AHEAD OF THE STORM

Site: Charlotte Senior Center

Location: 212 Ferry Road, Charlotte, Vermont

Primary Problem

Runoff from the existing building, parking lot, driveway, and sidewalk flows overland to a swale and a drainage system with catch basins that discharge mostly untreated stormwater from the parcel towards Holmes Creek. The Senior Center recently installed a drywell to treat runoff from a new building addition. This project will complement that installation by focusing on untreated runoff from the parking lot, driveway, sidewalks, and front lawn areas that are currently collected by catch basins and piped offsite to a swale at the north side of the property. The swale is partially vegetated, has steep banks, and is actively eroding. Runoff from this site includes pollutants from cars and the application of winter salt and sand. *(See existing conditions site summary and plan.)*

Three Optimal Conservation Practices (OCPs) are recommended to treat runoff from existing impervious cover including the driveway, parking, and sidewalks. The primary goals are to improve water quality protection and flood resiliency by slowing runoff, capturing sediment and pollutants, reducing erosion, and enhancing vegetation. This project will begin to reverse the cumulative impacts from incremental development within the Holmes Creek watershed where past water quality sampling found high turbidity, nitrogen, and phosphorus levels in streams.

Final Treatment Recommendations

1. Install a hydrodynamic separator at the end of the pipe collection system to treat parking lot runoff by removing sediment and pollutants.
2. Create a bio-retention area between the driveway and fire department to slow runoff and increase storage capacity. This will provide pre-treatment to the hydrodynamic separator.
3. Improve the swale by increasing vegetation and provide inline detention using check dams in order to reduce erosion, filter runoff, and retain sediment entering the site from upstream.

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. Runoff calculations indicate that the bio-retention area is capable of treating a significant portion of the 1-inch rainfall (i.e., the Water Quality Volume – WQv) and the hydrodynamic separator is able to treat flows larger than the 1-inch rainfall (Table 1). The swale will treat all runoff from upstream drainage areas. All practices have been designed to safely bypass larger storms. 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

Drainage Location	Total Drainage Area (Acres)	Drainage Area on the Site (Acres)	Impervious Area on the Site (%)	WQv Generated on the Site (Cubic Feet or CFS*)	Channel Protection Volume, CPv (Cubic Feet or CFS*)	10-yr Volume (Cubic Feet or CFS*)	Treatment Volume (Cubic Feet)	Treatment Volume (%)
Offsite To Upstream End of Swale	1.5	0.00	N/A	N/A	2,612	6,734	N/A*	N/A*
Onsite To Upstream End of Swale	0.3	0.3	0	58	508	1,255	N/A*	N/A*
To Bio-retention	0.4	0.4	94	1,240	2,288	3,694	510	40% of WQv
To Swirl Separator	0.8	0.8	61	0.4*	1.6*	2.9*	0.7*	175% of WQ flow

Cost

Construction and engineering oversight for the three recommended OCPs is estimated to cost $33,000, assuming that labor and materials are purchased at the market rate through a bid process from a construction contractor. Cost savings for this project may be achieved through donations or sole-source contracting if purchase requirements allow. *(See attached cost estimate.)*

MILONE & MACBROOM

LEWIS CREEK ASSOCIATION

AHEAD OF THE STORM

Site: Charlotte Senior Center

Location: 212 Ferry Road, Charlotte, Vermont

Site Description

Currently runoff from the existing building, parking lot, driveway, and sidewalk flows overland to swales, catchbasins, and pipes and leaves the parcel mostly untreated (Figure 1). The Senior Center recently installed a drywell to treat runoff from new impervious surface from a new entrance to the building. This project will complement that installation by focusing on runoff from the parking lot, driveway, sidewalks, and front lawn area.

Drainage Patterns

Runoff from most of the entrance drive, parking lot, sidewalks, and front lawn area drain to stormwater catchbasins and is piped to the swale along the north edge of the property. This collection system consolidates runoff from most of the impervious surface, except the building. Drainage area to the pipe system includes 0.8 acres, 61% of which is impervious surface. This drainage system receives a large amount of salt and sand runoff from the parking area in the winter time due to extra heavy application.

Roof runoff from the front portion of the building infiltrates into a drywell installed as part of the 2016 entrance addition. There is a strip of exposed crushed stone surrounding the building that catches roof runoff, which is collected and discharged to the swale along the northern edge of the property through the 4-inch PVC footing drain. A mowed grass swale exists along the west side of building that collects runoff from a portion of the front lawn and areas to the west of the building and carries it to the swale at the north edge of the property.

