Stormwater Master Plan for the Town of Bennington, Vermont

FINAL REPORT

April 30, 2025

Prepared by:

Fitzgerald Environmental Associates, LLC.
164 Main Street, Suite 2
Colchester, VT 05446

SLR International Corporation
1 South Main Street, 2nd Floor
Waterbury, VT 05676

Prepared under contract to:

Vermont Department of Environmental Conservation
1 National Life Drive
Montpelier, VT 05602

TABLE OF CONTENTS

1.0 Introduction

In 2022, Fitzgerald Environmental Associates (FEA) and SLR International Corporation (SLR) were contracted by the Vermont Department of Environmental Conservation (VTDEC) to develop a Stormwater Master Plan (SWMP) for the Town of Bennington. This final SWMP report for the Town of Bennington represents significant efforts and collaborations over the last several years between the Town, FEA, SLR, VTDEC, the Bennington County Regional Commission, and other partners, including private landowners and business owners, interested in mitigating stormwater and improving water quality.

1.1 Stormwater Master Planning

Stormwater runoff is caused by precipitation, both in the form of rain or melting snow/ice, that is not infiltrated into the ground, absorbed by wetlands, or otherwise intercepted by plants. Human alteration of our landscapes in the form of impervious surfaces (i.e., pavement, rooftops, etc.) and compaction of soils disrupts natural hydrology and causes increased stormwater runoff. Increased stormwater runoff leads to higher magnitude flood flows, greater erosive power in stream channels, and increased delivery of sediment, nutrients, and other pollutants to waterways. Increased stormwater runoff is directly linked to the quality of water in our streams, rivers, ponds, and lakes that we depend on for drinking water, healthy fisheries, and recreation.

Stormwater Master Plans (SWMPs) can address stormwater problem areas either by mitigating impacts before they create problems or by avoiding the creation of issues at vulnerable sites. Prevention is cheaper than restoration, and SWMPs aim to address stormwater problem areas primarily through prevention. If we are to avoid the high cost of restoring degraded surface waters, we must better manage stormwater runoff before those waters become impaired. SWMPs are developed with public involvement and comment and should be as comprehensive as possible in listing all known problem areas within the Town. SWMPs are based on a prioritized list of stormwater projects. This strategic approach is more likely to produce long term water quality resiliency than a reactionary approach that addresses problems as they arise. Historically, almost all Vermont municipalities have responded to stormwater runoff or drainage problems the latter way, often during an emergency or after a structural failure has occurred. SWMPs contain important information and recommendations about preserving natural features and functions of watersheds and provide lists of evaluated alternatives such as using traditional pipe (gray) infrastructure versus green stormwater infrastructure.

1.2 Project Goals and Objectives

The purpose of this planning effort is to better manage stormwater runoff to reduce sediment and nutrient pollution in village centers and to treat water from drainage networks with large watersheds. The primary objectives of this SWMP are to:

- Identify opportunities to incorporate stormwater treatment and/or outfall stabilization at the outfalls of existing closed stormwater conveyance systems.
- Identify opportunities to incorporate green stormwater infrastructure within Village Centers.
- Identify opportunities to improve stormwater management in areas with active erosion and/or poor conveyances.

Project prioritization followed the Unified Scoring Metrics developed by VTDEC (2023). Conceptual design plans (30% designs) were prepared for 5 high-priority projects. Phosphorus loading and removal estimates were provided for each project to assist the Town with project implementation prioritization for meeting water quality goals.

2.0 Study Area Description

Bennington is a 42.5 square mile town located in Bennington County in Southern Vermont (**Figure 1)**. As of the 2020 census, Bennington has a total population of 15,333 people (U.S. Census Bureau, 2021). The Town's area is majority forested with 20.6% developed and 14.2% agricultural (**Table 1**). The villages of Paper Mill Village, Old Bennington and North Bennington (with a 16-acre village center) are located entirely within the Town. Bennington is bordered by 4 Vermont towns (Shaftsbury, Glastenbury, Woodford, and Pownal). Most of the roads in Bennington are municipal and private, with 7.2% of the Town's road length on Vermont State Roads and 1.4% of the Town's road length on US Highways. (**Table 2**).

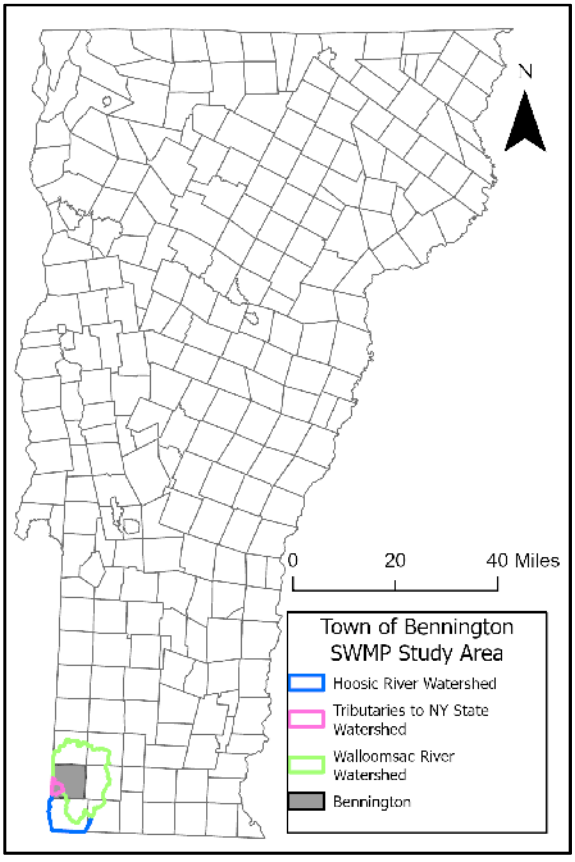


Figure 1: Town of Bennington and Associated Watershed Location Map

The Town of Bennington lies primarily within the Walloomsac River Watershed with a small portion within the Hoosic River Watershed. There are also tributaries that drain to New York's Hudson River Basin. Lake Paran is located in the Village of North Bennington along the Bennington-Shaftsbury border.

Table 1: Land cover in Bennington (Dewitz and U.S Geological Survey 2021)

Landcover/Landuse Type	Percent of Town Area
Agriculture	14.2%
Barren	0.3%
Developed	20.6%
Forest	56.5%
Grassland/Herbaceous	0.9%
Open Water	0.2%
Shrub/Scrub	0.6%
Wetland	6.7%

Table 2: Road length by AOT Class in Bennington (Enhanced 911 Board, 2022)

AOT Class	Description	Length (miles)	Percent of Town Road Length (excluding discontinued)
1	Class 1 Town Highway	5.8	3.1%
2	Class 2 Town Highway	13.7	7.4%
3	Class 3 Town Highway	92.2	49.6%
4	Class 4 Town Highway	3.7	2.0%
5	State Forest Highway	-	-
6	National Forest Highway	-	-
7	Legal Trail	1.92	1.0%
8 & 9	Private Road	32.0	17.2%
30	Vermont State Highway	13.4	7.2%
40	US Highway	2.5	1.4%
Other	-	20.5	11.1%
96	Discontinued Road	0.6	-

Soil mapping for the Town shows that soils are primarily mapped as C-type (somewhat poorly drained) and D-type (poorly drained). Most of the A-type soils (well drained) are located in the eastern portion of the Town. High groundwater table needs to be considered on a site by site basis due to the alluvial fan setting.

Table 3: Summary of town-wide soil drainage (VCGI, 2022).

Soil Hydrogroup	Area (acres)	Percent of Town Area
A	5,912	21.9%
B	2,701	10.0%
C	10,008	37.0%
D	8,262	30.5%
Water	167	0.6%

3.0 Stormwater Management Planning Library

3.1 Mapping Data

VTDEC Municipal Roads Program

A Road Erosion Inventory (REI) for the Town of Bennington was conducted by the Bennington County Regional Commission (BCRC) in 2020. The REI was developed for municipalities to fulfill requirements of the VTDEC Municipal Roads General Permit (MRGP). In this inventory, roads are divided into 100-meter (328 ft) segments with unique identification numbers. The segments deemed hydrologically connected to surface waters (rivers, lakes, wetlands, etc.) are assessed in the field and given a road erosion score. This score is determined from characteristics of the roadway and of the stormwater drainage features associated with it (crown, berm, ditch, conveyance stability, culverts, etc). Each segment is classified as "Fully Meets", "Partially Meets", or "Does Not Meet", to reflect the current level of conformance with the MRGP standards. Of the 796 hydrologically connected segments inventoried in Bennington, 11 (1.4%) did not meet MRGP standards and 38 (4.8%) partially met MRGP standards (link). Roads in the Town with segments that did not meet or partially met MRGP standards included Mount Anthony Road, McCullough Road, Pleasant Valley Road, Coleville Road, and Skiparee Road, among others. The MRGP specifies a timeline for bringing all road segments up to standards. High priority segments identified in the REI are potentially important opportunities to reduce erosion and sediment loading to receiving waters.

Light Detection and Ranging (LiDAR)

LiDAR returns for Bennington were collected in a series of flights conducted during 2017 as part of the VT LiDAR Initiative. These data meet the National Digital Elevation Program Quality Level 2 specifications for accuracy satisfactory for generation of a 0.7-meter Digital Elevation Model (DEM) and 1-foot contours. Derivations of LiDAR data, such as Digital Elevation Models (DEMs), terrain models, and contours are useful tools for stormwater feature identification and site design. The 0.7-meter DEM can assist in culvert watershed delineation and the design of stormwater management projects. Terrain models can assist in remote identification of erosion features, such as stormwater gullies.

Bennington Area Stormwater Infrastructure Mapping Project

This report was produced by Watershed Consulting Associates for the Vermont Department of Environmental Conservation (VTDEC) Watershed Management Division in 2015. The Stormwater Mapping Project documents the connectivity of stormwater infrastructure on private and public land within Bennington, Old Bennington, North Bennington, and a small area in Shaftsbury. The data show the paths of stormwater from different areas of impervious surface (**Figure 2**). The report did not identify any areas that would be good candidates for potential improvements.

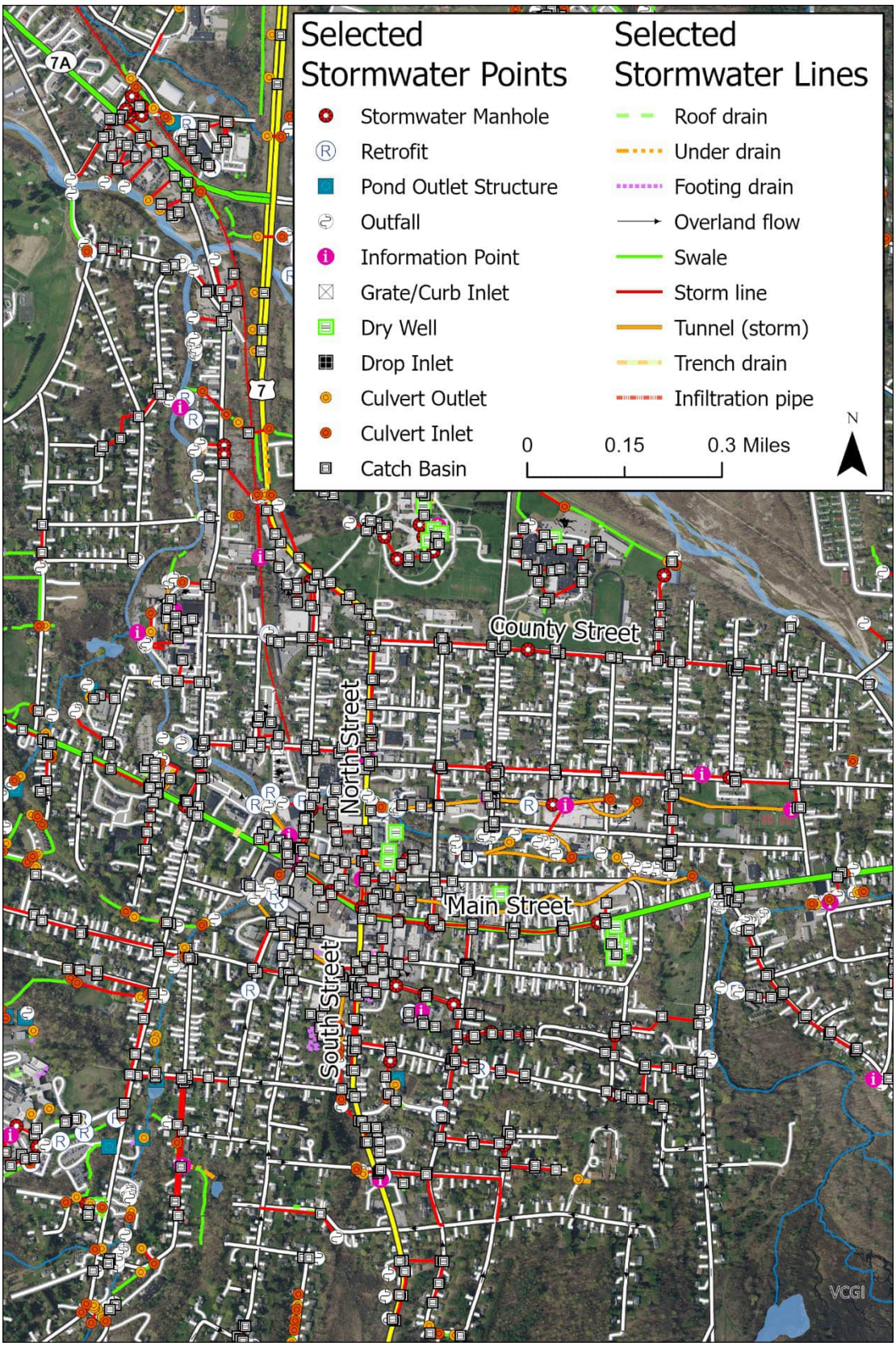


Figure 2: Bennington Stormwater Infrastructure Map

North Bennington Stormwater Infrastructure Mapping Project

This dataset was produced by the Vermont Agency of Natural Resources (VTANR) in 2018. The Stormwater Mapping Project documents the connectivity of stormwater infrastructure on private and public land within the Village of North Bennington. The data show the paths of stormwater from different areas of impervious surface (**Figures 2, 3 & 4**). The associated report identifies one high priority site for improvement at Bennington College.

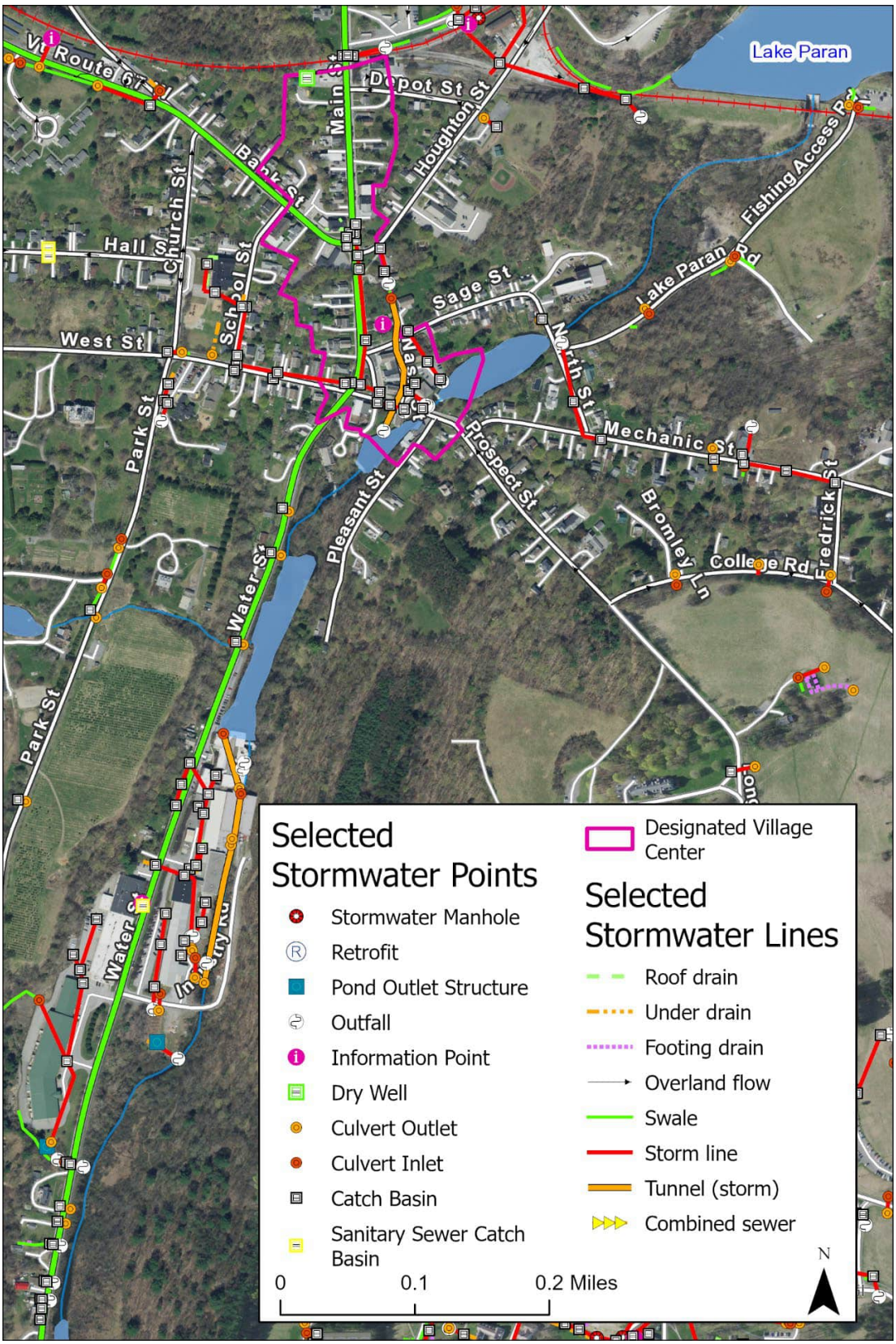


Figure 3: North Bennington Stormwater Infrastructure Map

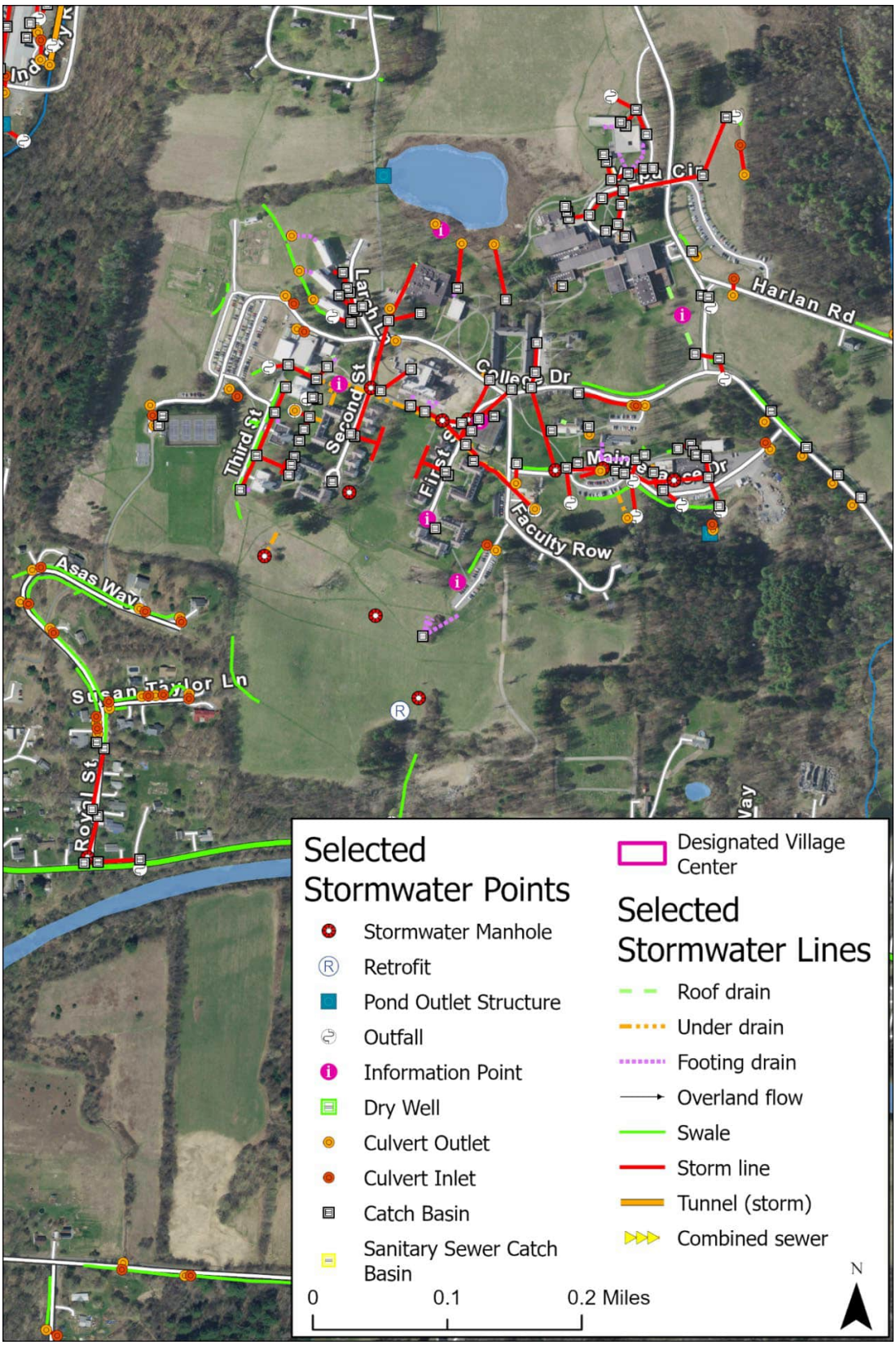


Figure 4: Bennington College Stormwater Infrastructure Map

Natural Resources Conservation Service (NRCS) Soils Survey

The NRCS soils survey dataset is valuable for stormwater master planning (websoilsurvey.sc.egov.usda.gov). As part of our initial scoping, we screened problem areas based on the NRCS hydrologic soil groupings (HSG). The HSGs indicate the infiltration potential of the native soil type, which is useful for identifying areas of excessive runoff potential (e.g., HSG D-type) or good infiltration (e.g., HSG A-type) where stormwater infiltration practices should be explored.

Flood Hazard Mapping

The FEMA DFIRM flood hazard dataset categorizes areas based on flooding potential. This dataset can inform planning based on areas where high flow volumes will occur during major storm events. This dataset can also be used to inform BMP designs and locations. BMPs proposed for locations upgradient of areas that are at high risk of flooding may have the potential to reduce downstream flooding and erosion issues. Prioritization of sites was informed by flood hazard potentials to mitigate flood damage within the Village center.

River Corridor Mapping

River corridor maps were produced by the Vermont Agency of Natural Resources. These data display both the river channel and the active corridor through which a river can be expected to meander over time. This mapping can inform stormwater mitigation efforts by indicating where rivers and streams might flow during flood events. This dataset also identifies areas where the river channel has been altered or confined. These problem areas are often prone to erosion and flooding.

