AHEAD OF THE STORM

Site: Hinesburg Town Garage

Location: Beecher Hill Road, Hinesburg, Vermont

Primary Problem

The Hinesburg Town Garage is in the planning stages of site redevelopment to upgrade facilities for both the Town Garage and Chittenden Solid Waste District (CSWD) Drop-Off Center. The property is adjacent to Beecher Hill Brook. The adjacent stream reach is in poor geomorphic condition. The stream has incised and disconnected from its historic floodplain due to channel straightening and subsequent down-cutting. The Stream Corridor Plan and Tactical Basin Plan recommend moving the Town garage operations out of the corridor. Runoff from the existing buildings, parking lot, driveway, and some portions of the gravel pit flows directly into Beecher Hill Brook untreated. The redevelopment of the property presents a unique opportunity to improve stormwater runoff, water quality, and flood resiliency. *(See existing conditions site summary and plan.)*

Two Optimal Conservation Practices (OCPs) are recommended to treat runoff from existing and relocated impervious surfaces including driveways, parking lots, and buildings. This project will provide the site redevelopment with sound stormwater treatment and river corridor protection. The primary goals are to improve water quality protection and flood resiliency by reconnecting floodplain, slowing runoff, capturing sediment and pollutants, reducing erosion, and enhancing vegetation. This project will begin to reverse the impacts from historic stream alteration and river corridor encroachment that have impacted Beecher Hill Brook.

Final Treatment Recommendations

1. Create a series of bio-infiltration swales and bio-infiltration areas to capture, filter, and infiltrate site runoff to reduce erosion, and retain sediment from entering the stream.
2. Naturalize and restore the Beecher Hill Brook river corridor by removing all buildings, stock piles, berms, and operations out of the historic floodplain. Restore floodplain to provide an area for water to slow, sediment to be deposited, and nutrients to be taken up by vegetation in addition to flood storage.

Site Constraints and Design Basis

The design maximizes treatment capacity and takes advantage of permeable soils that are rare in the watershed while working with the proposed site redevelopment features. Runoff calculations indicate that the bio-infiltration areas are capable of treating the 1-inch rainfall (i.e., the Water Quality Volume – WQv), storms larger than the 1-year, 24-hour rain storm (i.e., the Channel Protection Volume – CPv) (Table 1). Long-term maintenance procedures and costs are minimized. *(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)	Recharge Volume, Rev (Acre-Feet)	Channel Protection Volume, CPv (Cubic Feet)	Proposed 10-yr Volume (Cubic Feet)**	Treatment Volume (Cubic Feet)	Treatment Volume (%)
Upper	11.2	1.74	73.0	4,011	0.07	2,053	13,002	4,822	230% of CPv
Lower	2.2	1.51	64.0	3,089	0.05	3,031	7,909	5,872	200 % of CPv
River	1.5	0.00	0.0	N/A	N/A	N/A	-	-	-
Sum				7,100	5,322	5,084	20,911	10,693	50% of 10-yr

Cost

Construction and engineering services for the stormwater treatment portion of the project is estimated to cost $155,000. Project scoping and design including data collection, hydrology and hydraulics analysis, alternatives analysis, and final design of the floodplain restoration portion of the project is estimated to cost $22,800. *(See attached cost estimates.)*

MILONE & MACBROOM

LEWIS CREEK ASSOCIATION

Ahead of the Storm
Existing Conditions Site Summary
Hinesburg Town Garage

Site Description

The Hinesburg Town Garage is in the planning stages of site redevelopment to upgrade facilities for both the Town Garage and Chittenden Solid Waste District (CSWD) Drop-Off Center. The property is immediately adjacent to Beecher Hill Brook (T5.01D), a stream reach in poor geomorphic condition with a severe departure from its reference stream type. The stream has incised and disconnected from its historic floodplain due to channel straightening and subsequent down-cutting. The Stream Corridor Plan completed by the LaPlatte Watershed Partnership in 2007 recommends moving the Town garage sand pile and garage building out of the corridor.