The swale along the north side of the property drains east to the adjacent parcel. This swale is partially vegetated with steep banks with active erosion. There is a narrow natural vegetated buffer along this swale between the adjacent lawn or parking lot. This swale also collects runoff from the adjacent properties to the west on Greenbush Road, for a total drainage area of 2.6 acres at the east end of the property. This swale travels east to a pond behind the Fire Station and then flows north to Pringle Brook, a tributary of Holmes Creek.

Site Constraints

- If possible, the Senior Center is interested in expanding parking, that if done would increase runoff.
- Shallow groundwater has been observed at the site. Water has been observed 2 feet below the ground surface during past excavation for the installation of the street lights.
- Snow and ice removal in the parking area and sidewalks uses a heavy mix of salt and sand in the winter that would reduce the possible application of pervious pavement, since the surface would be prone to clogging.
- Building users are interested in the idea of a raingarden or other vegetated practice, but have minimal capacity for weeding. Minimizing maintenance will be a key design feature.
- A drinking water well, a sewer holding tank, a catch basin, and pipes are buried in the front lawn area between the building and Ferry Road that will limit excavation in these areas.

Possible Treatment Options Identified

1. Install a hydrodynamic separator at the end of the pipe collection system to treat parking lot runoff.
2. Excavate a bio-retention area in the grass island between the driveway and fire department.
3. Improvements to the swale to increase vegetation and provide inline detention using check dams.

AHEAD OF THE STORM

Site: Charlotte Senior Center

Location: 212 Ferry Road, Charlotte, Vermont

Figure 1: Senior Center existing building and front driveway area.

Figure 3: Parking lot draining to catch basins at the east side of the property.

Figure 2: Senior Center existing entryway, in process of being expanded.

Figure 4: Looking along the swale at the northern edge of the property and parking.

AHEAD OF THE STORM

Site: Charlotte Senior Center

Location: 212 Ferry Road, Charlotte, Vermont

Figure 5: Swale at the north side of the property with some erosion visible.

Figure 7: Swale at the north side of property, with some erosion visible.

Figure 6: Possible location of bio-retention area between the driveway and fire department.

Figure 8: Possible location of hydrodynamic separator (underground) at north-east side of property.

Y:\3452-22\Maps\EXISTING CONDITIONS\SeniorCenter_ExistingConditionsMap_V3.mxd

2'-Elevation Contour, 2012 Lidar

Drainage Area Boundary
- To Swale
- To Catch Basin
- To Drain Outfall
- NRCS Soil Area Boundary
- Parcel Boundary, Approximate

Stormwater Flow
- Overland
- Swale
- Culvert
- Pipe

DA TO SWALE
= 1.9 AC

12-INCH ADS STORM
DRAIN OUTFALL
DA = 0.8 ACRES

4-INCH PVC
FOOTING DRAIN

DRYWELL TO TREAT ROOF
RUNOFF, INSTALLED 2016

SENIOR CENTER

APPROXIMATE LOCATION OF
DRINKING WATER WELL

APPROXIMATE LOCATION OF
SEWER HOLDING TANK

CATCHBASIN
(TYP)

PaB, HSG C, potentially highly erodibl

CvI HSG D, not highly erodible

VeB, HSG D, potentially highly erodibl

HnB, HSG C, potentially highly erodibl

246 244 252 262 258 260 250 254 256 264 268 269 248

N W E S

0 25 50 100 Feet

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

CONCEPT DESIGN

EXISTING CONDITIONS

AHEAD OF THE STORM
CHARLOTTE SENIOR CENTER
212 FERRY ROAD
CHARLOTTE, VERMONT

Map By: JCL
MMI#: 3452-22
MXD:
1st Version: 3/31/2016
Revision: 10/3/2016
Scale: 1"=40'

01

Y:\3452-22\Maps\CONCEPT DESIGN\SeniorCenter_LAYOUT_v2.mxd

0 12.5 25 50 Feet

INSTALL HYDRODYNAMIC SEPARATOR
ALONG EXISTING PIPE (SEE DETAIL)
DA = 0.8 ACRES
IMPERVIOUS COVER = 94%
WQ FLOW = 0.4 CFS
10-YEAR FLOW = 2.9 CFS

OUTFALL
12-INCH ADS

INSTALL STONE CHECK DAMS
ALONG ERODING SWALE
(SEE DETAIL)