3.2 Watershed Planning

Basin 1 Tactical Basin Plan

The Tactical Basin Plan for Basin 1 was prepared by the Vermont Agency of Natural Resources in 2021. Basin 1 includes the Batten Kill, the Walloomsac River, the Hoosic River, and related tributaries. This Basin plan catalogs current surface water quality conditions, stressors, and recommended actions for water quality restoration. Roughly 82% of the basin is forested, with about 6% agriculture and about 6% developed. Within the Tactical Basin, Bennington is located primarily in the Walloomsac River watershed. In Bennington, the Walloomsac River is most heavily impacted by agricultural nutrient pollution and stormwater runoff from developed areas. Lake Paran is impacted by aquatic invasive species, particularly Eurasian watermilfoil. Projects of particular relevance to Bennington include providing education and technical support about Best Management Practices to farmers, promoting septic system maintenance, and riparian plantings.

Paran Creek Watershed Plan

The Watershed Plan for Paran Creek was prepared by the Paran Creek Watershed Project in consultation with the Watershed Management Division of the Vermont DEC in June 2017. The plan catalogs current surface water conditions, stressors, and recommended actions to improve water quality. The plan identifies addressing the presence of Eurasian milfoil in Lake Paran and addressing shoreline erosion around Lake Paran as priority actions. The plan also calls for the hiring of a watershed steward to perform regular testing and identify watershed projects.

Basins 1 and 12 IDDE Report

The Illicit Discharge Detection and Elimination (IDDE) report for Basins 1 and 12 was produced by Stone Environmental for VTDEC in June 2020. The study investigated discharges in 12 towns. Researchers collected water samples at outfalls and junctions in stormwater systems and tested them for chemical and biological pollutants. The Town of Bennington was not included in this study, but Bennington College was. Based on surveys in 2019, the study identified 1 location with a suspected illicit discharge at Bennington College. Any sites where stormwater and wastewater may be comingling are high priorities for the SWMP.

Hoosic River Watershed Updated Water Quality and Aquatic Habitat Assessment Report

This report on water quality in the Hoosic River watershed was produced in December 2014 by VTANR and VTDEC. The study included monitoring for biological contaminants as well as physical condition monitoring and identification of hazardous waste sites and old landfills. The study identified stressors of all these types in Bennington. The most common stressors in Bennington were hazardous waste sites. The biological health of the Walloomsac River and its tributaries for macroinvertebrates was generally good to excellent, however, several sites need to be resampled or sampled for the first time.

Channel Management and River Corridor Protection Plan: Walloomsac River and Roaring Branch

The Channel Management and River Corridor Plan for the Walloomsac River and Roaring Branch was prepared by Gomez and Sullivan Engineers for the Bennington County Conservation District in 2007. The Phase 2 Stream Geomorphic Assessment (SGA) of selected reaches of the Walloomsac River and Roaring Branch identified human-caused channel and valley constriction as issues. Channel straightening and stream bank armoring have all brought the Walloomsac River and Roaring Branch channels away from their natural geomorphology and caused increased risk of damage and erosion during high flow events. General information about each reach is summarized in **Table 4**. The locations of these reaches are shown in **Figure 5**. Potential projects identified in these reaches include removing berms and levees, stabilizing channel banks, and protecting river corridors via the acquisition of property adjacent to the channel.

Table 4: Summary of Phase 2 Reaches in Bennington (Gomez and Sullivan Engineers 2007)

Stream Segment	Sensitivity	Existing Stream Type	Natural Valley Type	Departure from Equilibrium	FEH Rating	
M06T3.04	High	C3b	Broad	Major Adjustment	HI	6
M06T3.03	Extreme	D3b	Very Broad	Major Adjustment	EX	10
M06T3.02	Extreme	D3b	Very Broad	Stream Type Departure	EX	10
M06T3.01	Extreme	D3	Very Broad	Stream Type Departure	EX	10
M06b	Very High	F3/C3	Very Broad	Major Adjustment	VH	8
M06a	High	C4	Very Broad	Major Adjustment	HI	7
M05	Very High	C4	Very Broad	Major Adjustment	VH	7
M04*	High	C5	Broad	Reference	HI	7
M03	Extreme	F4	Broad	Stream Type Departure	EX	9
M02	Extreme	F3	Broad	Stream Type Departure	EX	8

*For Reach M04, which is impounded, the reference stream type (C) was used for the sensitivity rating.

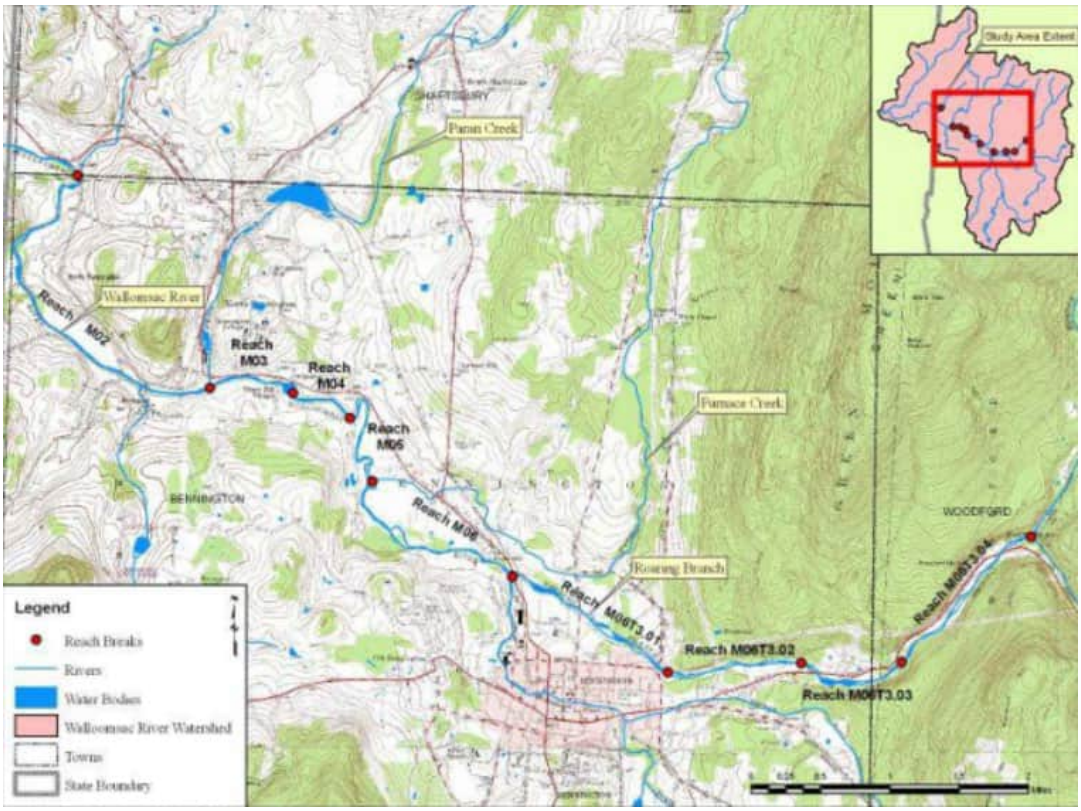


Figure 5: Map of Phase 2 Reaches in Bennington (Gomez and Sullivan Engineers 2009)

3.3 Town Planning and Permitting

Bennington Town Plan

The Bennington Town Plan was adopted by the Town in October 2015 and was prepared by the Bennington Planning Commission with assistance from BCRC. This plan aims to guide future growth and development of land, public services, and facilities, and to protect the environment. One of the main goals for the plan is to "recognize the importance of significant natural, scenic, and historic resources." Bennington restricts development within 200 feet of the shoreline of Lake Paran and regulates development within stream buffer zones. Bennington's Flood Hazard Area zoning regulations prohibit development other than agriculture and forestry in floodplains without approval from the Development Review Board.

Town of Bennington Hazard Mitigation Plan

This document was prepared by the Town of Bennington and the BCRC and adopted in 2017. The purpose of this plan is to identify natural hazards that are more likely to occur, assess their impacts on the community, and generate a list of strategies and actions to reduce the impacts. Of the hazards assessed, floods and flash floods were found to be one of the hazards to which Bennington is most susceptible. High priority actions and mitigation strategies associated with flooding include implementing stormwater control projects, regularly surveying culverts for blockages, and encouraging buyouts in flood or fluvial erosion hazard zones.

Town of Bennington, Vermont Land Use and Development Regulations

This document was completed and implemented by the Bennington Planning Commission in 2004 and amended in 2006. The purpose of these regulations is to promote the development of the Town in a way that minimizes potential damages from future flood events. It limits development in flood hazard areas such as floodplains, river corridors, and wetlands. These guidelines helped inform site selection for the SWMP. Development of BMPs in safer areas was prioritized over those in flood-prone areas.

3.4 Data Gaps

The data sources and information describing stormwater and watershed management in the Town of Bennington are thorough and primarily up to date. Since the stormwater infrastructure mapping was completed in 2015 and no discrepancies in the drainage mapping were found over the course of our field work.

4.0 Stormwater Problem Areas

One of the primary objectives of this SWMP is to "develop a comprehensive list of stormwater problems" within the Town of Bennington. SLR and FEA staff made several field visits to the project area and hosted meetings with the Town to identify existing problem areas, evaluate and prioritize sites, and recommend potential solutions.

4.1 Identification of Problem Areas

The initial round of problem area identification began with the identification of stormwater related projects using a desktop exercise scanning the watershed with aerial imagery, NRCS soils data, Town stormwater infrastructure mapping, contour data, and road erosion inventory results in GIS. Potential project areas were identified and mapped for review during site visits. A total of 41 stormwater problem areas were identified and assessed in the field (see map in Appendix A and table in Appendix B). We grouped the problem areas into five project categories described below.

- **Green Stormwater Infrastructure (GSI) Installation/Retrofit (36) –** Opportunity to reduce sediment and nutrient loads through the installation of a new stormwater best management practice (BMP). Also includes sites where nutrient and sediment reductions could be improved through the retrofit of existing stormwater BMPs .
- **Other (5) –** Areas that are not GSI. These projects included 4 proposed swirl separators and one culvert replacement.

4.2 Evaluation and Prioritization of Problem Areas

Projects were prioritized based on the potential for each project to improve water quality and reduce environmental impact, project feasibility, and co-benefits. Estimated project cost and the phosphorus removal efficiency ($/lb of P) were included. We followed the methods described in the “Unified Scoring Prioritization for Stormwater Master Plans” document developed by VTDEC (2023). These methods include a total of 19 criteria divided into 3 categories. The final score is expressed as a percentage of the maximum score (50 points). The final project scores ranged from 22% to 68%. Additional information about the unified prioritization methods can be found in **Section 4.3** and **Table 5**.

GIS-Based Site Screening

Using the field data points collected with sub-meter GPS during our watershed tours, we evaluated key characteristics for each site indicating the potential for increased stormwater runoff and pollutant loading, among several other factors described below. These GIS-based observations, along with field-based observations of site characteristics, are summarized in the project prioritization table (Appendix B).

The following geospatial data were reviewed and evaluated as part of the GIS-based screening:

- **Subwatershed Mapping –** The contributing drainage area to each problem area was mapped based on field observations and 1-foot contours derived from the 0.7-meter 2017 LiDAR elevation surface.
- **Aerial Photography** – We used the 0.6 m imagery collected in 2021 to review the site land cover characteristics (i.e., forest, grass, impervious).
- **Impervious Surfaces Data** – We used the 2016 statewide high-resolution impervious surfaces data layer developed by the UVM Spatial Analysis Lab.
- **Stormwater Infrastructure** – We used the Stormwater Infrastructure Mapping Project data collected in 2021 with detailed mapping of stormwater infrastructure throughout the Town.
- **NRCS Soils** – We used the VT Soils data to evaluate the inherent runoff and erosion potential of native soil types (i.e., hydrologic soil group, erodible land class). For project sites with potential for green stormwater infrastructure (GSI), we assessed the general runoff characteristics of the drainage area based on hydrologic soil group (HSG).
- **Parcel Data** – We used the parcel data available through VCGI to scope the limits of potential projects based on approximate parcel boundaries and road right-of-way.
- **VTDEC Hydrologically Collected Road Segment Data –** We used a statewide inventory of road erosion risk and hydrologic connectivity of road segments to prioritize areas of potential sediment loading to visit for field surveys.

4.3 Unified Matrix Evaluation and Prioritization of Problem Areas

The 41 projects described in the Unified Prioritization Project Table (Appendix B) were prioritized using the methods described in **Table 5**. Methods for determining project costs are described on page 17. Estimated project cost and the phosphorus removal efficiency ($/lb of P) were included. We followed the Unified Scoring Prioritization for Stormwater Master Plans document developed by VTDEC, with an adjustment to the phosphorus loading and phosphorus reduction criteria (VTDEC, 2018). This method includes a total of 19 criteria divided into 3 categories. The final score is expressed as a percent of the total score, with slightly different criteria applied to road drainage projects. **It is important to note that the phosphorus loading estimates for the unified scoring system have only been developed for the Lake Champlain Basin.** VTANR has not yet released a timeline for developing nutrient loading calculations for the Connecticut River Basin and Hudson River Basin. Phosphorus loading rates are highly variable between lake segments. We selected the loading rates for the "Winooski River" lake segment for the Town of Chester, as these rates are roughly in the median range for phosphorus loading from pervious and impervious surfaces.

Table 5: Unified prioritization scoring for Stormwater Master Plans, developed by VTDEC (2023).

Criteria	Proposed Weight	Max points
Water Quality/Environmental impact		
Sediment reduction (using STP calculator for sediment) (not yet developed)	0-4 (natural groupings within the range of sediment reductions for proposed projects for a specific plan. 0=very low reduction, 4= very high sediment reduction)	4
Phosphorus/nutrient reduction (using STP Calculator)	0-4 (natural groupings within the range of phosphorus reductions for proposed projects for a specific plan. 0=very low p reduction, 4= very high P reduction)	4
Impervious area managed	1-4 (natural groupings within the range of impervious surface managed for proposed projects for a specific plan. More impervious treated gets more points)	4
Percent of Water Quality & Channel Protection Volume treated*	0-3 (0= no WQ treated, 1= ½ WQV treated, 2=meeting WQV, 3=meets WQV and CPV). Do not apply to road projects.	3
Percent of Recharge criteria met *	0-3 (0 = no infiltration, 1 =infiltrates less than recharge volume, 2= meets full recharge, 3= exceeds recharge 1.5 times or more) Do not apply to road projects.	3
Streambank or other gully erosion mitigation	0-2 (calculate volume= Length x avg. width x avg. depth, use natural groupings to divide volume into 3 categories)	2
Green infrastructure opportunity	0-1 (0=no, 1=yes)	1
* WQV, CPV and Recharge criteria as outlined in 2017 Vermont Stormwater Management Manual		
Total Water Quality Score (out of 21, or 15 if road project)		
Feasibility Criteria		
Public land or Private Landowner support	0-3 (3=public land, 2=willing private land owner, 0=unwilling or unknown willingness of private landowner)	3
Project and Permitting complexity (number of permits required)	0-2 (2= simple permitting, 0= complex permitting-potential denial)	2
Infrastructure conflicts	1 (Y= 0, N=1)	1
Total Estimated Project Cost)	Enter engineering estimate+ construction estimate (no points)	
Project efficiency ($/lbs. of P removed)	1-12 (Use natural grouping of $/lbs. removed)	12
Ease of O&M and ease of access for O&M	0-2 (based on municipal input on what is easiest to maintain, 0=high maintenance, 2=easy maintenance)	2
Total Feasibility Score (out of 20)		
Other considerations/Co-benefits (0=doesn't address concern, 1=addresses concern)		
Educational benefits and or Recreational benefits	1	1
Natural habitat creation/protection	1	1
Infrastructure improvement (culvert replacement)	1	1
Outfall erosion control	1	1
Connected to receiving water	3=all runoff infiltrates on site, 2= runoff receives some treatment before reaching receiving water. 1=runoff drains via infrastructure directly to receiving water with no erosion or additional pollutant loading, 0 =runoff drains directly to receiving water	3
Flood mitigation (known problem)	1	1
Existing local concerns	1	1
Total Co-benefits Score (out of 9)		
Overall Score (out of 50 or 44)		

Phosphorus Loads from Sediment

Land cover-based phosphorus loading estimates account for generalized assumptions of sediment mobilization; however, we believe that phosphorus loading from active erosion areas may be underestimated for some of the stormwater problem areas. Other project types such as stream bank restoration or gully stabilization do not fit into the VTDEC Unified Scoring framework. We followed the VTDEC Standard Operating Procedure (SOP) for tracking and accounting of phosphorus associated with the Municipal Roads General Permit (MRGP) to estimate phosphorus loading and reduction associated with road improvements and erosion stabilization (VTDEC 2020).

For estimating the overall phosphorus loading and phosphorus reduction associated with excess sediment mobilization and stabilization, we used methods and loading rates established for the stabilization of roadside gully erosion in the VTDEC SOP. We estimate annual soil loss (in cubic feet) based on our best professional estimate of the age and volume of erosion features. We apply a 43.38 kg/ft^3 sediment bulk density to volume of erosion and 0.000396 kg (P)/ kg sediment (TSS), the equivalent of an annual loading rate of 0.017 kg (P)/ft^3 and 0.037 kg (P)/ft^3 (VTDEC 2020).

BMP Unit Costs and Adjustment Factors

BMP unit costs (**Table 6**) and adjustment factors (**Table 7**) were derived from research completed by the Charles River Watershed Association and the Center for Watershed Protection (EPA, 2016), as well as updates based on actual construction costs in Vermont compiled by FEA and other consultants. The unit cost estimates include a 28% total inflation adjustment for 2017-2023 based on the Consumer Price Indicator Inflation Calculator. Unit construction costs for road drainage projects were based on the estimates provided in the Road Erosion Site Prioritization and Remediation Project Summary (Fitzgerald Environmental Associates and Milone and MacBroom, Inc., 2017). Additional multipliers for site type (**Table 7**) and level of permitting and engineering required (**Table 8**) are also shown below.

Table 6: BMP Unit Costs ($)

BMP Type	Cost/ft^3 Treatment Volume
Constructed Wetland	$11.26
Dry Pond	$5.77
Grass Conveyance Swale	$5.13
Rain Garden (no underdrain)	$19.83
Rain Garden (with underdrain)	$19.83
Subsurface Infiltration	$8.02
Surface Infiltration	$8.00
Wet Pond	$8.72
Swirl Separator (small)	Lump Sum: $20,000
Swirl Separator (medium)	Lump Sum: $40,000
Swirl Separator (large)	Lump Sum: $60,000

Table 7: Site Type Cost Adjustment

Site Type	Cost Multiplier
Existing BMP retrofit	0.25
Complicated retrofit	0.75
New BMP in undeveloped area	1.00
New BMP in partially developed area	1.50
New BMP in developed area	2.00

Table 8: Permitting and Engineer (P&E) Cost Adjustment

Level of P&E Required	Cost Multiplier
None	1.00
Low	1.20
Moderate	1.25
High	1.35

4.4 Conceptual Designs

FEA and SLR hosted a meeting with the Town in April 2024 to discuss project prioritization and selection of 5 projects for conceptual design development. Five (5) projects were selected at this meeting for concept designs. SLR developed five 30% conceptual designs along with preliminary cost estimates. One additional 10% conceptual design on Prospect Street was added as a result of discussion with town representatives on April 24, 2025. This 10% design was deemed necessary due to existing additional runoff reaching the concept design location in North Bennington, but was not given the same level of detailed design as the 30% conceptual design plans. Concept designs include:

- A site plan with contours, existing stormwater infrastructure, and proposed design elements
- Where relevant, hydrologic and hydraulic modeling data of the contributing drainage area and proposed BMP sizing and design specifications
- Typical details for proposed practices
- A preliminary cost opinion (not included in 10% designs)

The projects selected for conceptual design were:

1. **Project BEN-02 – Bennington College (30%):** Storm pipes from Bennington College run through a field behind the college and drain to the Walloomsac River. Hand auger pit data collected at this site revealed a potential shallow seasonal high groundwater table. Soils consisted of silty loams, and mapped soils in the area are Hydrologic Soil Groups B and C.

   Proposed Best Management Practice(s): Gravel Wetland

   Estimated Cost Effectiveness: $ 40,000 – 50,000/lb P/year

2. **Project BEN-04 – Fire Department Picnic Area (30%):** Fire Department roof and surrounding impervious currently drain to river via asphalt swale and pipe, causing riverbank erosion. Mapped soils in this area are Hydrologic Soil Group A.

   Proposed Best Management Practice(s): Subsurface Infiltration Gallery

   Estimated Cost Effectiveness: $ 90,000 – 110,000/lb P/year

   Project BEN-04A – Prospect St and Mechanic St Drainage (10%): The roads opposite Paran Creek currently drain runoff across the existing bridge due to curbing, and contribute to flooding at the North Bennington Fire Department.

   Proposed Best Management Practice(s): Hydrodynamic Separator and new storm network

   Estimated Cost Effectiveness: Not estimated as part of the 10% design

3. **Project BEN-11 – Lincoln Street Fire Department (30%):** Runoff from the Fire Department parking drains through a storm pipe to the Walloomsac River. Hand auger pit data collected at this site showed a seasonal high groundwater table at a depth of approximately 5 feet, with gravelly loamy sands. Mapped soils in the area are Hydrologic Soil Group A.

   Proposed Best Management Practice(s): Bioretention Basin

Estimated Cost Effectiveness: $ 60,000 – 70,000/lb P/year

4. **Project BEN-19 –Town Hall (30%):** Parking lot in downtown Bennington with storm pipes beneath the surface. With assistance from the town, an approximately 11-foot test pit was dug at this location which showed seasonal high groundwater table at a depth of approximately 6 feet, and fine sandy loams transitioning to sand and a high percent cobble. Mapped soils in this area are Hydrologic Group A soils, likely with good infiltration, however the combination of existing pipe elevations and groundwater limit the applicability of infiltrating treatments at this location.

   Proposed Best Management Practice(s): Subsurface Detention Chambers

   Estimated Cost Effectiveness: $ 700,000 – 800,000/lb P/year

5. **Project BEN-30 – Beech Street (30%):** The storm drain for the Beech Street neighborhood currently outlets to Barney Brook just upstream of confluence with the Walloomsac River. With the assistance of the town, a test pit was also dug at this location. While seasonal high groundwater could not be determined due to unnatural fill in the area, the current groundwater table was found. Due to deep existing storm pipes and groundwater table, infiltration is not possible at this site.

   Proposed Best Management Practice(s): Gravel Wetland

   Estimated Cost Effectiveness: $ 25,000 – 35,000/lb P/year

The Vermont Veterans' Home site (BEN_14) was initially included in the top five prioritized projects for Bennington with a proposed subsurface infiltration chamber. However, upon further data collection, it was determined that a subsurface infiltration system would likely not be feasible to construct at this location due to high groundwater levels and deep existing pipe network elevations. Based on hand auger pits and discussion with members of the town and Vermont Veterans' Home, there is a high groundwater table at this location which already contributes to water pooling in the basements of surrounding buildings. Additionally, existing pipe elevations in combination with high groundwater would result in difficulty designing a surface treatment feature at this location. Therefore, this site was passed on, and BEN-04 was added to the list of priority projects.

5.0 Next Steps

This Stormwater Master Plan represents an extensive effort to identify, describe, and evaluate stormwater issues affecting water quality and localized flooding in the Town of Bennington. For each project recommendation, we provided a preliminary cost estimate and nutrient/sediment treatment estimates to town representatives to assist with planning and prioritizing project implementation. The problem area descriptions for town roads (e.g., roadside ditches) will aid the Town Highway Department in proactively stabilizing and maintaining these features to avoid future stormwater problems, and to come into compliance with the VTANR Municipal Roads General Permit.