Currently most of the runoff from the existing buildings, parking lot, and driveway, and some portions of the gravel pit flows overland into Beecher Hill Brook untreated (Figure 1). The redevelopment of the property allows a unique opportunity to improve stormwater runoff, water quality, and flood resiliency. This project will advise the redevelopment project to achieve stormwater treatment and river corridor integration above the minimum permit requirements.

Drainage Patterns

Runoff from the site enters Beecher Hill Brook, flowing to the LaPlatte River and Lake Champlain.

The site has multiple internal drainage areas, with some areas draining to internal detention depressions where water can infiltrate or if a large enough volume of water is collected, flow overland down to either the next depression or into the Brook (Figure 1). The gravelly soils on the site have high infiltration potential.

Portions of the site around the garage buildings drain directly to Beecher Hill Brook without stormwater treatment or delay to allow opportunity to infiltrate.

The soils on the site all have a Hydrologic Soil Group of A and are expected to have high infiltration potential.

Site Constraints

Gravel extraction on the site will continue so the network of access roads will remain in use that have highly compacted soils.

Operations at both the Town Garage and CSWD Drop-Off Center have certain space and configuration requirements, both of which require impervious surface in the form of buildings, parking, cuing, storage areas, and staging areas. CSWD rules require their facilities to be at least 100 feet from the river and the road.

The Vermont State Wetlands Inventory shows at class 2 wetland on a portion of the site including where the existing Town Garage building is located. Field investigation indicated that there are no wetland features on the property to the west of the river.

Possible Treatment Options Identified

1. Restore infiltration at strategic locations on the site, including removal of compacted soil.
2. Naturalize Beecher Hill Brook riparian area by removing all buildings, piles of material and berms, and operations out of the River Corridor and restoring a greenbelt to filter runoff from the site before entering the river.
3. Consider removal of the berm across the river to reconnect floodplain.
4. Continue the practice of managing the gravel pit areas by grading depressions to catch stormwater at strategic locations within the excavation area.
5. Explore floodplain reconnection options in the River Corridor.

Ahead of the Storm
Existing Conditions Photo Documentation Summary
Hinesburg Town Garage

Figure 1: The Town Garage buildings area surrounded by a large flat gravel staging area.

Figure 3: The active gravel pit excavation area is located at a higher elevation than the buildings.

Figure 2: A berm exists between the Garage staging area and Beecher Hill Brook.

Figure 4: Active excavation in the gravel pit area also includes large piles of stored gravel.

Ahead of the Storm
Existing Conditions Photo Documentation Summary
Hinesburg Town Garage

Figure 5: Depressions have been created around the site, including adjacent to the access road to catch water.

Figure 8: The CSWD facility and access road up to the gravel pit.

Figure 6: CSWD operates a Drop-Off Center including a paved area and buildings.

Figure 9: Beecher Hill Brook is immediately adjacent to the garage building.

Figure 7: Depressions have been created around the site to capture runoff.

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

2'-Elevation Contour, 2009 Lidar
Internal Site Access Roads
Existing Detention Areas
Vermont River Corridor (1/2/2015)
Drainage Area Boundary
NRCS Soil Area Boundary
Parcel Boundary, Approximate
Stream Order
1 2 3 4 5
Stormwater Flow
Overland
Swale
Culvert
Pipe

