



**Colchester**  
VERMONT

781 Blakely Road • Colchester, Vermont • 05446 • 802.264.5500

[www.colchestervt.gov](http://www.colchestervt.gov)

March 23, 2021

Christy Witters  
Vt. Department of Environmental Conservation  
Watershed Management Division  
1 National Life Drive, Main 2  
Montpelier, Vermont 05620-3522

Dear Ms. Witters:

Attached is the Town of Colchester's 2020 MS4 Annual Report. Included in this report are the following documents:

- 2020 Annual Report Form
- Annual Report Workbook
- BMP Tracking Table
- Attachments supporting our Annual Reporting Workbook
- MS4 NOI Form w/ PCP Information (Submitted via ANR Online)
- Phosphorus Control Plan (Submitted via ANR Online)

Please give me a call at 264-5620 if you require any additional information or have any questions.

Sincerely,

Bryan K. Osborne  
Director of Public Works

E: [bosborne@colchestervt.gov](mailto:bosborne@colchestervt.gov)  
P: 802.264.5620 | F: 802.264.5503

Colchester 2020 Annual Report Form



# Municipal Separate Storm Sewer System (MS4) 2020 Annual Report

## A. Permittee Information

1. Name of MS4: **Colchester**

2. Permit Number: **7023** - 9014

## B. Attached Documents

The following documents have been prepared and submitted with this Annual Report:

- Annual Report Workbook (.xlsx)
- BMP Tracking Table (.xlsx)

## C. Certification of STPs constructed to comply with the FRP or PCP

The following BMPs were built or implemented within the past calendar year and were constructed in compliance with the approved Flow Restoration Plan (FRP) or Phosphorus Control Plan (PCP).

Name of System	Location

\_\_\_\_\_  
Name of Qualified Designer \_\_\_\_\_  
Title

\_\_\_\_\_  
Signature \_\_\_\_\_  
Date

## D. MS4 Operator Certification

This Annual Report shall be signed by a principal executive officer, ranking elected official or other duly authorized employee consistent with 40 CFR §122.22(b) and certified as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**Aaron Frank** **Town Manager**

\_\_\_\_\_  
Print Name \_\_\_\_\_  
Title

*Aaron Frank* **3/23/2021**

\_\_\_\_\_  
Signature \_\_\_\_\_  
Date

List of Attachments to 2020 MS4 Annual Report – Town of Colchester

Attachment Title	Page(s)
Dues for ReThink Runoff	1
MM1 Annual Report	2-7
Annual Utility Newsletter	8-9
2020 Utility News Article	10-11
MM2 Annual Report	12-19
IDDE Report 2020	20
Manosh Invoice	21
MM4 / MM5 Project Information	22-23
Flow Monitoring Invoice	24
Colchester's Phosphorus Control Plan	25-49

Regional Stormwater Education Program  
 110 West Canal Street, Ste 202  
 Winooksi, VT 05404

# Invoice

Date	Invoice #
8/6/2019	130

Bill To
Karen Adams Technical Services Manager Town of Colchester PO Box 55 Colchester, VT 05468

			Terms
			Due on receipt
Quantity	Description	Rate	Amount
1	FY20 Dues: ReThink Runoff (formerly RSEP and CCST)	6,000.00	6,000.00
Thank you!		<b>Total</b>	<b>\$6,000.00</b>

KAA 8-7-19

2104434-480015

Minimum Control Measure #1:  
Public Education & Outreach  
REGIONAL STORMWATER EDUCATION PROGRAM  
RETHINK RUNOFF

JANUARY–DECEMBER 2020  
ANNUAL REPORT

Prepared by:

**Pluck**

## Introduction

Since 2003, Chittenden County's twelve MS4s have worked to pool resources to professionally engage the public in a one message, one outreach effort known as the Regional Stormwater Education Program. Through regular spring and summer advertisements to drive people to the program's website, [www.smartwaterways.org](http://www.smartwaterways.org), this cooperative approach to fulfilling its NPDES Permit Minimum Control Measure #1 (Public Education & Outreach) requirements has built a regional awareness among the public of the need for individual action to assist in fighting stormwater problems.

In the summer of 2016, the MS4s contracted with Tally Ho through their Lead Agency, the Chittenden County Regional Planning Commission, to rebrand the Smart Waterways campaign into a combined effort with the MS4's Minimum Measure #2 regional effort known as the Chittenden County Stream Team. The goal was to create one cohesive organization and outreach effort to both educate the public about stormwater and boost public participation in implementation of projects to combat the negative impacts of stormwater. In spring of 2017, Rethink Runoff was publicly launched, including a new website and revised creative.

Pluck has been responsible for the creative, administration, and management of Rethink Runoff since late 2017 .

This 2020 calendar year report recaps the work done primarily related to Minimum Control Measure #1.

## 2020 Initiatives

In January, we continued our year-round approach to advertising by introducing a small winter-based campaign on reducing salt use, to run alongside our winter pet waste ads.

We re-organized the Rethink Runoff site, updating the theme and adjusting messaging throughout.

In Spring 2020, we introduced an additional advertising push focusing on conservation and environmental impacts of stormwater runoff by featuring animals within the Lake Champlain ecosystem: one bird, one amphibian and one fish.

A new campaign, Ms. Drop's Tip of the Month was initiated. We create a :30 second animation that could be updated each month with a tip for reducing stormwater runoff. Animations were posted to social media channels (FB and Instagram) and promoted each month to a target audience within MS-4 locations.

In addition, we used the same creative for an additional set of ads, to work as a general awareness ad set for Rethink Runoff. As part of that, we introduced a test HTML5 ad (one size) to gauge effectiveness. Overall the change in metrics was minimal when looking at engagement.

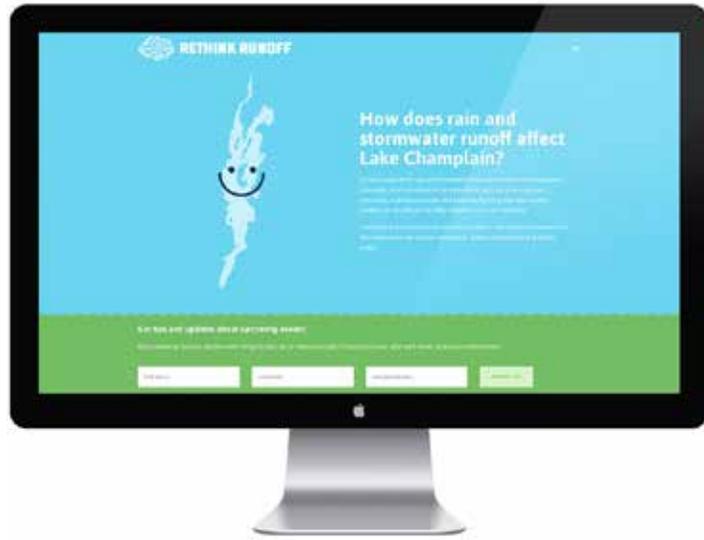
We updated the rack cards for Stream Team outreach from a creative and messaging standpoint to tie it with the messaging on the website.

When COVID prevented in-person workshops for Stream Team, we created a digital template for Google Sheets for Kristen Balschunat to use for digital/virtual events.

We introduced tracking onto the websites for conversions (or actions our visitors take while visiting the website). Our first conversion to be tracked is for a downloadable pdf with instructions on How to Build a Rain Barrel. These events often book to capacity and are also restricted by city or town, so including a downloadable pdf on the site allows us to determine to measure interest in visitors doing DIY stormwater-related projects.

2020 Creative

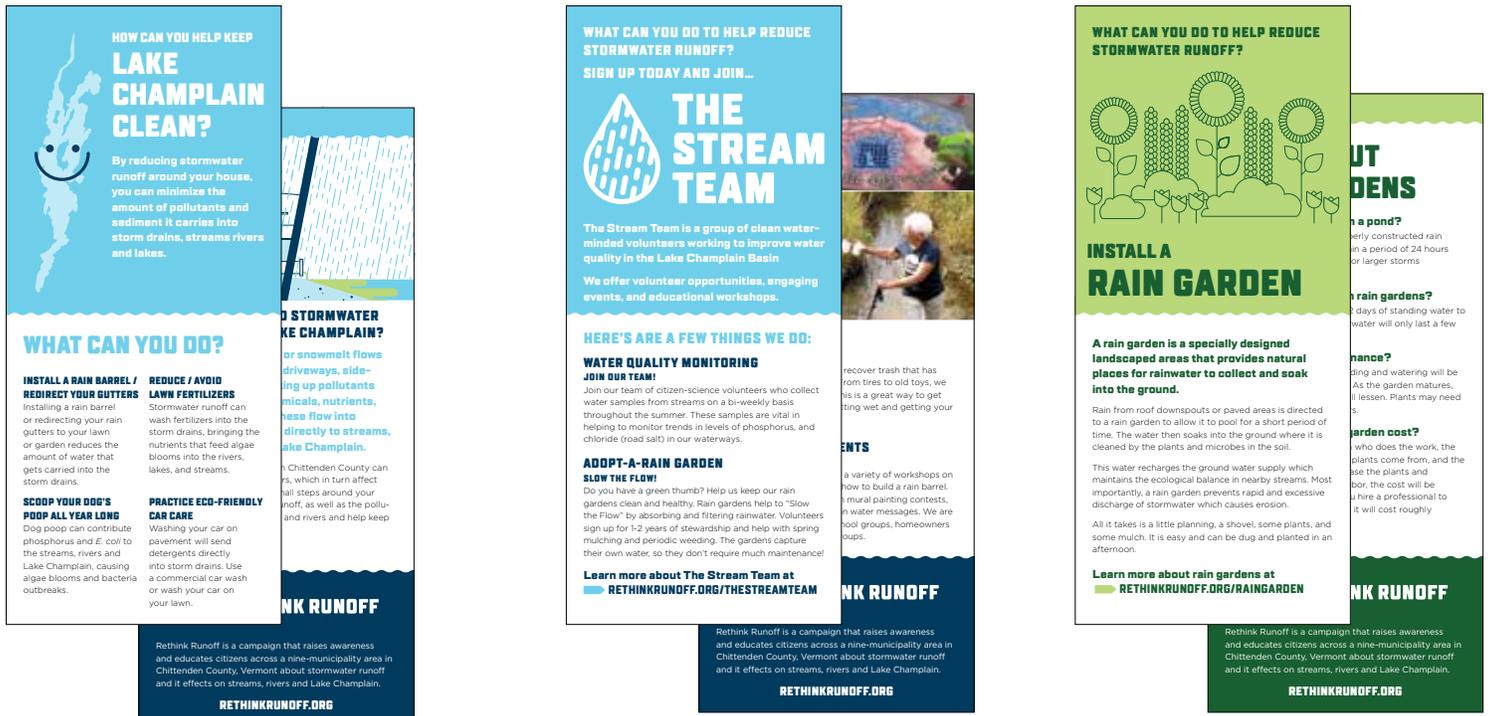
UPDATED WEBSITE



ECO-BASED CAMPAIGN - SAMPLE ADS



REVISED RACK CARDS



2020 Creative

TIP OF THE MONTH ANIMATION



Sample animation:

<https://www.facebook.com/131159566895612/videos/955827985225631>

GOOGLE SHEETS WEBINAR TEMPLATE



RAIN BARREL PDF

## HOW TO BUILD A RAIN BARREL

**WHAT IS A RAIN BARREL?**  
A rain barrel is a container that collects rain water from rooftops (this is called stormwater runoff). Rain barrels come in several different shapes and sizes, but they all do the same thing: they save water and decrease stormwater runoff. Placed at the base of a downspout, a typical rain barrel can hold 55.75 gallons of water at one time.

- Make sure the rain barrel remains securely screened to prevent mosquito entry.
- You can attach a hose to the spigot to fill a watering can.

**MATERIALS**

- 1 55 gallon plastic barrel
- 1 Rubber Drain Spigot—Heavy Duty, Brass male threaded, 1/2"
- 2 Rubber Garden Hose Washers
- 1 Locking Nut, Rigid Conduit Locknut Steel 1/2"
- 1 Hose Barb for a sump pump 1 1/4" (Adapter Insert Poly, 125 MPT)
- 1 Sump Pump Hose: 1 1/4" x 8' Discharge hose
- 1 Soffit Vent: Maurice Franklin RLW-100 4" round aluminum screen lower
- Plumber's Tape
- Caulk (clear acrylic)
- Tools
- Drill
- Hack saw
- Flashlight
- Drill Bits: 1/2" wing bit
- 1 1/4" hole saw
- 4" hole saw

**HOW CAN I USE THE WATER COLLECTED IN MY RAIN BARREL?**  
Water collected in a rain barrel should NOT be used for drinking or cooking. We also do not recommend using this water to irrigate vegetable garden beds. So what can you use it for?

