

AHEAD OF THE STORM

Site: Charlotte Library

Location: Ferry Road, Charlotte, Vermont



Primary Problem

Runoff from the Charlotte Library’s existing building, parking lot, driveway, and sidewalk leaves the property untreated (property area = 0.47 acres, 3,370 square feet impervious surface). Stormwater runoff flows overland offsite either across the driveway to a swale and flows to Thorp Brook or a newly installed trench drain on the Village Green leading to Pringle Brook, a tributary of Holmes Brook. A portion of the runoff originates from the roof and is unable to infiltrate into the lawn based on poorly draining soils. *(See existing conditions site summary and plan.)*

Three Optimal Conservation Practices (OCPs) are recommended to treat runoff from the existing impervious surface of the library roof. The primary goal is to improve water quality protection by slowing runoff, increase infiltration, and enhancing vegetation. This project will begin to reverse the cumulative impacts from incremental development within the Thorp Brook and Holmes Brook watersheds where past water quality sampling found high turbidity, suspended solids, nitrogen, and phosphorus levels in the streams.

Final Treatment Recommendations

1. Create bio-retention areas in existing landscaped beds on the west side of the building to slow runoff and increase storage capacity.
2. Install a rain barrel to water the gardens and flower beds to increase retention storage capacity.
3. Continue the practice of “rooftop disconnection” by allowing roof runoff to flow across the north lawn.

Site Constraints and Design Basis

Tight soils and high groundwater do not allow infiltration to take place or underground treatment practices to be effective. The design maximizes treatment while largely maintaining current land use, site features, and maintenance needs. The design was sized using methods in the “Green Stormwater Infrastructure Simplified Sizing Tool for Small Projects” created by the Vermont League of Cities and Towns and the Vermont Department of Environmental Conservation. This tool is readily available to members of the public to design similar practices on their properties. Runoff calculations embedded in the tool ensure that each of the practices are treating all of the 1-inch rain storm (i.e., the Water Quality Volume – WQv) (Table 1). Each of the practices has been designed to safely pass larger storm events without damage. The design minimizes long-term maintenance procedures and costs. *(See attached concept design plans, including operation and maintenance notes.)*

Table 1: Summary of Hydrology Calculations (see attached sizing tool worksheets)

Drainage Location	Drainage Area (Square Feet)	WQv Generated on the Site (Cubic Feet)	Treatment Volume (Cubic Feet)	Treatment Volume (%)
To Bio-retention	1,640	130	130	100% of WQv
To Rainbarrel	640	51	51	100% of WQv
To Rooftop Disconnect	1,090	86	86	100% of WQv
TOTAL	3,370	267	267	100% of WQv

Cost

Construction and engineering oversight for the two OCPs not yet implemented is estimated to cost \$8,000, assuming that labor and materials are purchased at the market rate through a bid process from a construction contractor. Cost savings for this small project may be achieved through donations or sole-source contracting if purchase requirements allow.

Ahead of the Storm

Existing Conditions Site Summary

Charlotte Library

Site Description

Currently runoff from the existing library building, parking lot, driveway, and sidewalk flows overland off site to either a swale across the driveway or a newly installed trench drain on the Village Green (Figure 1). This project will increase treatment of stormwater runoff leaving the site via overland flow. There are no reported stormwater related issues at the site.

Drainage Patterns

When developed, the property was filled to make it flat and slightly above the adjacent areas. Therefore no stormwater flows onto the property from adjacent areas. Stormwater generated at the site flows overland off of the property.

A vegetated swale runs along the east side of the property, carrying water south. Runoff from the east half of the property drains across the driveway to this swale. This swale has thick vegetation. The swale discharges to the south and eventually water enters the Thorp Brook headwater reach (Vermont Geomorphic Assessment Reach T8.05).

In 2015, a rock-filled trench perimeter drain was installed around the Village Green and existing grades were raised a few inches. This project was completed because the Green was chronically wet. The west half of the library property drains overland towards this perimeter drain. The perimeter drain discharges to a swale along the west side of the Green that flows north through a culvert under Ferry Road and into the pond behind the Fire Station, eventually flowing north to Pringle Brook.

Site Constraints

Library would like to use the project as a demonstration to kids, families, and others visiting the library and would like the practice to be simple to understand and easily transferable to someone's home.

Shallow groundwater is present around the site, as reported from Town officials involved in the Village Green perimeter drain project.

Infiltration options are limited due to the poorly draining soils. The library is sitting on a small piece of soil classified as Hydrologic Soil Group (HSG) C and is surrounded by hydric soils with a HSG D classification.

