AHEAD OF THE STORM

Site: Silver Street Rain Garden

Location: Silver Street and VT Route 116, Hinesburg, Vermont

POST-CONSTRUCTION SUMMARY

Construction Summary

A bio-retention stormwater treatment system, known as the Silver Street Rain Garden, was constructed at the discharge point of three drainage systems at the southeast corner of VT Route 116 and Silver Street. The primary goal of the bio-retention system was to improve water quality and flood resilience by filtering sediment and nutrients, reducing erosion, promoting infiltration, as well as providing retention storage. The project site was identified as a potential stormwater treatment site as a result of an initial Town-wide hydrology study completed in 2011 and 2012. The site was considered a top priority for stormwater treatment because runoff from three separate drainage systems were discharging to an eroding swale directly connected to the LaPlatte River. The entire project site was located on Town-owned land or the Town's right-of-way for Silver Street.

Construction of the bio-retention system took place over four weeks in September and October 2014. The project was constructed through a partnership between the Lewis Creek Association, the Town of Hinesburg, and Distinctive Landscaping of Charlotte, VT. Project design and implementation was funded through a 2014 Ecosystem Restoration Program Grant. The Town of Hinesburg Highway Department provided in-kind services to rough-grade the treatment cells and reshape the existing roadside drainage swale. Distinctive Landscaping of Charlotte, Vermont were contracted to install the various outlets and erosion control measures, finish grade the project site, place and amend topsoil as needed, plant the herbaceous plants and shrubs, recover the site, and provide year one maintenance. A planting plan was developed by Andrea Morgante Landscaping Services of Hinesburg, Vermont. Final design and bid phase services, as well as part-time construction oversight and final documentation was provided by Milone & MacBroom of Waterbury, Vermont.

Installed Treatment Elements

Two Optimal Conservation Practices (OCPs) were installed to mitigate stormwater runoff at the site.

1. A two-celled bio-retention system to slow and store water, promote infiltration, and filter sediment and nutrients to pre-treat runoff from three drainage system previously directly connected to the LaPlatte River.
2. Swale improvements including reshaping and installation of stone check dams to mitigate active erosion.

Project Benefits

This project will improve water quality by reducing sediment transport in stormwater runoff, reducing erosion, promoting infiltration, reducing nutrient loads by plant uptake, and providing retention storage. The primary goals are to improve water quality protection and flood resiliency by slowing runoff, reducing erosion, and enhancing vegetation. The bio-retention system was designed to treat stormwater runoff from a 6.7-acre urbanized watershed containing about 2.6 acres of impervious surface or 39% of the contributing area. The bio-retention system provides approximately 13,000 cubic feet (0.3 acre-feet) of runoff storage in a two-tiered configuration and is designed to treat approximately 1 inch of rainfall from the contributing drainage area (i.e., the Water Quality Volume – WQv). The herbaceous plant materials are native and also enhance habitat and biodiversity.

Additional Documentation Attached

Pre- and Post-Construction Photo Log
Construction Observation Reports
Construction Plans dated June 2014
Final Memo dated December 2014
Cost Opinion

MILONE & MACBROOM

LEWIS CREEK ASSOCIATION

AHEAD OF THE STORM

Site: Silver Street Rain Garden

Location: Silver Street and VT Route 116, Hinesburg, Vermont

PRE- AND POST-CONSTRUCTION PHOTO LOG

Pre-Construction, December 12, 2012: View of storm drainage outfall area looking west.

Post-Construction, October 3, 2014: View of completed upper treatment cell looking west.

Pre-Construction, December 12, 2012: View of storm drainage outfall area looking east.

Post-Construction, October 3, 2014: View of completed upper treatment cell and sediment forebay looking east.

Pre-Construction, December 12, 2012: View of vacant land and existing swale along Silver Street looking west.

Post-Construction, October 3, 2014: View of completed lower treatment cell looking west.

Pre-Construction, December 12, 2012: View of existing eroding swale along Silver Street looking north.

Post-Construction, October 3, 2014: View of completed swale and lower treatment cell looking north.

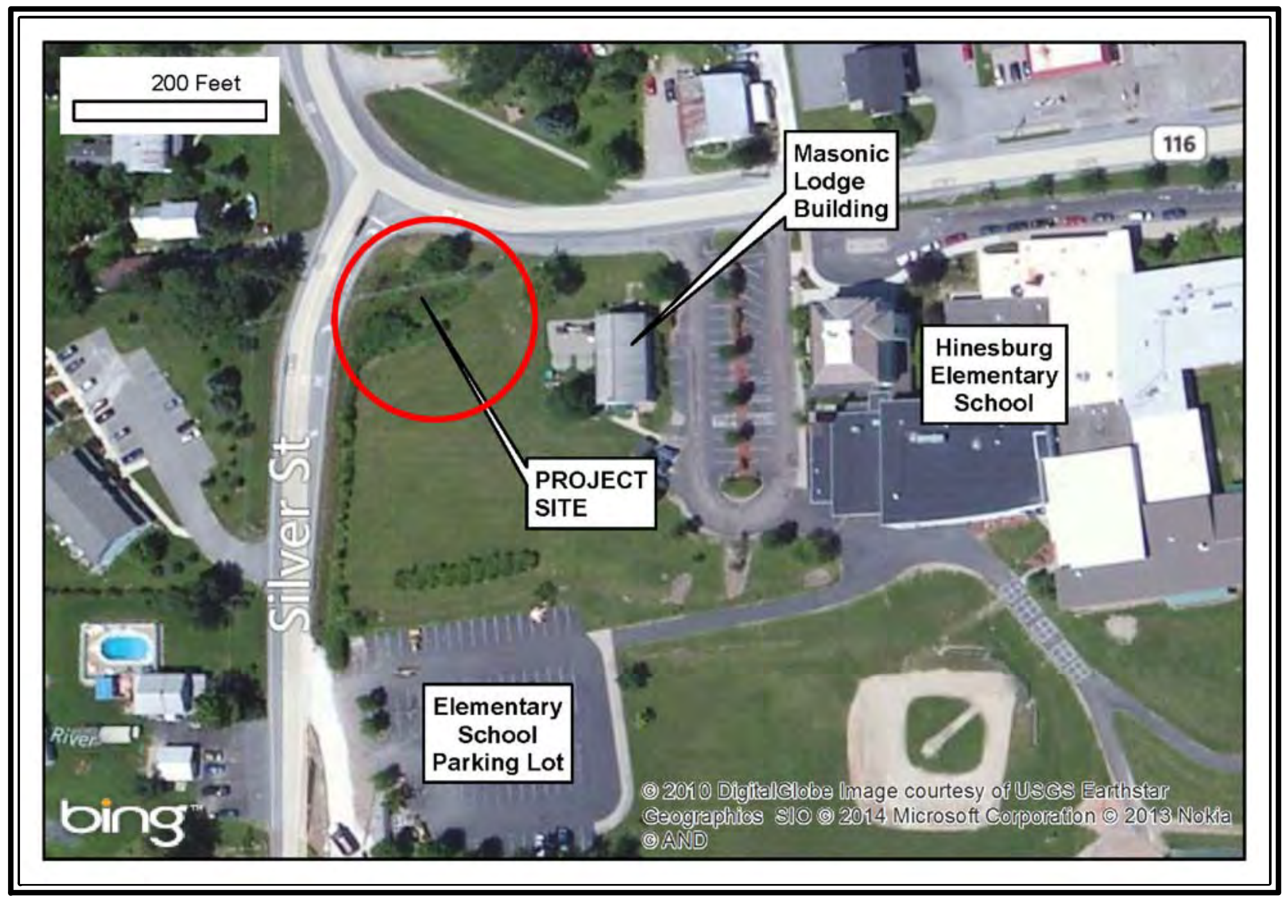
Post-Construction, June 2, 2017: View of upper cell looking east.

Post-Construction, June 2, 2017: View of both upper and lower cells looking south.

SILVER STREET RAIN GARDEN

SILVER STREET
HINESBURG, VERMONT

FINAL DESIGN
JUNE 3, 2014



PROJECT SITE VICINITY MAP:

0' 100' 200'
0 1/2" 1"
SCALE 1" = 200'

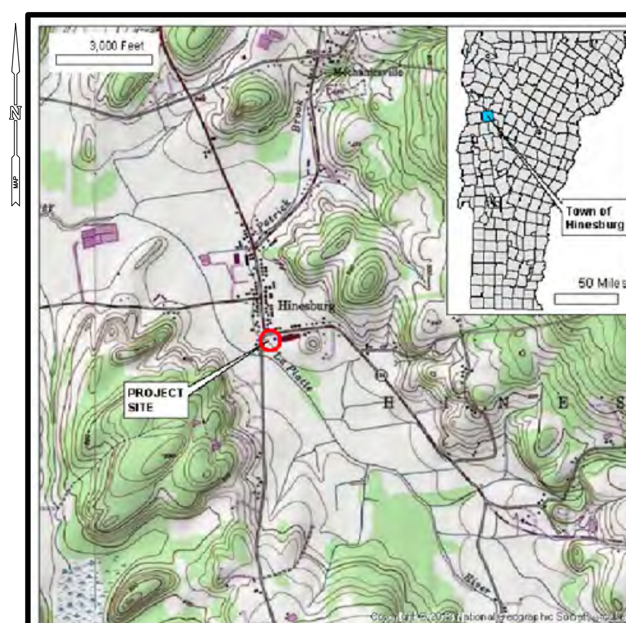
PREPARED FOR:

LEWIS CREEK ASSOCIATION

PROJECT PARTNERS:

TOWN OF HINESBURG

VERMONT AGENCY OF NATURAL RESOURCES



LOCATION MAP:

1"=6,000'

SHEET NO.	SHEET TITLE
---	TITLE SHEET & LOCATION MAP
NT1	NOTES AND CONSTRUCTION SEQUENCE
EX1	SITE PLAN - EXISTING CONDITIONS
PR1	SITE PLAN - PROPOSED CONDITIONS
LA1	SITE PLAN - PROPOSED LANDSCAPING
LA2	PLANTING LIST AND SEED MIX
XS1	CHANNEL PROFILE & CROSS SECTIONS
XS2	CROSS SECTIONS
SD1	SITE DETAILS
SD2	SITE DETAILS
SD3	SEDIMENT & EROSION CONTROL DETAILS

811
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Waterbury, Vermont 05676
(802) 882-8335 Fax (802) 882-8346
www.miloneandmacbroom.com

GENERAL NOTES

1. THE PURPOSE OF THIS PROJECT IS TO CONSTRUCT A RAIN GARDEN, ITS ASSOCIATED OUTLETS, PLANTINGS, AND TO RESHAPE AN EXISTING DRAINAGE SWALE LOCATED AT THE OUTFALL OF THREE EXISTING STORM DRAINAGE SYSTEMS AT THE CORNER OF SILVER STREET AND VERMONT ROUTE 116 IN THE TOWN OF HINESBURG, VERMONT.
2. THE LOCATION OF ALL EXISTING UTILITIES SHOULD BE CONFIRMED PRIOR TO BEGINNING CONSTRUCTION. CALL "DIG SAFE" AT 1-888-DIG-SAFE (344-7233). THE CONTRACTOR SHALL TAKE PRECAUTIONS NOT TO DISTURB EXISTING UTILITIES.
3. THE PROPOSED RAIN GARDEN DESIGN IS GENERALLY BASED ON THE GUIDELINES PRESENTED IN THE "VERMONT RAIN GARDEN MANUAL" PUBLISHED BY THE WINOOSKI NATURAL RESOURCES CONSERVATION DISTRICT. A COPY OF THE RAIN GARDEN MANUAL ALONG WITH THIS DESIGN PLAN SHALL BE MAINTAINED ON SITE BY THE CONTRACTOR AT ALL TIMES AND USED AS A REFERENCE WHERE NEEDED.
4. THE FINAL LOCATION OF THE PROPOSED RAIN GARDEN TREATMENT CELLS, SEDIMENT FOREBAY, AND OUTLETS SHALL BE DETERMINED IN THE FIELD BY PROJECT ENGINEER PRIOR TO CONSTRUCTION.
5. THE ELEVATIONS PROPOSED FOR THE SEDIMENT FOREBAY, RAIN GARDEN, BERMS, AND OUTLETS MAY BE ADJUSTED SLIGHTLY BY PROJECT ENGINEER BASED ON FIELD CONDITIONS.
6. TEMPORARY STOCKPILE AND STAGING AREAS ARE TO BE FLAGGED BY CONTRACTOR PRIOR TO CONSTRUCTION AND APPROVED BY THE TOWN AND PROJECT ENGINEER.
7. THE CONTRACTOR SHALL DESIGNATE A SUPERINTENDENT AT THE START OF CONSTRUCTION AND THE CONTRACTOR'S SUPERINTENDENT SHALL BE ON-SITE AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR AND HIS/HER JOB SUPERINTENDENT SHALL BE RESPONSIBLE FOR COMPLYING WITH THE JOB SPECIFICATIONS AND PERMIT REQUIREMENTS.
8. ALL STORAGE AND ACCESS ROUTES, PEDESTRIAN FENCES/BARRIERS, WORKING HOURS, AND LIMITS OF DISTURBANCE SHALL BE FLAGGED BY CONTRACTOR PRIOR TO CONSTRUCTION AND APPROVED BY TOWN AND PROJECT ENGINEER.
9. NO DISTURBANCE BEYOND THE ESTABLISHED LIMITS OF CLEARING IS ALLOWED UNLESS PRIOR PERMISSION IS OBTAINED FROM THE PROJECT ENGINEER.
10. ALL PROPOSED GRADES AND SPOT ELEVATIONS IN PLAN VIEW INDICATE FINISHED GRADE. THE NEED TO MODIFY PROPOSED FINISHED GRADES MAY BE REQUIRED IF UNEXPECTED CONDITIONS ARE ENCOUNTERED (E.G., BEDROCK, LEDGE, ETC.) OR IF SIGNIFICANT CHANGES TO EXISTING CONDITIONS OCCURS. CONSULT PROJECT ENGINEER FOR CHANGES.
11. NO CONSTRUCTION VEHICLES SHALL BE STORED, SERVICED, WASHED OR FLUSHED IN A LOCATION WHERE LEAKS, SPILLAGE, WASTE MATERIALS, CLEANERS, OR WATERS WILL BE INTRODUCED OR FLOW INTO WETLANDS OR WATERCOURSES. AN EMERGENCY MANAGEMENT PLAN AND SPILL KIT WILL BE MAINTAINED ON SITE AT ALL TIMES. IN THE EVENT OF AN ACCIDENTAL RELEASE, IMMEDIATELY STOP CONSTRUCTION WORK, CONTAIN THE SPILL, AND NOTIFY THE TOWN, APPROPRIATE AUTHORITIES AND PROJECT ENGINEER.
12. THE PROJECT SITE IS SUBJECT TO FLOODING FROM THE EXISTING STORM DRAINAGE OUTFALLS. THE CONTRACTOR SHALL MONITOR WEATHER FORECASTS AND STABILIZE THE CONSTRUCTION SITE AND REMOVE EQUIPMENT FROM FLOOD PRONE AREAS IN THE EVENT OF FLOOD WARNINGS. WORK SHOULD BE PERFORMED DURING LOW WATER.
13. THERE SHALL BE NO CLAIMS FOR EXTRA COMPENSATION DUE TO DELAYS IN WATER CONTROL ASSOCIATED WITH HIGH WATER LEVELS FROM NATURAL EVENTS SUCH AS FLOODS.
14. THE CONTRACTOR SHALL MAINTAIN ALL ROADWAYS, SIDEWALKS, AND WALKWAYS IN THE AREA FREE OF SOIL, MUD, AND CONSTRUCTION DEBRIS. CONSTRUCTION ENTRANCES SHALL BE PROVIDED AS NECESSARY.
15. CONTRACTOR MUST COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL PERMITS THROUGHOUT DURATION OF PROJECT.
16. COMPLIANCE WITH ALL CONDITIONS OF APPLICABLE AND SECURED PERMITS IS THE RESPONSIBILITY OF BOTH THE CONTRACTOR AND THE PERMITTEE.
17. ANY TRAFFIC CONTROL MUST CONFORM TO GUIDELINES SET IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS", MOST CURRENT EDITION, AS PUBLISHED BY U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION.
18. ANY MATERIAL EXPORTED OFF-SITE SHALL BE LEGALLY DISPOSED OF IN AN UPLAND LOCATION AT NO ADDITIONAL COST. THE CONTRACTOR IS RESPONSIBLE FOR FINDING A SUITABLE RECIPIENT OF THE MATERIAL, GAINING REGULATORY APPROVAL FOR EXPORTED MATERIAL PLACEMENT IF NEEDED, AND HAULING.
19. ALL AREAS SURROUNDING THE PROJECT SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED UPON COMPLETION OF CONSTRUCTION. THE RESTORATION OF THE SITE IS SUBJECT TO APPROVAL BY THE TOWN AND THE PROJECT ENGINEER.
20. FOLLOWING COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL PARTICIPATE IN A FINAL SITE INSPECTION WITH THE TOWN AND PROJECT ENGINEER FOR THE PURPOSE OF VERIFYING THAT THE PROJECT HAS BEEN COMPLETED ACCORDING TO THE CONSTRUCTION PLANS, SPECIFICATIONS AND THE TERMS AND CONDITIONS OF THE CONTRACT.