- Water house plants
- Water flower gardens
- Clean your tools
- Wash your car
- Water lawns and trees

**CONSIDERATIONS BEFORE YOU BUILD:**

- Your rain barrel must have an overflow to a safe discharge point away from your home and foundation. Details about installing an overflow are included in the instructions.
- If you use a moss control product on your roof, be sure to use a product that is garden-safe.
- The rain barrel must be located at the base of one of the downspouts draining your roof. You may want to install your rain barrel nearest to where you will use the water in your yard.
- Keep the lid secure so children or animals cannot fall in.
- Elevate your rain barrel slightly on a secure raised foundation (a full rain barrel may weigh over 400lbs!) to make access to the spigot easier. A few stacked cinder blocks work well, or you can build a stand from lumber.
- Empty your rain barrel often so that it has room to catch water from the next rainfall!

RETHINK RUNOFF

RETHINK RUNOFF

TO LEARN MORE ABOUT REDUCING STORMWATER RUNOFF, VISIT [RETHINKRUNOFF.ORG](http://RETHINKRUNOFF.ORG)

### 2. INSTALL THE OVERFLOW

Drill a hole about 6" from the top of the barrel. The hole should be at a 30° angle from the spigot location.

Use the 1 1/4" hole saw to drill a hole about 6" from the top of the barrel. The hole should be at a 30° angle from the spigot location.

Attach an 8' section of the sump pump hose over the hose barb.

### 3. INSTALL SCREEN

Use the 4" hole saw to drill a hole in the lid of the barrel. Drill slowly and with caution, as a 4" hole saw creates lots of torque—drilling too quickly could cause damage to the barrel or to you.

Use the 4" hole saw to drill a hole in the lid of the barrel. Drill slowly and with caution, as a 4" hole saw creates lots of torque—drilling too quickly could cause damage to the barrel or to you.

## Media Buy Breakdown

Below is a cost breakdown of media buys, compared with previous years. We continued our Winter Campaign with a focus on both pet waste and reducing salt use. Similar to our past efforts to shift outreach year-round, our Winter Campaign ran in January and February, traditionally a quieter time from an advertising standpoint.

In addition, our Facebook animated posts were boosted each month (starting in May), providing a secondary touchpoint for year-round advertising.

For 2017 and 2018, Summer was initially planned as part of the spring 2018 budget. However, since 2019, the spring media buy includes all purchases made through 6/30. The Summer media buy will include any media buys made from 7/1 to 9/1, and Fall media will span from 9/1–11/1. We typically do not run in December, except for our monthly Facebook ad boost.

2016 – MEDIA BUY			
SOURCE	SPRING	SUMMER	FALL
RADIO	\$4,500	-	\$3,258
DIGITAL	\$7,500	-	\$4,985
TV	\$5,500	-	\$2,379
PRINT	\$2,500	-	
TOTAL	\$20,000	-	\$10,622

2017 – MEDIA BUY			
SOURCE	SPRING	SUMMER* 05/28–08/02	FALL
RADIO	\$3,088	-	\$1,080
DIGITAL	\$3,600	\$3,826	\$4,582
TV	\$2,015	-	\$1,833
PRINT	\$1,755	\$585	\$1,170
TOTAL	\$13,191	\$4,235	\$8,666

2018 – MEDIA BUY			
SOURCE	SPRING	SUMMER* 6/16–08/27	FALL
RADIO	\$2,675	-	\$1,044
DIGITAL	\$3,394	\$7,534	\$2,987
TV	\$3,710	-	\$2,472
PRINT	\$1,755	-	\$1,006
TOTAL	\$11,534	\$7,534	\$7,509

## Advertising Click-through Rates, 2020

SOURCE	IMPRESSIONS	ENGAGEMENT	COST	COST PER ENGAGEMENT
DISPLAY ADS	4,550,215	3,079	4329.18	\$1.40
VIDEO (YOUTUBE)	326,839	181,417	2663.48	\$0.01
WCAX DIGITAL	99,120	37	\$800	\$21.62
FACEBOOK/SOCIAL MEDIA	137,219	195 CLICKS 39,240 ENGAGEMENT	\$1,345.08	\$6.89

2019 – MEDIA BUY				
SOURCE	WINTER	SPRING	SUMMER* 5/27–09/2	FALL
RADIO	\$360	\$1,008		\$1,025
DIGITAL	\$1,800	\$2,320	\$5,830	\$3,000
TV		\$5,830		\$3,306
PRINT	\$503	\$2,012		\$1,006
TOTAL	\$2,663	\$11,170	\$5,830	\$7,509

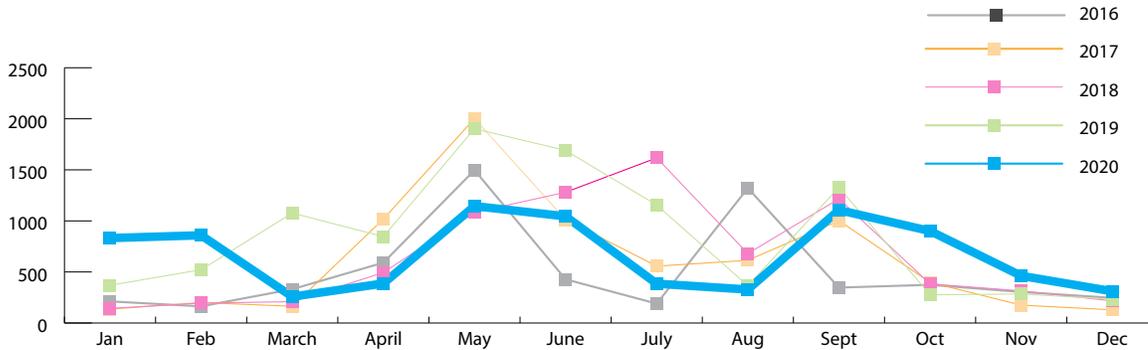
2020 – MEDIA BUY				
SOURCE	WINTER	SPRING	SUMMER 7/1–9/1	FALL
RADIO		\$375		\$375
DIGITAL	\$1,800	\$4,557.51	\$400	\$3,430.33
TV		\$5,788.75		\$2,063.83
PRINT		\$1,579.50		\$1,053
TOTAL	\$1,800	\$12,301	\$400	\$6,922

Digital media buys include Google Ads, Facebook Ads and WCAX.

TV includes WCAX and Xfinity media buys.

### Website Metrics for 2016–2020

Web visits as a whole were down compared to 2019. We attribute this to COVID-19. Our digital ad spend was also down, reflecting a general downturn across the board. Fall visits and ad spends began to rise in September and October, still down from the previous year, but much less drastic than the downturn in Spring and Summer. We did also notice an uptick in desktop visits, again due to COVID-19 and more people being at home.



#### 2020 vs. 2019 Users

-8%  
7,861 vs. 8,534

#### New Users

-8%  
7,860 vs 8,529

#### Pageviews

-17%  
13,112 vs 15,769

#### Total Sessions/Visits (1/1–12/31)

TOTAL	TIME PERIOD
8,908	2020
10,111	2019
7,832	2018
7,407	2017
6,004	2016
4,659	2015
7,728	2014
3,541	2013
2,787	2012

#### Website Visits by Device

DEVICE	2020	2019	2018	2017	2016
DESKTOP	51.25%	40.2%	50.1%	52.8%	65.7%
MOBILE	41.28%	44%	40.6%	36.4%	24.5%
TABLET	7.47%	15.8%	9.3%	10.8%	9.8%

#### Most Visited Pages

PAGE	TOTAL
HOME PAGE	3,162
/EDUCATIONAL-RESOURCES/FOR-KIDS/CREATE-YOUR-OWN-WATER-CYCLE/	960
/EDUCATIONAL-RESOURCES/REDUCE-ROAD-SALT/INDEX.HTML	767
/EDUCATIONAL-RESOURCES/	745
/VERMONT-ENDANGERED-ANIMALS/	568
/EDUCATIONAL-RESOURCES/PICK-UP-DOG-POOP/INDEX.HTML	540
/EDUCATIONAL-RESOURCES/FOR-KIDS/WHAT-IS-A-WATERSHED/	436
/EDUCATIONAL-RESOURCES/INSTALL-A-RAIN-BARREL/	406
/THE-STREAM-TEAM/	401

#### Top Vermont Cities and Towns

TOTAL	SESSIONS
BURLINGTON*	962
SOUTH BURLINGTON*	582
COLCHESTER*	525
ESSEX*	465
SHELBURNE*	187
STOWE*	118
MIDDLEBURY*	50
JERICHO	39
WILLISTON	37
MONTPELIER	35

MILTON: 20  
WINOOSKI 13

\* SAME POSITION AS LAST YEAR

#### Website Event Tracking

DEVICE	2020
MAILCHIMP FORM	61
RAIN BARREL PDF	8
SOIL TEST CTA	5

## Winter Salting Tips

While use of road salt improves safety conditions in winter ice and snow, overuse of salt can have negative effects on water bodies, aquatic plants and animals, and can damage metal and concrete. Testing data from around Vermont indicates that road salt is accumulating in our waterways. While public safety is of the utmost importance, we also value our surrounding ecosystems and work hard to minimize the impacts of our maintenance programs.

Our primary salt trucks are equipped with computerized spreader controls that carefully control the amount of salt being placed on our roadways. We also closely monitor temperatures and other storm conditions to ensure we are using road salt as efficiently as we can. This not only minimizes environmental impacts, but also saves tax payers thousands of dollars in salt costs.

As a property owner, you can also take steps to minimize impacts to our environment. If you are planning to use salt this winter around your property, please consider the following:

- Salt should be stored in airtight containers to minimize loss and maximize effectiveness
- Pre-treat walkways before the storm hits to limit post-storm usage
- Shovel early after a storm to minimize need for de-icing agents
- Only use on impervious surfaces, never on lawns, or near wetlands or surface waters

## Stormwater Utility Information

The Town's stormwater utility began in 2017 as part of the Malletts Bay Initiative. The utility implements clean water programs, manages capital projects, and oversees regulations designed to improve and protect the community's water resources. For more info:

[www.colchestervt.gov/1837/StormwaterUtility](http://www.colchestervt.gov/1837/StormwaterUtility)

Water Quality Hotline: **(802)-264-5628**

General stormwater inquiries: **(802)-264-5620**

**TOWN OF COLCHESTER**  
781 Blakely Road  
Colchester, VT 05446

PRST STD  
US POSTAGE  
PAID  
Burlington, VT  
05401  
Permit#478  
ECRWSS

POSTAL PATRON

# CLEAN WATER NEWSLETTER

**Town of Colchester**  
Stormwater Utility

## CLEAN WATER NEWSLETTER FALL 2020



*Above: A fall scene from a Lakeside bench at Bayside Park.*

As the leaves change and we ready for winter, here is the latest Colchester Stormwater Utility Clean Water Newsletter from the Department of Public Works. In this edition of the newsletter, learn about:

- Phase II Condition Assessment Update
- Fall Utility Project Updates
- Winter Salting Tips
- Spring 2021 Billing Information

### ? Did You Know ?

The Department of Public Works maintains over 21.5 miles of stormwater piping in Colchester.

## Phase II Condition Assessment

Phase II of a Townwide Stormwater Condition Assessment is currently underway and is expected to be completed by the end of 2020. Phase I was completed in December of 2018, when GPS information was collected and video was taken of town stormwater pipes in order to help staff identify needed repairs and upgrades. At that time, a number of pipes were identified for cleaning to ensure stormlines continue to function properly during storm events.

Phase II was begun this fall and involves the cleaning of almost 25,000 linear feet of underground stormwater pipes. Also to be completed this fall is performing video assessments of these newly cleaned pipe segments. This will complete the Town's video collection efforts, and we will use this information to identify any needed repairs and plan future investments in the public stormwater system.



Above: Example of a video taken during Phase I in 2018.

This phased project represents an investment of over \$336,000 in the Town's stormwater system. Both phases of the project have received federal grants, totaling over \$205,000. The remaining project costs (including all cleaning work) have been funded through stormwater utility fees.

## Ongoing Water Quality Projects

### Fall Public Works Clean Water Projects

- Phase II of a Townwide Condition Assessment will be complete by the end of this year. Total Phase II costs are approximately \$176,000, which includes \$80,000 in grant funding.
- We are finalizing the Town's phosphorus control plan, a requirement of the Town's federal stormwater permit. This must be completed by April 2021.
- Roadway improvements for Coon Hill and Galvin Hill Roads to address erosion and drainage issues are currently under design, with construction planned in 2021.
- Conceptual plans for a roundabout at the Bay-side Intersection are currently under design. This will involve stormwater improvements designed to capture and treat runoff from the roadway before it is directed to Lake Champlain.
- Improvements to a town-owned stormwater outfall on Smith Hollow Creek are currently under design. This project is funded through a Clean Water Block Grant.
- The Moorings Stream/Shore Acres Stormwater Project has entered the Right-of-Way phase. This project involves a series of water quality improvements to help filter and treat stormwater runoff before it reaches Lake Champlain. Project Engineering plans are currently under review by the VT Agency of Transportation, who is providing grant funding to complete the project. More information about this project can be found at:

<http://tinyurl.com/ShoreAcresProject>

## Water Quality Projects (Cont.)

### Lower Mountain View Dr Culvert Replacement

Last month, we completed a culvert replacement project on Lower Mountain View Drive. The metal culverts approximately 500 feet from the intersection of Lower Mountain View Dr and Roosevelt Highway were replaced with plastic culverts, and the inlet and outlet areas surrounding the pipes were upgraded. A big THANK YOU to drivers and surrounding property owners for their patience as we completed this important project.