Possible Treatment Options Identified

1. Capture rainwater on southeast portion of roof with gutters and detain in rainbarrels to be used for watering the gardens.
2. Convert and expand existing planted beds on the west side of the building adjacent to covered porch into bioretention depressions.
3. Create a new bioretention area in the existing lawn area to the west of the building.
4. Some portions of the site are recommended to continue to have disconnected sheet flow.

Ahead of the Storm
Existing Conditions Photo Documentation Summary
Charlotte Library



Figure 1: Library existing building, looking across Green. Newly installed gravel perimeter trench drain visible.



Figure 3: South end of library building. Existing gardens in foreground could be watered using collected rainwater.



Figure 2: Library entrance driveway. Existing site runoff sheet flows across driveway to swale on other side in bushes.



Figure 4: Potential location of new gutter, downspout, and rainbarrel to be used for garden watering.

Ahead of the Storm
Existing Conditions Photo Documentation Summary
Charlotte Library



Figure 5: West side of the library. Roof runoff currently falls off roof and travels overland into the Green.



Figure 7: Possible location of bio-retention area between two trees in existing lawn area.



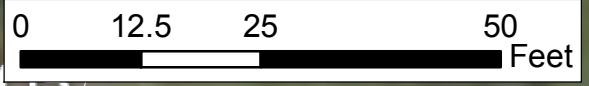
Figure 6: Possible location of bio-retention area to west of building, at location of existing planted bed.



Figure 8: Possible location of bio-retention area to west of building, at location of existing planted bed.

Y:\3452-22\Maps\EXISTING CONDITIONS\Library_ExistingConditionsMap_V2.mxd

2'-Elevation Contour, 2012 Lidar	Stormwater Flow
Drainage Area Boundary	Overland
NRCS Soil Area Boundary	Swale
Parcel Boundary, Approximate	Culvert
	Pipe








MILONE & MACBROOM
 1 South Main Street, 2nd Floor
 Waterbury, Vermont 05676
 (802) 882-8335 Fax (802) 882-8346
 www.miloneandmacbroom.com

SOURCE(S):
 2012 LIDAR 2 FT CONTOURS, VCGI
 BING AERIAL
 NRCS SOIL MAPPING
 MMI FIELD DATA

EXISTING CONDITIONS
AHEAD OF THE STORM
CHARLOTTE LIBRARY
 FERRY ROAD
 CHARLOTTE, VERMONT

CONCEPT DESIGN

Map By: JCL
 MMI #: 3452-22
 MXD:
 1st Version: 7/11/2016
 Revision:
 Scale: 1"=20'

-  Bio-Retention Area
-  2'-Elevation Contour, 2012 Lidar
-  Drainage Area Boundary
-  NRCS Soil Area Boundary
-  Parcel Boundary, Approximate
-  Stormwater Flow Overland
-  Swale
-  Culvert
-  Pipe

THIS DESIGN FOLLOWS METHODS OUTLINED IN THE "GREEN STORMWATER INFRASTRUCTURE SIMPLIFIED SIZING TOOL FOR SMALL PROJECTS" CREATED BY THE VERMONT LEAGUE OF CITIES AND TOWNS AND THE VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

CONTINUE TO ALLOW ROOF RUNOFF TO FLOW ACROSS LAWN TO NORTH OF LIBRARY. THIS TREATMENT IS "ROOFTOP DISCONNECTION" AND MEETS REQUIREMENTS FOR A 12 FOOT BY 65 FOOT VEGETATED FLOW AREA.

CREATE BIO-RETENTION AREAS ALONG EXISTING FLOWER BEDS (SEE DETAIL)
 DEPTH ~ 6 INCHES
 AREA ~ 136 SQUARE FEET
 VOLUME ~ 129 CUBIC FEET

PERIMETER DRAIN INSTALLED 2015

OVERFLOW PIPE TO DAYLIGHT, TYP.

OVERFLOW AND CLEANOUT, TYP.

PERFORATED UNDERDRAIN PIPE, TYP.

INSTALL ~20 FEET GUTTER, DOWNSPOUT, AND ICE BARS

INSTALL 360 GALLON RAIN BARREL, SEE DETAIL

USE WATER IN RAIN BARREL TO WATER GARDEN AND FLOWER BEDS. DIRECT OVERFLOW ONTO GRASS TOWARDS WEST.