GENERAL NOTES (CON'T)

21. SURVEY DATA COLLECTED IN DECEMBER 2013 AND JANUARY 2014 BY MILONE & MACBROOM, INC. BASE MAPPING SUPPLEMENTED WITH 2-FOOT CONTOURS DERIVED FROM CHITTENDEN COUNTY LIDAR DATA. ALL ELEVATIONS REFER TO THE NAVD 88 VERTICAL DATUM.
22. PROPERTY BOUNDARIES SHOWN ON THE BASE MAPPING WERE OBTAINED FROM THE VERMONT CENTER FOR GEOGRAPHIC INFORMATION (VCGI) AND SHOULD BE CONSIDERED APPROXIMATE IN NATURE.
23. FEATURES SHOWN ON THE BASE MAPPING WERE OBTAINED FROM AVAILABLE GIS DATA, AERIAL PHOTOGRAPHY, AND FIELD MEASUREMENTS. THE HORIZONTAL DATUM REFERENCES THE NAD 83 VERMONT STATE PLANE WITH UNITS OF FEET.

CONSTRUCTION NOTES

1. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO STATE OF VERMONT, AGENCY OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION, DATED 2006, AND ITS LATEST REVISIONS.
2. ALL FILL AREAS USED TO CREATE THE EMBANKMENTS OF THE RAIN GARDEN TREATMENT CELLS SHALL BE COMPACTED USING VIBRATORY EQUIPMENT OR APPROVED EQUAL. THE CONTRACTOR SHALL PROVIDE THE PROJECT ENGINEER WITH THE COMPACTION APPROACH PLANNED FOR APPROVAL PRIOR TO CONSTRUCTION.
3. ALL DIMENSIONS AND ELEVATIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION.
4. TYPICAL DETAILS AND NOTES ON THESE DRAWINGS SHALL APPLY UNLESS SPECIFICALLY SHOWN OR NOTED OTHERWISE. CONSTRUCTION DETAILS NOT FULLY SHOWN OR NOTED SHALL BE SIMILAR TO DETAILS SHOWN FOR OTHER SIMILAR CONDITIONS.
5. IF ANY CONDITIONS ARISE DURING CONSTRUCTION THAT PRECLUDE COMPLIANCE WITH THE DETAILS SHOWN ON THESE DRAWINGS, THE WORK IN THE AFFECTED AREAS SHALL CEASE AND THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY.
6. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR EXCAVATION PROCEDURES, BLASTING, SHORING, AND PROTECTION.

EROSION CONTROL NOTES

1. THE SEDIMENT AND EROSION CONTROL PRACTICES IMPLEMENTED AS PART OF THE PROJECT SHALL BE IMPLEMENTED AND MAINTAINED ACCORDING TO "THE LOW RISK SITE HANDBOOK FOR EROSION PROTECTION AND SEDIMENT CONTROL" GUIDANCE DOCUMENT FROM THE VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION, WHERE APPLICABLE IN CONSULTATION WITH PROJECT ENGINEER.
2. THE PROJECT IS LOCATED ON A SLOPED SITE WHERE RUNOFF WILL BE MOSTLY DIRECTED TO AN EXISTING DRAINAGE SWALE WITHIN THE PROJECT LIMITS. REFER TO THE SEDIMENT AND EROSION CONTROL PLAN FOR SPECIFIC CONTROLS NEEDED. ADDITIONAL CONTROLS MAY BE REQUIRED IF SEDIMENT MIGRATION IS OBSERVED DURING CONSTRUCTION, AS DETERMINED BY THE PROJECT ENGINEER IN THE FIELD.
3. THE LIMITS OF DISTURBANCE SHALL BE CLEARLY MARKED IN THE FIELD FOR REVIEW BY THE PROJECT ENGINEER.
4. CLEARING OF NATIVE VEGETATION FOR CONSTRUCTION SHALL BE MINIMIZED TO THE EXTENT POSSIBLE.
5. LIMIT SOIL DISTURBANCE. NO DISTURBED SOIL SURFACES SHALL BE ALLOWED TO REMAIN EXPOSED FOR MORE THAN 7 CONSECUTIVE DAYS.
6. SITE ACCESS IS PROPOSED FROM THE EXISTING ELEMENTARY SCHOOL PARKING LOT LOCATED ALONG SILVER STREET. AN IMPROVED STABILIZED CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED IF SOIL TRACKING OCCURS. IF REQUIRED, THE CONSTRUCTION ENTRANCE MUST BE MAINTAINED THROUGHOUT ITS USE.
7. THE CONTRACTOR SHALL MAINTAIN ALL STREETS, SIDEWALKS, AND WALKWAYS IN THE AREA FREE OF SOIL, MUD AND CONSTRUCTION DEBRIS.
8. SILT FENCE SHALL BE INSTALLED AS DIRECTED BY PROJECT ENGINEER AND MAINTAINED DURING THE COURSE OF CONSTRUCTION.
9. THE CONTRACTOR IS RESPONSIBLE FOR THE MAINTENANCE OF ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES. THE CONSTRUCTION INSPECTOR WILL VERIFY THE MAINTENANCE ON A PREDETERMINED SCHEDULE AND AFTER RAINFALL EVENTS OF 0.5 INCH OR GREATER.
10. THE PROJECT ENGINEER IS TO BE NOTIFIED IMMEDIATELY IF EXCESSIVE SEDIMENT EROSION TAKES PLACE, IF SIGNIFICANT FINE GRAIN SEDIMENT IS ENCOUNTERED OR IF POTENTIALLY CONTAMINATED SEDIMENTS ARE ENCOUNTERED (OILY, DARK COLOR, CHEMICAL ODOR).
11. ANY DISTURBED SLOPES 2:1 OR STEEPER SHALL BE STABILIZED WITH EROSION CONTROL BLANKET PER DIRECTION OF PROJECT ENGINEER, SEE DETAIL.
12. WITHIN 48 HOURS OF FINAL GRADING, EXPOSED SOIL NOT PROTECTED BY STONE RIPRAP MUST BE SEEDED AND MULCHED (SEE PLANTING NOTES).

EROSION CONTROL NOTES (CON'T)

13. THE CONTRACTOR SHALL PERFORM SITE INSPECTIONS TO ENSURE THAT ALL SEDIMENT AND EROSION CONTROL PRACTICES ARE FUNCTIONING.
14. THE SITE SHOULD BE KEPT CLEAN OF LOOSE DEBRIS, LITTER, AND BUILDING MATERIALS.
15. A COPY OF ALL PLANS AND REVISIONS, APPLICABLE PERMITS, AND THE SEDIMENT AND EROSION CONTROL PLAN SHALL BE MAINTAINED ON-SITE BY THE CONTRACTOR AT ALL TIMES DURING CONSTRUCTION.

CONSTRUCTION SEQUENCE

THE PROPOSED CONSTRUCTION SEQUENCE IS PROVIDED FOR GENERAL INFORMATION ONLY. SEE PLANS, DETAILS, AND SPECIFICATIONS FOR ADDITIONAL NOTES. THE OVERALL SEQUENCE OF CONSTRUCTION IS TO ULTIMATELY BE DETERMINED BY THE CONTRACTOR AND SUBMITTED TO THE PROJECT ENGINEER FOR APPROVAL.

1. STAKE LIMITS OF DISTURBANCE, STOCKPILE AREAS, AND STAGING AREAS FOR APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
2. INSTALL EROSION CONTROLS AS SPECIFIED ON THE PLANS.
3. REMOVE EXISTING SOD, STRIP AND STOCKPILE EXISTING TOPSOIL FOR REUSE.
4. EXCAVATE TO BEGIN CREATING TREATMENT CELL 2 OF THE RAIN GARDEN.
5. CONSTRUCT FILL BERM FOR CELL 2 ACCORDING TO THE SPECIFICATIONS PROVIDED ON THE PLANS.
6. CONSTRUCT STONE OUTLET WEIR FOR TREATMENT CELL 2 PER THE PROVIDED DETAIL.
7. EXCAVATE TO CREATE TREATMENT CELL 1 OF THE RAIN GARDEN. MAINTAIN EXISTING DRAINAGE SWALE UNDISTURBED TO THE EXTENT POSSIBLE TO ALLOW FLOW THRU THE PROJECT SITE UNTIL RISER OUTLET FROM TREATMENT CELL 1 TO CELL 2 IS IN PLACE.
8. INSTALL THE STONE FILTER BERM AND SPLASH PADS AT THE OUTLET OF THE EXISTING STORM DRAINAGE SYSTEMS IN TREATMENT CELL 1 PER THE PROVIDED DETAILS.
9. INSTALL THE RISER OUTLET IN TREATMENT CELL 1 AND STONE SPLASH PAD AT THE OUTLET OF THE RISER IN CELL 2 PER THE PROVIDED DETAILS.
10. COMPLETE CONSTRUCT FILL BERM BETWEEN TREATMENT CELL 1 AND CELL 2. DIRECT FLOW FROM EXISTING DRAINAGE SWALE TO OUTLET RISER.
11. CONSTRUCT THE STONE BYPASS WEIR ACCORDING TO THE PROVIDED DETAILS.
12. RESHAPE EXISTING DRAINAGE SWALE AND INSTALL STONE CHECK DAMS AS SHOWN ON THE PLANS AND PER THE PROVIDED DETAILS.
13. INSTALL EROSION CONTROL MATTING WITHIN THE RESHAPED DRAINAGE SWALE AND PLACE SEED MIX ACCORDING TO THE LANDSCAPE PLAN AND PLANTING NOTES.
14. PLACE ALL PROPOSED PLANTINGS, TREES, SHRUBS, AND SEED MIX ACCORDING TO THE LANDSCAPE PLAN AND PLANTING NOTES.
15. RESTORE ANY REMAINING DISTURBED AREAS. REMOVE ALL SEDIMENT AND EROSION CONTROLS ONCE VEGETATION HAS FULLY ESTABLISHED.