*Below: Crews installing the new culvert headwall on the inlet side of Sunnyside Brook in October 2020.*



### Spring 2021 Billing Information

Annual stormwater utility invoices will be mailed in January 2021 with payments due February 22, 2020. These fees fund critical system repairs, keep the town stormwater system in compliance with state and federal water quality requirements, plan for future upgrades and improvements, perform water quality testing, and explore new stormwater treatment programs like BLUE<sup>®</sup>CVT (side panel).

Commercial properties are eligible to apply for credits to reduce their site fee. For more information about credits, visit the utility webpage listed on the front page of the newsletter.

<https://www.samessenger.com/tncms/asset/editorial/f0383cce-3618-11ea-bd74-c3705083a31e/>

## **Town mails out stormwater utility invoices**

Courtesy of Colchester Public Works

Jan 13, 2020

Colchester's annual stormwater utility invoices were mailed this week, with payments due to the Town Clerk by Friday, Feb. 21. Every parcel or lot pays at least a base fee of \$52 to help fund the Town's stormwater programs.

The stormwater utility was formed in 2017 as a new function of the Department of Public Works, changing the way that revenues are raised to fund the Town's efforts in combatting stormwater pollution.

Under a utility structure funds are collected from all property-owners in the community, including those that are tax exempt, instead of collecting the funds through property taxes.

These fees fund the planning, design, construction, operation, and maintenance of the Town's stormwater system and other water quality activities and programs. Needed system repairs and upgrades, street sweeping and other regular system maintenance, planning and engineering of new improvements town-wide, water quality testing, and compliance with state permitting requirements are all funded through the stormwater utility.

The fees are billed annually in January each year based on the amount of impervious surfaces on a property. Impervious surfaces are areas that cover the natural ground and do not allow for easy infiltration of rainfall; they include any paved areas (driveways, sidewalks, parking areas, roads,

buildings) and dirt, gravel, or other compacted areas (parking areas, roads).

Credits up to 50% of a site's stormwater fees are available for commercial property owners.

Payments can be made by cash, check or credit/debit card both online and in person at the Town Offices.

For more information about the stormwater utility, upcoming projects, or credit information, please visit: [colchestervt.gov/1837/Stormwater-Utility](http://colchestervt.gov/1837/Stormwater-Utility) or contact Karen Adams, Technical Services Manager, at [kadams@colchestervt.gov](mailto:kadams@colchestervt.gov) or 802-264-5620.

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**Avalon Ashley**

Staff Writer

# Minimum Control Measure #2: Public Involvement & Participation Rethink Runoff Stream Team

## Summary of Activities



### 2020 Calendar Year

#### Overview

Although the pandemic created challenges for the Stream Team in 2020 we were still able to engage many residents in meaningful actions to improve stormwater in their community. We hosted a contactless rain barrel kit pickup and two in-person riparian tree planting events. In the digital realm, we presented online lectures, participated in remote radio and TV interviews and launched the Clean Water Challenge to inspire people to clean out their neighborhood storm drains. For the first time in the history of the program we were unable to collect water quality samples for chemical analysis due to state budget cuts, so we re-worked the program by asking volunteers to collect photographs, drawings and stories. The portfolio of presentations, handouts and new programs that were created this year will serve as a resource for member municipalities and residents for years to come.

#### RRST Estimated Impact by Municipality

The table below depicts the estimated number of individuals engaged in each RRST municipality in 2020. This table reflects both digital and in-person interactions where it was possible to log participants' town of residence.

Municipality	# of people reached in 2020
Burlington	17
Colchester	9
Town of Essex	31
Village of Essex Junction	10
Milton	4
Shelburne	21
Williston	13
South Burlington	16
Winooski	2
<b>TOTAL</b>	<b>123</b>

Table 1: Interaction with the Stream Team by municipality

## Organizational Partnerships

The Rethink Runoff Stream Team partnered with **10** organizations in 2020:

1. **Essex Free Library:** Hosted our Watershed Explorers public program and helped create posters for advertising materials for the event.
2. **Essex Conservation & Trails Committee:** Invited us to their meeting to share about RRST program, discuss water quality data and partner on rain barrel outreach.
3. **Shelburne Natural Resources and Conservation Committee:** Invited us to join their meeting to share info about the RRST program and describe findings of Stream Team data results per request of the committee.
4. **Williston Conservation Commission** Invited us to join their meeting to share about the RRST program and describe changes homeowners can make to become more "stormwater friendly."
5. **ECHO:** Provided a digital platform for us to host a talk in a Zoom event called "Change Your Stormwater Footprint" Helped with advertising and technical issues.
6. **UVM Sea Grant:** Hosted a training about best practices for citizen science projects during the pandemic. This presentation helped us decide how to restructure the Stream Team summer volunteer program with safety in mind.
7. **Colchester Scouts:** Planned to volunteer for a catch basin painting day. Event deferred to 2021 due to concerns around covid safety.
8. **Lake Champlain Chocolates:** Donated 25 bars of chocolate to provide incentive for our Clean Water Challenge program.
9. **Winooski Valley Parks District:** Provided land and staff time to support the riparian tree planting project in Colchester.
10. **Meach Cove Farm:** Provided land and staff time to support the riparian tree planting project in Shelburne.

## Outreach -----

**Media** Rethink Runoff Stream Team had **6** media appearances in 2020:

1. **Positively VT** Invited us to participate in a 20-minute Zoom interview for Positively VT on Channel 17. Watch it [here](#).
2. **WDEV** Invited us to participate in a 30 min Radio Interview on Vermont Viewpoint Segment Listen [here](#).
3. Posts were published on **Front Porch Forum** in Essex to advertise the Rain Barrel Kit Pickup event.
4. Posts were published on **Front Porch Forum** in South Burlington to advertise the Clean Water Challenge.
5. Posts were published on **Front Porch Forum** in Shelburne to advertise the Clean Water Challenge.
6. A press release about how individuals in South Burlington can make a difference for clean water was sent to **The Other Paper**, but was not published. The same article was shared with South Burlington Municipal staff to add to the quarterly SoBu newsletter, but printing of the publication was stopped due to covid-related budget cuts.

## Social Media

### Facebook

- Total Posts = 32
- 283 page "likes"
- 340 "follows"

### Instagram

- Total Posts = 14
- 272 total "followers"

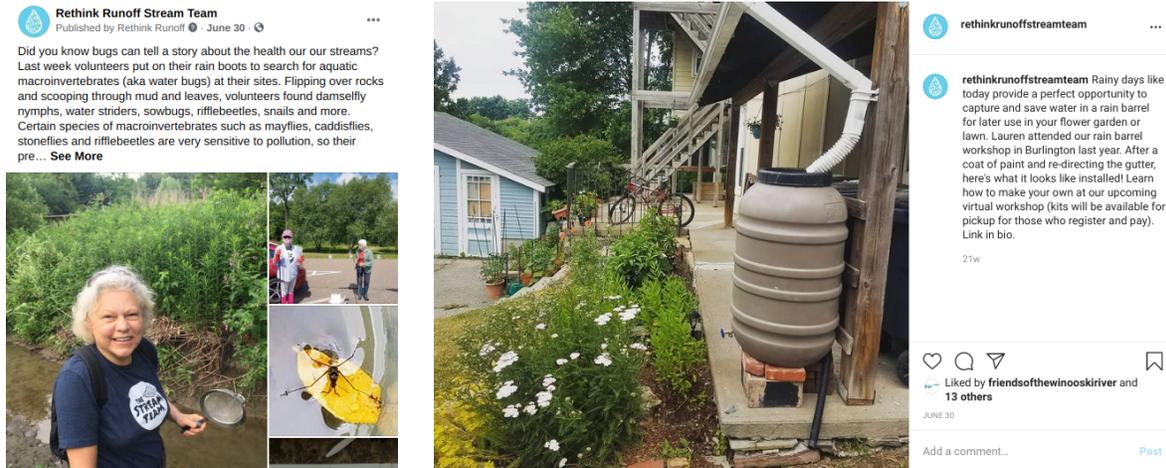


Figure 1: Two instagram posts from 2020

## RRST Website

We maintained the "events" section of the website and occasionally helped to develop ideas for new web content in collaboration with Pluck Design including:

- How to Build a Rain Barrel PDF
- "Book A Speaker" website text
- "What is a Watershed" infographic

## Newsletter

At the end of 2020 there were **770** subscribers to the RRST newsletter (an increase from 629 in 2019). Three newsletters were published this year in March, May and July.

## Outreach Events

Six "outreach" events were held in 2020. A total of **37** people participated in presentations or engaged with digital initiatives. Each outreach event is described in more details below:

1. **Essex Library Event** [January] Hosted a 1-hour workshop for families titled "Clean Water Explorers." Participants looked at a map of the Champlain Valley to determine which subwatershed they live in and then constructed a watershed model using tinfoil. The watershed model was used to discuss the way pollutants travel across the landscape through runoff and was used to discuss potential solutions. 6 participants
2. **Essex Conservation & Trails Committee** [February] asked us to share about the resources and programs offered by RRST and offered to help with rain barrel workshop outreach. Reached 9 people.
3. **Shelburne Natural Resources and Conservation Committee** [February] asked us to describe the results of Stream Team data to inform their understanding of water quality

issues in the town. We also discussed general resources and programs offered by RRST. Reached 8 people.

4. **ECHO Zoom Presentation** [May] This 30 -minute presentation for all ages, titled "Change Your Stormwater Footprint" discussed 8 actions individuals can take to improve stormwater quality in their communities. Topics covered included picking up pet waste, diverting gutters to permeable surfaces and using less salt in the winter. 3 participants
5. **Williston Conservation Commission** [July] asked us to present about actions that individual homeowners can take to improve water quality. We also discussed the Rethink Runoff program goals and brainstormed ways that commission can help spread the word about programs and resources. Reached 6 people.
6. **Clean Water Challenge** [July] In an effort to engage people in hands-on stormwater projects through a digital platform, we launched the Clean Water Challenge online contest in July. Members of the public were invited to clean a storm drain in their neighborhood and submit before and after pictures to be entered into a drawing for a prize. The contest was advertised in our newsletter, Facebook, Instagram and shared on Front Porch Forum by some Stream Team volunteers. The contest was open to residents of all nine RRST municipalities. In total, 5 people participated. All 5 were awarded with Stream Team t-shirts, stickers and Lake Champlain Chocolates. (4 from S. Burlington, one from Essex Junction)



Figure 2: Participants in the Clean Water Challenge clear debris from storm drains in their neighborhood.

## Projects -----

Five "project" events were held in 2020. A total of **86** people participated in hands-on events in their communities. The following projects are described in more details below:

1. Colchester Riparian Tree Planting
2. Shelburne Riparian Tree Planting
3. Rain Barrel Kit Pickup in Essex
4. Stream Team Water Quality Monitoring
5. Rain Garden Maintenance

## Colchester Project: Tree Planting along the Winooski River

**Summary:** RRST helped to advertise and recruit volunteers for a tree planting project at Macrae Farm Park in Colchester that was planned by the Winooski NRCD and co-funded by the Lake Champlain Basin Program and Partners for Fish and Wildlife.

**Advertising:** Advertising was mainly achieved through email outreach to our list of existing volunteers, posting on social media and inviting community members to share a post on Front Porch Forum.

**Challenges:** Completing the event in a covid-safe manner was the biggest challenge. We required each participant to sign a volunteer waiver that included a covid checklist. Participants were asked to wear masks and maintain social distance. Many participants shared a feeling of gratitude to be able to complete hands-on work to improve their community even amidst a pandemic. A secondary challenge was weather. We postponed the original planting day due to predicted thunderstorms, but were able to maintain enough volunteers for a successful event on the rain date.

**Impact:** 10 Volunteers participated in two shifts throughout the day. 450 trees were planted at this site. These trees will help to decrease erosion, improve water quality and provide wildlife habitat for years to come. We have recruited a community volunteer to check in on the trees throughout 2021 which should help to ensure greater survival rates. Furthermore, the social impact of engaging people in a meaningful and safe in-person event amidst a pandemic cannot be overestimated. Building a sense of community around watershed conservation gave volunteers joy and a sense of purpose. Most participants accepted a Stream Team t-shirt and sticker as thanks for assisting. Finally, about 50 people opted to join our email list after expressing interest in the tree planting. We hope to engage folks who were not able to attend the planting, but chose to connect to our newsletter in activities in 2021.