DA = 130 SF

DA = 960 SF

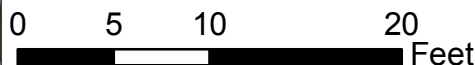
DA = 1,640 SF

DA = 640 SF

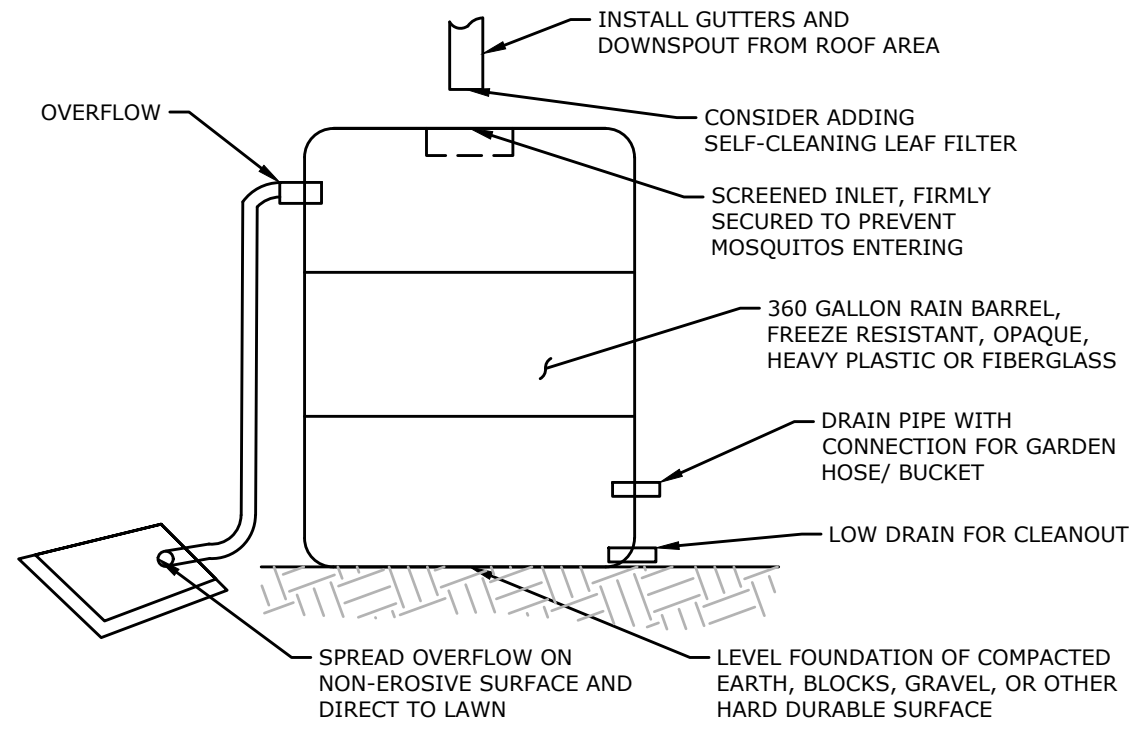
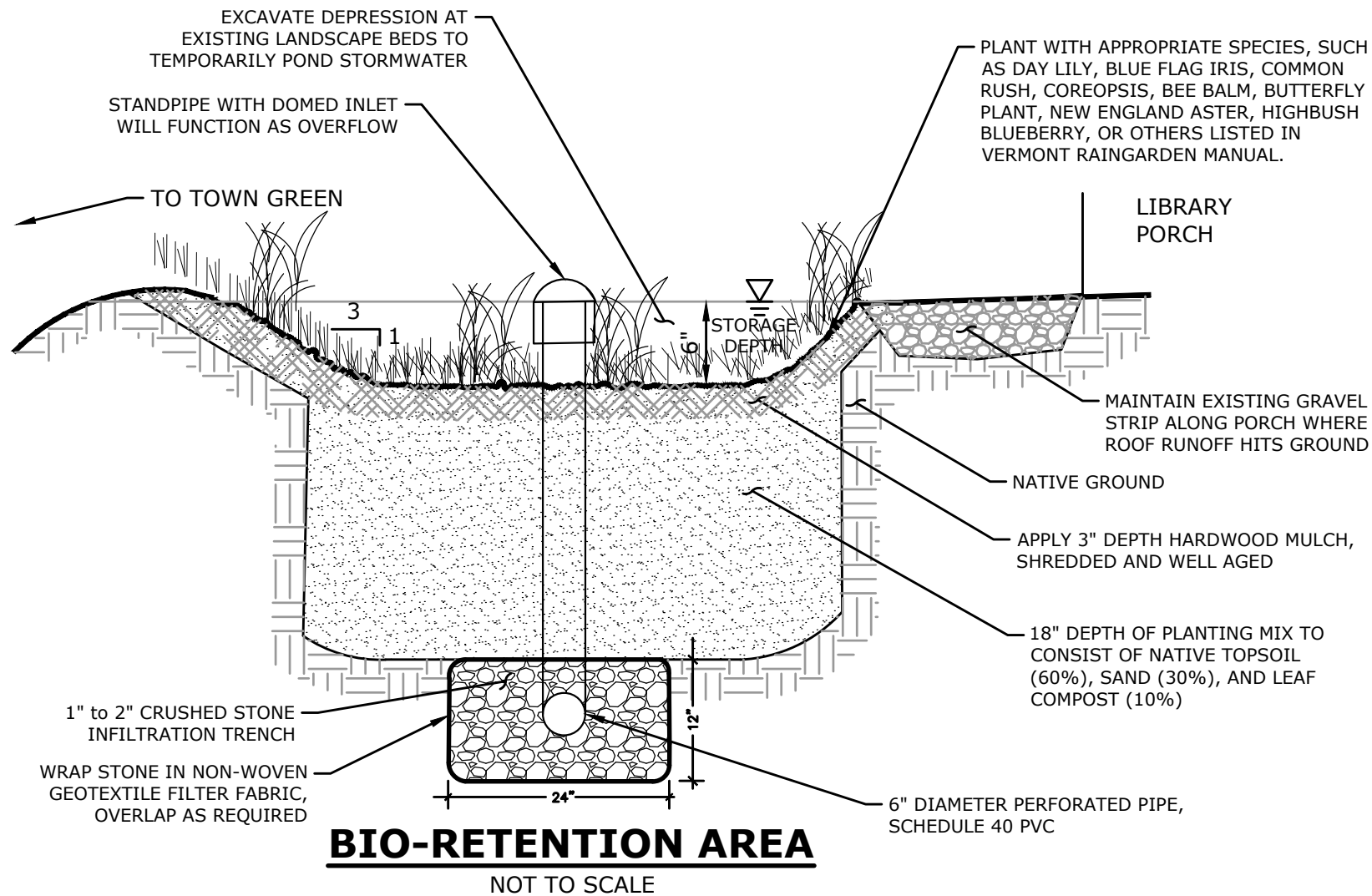
LIBRARY