We recommend that the Town work with VTDEC and other partners to secure funding for the high priority projects described in Appendices B and C. Landowner outreach should be completed for all projects that are not on Town land or right-of-way; outreach has been initiated at Bennington College, site BEN-02. The BMP installation/retrofit opportunities identified in the Unified Prioritization Matrix represent a potential phosphorus load reduction of approximately 360 lb/year. Based on our review and preliminary designs and our experience with previous SWMP efforts, we feel that the projects listed in Appendix C should be considered for further development and implementation.

6.0 References

Bennington County Regional Commission, September, 2017. Town of Bennington Hazard Mitigation Plan.

Bennington Planning Commission, January, 2018. Bennington Town Plan.

Bennington Planning Commission, June, 2006. Town of Bennington, Vermont Land Use and Development Regulations.

Clean Water Initiative Program, Watershed Management Division, Vermont Department of Environmental Conservation, July, 2018. North Bennington (Bennington, VT) Stormwater Infrastructure Mapping Project.

Dewitz, J., and U.S. Geological Survey, 2021. National Land Cover Database (NLCD) Products (ver. 2.0, June 2021)

Environmental Protection Agency (EPA), 2016. Methodology for developing cost estimates for Opti-Tool.

Enhanced 911 Board, 2022. VT Data – E911 Road Centerlines.

Fitzgerald Environmental Associates (FEA) and Milone and MacBroom (MMI). 2017. Road Erosion Site Prioritization and Remediation Project Summary. Memo prepared for the Chittenden County Regional Planning Commission. Dated December 27, 2017.

Gomez and Sullivan Engineers, December, 2007. Channel Management and River Corridor Protection Plan: Walloomsac River and Roaring Branch, Bennington County, Vermont.

Paran Creek Watershed Project, June, 2017. Paran Creek Watershed Plan.

Stone Environmental, June 2020. Detecting and Eliminating Illicit Discharges in Basins 1 and 12.

U.S. Census Bureau, 2020. 2020 United States Census.

Vermont Center for Geographic Information (VCGI), 2022. VT Data – NRCS Soil Survey Units.

Vermont Department of Environmental Conservation, 2023. Unified Scoring Prioritization for Stormwater Master Plans (SWMPs).

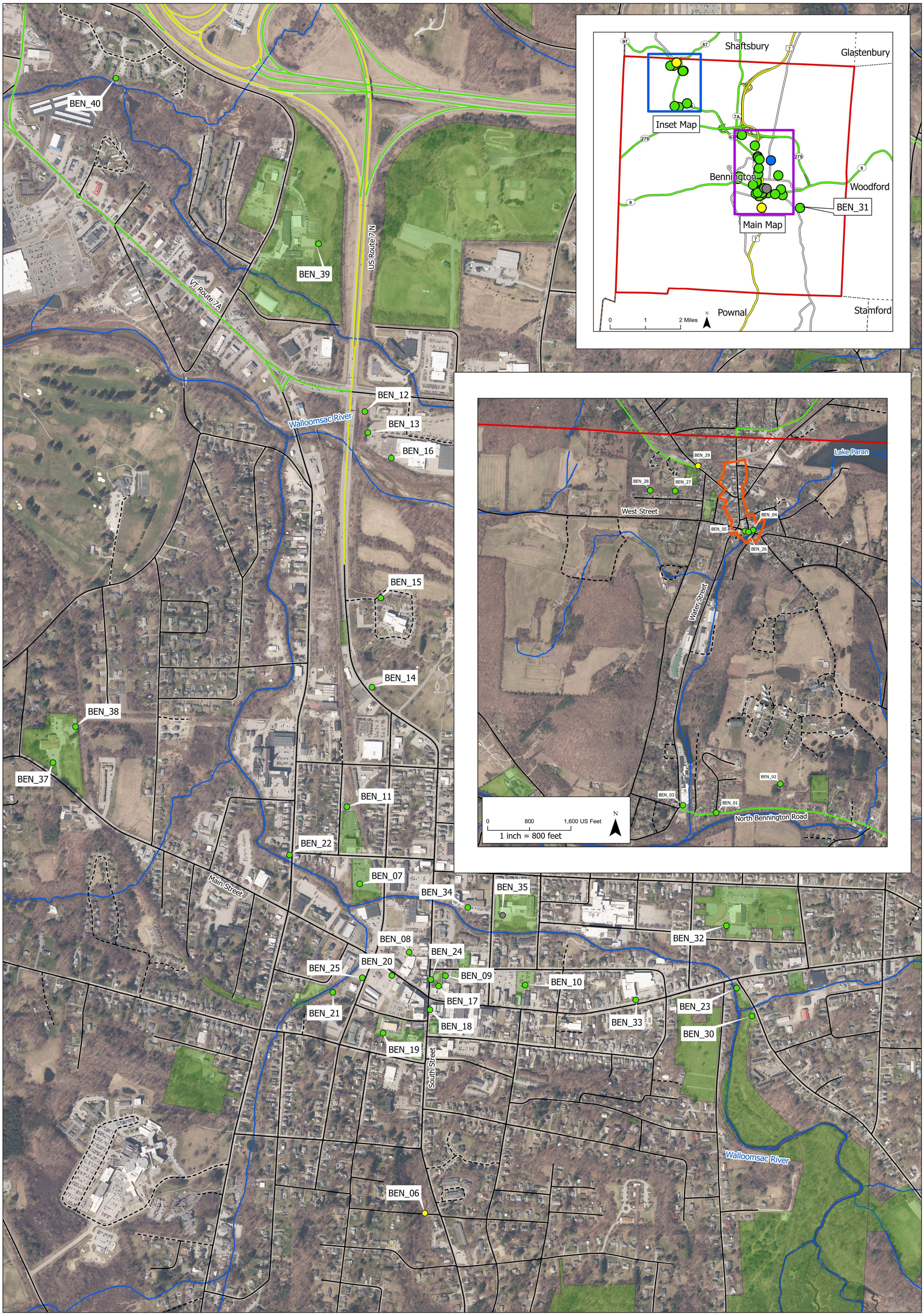
Watershed Consulting Associates, October, 2015. Stormwater Infrastructure Mapping Project: Bennington Area, Vermont.

Watershed Investment Division, Vermont Agency of Natural Resources, November, 2021. Basin 1-Batten Kill, Hoosic, and Walloomsac Tactical Basin Plan.

Watershed Management Division, Vermont Agency of Natural Resources, December, 2014. Hoosic River Watershed Updated Water Quality and Aquatic Habitat Assessment Report.

APPENDIX A

Project Location Map
(24**”x3**6**”)**



Fitzgerald Environmental Associates, LLC
164 Main Street, Suite 2
Colchester, VT 05446
Telephone: 802.876.7778
www.fitzgeraldenvironmental.com

Town of Bennington

Stormwater Master Plan Study Area
Project Location Map

Notes:
-Project locations and recommendations are based on field assessments conducted from Fall 2022 - Summer 2023

DRAWN	JWC
CHECKED	JHB
DATE	March 20, 2024

Proposed Project Type
- Stormwater BMP New/Retrofit
- Culvert Replacement
- Stream Restoration
- Other

Roads
- Town Road
- US Highway
- State Highway
- Private Road

Surface Waters
- Bennington
- Village Center
- Town Boundaries
- Municipal Parcels
- Town Boundaries

N
0 400 800 US Feet
1 inch = 400 feet

Appendix **B**

Unified Project Prioritization

Summary Table (11”x17”)

Fitzgerald
Environmental

Stormwater Master Plan - Bennington
Unified Prioritization Project Table
April 30, 2025

Project ID	Project Type	Location	Description	Preliminary Recommendations	Total Acreage	Impervious Acreage	% Impervious	P Load (lb/yr)	WQv (cf)	BMP Type	BMP Volume (cf)	BMP P Reduction (lb/yr)	Erosion P Reduction (lb/yr)	Total P Reduction (lb/yr)	Gully Mitigation	Landowner	Project/ Permitting Complexity	Infrastructure Conflicts	Total Cost	Project Efficiency $/lb	Ease of O&M	Co-Benefits Sum	Total Score	Possible	Final Score %
BEN_14	GSI	Deer Park	Vermont Veterans' Home Deer Park parking and lawn area. Under lawn area and parking are storm pipes draining a large portion of North Bennington.	Intercept storm pipes and route through subsurface infiltration chamber under lawn and parking lot. Pretreatment provided via swirl separator.	69.54	39.11	56%	121.98	140394	Subsurface infiltration	225000	120.07	0.00	120.07	0	3	2	1	$2,515,700	$20,952	0	3	34	50	68%
BEN_15	GSI	Memorial Drive State Complex	Intermittent stream/swale drains the state complex and a portion of the Vermont Veterans' Home.	Reroute swale to bioretention practice on existing lawn area north of Memorial Drive.	25.02	9.84	39%	31.90	36691	Bioretention	43000	31.06	0.00	31.06	0	3	2	1	$1,065,700	$34,313	1	3	34	50	68%
BEN_29	GSI	Bank St and VT Route 67	Existing crushed pipe under Bank Street. Ponding issues, especially in winter.	Install surface infiltration basin on private land downstream of culvert outlet. Coordinate with VTrans and town on culvert replacement.	10.74	1.34	12%	8.05	6327	Surface Infiltration	10200	7.59	0.07	7.66	1	0	2	0	$153,100	$19,977	1	7	34	50	68%
BEN_30	GSI	Beech St	Storm drain for Beech Street neighborhood currently outlets to Barney Brook just upstream of confluence with Walloomsac River.	Intercept storm pipe before outfall, install gravel wetland. Pretreatment provided via swirl separator.	13.79	5.73	42%	18.17	21223	Gravel wetland	17700	9.64	0.00	9.64	0	3	2	0	$350,100	$36,333	0	4	34	50	68%
BEN_39	GSI	Molly Stark Elementary School	Existing grass and rock lined swale draining runoff from building and parking lot at elementary school.	Intercept drainage before culvert to Willow Brook; install bioretention practice.	11.78	2.70	23%	11.25	10948	Bioretention	20000	10.34	0.07	10.42	1	3	2	1	$495,700	$47,588	1	5	34	50	68%
BEN_02	GSI	Bennington College - No Field	Storm pipes from Bennington College run through field behind the college and drain to the Walloomsac River.	Intercept storm pipe and route to gravel wetland.	9.38	3.80	41%	12.17	14117	Gravel wetland	20500	7.46	0.00	7.46	0	3	2	1	$288,500	$38,683	1	4	33	50	66%
BEN_32	GSI	Bennington Rec Center	Runoff from basketball court and Bennington Rec Center currently outlets to grass swale.	Install surface infiltration basin on west side of basketball court. Reroute roof drainage through basin.	1.59	1.20	75%	3.14	4200	Surface infiltration	6400	3.12	0.00	3.12	0	3	2	1	$96,000	$30,782	1	4	31	50	62%
BEN_05	GSI	North Bennington Prospect St Park	Runoff from surrounding neighborhood drains to Walloomsac River behind Town Park.	Install subsurface infiltration with maximum possible footprint under Town Park to partially treat the WQv. An additional separator is recommended for removal of sediment.	19.35	9.66	50%	28.66	35075	Subsurface infiltration and separator	13200	21.06	0.00	21.06	0	0	2	0	$295,300	$14,019	0	4	29	50	58%
BEN_41	GSI	Bowen Rd Department of Public Works Facility	Stream piped under entrances of Public Works facility.	Route stream and surface runoff through gravel wetland to treat runoff from facilities on Bowen Rd. Potentially larger project to daylight the stream and install new structures under Public Works entrances.	10.87	6.20	57%	17.60	22233	Gravel wetland	22300	10.16	1.85	12.01	2	3	0	1	$508,500	$42,326	1	3	29	50	58%
BEN_04	GSI	Fire Dept Picnic Area	Fire Department roof and surrounding impervious currently drain to river via asphalt swale and pipe, causing river bank erosion.	Install dry well in the Fire Department picnic area.	0.89	0.73	82%	1.87	2546	Dry well	2600	1.85	0.00	1.85	0	3	2	0	$56,300	$30,465	1	5	28	50	56%
BEN_16	GSI	Staples Parking Lot	Area available on back side of Staples Complex.	Potential to treat all rooftop drainage and remaining back parking lot drainage in a subsurface infiltration chamber. Pretreatment provided via swirl separator.	6.77	5.80	86%	14.74	20174	Subsurface infiltration	39000	14.65	0.00	14.65	0	0	2	1	$714,000	$48,734	0	3	28	50	56%
BEN_31	GSI	Cyr Ct Near Harbour Rd	Outfall from storm pipe draining neighborhood is currently causing gully erosion (8 ft x 15 ft x 4 ft).	Install subsurface infiltration with maximum possible footprint to partially treat the WQv. An additional separator is recommended for removal of sediment. Private land.	4.56	1.59	35%	5.42	6018	subsurface infiltration and separa	4500	4.75	0.37	5.12	2	0	2	1	$102,700	$20,051	0	3	28	50	56%
BEN_33	GSI	Old Bennington High	Redevelopment project in planning phase at old Bennington High School. Opportunity to add stormwater treatment to project.	Intercept storm pipe and roof drainage and route to surface infiltration basin. Depending on project limits, subsurface infiltration may be more appropriate.	2.56	2.47	96%	6.12	8537	Surface Infiltration	8500	5.98	0.00	5.98	0	0	0	1	$137,700	$23,038	1	4	28	50	56%
BEN_38	GSI	Monument Elementary School	Outfall from roof drain of elementary school.	Intercept roof drain as well as surface runoff from parking lot and residential area behind school; install bioretention practice either on school property or on cemetary property to the East.	2.70	1.07	40%	3.46	3994	Bioretention	10400	3.30	0.00	3.30	1	3	2	1	$257,800	$78,219	1	4	28	50	56%
BEN_13	GSI	Staples Parking Lot	Minimally used section of large parking lot, which intercepts flow to river.	There is an opportunity to treat a large portion of the same area as BEN_12, but with subsurface infiltration under this portion of the parking lot. Rooftop drainage would be routed elsewhere. Pretreatment provided via swirl separator.	7.01	6.45	92%	16.14	22357	Subsurface infiltration	49500	16.05	0.00	16.05	0	0	2	0	$884,500	$55,096	0	3	27	50	54%
BEN_35	GSI	Bennington Elementary School	Surface and roof runoff from elementary school currently drains to underground tributary to Walloomsac River.	Intercept storm pipes, roof drainage and surface runoff; route to subsurface infiltration chamber prior to outlet to underground tributary.	1.70	1.22	72%	3.24	4290	Subsurface infiltration	9300	3.21	0.00	3.21	0	3	2	0	$205,000	$63,913	0	4	27	50	54%
BEN_37	GSI	Monument Elementary School	Existing rock swale draining a portion of school property in addition to hill behind school.	Install bioretention practice to the left of school entrance drive.	1.93	0.42	22%	1.80	1725	Bioretention	6000	1.70	0.00	1.70	1	3	2	1	$148,700	$87,332	1	4	27	50	54%
BEN_10	GSI	Pleasant St and School St Public Parking	Parking lot in downtown Bennington with storm pipes beneath surface.	Route parking lot and roof runoff to subsurface infiltration chamber. Pretreatment provided via swirl separator.	1.99	1.92	96%	4.74	6619	Subsurface infiltration	14400	4.74	0.00	4.74	0	3	0	0	$287,700	$60,681	0	4	26	50	52%
BEN_34	GSI	Catamount Elementary School	Elementary school runoff currently drains to underground tributary to Walloomsac River and directly into Walloomsac River.	Intercept storm pipes and roof drainage and route to subsurface infiltration chamber prior to outfall to Walloomsac.	1.71	1.50	88%	3.80	5223	Subsurface infiltration	11400	3.78	0.00	3.78	0	0	2	0	$239,000	$63,282	0	5	26	50	52%
BEN_34	GSI	Catamount Elementary School	Elementary school runoff currently drains to underground tributary to Walloomsac River and directly into Walloomsac River.	Intercept storm pipes and roof drainage and route to subsurface infiltration chamber prior to outfall to Walloomsac.	1.71	1.50	88%	3.80	5223	Subsurface infiltration	11400	3.78	0.00	3.78	0	0	2	0	$239,000	$63,282	0	5	26	50	52%
BEN_21	GSI	Washington Ave Credit Union	Parking lot and lawn area behind Tri State Area Federal Credit Union with underground tributary beneath surface.	Intercept a portion of runoff from downtown Bennington area before it drains into underground tributary to Walloomsac River. Pretreatment provided via swirl separator.	20.10	5.00	25%	19.95	19983	Subsurface infiltration	N/A	19.03	0.00	19.03	0	0	2	0	$1,197,700	$62,937	0	3	25	50	50%
BEN_25	GSI	Washington Ave Gravel Parking Lot	Existing gravel parking lot near Tri State Area Federal Credit Union.	Install bioretention practice and necessary routing for local surface and intercepting road drainage pipe.	3.04	2.30	76%	6.02	8057	Bioretention	10000	5.92	0.00	5.92	0	0	0	1	$267,700	$45,183	1	3	25	50	50%
BEN_36	Other	Congress Street at USACE Levee	End of storm line from surrounding neighborhood. Storm pipe travels under USACE Levee before outleting to the Roaring Branch.	Due to the small available footprint and large drainage area, a separator is recommended prior to the end of the storm line to remove sediment.	25.33	10.80	43%	33.92	39873	Swirl Separator	N/A	3.39	0.00	3.39	0	3	2	0	$72,000	$21,227	1	1	25	50	50%

Stormwater Master Plan - Bennington
Unified Prioritization Project Table
April 30, 2025

Project ID	Project Type	Location	Description	Preliminary Recommendations	Total Acreage	Impervious Acreage	% Impervious	P Load (lb/yr)	WQv (cf)	BMP Type	BMP Volume (cf)	BMP P Reduction (lb/yr)	Erosion P Reduction (lb/yr)	Total P Reduction (lb/yr)	Gully Mitigation	Landowner	Project/ Permitting Complexity	Infrastructure Conflicts	Total Cost	Project Efficiency $/lb	Ease of O&M	Co-Benefits Sum	Total Score	Possible	Final Score %
BEN_19	GSI	Town Hall	Parking lot in downtown Bennington with storm pipes beneath surface.	Intercept a portion of runoff from downtown Bennington area before it drains into underground tributary to Walloomsac River.	2.34	2.34	100%	5.76	8069	Subsurface detention chamber	8400	0.68	0.00	0.68	0	3	2	0	$211,900	$310,704	0	3	24	50	48%
BEN_26	GSI	North Bennington Prospect St Park	Storm pipe outfall drains large neighborhood area, with existing riverbank erosion at outfall.	Due to the small available footprint and large drainage area, a separator is recommended prior to the end of the storm line to remove sediment.	21.15	10.52	50%	31.25	38210	Swirl Separator	1	3.13	0.00	3.13	0	3	2	0	$162,000	$51,832	1	3	24	50	48%
BEN_28	GSI	Hall St Backyard	Existing area with drainage issues behind private residences on Hall St. Town has put out an RFP for drainage study.	Install gravel wetland. Locate and reroute presumed buried outlets.	2.69	0.58	22%	2.49	2383	Gravel wetland	4400	1.39	0.00	1.39	0	0	2	1	$66,900	$48,268	1	4	24	50	48%
BEN_03	GSI	Water St and Hillside Parking Lot	Storm pipes drain behind factory into Paran Creek, a tributary to the Walloomsac River.	Route storm pipes through subsurface infiltration chambers below existing parking lot. Pretreatment provided via swirl separator.	6.05	2.57	42%	8.08	9485	Subsurface infiltration	33000	8.08	0.00	8.08	0	0	2	0	$616,600	$76,306	0	3	23	50	46%
BEN_06	Other	Prospect St and South St	Existing 30" HDPE culvert is perched and causing erosion.	Replace culvert with bankfull width structure.	202.84	30.53	15%	162.58	136542	Culvert Replacement	1	0.00	3.70	3.70	2	3	0	0	$250,000	$67,568	2	2	23	50	46%
BEN_07	GSI	River St and Depot Street Public Parking	Sheet flow from south half of parking lot drains south.	Install swale to collect runoff and route to bioretention practice.	1.26	0.93	74%	2.46	3275	Bioretention	N/A	2.45	0.00	2.45	0	3	2	0	$224,800	$91,618	1	4	23	50	46%
BEN_23	GSI	Beech St and Main St	Storm pipe outfall from gas station across Beech Street.	Install subsurface infiltration chamber to treat gas station parking and roof runoff. Pretreatment provided by swirl separator.	0.78	0.68	87%	1.72	2363	Subsurface infiltration	5100	1.72	0.00	1.72	0	3	0	1	$109,800	$63,986	0	3	23	50	46%
BEN_27	GSI	Hall St Backyard	Existing area with drainage issues behind private residences on Hall St. Town has put out an RFP for drainage study.	Install gravel wetland. Locate and reroute presumed buried outlets.	3.60	1.23	34%	4.22	4672	Gravel wetland	9278	2.49	0.00	2.49	0	0	2	1	$141,000	$56,718	1	4	23	50	46%
BEN_11	GSI	Lincoln St Fire Department	Fire Department parking currently drains through storm pipe to Walloomsac River.	Reroute pipes draining parking and runoff from bike path to bioretention practice at North end of parking lot.	1.32	0.80	61%	2.22	2853	Bioretention	2900	2.18	0.00	2.18	0	3	2	0	$107,800	$49,495	1	3	22	50	44%
BEN_12	GSI	Staples Parking Lot	Existing lawn space at edge of large private parking area, all of which drains toward river.	A gravel wetland at this location could encompass runoff from entire parking lot and smaller businesses. Rooftop drainage would be routed elsewhere.	9.32	7.47	80%	19.30	26102	Gravel wetland	57400	12.18	0.00	12.18	0	0	0	1	$872,600	$71,633	1	3	22	50	44%
BEN_01	Other	Royal St and Main St	Storm pipes carrying residential runoff currently run along Royal St. Pipes cross Main Street and drain to the Walloomsac River.	Due to the small available footprint and large drainage area, a separator is recommended at the storm pipe junction to remove sediment.	5.16	1.96	38%	6.44	7344	Swirl Separator	N/A	0.64	0.00	0.64	0	3	2	0	$36,000	$55,868	1	4	21	50	42%
BEN_20	GSI	W. Main St Parking	Seemingly abandoned parking lot in downtown Bennington.	Grade parking lot to drain to surface infiltration basin in middle of parking area.	0.48	0.47	100%	1.17	1635	Surface infiltration	3600	1.16	0.00	1.16	0	0	0	0	$77,800	$67,032	1	3	21	50	42%
BEN_09	GSI	Pleasant St Public Parking	Parking lot in downtown Bennington with storm pipes nearby.	Intercept storm pipe and sheet flow off parking lot and route through subsurface infiltration chamber. Pretreatment provided via swirl separator.	1.38	1.07	78%	2.78	3743	Subsurface infiltration	N/A	2.77	0.00	2.77	0	0	0	0	$185,500	$66,931	0	3	20	50	40%
BEN_22	Other	Benmont Ave and River St	Storm line drains into Walloomsac River behind private residence.	Due to the small available footprint and large drainage area, a separator is recommended prior to the end of the storm line to remove sediment.	9.94	7.37	74%	19.43	25898	Swirl Separator	1	1.94	0.00	1.94	0	3	0	1	$108,000	$55,592	1	2	20	50	40%
BEN_18	GSI	South St and Main St	Road and sidewalk runoff currently collected via catch basin.	Install tree box to collect runoff before routing to storm pipe. This practice could be installed in many locations	0.30	0.29	96%	0.71	987	Tree Box 7x13	1000	0.37	0.00	0.37	0	3	0	0	$61,400	$167,311	1	3	14	50	28%
BEN_04A	Other	Drainage on Prospect Street - N Bennington	Overflow crossing bridge and flooding fire station.	New storm system, with hydrodynamic separator.	6.50	2.14	33%	7.48	8171	Swirl Separator	500	0.75	0.00	0.75	0	2	2	0	$81,000	$108,289	1	4	13	50	26%
BEN_17	GSI	Pleasant St and North St Park	Park patio with existing catch basin.	Install tree box to collect patio runoff before routing to storm pipe.	0.06	0.04	76%	0.12	158	Tree Box 4x4	160	0.06	0.00	0.06	0	3	0	0	$50,600	$847,539	1	3	13	50	26%
BEN_24	GSI	Route 7 North St Near Fountain	Road and sidewalk runoff currently collected via catch basin.	Install tree box to collect runoff before routing to storm pipe. This practice could be installed in many locations along downtown Bennington sidewalks.	0.20	0.14	72%	0.38	501	Tree Box 6x10	N/A	0.19	0.00	0.19	0	3	0	0	$61,400	$324,262	1	3	13	50	26%
BEN_40	Other	Applegate Rd Apartment Complex	Multiple outlets throughout apartment complex from stormwater catchment system.	Install separators at storm pipe outlets throughout apartment complex.	1.89	1.06	56%	3.03	3806	Swirl Separator	N/A	0.30	0.00	0.30	0	0	2	1	$40,500	$133,779	1	2	11	50	22%

APPENDIX C

Conceptual Designs
(11”x17**”)**

Proposed Features

- Pretreatment
- Stormwater Treatment Feature
- Swale
- Outlet structure
- Storm Pipe
- Diversion Structure
- Manhole
- Deep Sump Catch Basin
- Drainage Area

Existing Conditions

- LiDAR Contours
- Parcel Boundaries (VCGI)
- Tree

Stormwater Points

- Other
- Catchbasin
- Stormwater manhole
- Outfall
- Culvert Inlet
- Culvert Outlet

Stormwater Lines

- Storm Line
- Swale
- Overland Flow
- Footing Drain
- Under Drain
- Roof Drain
- Storm Line (Prior Sanitary)
- Stream
- River Tunnel

EXISTING STORM PIPE

SEDIMENT FOREBAY - BOTTOM SURFACE STONE-LINED (APPROX. 6,000 CU. FT.)