OPERATION AND MAINTENANCE

1. ALL OF THE FOLLOWING TASKS SHOULD BE PERFORMED ONCE ANNUALLY AT A MINIMUM OR AS NOTED. IN ADDITION, THE FOLLOWING SHOULD BE PERFORMED AFTER A RAINFALL EVENT EQUAL TO OR GREATER THAN 2-INCHES OVER A 24-HOUR PERIOD AND AFTER A RAIN ON SNOW EVENT. ALL MATERIAL REMOVED AND EXPORTED FROM THE SITE SHALL BE DISPOSED OF PROPERLY IN ACCORDANCE WITH CURRENT REGULATORY STANDARDS AND IN LEGALLY ACCEPTABLE DISPOSAL AREAS.
2. THE ACCUMULATION OF SEDIMENT WITHIN THE FOREBAY AREA SHOULD BE MONITORED AND INSPECTED A MINIMUM OF ONCE ANNUALLY. REMOVE SEDIMENT AFTER APPROXIMATELY 12 INCHES OF SEDIMENT HAS ACCUMULATED.
3. THE RISER OUTLET SHALL BE INSPECTED FOR BLOCKAGE, ACCUMULATION OF DEBRIS, OR DAMAGE TWICE ANNUALLY. OBSTRUCTIONS OR DEBRIS IMPEDING FLOW THROUGH THE RISER SHALL BE REMOVED IMMEDIATELY.
4. THE STONE BYPASS WEIR AND STONE OUTLET WEIR SHOULD BE VISUALLY INSPECTED FOR EROSION OR DAMAGE A MINIMUM OF ONCE ANNUALLY. OBSTRUCTIONS OR DEBRIS IMPEDING FLOW SHALL BE REMOVED IMMEDIATELY.
5. THE STONE SPLASH PADS AND RIPRAP FILTER BERM SHOULD BE VISUALLY INSPECTED FOR EROSION OR DAMAGE A MINIMUM OF ONCE ANNUALLY.
6. THE RESHAPED DRAINAGE SWALE AND STONE CHECK DAMS SHOULD BE MONITORED FOR EROSION A MINIMUM OF ONCE ANNUALLY. VEGETATION SHOULD BE MOWED A MINIMUM OF ONCE ANNUALLY TO MAINTAIN DESIGN CAPACITY. OBSTRUCTIONS OR DEBRIS IMPEDING FLOW IN THE SWALE SHALL BE REMOVED IMMEDIATELY.
7. ALL PLANTINGS SHOULD BE MONITORED FOR HEALTH AND VITALITY A MINIMUM OF ONCE ANNUALLY. TRIMMING, MOWING, AND PRUNING SHOULD BE PERFORMED AS APPROPRIATE. MONITOR RAIN GARDEN TREATMENT CELLS FOR INVASIVE SPECIES.

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1 South Main Street, 2nd Floor
Waterbury, Vermont 05676
(802) 882-8335
Fax (802) 882-8346
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REVISIONS

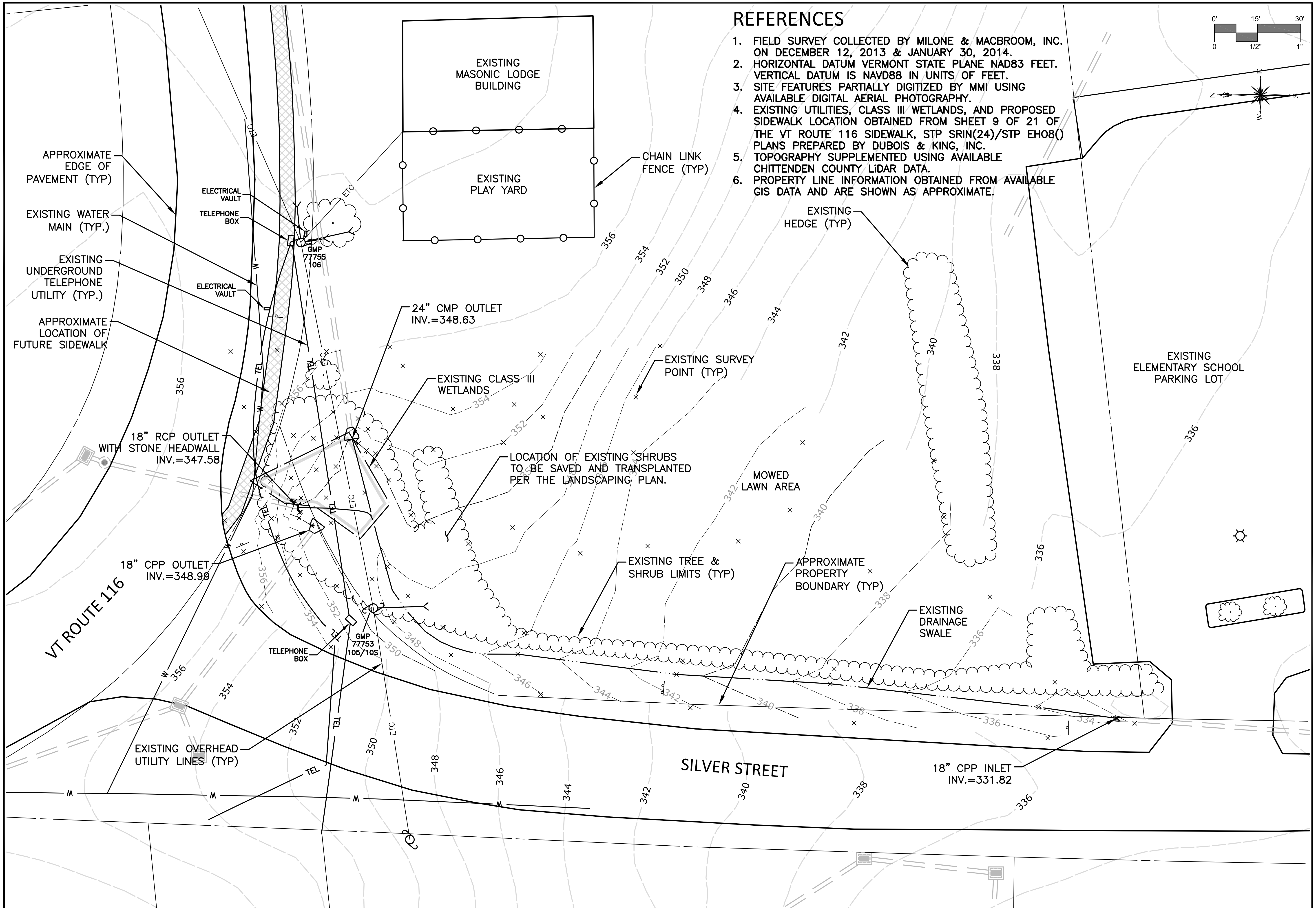
NOTES AND CONSTRUCTION SEQUENCE
SILVER STREET RAIN GARDEN
SILVER STREET
HINESBURG, VERMONT
FINAL DESIGN

DESIGNED	DRAWN	CHECKED
BMC	BMC	RKS

SCALE: AS SHOWN
DATE: JUNE 3, 2014
PROJECT NO.: 3452-19-1
SHEET NO.: NT1

REFERENCES

1. FIELD SURVEY COLLECTED BY MILONE & MACBROOM, INC. ON DECEMBER 12, 2013 & JANUARY 30, 2014.
2. HORIZONTAL DATUM VERMONT STATE PLANE NAD83 FEET. VERTICAL DATUM IS NAVD88 IN UNITS OF FEET.
3. SITE FEATURES PARTIALLY DIGITIZED BY MMI USING AVAILABLE DIGITAL AERIAL PHOTOGRAPHY.
4. EXISTING UTILITIES, CLASS III WETLANDS, AND PROPOSED SIDEWALK LOCATION OBTAINED FROM SHEET 9 OF 21 OF THE VT ROUTE 116 SIDEWALK, STP SRIN(24)/STP EH08() PLANS PREPARED BY DUBOIS & KING, INC.
5. TOPOGRAPHY SUPPLEMENTED USING AVAILABLE CHITTENDEN COUNTY LiDAR DATA.
6. PROPERTY LINE INFORMATION OBTAINED FROM AVAILABLE GIS DATA AND ARE SHOWN AS APPROXIMATE.



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REVISIONS

FINAL DESIGN

SITE PLAN - EXISTING CONDITIONS

SILVER STREET RAIN GARDEN

SILVER STREET
HINESBURG, VERMONT

DESIGNED	DRAWN	CHECKED
BMC	BMC	RKS

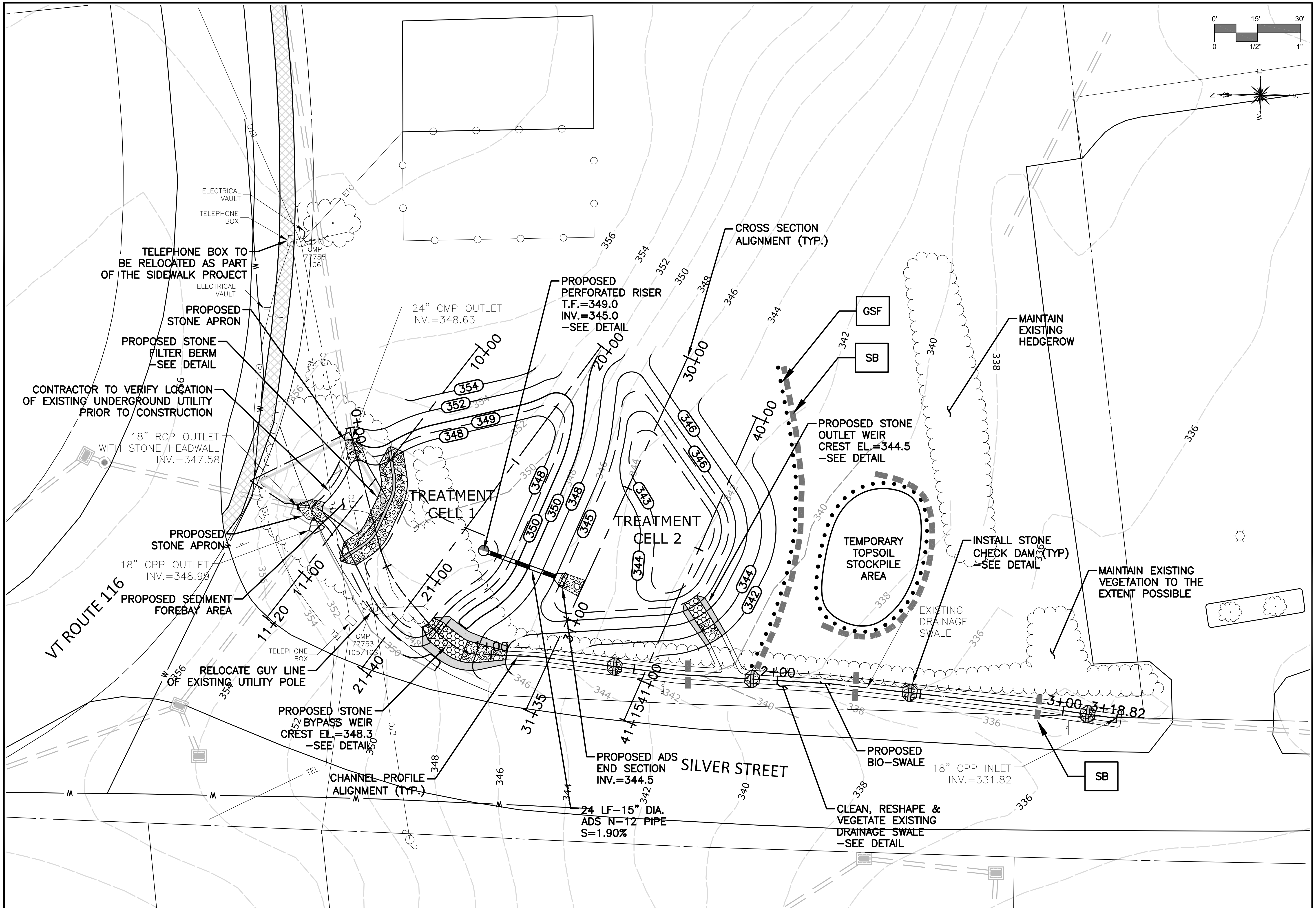
SCALE: 1"=30'

DATE: JUNE 3, 2014

PROJECT NO.: 3452-19-1

SHEET NO.: EX1

Drawing: W:\DESIGN\3452-19-DE\CAD\SS-EXCOND.DWG Layout Tab:EX1
Plotted by: BRIANC On this date: Tue, 2014 June 3 - 3:12pm



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REVISIONS

FINAL DESIGN

SITE PLAN - PROPOSED CONDITIONS

SILVER STREET RAIN GARDEN

SILVER STREET
HINESBURG, VERMONT

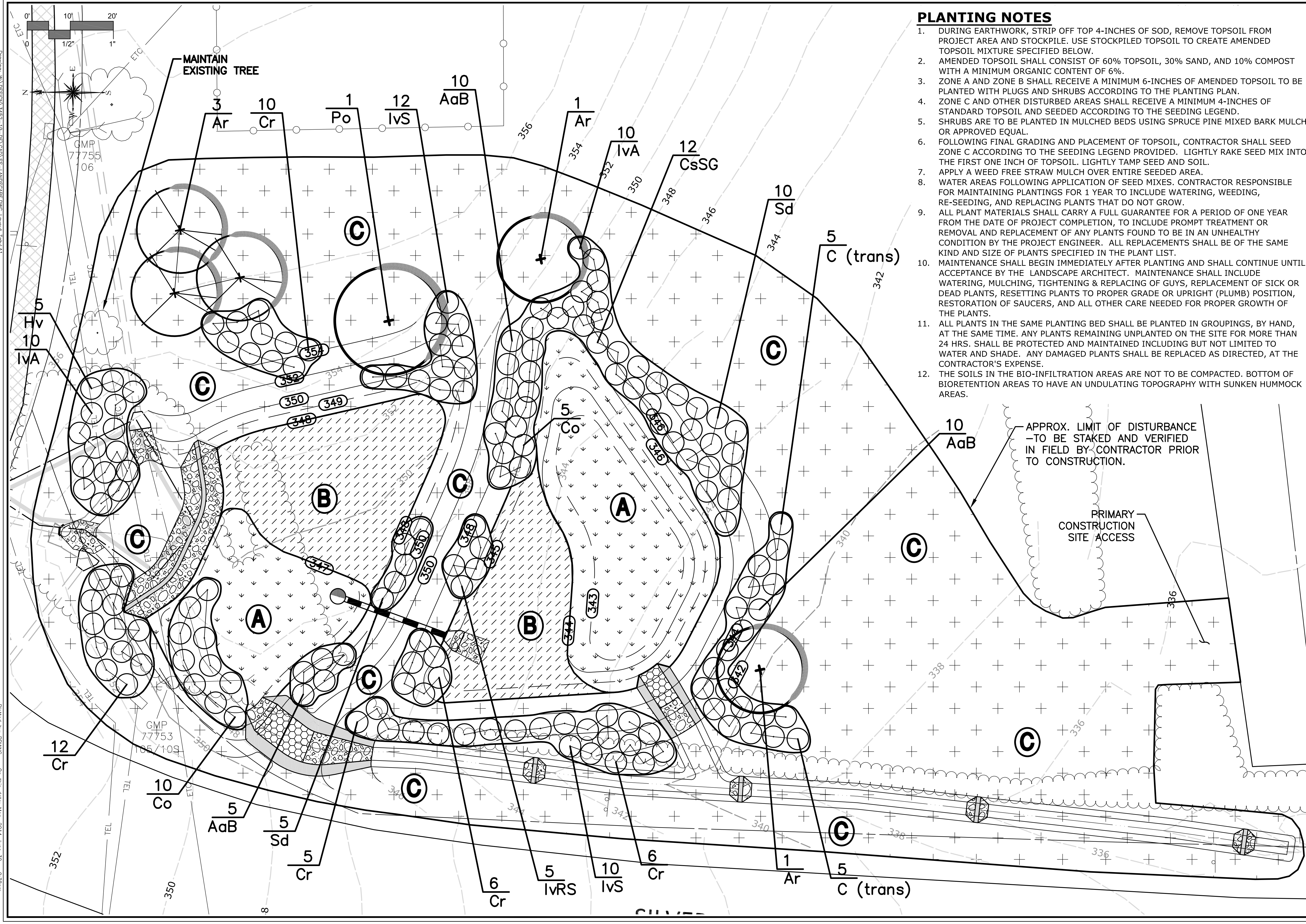
BMC	BMC	RKS
DESIGNED	DRAWN	CHECKED

1"=30'
SCALE

JUNE 3, 2014
DATE

3452-19-1
PROJECT NO.