PaB, HSG C, potentially highly erodibl

GARDEN



Drawing: W:\DESIGN\3452-22-DE\CAD\CL-DETAILS\DWG Layout TopDETAILS



INSTALLATION NOTES:

1. THE VERMONT RAINGARDEN MANUAL IS A GOOD EDUCATIONAL RESOURCE TO ACCOMPANY THIS PROJECT. ALTERNATIVES TO THE DETAILS PRESCRIBED IN THIS PLAN ARE AVAILABLE IN THAT MANUAL INCLUDING ADDITIONAL APPROPRIATE PLANT SPECIES.
2. IT IS RECOMMENDED TO SAVE SOME OF THE PLANTS EXISTING IN THE LANDSCAPED BEDS TO REPLANT INTO THE COMPLETED BIO-RETENTION AREA.
3. ENSURE THAT THE FINAL GRADES OF THE BIO-RETENTION AREA DO NOT DIRECT WATER TOWARD THE BUILDING FOUNDATION.
4. PLANTING DENSITIES ARE RECOMMENDED TO BE ONE PERENNIAL EVERY 2.5 FEET ON CENTER OR ONE SHRUB EVERY 5 FEET ON CENTER.
5. THE UNDERDRAIN SHOULD DAYLIGHT NEAR THE PERIMETER DRAIN TO THE WEST OF THE LIBRARY.

OPERATION AND MAINTENANCE NOTES:

1. MAINTENANCE OF THE BIO-RETENTION AREA IS VERY SIMILAR TO THE PLANTED LANDSCAPED BEDS THAT IT IS REPLACING. REPLACEMENT OF SOME MULCH MAY BE REQUIRED IN THE SPRING. OCCASIONAL WEEDING WILL BE REQUIRED TO MAINTAIN THE SELECTED PLANTS AESTHETICALLY PLEASING.
2. DURING THE FIRST YEAR OF OPERATION, WATERING, WEEDING, AND REPLACEMENT OF DEAD PLANTS IS IMPORTANT FOR PROPER ESTABLISHMENT.
3. PERIODICALLY, INCLUDING AFTER LARGE STORMS AND REGULARLY DURING THE FALL, REMOVE LEAVES AND DEBRIS ACCUMULATED AT PIPE INLET.
4. THE ACCUMULATION OF SEDIMENT WITHIN THE BIO-RETENTION AREA SHOULD BE MONITORED AND INSPECTED A MINIMUM OF ONCE ANNUALLY. REMOVE SEDIMENT AFTER APPROXIMATELY 3 INCHES OF SEDIMENT HAS ACCUMULATED OR RAKE AWAY WHEN DOES NOT DRAIN WITHIN 1 DAY.
5. ANNUALLY INSPECT MAKE SURE NO INVASIVE SPECIES ARE PRESENT.
6. IF OUTLET PIPE BECOMES CLOGGED, REMOVE DOME INLET AND SPRAY WITH HOSE TO CLEANOUT.

INSTALLATION NOTES:

1. USE DESERT PLASTICS, AQUA FRIA, 360 GALLON TANK WITH FLAT TOP AND 17" BASKET STRAINER (48" DIAMETER, 52" TALL), AVAILABLE FROM WWW.TIJERASRAINBARRELS.COM, (866) 793-0376, OR SIMILAR FREEZE RESISTANT PRODUCT.

OPERATION AND MAINTENANCE NOTES:

1. USE WATER REGULARLY TO MAINTAIN STORAGE CAPACITY.
2. ROUTINELY CHECK LEAF SCREEN TO BOTH MAKE SURE IT IS TIGHT TO PREVENT MOSQUITOS AND REMOVE LEAVES AND DEBRIS BLOCKING, MORE OFTEN IN FALL MONTHS WHEN LEAVES WILL CLOG INLET.
3. INSPECT AND CLEAN TANK ANNUALLY BY SCRUBBING INSIDE AND OUTSIDE WITH STIFF BRUSH.
4. DRAIN TANK FOR WINTER AND COVER INLET.

Plotted by: JESSICA On this date: Mon, 2016 July 11 - 5:08pm

<p style="font-size: small;">1 South Main Street, 2nd Floor Waterbury, Vermont 05676 (802) 882-8335 Fax: (802) 882-8346 www.miloneandmacbroom.com</p>		
REVISIONS		
	CONCEPT DESIGN	
DETAILS	AHEAD OF THE STORM CHARLOTTE LIBRARY FERRY ROAD CHARLOTTE, VERMONT	
JCL DESIGNED	JCL DRAWN	BMC CHECKED
SCALE: NOT TO SCALE		
DATE: 7/11/2016		
PROJECT NO: 3452-22		
03		
SHEET NO.		

Copyright Milone & MacBroom, Inc. - 2016

BALLPARK OPINION OF PROBABLE CONSTRUCTION COST

**CHARLOTTE LIBRARY
AHEAD OF THE STORM
Charlotte, Vermont
MMI #3452-22
July 29, 2016**

*Engineering,
Landscape Architecture
and Environmental Science*



Item	ITEM/DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST	
	CONSTRUCTION LABOR					
1	Labor to Install Underdrain and Piping	HR	16	\$35	\$560	
2	Labor to Install and Transplant Plants	HR	12	\$35	\$420	
3	Labor to Restore Site	HR	4	\$35	\$140	
	CONSTRUCTION EQUIPMENT					
4	Excavator Rental / Operator	HR	8	\$110	\$880	
5	Haul Materials On or Off Site	LOAD	4	\$100	\$400	
	CONSTRUCTION MATERIALS					
6	Furnish and Install Gutter, Downspout, and Ice Bars	LS	1	\$1,200	\$1,200	
7	Rain Barrel, 360 Gallons, Shipped	EA	1	\$1,200	\$1,200	
8	Rain Barrel Fittings / Hose / Winter Cover	LS	1	\$50	\$50	
9	Drainage Pipe and Fittings	LS	1	\$250	\$250	
10	Ammended Soil for Bio-Retention Area	CY	8	\$45	\$360	
11	Stone for Underdrain	CY	6	\$18	\$108	
12	Mulch	CY	2	\$45	\$90	
13	Plants	LS	1	\$400	\$400	
	CONSTRUCTION MISCELLANEOUS					
14	Mobilization / Demobilization / Site Recovery	LS	1	\$300	\$300	
	ENGINEERING SERVICES					
15	Construction Implementation Guidance	HR	16	\$113	\$1,808	
	CONSTRUCTION SUBTOTAL					\$6,058
	ENGINEERING SERVICES SUBTOTAL					\$1,808
	TOTAL (ROUNDED)					\$8,000