NEW STORM LINE

NEW DIVERSION STRUCTURE TO TIE INTO EXISTING STORM LINE (FINAL LOCATION DEPENDENT ON EXISTING PIPE ELEVATIONS) - DIVERT UP TO 1-YR EVENT TO GRAVEL WETLAND.

PROPOSED SWALE TO ROUTE RUNOFF FROM FIELD AROUND GRAVEL WETLAND

TIE GRAVEL WETLAND OUTLET INTO EXISTING STORMWATER MANHOLE.

PROJECT WILL REQUIRE EXTENSIVE GRADING - BALANCE CUT AND FILL FOR MINIMAL FILL REMOVAL FROM SITE.

NYLOPLAST OUTLET STRUCTURE (OR APPROVED ALTERNATIVE) - SEE EXAMPLE GRAVEL WETLAND DETAIL.

GRAVEL WETLAND (APPROX. 14,500 CU. FT.) SEE EXAMPLE GRAVEL WETLAND DETAIL.

VCGI, Maxar, Microsoft

N

0 50

Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

CONCEPTUAL DESIGN - BENN_02

Stormwater Master Plan - Town of Bennington

Fitzgerald Environmental Associates, LLC

Bennington College
1 College Drive
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

SCALE: 1 IN = 50 FT

DATE: 3/25/2025

PROJECT NO.: 14294.00009

SHEET 1A

DATE SAVED: 3/25/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX

Proposed Features

- Pretreatment
- Stormwater Treatment Feature
- Swale
- Outlet structure
- Storm Pipe
- Diversion Structure
- Manhole
- Deep Sump Catch Basin
- Drainage Area

Existing Conditions

- LiDAR Contours
- Parcel Boundaries (VCGI)
- Tree

Stormwater Points

- Other
- Catchbasin
- Stormwater manhole
- Outfall
- Culvert Inlet
- Culvert Outlet

Stormwater Lines

- Storm Line
- Swale
- Overland Flow
- Footing Drain
- Under Drain
- Roof Drain
- Storm Line (Prior Sanitary)
- Stream
- River Tunnel

Drainage Area - Pipe Network: 9.4 AC
41% Impervious
WQv: 14,200 CU FT

Drainage Area - Field: 15.8 AC
(To be rerouted)
5% Impervious
WQv: 5,400 CU FT

CAMPUS RD
FIFTH AVE
THIRD ST
SECOND ST
OLD FACULTY RD
MAINTENANCE DR
ASA'S WAY
SUSAN TAYLOR LN
ROYAL ST
SCAREY LN

N

0 200
Feet

SLR
1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

DRAINAGE AREA - BENN_02

Stormwater Master Plan - Town of Bennington
Fitzgerald Environmental Associates, LLC

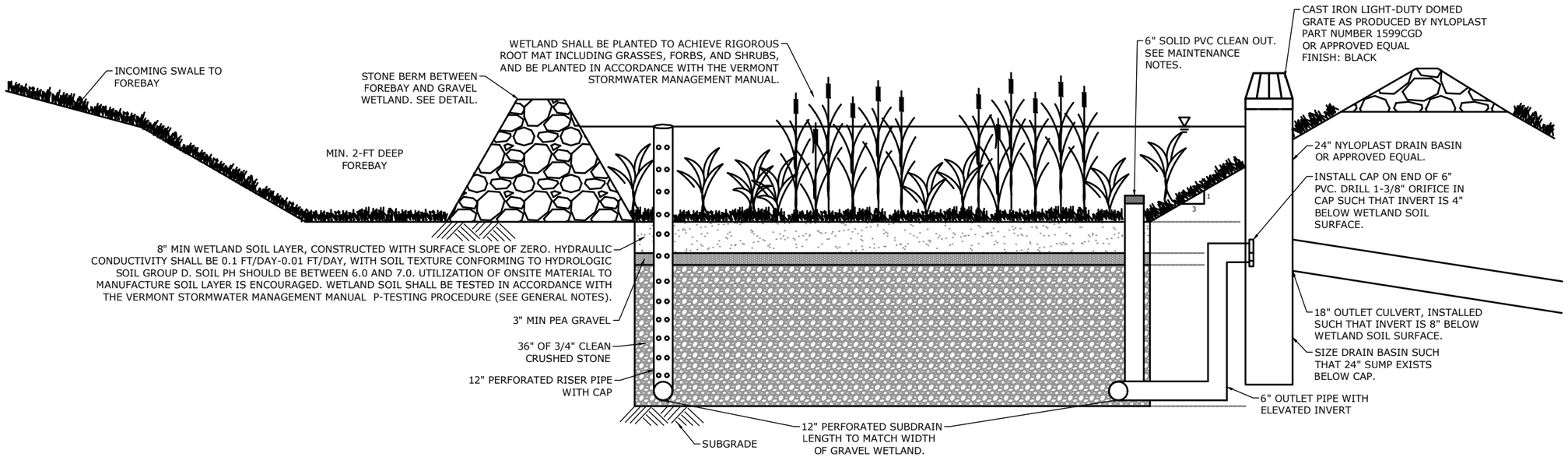
Bennington College
1 College Drive
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

SCALE	1 IN = 200 FT
DATE	3/25/2025
PROJECT NO.	14294.00009

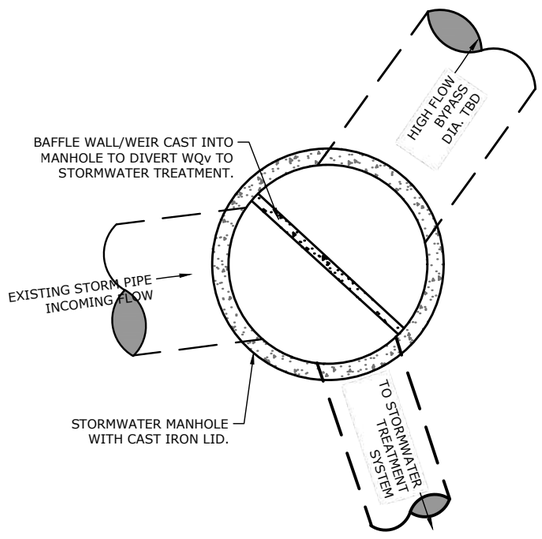
SHEET 1B

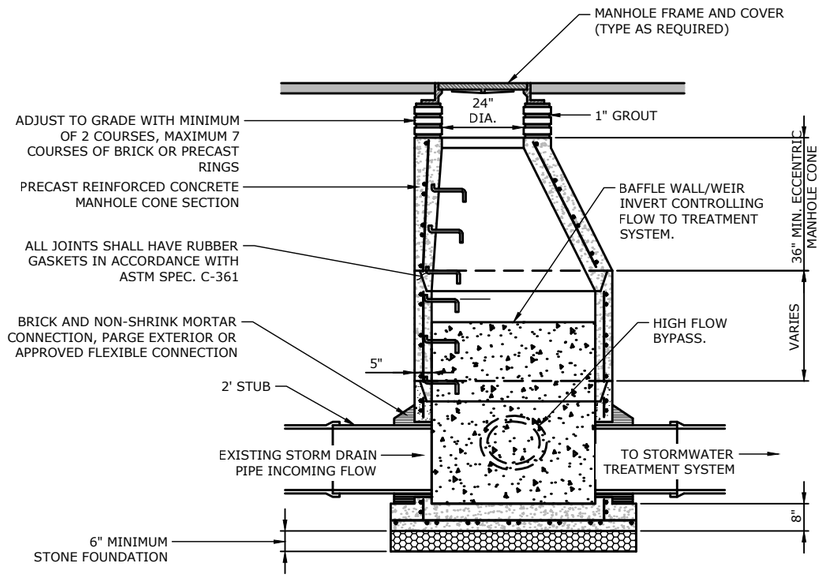
DATE SAVED: 3/25/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX



GRAVEL WETLAND SECTION VIEW

NOT TO SCALE



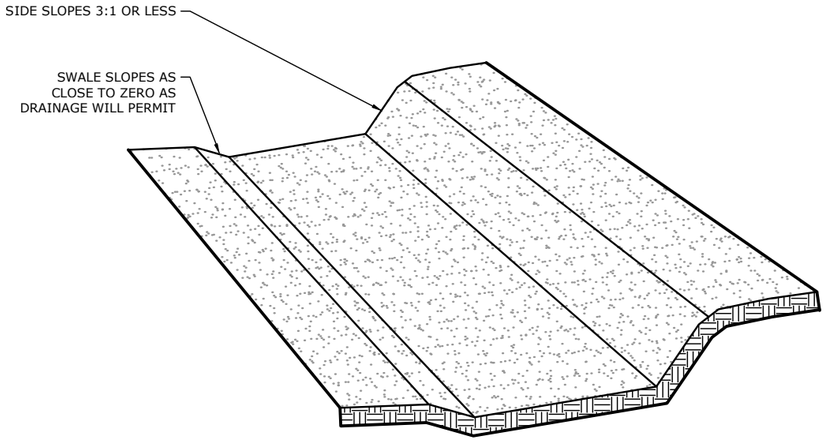


NOTES:

1. 5' OR 6' DIAMETER PRECAST BASES MAY BE REQUIRED DUE TO SIZE OR NUMBER OF PIPES AT THE MANHOLE. PRECAST REDUCERS WILL BE PLACED ABOVE THE 5' OR 6' BASES AS DIRECTED BY THE ENGINEER. WALL THICKNESS TO INCREASE BY 1" FOR EACH 1'-0" OF INSIDE DIAMETER.

TYPICAL DIVERSION STRUCTURE

NOT TO SCALE



GRASSED SWALE

NOT TO SCALE

SLR
1 SOUTH MAIN STREET
WATERBURY, VT 05676
802.882.8355
SLRCONSULTING.COM

REVISIONS

CONCEPTUAL DESIGN

DETAILS - BEN_02

STORMWATER MASTER PLANN
TOWN OF BENNINGTON

BENNINGTON, VT

EMT	EMT	JCL
DESIGNED	DRAWN	CHECKED

SCALE: NOT TO SCALE

DATE: MARCH 25, 2025

PROJECT NO.: 14294.00009

SHEET NO.: DET-1

Drawing: W:\CAD\DESIGN\14294.00009-DE\CAD\BENNINGTON_CONCEPTDETAILS.DWG Layout: Tab:BEN_02
Plotted by: ETHOMPSON On this date: Wed, 2025, April, 30 - 10:54am

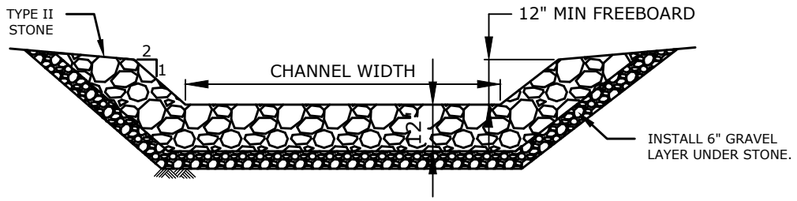
INSTALLATION NOTES:
1. THE VERMONT STORMWATER MANAGEMENT MANUAL IS A GOOD EDUCATIONAL RESOURCE TO ACCOMPANY THIS PROJECT. ALTERNATIVES TO THE DETAILS PRESCRIBED IN THIS PLAN ARE AVAILABLE IN THAT MANUAL.
2. PLANTING DENSITIES ARE RECOMMENDED TO BE ONE PERENNIAL EVERY 2.5 FEET ON CENTER OR ONE SHRUB EVERY 5 FEET ON CENTER. ALL PLANTING IS TO OCCUR ON BOTTOM SURFACE OF GRAVEL WETLAND.
3. INSTALL STONE BERM EMERGENCY SPILLWAY TO NON-EROSIVELY PASS LARGER EVENTS TO FIELD.

OPERATION AND MAINTENANCE NOTES:
1. MAINTENANCE OF THE FOREBAY WILL BE REQUIRED TO REMOVE BUILT UP SEDIMENT AND CHECK FOR EROSION. 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. ANNUALLY INSPECT MAKE SURE NO INVASIVE SPECIES ARE PRESENT.
4. INSPECT FOR EROSION PATHS OR CONCENTRATED FLOW OVER STONE BERM, AS NEEDED REDISTRIBUTE STONE TO REMOVE CONCENTRATED FLOW PATHS.
5. INSPECT SWALE FOR EROSION OR SEDIMENT ACCUMULATION.
6. INSPECT OUTLET STRUCTURE OF GRAVEL WETLAND - INSPECT LOW FLOW ORIFICE, OVERFLOW GRATE, STRUCTURE SUMP, PIPE CONNECTIONS, AND OVERALL STRUCTURE CONDITION. NOTE SUMP DEPTH, DEPTH OF ACCUMULATED SEDIMENT IN SUMP AND OTHER DEBRIS, AND OTHER NEEDED MAINTENANCE. SUMP TO BE CLEANED WHEN 50% FULL

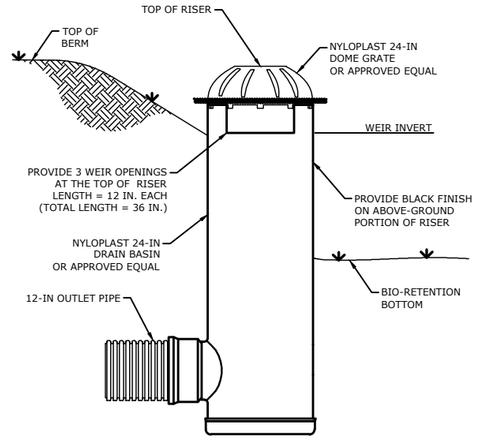
DESIGN NOTES FOR FINAL DESIGN:
1. INVESTIGATE SOILS TO DETERMINE AMENDMENTS NEEDED TO PROVIDE 8 INCHES OF WETLAND SOILS WITH LOW INFILTRATION RATE. SOILS WILL NEED TO BE TESTED FOR PHOSPHORUS CONCENTRATION.

Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
Stockpile Topsoil and Respread	130	CY	$ 40	$ 5,200
Common Excavation	1700	CY	$ 25	$ 42,500
Trucking	1200	CY	$ 20	$ 24,000
Trench Excavation	50	CY	$ 25	$ 1,250
Gravel Wetland Pipes and Structures	1	LS	$ 12,500	$ 12,500
Gravel	550	CY	$ 75	$ 41,250
Pea Stone	60	CY	$ 100	$ 6,000
Wetland Soils	140	CY	$ 150	$ 21,000
Diversion Structure	1	EA	$ 10,000	$ 10,000
Storm Pipe	140	LF	$ 70	$ 9,800
Seed & Mulch	1	LS	$ 5,000	$ 5,000
Plantings - Perennials	1	LS	$ 10,000	$ 10,000
Site Restoration	1	LS	$ 10,000	$ 10,000
Final Design & Permitting				$ 40,000
Construction Oversight				$ 30,000
			Subtotal	$ 278,500
			Contingency (20%)	$ 55,700
			Total	**$ 334,200**



EMERGENCY SPILLWAY DETAIL
NOT TO SCALE



24-INCH OUTLET RISER
NOT TO SCALE

SLR
1 SOUTH MAIN STREET
WATERBURY, VT 05676
800.282.2335
SLRCONSULTING.COM

REVISIONS

CONCEPTUAL DESIGN

DETAILS - BEN_02

STORMWATER MASTER PLANN
TOWN OF BENNINGTON

BENNINGTON, VT

EMT	EMT	JCL
DESIGNED	DRAWN	CHECKED

SCALE: NOT TO SCALE
DATE: MARCH 25, 2025
PROJECT NO.: 14294.00009

SHEET NO.: DET-2

SLR Job No.:	SLR	Sheet:
14294.00009	1 South Main Street, 2nd Floor Waterbury, Vermont 05676	1 of 1
Excavation Co.:	Project Name: Multi-Town Stormwater Planning	Hole ID:
Town of Bennington	Bennington	B-02-1
Operator:	Town:	Date:
	Bennington	12/10/24
MMI Inspector:	Test Pit Location: Bennington College BEN_02	Time:
E. Thompson & B. Cote	Mid-hill	1:30 pm
Landuse:	Vegetation:	Landform:
Field	Meadow grasses	
Slope %:	Surface Stones:	Parent Material (geologic):
13	N/A	
Weather:	Depth to Bedrock: N/A	
Overcast 40 deg	Standing Water in Hole: N/A	
Surface Elevation:	Weeping from Pit Face: N/A	
625.0	Est. Seasonal High Ground Water: No clear mottling, possibly 623.33	

Depth (inches)	Elevation (feet)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consitency, % Gravel)
4	624.7	A	Topsoil			
20	623.3	B	Silty loam with fine sand			Trace gravel, rusty mottling at 20" down
Second auger performed near same location, with no sign of rusty mottling.						

SLR

SLR Job No.:	SLR	Sheet:
14294.00009	1 South Main Street, 2nd Floor Waterbury, Vermont 05676	1 of 1
Excavation Co.:	Project Name: Multi-Town Stormwater Planning	Hole ID:
Town of Bennington	Bennington	B-02-2
Operator:	Town:	Date:
	Bennington	12/10/24
MMI Inspector:	Test Pit Location: Bennington College BEN_02	Time:
E. Thompson & B. Cote	Bottom of hill	1:30 pm
Landuse:	Vegetation:	Landform:
Field	Meadow grasses	
Slope %:	Surface Stones:	Parent Material (geologic):
13	N/A	
Weather:	Depth to Bedrock: N/A	
Overcast 40 deg	Standing Water in Hole: N/A	
Surface Elevation:	Weeping from Pit Face: N/A	
618.0	Est. Seasonal High Ground Water: No clear mottling	

Depth (inches)	Elevation (feet)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consitency, % Gravel)
18	616.5	A	Silty loam with fine sand	10YR 3/3		
24	616.0	B	Silty loam with clay	10YR 3/6		Smear on side of auger

SLR Job No.:	SLR	Sheet:
14294.00009	1 South Main Street, 2nd Floor Waterbury, Vermont 05676	1 of 1
Excavation Co.:	Project Name: Multi-Town Stormwater Planning	Hole ID:
Town of Bennington	Bennington	B-02-3
Operator:	Town:	Date:
	Bennington	12/10/24
MMI Inspector:	Test Pit Location: Bennington College BEN_02	Time:
E. Thompson & B. Cote	Top of hill	1:30 pm
Landuse:	Vegetation:	Landform:
Field	Meadow grasses	
Slope %:	Surface Stones:	Parent Material (geologic):
13	N/A	
Weather:	Depth to Bedrock: N/A	
Overcast 40 deg	Standing Water in Hole: N/A	
Surface Elevation:	Weeping from Pit Face: N/A	
645.0	Est. Seasonal High Ground Water: No clear mottling	

Depth (inches)	Elevation (feet)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consitency, % Gravel)
12	644.0	A	Topsoil/silty loam	10YR 3/3		
24	643.0	B	Silty loam with trace clay	10YR 4/4		Smear on side of auger, some shale near bottom of sample

REPLACE EXISTING CATCHBASINS WITH HOODED DEEP SUMP CATCHBASINS

REPLACE STORM PIPE WITH SHORTENED CONNECTION TO NEW CATCH BASIN

INFILTRATION GALLERY/DRY WELL GALLERY UNDER EXISTING PAVED PARKING (APPROX. 2,500 CU FT)

OVERFLOW OUTLET PIPE FROM GALLERY OUTLET MANIFOLD

PROPOSED CURB ALONG EDGE OF PARKING

PROPOSED CATCH BASIN RIM 611 FT

REMOVE ASPHALT, FILL SWALE AND RETURN TO LAWN

STABILIZE OUTFALL

REPLACE EXISTING STRUCTURE WITH NEW MANHOLE

DIVERSION STRUCTURE WQv TO DRY WELL, OVERFLOW BYPASSES TO EXISTING MANHOLE.