EXTRACTION AREA WHERE PREVIOUS ROAD

DA#3 = 4.4 AC

DA#2 = 2.4 AC

DA#5 = 1.2 AC

DA#1 = 3.6 AC

CSWD DROP-OFF CENTER

DA#4 = 1.3 AC

DA#6 = 0.4 AC

DA#8 = 0.2 AC

DA#7 = 0.3 AC

NO WETLAND FEATURES OBSERVED WEST OF RIVER

NORTH RD

C, HSG A, potentially highly erodibl

StA, HSG A, not highly erodible

CsD, HSG A, highly erodible

StC, HSG A, potentially highly erodibl

CsE, HSG A, highly erodible

An, HSG not rated, not rated

0 25 50 100 Feet

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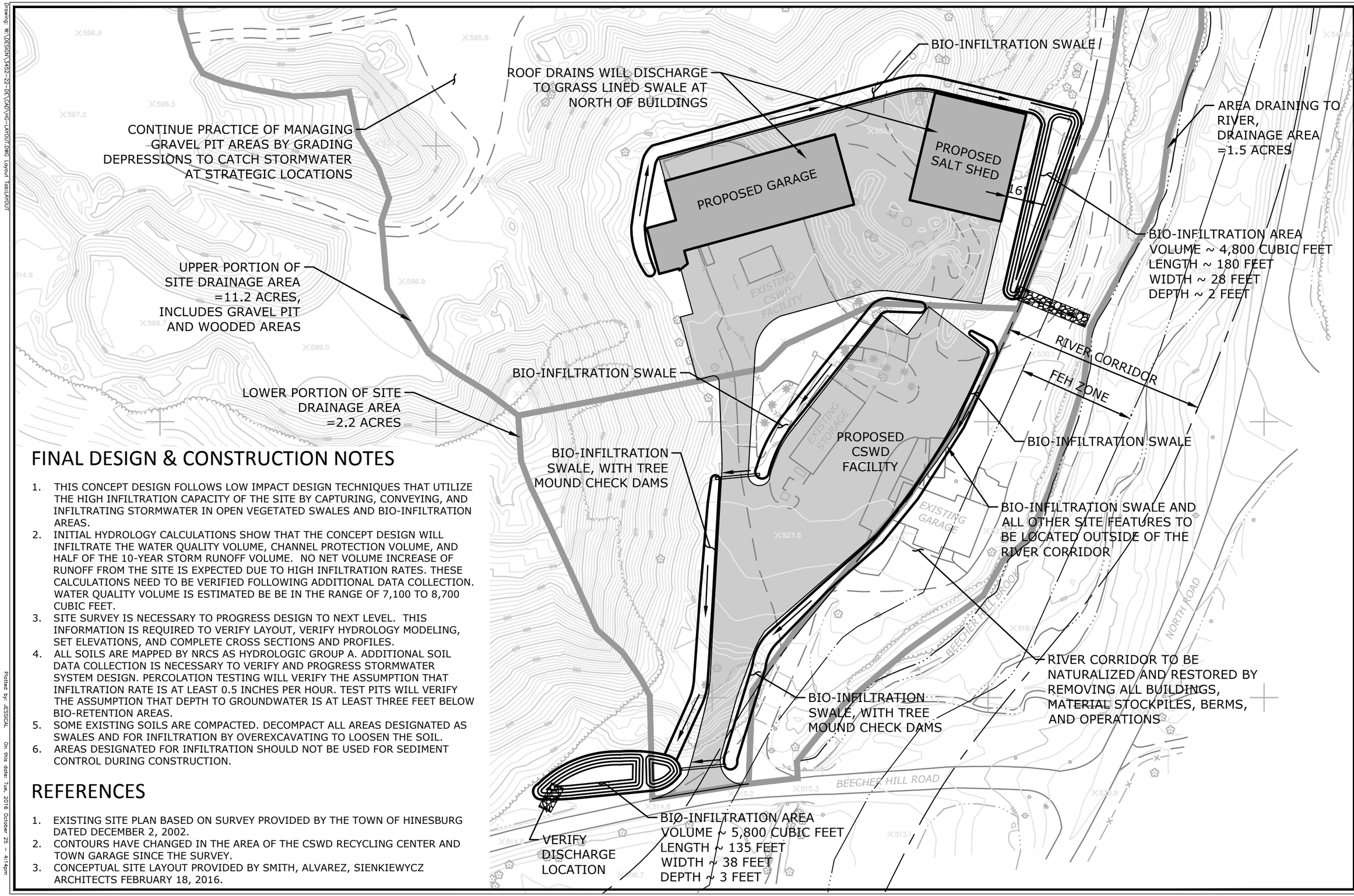
SOURCE(S):
2009 LIDAR 2 FT CONTOURS, VCGI
NRCS SOIL MAPPING
MMI FIELD DATA

EXISTING CONDITIONS - HINESBURG TOWN GARAGE
AHEAD OF THE STORM
BEECHER HILL ROAD
HINESBURG, VERMONT

Map By: JCL
MM#: 3452-22
MXD:
1st Version: 12/23/2015
Revision:
Scale: 1"=100'