REVEGETATE SWALE AND
APPLY EROSION CONTROL
BLANKET (SEE DETAIL)

MAINTAIN EXISTING VEGETATED BUFFER
ALONG SWALE AND REPLACE ALL VEGETATION
DISTURBED DURING CONSTRUCTION

DRYWELL TO TREAT ROOF
RUNOFF, INSTALLED 2016

SENIOR CENTER

CB1 WILL REMAIN
IN PLACE AND SERVE
AS OVERFLOW OUTLET

CREATE BIO-RETENTION AREA AROUND
EXISTING CATCH BASIN (SEE DETAIL)
DA = 0.4 ACRES
DEPTH ~ 1 FOOT
AREA ~ 650 SQUARE FEET
VOLUME ~ 510 CUBIC FEET

246
244
246
250
248

Bio-Retention Area
Stone Check Dam
Vegetated Buffer
Drainage Area Boundary
To Swale
To Bio-Retention Area
To Hydrodynamic Separator
2'-Elevation Contour, 2012 Lidar
Parcel Boundary, Approximate
Stormwater Flow
Overland
Swale
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
PIPE INVERT FROM 2000 SITE PLAN
ON RECORD WITH TOWN

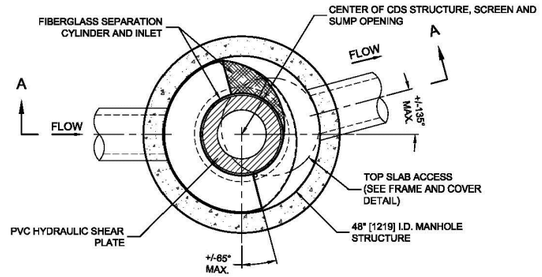
CONCEPT DESIGN

LAYOUT

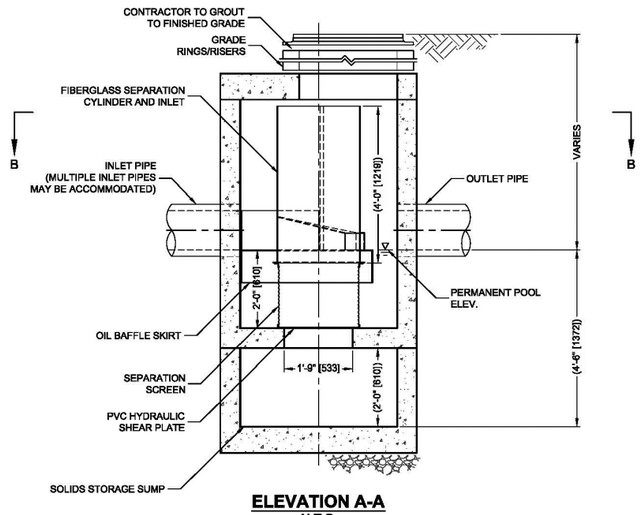
AHEAD OF THE STORM
CHARLOTTE SENIOR CENTER
212 FERRY ROAD
CHARLOTTE, VERMONT

Map By: JCL
MMI#: 3452-22
MXD:
1st Version: 10/3/2016
Revision:
Scale: 1"=20'

02



PLAN VIEW B-B
N.T.S.



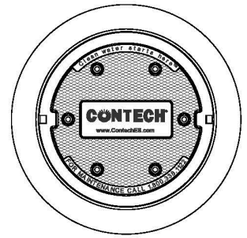
ELEVATION A-A
N.T.S.

CDS2015-4-C DESIGN NOTES

CDS2015-4-C RATED TREATMENT CAPACITY IS 0.7 CFS [19.8 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 10.0 CFS [283 L/s]. IF THE SITE CONDITIONS EXCEED 10.0 [283 L/s] CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST	WIDTH	HEIGHT	
	*	*	

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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

CDS2015-4-C
INLINE CDS
STANDARD DETAIL

CONTECH CDS 2015-4-C, TYPICAL DETAIL

NOT TO SCALE

INSTALLATION NOTES:
1. INSTALLATION SHALL FOLLOW MANUFACTURERS INSTRUCTIONS.
2. FINAL DESIGN OF UNIT WILL SET ELEVATIONS AND SPECIFIC DETAILS OF UNIT. A MANUFACTURERS TYPICAL DETAIL IS SHOWN FOR GENERAL REFERENCE.