OPTIONAL HYDRODYNAMIC SEPARATOR FOR ADDITIONAL PRETREATMENT AND REDUCED INFILTRATION GALLERY MAINTENANCE

NORTH BENNINGTON FIRE DEPARTMENT

NASH ST

ST

613 612 615 614

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS User Community | Vermont State, VCGI, Maxar, Microsoft

Proposed Features
- Pretreatment
- Stormwater Treatment Feature
- Swale
- Outlet structure
- Storm Pipe
- Diversion Structure
- Manhole
- Deep Sump Catch Basin
- Drainage Area

Existing Conditions
- LiDAR Contours
- Parcel Boundaries (VCGI)

- Tree

Stormwater Points
- Other
- Catchbasin
- Stormwater manhole
- Outfall
- Culvert Inlet
- Culvert Outlet

Stormwater Lines
- Storm Line
- Swale
- Overland Flow
- Footing Drain
- Under Drain
- Roof Drain

- Storm Line (Prior Sanitary)
- Stream
- River Tunnel
- Deep Sump Catch Basin
- Manhole
- Swale
- Outlet structure
- Diversion Structure
- Storm Pipe
- Pretreatment
- Stormwater Treatment Feature
- Curb
- Drainage Area
- BENN_02_DASplit

Stormwater Points
- Other
- Catchbasin
- Stormwater manhole
- Outfall
- Culvert Inlet
- Culvert Outlet

Stormwater Lines
- Storm Line
- Swale
- Overland Flow
- Footing Drain
- Under Drain
- Roof Drain
- Storm Line (Prior Sanitary)

N

0 10
Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

DRAINAGE AREA - BENN_04

Stormwater Master Plan - Town of Bennington

Fitzgerald Environmental Associates, LLC

Bennington Town Office
205 South Street
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

SCALE	1 IN = 10 FT
DATE	4/30/2025
PROJECT NO.	14294.00009

SHEET 2A

DATE SAVED: 4/30/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX

Proposed Features

- Pretreatment
- Stormwater Treatment Feature
- Swale
- Outlet structure
- Storm Pipe
- Diversion Structure
- Manhole
- Deep Sump Catch Basin
- Drainage Area

Existing Conditions

- LiDAR Contours
- Parcel Boundaries (VCGI)
- Tree

Stormwater Points

- Other
- Catchbasin
- Stormwater manhole
- Outfall
- Culvert Inlet
- Culvert Outlet

Stormwater Lines

- Storm Line
- Swale
- Overland Flow
- Footing Drain
- Under Drain
- Roof Drain
- Storm Line (Prior Sanitary)
- Stream
- River Tunnel

SAGE ST

PROSPECT ST

NASH DR

Drainage Area : 0.9 AC
82% Impervious
WQv: 2,500 CU FT

New York State, VCGI, Maxar, Microsoft

N

0 40
Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

CONCEPTUAL - NOT FOR CONSTRUCTION

DRAINAGE AREA - BENN_DA_NN_04

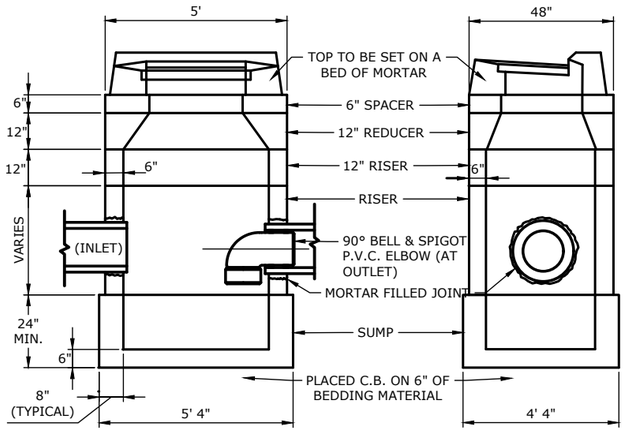
Stormwater Master Plan - Town of Bennington
Fitzgerald Environmental Associates, LLC

North Bennington Firehouse
2 Prospect Street
Bennington, VT 05257

SCALE	1 IN = 40 FT
DATE	3/25/2025
PROJECT NO.	14294.00009

SHEET 2B

DATE SAVED: 3/25/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX

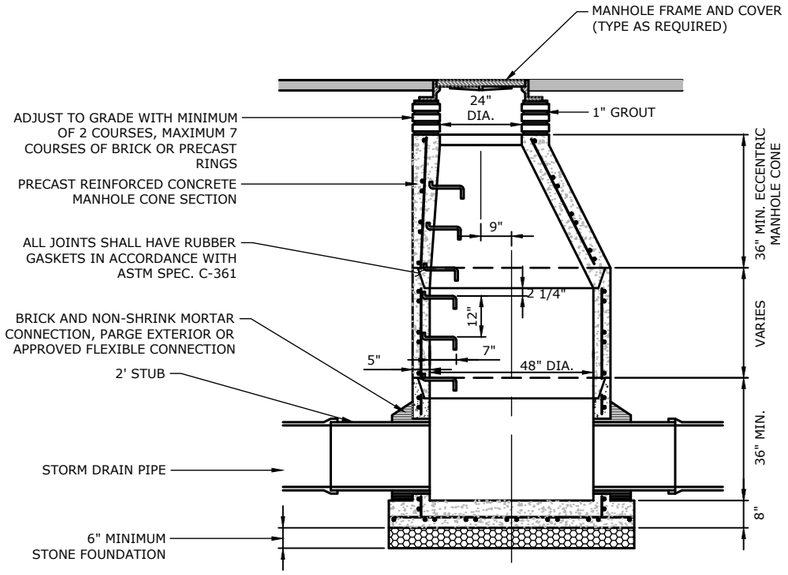


NOTES:

1. ALL CATCH BASIN COMPONENTS TO BE PRECAST REINFORCED CONCRETE, ABLE TO WITHSTAND THE APPLIED EARTH LOADS WITH AN HS-20 TRUCK LOAD, ALL JOINTS TO BE MORTARED. CATCH BASIN SHALL CONFORM TO ASTM C478

CATCH BASIN WITH TRAP AND SUMP

NOT TO SCALE

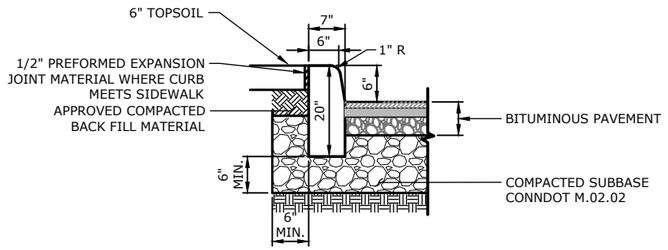


NOTES:

1. 5' OR 6' DIAMETER PRECAST BASES MAY BE REQUIRED DUE TO SIZE OR NUMBER OF PIPES AT THE MANHOLE. PRECAST REDUCERS WILL BE PLACED ABOVE THE 5' OR 6' BASES AS DIRECTED BY THE ENGINEER. WALL THICKNESS TO INCREASE BY 1" FOR EACH 1'-0" OF INSIDE DIAMETER.

PRECAST CONCRETE STORM DRAINAGE MANHOLE

NOT TO SCALE



CAST-IN-PLACE CONCRETE CURB

NOT TO SCALE

INSTALLATION NOTES:

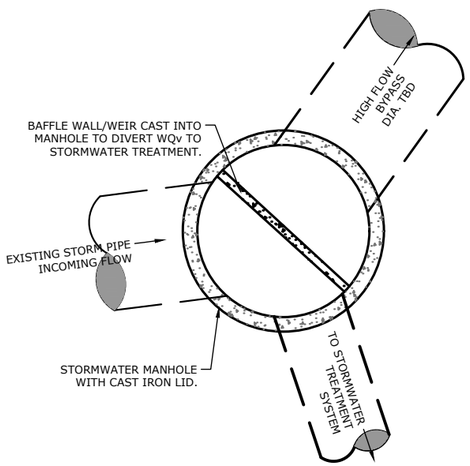
1. THE VERMONT STORMWATER MANAGEMENT MANUAL IS A GOOD EDUCATIONAL RESOURCE TO ACCOMPANY THIS PROJECT. ALTERNATIVES TO THE DETAILS PRESCRIBED IN THIS PLAN ARE AVAILABLE IN THAT MANUAL.
2. INSTALL DIVERSION STRUCTURE TO PASS LARGER FLOWS TO RIVER.

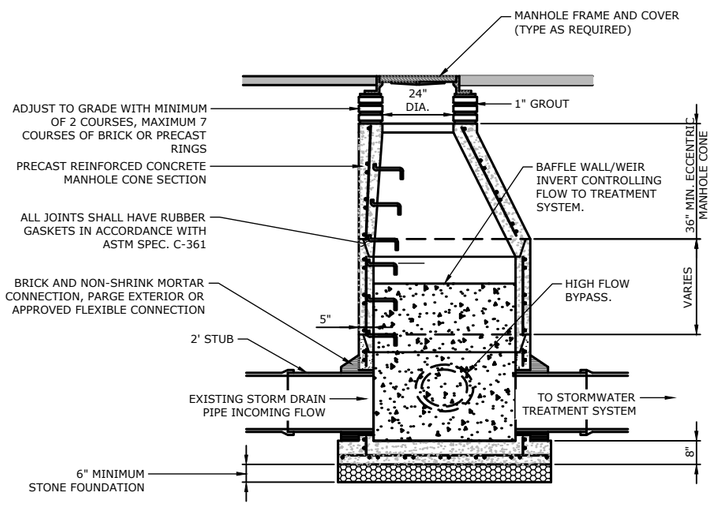
OPERATION AND MAINTENANCE NOTES:

1. REGULAR MAINTENANCE OF THE CATCHBASINS, DIVERSION STRUCTURE AND INSPECTION PORTS TO REMOVE BUILT UP SEDIMENT AND CHECK SYSTEM OPERATION WILL BE NECESSARY.
2. INSPECT OUTLET STRUCTURE OF SUBSURFACE INFILTRATION CHAMBER - INSPECT DIVERSION STRUCTURE, PIPE CONNECTIONS, AND OVERALL STRUCTURE CONDITION. NOTE ANY NEEDED MAINTENANCE. CATCHBASIN SUMPS TO BE CLEANED WHEN 50% FULL.

DESIGN NOTES FOR FINAL DESIGN:

1. INVESTIGATE SOILS TO CONFIRM INFILTRATION RATE GREATER THAN 0.2 IN/HR.





NOTES:

1. 5' OR 6' DIAMETER PRECAST BASES MAY BE REQUIRED DUE TO SIZE OR NUMBER OF PIPES AT THE MANHOLE. PRECAST REDUCERS WILL BE PLACED ABOVE THE 5' OR 6' BASES AS DIRECTED BY THE ENGINEER. WALL THICKNESS TO INCREASE BY 1" FOR EACH 1'-0" OF INSIDE DIAMETER.

TYPICAL DIVERSION STRUCTURE

NOT TO SCALE

Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
Traffic Control	1	LS	$ 5,000	$ 5,000
Excavation of Surfaces and Pavements	25	CY	$ 50	$ 1,250
Common Excavation	175	CY	$ 25	$ 4,375
Trucking	200	CY	$ 20	$ 4,000
Trench Excavation	65	CY	$ 25	$ 1,625
Subsurface Infiltration System	1	LS	$ 40,000	$ 40,000
Thermoplastic Liner	1	LS	$ 10,000	$ 10,000
Gravel	150	CY	$ 75	$ 11,250
System Installation	1	LS	$ 10,000	$ 10,000
Diversion Structure	1	EA	$ 10,000	$ 10,000
Deep Sump Hooded Catchbasins	3	EA	$ 10,000	$ 30,000
Manhole	1	EA	$ 7,000	$ 7,000
Storm Pipe	150	LF	$ 70	$ 10,500
Re-Paving	1	LS	$ 30,000	$ 30,000
Seed & Mulch Disturbed Lawn	1	LS	$ 2,000	$ 2,000
Site Restoration	1	LS	$ 5,000	$ 5,000
Final Design & Permitting				$ 40,000
Construction Oversight				$ 30,000
			Subtotal	$ 262,000
			Contingency (20%)	$ 52,400
			Total	**$ 314,400**

SLR
1 SOUTH MAIN STREET
WATERBURY, VT 05676
802.882.8355
SLRCONSULTING.COM

REVISIONS

CONCEPTUAL DESIGN

DETAILS - BEN_04

STORMWATER MASTER PLANN
TOWN OF BENNINGTON

BENNINGTON, VT

EMT	EMT	JCL
DESIGNED	DRAWN	CHECKED

NOT TO SCALE (SCALE)

MARCH 25, 2025 (DATE)

14294.00009 (PROJECT NO.)

DET-1 (SHEET NO.)

ADS MC-3500
- 15 chambers installed
- System invert = 605.0 ft

ADS
Advanced Drainage Systems, Inc.

ADS SiteAssist
FOR STORMTECH INSTALLATION INSTRUCTIONS VISIT OUR WEBSITE

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.
10. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.32 FOR MANIFOLD SIZING GUIDANCE. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
11. ADS DOES NOT DESIGN OR PROVIDE MEMBRANE LINER SYSTEMS. TO MINIMIZE THE LEAKAGE POTENTIAL OF LINER SYSTEMS, THE MEMBRANE LINER SYSTEM SHOULD BE DESIGNED BY A KNOWLEDGEABLE GEOTEXTILE PROFESSIONAL AND INSTALLED BY A QUALIFIED CONTRACTOR.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE; AASHTO M43 #3, 357, 4, 467, 5, 56, OR 57.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

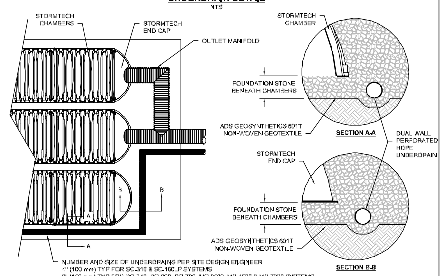
NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-800-821-6710 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

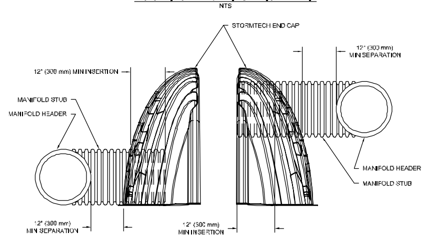
UNDERDRAIN DETAIL
NTS



NUMBER AND SIZE OF UNDERDRAINS PER SITE DESIGN ENGINEER
4" (100 mm) TYP FOR SC-310 & SC-160LP SYSTEMS
6" (150 mm) TYP FOR SC-740, DC-780, MC-3500, MC-4500 & MC-7200 SYSTEMS

5 UNDERDRAIN DETAIL

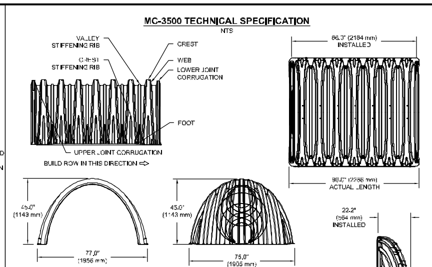
MC-SERIES END CAP INSERTION DETAIL
NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

6 MC-SERIES END CAP INSERTION DETAIL

MC-3500 TECHNICAL SPECIFICATION
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	131 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

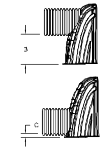
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" (152 mm) STONE BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"

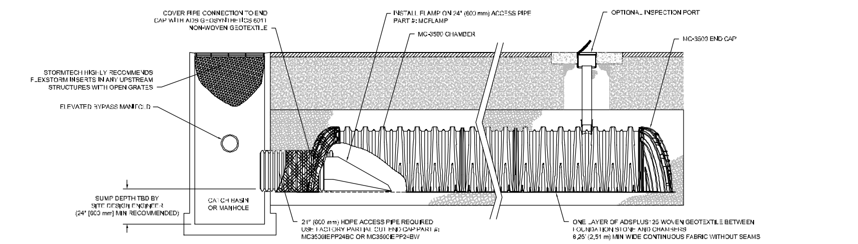
PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	--
MC3500IEPP06B		--	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	--
MC3500IEPP08B		--	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	--
MC3500IEPP10B		--	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	--
MC3500IEPP12B		--	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	--
MC3500IEPP15B		--	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	--
MC3500IEPP18TW			
MC3500IEPP18BC		--	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	--
MC3500IEPP24TW			
MC3500IEPP24BC		--	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	--	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



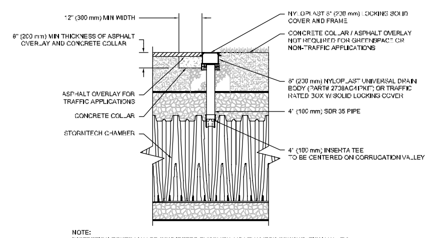
CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-3500 TECHNICAL SPECIFICATIONS



MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

3 MC-3500 ISOLATOR ROW PLUS DETAIL



4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

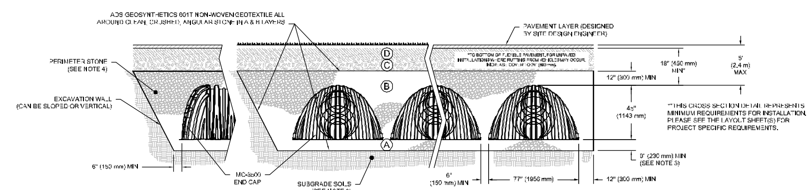
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

4 4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 18" (450 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-3500 CROSS SECTION DETAIL

DRAWN: SMW | DATE: 02/17/2025
REVIEWED: JLM | PROJECT NO: 724-390
NOT TO SCALE
REV:

MC-3500
STANDARD DETAILS

StormTech Chamber System
4640 TRUEMAN BLVD
HILLIARD, OH 43026

SHEET 1

DESIGN NOTE: POTENTIAL CATCH BASIN LOCATIONS AND LAYOUT ARE PROVIDED - A FULL DRAINAGE ANALYSIS IS NECESSARY TO CONFIRM CAPACITY, AND MORE CATCHBASINS MAY BE REQUIRED. DETAILS ON SIZING AND COMPONENTS WOULD REQUIRE FURTHER ANALYSIS.

MORE CATCHBASINS MAY BE REQUIRED ON MECHANIC ST

INSTALL HYDRODYNAMIC SEPARATOR AND STONE-LINED SWALE

Drainage Area: 6.5 AC
33% Impervious
WQv: 8,200 CU FT

INSTALL NEW STORM NETWORK

PARAN CREEK
ARMORY
MECHANIC ST
PROSPECT ST
BROMLEY LN
COLLEGE RD
JENNINGS DR

- Drainage Area
- Deep Sump Catch Basin
- Manhole
- Swale
- Outlet structure
- Diversion Structure
- Storm Pipe
- Parcel Boundaries (VCGI)
- LiDAR Contours

Stormwater Points
- Other
- Catchbasin
- Stormwater manhole
- Outfall
- Culvert Inlet
- Culvert Outlet

Stormwater Lines
- Storm Line

- Swale
- Overland Flow
- Footing Drain
- Under Drain
- Roof Drain
- Storm Line (Prior Sanitary)
- Stream
- River Tunnel

New York State, VCGI, Maxar, Microsoft

N

0 80
Feet

SLR
1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

CONCEPTUAL DESIGN - BENN_04A

Stormwater Master Plan - Town of Bennington
Fitzgerald Environmental Associates, LLC

Bennington Town Office
205 South Street
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

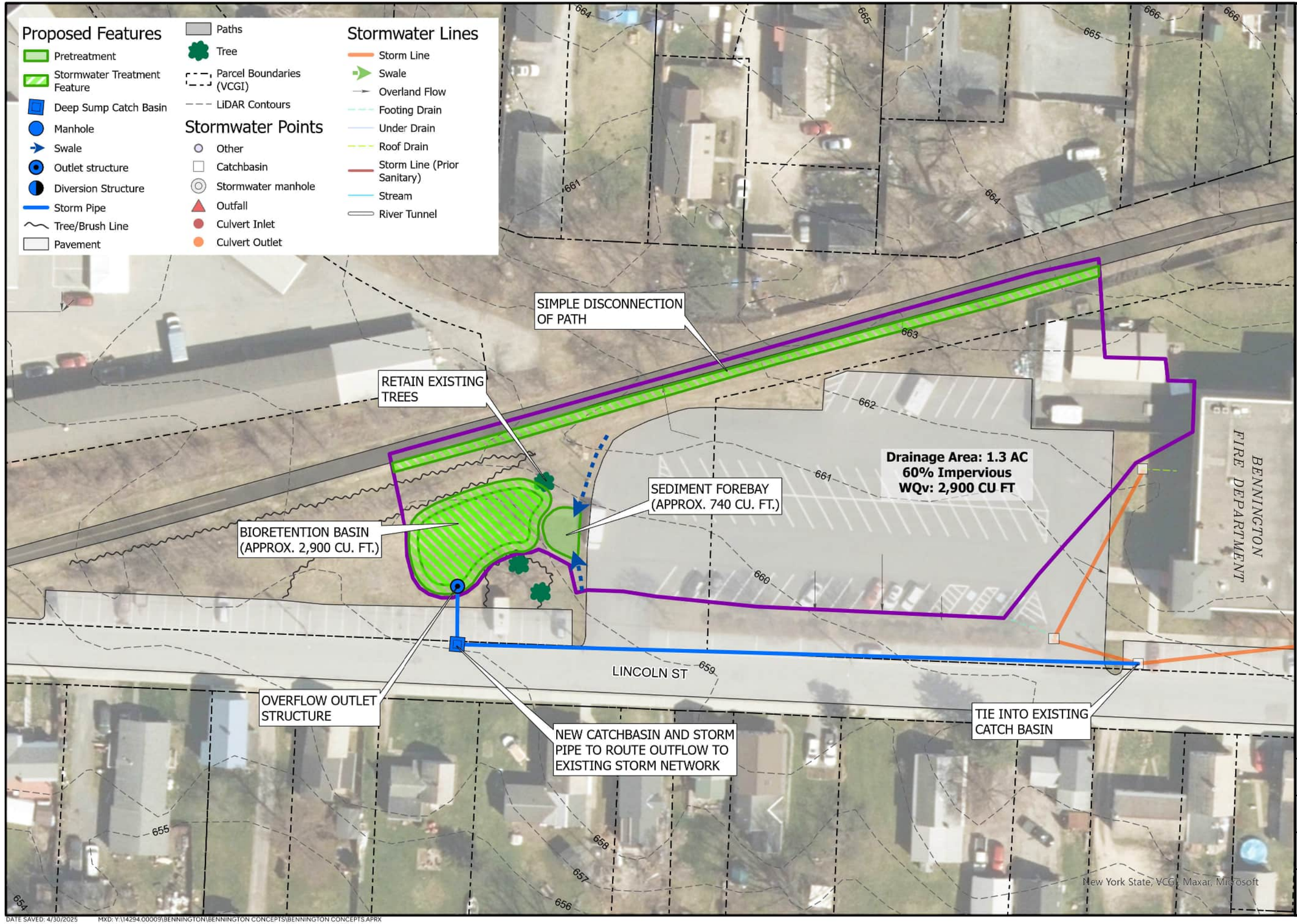
SCALE 1 IN = 100 FT

DATE 4/29/2025

PROJECT NO. 14294.00009

SHEET 2C

DATE SAVED: 4/29/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX



N

0 50

Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

CONCEPTUAL DESIGN - BENNINGTON FIRE HOUSE_NN_11

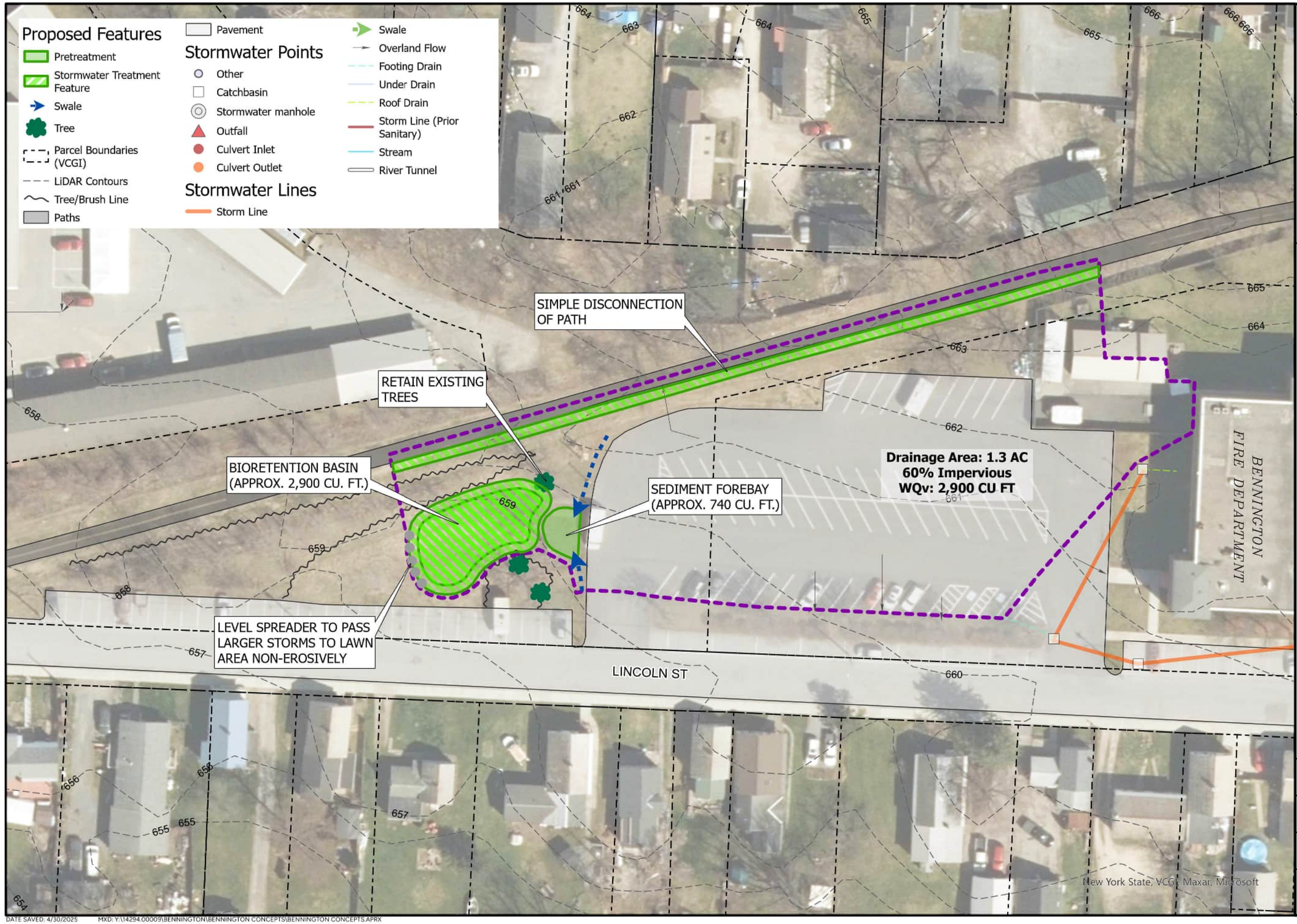
Stormwater Master Plan - Town of Bennington