FIGURE 1



FINAL DESIGN & CONSTRUCTION NOTES

1. THIS CONCEPT DESIGN FOLLOWS LOW IMPACT DESIGN TECHNIQUES THAT UTILIZE THE HIGH INFILTRATION CAPACITY OF THE SITE BY CAPTURING, CONVEYING, AND INFILTRATING STORMWATER IN OPEN VEGETATED SWALES AND BIO-INFILTRATION AREAS.
2. INITIAL HYDROLOGY CALCULATIONS SHOW THAT THE CONCEPT DESIGN WILL INFILTRATE THE WATER QUALITY VOLUME, CHANNEL PROTECTION VOLUME, AND HALF OF THE 10-YEAR STORM RUNOFF VOLUME. NO NET VOLUME INCREASE OF RUNOFF FROM THE SITE IS EXPECTED DUE TO HIGH INFILTRATION RATES. THESE CALCULATIONS NEED TO BE VERIFIED FOLLOWING ADDITIONAL DATA COLLECTION. WATER QUALITY VOLUME IS ESTIMATED BE BE IN THE RANGE OF 7,100 TO 8,700 CUBIC FEET.
3. SITE SURVEY IS NECESSARY TO PROGRESS DESIGN TO NEXT LEVEL. THIS INFORMATION IS REQUIRED TO VERIFY LAYOUT, VERIFY HYDROLOGY MODELING, SET ELEVATIONS, AND COMPLETE CROSS SECTIONS AND PROFILES.
4. ALL SOILS ARE MAPPED BY NRCS AS HYDROLOGIC GROUP A. ADDITIONAL SOIL DATA COLLECTION IS NECESSARY TO VERIFY AND PROGRESS STORMWATER SYSTEM DESIGN. PERCOLATION TESTING WILL VERIFY THE ASSUMPTION THAT INFILTRATION RATE IS AT LEAST 0.5 INCHES PER HOUR. TEST PITS WILL VERIFY THE ASSUMPTION THAT DEPTH TO GROUNDWATER IS AT LEAST THREE FEET BELOW BIO-RETENTION AREAS.
5. SOME EXISTING SOILS ARE COMPACTED. DECOMPACT ALL AREAS DESIGNATED AS SWALES AND FOR INFILTRATION BY OVEREXCAVATING TO LOOSEN THE SOIL.
6. AREAS DESIGNATED FOR INFILTRATION SHOULD NOT BE USED FOR SEDIMENT CONTROL DURING CONSTRUCTION.

REFERENCES

1. EXISTING SITE PLAN BASED ON SURVEY PROVIDED BY THE TOWN OF HINESBURG DATED DECEMBER 2, 2002.
2. CONTOURS HAVE CHANGED IN THE AREA OF THE CSWD RECYCLING CENTER AND TOWN GARAGE SINCE THE SURVEY.
3. CONCEPTUAL SITE LAYOUT PROVIDED BY SMITH, ALVAREZ, SIENKIEWYCZ ARCHITECTS FEBRUARY 18, 2016.

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REVISIONS

CONCEPT DESIGN

SITE LAYOUT - HINESBURG TOWN GARAGE

AHEAD OF THE STORM
HINESBURG TOWN GARAGE

BEECHER HILL ROAD
HINESBURG VERMONT

JCL	JCL	RS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=80'