PR1
SHEET NO.



PLANTING NOTES

1. DURING EARTHWORK, STRIP OFF TOP 4-INCHES OF SOD, REMOVE TOPSOIL FROM PROJECT AREA AND STOCKPILE. USE STOCKPILED TOPSOIL TO CREATE AMENDED TOPSOIL MIXTURE SPECIFIED BELOW.
2. AMENDED TOPSOIL SHALL CONSIST OF 60% TOPSOIL, 30% SAND, AND 10% COMPOST WITH A MINIMUM ORGANIC CONTENT OF 6%.
3. ZONE A AND ZONE B SHALL RECEIVE A MINIMUM 6-INCHES OF AMENDED TOPSOIL TO BE PLANTED WITH PLUGS AND SHRUBS ACCORDING TO THE PLANTING PLAN.
4. ZONE C AND OTHER DISTURBED AREAS SHALL RECEIVE A MINIMUM 4-INCHES OF STANDARD TOPSOIL AND SEEDED ACCORDING TO THE SEEDING LEGEND.
5. SHRUBS ARE TO BE PLANTED IN MULCHED BEDS USING SPRUCE PINE MIXED BARK MULCH OR APPROVED EQUAL.
6. FOLLOWING FINAL GRADING AND PLACEMENT OF TOPSOIL, CONTRACTOR SHALL SEED ZONE C ACCORDING TO THE SEEDING LEGEND PROVIDED. LIGHTLY RAKE SEED MIX INTO THE FIRST ONE INCH OF TOPSOIL. LIGHTLY TAMP SEED AND SOIL.
7. APPLY A WEED FREE STRAW MULCH OVER ENTIRE SEEDED AREA.
8. WATER AREAS FOLLOWING APPLICATION OF SEED MIXES. CONTRACTOR RESPONSIBLE FOR MAINTAINING PLANTINGS FOR 1 YEAR TO INCLUDE WATERING, WEEDING, RE-SEEDING, AND REPLACING PLANTS THAT DO NOT GROW.
9. ALL PLANT MATERIALS SHALL CARRY A FULL GUARANTEE FOR A PERIOD OF ONE YEAR FROM THE DATE OF PROJECT COMPLETION, TO INCLUDE PROMPT TREATMENT OR REMOVAL AND REPLACEMENT OF ANY PLANTS FOUND TO BE IN AN UNHEALTHY CONDITION BY THE PROJECT ENGINEER. ALL REPLACEMENTS SHALL BE OF THE SAME KIND AND SIZE OF PLANTS SPECIFIED IN THE PLANT LIST.
10. MAINTENANCE SHALL BEGIN IMMEDIATELY AFTER PLANTING AND SHALL CONTINUE UNTIL ACCEPTANCE BY THE LANDSCAPE ARCHITECT. MAINTENANCE SHALL INCLUDE WATERING, MULCHING, TIGHTENING & REPLACING OF GUYS, REPLACEMENT OF SICK OR DEAD PLANTS, RESETTING PLANTS TO PROPER GRADE OR UPRIGHT (PLUMB) POSITION, RESTORATION OF SAUCERS, AND ALL OTHER CARE NEEDED FOR PROPER GROWTH OF THE PLANTS.
11. ALL PLANTS IN THE SAME PLANTING BED SHALL BE PLANTED IN GROUPINGS, BY HAND, AT THE SAME TIME. ANY PLANTS REMAINING UNPLANTED ON THE SITE FOR MORE THAN 24 HRS. SHALL BE PROTECTED AND MAINTAINED INCLUDING BUT NOT LIMITED TO WATER AND SHADE. ANY DAMAGED PLANTS SHALL BE REPLACED AS DIRECTED, AT THE CONTRACTOR'S EXPENSE.
12. THE SOILS IN THE BIO-INFILTRATION AREAS ARE NOT TO BE COMPACTED. BOTTOM OF BIORETENTION AREAS TO HAVE AN UNDULATING TOPOGRAPHY WITH SUNKEN HUMMOCK AREAS.

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REVISIONS

FINAL DESIGN

SITE PLAN - PROPOSED LANDSCAPING

SILVER STREET RAIN GARDEN

SILVER STREET
HINESBURG, VERMONT

AM/BC	BMC	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=20'

DATE: JUNE 3, 2014

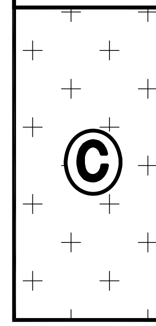
PROJECT NO.: 3452-19-1

SHEET NO.: **LA1**

PLANTING LIST

	Quanity	Botanical Name	Common Name	Size
Trees and Shrubs	**5**	Acer rubrum	Red Maple	$1\ ^3/_4$" - 2"
	30	Aronia arbutifolia Brilliantissiam	Red Chokeberry	3 gal
	15	Cephalanthus occidentalis	Buttonbush	3 gal
	30	Clethra alnifolia	Summersweet	3 gal
	15	Cornus racemosa	Gray Dogwood	3 gal
	5	Cornus serica Silver and Gold	Variegated Yellow Dogwood	3 gal
	15	Hamamelis virginiana	Witch Hazel	3 gal
	10	Ilex verticilata Afterglow	Winterberry	3 gal
	15	Ilex verticilata Berry Heavy	Winterberry	3 gal
	5	Ilex vercilata Red Sprite	Winterberry	3 gal
	20	Ilex vericilata Jim Dandy	Winterberry	3 gal
Zone A	**300**	Acorus americanus	Sweetflag	2" plug
	300	Carex vulphinoidea	Fox Sedge	2" plug
	400	Caltha palustis	Marsh Marigold	2" plug
	350	Juncus effusus	Common Rush	2" plug
	300	Iris versicolor	Blue Flag Iris	2" plug
Zone B	**25**	Amsonia tabernaemontana	Blue Star Flower	4" pot
	200	Asclepias incarta	Swamp Milkweed	2" plug
	50	Aster nova angliae	New England Aster	2" plug
	25	Baptisia australis	False Blue Indigo	4" pot
	25	Boltonia asteroides	Bolton's Aster	4" pot
	150	Chelone glabra	Turtlehead	2" plug
	150	Eupatorium maculatum	Joe Pye Weed	2" plug
	150	Lobelia cardinalis	Cardinal l Flower	2" plug
	150	Lobelia siphilitica	Blue Lobelia	2" plug
	25	Monarda	Bee Balm	4" pot
	150	Osmunda cinnamomea	Cinnamon Fern	Bareroot
	100	Symphyotrichum nova angliae	New England Aster	2" plug
	50	Verbena hastq	Blue Vervain	2" plug
	25	Veronicastrum virginicum	Culver's Root	4" pot

SEEDING LEGEND



ZONE C - RAIN GARDEN FRINGE, RESHAPED SWALE & DISTURBED AREAS

CONSERVATION GRASS SEED MIX

SEED MIX PER VERMONT WETLAND PLANT SUPPLY OR APPROVED EQUAL. SEED RAIN GARDEN FRINGE AND SIDE SLOPES, ALONG RESHAPED SWALE, AND ALL DISTURBED AREAS AS SHOWN. BEST RESULTS ARE OBTAINED WITH AN EARLY SPRING SEEDING. SUMMER SEEDING CAN BE SUCCESSFUL WITH A LIGHT MULCH OF WEED FREE STRAW TO CONSERVE MOISTURE. LATE FALL AND WINTER DORMANT SEEDING REQUIRES A SLIGHT INCREASE IN SEEDING RATE. FERTILIZATION IS NOT REQUIRED UNLESS SOILS ARE PARTICULARLY INFERTILE.
APPLICATION RATE: 20 LBS/ARCE