Fitzgerald Environmental Associates, LLC

Bennington Fire House
130 River Street
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

SCALE	1 IN = 50 FT
DATE	4/30/2025
PROJECT NO.	14294.00009
	SHEET 3A



N

0 50

Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

CONCEPTUAL DESIGN - BENN_11

Stormwater Master Plan - Town of Bennington

Fitzgerald Environmental Associates, LLC

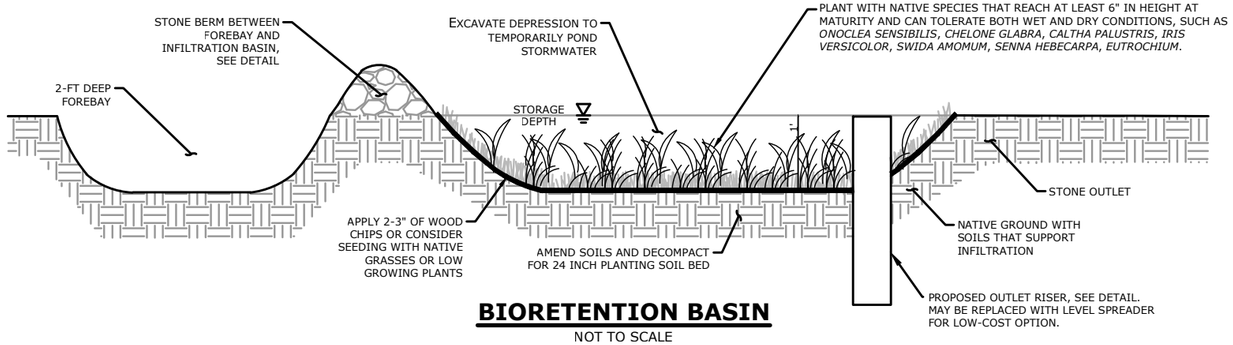
Bennington Fire House
130 River Street
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

SCALE	1 IN = 50 FT
DATE	4/30/2025
PROJECT NO.	14294.00009

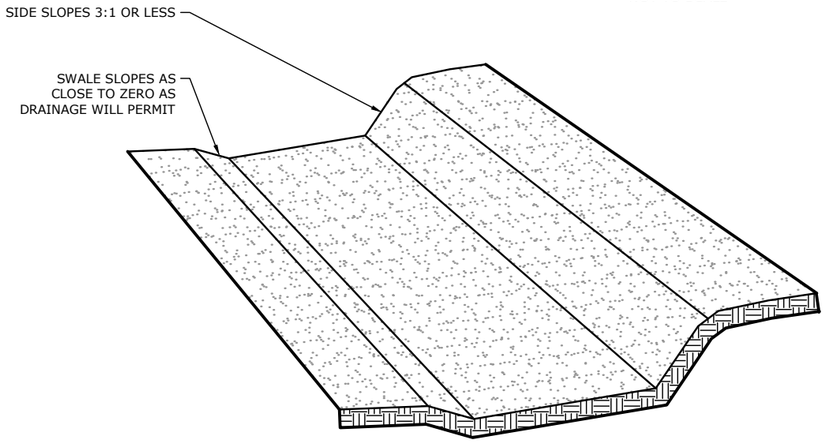
SHEET 3B

DATE SAVED: 4/30/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX



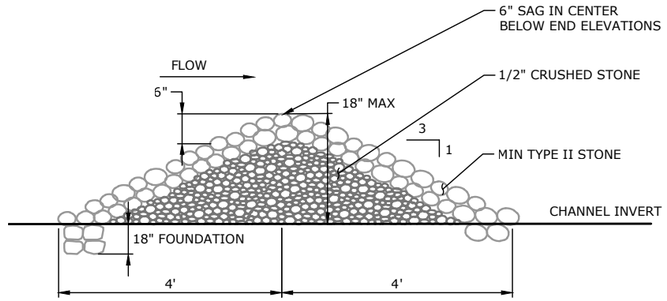
BIORETENTION BASIN

NOT TO SCALE



GRASSED SWALE

NOT TO SCALE



STONE BERM

NOT TO SCALE

INSTALLATION NOTES:

1. THE VERMONT STORMWATER MANAGEMENT MANUAL IS A GOOD EDUCATIONAL RESOURCE TO ACCOMPANY THIS PROJECT. ALTERNATIVES TO THE DETAILS PRESCRIBED IN THIS PLAN ARE AVAILABLE IN THAT MANUAL.
2. PLANTING DENSITIES ARE RECOMMENDED TO BE ONE PERENNIAL EVERY 2.5 FEET ON CENTER OR ONE SHRUB EVERY 5 FEET ON CENTER.
3. INSTALL STONE BERM OUTLET SO OVERFLOW RUNOFF CAN BE CONVEYED AS NON-EROSIVE SHEET FLOW THOUGH THE BUFFER PLANTINGS BEFORE ENTERING THE POND.

OPERATION AND MAINTENANCE NOTES:

1. MAINTENANCE OF THE INFILTRATION BASIN 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. THE ACCUMULATION OF SEDIMENT WITHIN THE INFILTRATION BASIN SHOULD BE MONITORED. REMOVE SEDIMENT AFTER APPROXIMATELY 3 INCHES OF SEDIMENT HAS ACCUMULATED OR RAKE AWAY WHEN DOES NOT DRAIN WITHIN 1 DAY.
4. ANNUALLY INSPECT MAKE SURE NO INVASIVE SPECIES ARE PRESENT.
5. INSPECT FOR EROSION PATHS OR CONCENTRATED FLOW OVER STONE BERM, AS NEEDED REDISTRIBUTE STONE TO REMOVE CONCENTRATED FLOW PATHS.

DESIGN NOTES FOR FINAL DESIGN:

1. TEST INFILTRATION RATE, SHOULD BE AT LEAST 0.2 INCHES PER HOUR.
2. INVESTIGATE SOILS TO DETERMINE AMENDMENTS NEEDED TO PROVIDE 24 INCHES OF USDA SAND TO LOAMY SAND AS NOTED IN THE VERMONT STORMWATER TREATMENT STANDARDS.

Preliminary Cost Opinion - with Level Spreader

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
Stockpile Topsoil and Respread	50	CY	$ 40	$ 2,000
Common Excavation	360	CY	$ 25	$ 9,000
Trucking	200	CY	$ 20	$ 4,000
Bioretention Soil Amendments	140	CY	$ 150	$ 21,000
Level Spreader Installation	1	LS	$ 5,000	$ 5,000
Seed & Mulch	1	LS	$ 2,000	$ 2,000
Plantings - Perennials	1	LS	$ 5,000	$ 5,000
Site Restoration	1	LS	$ 5,000	$ 5,000
Final Design & Permitting				$ 40,000
Construction Oversight				$ 30,000
			Subtotal	$ 133,000
			Contingency (20%)	$ 26,600
			Total	**$ 159,600**

Preliminary Cost Opinion - with Storm Pipe Outlet

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
Traffic Control	1	LS	$ 5,000	$ 5,000
Excavation of Surfaces and Pavements	15	CY	$ 50	$ 750
Stockpile Topsoil and Respread	50	CY	$ 40	$ 2,000
Common Excavation	360	CY	$ 25	$ 9,000
Trucking	200	CY	$ 20	$ 4,000
Trench Excavation	150	CY	$ 25	$ 3,750
Outlet Structure	1	LS	$ 6,000	$ 6,000
Bioretention Soil Amendments	140	CY	$ 150	$ 21,000
Standard Catchbasin	1	EA	$ 7,000	$ 7,000
Storm Pipe	400	LF	$ 70	$ 28,000
Seed & Mulch	1	LS	$ 2,000	$ 2,000
Plantings - Perennials	1	LS	$ 5,000	$ 5,000
Site Restoration	1	LS	$ 5,000	$ 5,000
Final Design & Permitting				$ 40,000
Construction Oversight				$ 30,000
			Subtotal	$ 178,500
			Contingency (20%)	$ 35,700
			Total	**$ 214,200**

SLR
1 SOUTH MAIN STREET
WATERBURY, VT 05676
802.882.8355
SLRCONSULTING.COM

REVISIONS

DETAILS - BEN_11 OPTION 2
STORMWATER MASTER PLANN
TOWN OF BENNINGTON
BENNINGTON, VT
CONCEPTUAL DESIGN

EMT	EMT	JCL
DESIGNED	DRAWN	CHECKED

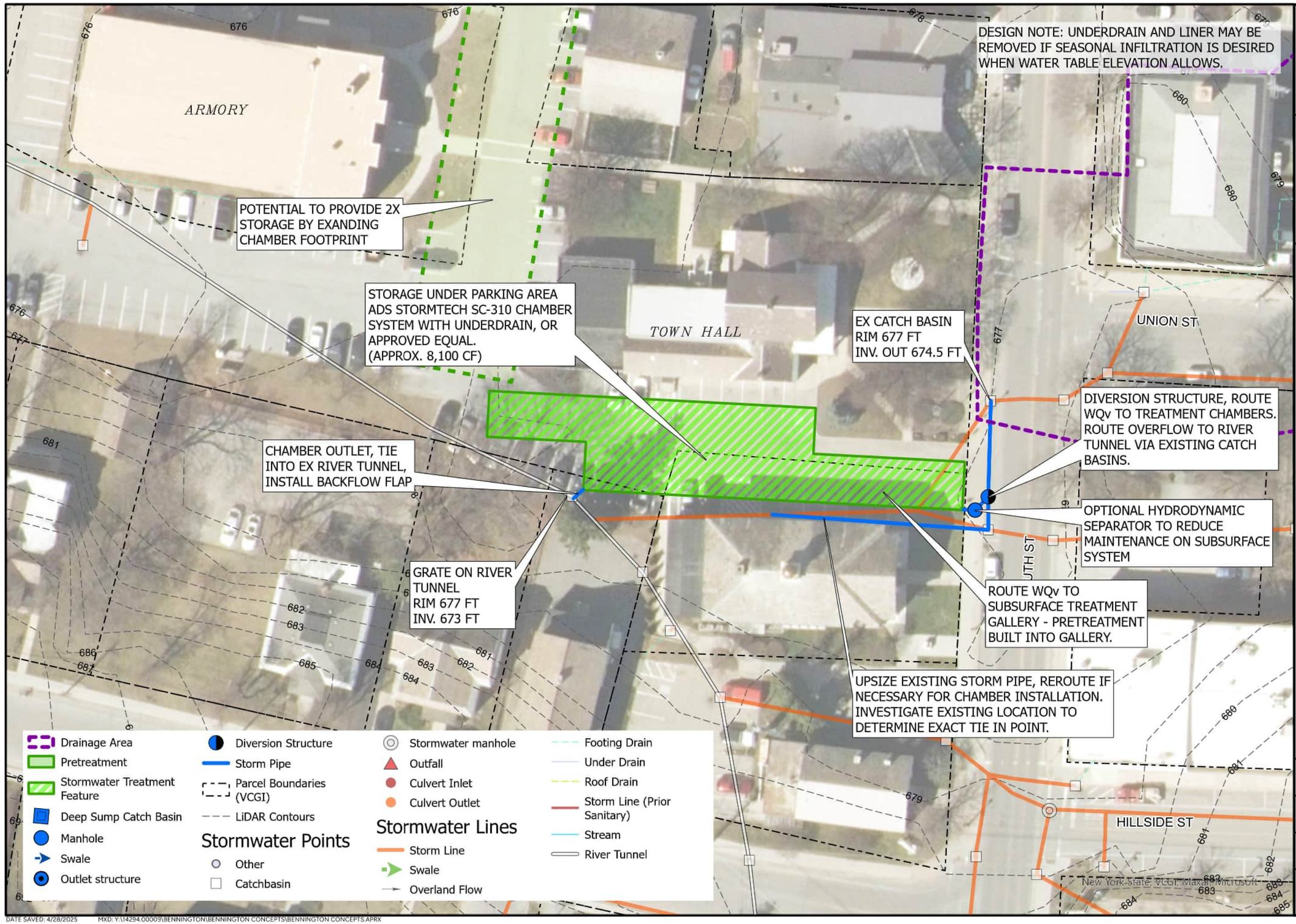
SCALE: NOT TO SCALE
DATE: APRIL 28, 2025
PROJECT NO.: 14294.00009
SHEET NO.: DET-1

SLR Job No.:	SLR	Sheet:
14294.00009	1 South Main Street, 2nd Floor Waterbury, Vermont 05676	1 of 2
Excavation Co.:	Project Name: Multi-Town Stormwater Planning	Hole ID:
Town of Bennington	Bennington	B-11
Operator:	Town:	Date:
	Bennington	5/31/24
MMI Inspector:	Test Pit Location: Lincoln St Fire Department BEN-11	Time:
E. Thompson & J. Louisos		10:00 am
Landuse:	Vegetation:	Landform:
Lawn	Short grass	
Slope %:	Surface Stones:	Parent Material (geologic):
0	N/A	
Weather:	Depth to Bedrock: N/A	
Sunny 60 deg	Standing Water in Hole: N/A	
Surface Elevation:	Weeping from Pit Face: N/A	
658.5	Est. Seasonal High Ground Water: 653.5	

Depth (inches)	Elevation (feet)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consitency, % Gravel)
8	657.8	A	Topsoil	2/1		
11	657.6	A	Topsoil	2/1		
13	657.4	B	Gravelly loamy sand	3/2		
14	657.3	B	Gravelly loamy sand	4/4		
24	656.5	C	Loamy sand	4/4		
32	655.8	C	Loamy sand	4/4		
38	655.3	C	Loamy sand	4/4		
50	654.3	D	Sand	5/6		
53	654.1	D	Coarse sand	5/6		
56	653.8	D	Sand	5/6		

SLR Job No.:	SLR	Sheet:
14294.00009	1 South Main Street, 2nd Floor Waterbury, Vermont 05676	2 of 2
Excavation Co.:	Project Name: Multi-Town Stormwater Planning	Hole ID:
Town of Bennington	Bennington	B-11
Operator:	Town:	Date:
	Bennington	5/31/24
MMI Inspector:	Test Pit Location: Lincoln St Fire Department BEN_11	Time:
E. Thompson & J. Louisos		10:30 am
Landuse:	Vegetation:	Landform:
Lawn	Short grass	
Slope %:	Surface Stones:	Parent Material (geologic):
0	N/A	
Weather:	Depth to Bedrock: N/A	
Sunny 60 deg	Standing Water in Hole: N/A	
Surface Elevation:	Weeping from Pit Face: N/A	
658.5	Est. Seasonal High Ground Water: 653.5	

Depth (inches)	Elevation (feet)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consitency, % Gravel)
60	653.5	D	Very gravelly sand	5/6		
62	653.3	D	Very gravelly sand	5/6	Gley mottling (4/1) 10-15%	



N

0 40

Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

CONCEPTUAL DESIGN - BENNINGTON_19

Stormwater Master Plan - Town of Bennington

Fitzgerald Environmental Associates, LLC

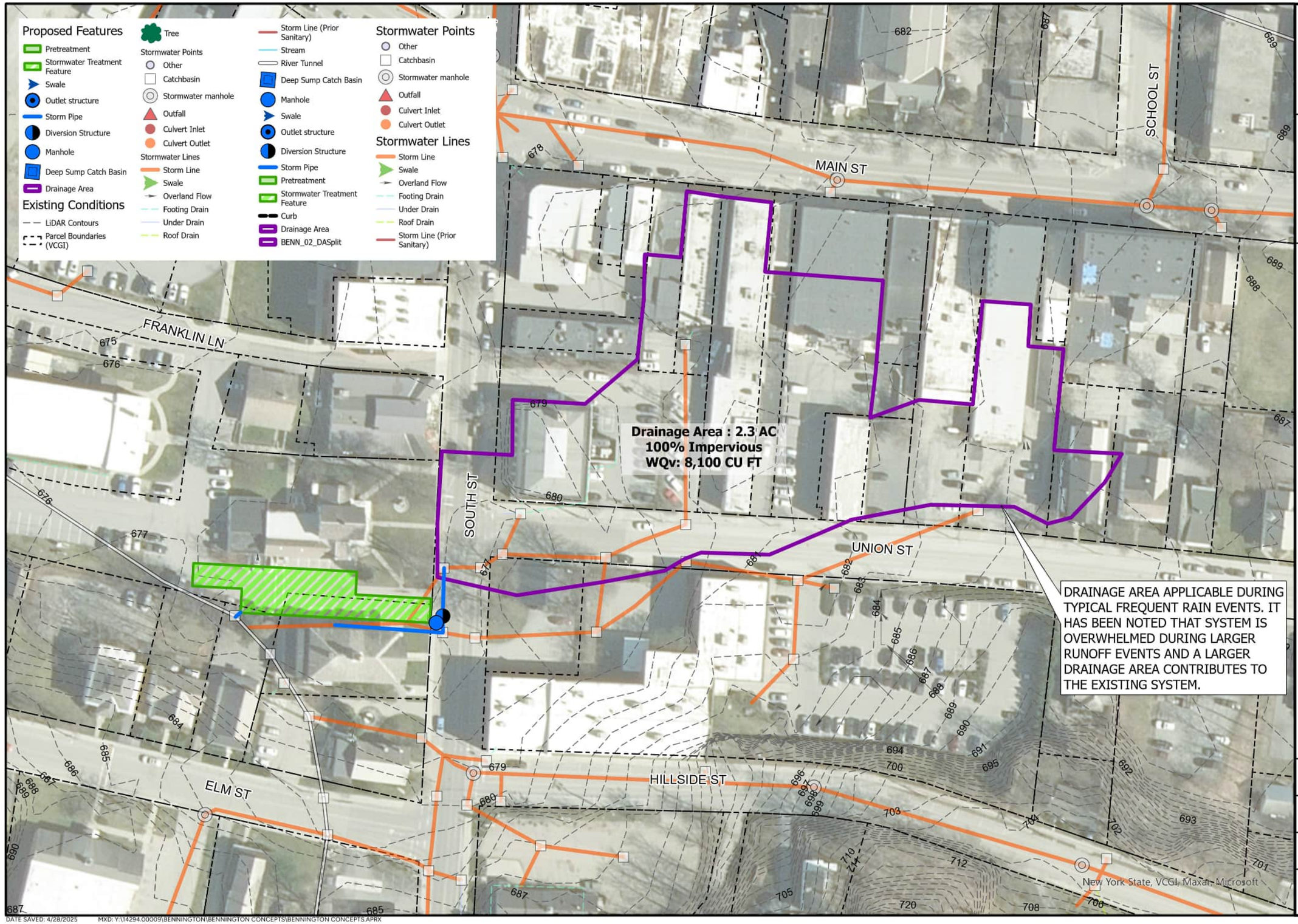
Bennington Town Office
205 South Street
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

SCALE	1 IN = 40 FT
DATE	4/28/2025
PROJECT NO.	14294.00009

SHEET 4A

DATE SAVED: 4/28/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX



N

0 80

Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

DRAINAGE AREA - BENN_19

Stormwater Master Plan - Town of Bennington

Fitzgerald Environmental Associates, LLC

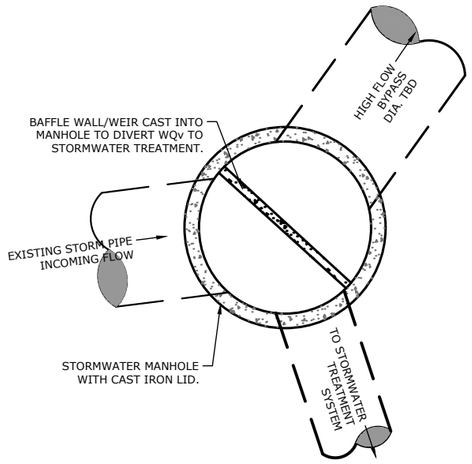
Bennington Town Office
205 South Street
Bennington, VT 05201

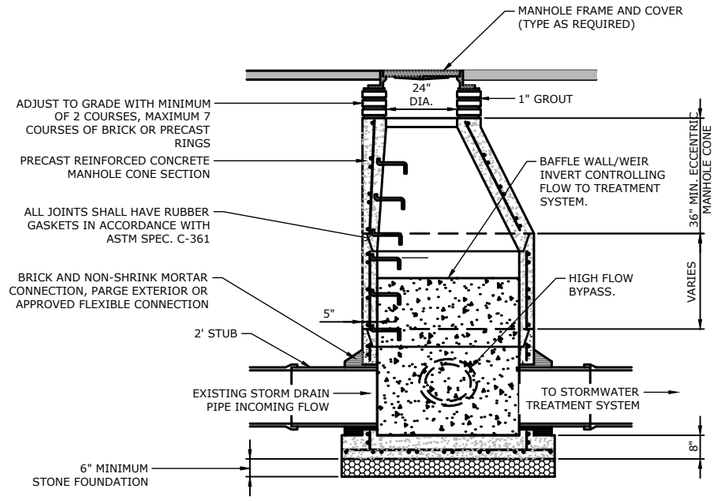
CONCEPTUAL - NOT FOR CONSTRUCTION

SCALE	1 IN = 80 FT
DATE	4/28/2025
PROJECT NO.	14294.00009

SHEET 4B

DATE SAVED: 4/28/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX





NOTES:

1. 5' OR 6' DIAMETER PRECAST BASES MAY BE REQUIRED DUE TO SIZE OR NUMBER OF PIPES AT THE MANHOLE. PRECAST REDUCERS WILL BE PLACED ABOVE THE 5' OR 6' BASES AS DIRECTED BY THE ENGINEER. WALL THICKNESS TO INCREASE BY 1" FOR EACH 1'-0" OF INSIDE DIAMETER.