*Figure 3: Volunteers plant saplings along the Winooski River at the Colchester tree planting*

## Shelburne Project: Tree Planting along McCabe's Brook

**Summary:** RRST helped advertise and recruit volunteers for a tree planting project at Meach Cove Farm Park along McCabe's Brook in Shelburne that was planned by the Winooski NRCDC and co-funded by the PUR Project and Partners for Fish and Wildlife.

**Advertising:** Advertising was mainly achieved through email outreach to our list of existing volunteers, posting on social media and inviting community members to share a post on Front Porch Forum. Staff at Meach Cove Farm also helped to recruit community members through a variety of local connections.

**Challenges:** Similarly to the Colchester tree planting, completing the event in a covid-safe manner was the biggest challenge. We required each participant to sign a volunteer waiver that included a covid checklist. Participants were asked to maintain social distance. Again, many participants shared a feeling of gratitude to be able to complete hands-on work to improve their community even amidst a pandemic. At this site a secondary challenge was also weather. We postponed the original planting day due to predicted rainstorms, but were able to maintain enough volunteers for a successful event on the rain date.

**Impact:** 16 Volunteers participated in two shifts throughout the day. 250 trees were planted at this site. These trees will help to decrease erosion, improve water quality and provide wildlife habitat for years to come. Finally, about 30 people opted to join our email list after expressing interest in the tree planting. We hope to engage folks who were not able to attend the planting, but chose to connect to our newsletter in activities in 2021.



*Figure 4: Volunteers of all ages plant saplings along McCabe's Brook at the Shelburne tree planting event.*

## Town of Essex Project: Rain Barrel Kit Pickup

**Summary:** We hosted a rain barrel kit pickup event in the Town of Essex that was covid-compliant and enabled us to share rain barrel supplies with 39 residents of RRST municipalities. We created a new instructional PDF and video about rain barrel construction.

**Challenges:** When our original plans of hosting an in-person rain barrel workshop in April came to a halt due to covid restrictions we decided to pivot and host a contactless rain barrel kit pickup day instead. We washed the barrels, pre-drilled holes and created hardware kits so that participants could assemble their barrels at home without specialized tools. On August 15th, we set up a tent at the Essex Fire Department and distributed kits to 39 people.

**Advertising:** This event was advertised on the RRST website, newsletter and social media pages. Municipal staff and members of the Essex Conservation and Trails Committee also helped to spread the message on Front Porch Forum.

**Impact:** Once the rain barrels are installed, they will help to decrease stormwater runoff volume in member municipalities. All participants were given educational handouts about the Stream Team and many elected to join our newsletter mailing list. Additionally, we produced an informational [VIDEO](#) about how to build a rain barrel and worked with Pluck Design to create a [PDF](#) handout about how to build a rain barrel. Both the video and PDF will serve as excellent resources to share with residents in the years to come.

**Cost:** The cost of materials was fully covered by the registration fee (\$40), so the only expense for this program was staff time.



*Figure 5: Left to right: Hardware kits with Rethink Runoff handouts ready to be distributed, rain barrels with pre-drilled holes wait to be picked up by participants, Kristen masked and ready for a covid-safe distribution day*

## Water Quality Monitoring

RRST has maintained an ongoing water quality monitoring program since 2012. Historically, citizen science volunteers have collected water samples in urban or suburban streams that are impacted by sedimentation, excessive nutrient loading, high temperatures, bacteria, and other pollution. This data provides information to towns about long term trends and may help towns identify good locations for stormwater BMPs.

In 2020 the program was forced to adapt since funding from VT DEC's LaRosa program was unavailable due to COVID-19 related budget cuts. Instead of collecting water samples for chemical analysis, volunteers were recruited to collect pictures and stories of our urban streams.

The RRST coordinator sent seven weekly emails to Stream Storytelling volunteers to share prompts for reflection. The weekly prompts included:

1. Get to Know Your Stream
2. Macroinvertebrates
3. Bird Identification
4. Using iNaturalist to record species diversity
5. Nature Journaling
6. Soil Analysis
7. Opportunities for Action



Figure 6: Stream Team volunteer story submissions including (left to right) macroinvertebrate monitoring, iNaturalist observations, baby snapping turtle in Alder Brook, nature journaling

In total, this program collected about 50 stories, 65 pictures and 15 illustrations. The findings have been compiled and posted in a Google Earth Tour, which can be accessed at the link below. It will be posted on the Rethink Runoff website shortly.

<https://earth.google.com/web/data=MicKJQojCiExMmcyVUVyZTNpVFhvN2ptcExKMS1PeEiwUVdxZDVlb3M6AwoBMA?authuser=0>

2020

<i>Location</i>	<i>ID#</i>	<i>Date</i>	<i>Flow</i>	<i>pH</i>	<i>E.Coli</i>	<i>Notes</i>
Lexington Ro	6 / CP1397	8/18	No	7.2		Upsteam Erosion
112 Wyndham	7 / CP1399	8/18	Yes	7.2	4.1	Rust - Tires
Coventry Rod	8 / CP1398	8/18	Yes	7.2	200	Good shape
196 Liberty L	11 / CP1402	8/18	Yes	7.6	330	Slope Erosion
122 Foreman	18 / CP1428	8/18	No / Yes	7.2	76	New: Homeowner modications
12 Woodrose	5 / OC1483	8/18	Dry			No Change
Severance Rd	48 / CP1391	8/18	Damp			No yard waste this year
Young Street		8/18	Dry			Water from upstream
Opposite Int	B3-016	8/18	Damp			Active erosion
Between Mod	B3-017	8/18	Dry			Lots of vegetation
Moorings Baf	B3-018	8/18	Yes	7.2	410	Discolored, surface scum
1086 E. Lake	C2-001	8/18	No	8.0		Beach erosion & secondary flow
1063 E. Lake	C2-002	8/18	Dry			Through rip-rap
E, Lakeshore	C2-003	8/18	Yes	7.6	31.0	Coming out of beach sand
1277 E. Lake	C2-004	8/18	Dry			Little activity
Lefevre's	C2-005	8/18	Dry			Recent re-build
230 Stone D	C2-006	8/18	No	7.2		Little activity
230 Stone D	C2-007	8/18	No	7.2		Heavy vegetation
Tower Ridge	C3-002	8/18	Dry			Heavy vegetation
Everbreeze	C3-003	8/18	Yes	7.2	56	Good shape
Blakely Road	C3-004	8/18	No	7.2		Very low
Opposite Wil	C3-005	8/18	Yes	7.6	310	Coming outside of drain
Opposite Wil	C3-006	8/18	Dry			Covered
Acorn Lane -	C3-018	8/18	SITE GONE - New Driveway Covered it			
Acorn Lane -	C3-019	8/18	Damp			Strong vegetation
Champlain Dr	C3-021	8/18	Damp			Strong vegetation
118 Orchard	C3-025	8/18	Dry			New constuction
Route 2 & 7 (	C4-015	8/18	Dry			Very dry
Shaw's 1	C4-017	8/18	No	7.2		Heavy vegetation
Hampton Inn	C4-018	8/18	Dry			Heavy vegetation ( parsnip)
Shaw's 2	C4-019	8/18	No	7.2		Vegetation
Main Street	D3-010	8/18	Damp			Little activity
Fort Ethan A	D4-001	8/18	Dry			Bank erosion / Safety fence
Fort Ethan A	D4-003	8/18	Yes	7.2		Rust & second flow / Rock snot



**NA Manosh Inc**  
120 Northgate Plaza  
Morrisville, VT 05661  
Phone: (802) 888-5722  
Fax: (802) 888-4681

8912

# Invoice

Invoice Number	13675
Invoice Date	9/2/2020

**Bill To:** Town of Colchester WWT  
783 Blakely Road  
  
Colchester, VT 05446

**Re:** 331 West Lakeshore Drive  
Colchester

RECEIVED  
SEP 14 2020  
Finance Dept.

Job No	Customer Job No	Customer PO	Payment Terms	Technician(s)	Service Date
2020HYDRO			Due Upon Receipt	Brian	08/31/2020
Quantity	Description		U/M	Rate/Unit	Price

08/31/2020 Jet culvert & clean storm water tank at Marina

1.00 Vactor Service Call Daily Rate DY 2,200.00 2,200.00

- \*\* Cleaned storm water material from 40'x8' Vortech Chamber
- \*\* Jet culvert 12" galv on Culver Hill Rd.
- \*\* Disposal onsite

2104434 445002  
my 9/11/20  
350 9.14.20

**PAID**  
**PAID** SEP 22 2020 **PAID**  
BY: \_\_\_\_\_

**Please make checks payable to N.A. Manosh Inc.**

New drilled wells, new shallow wells, new driven well point, new springs or deepening existing groundwater sources now require testing the water before using it. Please see the Water Supply Rule at the following link:

[dec.vermont.gov/sites/dec/files/dwgwp/rorules/pdf/Wastewater-System-and-Potable-Water-Supply-Rules-April-12-2019.pdf](http://dec.vermont.gov/sites/dec/files/dwgwp/rorules/pdf/Wastewater-System-and-Potable-Water-Supply-Rules-April-12-2019.pdf)

Subtotal	\$	2,200.00
Sales Tax (if applicable)	\$	0.00
Payments to Date	\$	0.00
Deposit	\$	0
<b>Total Due</b>	<b>\$</b>	<b>2,200.00</b>

Thank you for your business!  
Page 21 of 49

MEMORANDUM

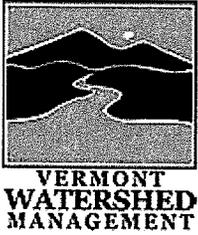
TO: Karen Adams, Technical Services Manager  
FROM: Sarah Hadd, Director of Planning & Zoning  
DATE: February 8, 2021  
RE: Stormwater Reporting Calendar Year 2020

---

Please find attached a spreadsheet enumerating projects advanced to construction for the period January 1, 2020 through December 31, 2020 with more than an acre but less than five acres of land disturbance. In calendar year 2020, the Department issued 1037 permits and conducted 782 inspections.

Colchester Projects, Under Construction as of December 2020 over 1 acre  
Colchester Planning Zoning Department Monthly Report

Permit #	APN	Description	Acres Disturbed	ImperviousArea	Date Issued	OWNER	STATUS
27761	09-026003-0000000	Road, Driveway, utility pole, underground conduit, sewer force main	1-5		10/27/2020	WINOOSKI VALLEY PARK DISTRICT	Under construction
SP2016	78-008030-0000000	Shoreline Stabilization	1-5		2/25/2020	RUPERTS CASTLE TRUST C/O BURTON GOLDSTEN	Under construction
FP2013	16-032000-0000000	8 Lot Subdivision	1-5		2/26/2020	WILCOX RONALD G SINGER ELICIA	Under construction
FP2104	26-005003-0000000	Two-Lot, 5-Unit PUD	1-5		8/26/2020	RIVERS EDGE	Under construction
FP2016	16-020040-0000000	4 lot, 3 Unit PUD	1-5		2/26/2020	R GARDNER CONTRACTING INC	Under construction
27366	12-026040-0000000	Residential, 4 bedroom	1-5		5/18/2020	VERDON CLAUDE	Approved
27445	16-020110-0000000	single family 2 story 4 bedroom home	1-5		7/23/2020	ANTHONY CHRISTIAN B	Complete
FP2109	26-005003-0000000	Final Plat amendment to add a Duplex containing Units 6 & 7 (also on Footprint Lots) located to the west of the previously approved units on Lot 2.	1-5		12/16/2020	RIVERS EDGE	Under construction



# STORMWATER Operating Fee INVOICE

Billing Date: April 16, 2019

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

Payor:	Town of Colchester Bryan Osborne 781 Blakely Road Colchester VT 05446
Permit Number:	7023-9014.A
Permit Name:	MS4 Town of Colchester
Permit Expiration Date:	12/5/2017
Total Impervious:	1061.30
Impervious Designated to this Permittee:	1061.30

Transaction Type	Date	Amount
Operating Fee	11/25/2017	\$10,613.00
MOU Fee	This fee is due prior to 5/1/2018	\$7,149.00
Payment Received	5/25/2018	(\$10,613.00)
MOU Payment Received	5/25/2018	(\$7,149.00)
Payment Received	10/25/2018	(\$10,613.00)
MOU Payment Received	10/25/2018	(\$7,126.00)
Operating Fee	11/25/2018	\$10,613.00
MOU Fee	This fee is due prior to 5/1/2019	\$7,126.00
Operating Fee	11/25/2019	\$10,613.00
MOU Fee	This fee is due prior to 5/1/2020	\$5,319.00
<b>YOUR AMOUNT DUE:</b>		<b>\$15,932.00</b>

Please Reference: Permit Number/Invoice: 7023-9014.A

**Your operating fee is due by: 11/25/2019 This bill is for future reference**

The MOU (Memorandum of Understanding) fee is a division of costs between all MS4 communities for flow monitoring in stormwater impaired streams. You will be billed on an annual basis based on the fee structure specified in the MOU. Please refer to the Flow Monitoring MOU for further details.