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REVISIONS

FINAL DESIGN

PLANTING LIST AND SEED MIX

SILVER STREET RAIN GARDEN

SILVER STREET
HINESBURG, VERMONT

DESIGNED	DRAWN	CHECKED
AM/BC	BMC	RKS

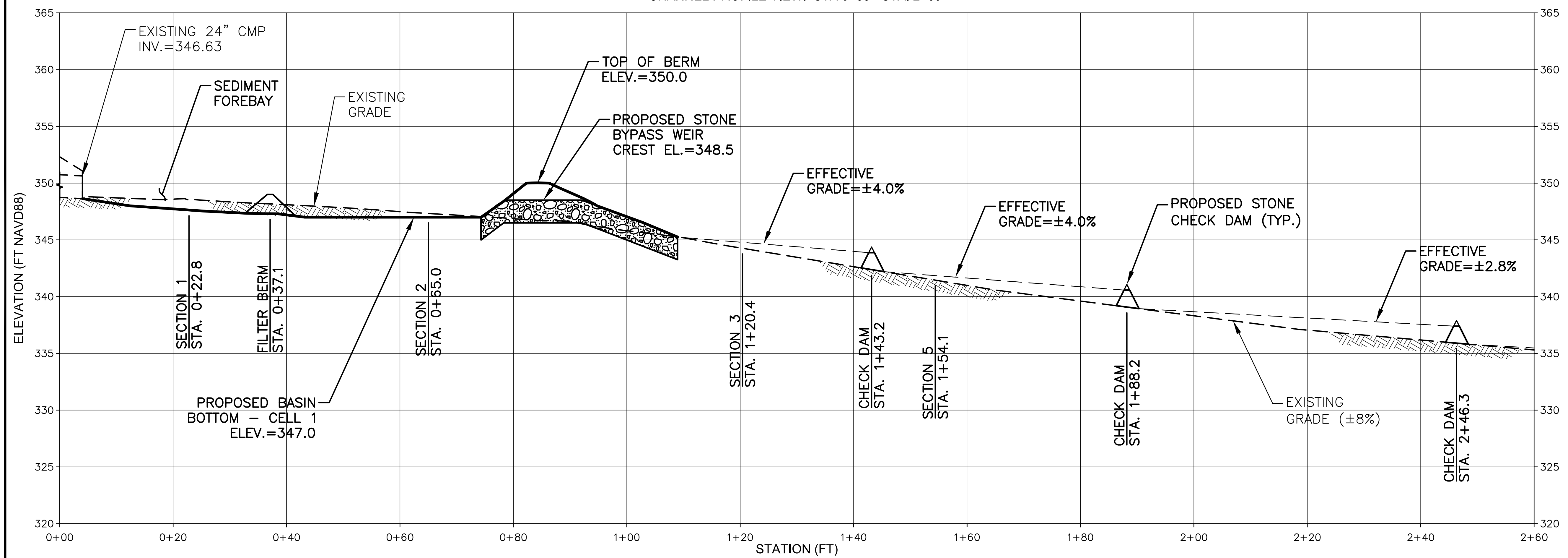
SCALE: AS SHOWN

DATE: JUNE 3, 2014

PROJECT NO.: 3452-19-1

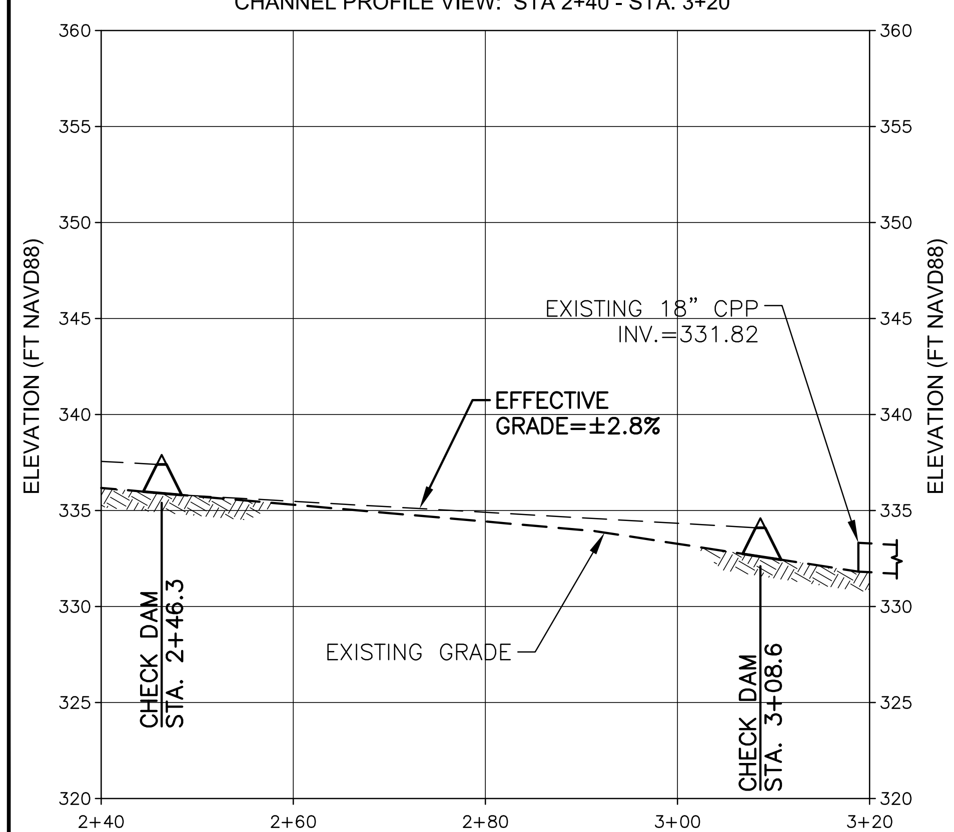
SHEET NO.: LA2

CHANNEL PROFILE VIEW: STA 0+00 - STA. 2+60



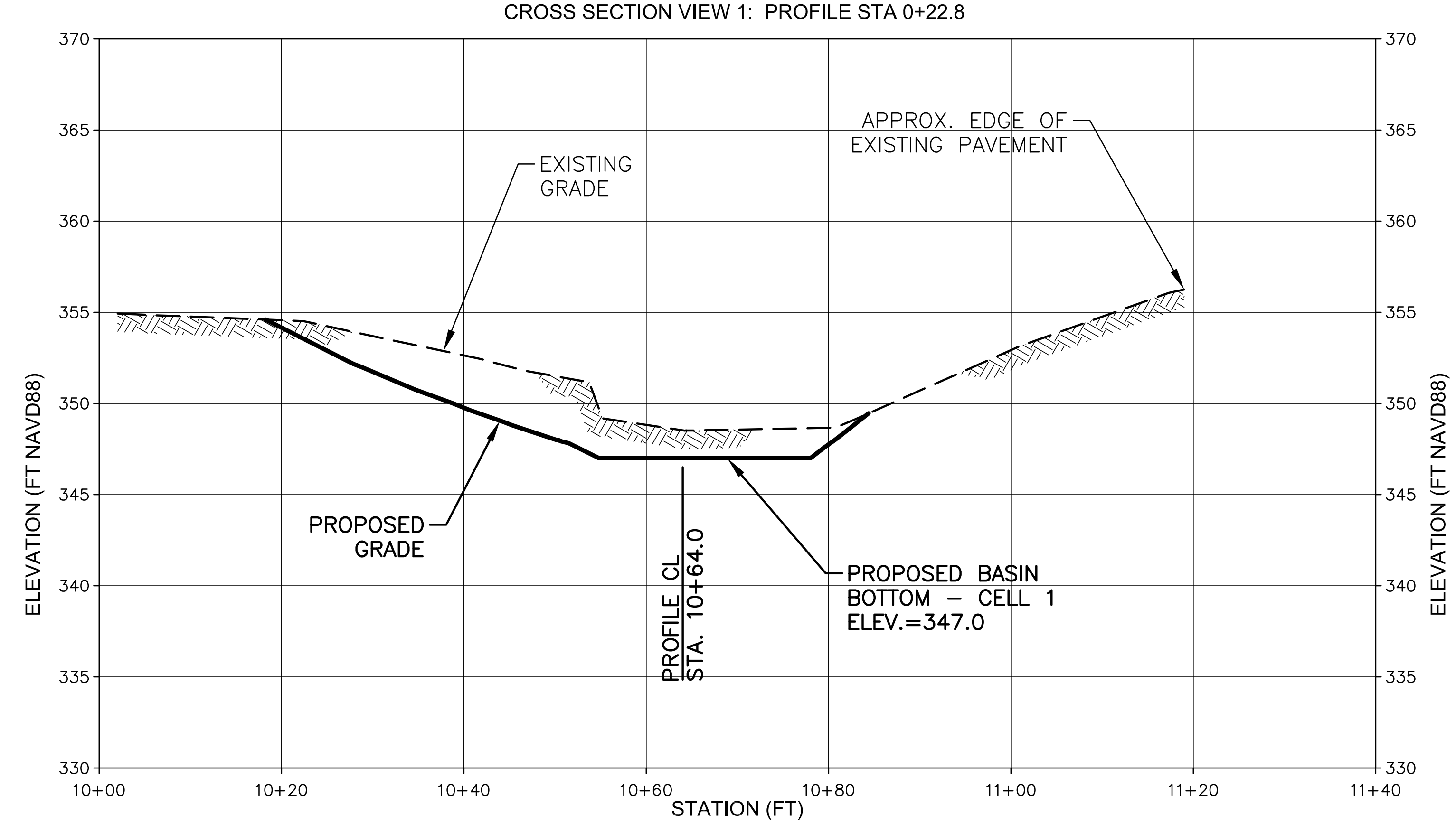
1"=30' H : 1"=15' V

CHANNEL PROFILE VIEW: STA 2+40 - STA. 3+20

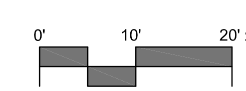


1"=30' H : 1"=15' V

CROSS SECTION VIEW 1: PROFILE STA 0+22.8



1"=20' H : 1"=10' V



SCALE 1" = 20'H
1" = 10'V

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REVISIONS

FINAL DESIGN

CHANNEL PROFILE & CROSS SECTIONS

SILVER STREET RAIN GARDEN

**SILVER STREET
HINESBURG, VERMONT**

DESIGNED	DRAWN	CHECKED
BMC	BMC	RKS

SCALE: AS SHOWN

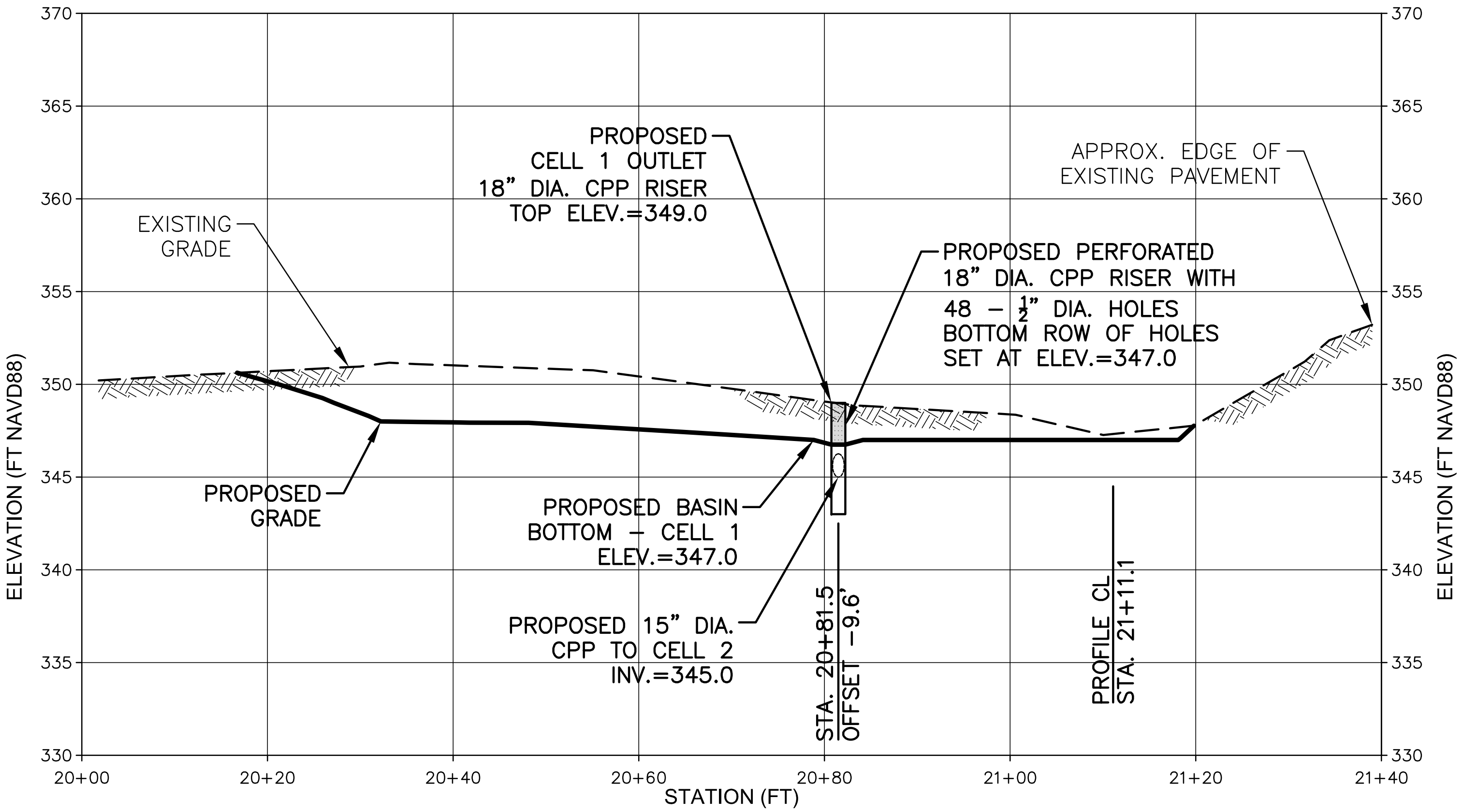
DATE: JUNE 3, 2014

PROJECT NO.: 3452-19-1

SHEET NO.: **XS1**

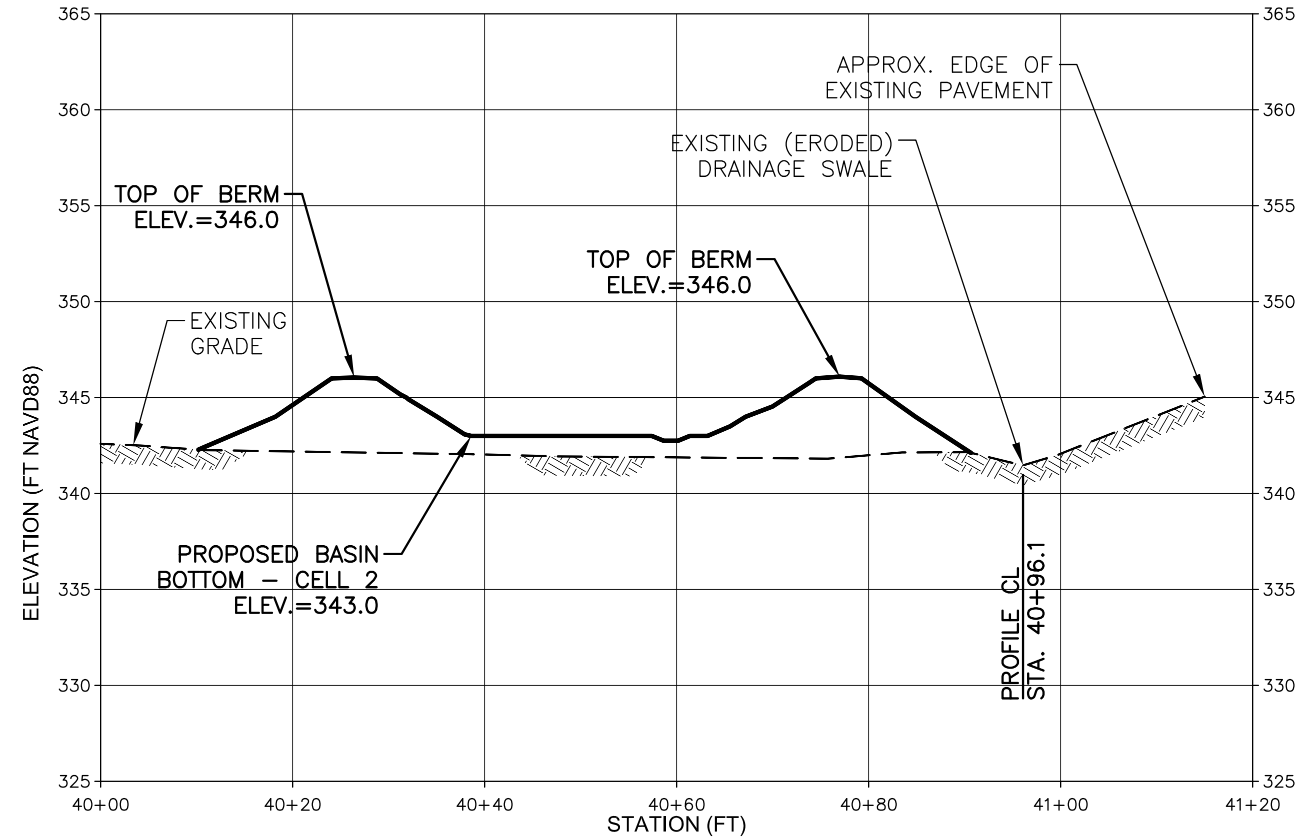
Drawing: W:\DESIGN\3452-19-DE\CAD\SS-XSECTION.DWG Layout Tab:XS2