TYPICAL DIVERSION STRUCTURE

NOT TO SCALE

INSTALLATION NOTES:

1. THE VERMONT STORMWATER MANAGEMENT MANUAL IS A GOOD EDUCATIONAL RESOURCE TO ACCOMPANY THIS PROJECT. ALTERNATIVES TO THE DETAILS PRESCRIBED IN THIS PLAN ARE AVAILABLE IN THAT MANUAL.
2. INSTALL DIVERSION STRUCTURE TO PASS LARGER FLOWS TO RIVER.

OPERATION AND MAINTENANCE NOTES:

1. REGULAR MAINTENANCE OF THE DIVERSION STRUCTURE, HYDRODYNAMIC SEPARATOR AND INSPECTION PORTS TO REMOVE BUILT UP SEDIMENT AND CHECK SYSTEM OPERATION WILL BE NECESSARY.
2. INSPECT OUTLET STRUCTURE OF SUBSURFACE INFILTRATION CHAMBER - INSPECT DIVERSION STRUCTURE, SEPARATOR SUMP, PIPE CONNECTIONS, AND OVERALL STRUCTURE CONDITION. NOTE ANY NEEDED MAINTENANCE. SUMP TO BE CLEANED WHEN 50% FULL.

DESIGN NOTES FOR FINAL DESIGN:

1. INVESTIGATE LOCATIONS AND INVERTS OF EXISTING STORM PIPES AND STRUCTURES THAT WILL BE TIED INTO.
2. OBTAIN DETAILED SURVEY OF PROJECT AREA.

Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
Traffic Control	1	LS	$ 5,000	$ 5,000
Excavation of Surfaces and Pavements	150	CY	$ 50	$ 7,500
Common Excavation	850	CY	$ 25	$ 21,250
Trucking	1000	CY	$ 20	$ 20,000
Trench Excavation	65	CY	$ 25	$ 1,625
Temporary Earth Restraining Systems	1	LS	$ 5,000	$ 5,000
Subsurface Infiltration System	1	LS	$ 75,000	$ 75,000
System Installation	1	LS	$ 10,000	$ 10,000
Thermoplastic Liner	1	LS	$ 40,000	$ 40,000
Gravel	500	CY	$ 75	$ 37,500
Diversion Structure	1	EA	$ 10,000	$ 10,000
Hydrodynamic Separator (Optional)	1	EA	$ 50,000	$ 50,000
Storm Pipe	170	LF	$ 70	$ 11,900
Re-Paving	1	LS	$ 30,000	$ 30,000
Site Restoration	1	LS	$ 10,000	$ 10,000
Final Design & Permitting				$ 50,000
Construction Oversight				$ 35,000
			Subtotal	$ 429,775
			Contingency (20%)	$ 85,960
			Total	**$ 515,735**

Add approximately $250,000 to increase footprint

SLR
1 SOUTH MAIN STREET
WATERBURY, VT 05676
802.882.8355
SLRCONSULTING.COM

REVISIONS

CONCEPTUAL DESIGN

DETAILS - BEN_19

STORMWATER MASTER PLANN
TOWN OF BENNINGTON

BENNINGTON, VT

EMT	EMT	JCL
DESIGNED	DRAWN	CHECKED

SCALE: NOT TO SCALE

DATE: MARCH 25, 2025

PROJECT NO.: 14294.00009

SHEET NO.: DET-1

ADS SC-310
- 252 chambers installed with underdrain
- System invert = 673.33 ft

Advanced Drainage Systems, Inc.

SiteAssist® FOR STORMTECH INSTALLATION INSTRUCTIONS VISIT OUR WEBSITE

SC-310 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-310.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE OR POLYETHYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD HINDER FLOW OR INHIBIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (< 1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75+ YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (>WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, AND THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 335 LBS/FT/%, THE ASCE DEFINED IN SECTION 6.3.8 OF ASTM F2418, AND TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73°F / 23°C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER AS BE ALLOWED, UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3.4 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2922 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE NO THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE MANUFACTURED IN AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.
10. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.30 FOR MANIFOLD SIZING GUIDANCE, DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
11. ADS DOES NOT DESIGN OR PROVIDE MEMBRANE LINER SYSTEMS. TO MINIMIZE THE LEAKAGE POTENTIAL OF LINER SYSTEMS, THE MEMBRANE LINER SYSTEM SHOULD BE DESIGNED BY A KNOWLEDGEABLE GEOTEXTILE PROFESSIONAL AND INSTALLED BY A QUALIFIED CONTRACTOR.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310 SYSTEM

1. STORMTECH SC-310 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-310EC/SC-310P/SC-310PEC CHAMBER SYSTEMS FOR USE WITH ADS GEOSYNTHETICS 601T NON-WOVEN GEOTEXTILE" CONSTRUCTION GUIDE.
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONE SHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVEL AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM 9" (75 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE; AASHTO M43 #3, #357, #4, #467, #5, #56, OR #57.
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

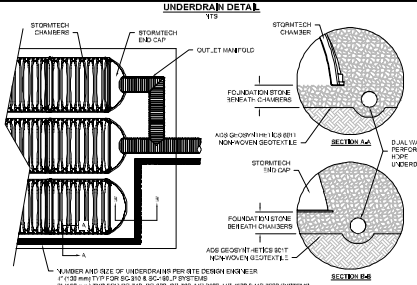
NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-310EC/SC-310P/SC-310PEC CHAMBER SYSTEMS FOR USE WITH ADS GEOSYNTHETICS 601T NON-WOVEN GEOTEXTILE" CONSTRUCTION GUIDE.
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-310EC/SC-310P/SC-310PEC CHAMBER SYSTEMS FOR USE WITH ADS GEOSYNTHETICS 601T NON-WOVEN GEOTEXTILE" CONSTRUCTION GUIDE.
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-310EC/SC-310P/SC-310PEC CHAMBER SYSTEMS FOR USE WITH ADS GEOSYNTHETICS 601T NON-WOVEN GEOTEXTILE" CONSTRUCTION GUIDE.
3. FULL, 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

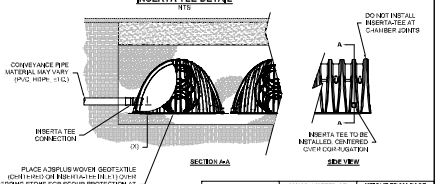
CONTACT STORMTECH AT 1-800-821-6710 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

UNDERDRAIN DETAIL
NTS



5 UNDERDRAIN DETAIL

INSERTA TEE DETAIL
NTS



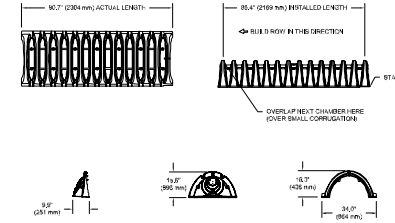
NOTES:
- PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.
- CONTACT ADS ENGINEERING SERVICES IF INSERTA TEE INLET MUST BE RAISED AS NOT ALL INVERTS ARE POSSIBLE.

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (102 mm)
SC-160	10" (250 mm)	4" (102 mm)
SC-160	10" (250 mm)	4" (102 mm)
DC-780	10" (250 mm)	4" (102 mm)
MC-3500	12" (300 mm)	6" (152 mm)
MC-4500	12" (300 mm)	6" (152 mm)
MC-7200	12" (300 mm)	6" (152 mm)

INSERTA TEE FITTINGS AVAILABLE FOR SCH 35, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORILOC C-900 OR DUCTILE IRON

6 INSERTA-TEE SIDE INLET DETAIL

SC-310 TECHNICAL SPECIFICATION
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)		34.0" X 19.5" X 85.4"	(864 mm X 426 mm X 2169 mm)
CHAMBER STORAGE		14.7 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*		26.24 CUBIC FEET	(0.83 m³)
WEIGHT		39.0 lbs.	(18.4 kg)

*ASSUMES 9" (150 mm) ABOVE AND BELOW CHAMBER; 3" (76 mm) BETWEEN CH-AMBERS

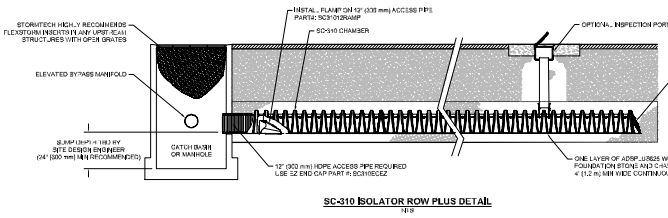
PART #	STUB	B	C
SC310EPE06TPC	6" (150 mm)	5.5" (147 mm)	—
SC310EPE06BPC		—	2.5" (19 mm)
SC310EPE08TPC	8" (200 mm)	3.5" (89 mm)	—
SC310EPE08BPC		—	2.5" (19 mm)
SC310EPE12TPC	12" (300 mm)	1.4" (36 mm)	—
SC310EPE12BPC		—	2.7" (69 mm)
SC310ESE12*	12" (300 mm)	—	2.5" (23 mm)

ALL STUBS, EXCEPT FOR THE SC310ESE12 ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. *FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC310ESE12 THE 12" (300 MM) STUB IS RECESSED THE BOTTOM OF THE END CAP APPROXIMATELY 0.25" (6 MM). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE 12" (300 MM) STUB SO THAT THE FITTING SITS LEVEL.

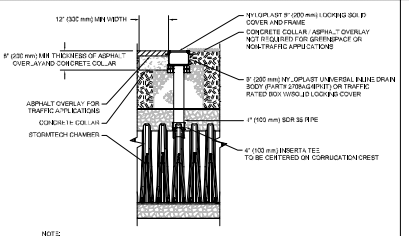
NOTE: ALL DIMENSIONS ARE NOMINAL; PRE-CORED END CAPS END WITH "PC"

2 SC-310 TECHNICAL SPECIFICATIONS



SC-310 ISOLATOR ROW PLUS DETAIL
NTS

3 SC-310 ISOLATOR ROW PLUS DETAIL



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4" PVC INSPECTION PORT DETAIL (SC SERIES CHAMBER)
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS (IF EQUIPPED)
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE COVER AND LOOK DOWN THE PORT IN THE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 6" (150 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i. MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii. FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 6" (150 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

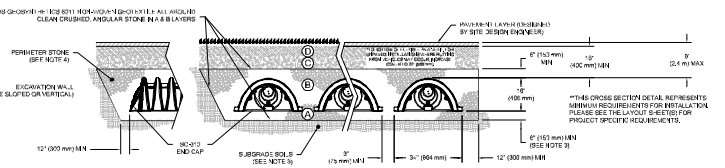
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

4 4" PVC INSPECTION PORT DETAIL (SC SERIES CHAMBER)

ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	FINAL FILL: FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIAL, IN-SITU SOILS OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATION MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	INITIAL FILL: FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 16" (400 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIAL. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	EMBEDMENT STONE: FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[2]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[2]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[3,4]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #1 STONE WOULD STATE "C LEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DROPPING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.23 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-310 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. WHERE SOILS CAN NOT PROVIDE THE REQUIRED ALLOWABLE BEARING CAPACITY IN THE IN-SITU CONDITION, OVER-EXCAVATION AND REPLACEMENT OF SOILS MAY BE REQUIRED TO ACHIEVE THE REQUIRED BEARING CAPACITY.
4. PRIMED AND BITUMINOUS COATED CONSTRUCTION WALL FOR SOIL VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.3.8 OF ASTM F2922 SHALL BE GREATER THAN OR EQUAL TO 335 LBS/FT/%, AND TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73°F / 23°C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 SC-310 CROSS SECTION DETAIL

DRAWN: SMW | DATE: 01/15/25
REVIEWED: JLM | PROJECT NO: 721-380
REV: | NOT TO SCALE

SC-310
STANDARD DETAILS

StormTech® Chamber System
866-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026

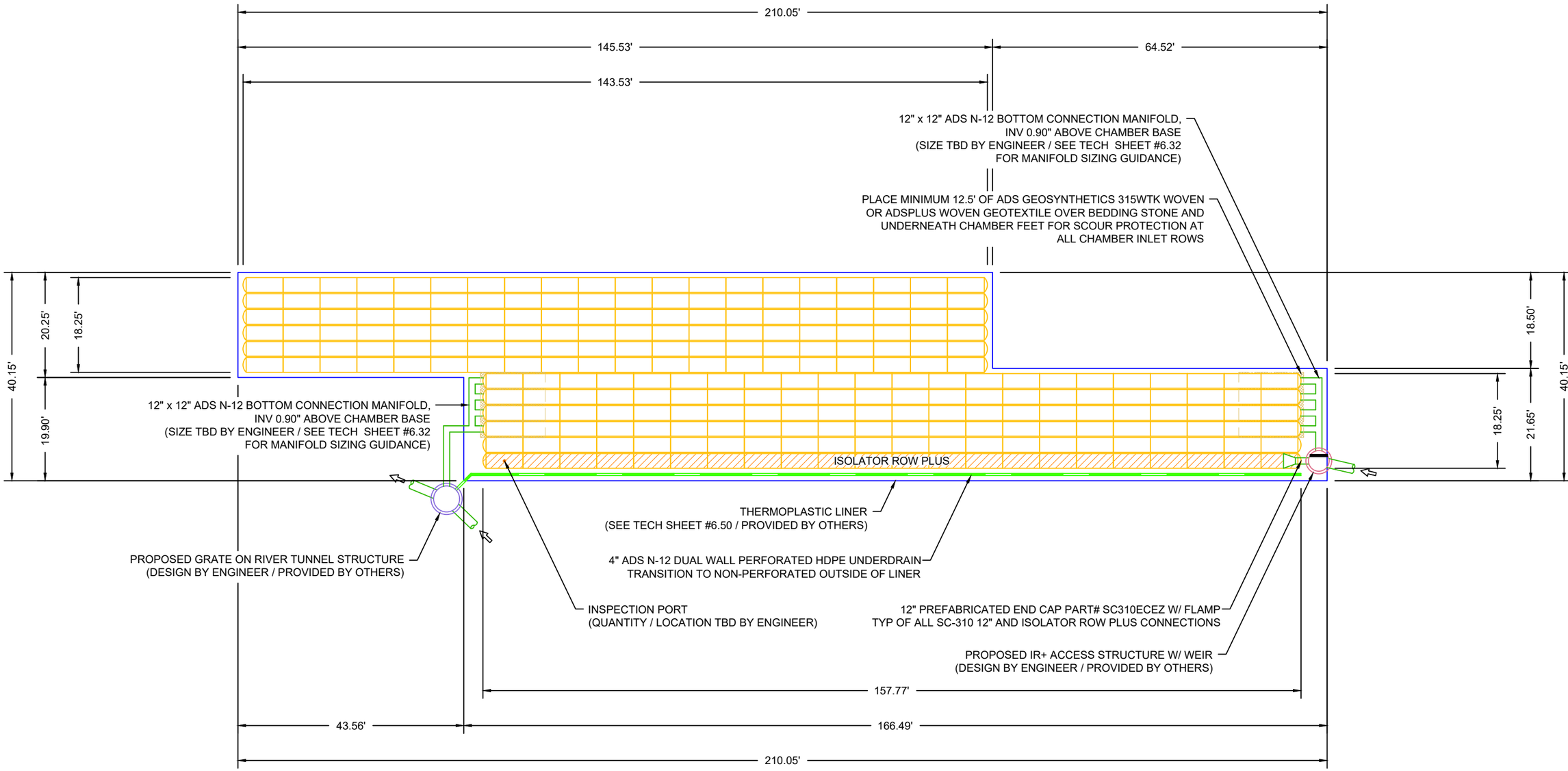
SHEET 1

CONCEPTUAL LAYOUT

(252) STORMTECH SC-310 CHAMBERS
(24) STORMTECH SC-310 END CAPS
INSTALLED WITH 6" COVER STONE, 6" BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 8180 CF
AREA OF SYSTEM: 6373 **FT²**
PERIMETER OF SYSTEM: 500 **FT**

PROPOSED ELEVATIONS

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	683.16
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	677.16
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	676.66
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	676.66
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	676.66
TOP OF STONE:	675.66
TOP OF CHAMBER:	675.16
12" BOTTOM / ISOLATOR ROW CONNECTION INVERT:	673.91
BOTTOM OF CHAMBER:	673.83
4" UNDERDRAIN INVERT:	673.33
BOTTOM OF STONE:	673.33



BENNINGTON TOWN OFFICE
BENNINGTON, VT

DATE: 03/04/2025 | DRAWN: AC | CHECKED: ---
PROJECT #: -

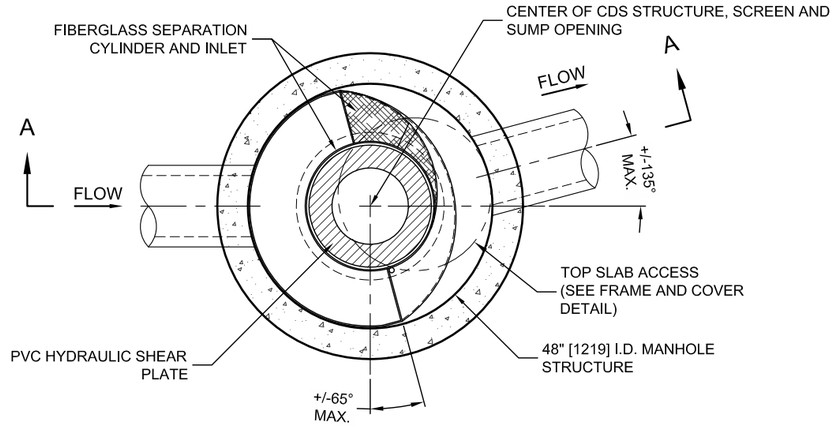
REV	DRW	CHK	DESCRIPTION
03/05/2025	AC		REVISED PER ENGINEER'S COMMENTS

StormTech
Detention • Retention • Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

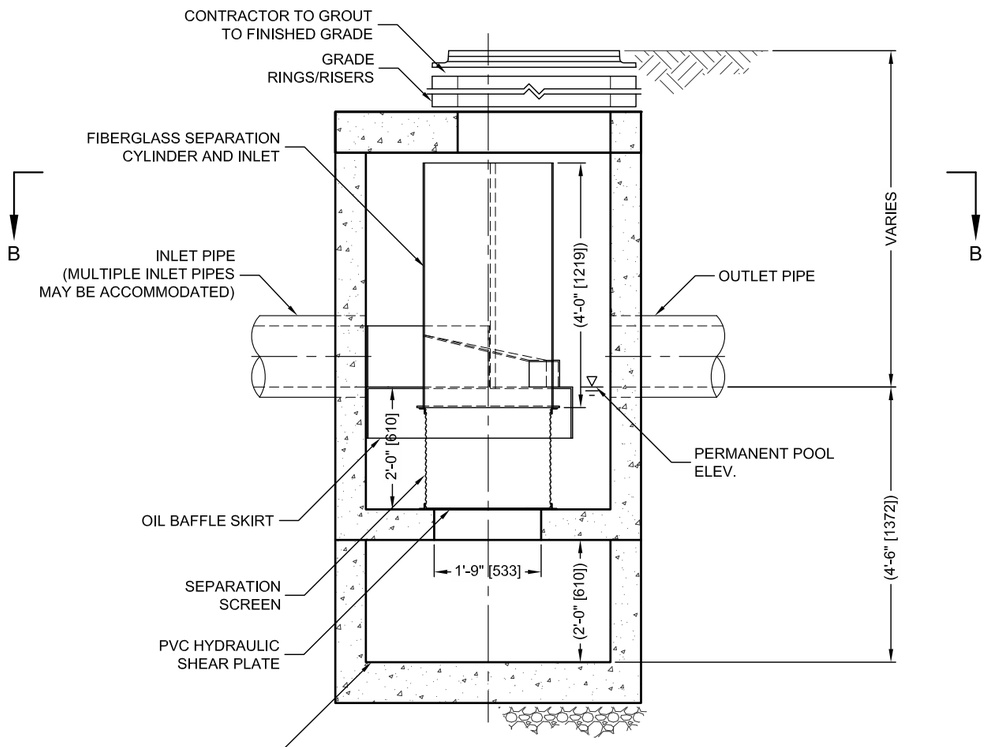
ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

NOT TO SCALE

Hydrodynamic Separator Example Detail



PLAN VIEW B-B
N.T.S.



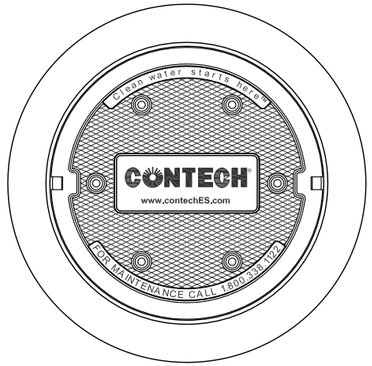
ELEVATION A-A
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,782; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS2015-4-C DESIGN NOTES

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

SLR Job No.:	SLR	Sheet:
14294.00009	1 South Main Street, 2nd Floor Waterbury, Vermont 05676	1 of 1
Excavation Co.:	Project Name: Multi-Town Stormwater Planning	Hole ID:
Town of Bennington	Bennington	B-19
Operator:	Town:	Date:
	Bennington	12/10/24
MMI Inspector:	Test Pit Location:	Time:
E. Thompson & B. Cote	Town Hall picnic area BEN_19	9:15 am
Landuse:	Vegetation:	Landform:
Lawn	Short grass	
Slope %:	Surface Stones:	Parent Material (geologic):
0	N/A	
Weather:	Depth to Bedrock: N/A	
Overcast 40 deg	Standing Water in Hole: N/A	
Surface Elevation:	Weeping from Pit Face: N/A	
676.8	Est. Seasonal High Ground Water: 652.8	No clear mottling

Depth (inches)	Elevation (feet)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consitency, % Gravel)
5	676.4	A	Topsoil	10YR 3/3		
14	675.6	A	Silty loam/topsoil			
25	674.7	B	Fill	10YR 3/4		Some cobble
37	673.7	C	Fine sandy loam	10YR 3/6		Cobbles, some boulders
48	672.8	C	Fine sandy loam	10YR 3/6		Cobble, gravel, some boulders
74	670.6	D	Coarse sand	Mixed light brown sand		Higher % cobble
104	668.1	D	Sand with silt	10YR 4/6		More cobble, appears to be old river bed material. Increasing silt.