OPERATION AND MAINTENANCE NOTES:

1. OPERATION AND MAINTENANCE OF THE CDS UNIT SHOULD FOLLOW THE CONTECH ENGINEERED SOLUTIONS CDS OPERATION, DESIGN, PERFORMANCE AND MAINTENANCE GUIDE DOCUMENT IS AVAILABLE FROM CONTECH ENGINEERED SOLUTIONS.
2. SET A REGULAR INSPECTION SCHEDULE. USE A MEASURING TOOL OR ROD TO RECORD SEDIMENT ACCUMULATION. KEEP A RECORD OF SEDIMENT DEPTH AND MAINTENANCE.
3. DURING THE FIRST YEAR OF OPERATION, INSPECT THE SEDIMENT ACCUMULATED IN THE UNIT AFTER EACH LARGE STORM, OR AT MINIMUM EACH MONTH, TO SET A BASELINE FOR FUTURE YEARS.
4. DURING FOLLOWING YEARS, CONSIDER REDUCING INSPECTION SCHEDULE TO A MINIMUM OF 2 TIMES PER YEAR, ONCE IN THE SPRING AND ONCE IN THE FALL, IF MONITORING DURING THE FIRST YEAR INDICATES THAT THIS SCHEDULE WILL BE SUFFICIENT TO ENSURE SEDIMENT ACCUMULATION IS LESS THAN 18 INCHES DEEP BETWEEN CLEANOUTS.
5. CLEAN OUT SEDIMENT WHEN IT AS ACCUMULATED 12 TO 18 INCHES DEEP. USE A VACUUM TRUCK TO SUCK MATERIAL OUT OF THE SWIRL CHAMBER. SKIM FLOATING DEBRIS OFF OF THE WATER.
6. ICE ACCUMULATION MAY TEMPORARILY REDUCE TREATMENT EFFICIENCY, BUT IS NOT EXPECTED AND WILL NOT DAMAGE THE SYSTEM.
7. ENTRY INTO THE UNIT IS TYPICALLY NOT REQUIRED FOR MAINTENANCE. IF ENTRY DOES BECOME REQUIRED ALL LIQUID SHOULD BE EVACUATED PRIOR TO ENTRY. CONFINED SPACE ENTRY PROCEDURES MUST BE FOLLOWED IF THE UNIT IS ENTERED.
8. DISPOSE OF SEDIMENTS REMOVED FROM THE SYSTEM ACCORDING TO STATE AND LOCAL REGULATIONS. SEDIMENT SHOULD BE DISPOSED TO MINIMIZE THE CHANCE OF REMOBILIZING BY RUNOFF.