CROSS SECTION VIEW 2: PROFILE STA 0+65.0



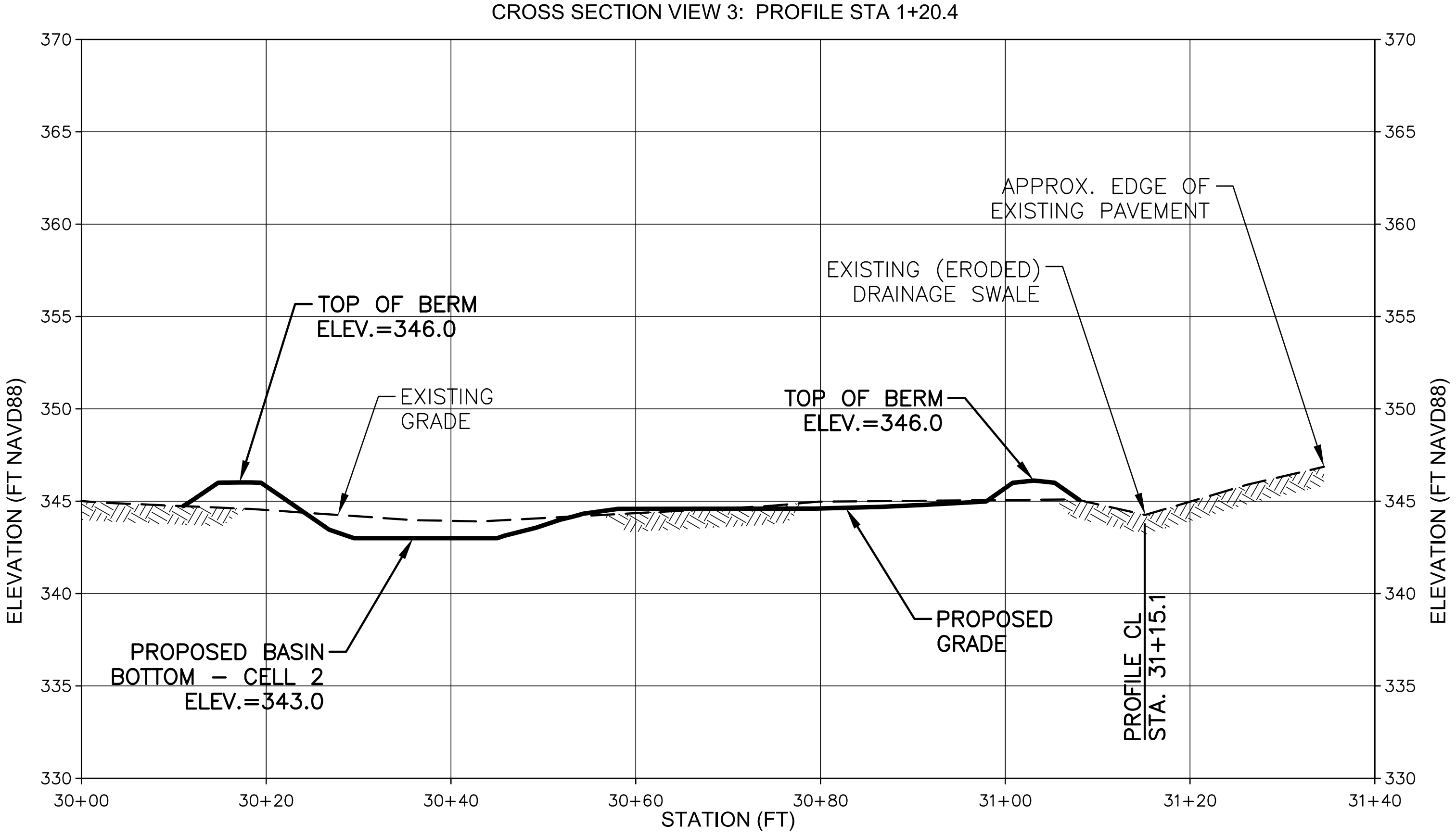
1"=20' H : 1"=10' V

CROSS SECTION VIEW 4: PROFILE STA 1+54.1

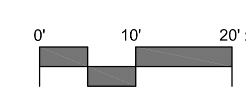


1"=20' H : 1"=10' V

CROSS SECTION VIEW 3: PROFILE STA 1+20.4



1"=20' H : 1"=10' V



SCALE 1" = 20'H
1" = 10'V

Plotted by: BRIANC On this date: Tue, 2014 June 3 - 3:27pm

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REVISIONS

FINAL DESIGN

CROSS SECTIONS

SILVER STREET RAIN GARDEN

SILVER STREET
HINESBURG, VERMONT

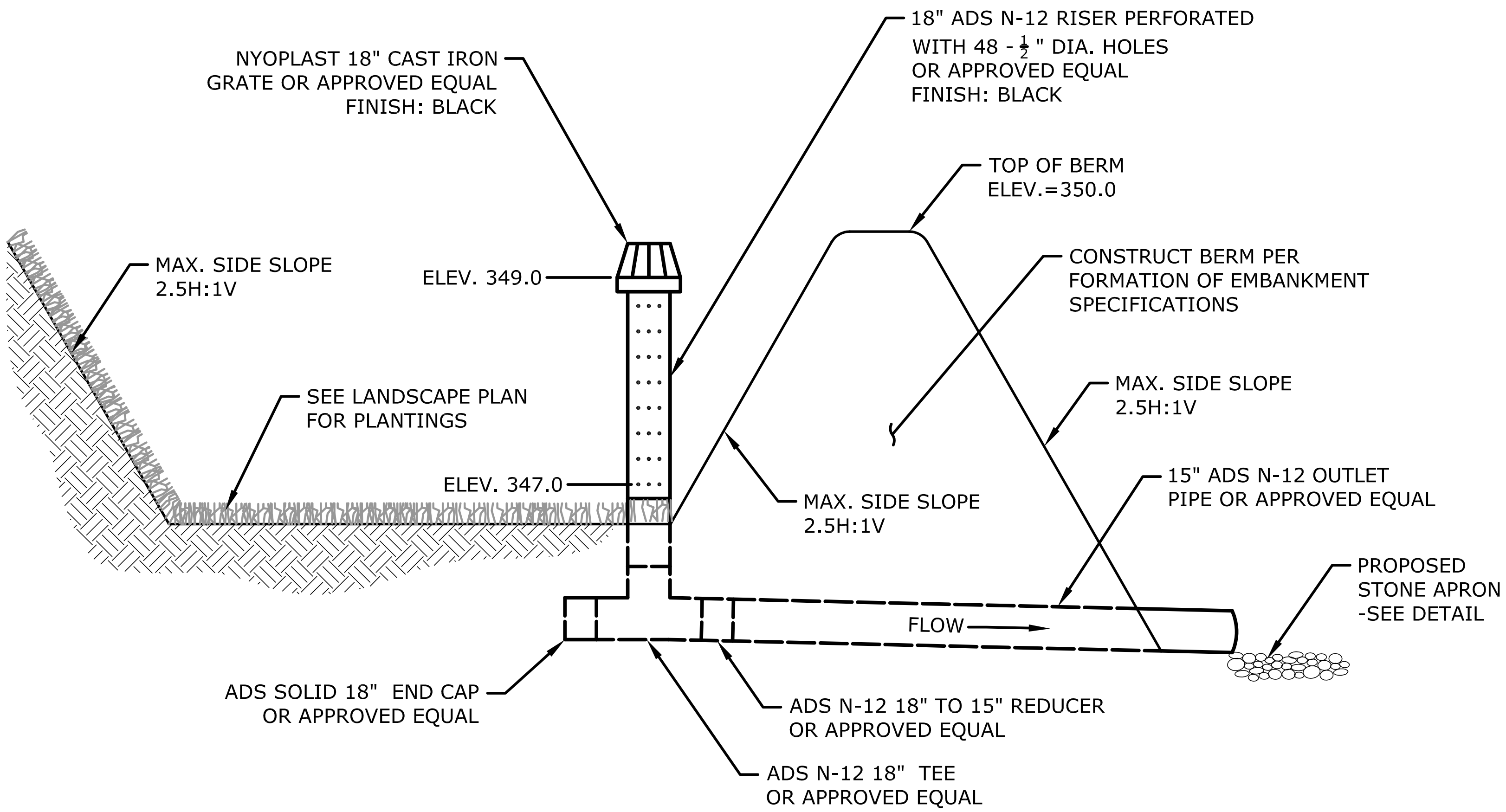
BMC	BMC	RKS
DESIGNED	DRAWN	CHECKED

AS SHOWN
SCALE

JUNE 3, 2014
DATE

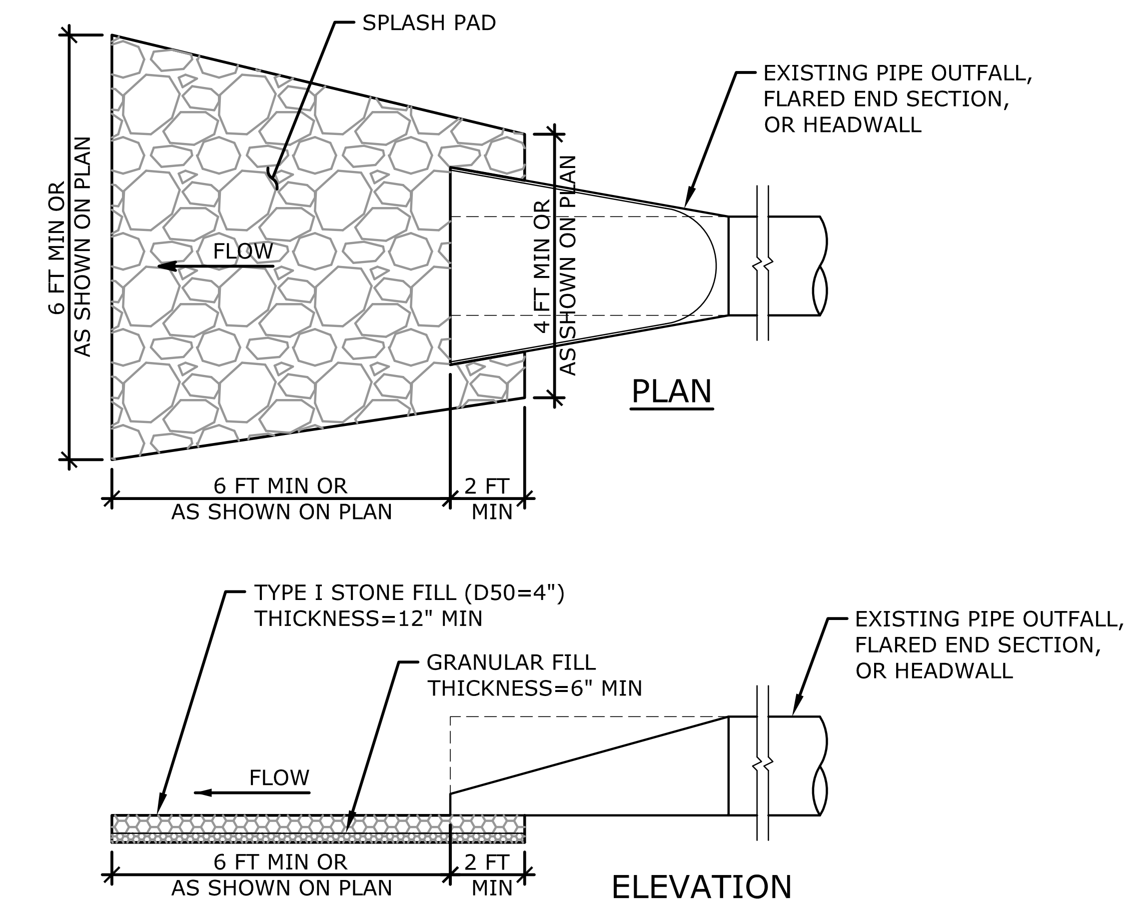
3452-19-1
PROJECT NO.

XS2
SHEET NO.



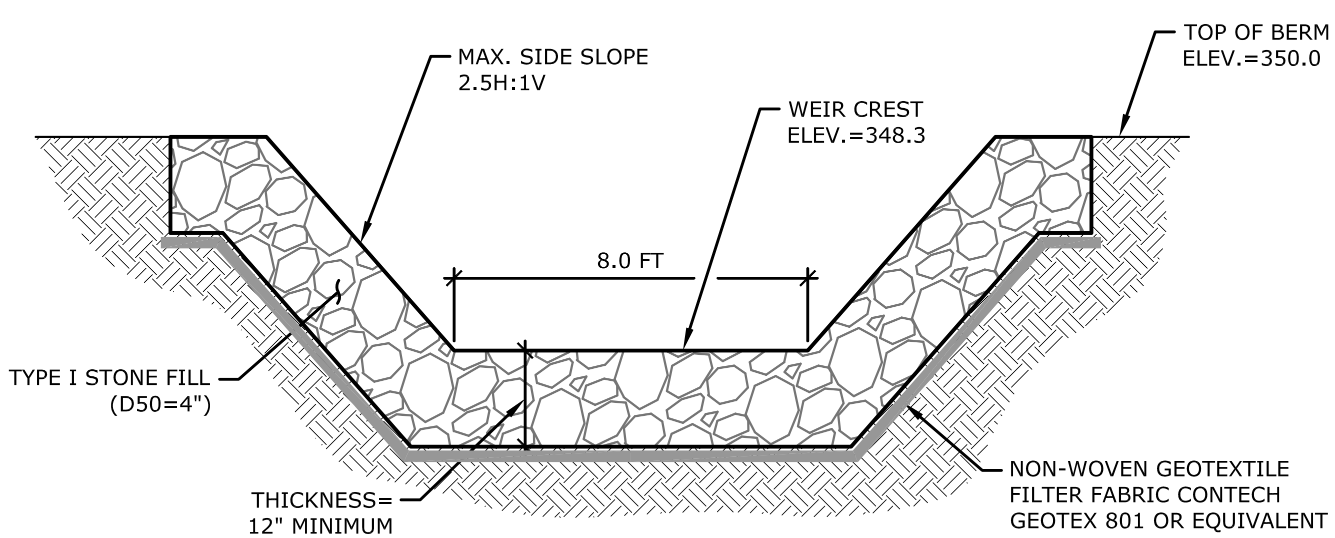
PERFORATED RISER OUTLET

N.T.S.