The Stormwater Program has administratively continued the current Municipal Separate Storm Sewer System (MS4) General Permit which expired on December 6, 2017. Your authorization will remain in full force and effect until a replacement permit is issued. You will be notified when a new application is due. Please refer to the MS4 website at: <http://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/ms4-permit> for additional information.

2104434 - 445007  
Stormwater Permittive

2104434 - 445000  
Flow Monitoring

FY20

KAA

7-26-19

---

Phosphorus Control Plan Summary Report

# Town of Colchester

# Phosphorus Control Plan

Colchester, Vermont

PREPARED FOR

---



**Colchester**  
VERMONT

Town of Colchester  
Public Works Department  
781 Blakely Road  
Colchester, Vermont 05446  
(802) 264-5500

PREPARED BY

---



40 IDX Drive, Building 100  
Suite 200  
South Burlington, Vermont 05403  
(802) 497-6100

Final 12/9/2020

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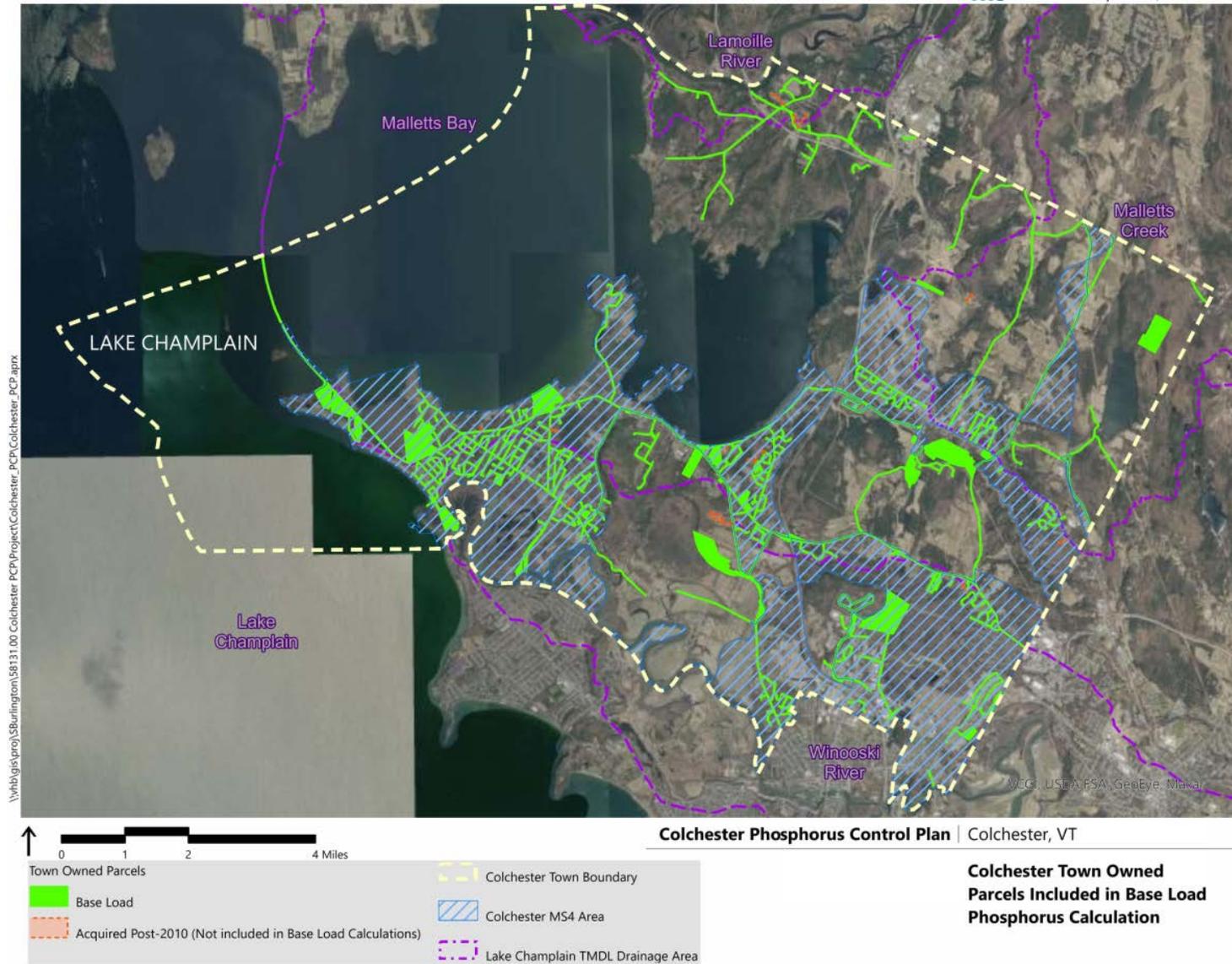
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## 1.0 Introduction

The Town of Colchester (“Town”) has developed this Phosphorus Control Plan (“PCP”) to satisfy requirements of Part 8.2 of the Vermont Department of Environmental Conservation (“DEC”) General Permit 3-9014 (the “Permit”) for Municipal Separate Storm Sewer Systems (“MS4”). In accordance with Section 8.2.A.1 of the Permit, this PCP has been designed to achieve a level of phosphorus (“P”) reduction equivalent to the percent reduction target for developed land in the associated Total Maximum Daily Load (“TMDL”) lake segments as applied to municipally-owned developed lands. This plan achieves that requirement and is intended to be revised as needed to track progress made toward P reduction goals, incorporate supplemental data from forthcoming mitigation project analyses, and to document any changes in prioritization of PCP projects. Complete implementation of the PCP is required by June 17, 2036 per Section 8.2.D of the Permit.

## 2.0 Phosphorus Reduction Targets

To determine the Town’s phosphorus reduction targets, first existing P base load for the PCP was calculated by clipping the DEC-provided Developed Lands GIS layer to include only Town-owned lands (Figure 1 below). Next, annualized P loading rates by land use class (impervious, developed pervious, etc.) were calculated as provided in the DEC Stormwater Treatment Practice Calculator (based upon Lake Champlain Scenario Tool, TetraTech, 2015). This resulted in the total annual P load for Town-owned lands in Colchester. This total annual P load was then multiplied by the required P reductions per TMDL Lake Segment prescribed in Appendix A of the Permit to arrive at the target P reductions for the Town’s PCP. This calculation results in a baseline P load and reduction target as of July 1, 2010. Phosphorus base load reduction targets associated with impervious surfaces acquired or adopted by the Town since the baseline date are represented by the future growth component of the reduction target.



**Figure 1:** Town Owned Lands used for the Base Load Calculation

Table 1 below presents the calculated P base load and prescribed target reduction. These calculations were last updated by VHB on June 12, 2019 and were sent (as spreadsheet, webmap, and GIS files) to DEC for review and informal confirmation on July 3, 2019.

**Table 1.** Phosphorus base load and reduction target for town-owned developed lands. See Appendix B for supporting information.

Lake Segment	Base Load (kg/yr)	Future Growth Reduction Target	Existing Developed Lands Reduction Target	Total Developed Lands Reduction Target	Future Growth Reduction Target (kg/yr)	Existing Developed Lands Reduction Target (kg/yr)	Total Developed Lands Reduction Target (kg/yr)
Malletts Bay	189.7	4.0%	16.5%	20.5%	7.5	31.3	38.9
Main Lake	159.9	4.1%	16.2%	20.2%	6.5	25.8	32.3
<b>Total</b>							<b>71.2</b>

In accordance with section 8.2.A.3.e of the Permit, the Town then assessed any existing sub-jurisdictional retrofit treatment projects on Town-owned properties implemented since July 1, 2010, to determine if P reduction credit could be taken for such projects. For the purposes of this PCP, sub-jurisdictional projects are defined as any stormwater treatment projects or upgrades that did not require coverage under a DEC operational phase stormwater discharge permit. It was determined that minimal opportunities for credit was available for this category of projects therefore the Town will not be seeking such credit at this time.

## 3.0 Phosphorus Loading Reduction Strategy

In order to meet the prescribed P reduction targets, a variety of project types are proposed for completion. Section 3.1 below gives an overview of the overall suite of projects selected for initial inclusion into the PCP along with their estimated P reduction potential. These project types are described in sections 3.1.1 to 3.1.5 below, with a majority of the P reduction proposed to be achieved by installation of retrofit stormwater treatment practices at selected project locations. Additional reductions will result from improvement of existing impervious roadway surfaces and stormwater outlets that will be upgraded to satisfy the conditions of the Municipal Roads General Permit (MRGP), as well as potential reductions in existing roadway impervious surface (Road Diets) within the Town.

At the end of this section is Table 3, which summarizes all projects included in this PCP to achieve compliance, and provides relevant information for each included project including potential p reductions and planned project timelines. This Plan includes more projects than necessary to achieve compliance; this approach provides a margin of safety for flexibility in implementing the PCP and enables the Town to select the most impactful projects as resources become available and feasibility reviews for each site or project type are performed. Information about the underlying assumptions used to develop Table 3 and an expanded version of the Table can be found in Appendix A.

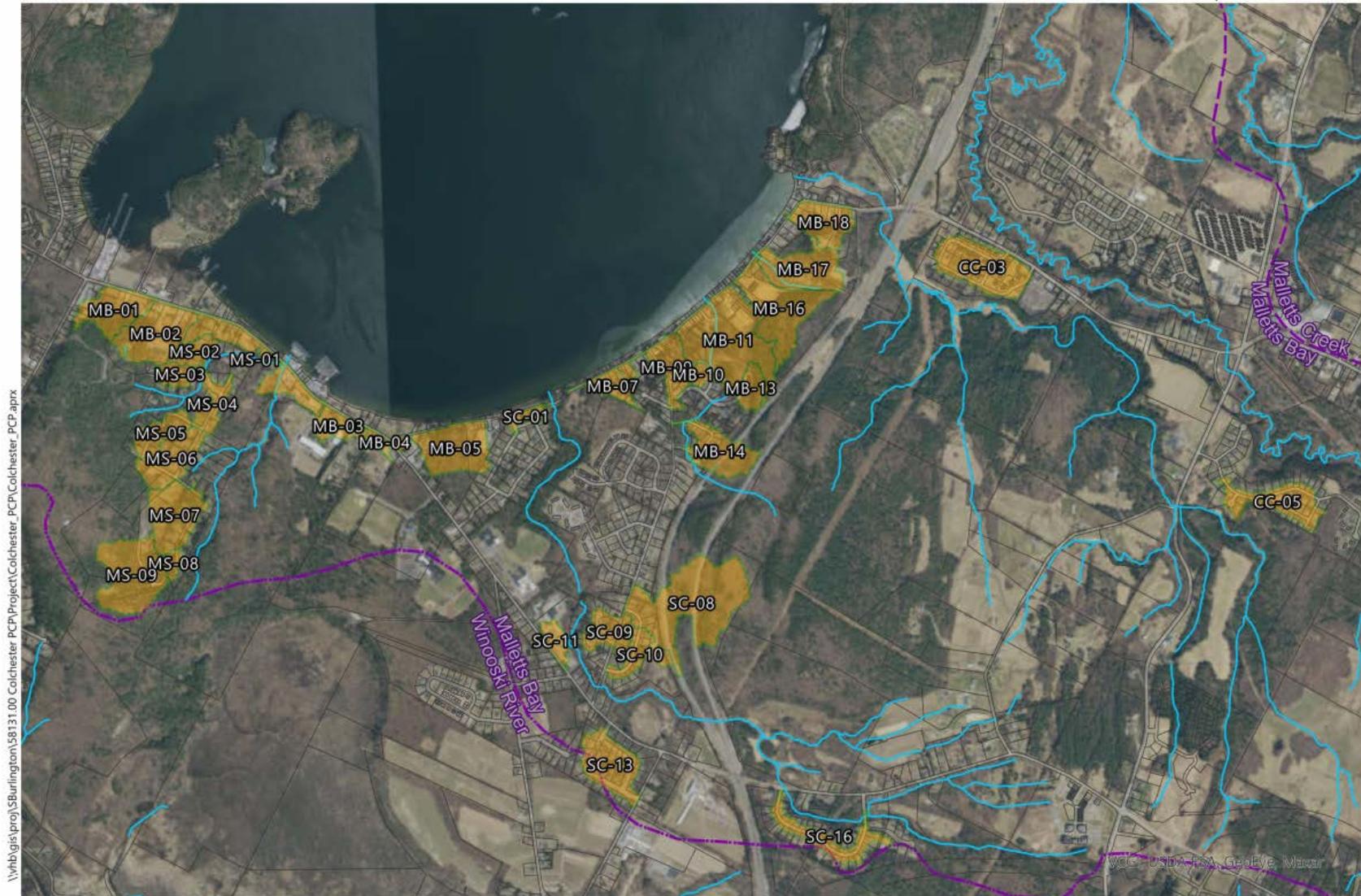
### 3.1 Project Descriptions

#### 3.1.1 Malletts Bay Scoping Study Projects

The Malletts Bay Scoping Study (MBSS) was completed by the Town of Colchester in November of 2017 and consisted of a three-part examination of transportation and stormwater conditions within the Malletts Bay area. The stormwater portion of the project examined ways to reduce public roadway and private property damage due to stormwater, and to reduce the volume of stormwater, sediment and P currently being discharged from roadways to Malletts Bay. The project examined the watersheds of Crooked Creek, Smith Hollow Creek, the Moorings Stream, and other direct drainages to Malletts Bay along West and East Lakeshore Drives. Grant funds have been pursued and received for the implementation of a few projects proposed within the report, which included various Green Stormwater Infrastructure (GSI) and other Low Impact Development (LID) treatment practices.