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

REVISIONS

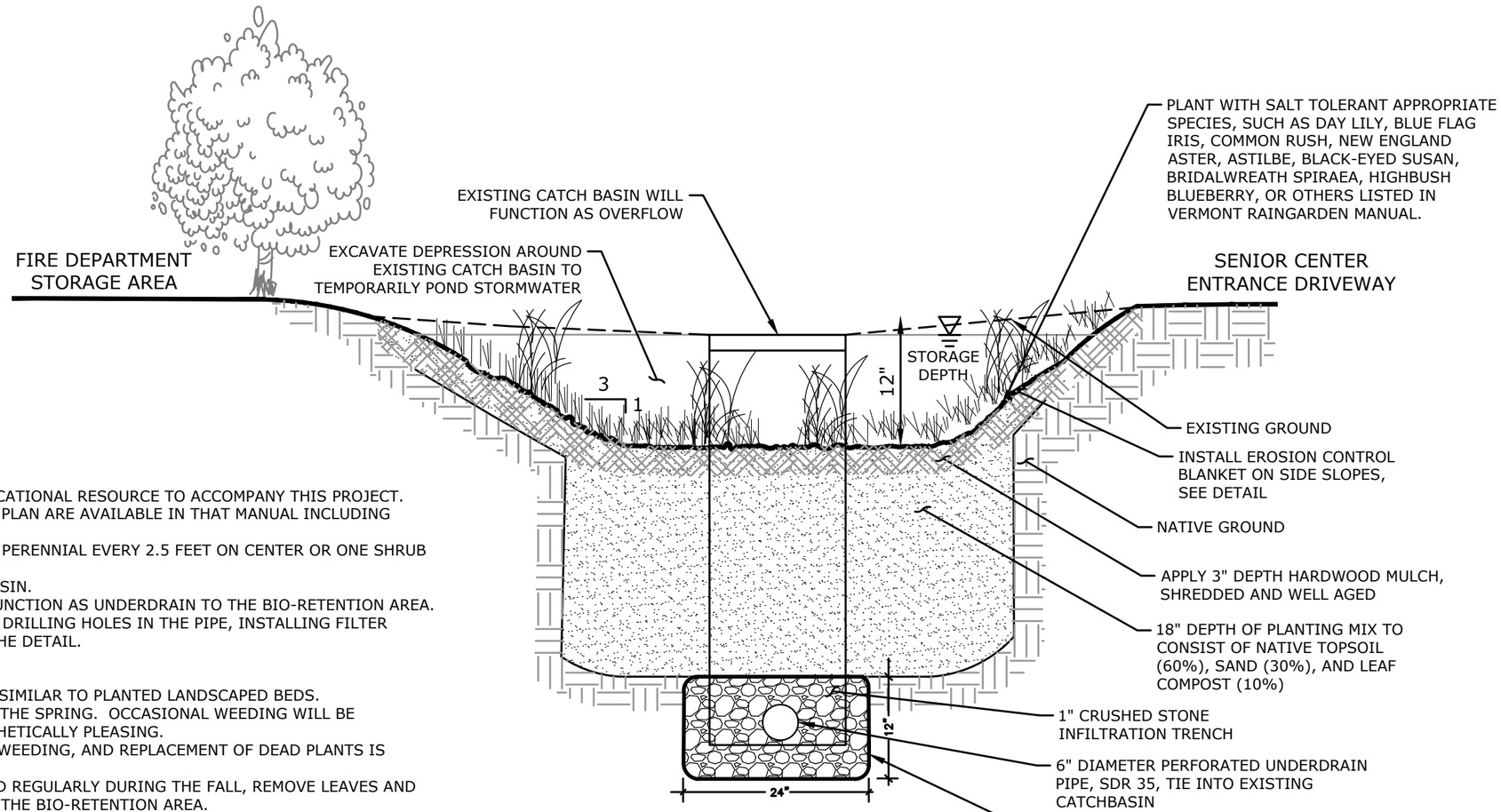
DETAILS

AHEAD OF THE STORM
CHARLOTTE SENIOR CENTER
212 FERRY ROAD
CHARLOTTE, VERMONT

CONCEPT DESIGN

JCL DESIGNED	JCL DRAWN	BMC CHECKED

SCALE: NOT TO SCALE
DATE: 10/3/2016
PROJECT NO.: 3452-22
SHEET NO.: 03



BIO-RETENTION AREA

NOT TO SCALE

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. PLANTING DENSITIES ARE RECOMMENDED TO BE ONE PERENNIAL EVERY 2.5 FEET ON CENTER OR ONE SHRUB EVERY 5 FEET ON CENTER.
3. THE UNDERDRAIN WILL TIE INTO EXISTING CATCH BASIN.
4. ALTERNATIVELY, MODIFY EXISTING STORM PIPE TO FUNCTION AS UNDERDRAIN TO THE BIO-RETENTION AREA. THIS CAN BE ACCOMPLISHED BY EXPOSING THE PIPE, DRILLING HOLES IN THE PIPE, INSTALLING FILTER FABRIC AND ROCK AROUND THE PIPE AS SHOWN IN THE DETAIL.

OPERATION AND MAINTENANCE NOTES:

1. MAINTENANCE OF THE BIO-RETENTION AREA IS VERY SIMILAR TO PLANTED LANDSCAPED BEDS. 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 CATCH BASIN AND WITHIN THE BIO-RETENTION AREA.
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. THIS IS EXPECTED TO OCCUR APPROXIMATELY EVERY TWO YEARS AND BE DONE WITH A HAND SHOVEL AND WHEELBARROW OR BUCKETS.
5. ANNUALLY INSPECT MAKE SURE NO INVASIVE SPECIES ARE PRESENT.