OUTLET STRUCTURE TO TIE INTO EXISTING CATCH BASIN

EXISTING HEADWALL STRUCTURE

GRAVEL WETLAND - BOTTOM SURFACE AREA = 6,000 SQ. FT. TREATS 83% WQv. (APPROX. 17,600 CF)

EX CATCH BASIN RIM 739.4 FT INV. OUT 733.6 FT

ABANDON SECTION OF STORM PIPE

DIVERSION STRUCTURE - TIE INTO EXISTING PIPE. OUTLETS AND INTERNAL WEIR DESIGNED TO DIVERT1-INCH RAINFALL EVENT ENTIRELY TO WETLAND.

OUTLET INV. 734.1 FT

HYDRODYNAMIC SEPARATOR

EX CATCH BASIN RIM 741.2 FT INV. OUT 734.87 FT

BEECH ST

ROLLIN ST

VCGI, Maxar, Microsoft

Proposed Features

- Pretreatment
- Stormwater Treatment Feature
- Swale
- Outlet structure
- Storm Pipe
- Diversion Structure
- Manhole
- Deep Sump Catch Basin
- Drainage Area

Existing Conditions

- LiDAR Contours
- Parcel Boundaries (VCGI)
- Tree

Stormwater Points

- Other
- Catchbasin
- Stormwater manhole
- Outfall
- Culvert Inlet
- Culvert Outlet

Stormwater Lines

- Storm Line
- Swale
- Overland Flow
- Footing Drain
- Under Drain
- Roof Drain
- Storm Line (Prior Sanitary)
- Stream
- River Tunnel

N

0 50

Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

CONCEPTUAL DESIGN - BENN_30

Stormwater Master Plan - Town of Bennington

Fitzgerald Environmental Associates, LLC

Beech Street Town Parcel
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

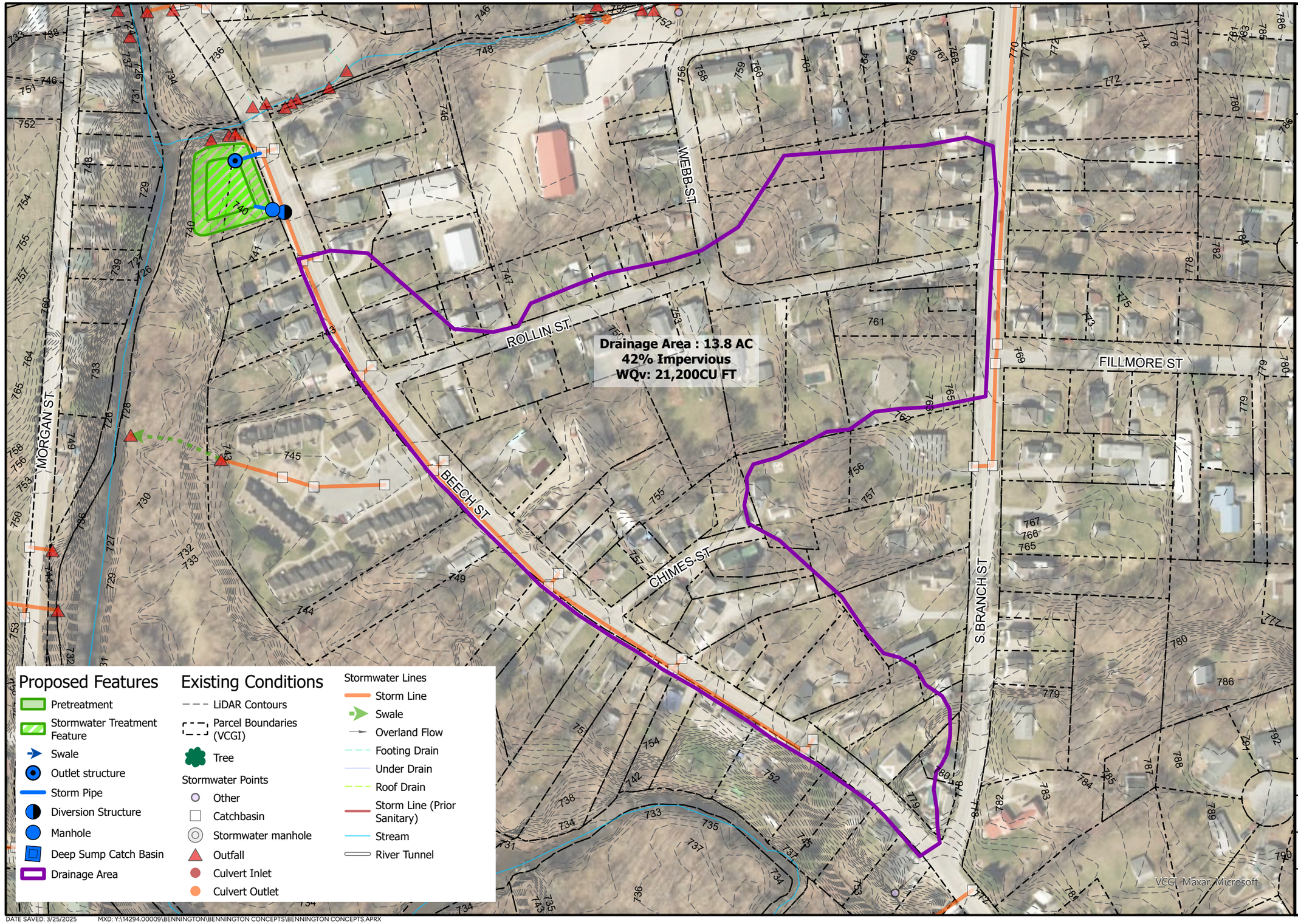
SCALE 1 IN = 50 FT

DATE 3/25/2025

PROJECT NO. 14294.00009

SHEET 5A

DATE SAVED: 3/25/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX



Proposed Features

- Pretreatment
- Stormwater Treatment Feature
- Swale
- Outlet structure
- Storm Pipe
- Diversion Structure
- Manhole
- Deep Sump Catch Basin
- Drainage Area

Existing Conditions

- LiDAR Contours
- Parcel Boundaries (VCGI)
- Tree

Stormwater Points

- Other
- Catchbasin
- Stormwater manhole
- Outfall
- Culvert Inlet
- Culvert Outlet

Stormwater Lines

- Storm Line
- Swale
- Overland Flow
- Footing Drain
- Under Drain
- Roof Drain
- Storm Line (Prior Sanitary)
- Stream
- River Tunnel

N

0 150

Feet

SLR

1 S MAIN STREET
WATERBURY, VT 05676
802.882.8335

DRAINAGE AREA - BENN_30

Stormwater Master Plan - Town of Bennington

Fitzgerald Environmental Associates, LLC

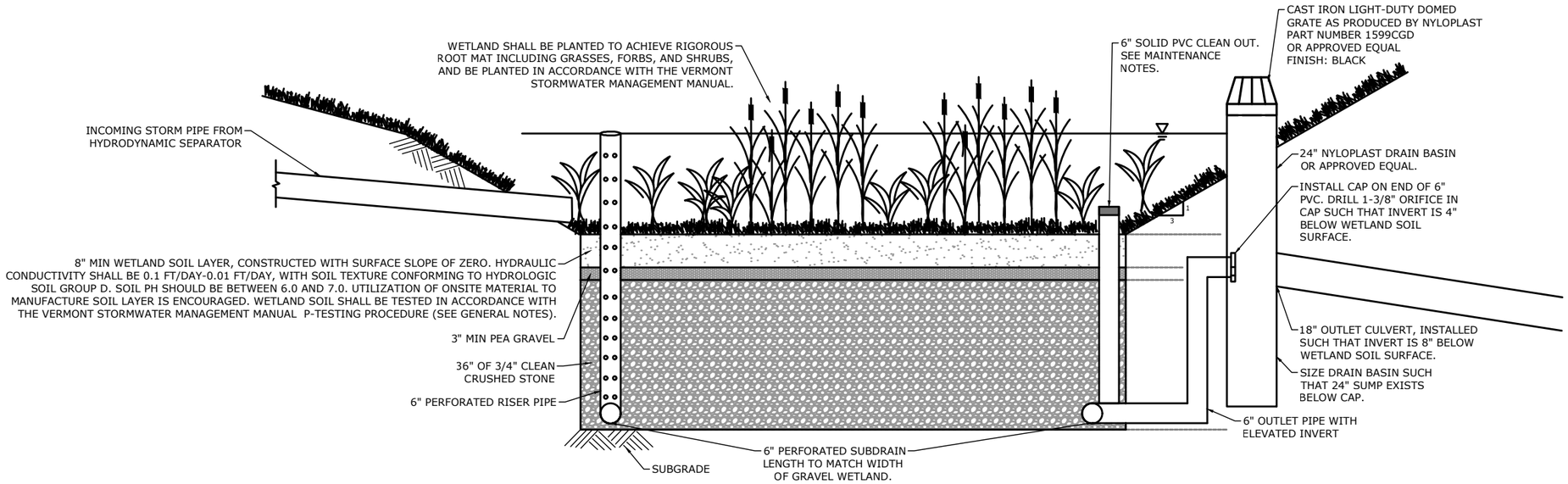
Beech Street Town Parcel
Bennington, VT 05201

CONCEPTUAL - NOT FOR CONSTRUCTION

SCALE	1 IN = 150 FT
DATE	3/25/2025
PROJECT NO.	14294.00009

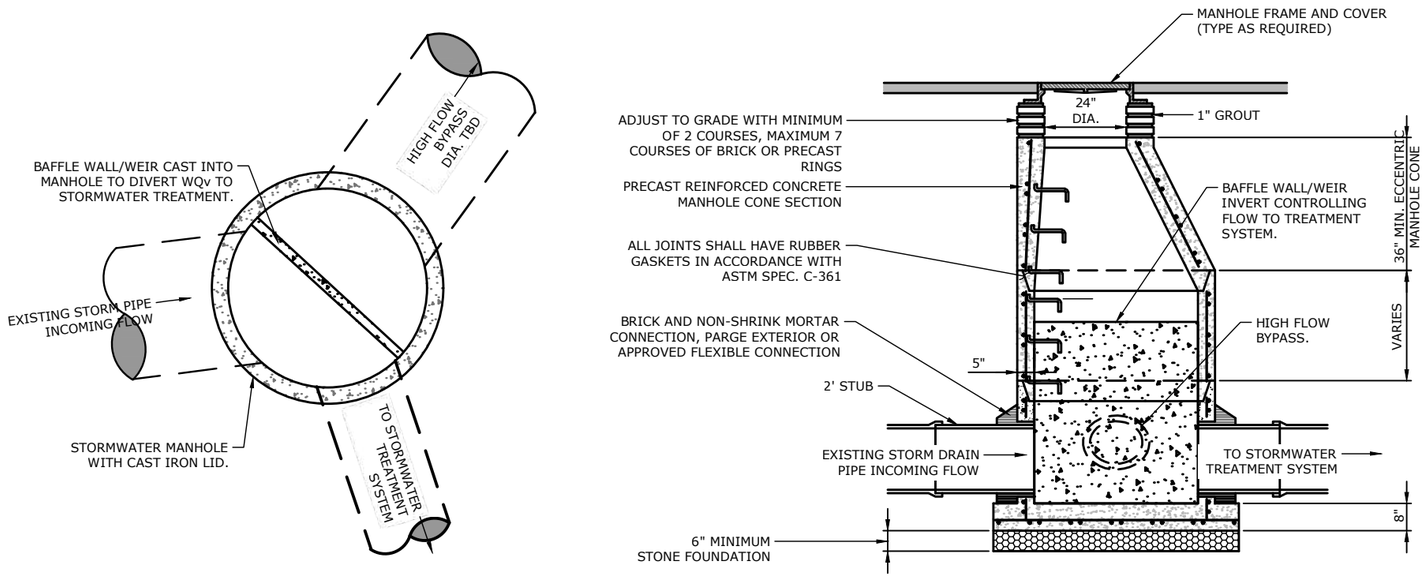
SHEET 5B

DATE SAVED: 3/25/2025 MXD: Y:\14294.00009\BENNINGTON\BENNINGTON CONCEPTS\BENNINGTON CONCEPTS.APRX



GRAVEL WETLAND SECTION VIEW

NOT TO SCALE



NOTES:

1. 5' OR 6' DIAMETER PRECAST BASES MAY BE REQUIRED DUE TO SIZE OR NUMBER OF PIPES AT THE MANHOLE. PRECAST REDUCERS WILL BE PLACED ABOVE THE 5' OR 6' BASES AS DIRECTED BY THE ENGINEER. WALL THICKNESS TO INCREASE BY 1" FOR EACH 1'-0" OF INSIDE DIAMETER.

TYPICAL DIVERSION STRUCTURE

NOT TO SCALE

SLR
1 SOUTH MAIN STREET
WATERBURY, VT 05676
802.882.8355
SLRCONSULTING.COM

REVISIONS

CONCEPTUAL DESIGN

DETAILS - BEN_30

STORMWATER MASTER PLANN
TOWN OF BENNINGTON

BENNINGTON, VT

EMT	EMT	JCL
DESIGNED	DRAWN	CHECKED

SCALE: NOT TO SCALE

DATE: MARCH 25, 2025

PROJECT NO.: 14294.00009

SHEET NO.: DET-1

INSTALLATION NOTES:

1. THE VERMONT STORMWATER MANAGEMENT MANUAL IS A GOOD EDUCATIONAL RESOURCE TO ACCOMPANY THIS PROJECT. ALTERNATIVES TO THE DETAILS PRESCRIBED IN THIS PLAN ARE AVAILABLE IN THAT MANUAL.
2. PLANTING DENSITIES ARE RECOMMENDED TO BE ONE PERENNIAL EVERY 2.5 FEET ON CENTER OR ONE SHRUB EVERY 5 FEET ON CENTER. ALL PLANTING IS TO OCCUR ON BOTTOM SURFACE OF GRAVEL WETLAND.

OPERATION AND MAINTENANCE NOTES:

1. MAINTENANCE OF THE PRETREATMENT SEPARATOR WILL BE REQUIRED TO REMOVE BUILT UP SEDIMENT. OCCASIONAL WEEDING OF THE WETLAND 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. ANNUALLY INSPECT MAKE SURE NO INVASIVE SPECIES ARE PRESENT.
4. INSPECT FOR EROSION PATHS OR CONCENTRATED FLOW.
5. INSPECT OUTLET STRUCTURE OF GRAVEL WETLAND - INSPECT LOW FLOW ORIFICE, OVERFLOW GRATE, STRUCTURE SUMP, PIPE CONNECTIONS, AND OVERALL STRUCTURE CONDITION. NOTE SUMP DEPTH, DEPTH OF ACCUMULATED SEDIMENT IN SUMP AND OTHER DEBRIS, AND OTHER NEEDED MAINTENANCE. SUMP TO BE CLEANED WHEN 50% FULL

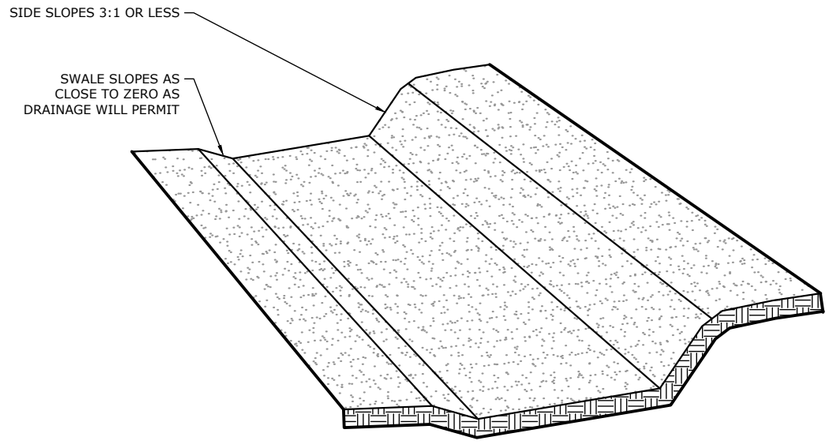
DESIGN NOTES FOR FINAL DESIGN:

1. INVESTIGATE SOILS TO DETERMINE AMENDMENTS NEEDED TO PROVIDE 8 INCHES OF WETLAND SOILS WITH LOW INFILTRATION RATE. SOILS WILL NEED TO BE TESTED FOR PHOSPHORUS CONCENTRATION.

Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
Traffic Control	1	LS	$ 5,000	$ 5,000
Import Topsoil	200	CY	$ 65	$ 13,000
Excavation of Surfaces and Pavements	5	CY	$ 50	$ 250
Common Excavation	3800	CY	$ 25	$ 95,000
Trucking	3800	CY	$ 20	$ 76,000
Trench Excavation	70	CY	$ 25	$ 1,750
Gravel Wetland Pipes and Structures	1	LS	$ 15,000	$ 15,000
Gravel	700	CY	$ 75	$ 52,500
Pea Stone	70	CY	$ 100	$ 7,000
Wetland Soils	170	CY	$ 150	$ 25,500
Diversion Structure	1	EA	$ 10,000	$ 10,000
Hydrodynamic Separator	1	EA	$ 50,000	$ 50,000
Storm Pipe	90	LF	$ 70	$ 6,300
Seed & Mulch	1	LS	$ 4,000	$ 4,000
Plantings - Perennials	1	LS	$ 12,000	$ 12,000
Site Restoration	1	LS	$ 5,000	$ 5,000
Final Design & Permitting				$ 45,000
Construction Oversight				$ 30,000
			Subtotal	$ 463,300
			Contingency (20%)	$ 92,660
			Total	**$ 555,960**

24-INCH OUTLET RISER
NOT TO SCALE



GRASSED SWALE
NOT TO SCALE

SLR
1 SOUTH MAIN STREET
WATERBURY, VT 05676
802.882.8355
SLRCONSULTING.COM

REVISIONS

CONCEPTUAL DESIGN

DETAILS - BEN_30

STORMWATER MASTER PLANN
TOWN OF BENNINGTON

BENNINGTON, VT

EMT	EMT	JCL
DESIGNED	DRAWN	CHECKED

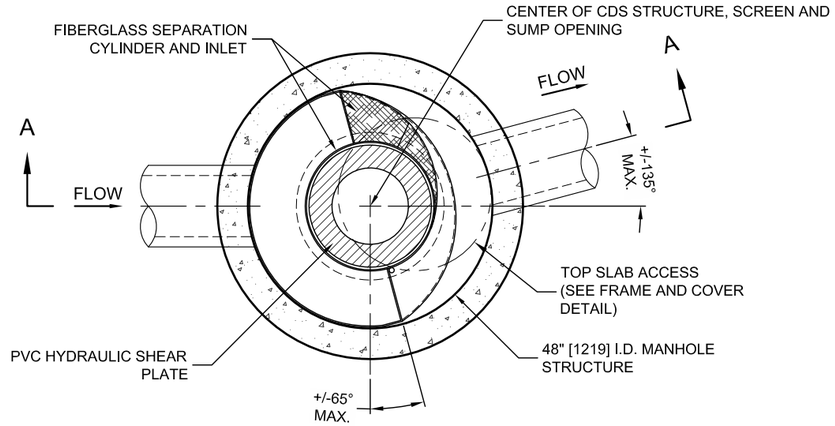
SCALE: NOT TO SCALE

DATE: MARCH 25, 2025

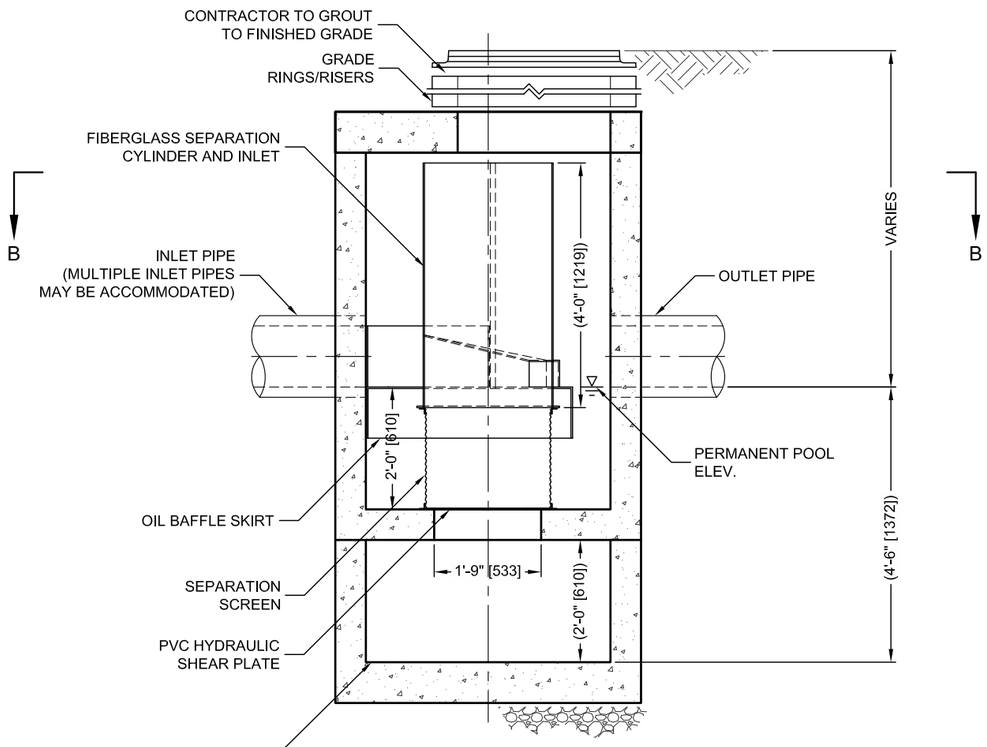
PROJECT NO.: 14294.00009

SHEET NO.: DET-2

Hydrodynamic Separator Example Detail



PLAN VIEW B-B
N.T.S.



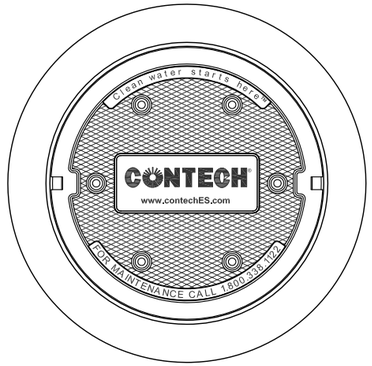
ELEVATION A-A
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,782; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS2015-4-C DESIGN NOTES

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

SLR Job No.:	SLR	Sheet:
14294.00009	1 South Main Street, 2nd Floor Waterbury, Vermont 05676	1 of 1
Excavation Co.:	Project Name: Multi-Town Stormwater Planning	Hole ID:
Town of Bennington	Bennington	B-30
Operator:	Town:	Date:
	Bennington	12/10/24
MMI Inspector:	Test Pit Location:	Time:
E. Thompson & B. Cote	Beech St parking lot BEN_30	12:00pm
Landuse:	Vegetation:	Landform:
Gravel Parking	None	
Slope %:	Surface Stones:	Parent Material (geologic):
0	N/A	
Weather:	Depth to Bedrock: N/A	
Overcast 40 deg	Standing Water in Hole: 730.8	
Surface Elevation:	Weeping from Pit Face: N/A	
740.0	Est. Seasonal High Ground Water: No clear mottling, possibly no native material	

Depth (inches)	Elevation (feet)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consitency, % Gravel)
4	739.7	A	Topsoil			
12	739.0	B	Sandy loam/fill			
18	738.5	B	Fill			Burn layer
24	738.0	B	Sandy loam with cobble			Old gas line in this layer
30	737.5	C	Coarse sand			Sections of fill/unnatural material all around pit
54	735.5	C	Coarse sand			Some cobble, boulders
132	729.0	C	Coarse sand, trace silt	10 YR 5/8		Some cobble, boulders