRCS Soil survey?	◉ Yes ◯ No	Not Feasible	Not Feasible	Not Feasible	n/a	n/a	Not Feasible	Not Feasible
Will runoff to the practice include discharge from a hotspot landuse or activity?	◯ Yes ◉ No	Available	Available	Available	Available	Available	Available	Available
Is the site a brownfield or contaminated site where infiltration is restricted or where infiltration would increase the threat of pollution migration, as confirmed in writing by the Department's Waste Management and Prevention Division?	◯ Yes ◉ No	Available	Available	Available	Available	Available	Available	Available
Is the slope of the vegetated buffer greater than 15%	◯ Yes ◉ No	n/a	n/a	n/a	Available	Available	n/a	n/a
Is the slope of the filter strip greater than 15%	◯ Yes ◉ No	n/a	n/a	n/a	Available	n/a	n/a	n/a
Is the slope of the vegetated buffer greater than 8%	◯ Yes ◉ No	n/a	n/a	n/a	n/a	Available	n/a	n/a
Are natural slopes where an infiltration trench or basin could be sited greater than 15%	◯ Yes ◉ No	Available	n/a	Available	n/a	n/a	Available	Available
Bottom of practice would be below seasonal high water table	◯ Yes ◉ No	Available	Available	Available	n/a	n/a	Available	Available
Seasonal high water table or bedrock would be less than 1 foot from the bottom of the practice.	◉ Yes ◯ No	Not Feasible	Not Feasible	n/a	n/a	n/a	n/a	n/a
Seasonal high water table or bedrock would be less than 3 feet from the bottom of the practice.	◉ Yes ◯ No	Not Feasible	n/a	n/a	n/a	n/a	n/a	n/a

Will the practice be located within 75 feet down-gradient of a wastewater disposal area system, within 35 feet up-gradient or 75 feet down-gradient of a wastewater disposal system?	◯ Yes ◉ No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice be located within 150 feet of a drinking water source located in an unconfined aquifer?	◯ Yes ◉ No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice be located within 100 feet of a drinking water source located in bedrock or a confined unconsolidated aquifer?	◯ Yes ◉ No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice be located within Zone 1 or Zone 2 of a public community groundwater source protection area?	◯ Yes ◉ No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice be located within 200 feet of non-transient non-community groundwater source?	◯ Yes ◉ No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice violate any restrictions of the Vermont Wastewater and Potable Water Supply Rules, or their replacement?	◯ Yes ◉ No	Available	Available	Available	Available	Available	Available	Available

Step 3: Other feasibility constraints for remaining Tier 1 and Tier 2 practices

If, following completion of Step 2 of the STP Selection Tool there are no Tier 1 Practices available for use on the project site, designers shall consider the use of Tier 2 practices for treatment of the Water Quality Treatment Standard.

Is the Water Quality Treatment Standard entirely managed with Tier 2 Practices? ◯ Yes ◉ No

Provide written site specific justification below. Tier 3 Practices may be used to meet the Water Quality Treatment Standard.

If the the use of a Tier 1 or Tier 2 Practice is infeasible for reasons beyond those listed in Step 2 of the STP Selection Matrix, a designer may submit site specific detailed feasibility justification that such practices are not feasible following the guidance in Section 2.2.4.1 of the 2017 VSMM. Only after completion of the STP Selection Matrix and determination that Tier and Tier 2 Practices are infeasible shall a designer consider Tier 3 Practices or existing stormwater infrastructure for meeting the Water Quality Treatment Standard (WQTS) on the project site.

Provide written feasibilty justification below or list attachments

WATERSHED #89:

Description:
The watershed as mapped by VTDEC is 23.1 acres in size and 15.1% impervious surfaces (3.5 acres). VTDEC did not identify a retrofit site within their mapping investigation. The contributing watershed is mainly comprised of residences and park land that have river frontage along the Third Branch of the White River. Stormwater runoff is dispersed along the river and flows travel south and overland through vegetated buffers directly to the receiving water. Since, dispersed flows would otherwise need to be collected using piping or ditching, installation of a treatment practice that can effectively treat stormwater from impervious areas is not practical. We therefore do not recommend a retrofit site or improvements for this watershed.