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

REVISIONS

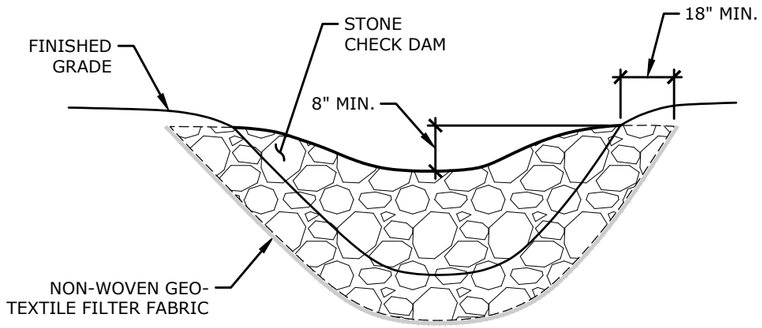
CONCEPT DESIGN

DETAILS

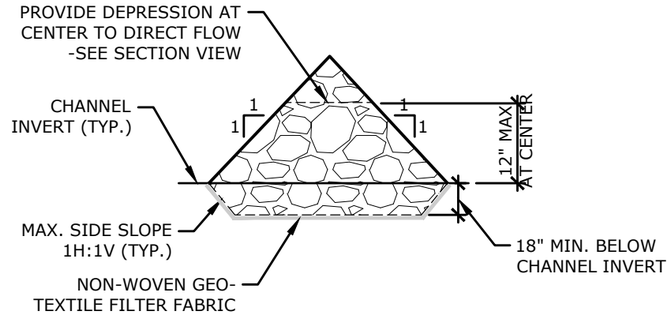
AHEAD OF THE STORM
CHARLOTTE SENIOR CENTER
212 FERRY ROAD
CHARLOTTE, VERMONT

JCL	JCL	BMC
DESIGNED	DRAWN	CHECKED

SCALE: NOT TO SCALE
DATE: 10/3/2016
PROJECT NO.: 3452-22
SHEET NO.: 04



SECTION VIEW



ELEVATION VIEW

STONE CHECK DAM

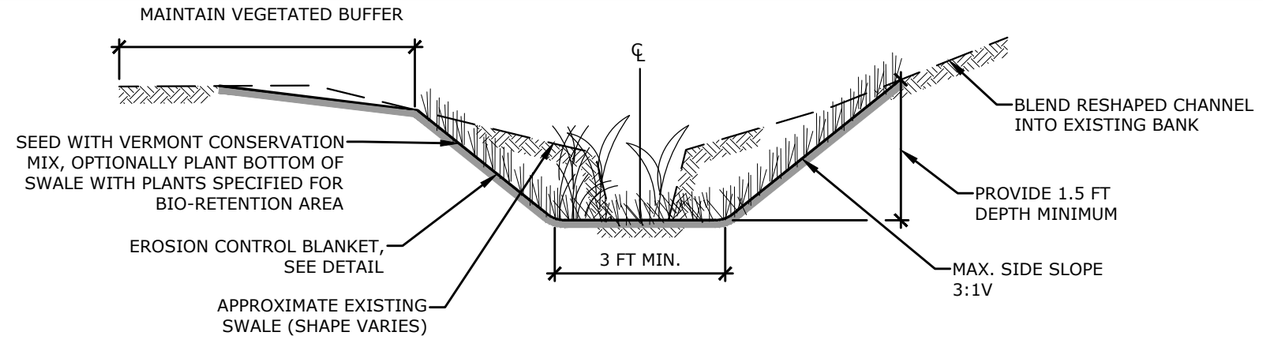
NOT TO SCALE

STONE CHECK DAM INSTALLATION NOTES:

1. EXTEND THE STONE A MINIMUM OF 18 INCHES BEYOND THE BANKS AND CHANNEL INVERT OF THE SWALE TO PREVENT CUTTING AROUND THE ENDS OF OR UNDERNEATH THE CHECK DAM.
2. USE TYPE II STONE FILL (D50=12") or 6" -12" EROSION STONE AS PER PIKE INDUSTRIES, NEW HAVEN, VT.
3. USE CONTECH GEOTEX 801 NON-WOVEN GEOTEXTILE FILTER FABRIC OR APPROVED EQUAL ALONG THE BOTTOM OF THE CUTOFF TRENCH AS A FILTER

STONE CHECK DAM OPERATION AND MAINTENANCE NOTES:

1. PERIODICALLY, INCLUDING AFTER LARGE STORMS AND REGULARLY DURING THE FALL, REMOVE LEAVES AND DEBRIS ACCUMULATED AT CHECK DAMS.
2. SWALE IS EXPECTED TO REQUIRE RESHAPING AND REMOVAL OF SEDIMENT APPROXIMATELY EVERY 10-15 YEARS. WHEN RESHAPING IS NECESSARY, USE DETAIL PROVIDED FOR IDEAL CROSS SECTION.
3. RESEEDING OF VERMONT CONSERVATION SEED MIX SHOULD OCCUR AFTER REMOVAL OF SEDIMENT OR RESHAPING OF SWALE.