Of the 47 drainage subcatchments delineated in the Malletts Bay Scoping Study, 34 of the most promising were selected to be included as projects in the PCP. This selection of the top 34 projects was largely based upon project size and the estimated lowest cost per kg of P removal for each project. The projects included a mix of privately owned residential, and Town owned impervious surfaces, and could provide a potential P reduction of approximately 40.2 kg/year out of the total 71.2 kg/yr required reduction. These projects are listed in Table 3 below. Based upon future feasibility reviews, and final engineering design, it is expected that the P reductions will be refined and updated as each project is advanced.

Several of the MBSS projects are already in the design stage, as seen in Table 3. Phosphorus reduction calculations will be updated by the design team for those projects and will be incorporated into future updates to this plan.



\\vblgis\proj\SBurlington\58131.00 Colchester PCP\Project\Colchester\_PCP\Colchester\_PCP.aprx

WGC - USDA-FSA, GeoEye, Maxar

Colchester Phosphorus Control Plan | Colchester, VT

**Malletts Bay Scoping Study Subcatchments**

- Colchester Town Boundary
- Lake Champlain TMDL Drainage Area
- VHD Stream
- Malletts Bay Scoping Study Projects/Subcatchments
- Parcel Boundary (CAI)

**Figure 2.** Malletts Bay Scoping Study Projects

### 3.1.2 MRGP Projects

The Municipal Roads General Permit 3-9040 (MRGP), is aimed at reducing stormwater related erosion and sedimentation from both paved and unpaved municipal roads, and in and around stormwater outfalls. Phosphorus reduction related to stormwater outfalls will be evaluated in the future as projects are developed. For this report only phosphorus reductions related to roadway work are considered. The MRGP permit is required by Act 64, the Vermont Clean Water Act, and the Lake Champlain Phosphorus TMDL. Under the MRGP, municipalities must implement a customized, multi-year plan to stabilize their road drainage system. Each municipality must perform a Road Erosion Inventory (“REI”) to evaluate all hydrologically connected roadways and assign a level of compliance based upon inspections of roadway conditions. Roadways are divided into 100-meter segments for this process, and features like crown, gutters, evidence of rilling, and other erosion are considered when determining compliance level. Each year, municipalities must submit a report detailing progress made toward implementing MRGP standards, and updates for roads that are newly non-compliant. For Colchester this reporting will be completed through the CCRPC. Colchester’s REI was submitted to DEC in April 2020.

The REI identified 26 segments of roadway in Colchester that would require improvements as part of MRGP compliance. Calculations of potential P reductions included in this PCP were performed based upon guidance released by DEC in a document titled *Standard Operating Procedures for Tracking & Accounting of Stormwater Permit Programs: MRGP*, dated June 1, 2020 (“MRGP SOP”), which establishes P loading rates per watershed, level of compliance, road slope, and type of roadway surface (paved versus unpaved).

Phosphorus loading associated with each segment’s current level of compliance was compared with the loading from the same segment once brought into full compliance with the MRGP. The difference between these two loadings was used as the potential P reduction available. Altogether, the segments identified in the REI as requiring improvement will provide approximately 16.4 kg/yr of P reduction, which will be applied toward total of 71.2 kg/yr reduction target of the PCP.



Figure 3. Municipal Road General Permit Segments

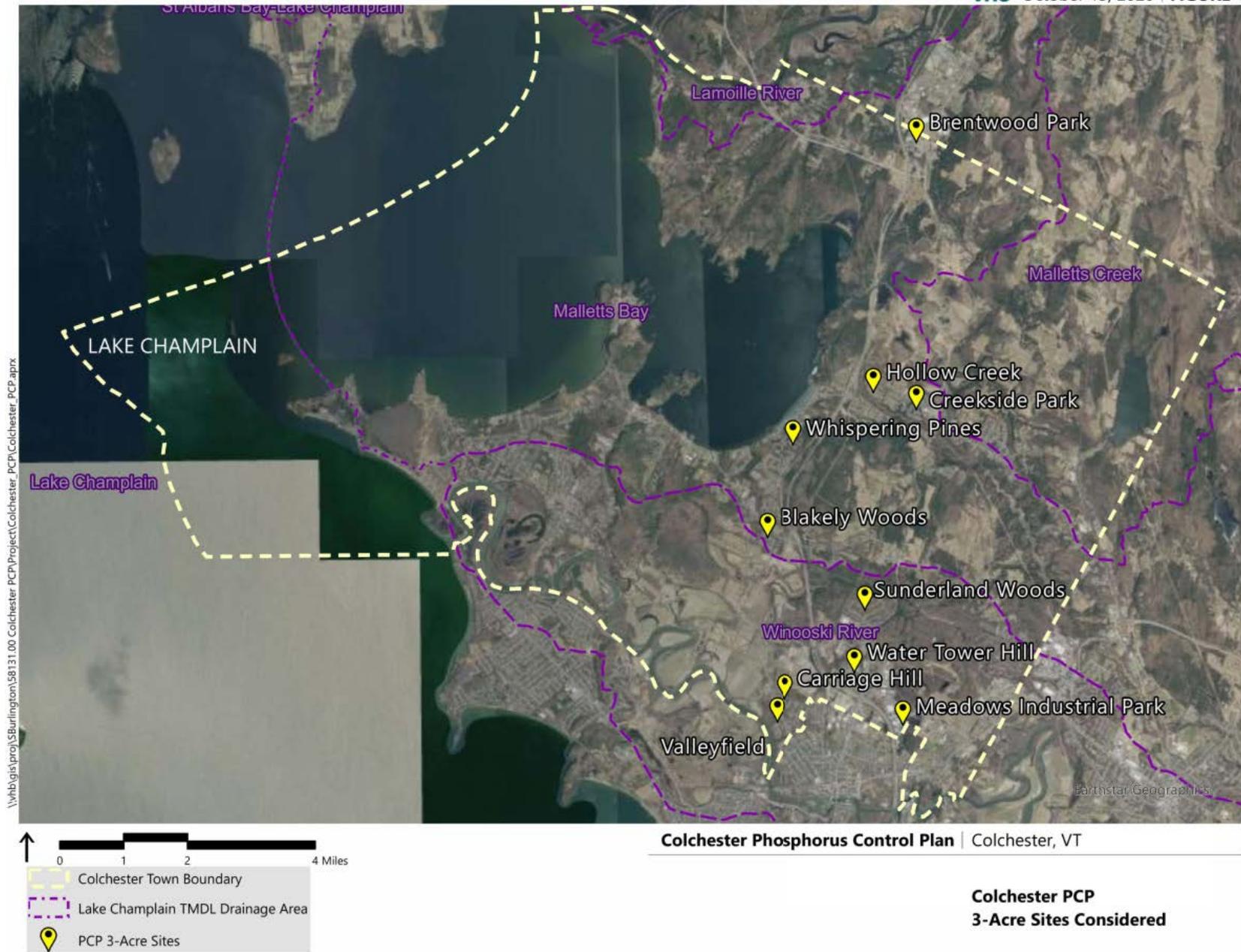
### 3.1.3 Three-Acre Permit Projects

DEC General Permit 3-9050 (“Three-Acre Permit” or “GP 3-9050”) was issued on September 1, 2020 and goes into effect on December 1, 2020. GP 3-9050 is a component of Act 64 with the goal of implementing clean-up efforts in Lake Champlain, Lake Memphremagog, and stormwater-impaired waters, while also protecting high quality surface waters statewide. The Three-Acre Permit process will require stormwater treatment upgrades to sites with more than three acres of impervious surface, that were designed prior to the adoption of the 2002 Vermont Stormwater Management Manual. This process will include a preliminary step involving the completion of an Engineering Feasibility Analysis (EFA) to determine the extent of stormwater retrofit options available for each site. In Colchester’s case, each three-acre site to come under this new permitting framework is already under an existing stormwater operational permit, so deadlines associated with compliance will be staggered based on existing permit expirations. The state has provided permittees up to 18 months to perform the needed EFAs, and all projects associated with compliance will need to be completed by 2030.

There are 10 three-acre sites in Colchester where the Town will have a responsibility for compliance, with this responsibility spread amongst all parties subject to each existing operational permit. For each site, the Town has a co-permittee (or co-permittees) who also own and maintain a portion of the stormwater system and/or impervious surfaces subject to the new permit requirements. While these permit requirements must be met regardless of whether they become a component of Colchester’s PCP, the possibility for P reduction potential through these projects is promising. As seen in Table 3, estimates indicate that there is a possible reduction of 15.9 kg/yr after construction of these requirements is complete. As described above, the timeline for performing an EFA under the Three-Acre Permit is roughly 18 months. The EFAs will result in a more detailed review of each individual site, which will result in a better understanding of both the existing treatment system removal efficiency, and the treatment benefit of any proposed retrofits. It is expected that the PCP will be updated accordingly as these EFAs are performed.

**Table 2.** Three-Acre properties co-owned by the Town requiring retrofit treatment under GP 3-9050

<b>Residential Subdivisions</b>	<b>Existing DEC Permit #</b>
Blakely Woods	3493-9010.R
Carriage Hill	3300-9010.R
Creekside Park	3282-9010.R
Hollow Creek	3334-9010.R
Sunderland Woods	4131-9010.R
Valleyfield	3266-9010
Whispering Pines	3631-9010
<b>Commercial/Industrial Sites</b>	
Brentwood Park	4955-9010.A2
Meadows Industrial Park	4057-9010.1
Water Tower Hill	4087-9010.RA



**Figure 4.** Three-acre permit sites considered for Phosphorus Control Plan

### 3.1.4 Road Diet Program

Colchester Department of Public Works roadway design standards have evolved over the years, creating the opportunity for narrowing of certain roadways throughout the Town, thus reducing impervious surface, and therefore P loading. Roadways may be able to be narrowed from 30 feet wide to a minimum of 26 feet in some cases. Specific locations for Road Diet projects will require further assessment of several factors including, but not limited to, existing traffic patterns and volumes, drainage infrastructure, emergency vehicle access, and bicycle and pedestrian accommodations.

Potential P reductions from the Road Diet Program were estimated by multiplying area of removed roadway impervious by a P loading value of 0.758 kg/yr/acre. This loading rate represents an average loading value for developed lands draining to Mallets Bay - Direct Drainage Lake Segment, as established by DEC. This is the lowest loading rate for receiving waters associated with Colchester's roads and was used as a planning level conservative estimate of P reductions that could be available through advancement of the Road Diet Program. Using this methodology, the Road Diet Program results in a potential phosphorus reduction of approximately 9.4 kg/yr. Once the Road Diet Program is advanced, P loading rates can be applied based upon the watershed in which the specific roadway project is situated.