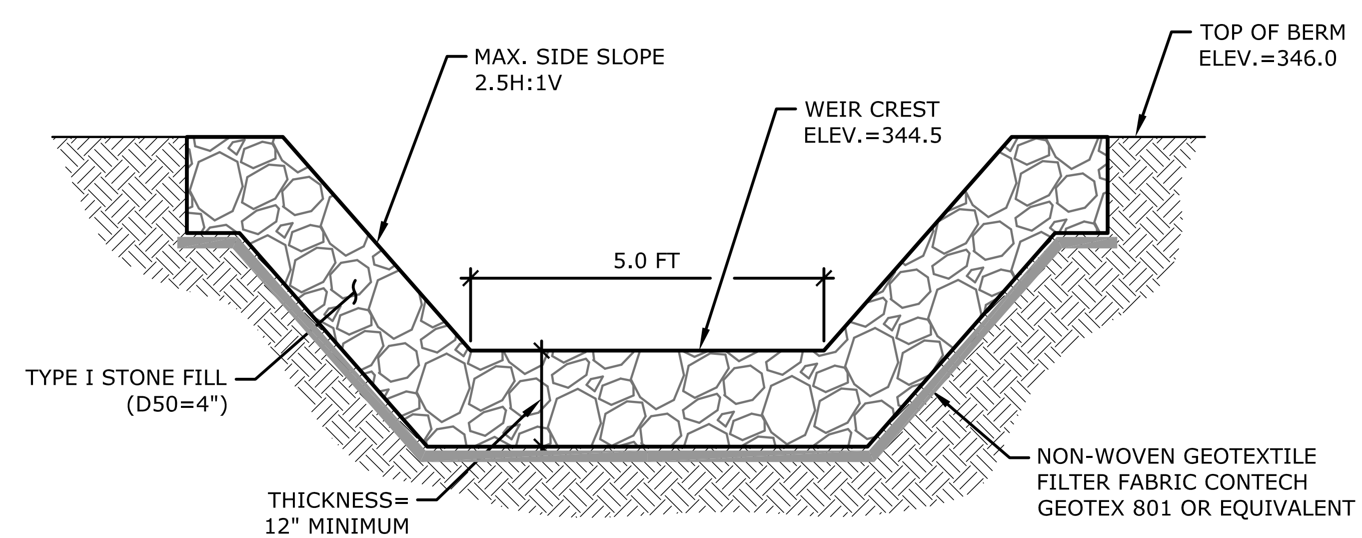
STONE SPLASH PAD

N.T.S.



STONE BYPASS WEIR

N.T.S.



STONE OUTLET WEIR

N.T.S.

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REVISIONS

FINAL DESIGN

SITE DETAILS

SILVER STREET RAIN GARDEN

SILVER STREET
HINESBURG, VERMONT

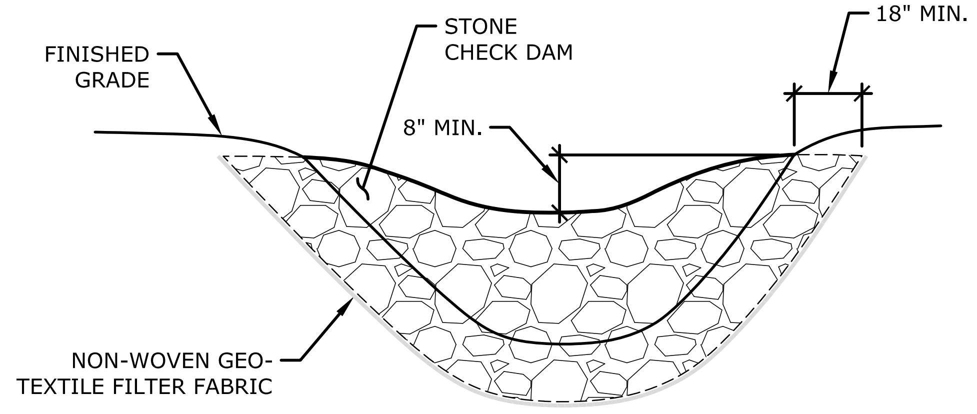
BMC	BMC	RKS
DESIGNED	DRAWN	CHECKED

AS SHOWN
SCALE

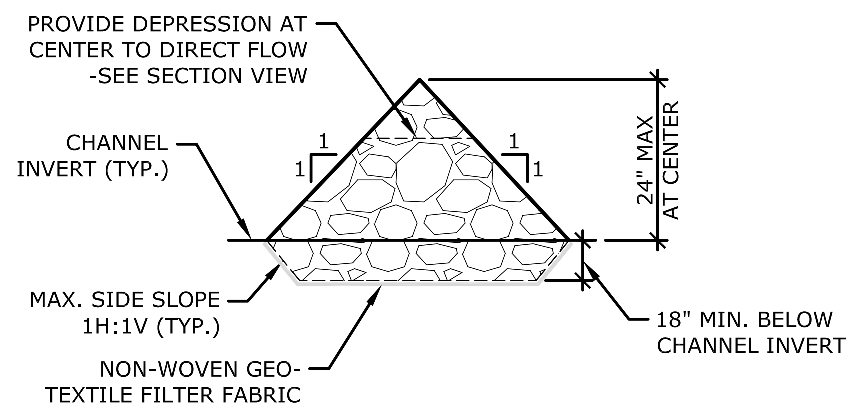
JUNE 3, 2014
DATE

3452-19-1
PROJECT NO.

SD1
SHEET NO.



SECTION VIEW



ELEVATION VIEW

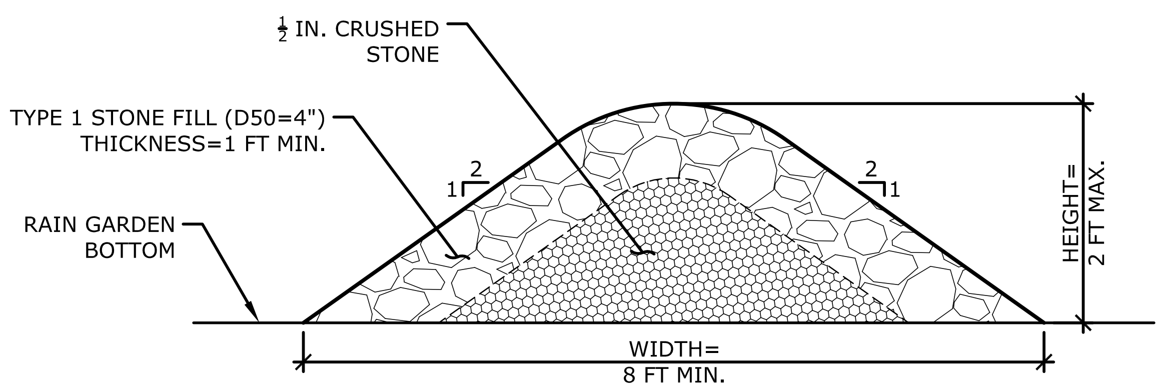
NOTES:
EXTEND THE STONE A MINIMUM OF 18 INCHES BEYOND THE BANKS AND CHANNEL INVERT OF THE SWALE TO PREVENT CUTTING AROUND THE ENDS OF OR UNDERNEATH THE CHECK DAM.

USE TYPE 1 STONE FILL (D50=4") TO CREATE CHECK DAM. USE ½ INCH CRUSHED STONE TO CREATE THE CUTOFF TRENCH.

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

N.T.S.

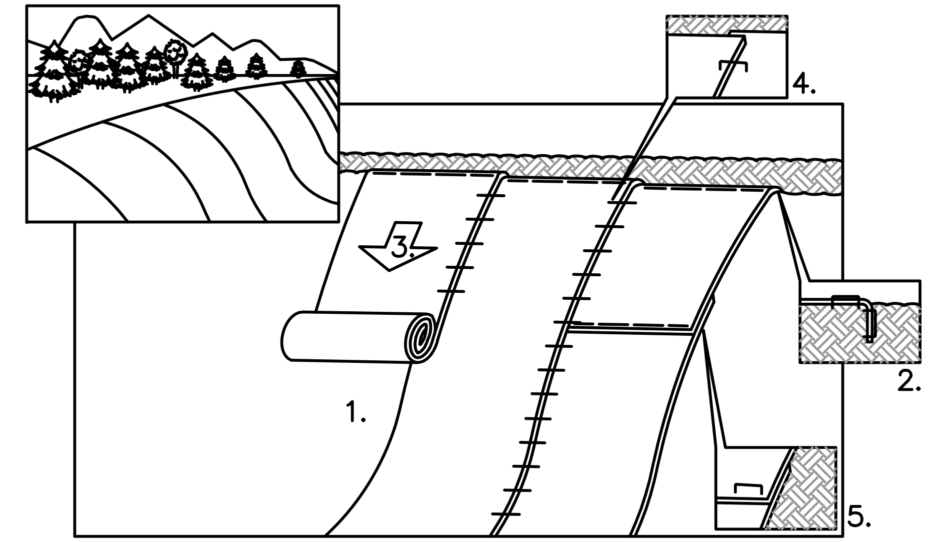


CROSS SECTION

NOTES:
EXTEND THE STONE A MINIMUM OF 18 INCHES BEYOND THE BANKS OF THE RAIN GARDEN TO PREVENT CUTTING AROUND THE ENDS OF THE FILTER BERM.

STONE FILTER BERM

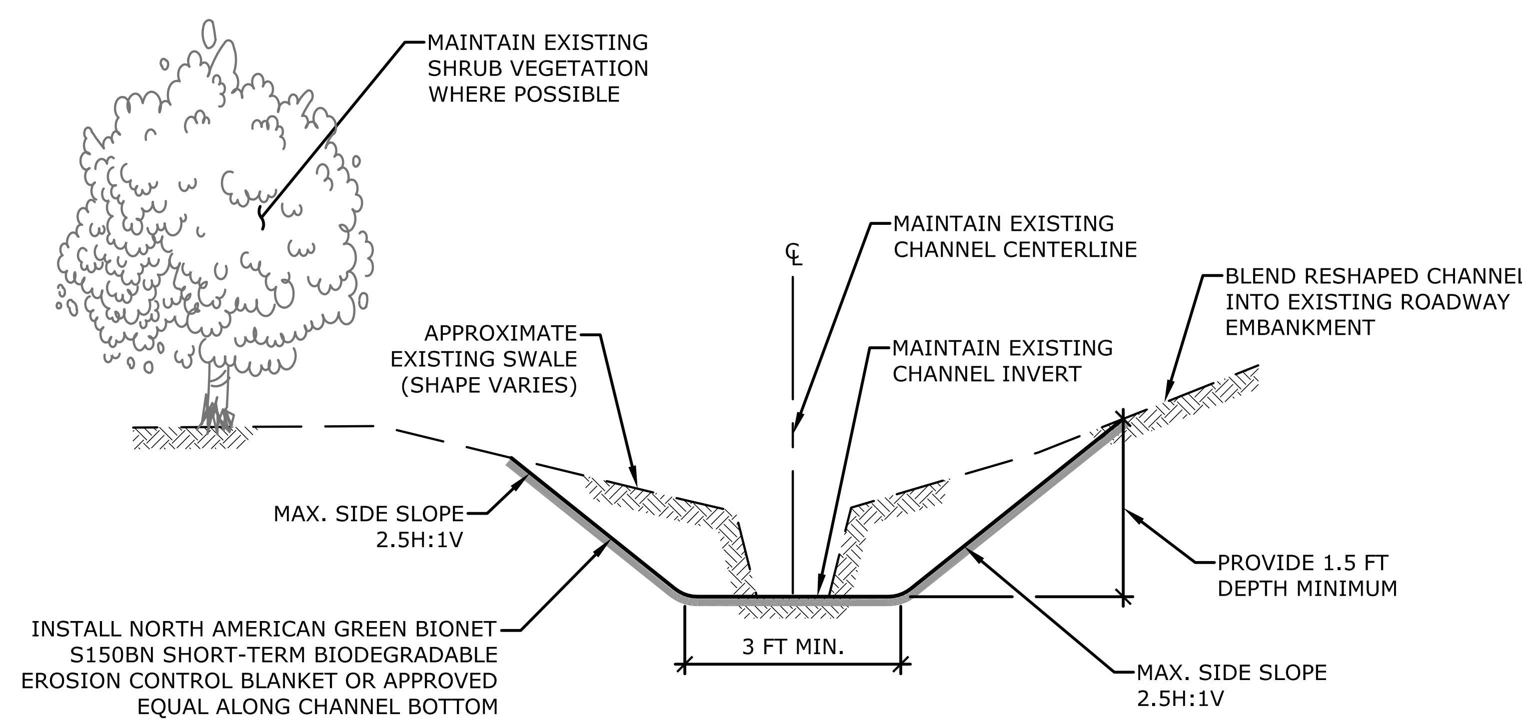
N.T.S.



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. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF AMENDED SOIL AND SEED.
3. BEGIN AT TOP OF SLOPE BY ANCHORING THE BLANKET IN A 6" DEEP BY 6: WIDE TRENCH. BACKFILL AND COMPACT BEFORE STAPLING.
4. ROLL BLANKETS DOWN SLOPE IN DIRECTION OF WATER FLOW.
5. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2" OVERLAP.
6. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS OVER END (SHINGLE STYLE) WITH APPROXIMATELY 6" OVERLAP. STAPLE THROUGH OVERLAP AREA, APPROXIMATELY 12' APART.
7. REFER TO GENERAL STAPLE PATTERN GUIDE IN "NORTH AMERICAN GREEN" CATALOGUE OR WEBSITE FOR CORRECT STAPLE PATTERN.

EROSION CONTROL BLANKET

N.T.S.



RESHAPED BIO–SWALE

N.T.S.