REVEGETATED/RESHAPED SWALE

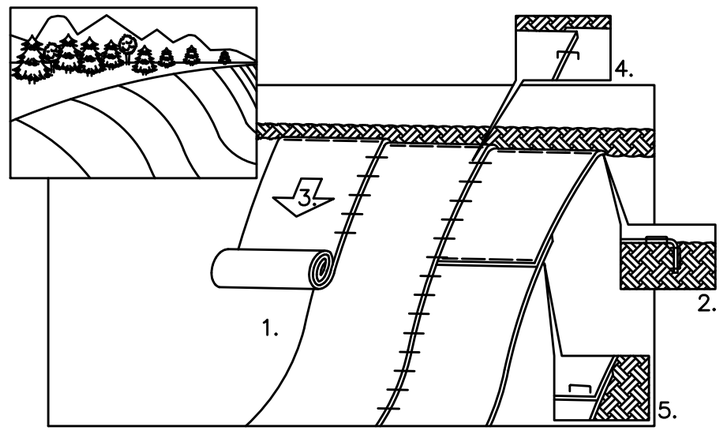
NOT TO SCALE

SWALE INSTALLATION NOTES:

1. SWALE SHAPE PROVIDED HERE FOR FUTURE USE. ONLY REVEGETATION AND APPLICATION OF EROSION CONTROL BLANKET IS CURRENTLY RECOMMENDED.
2. DO NOT COMPACT THE GROUND WHEN GRADING SWALES.

SWALE OPERATION AND MAINTENANCE NOTES:

1. DURING THE FIRST YEAR OR UNTIL VEGETATION HAS BEEN ESTABLISHED, INSPECT THE SWALES AFTER ALL STORMS GREATER THAN 0.5 INCHES. REPAIR ANY EROSION THAT HAS OCCURRED AND SPOT SEED ANY BARE PATCHES.
2. SWALES ARE EXPECTED TO REQUIRE RESHAPING AND REMOVAL OF SEDIMENT EVERY 10-15 YEARS.
3. SWALES SHOULD BE ALLOWED TO GROW TALL PERENNIAL VEGETATION.



EROSION CONTROL BLANKET

NOT TO SCALE

EROSION CONTROL BLANKET INSTALLATION NOTES:

1. USE BIONET SHORT TERM BIODEGRADABLE EROSION CONTROL BLANKETS ITEM NUMBER S150BN, AS MANUFACTURED BY NORTH AMERICAN GREEN, 5401 ST. WENDEL-CYNTHIANA ROAD, POSEYVILLE, IN 47633.
2. USE BIODEGRADABLE STAPLES.
3. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF AMENDED SOIL AND SEED.
4. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" DEEP BY 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
5. ROLL THE BLANKETS DOWN THE SLOPE IN THE DIRECTION OF THE WATER FLOW.
6. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2" OVERLAP.
7. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH APPROXIMATELY 6" OVERLAP. STAPLE THROUGH OVERLAP AREA, APPROXIMATELY 12" APART
8. REFER TO GENERAL STAPLE PATTERN GUIDE IN NORTH AMERICAN GREEN CATALOG FOR CORRECT STAPLE PATTERN RECOMMENDATIONS FOR SLOPE INSTALLATIONS.

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

REVISIONS

CONCEPT DESIGN

DETAILS

AHEAD OF THE STORM
CHARLOTTE SENIOR CENTER
212 FERRY ROAD
CHARLOTTE, VERMONT

JCL	JCL	BMC
DESIGNED	DRAWN	CHECKED

SCALE: NOT TO SCALE
DATE: 10/3/2016
PROJECT NO.: 3452-22

SHEET NO.: 05

CDS ESTIMATED NET ANNUAL TSS REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON AN AVERAGE PARTICLE SIZE OF 50 MICRONS
CHARLOTTE SENIOR CENTER
CHARLOTTE, VT
for SYSTEM: CDS2015-4