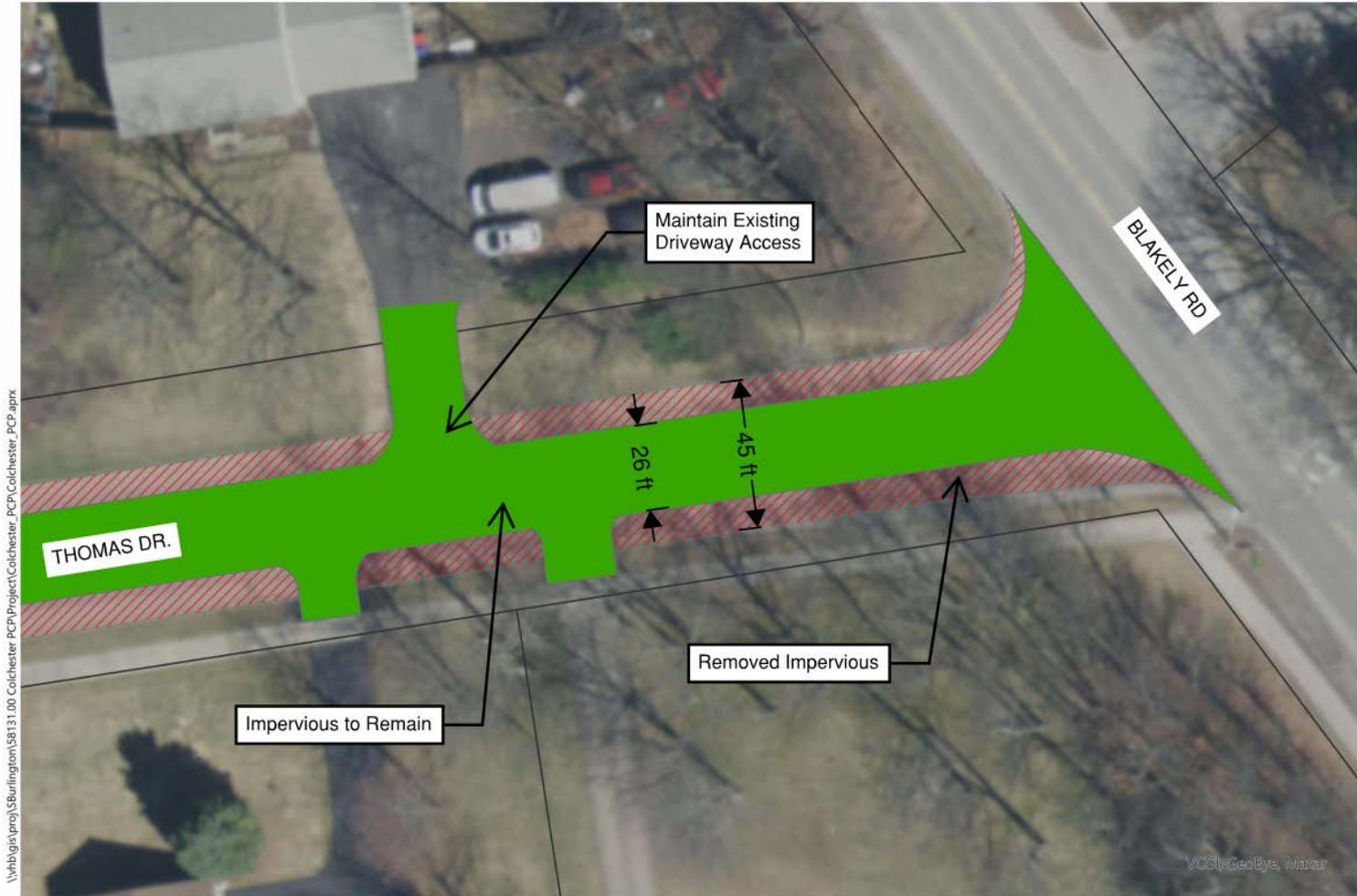


Figure 5. Road Diet Example

### 3.1.5 Town Owned Facilities

The PCP also includes projects associated with non-roadway properties owned by the Town, such as Airport Park and Burnham Library. The properties were selected for inclusion because they currently have large impervious surfaces onsite, mainly parking areas, with limited stormwater treatment installations. Projects on properties owned by the Town have the advantage of being unlikely to require acquisition of additional land or negotiations of agreements with private stakeholders. Scoping studies to further evaluate the phosphorus reduction potential of these town-owned properties will be pursued. The PCP will be updated accordingly as phosphorus reduction calculations are prepared by the design team(s) for those projects.

**Table 3:** Summary of projects considered, impervious and pervious areas, potential P reduction, timeline, and project status.

<b>Total Phosphorus Reduction Needed: 71.2 kg/yr</b>					
<b>Project Name</b>	<b>Impervious area (acres)</b>	<b>Total Pervious area (acres)</b>	<b>"Town-Owned" Potential P Reduction (kg/yr)</b>	<b>Timeline</b>	<b>Project Status</b>
(MS-3 to 7) Shore Acres - Cedar Ridge Project	8.6	38.9	5.0	2026	Under Design
(SC-11) Town Offices	1.3	2.5	0.8	2026	Under Design
Malletts Bay Scoping MB-04-1	0.8	0.7	0.6	2026	Under Design
Malletts Bay Scoping MB-04-2	1.0	0.9	0.8	2026	Under Design
MRGP Projects "Very High" Priority (Coon Hill, Galvin Hill Rd) Segment ID: 25811, 101028			4.5	2026	Under Design/Started
Airport Park - 500 Colchester Point Rd	5.5	61.9	4.7	2026	Not Yet Started
Burnham Library	1.3	2.1	1.0	2026	Not Yet Started
(SC-13, Blakely Woods) Burnham Ln., Nice Way	5.0	10.3	2.1	2026	3 Acre Permit, Not Yet Started
Brentwood Park Overall	11.8	28.4	0.4	2026	3 Acre Permit, Not Yet Started
Carriage Hill	0.7	5.9	0.7	2026	3 Acre Permit, Not Yet Started
Creekside Park	4.9	16.5	1.3	2026	3 Acre Permit, Not Yet Started
Hollow Creek	3.9	26.9	0.8	2026	3 Acre Permit, Not Yet Started
Meadows Industrial Park	5.9	4.4	0.0	2026	3 Acre Permit, Not Yet Started
Sunderland Woods	8.6	25.3	5.2	2026	3 Acre Permit, Not Yet Started
Valleyfield	2.9	4.7	0.9	2026	3 Acre Permit, Not Yet Started
Water Tower Hill	46.1	55.6	1.9	2026	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-09 (Whispering Pines)	1.2	6.4	0.7	2026	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-10 (Whispering Pines)	0.7	2.2	0.4	2026	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-11 (Whispering Pines)	1.3	9.5	0.7	2026	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-12 (Whispering Pines)	1.6	6.7	0.7	2026	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-13 (Whispering Pines)	0.6	5.2	0.1	2026	3 Acre Permit, Not Yet Started
<b>Totals for Projects Completed by 2026 (0-10yrs)</b>	<b>113.8</b>	<b>314.9</b>	<b>33.3</b>		

Project Name	Impervious area (acres)	Total Pervious area (acres)	"Town-Owned" Potential P Reduction (kg/yr)	Timeline	Project Status
MRGP Projects (Minus "Very High" Priority Segments)			11.9	2036	MS4 Requirement, Not Yet Started
(SC-16) Edgewood Dr.	4.7	6.5	2.8	2036	Not Yet Started
Malletts Bay Scoping CC-03 (Bay Creek Subdivision)	6.5	14.1	4.0	2036	Not Yet Started
(CC-05) Orchard Drive, Circle, Field Green Drive	5.2	8.5	3.2	2036	Not Yet Started
(SC-09) Williams Rd., Tower Ridge Circle, Midnight Pass	2.6	6.0	2.0	2036	Not Yet Started
(SC-10) Everbreeze Dr.	2.1	5.6	1.6	2036	Not Yet Started
(MB-18) East Lakeshore Dr.	2.0	7.6	1.6	2036	Not Yet Started
(MB-14) Joey Dr.	2.9	10.7	2.3	2036	Not Yet Started
Road Diet Program			9.4	2036	Not Yet Started
Total "Town Owned" Potential Phosphorus Reduction above this line achieves target of 71.2 kg/yr. Total above line (kg/yr) =			<b>72.1</b>		
Malletts Bay Scoping MB-01	0.9	20.9	0.9	2036	Not Yet Started
Malletts Bay Scoping MB-02	0.5	0.6	0.4	2036	Not Yet Started
Malletts Bay Scoping MB-03	0.6	1.7	0.5	2036	Not Yet Started
Malletts Bay Scoping MB-05	1.7	10.4	1.4	2036	Not Yet Started
Malletts Bay Scoping MB-07	1.7	3.3	1.3	2036	Not Yet Started
Malletts Bay Scoping MB-16	0.7	2.5	0.5	2036	Not Yet Started
Malletts Bay Scoping MB-17	0.5	5.1	0.4	2036	Not Yet Started
Malletts Bay Scoping MS-01	0.8	1.5	0.3	2036	Not Yet Started
Malletts Bay Scoping MS-02	0.7	4.5	0.6	2036	Not Yet Started
Malletts Bay Scoping MS-08	0.8	1.7	0.3	2036	Not Yet Started
Malletts Bay Scoping MS-09	0.9	21.8	0.5	2036	Not Yet Started
Malletts Bay Scoping SC-01	0.5	2.2	0.4	2036	Not Yet Started
Malletts Bay Scoping SC-08	4.2	35.1	3.5	2036	Not Yet Started
Totals for Projects Completed by 2036 (10-20yrs)	40.5	170.2	49.7		
<b>Grand Total (All Projects)</b>	<b>154.2</b>	<b>485.1</b>	<b>83.00</b>		

## 4.0 Implementation Schedule

The projects in this plan are intended to be carried out by the June 17, 2036 timeline as established by the Permit. Table 3 above shows the timeline for each project. Several of the MBSS projects are already underway. MS-3 through MS-7, which represent the Shore Acres/Cedar Ridge projects, SC-11, which represents the Town Offices projects, and MB-04-1 and MB-04-2 fall into this category. Airport Park and Burnham Library are also scheduled to be completed sooner (by 2026) as they are Town-owned properties and are therefore likely easier to implement. In addition, two segments of road on Coon Hill and Galvin Hill Road were deemed very high priority by the REI, and work on these segments is already in progress.

All of the projects associated with three-acre sites have been placed in the 2026 year bracket. This reflects the Town's intent to complete these projects in partnership with co-permittees as soon as resources allow. However, these timelines may be adjusted as Engineering Feasibility Analyses are completed for the sites and more information becomes available about the types of retrofits needed for compliance, the cost of such retrofits, and the availability of and access to funding made available to complete these projects. All projects will be completed by 2030 due to permitting requirements.

All projects in the road diet category are in the 2036 time frame, and are lower priority as feasibility, cost effectiveness, and extent of this program will require further study. The MRGP projects are scheduled to be completed along the 2036 timeframe as well. Four segments on Galvin Hill Road, Colchester Pond Road, Creek Farm Road, and E. Lakeshore Drive are categorized as not meeting MRGP standards and are high priority. Projects generally will be completed in order of priority. Updates and refinements to this plan will be documented in annual reports due April 1<sup>st</sup> of each year in accordance with Section 8.2.E of the Permit.

## 5.0 Summary and Conclusions

This PCP was developed to meet the Town of Colchester's requirements of Part 8.2 of GP 3-9014. The PCP will become part of the Towns MS4 Permit upon approval by DEC. This plan will be revised as needed to track progress made toward P reduction goals, incorporate supplemental data from P mitigation project analyses, and to document any changes in prioritization of PCP projects. Complete implementation of the PCP is required by June 17, 2036 per Section 8.2.D of the Permit.

Appendix A: Full Phosphorus Summary Table

## **Project Summary Table Methodology**

This section documents the methodology and key assumptions that were used to develop the P reduction estimates for each project as tabulated in Table 3. Additional tabulated calculation results are included in the table below.

### Watershed/ Property Areas

For the MBSS, Three-Acre Sites, and miscellaneous Town-owned properties, pervious and impervious areas for each project were calculated based upon information in the DEC Developed Lands Layer, MBSS, prior permits where available, and GIS-based topography and land cover data otherwise.

### Proposed Treatment Practice Removal Efficiency Estimates

Initial estimated P removal efficiencies for proposed treatment practices in the PCP are based upon NRCS mapped soils type and the removal efficiencies of the 2017 Vermont Stormwater Management Manual Rule and Design Guidance ("VSMM"). For project locations mapped with A or B Hydrologic Soil Group (HSG) soils, it was assumed an infiltrative practice would be used which achieves a 90% P removal rate per the 2017 VSMM. For projects with C or D soils, gravel wetland treatment with a P removal rate of 40% was assumed. These removal rates are associated with treating the Water Quality volume (first inch of rainfall) in accordance with the 2017 VSMM. Due to site constraints it is likely that many projects may not be able to achieve full treatment of the Water Quality volume, however the assumption of achieving full treatment was used to represent to total P removal potential for each project site until site specific studies can be completed.

### Existing Treatment Practice Removal Efficiency Estimates

Treatment practices associated with three-acre sites or other existing sites are generally older systems or only treat a portion of the site. Existing stormwater treatment practices were assumed to have a P removal rate of 20% which corresponds to half of the prescribed 40% P removal rate of a practice designed to the 2002 VSMM. Where no evidence of an existing practice exists, no existing P removal was assumed. This approach was utilized as a way to provide a planning-level estimate of existing treatment and therefore the benefit of providing retrofit treatment at a given project. As site specific studies are advanced for each project, the level of existing treatment in the existing systems can be estimated and tracked using the DEC STP calculator/ BMP tracking spreadsheet and the project P removal benefit can be updated accordingly.