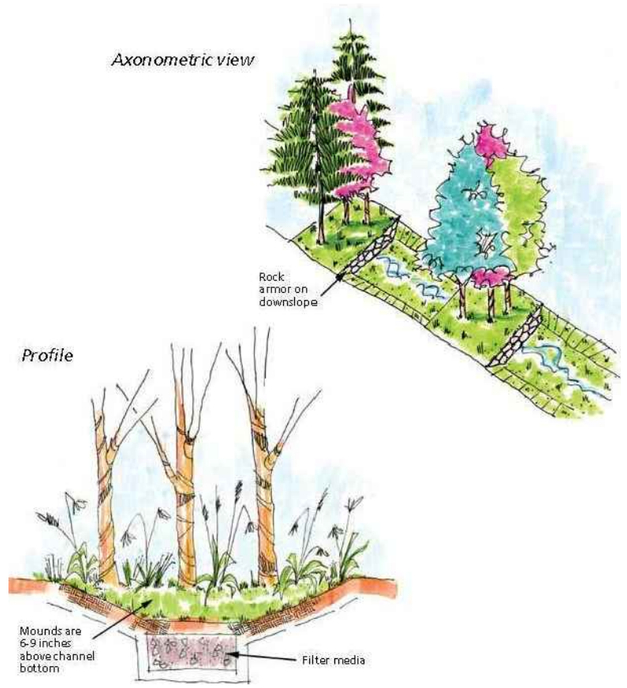
DATE: 10/25/2016

PROJECT NO.: 3452-22

SHEET NO.: 02

OPERATION AND MAINTENANCE NOTES

1. THE CONCEPTUAL STORMWATER PLAN HAS BEEN DESIGNED TO MINIMIZE MAINTENANCE TO THE SYSTEM AND ONLY REQUIRE MAINTENANCE THAT CAN EASILY BE COMPLETED BY TOWN PERSONNEL WITH EQUIPMENT ONSITE.
2. PERIODICALLY, INCLUDING AFTER LARGE STORMS AND REGULARLY DURING THE FALL, REMOVE LEAVES AND DEBRIS ACCUMULATED AT CULVERTS AND AT BIO-INFILTRATION AREA INLET AND OUTLET.
3. THE ACCUMULATION OF SEDIMENT WITHIN THE FOREBAY AREAS SHOULD BE MONITORED AND INSPECTED A MINIMUM OF ONCE ANNUALLY. REMOVE SEDIMENT AFTER APPROXIMATELY 12 INCHES OF SEDIMENT HAS ACCUMULATED.
4. SWALES ARE EXPECTED TO REQUIRE RESHAPING AND REMOVAL OF SEDIMENT APPROXIMATELY EVERY 5 TO 10 YEARS.
5. BIO-INFILTRATION AREAS AND SWALES CAN BE MOWED OR BRUSH-HOGGED AT THE END OF EACH GROWING SEASON.
6. RESEEDING OF THE SPECIFIED SEED MIX SHOULD OCCUR AFTER REMOVAL OF SEDIMENT OR RESHAPING OF BIO-INFILTRATION AREAS OR SWALES.



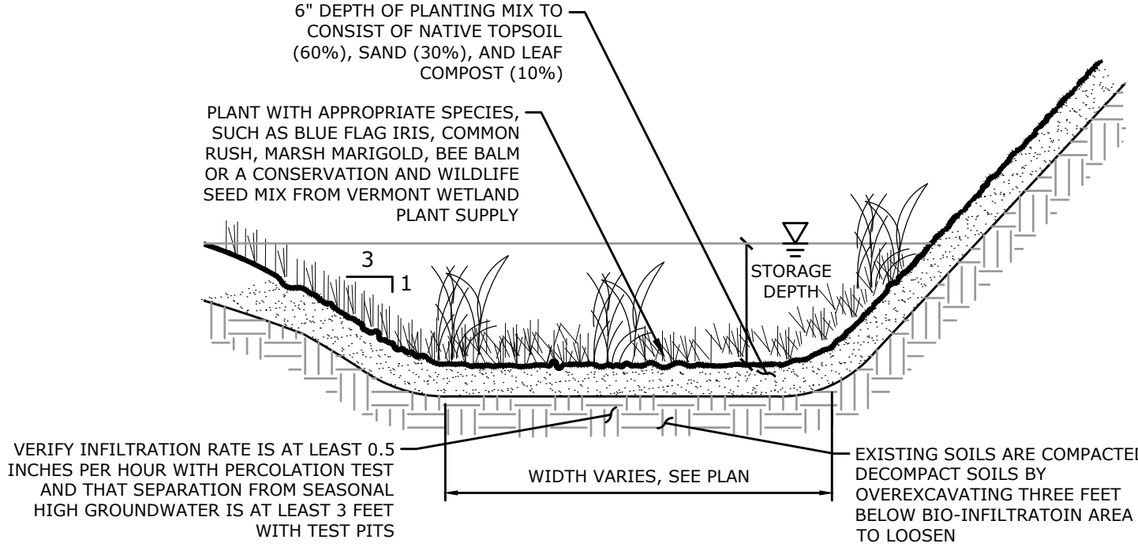
NOTES:

INSTALL TREE MOUND CHECK DAMS ALONG BIO-INFILTRATION SWALE AS SHOWN ON PLAN TO REDUCE EFFECTIVE SLOPE OF SWALE AND SLOW WATER.