REVISIONS

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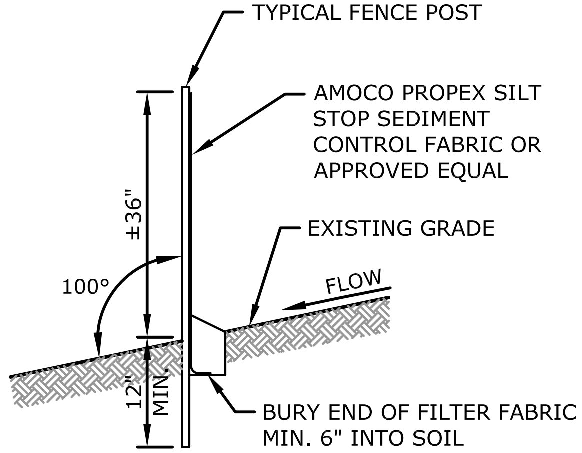
FINAL DESIGN

SITE DETAILS
SILVER STREET RAIN GARDEN
SILVER STREET
HINESBURG, VERMONT

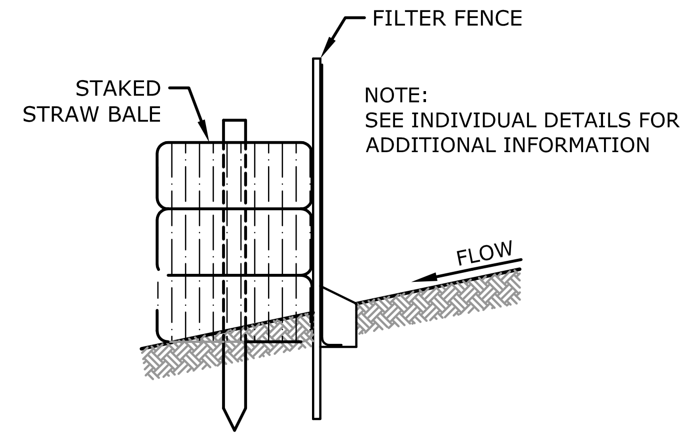
BMC DESIGNED	BMC DRAWN	RKS CHECKED

SCALE: AS SHOWN
DATE: JUNE 3, 2014
PROJECT NO.: 3452-19-1
SHEET NO.: SD2



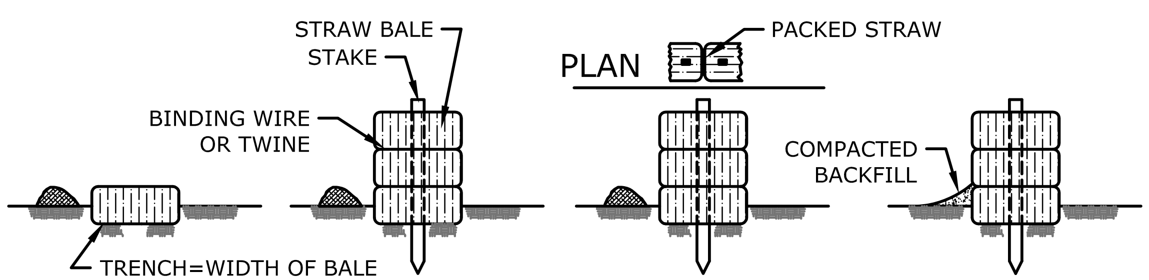
SEDIMENT FILTER FENCE (GSF)

NOT TO SCALE



SEDIMENT FILTER FENCE & STRAW BALE (GSF) (SB)

NOT TO SCALE



1.) EXCAVATE A TRENCH 4" DEEP AND THE WIDTH OF A STRAW BALE.

2.) PLACE AND STAKE STRAW BALES, TWO STAKES PER BALE.

3.) WEDGE LOOSE STRAW BETWEEN BALES TO CREATE A CONTINUOUS BARRIER.

4.) BACKFILL AND COMPACT THE EXCAVATED SOIL AS SHOWN ON THE UPHILL SIDE OF THE BARRIER TO PREVENT PIPING.

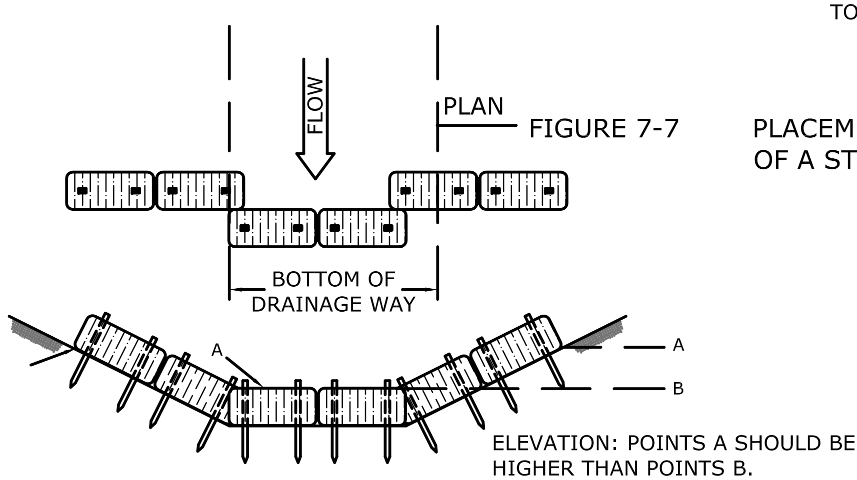


FIGURE 7-7

PLACEMENT AND CONSTRUCTION OF A STRAW BALE BARRIER

PLACEMENT & CONSTRUCTION OF A STRAW BALE BARRIER (SB)

NOT TO SCALE

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REVISIONS

FINAL DESIGN

SEDIMENT & EROSION CONTROL DETAILS

SILVER STREET RAIN GARDEN

SILVER STREET
HINESBURG, VERMONT

BMC	BMC	RKS
DESIGNED	DRAWN	CHECKED

SCALE: AS SHOWN

DATE: JUNE 3, 2014

PROJECT NO.: 3452-19-1

SHEET NO.: SD3

TECHNICAL MEMORANDUM

TO: Lewis Creek Association

FROM: Milone & MacBroom, Inc.

DATE: December 30, 2014

RE: Silver Street Rain Garden (PM 8a)
MMI# 3452-19
Stormwater Treatment Project Implementation in the LaPlatte River Corridor
2014 Ecosystem Restoration Grant (ERP-2-14.1)

The following narrative describes the design basis and implementation of the bio-retention basin known locally as the Silver Street Rain Garden. The rain garden was constructed at the southeast corner of VT Route 116 and Silver Street in the Town of Hinesburg. The stormwater treatment project represents the culmination of the work completed in an initial Town-wide hydrology study completed in 2011 and 2012.

Final Design

Field survey was conducted by Milone & MacBroom, Inc. in December 2013 and January 2014 prior to advancing design. The survey collected along with supplemental data such as Chittenden County LiDAR, GIS Shapefiles, aerial photos, and VT Route 116 Sidewalk design plans were used to create a base map of existing conditions. Information regarding data used to create the base map is provided in the final plan set (attached).

The rain garden was designed to fit within the Town-owned sloping site along Silver Street between an existing drainage swale and the Hinesburg Masonic Lodge Building. The site was selected because it is the location of three storm drainage outfalls that drain a portion of the Village where impervious surfaces exist. Prior to constructing the rain garden, runoff from the three outfalls was conveyed to the Laplatte River by an existing drainage swale with little treatment.

The rain garden was designed in a two-tiered configuration and is capable of storing a total of approximately 13,000 cubic feet (0.3 acre-feet) covering an area approximately 100 feet wide by 170 feet long. Both treatment cells were planted with select herbaceous plants and shrubs based on their anticipated moisture levels.

The upper treatment cell was designed to collect all of the stormwater from the existing drainage outfalls, transfer stormwater to the lower treatment cell using a perforated riser structure, and bypass larger storms to the swale along Silver Street. The roadside swale was reshaped, re-vegetated, and stone check dams were installed as part of the overall project. A sediment forebay was incorporated into the upper cell using a stone filter berm allowing course sediment and debris to settling at the drainage outfalls where routine maintenance can be performed.

The lower treatment cell was designed as a bio-retention basin allowing stormwater to pond a maximum of 18 inches before discharging through a stone outlet weir. A bio-retention configuration provides the greatest opportunity for stormwater to infiltrate, evaporate, or be utilized by the plants. If stormwater runoff discharges from the stone outlet, it is conveyed by the re-shaped vegetated swale along Silver Street to the Laplatte River.

A detailed landscaping plan was developed for both the upper and lower treatment cells. Two planting zones were outlined on the landscaping plan based on the anticipated depth of flooding and level of moisture. The herbaceous plants were primarily installed along the bottom of the treatment cells, while shrubs were placed along the side slopes of the rain garden. All additional disturbed areas were planted with a conservation grass seed mix.

The design of the rain garden is based on the Water Quality Volume (WQv) as outlined in the Vermont Stormwater Management Manual. The primary design goal is to capture the runoff from a 1-inch rainfall event, which generally represents 90 percent of the rainfall events occurring annually. Treatment objectives are to remove 80% of the average annual total suspended solids (TSS) and to remove 40% of the total phosphorus (TP) load present in the contributing stormwater runoff.

The WQv was calculated using the drainage area contributing to the rain garden and the percent impervious of the sub-watershed. The sub-watershed contributing to the rain garden is approximately 6.7 acres containing about 2.6 acres of impervious surface or 39% of the contributing area. The watershed draining to the rain garden generally collects an area extending to the south of Papa Nick's and north to St. Jude's Church (Figure 1).

Figure 1: Map of the 6.7-acre drainage area in Hinesburg Village

The WQv was calculated as 0.38 acre-feet. The perforated riser structure provided in upper treatment cell was designed to transfer a maximum of 0.38 acre-feet to the lower treatment cell while maintaining 1 foot of freeboard. Excess stormwater is bypassed to the roadside swale along Silver Street through the stone bypass weir. The bypass weir is designed to activate during a 1-year storm event equal to a 2.1-inch rainfall over a 24-hour period. The design of the rain garden and its outlets was conducted using *Hydraflow Hydrographs Extension for AutoCAD Civil3D 2014 version 10.3*. The software was used to determine the peak flow rates entering the rain garden and design the hydraulic capacity of the riser structure and bypass weir in the upper treatment cell, as well as the overflow outlet in the lower treatment cell.

Implementation

Construction of the Silver Street Rain Garden began during the first week of September 2014. The project was constructed using work crews from the Hinesburg Public Works Department and Distinctive Landscaping of Charlotte, VT. Hinesburg Public Works provided in-kind services by preparing the project site, rough grading and shaping of the treatment cells, and re-shaping of the existing drainage swale.

Distinctive Landscaping was contracted to install the various outlets and erosion control measures, complete finish grading, place and amend topsoil as needed, install the herbaceous plants and shrubs, and recover the site. Milone & MacBroom, Inc. was tasked with providing construction oversight. Site visits were conducted throughout construction to provide stakeout of proposed grades and rain garden features, as well as to guide work crews. Oversight reports were prepared and provided to the Lewis Creek Association and the project team throughout the construction period.

The rain garden was successfully constructed following the final plans. The final dimensions and elevations of the treatment cells and outlets will allow the rain garden to function as designed. A final site walk was conducted with the Lewis Creek Association, Town of Hinesburg, and Distinctive Landscaping on October 3, 2014 (Figures 2-5). The majority of the plantings began to grow following construction before the arrival of winter. All of the herbaceous plants and shrubs were planted in accordance with the final design plans. The five (5) trees that were originally planned for along the edges of the rain garden were not planted due to lack of funding. Additional funding is being sought for the trees, a bench, and an informational placard to be placed along the edge of the rain garden.

During the earthwork and rough grading phase of the project, some compacted fill, stumps, and debris were uncovered while excavating the upper treatment cell. Some minor adjustments to the shape of the upper treatment cell were made to avoid having to remove this material.

An effort was made to avoid soil compaction during construction, yet some compaction took place within the footprint of the lower treatment cell due to moving of excavated material with heavy equipment. The area was rototilled when finishing construction to help loosen the soils for planting and to restore infiltration.

Initially, the source of irrigation water for the plantings was to run several hundred feet of hose from the front entrance of the nearby elementary school to the rain garden. This watering option did not work well since the hoses had to be removed each day so that the school could be locked and irrigation was not possible on weekends since the school was closed. As an alternative, connection to a nearby hydrant was explored but not allowed. Ultimately, the solution was to withdraw water from the LaPlatte River to water the plantings using a pump placed under the Silver Street Bridge. The Vermont Agency of Natural Resources confirmed that a small water withdrawal was allowed as long as the flow rate was limited to 15 gallons per minute.

Figure 2: View of completed rain garden treatment cells from Silver Street. Irrigation sprinkler operating in lower cell, and water supply hose visible along the reshaped drainage swale in the foreground. Stone outlet from lower treatment cell and stone check dam visible in the left portion of the photo.

Figure 3: View of completed lower treatment cell.

Figure 4: View of completed upper treatment cell.

Figure 5: View of completed rain garden treatment cells from the school parking lot / site access point. Erosion control matting used to recover the site visible in the foreground.

2014-12-30-memo_silverstreet.doc

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS
SILVER STREET RAIN GARDEN
HINESBURG, VERMONT
JUNE 2014

FINAL DESIGN

	ITEM DESCRIPTION	UNIT	QTY	UNIT COST	AMOUNT IN FIGURES
TOWN	Construction Safety Fencing	LS	1	$ 500.00	$ 500.00
	Common Excavation	CY	585	$ 7.50	$ 4,387.50
	Earthen Embankment / Fill Compaction	LS	1	$ 2,000.00	$ 2,000.00
	Excess Material Export	CY	165	$ 10.00	$ 1,650.00
CONTRACTOR	Mobilization / Demobilization / Construction Layout	LS	1	$ 1,000.00	$ 1,000.00
	Sediment & Erosion Controls	LS	1	$ 675.00	$ 675.00
	Furnish & Install - Riser Outlet Structure	LS	1	$ 1,600.00	$ 1,600.00
	Furnish & Install - Stone Bypass Weir & Stone Overflow Weir	LS	1	$ 2,150.00	$ 2,150.00
	Furnish & Install - Stone Filter Berm	LS	1	$ 1,350.00	$ 1,350.00
	Furnish & Install - Stone Splash Pads	LS	1	$ 900.00	$ 900.00
	Furnish & Install - Stone Check Dams	LS	1	$ 1,000.00	$ 1,000.00
	Furnish & Install - Erosion Control Matting	LS	1	$ 900.00	$ 900.00
	Amended Topsoil	LS	1	$ 12,500.00	$ 12,500.00
	Plantings - Furnish & Install Trees	*LS*	*1*	*$ 19,000.00*	*$ 19,000.00*
	Plantings - Furnish & Install Shrubs with Mulched Beds	*LS*	*1*		*$ -*
	Plantings - Furnish & Install Herbacious Plants	*LS*	*1*		*$ -*
	Seed Mix - Furnish & Install Conservation Seed Mix with Straw Mulch	*LS*	*1*		*$ -*
	Site Recovery	*LS*	*1*	*$ 1,000.00*	*$ 1,000.00*

*Cost does not include utility relocations and property acquistions/easements

PROJECT SUBTOTAL =	**$**	**50,612.50**
CONTINGENCY ±10% =	**$**	**5,061.25**
INCIDENTALS TO CONSTRUCTION ±5% =	**$**	**2,530.63**
PROJECT SUBTOTAL =	**$**	**58,204.38**
INKIND SERVICES (TOWN) =	**$**	**8,037.50**
TOTAL =	**$**	**50,166.88**
TOTAL (ROUNDED) =	**$**	**50,200.00**