CONTECH ENGINEERED SOLUTIONS

Area	0.8	acres
Weighted C	0.86	
Tc	6	minutes

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Removal Efficiency (%)	Incremental Removal (%)
0.02	15.6%	15.6%	0.01	0.01	96.5	15.1
0.04	13.6%	29.2%	0.03	0.03	95.9	13.0
0.06	11.1%	40.3%	0.04	0.04	95.2	10.5
0.08	8.6%	48.9%	0.06	0.06	94.5	8.1
0.10	7.6%	56.4%	0.07	0.07	93.9	7.1
0.12	5.5%	61.9%	0.08	0.08	93.2	5.1
0.14	4.0%	65.9%	0.10	0.10	92.5	3.7
0.16	3.8%	69.7%	0.11	0.11	91.8	3.5
0.18	3.3%	73.0%	0.12	0.12	91.2	3.0
0.20	2.8%	75.8%	0.14	0.14	90.5	2.5
0.25	4.6%	80.5%	0.17	0.17	88.8	4.1
0.30	3.6%	84.1%	0.21	0.21	87.1	3.2
0.35	2.2%	86.3%	0.24	0.24	85.4	1.9
0.40	1.2%	87.5%	0.28	0.28	83.8	1.0
0.45	1.4%	88.9%	0.31	0.31	82.1	1.2
0.50	1.1%	90.1%	0.35	0.35	80.4	0.9
0.75	4.1%	94.1%	0.52	0.52	72.0	2.9
1.00	2.6%	96.7%	0.69	0.69	63.6	1.6
1.50	3.3%	100.0%	1.04	0.70	42.6	1.4
2.00	0.0%	100.0%	1.38	0.70	32.0	0.0
						89.9
					Removal Efficiency Adjustment[2] =	6.5%
					Predicted % Annual Rainfall Treated =	92.5%
					Predicted Net Annual Load Removal Efficiency =	**83.5%**

1 - Based on 10 years of hourly precipitation data from NCDC 1081, Burlington WSO AP, Chittenden County, VT
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

BALLPARK OPINION OF PROBABLE CONSTRUCTION COST

CHARLOTTE SENIOR CENTER

AHEAD OF THE STORM

Charlotte, Vermont

MMI #3452-22

October 24, 2016

Engineering, Landscape Architecture and Environmental Science

MILONE & MACBROOM

Item	ITEM/DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
	BIO-RETENTION AREA				
1	Labor to Install Underdrain and Piping	HR	16	$35	$560
2	Labor to Install Plants	HR	12	$35	$420
3	Labor to Restore Site	HR	4	$35	$140
4	Excavator Rental / Operator	HR	8	$110	$880
5	Haul Materials On or Off Site	LOAD	8	$100	$800
6	Drainage Pipe and Fittings for Underdrain	LS	1	$250	$250
7	Ammended Soil for Bio-Retention Area	CY	24	$45	$1,080
8	Stone for Underdrain	CY	4	$18	$72
9	Mulch	CY	6	$45	$270
10	Plants	LS	1	$1,000	$1,000
	HYDRODYNAMIC SEPARATOR				
11	Contech CDS 2015-4 Unit, Delivered	LS	1	$8,000	$8,000
12	Installation of CDS Unit	LS	1	$6,500	$6,500
13	Rental of Crane	HR	4	$130	$520
14	Pipe and Fittings for Connections	LS	1	$500	$500
15	Minor Items	LS	1	$500	$500
16	Labor to Restore Site	HR	8	$35	$280
	SWALE IMPROVEMENTS				
17	Labor to Install Check Dams	HR	4	$35	$140
18	Labor to Install Erosion Matting, Seed, Restore Site	HR	12	$35	$420
19	Excavator Rental / Operator	HR	4	$110	$440
20	Haul Materials On or Off Site	LOAD	2	$100	$200
21	Stone for Check Dams	TN	12	$10	$120
22	Temporary Erosion Matting and Staples	ROLL	4	$115	$460
	CONSTRUCTION - MISCELLANEOUS				
23	Mobilization / Demobilization / Site Recovery	LS	1	$1,000	$1,000
	ENGINEERING SERVICES				
24	Construction Plans				$3,300
25	Contractor Selection				$1,000
26	Construction Oversight (Part-time)				$4,500
	BIO-RETENTION AREA SUBTOTAL				**$5,472**
	HYDRODYNAMIC SEPARATOR SUBTOTAL				**$16,300**
	SWALE IMPROVEMENTS SUBTOTAL				**$1,780**
	CONSTRUCTION - MISCELLANEOUS SUBTOTAL				**$1,000**
	ENGINEERING SERVICES SUBTOTAL				**$8,800**
	TOTAL (ROUNDED)				**$33,000**