REFERENCED FROM: URBAN WATERSHED FORESTRY MANUAL, PART 2: CONSERVING AND PLANTING TREES AT DEVELOPMENT SITES. UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE. NA-TP-01-06. MAY 2006.

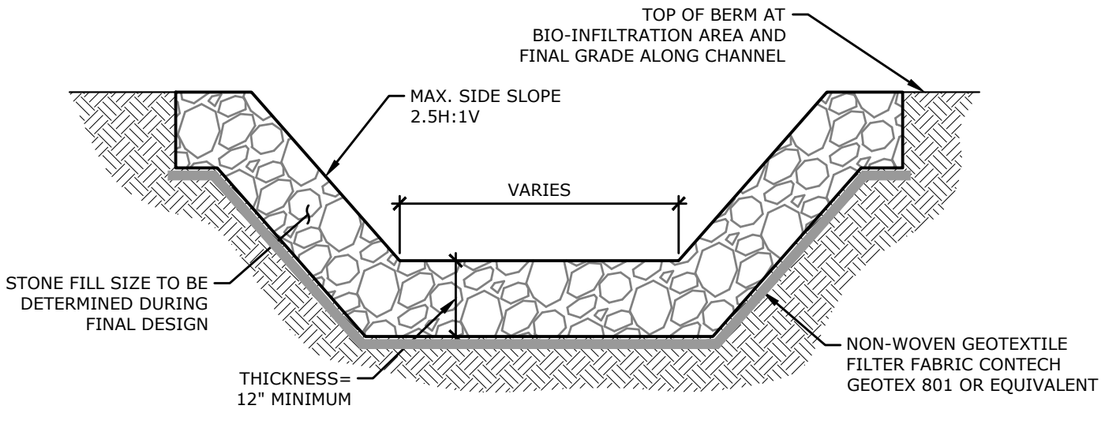
TREE MOUND CHECK DAM

NOT TO SCALE



BIO-INFILTRATION AREAS AND SWALES

NOT TO SCALE



STONE OUTLET WEIR AND CHANNEL

NOT TO SCALE

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REVISIONS

CONCEPT DESIGN

DETAILS - HINESBURG TOWN GARAGE

AHEAD OF THE STORM
HINESBURG TOWN GARAGE
BEECHER HILL ROAD
HINESBURG VERMONT

JCL	JCL	RS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=80'

DATE: 10/25/2016

PROJECT NO.: 3452-22

SHEET NO.: 03

Memorandum

TO: **Stephen Smith, Smith Alvarez Sienkiewycz Architects**

FROM: **Jessica Louisos, PE & Roy Schiff, PE, Milone & MacBroom**

DATE: **2/26/2016**

RE: **Hinesburg Town Garage Conceptual Stormwater Treatment**

A concept design for stormwater treatment and a ballpark cost opinion have been prepared for the proposed Town Garage and Chittenden Solid Waste Management recycling facility in Hinesburg, Vermont off of Beecher Hill Road. The concept design has been prepared in collaboration with SAS Architects, and will need refinement as site survey and additional information become available.

Initial hydrology calculations were used to estimate required storage volumes and suggest ample detention and infiltration area exists at the site for treatment. Soil permeability will need verification with percolation tests and depth to ground water will need to be explored with test pits. Runoff volumes, treatment methods, and treatment locations will be updated with the existing information.