**Colchester PCP Project Table Total P Reduction Needed: 71.2 kg/yr**



Project: Colchester PCP Retrofit Scoping  
 Location: Colchester, VT  
 Calculated by: CHS  
 Checked by: .  
 Title: Conceptual Phosphorus Removal Estimates (SCENARIO)

Project #: 58131.00  
 Sheet: 1 1  
 Date: 10/29/2020  
 Date: .

Notes

Project Name	Impervious area (acres) <sup>1</sup>	Total Pervious area (acres) <sup>1</sup>	Phosphorus (P) Load Before Treatment (kg/yr) <sup>2</sup>	Existing BMP?	Existing Practice Assumed Efficiency <sup>3</sup>	Existing P Load (kg/yr)	Proposed Practice Assumed Efficiency <sup>4</sup>	Potential P Reduction Credit (kg/yr)	"Town-Owned" Potential P Reduction (kg/yr)	Timeline	Project Status
(MS-3 to 7) Shore Acres - Cedar Ridge Project	8.6	38.9	7.6	No	0%	7.6	45%	5.0	5.0	0-10 yrs	Under Design
(SC-11) Town Offices	1.3	2.5	1.1	Yes	20%	0.9	90%	0.8	0.8	0-10 yrs	Under Design
Malletts Bay Scoping MB-04-1	0.8	0.7	0.7	No	0%	0.7	90%	0.6	0.6	0-10 yrs	Under Design
Malletts Bay Scoping MB-04-2	1.0	0.9	0.8	No	0%	0.8	90%	0.8	0.8	0-10 yrs	Under Design
MRGP Projects "Very High" Priority (Coon Hill, Galvin Hill Rd) Segment ID: 25811, 101028								4.5	4.5	0-10 yrs	Under Design/Started
Airport Park - 500 Colchester Point Rd	5.5	61.9	5.3	No	0%	5.3	90%	4.7	4.7	0-10 yrs	Not Yet Started
Burnham Library	1.3	2.1	1.1	No	0%	1.1	90%	1.0	1.0	0-10 yrs	Not Yet Started
(SC-13, Blakely Woods) Burnham Ln., Nice Way	5.0	10.3	4.3	Yes	20%	3.4	90%	3.1	2.1	0-10 yrs	3 Acre Permit, Not Yet Started
Brentwood Park Overall	11.8	28.4	10.1	Yes	20%	8.1	45%	3.6	0.4	0-10 yrs	3 Acre Permit, Not Yet Started
Carriage Hill	0.7	5.9	2.2	No	0%	2.2	45%	1.0	0.7	0-10 yrs	3 Acre Permit, Not Yet Started
Creekside Park	4.9	16.5	4.3	No	0%	4.3	90%	3.8	1.3	0-10 yrs	3 Acre Permit, Not Yet Started
Hollow Creek	3.9	26.9	3.6	Yes	20%	2.9	90%	2.6	0.8	0-10 yrs	3 Acre Permit, Not Yet Started
Meadows Industrial Park	5.9	4.4	7.6	Yes	20%	6.1	90%	5.5	0.0	0-10 yrs	3 Acre Permit, Not Yet Started
Sunderland Woods	8.6	25.3	15.5	Yes	20%	12.4	90%	11.1	5.2	0-10 yrs	3 Acre Permit, Not Yet Started
Valleyfield	2.9	4.7	4.3	Yes	20%	3.5	90%	3.1	0.9	0-10 yrs	3 Acre Permit, Not Yet Started
Water Tower Hill	46.1	55.6	64.4	Yes	20%	51.5	45%	23.2	1.9	0-10 yrs	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-09 (Whispering Pines)	1.2	6.4	1.1	No	0%	1.1	90%	1.0	0.7	0-10 yrs	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-10 (Whispering Pines)	0.7	2.2	0.6	No	0%	0.6	90%	0.5	0.4	0-10 yrs	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-11 (Whispering Pines)	1.3	9.5	1.2	No	0%	1.2	90%	1.1	0.7	0-10 yrs	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-12 (Whispering Pines)	1.6	6.7	1.4	Yes	20%	1.1	90%	1.0	0.7	0-10 yrs	3 Acre Permit, Not Yet Started
Malletts Bay Scoping MB-13 (Whispering Pines)	0.6	5.2	0.5	Yes	20%	0.4	45%	0.2	0.1	0-10 yrs	3 Acre Permit, Not Yet Started
<b>Totals 0-10 years</b>	<b>113.8</b>	<b>314.9</b>	<b>137.4</b>			<b>114.9</b>		<b>78.0</b>	<b>33.3</b>		
MRGP Projects								11.9	11.9	10-20yrs	MS4 Requirement, Not Yet Started
(SC-16) Edgewood Dr.	4.7	6.5	3.9	Yes	20%	3.2	90%	2.8	2.8	10-20yrs	Not Yet Started
Malletts Bay Scoping CC-03 (Bay Creek Subdivision)	6.5	14.1	5.5	Yes	20%	4.4	90%	4.0	4.0	10-20yrs	Not Yet Started
(CC-05) Orchard Drive, Circle, Field Green Drive	5.2	8.5	4.4	Yes	20%	3.5	90%	3.2	3.2	10-20yrs	Not Yet Started
(SC-09) Williams Rd., Tower Ridge Circle, Midnight Pass	2.6	6.0	2.2	No	0%	2.2	90%	2.0	2.0	10-20yrs	Not Yet Started
(SC-10) Everbreeze Dr.	2.1	5.6	1.8	No	0%	1.8	90%	1.6	1.6	10-20yrs	Not Yet Started
(MB-18) East Lakeshore Dr.	2.0	7.6	1.7	No	0%	1.7	90%	1.6	1.6	10-20yrs	Not Yet Started
(MB-14) Joey Dr.	2.9	10.7	2.5	No	0%	2.5	90%	2.3	2.3	10-20yrs	Not Yet Started
Road Diet Program <sup>5</sup>								9.4	9.4	10-20yrs	Not Yet Started
<b>Total "Town Owned" Potential Phosphorus Reduction above this line achieves target of 71.2 kg/yr. Total above line (kg/yr) =</b>									<b>72.1</b>		
Malletts Bay Scoping MB-01	0.9	20.9	1.0	No	0%	1.0	90%	0.9	0.9	10-20yrs	Not Yet Started
Malletts Bay Scoping MB-02	0.5	0.6	0.4	No	0%	0.4	90%	0.4	0.4	10-20yrs	Not Yet Started
Malletts Bay Scoping MB-03	0.6	1.7	0.5	No	0%	0.5	90%	0.5	0.5	10-20yrs	Not Yet Started
Malletts Bay Scoping MB-05	1.7	10.4	1.5	No	0%	1.5	90%	1.4	1.4	10-20yrs	Not Yet Started
Malletts Bay Scoping MB-07	1.7	3.3	1.5	No	0%	1.5	90%	1.3	1.3	10-20yrs	Not Yet Started
Malletts Bay Scoping MB-16	0.7	2.5	0.6	No	0%	0.6	90%	0.5	0.5	10-20yrs	Not Yet Started
Malletts Bay Scoping MB-17	0.5	5.1	0.5	No	0%	0.5	90%	0.4	0.4	10-20yrs	Not Yet Started
Malletts Bay Scoping MS-01	0.8	1.5	0.7	No	0%	0.7	45%	0.3	0.3	10-20yrs	Not Yet Started
Malletts Bay Scoping MS-02	0.7	4.5	0.6	No	0%	0.6	90%	0.6	0.6	10-20yrs	Not Yet Started
Malletts Bay Scoping MS-08	0.8	1.7	0.6	No	0%	0.6	45%	0.3	0.3	10-20yrs	Not Yet Started
Malletts Bay Scoping MS-09	0.9	21.8	1.0	No	0%	1.0	45%	0.5	0.5	10-20yrs	Not Yet Started
Malletts Bay Scoping SC-01	0.5	2.2	0.4	No	0%	0.4	90%	0.4	0.4	10-20yrs	Not Yet Started
Malletts Bay Scoping SC-08	4.2	35.1	3.9	No	0%	3.9	90%	3.5	3.5	10-20yrs	Not Yet Started
<b>Totals 10-20 years</b>	<b>40.5</b>	<b>170.2</b>	<b>35.4</b>			<b>32.6</b>		<b>49.7</b>	<b>49.7</b>		
<b>Total</b>	<b>154.2</b>	<b>485.1</b>	<b>172.8</b>			<b>147.5</b>		<b>127.7</b>	<b>83.0</b>		

1. Areas based on area delineation received from the Town of Colchester, and GIS data analysis performed by VHB.

2. Phosphorus (P) loading calculated using VT ANR's online Stormwater Treatment Practice Calculator

3. Sites with existing treatment practices were assumed to have an existing P removal rate/efficiency of 20%, which is based upon half of the 40% P removal rate of practices designed to the 2002 Vermont Stormwater Management Manual. This estimate can be adjusted based upon future site specific assessments as projects are advanced.

4. Potential stormwater treatment practices on sites with predominantly Hydrologic Soil Group (HSG) A or B soils were assumed to have a 90% phosphorus removal efficiency due to infiltration potential. For sites with predominantly HSG C-D soils, removal efficiency was assumed to be 45%. These efficiencies are taken from the DEC BMP tracking table.

5. Based upon area reductions associated with potential road diet locations provided by the Town of Colchester This area was multiplied by a phosphorus loading value of 0.758 kg/yr/acre which represents an average loading value for developed lands draining to Malletts Bay - Direct Drainage, as established by DEC. This is the lowest loading rate for receiving waters associated with Colchester's roads and was used as a conservative estimate of available P reductions until the road diet program can be advanced.

## Appendix B: Base Load Calculation Summary Table

## Colchester Developed Lands Base Load and Target Reductions

This is the base load summary calculated by VHB on behalf of the Town of Colchester. Areas were derived in GIS by clipping the DEC provided Developed Lands layer (Jan 24, 2019) to town-owned parcels and roadways, then intersecting the clipped areas to the the drainage areas layer. The calculations were last updated on 6/12/2019.

### Town Owned Land Summary by Lake Segment

Lake Segment	Base Load (kg/yr)	Future Growth Reduction Target	Existing Lands Reduction Target	Total Developed Lands Target Reduction	Future Growth Reduction Target (kg/yr)	Existing Development Reduction Target (kg/yr)	Total Reduction Target (kg/yr)
Malletts Bay	189.7	4.0%	16.5%	20.5%	7.5	31.3	38.9
Main Lake	159.9	4.1%	16.2%	20.2%	6.5	25.8	32.3
	349.6						71.2

### Raw Data

LU_Class	Loading Rate Class	MS4	SWAT_drain	Lake Segment	Area_acres	Loading Rate	Load (kg/yr)
Developed Pervious	Developed Pervious	Colchester	Lamoille River	Malletts Bay	6.60	0.228	1.5
Developed Pervious	Developed Pervious	Colchester	Main Lake - DD	Main Lake	13.02	0.095	1.2
Developed Pervious	Developed Pervious	Colchester	Malletts Bay - DD	Malletts Bay	188.40	0.012	2.3
Developed Pervious	Developed Pervious	Colchester	Winooski River	Main Lake	110.91	0.231	25.6
Developed Impervious	Impervious	Colchester	Lamoille River	Malletts Bay	0.99	0.986	1.0
Developed Impervious	Impervious	Colchester	Main Lake - DD	Main Lake	3.58	0.914	3.3
Developed Impervious	Impervious	Colchester	Malletts Bay - DD	Malletts Bay	35.04	0.758	26.6
Developed Impervious	Impervious	Colchester	Winooski River	Main Lake	14.91	0.980	14.6
Paved Roads	Impervious	Colchester	Lamoille River	Malletts Bay	5.63	0.986	5.6
Paved Roads	Impervious	Colchester	Main Lake - DD	Main Lake	8.83	0.914	8.1
Paved Roads	Impervious	Colchester	Malletts Bay - DD	Malletts Bay	136.15	0.758	103.3
Paved Roads	Impervious	Colchester	Winooski River	Main Lake	102.68	0.980	100.6
Unpaved Roads	Unpaved Roads	Colchester	Lamoille River	Malletts Bay	1.33	2.034	2.7
Unpaved Roads	Unpaved Roads	Colchester	Main Lake - DD	Main Lake	0.24	2.081	0.5
Unpaved Roads	Unpaved Roads	Colchester	Malletts Bay - DD	Malletts Bay	23.32	2.010	46.9
Unpaved Roads	Unpaved Roads	Colchester	Winooski River	Main Lake	2.70	2.207	6.0
					654.36		349.6