The goal of the Ahead of the Storm Project being led by the Lewis Creek Association is to provide optimal conservation practices (OCPs) that establish treatment levels above permit requirements that protect ecosystem functions where feasible and cost-effective. For example, this project consists of a redevelopment site where treatment is not required for runoff from existing impervious areas, yet the concept design includes runoff treatment for the entire site since it is readily achievable and the best approach for both site function and protection of nearby Beecher Hill Brook.

The treatment areas will infiltrate more than the water quality volume, the full channel protection volume, and half of the 10-year storm runoff volume (VTANR, 2002). This level of treatment is achieved with simple low-impact design techniques such as grass-lined swales and bioinfiltration areas. Infiltration volumes are double the required recharge volume. By minimizing required maintenance at the site it further ensures long-term performance of the system.

An initial conversation with the Vermont Department of Environmental Conservation Stormwater Section suggests that several site characteristics may require additional treatment components. Continued consultation with a state permit specialist will be needed to resolve the following items.

- The fuel station at the garage will be considered a “hotspot” and will need to be covered with a roof and isolated from stormwater by site grading.
- The CSWD facility may be considered a “hotspot” and thus runoff may not be allowed to be infiltrated indicating that swales and bioinfiltration areas would not be allowed to treat the runoff from the drop-off center. DEC suggests using any of the non-infiltration treatment methods such as a lined pond, sand filter, or taking the water quality disconnection credit by allowing the water to sheet off of the site into the vegetated corridor. A constructed wetland and the filtering practice of bioretention may be acceptable. The stormwater treatment approach for the lower portion of the site may need to be revised from the concept plan if some or all of the CSWD facility is designated as a “hotspot”.
- The project may need to get a Multi-Sector General Permit (MSGP) in addition to the Operational Stormwater Permit and Construction Permit.

VTANR, 2002. The Vermont Stormwater Management Manual, Volume I - Stormwater Treatment Standards. Vermont Agency of Natural Resources, Department of Environmental Conservation, Waterbury, VT.

BALLPARK OPINION OF PROBABLE CONSTRUCTION COST - BASED ON CONCEPT DESIGN

STORMWATER TREATMENT

HINESBURG TOWN GARAGE

AHEAD OF THE STORM

Hinesburg, Vermont

MMI #3452-22

October 25, 2016

Engineering, Landscape Architecture and Environmental Science

MILONE & MACBROOM

Item	ITEM/DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
1	Mobilization / Demobilization / Site Recovery	LS	1	$5,000	$5,000
2	Erosion Control and Temporary Stormwater Controls	LS	1	$10,000	$10,000
3	Excavate to Create Bio-Infiltration Areas	CY	1,700	$10	$17,000
4	Excavate to Create Bio-Infiltration Swales	LF	1,500	$10	$15,000
5	Stone Outlet Weirs and Channels	LF	120	$25	$3,000
6	Culverts Under Driveways	EA	2	$3,500	$7,000
7	Planting Medium for Bio-Infiltration Areas and Swales	CY	500	$45	$22,500
8	Install Tree Mound Check Dams	LS	1	$10,000	$10,000
9	Plant Bio-Infiltration Area and Swale	LS	1	$10,000	$10,000
10	Temporary Erosion Matting in Bio-Infiltration Areas	ROLL	40	$180	$7,200
	CONSTRUCTION SUB-TOTAL				**$106,700**
	ENGINEERING FINAL DESIGN				$19,000
	PERMITTING				$6,000
	BID ASSISTANCE				$1,500
	ENGINEERING OVERSIGHT				$6,000
	15% CONSTRUCTION CONTINGENCY				$16,005
	TOTAL (ROUNDED)				**$155,000**

ESTIMATED ENGINEERING SERVICES COST FOR FINAL DESIGN

FLOODPLAIN RESTORATION

HINESBURG TOWN GARAGE

AHEAD OF THE STORM

Hinesburg, Vermont

MMI #3452-22

October 25, 2016

Engineering, Landscape Architecture and Environmental Science

MILONE & MACBROOM

Item	ITEM/DESCRIPTION				COST
	Data Review and Collection				$6,900
	Hydrology, Hydraulics, and Alternatives Analysis				$4,100
	Design				$11,800
	Permitting and Construction Plans				$6,500
	TOTAL (ROUNDED)				**$29,300**