Stormwater Master Plan for the Town of Cambridge, Vermont

FINAL REPORT

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Lamoille River at project JV-01

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1.0 Introduction

In 2020 the Lamoille County Planning Commission (LCPC) obtained grant funding from the Vermont Department of Environmental Conservation (VTDEC) Ecosystem Restoration Program (ERP) to develop a Stormwater Master Plan (SWMP) for the Town of Cambridge, focusing on the two Village Centers of Cambridge and Jeffersonville. In consultation with the Town, LCPC hired Fitzgerald Environmental Associates, LLC (FEA) and project partner SLR International (formerly Milone and MacBroom, Inc.) in the summer of 2020 to develop the plan. This final SWMP report for the Town of Cambridge represents significant efforts and collaborations over the last year between the Town, FEA, SLR, LCPC, VTDEC, 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) and compaction of soils disrupts natural hydrology and causes increased stormwater runoff. Increased stormwater runoff leads to higher magnitude flood flows and greater erosive power in stream channels, increased delivery of sediment, nutrients, and other pollutants to waterways, and increased flooding conflicts with improved properties downstream. 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 can prevent problems from happening either by mitigating impacts before they create problems or by avoiding the creation of problems; in other words, prevention is cheaper than restoration. If we are to avoid the high cost of restoring degraded surface waters, we must better manage stormwater runoff before waters become impaired. Plans are developed with public involvement and comment and should be as comprehensive as possible in listing all known problems. Plans are based on a prioritized list of projects or a strategic approach and are therefore more likely to succeed 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, and frequently during an emergency or after a structural failure has occurred. Stormwater management plans contain important information about preserving natural features and functions of a watershed and provide a list of evaluated alternatives such as using traditional pipe (gray) infrastructure versus green stormwater infrastructure.

1.2 Project and Town Background

The Town of Cambridge (Population 3,839) has dense residential and commercial development within the Village Centers of Jeffersonville and Cambridge as well as Smuggler's Notch Resort. The Lamoille River flows through the Town of Cambridge and has confluences with the Brewster River in the Village of Jeffersonville and with the Seymour River in the Village of Cambridge. Smuggler's Notch Resort is in the southern portion of the Town and is a significant recreational area. A Town Road Erosion Inventory completed by LCPC in 2019 found that 43% of the hydrologically connected road segments within the Town were not in compliance with standards in the VTDEC Municipal Roads General Permit (MRGP). These findings suggest that runoff from Town roads is a significant concern for water quality.

1.3 Project Goals and Objectives

The primary goals of this planning effort are to better manage stormwater runoff to reduce sediment and nutrient pollution in the Lamoille, Brewster, and Seymour Rivers and to increase flood resiliency in and around the Village Centers. The primary objectives of this SWMP are to:

- Build on past efforts to alleviate flooding within the Village centers.
- 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 the Villages of Jeffersonville and Cambridge.
- 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 (2018). Conceptual design plans (30% design) were prepared for 4 high-priority projects. Phosphorus loading and removal estimates were provided for each project to assist the Town with prioritization for meeting water quality goals.

2.0 Study Area Description

Cambridge is a 63.7 square mile town located in Lamoille County in Northern Vermont. The Cambridge Village center covers 0.11 square miles. The 0.14 square mile Village center of Jeffersonville also lies within Cambridge and constitutes a second village center. As of the 2020 census, Cambridge has a total population of 3,839 people, with 210 living in the Cambridge Village center and 750 living in Jeffersonville (U.S. Census Bureau, 2021). The Town of Cambridge is primarily forested, with only 4.6% of its area mapped as developed lands (Table 1). Cambridge is bordered by 8 Vermont towns (Waterville, Johnson, Morristown, Stowe, Underhill, Westford, Fairfax, and Fletcher). The town's roads are mostly municipal and private, with 22.5% of its road length made up of Vermont state roads (Table 2).

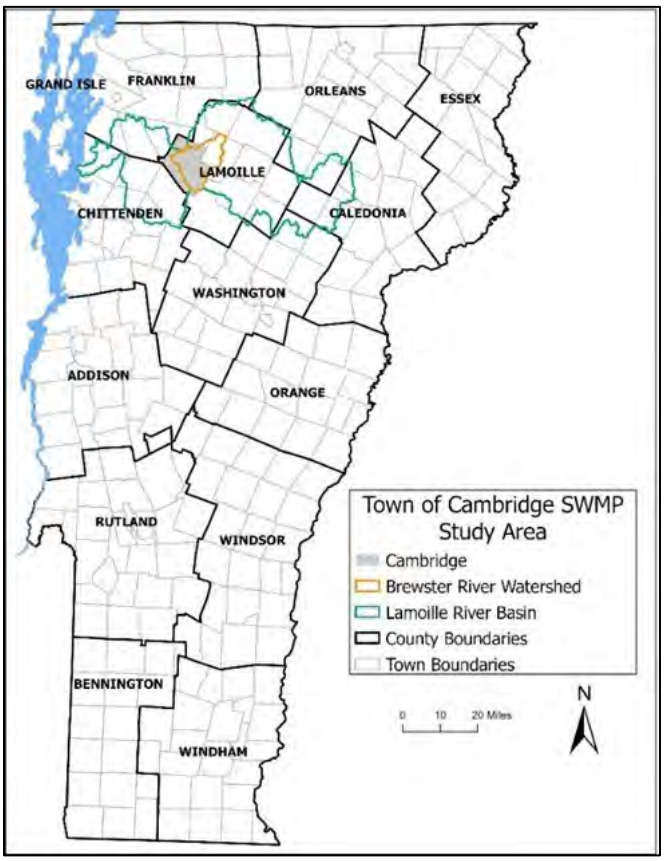


Figure 1: Town of Cambridge, Lamoille Basin, and Brewster River Watershed Location Map.

Most of the town area and village centers are part of the Lamoille River Basin, with much of the town falling in the Brewster River watershed. The Brewster River joins the

mainstem of the Lamoille River in the Jeffersonville Village. A small portion of the southern corner of Cambridge is in the Winooski River watershed, and a slightly larger portion of the northern corner is in the Missisquoi watershed (Figure 1).

Table 1: Land cover in Cambridge (Homer et al., 2015)

Landcover/Landuse Type	% of Town
Agriculture	10.1
Barren	0.04
Developed	4.6
Forest	80.1
Open Water	0.4
Shrub/Scrub	0.9
Grassland/Herbaceous	1.2
Wetland	2.7

Table 2: Road length by AOT Class in Cambridge (VTrans, 2017)

AOT Class	Description	Length (miles)	% of Town Road Length (excluding discontinued)
2	Class 2 Town Highway	12.9	10
3	Class 3 Town Highway	48.9	37.6
4	Class 4 Town Highway	7.1	5.5
5	State Forest Highway	-	-
7	Legal Trail	-	-
8 & 9	Private Road	31.8	24.5
30	Vermont State Highway	29.2	22.5
40	US Highway	-	-
96	Discontinued Road	0.3	-

Soil mapping for the Town shows that well drained soils (Hydrogroup A and B) are primarily located at lower elevations along the rivers and heavier soils (Hydrogroup C and D) are most common at higher elevations (Table 3). Smuggler's Notch Resort is generally mapped as C-type and D-type soils.

Table 3: Summary of town-wide and developed lands soil drainage

Soil Hydrogroup	Town of Cambridge (acres)	Developed Lands (acres)
A	4,150 (10%)	642 (27%)
B	8,130 (20%)	585 (25%)
C	13,326 (33%)	397 (16%)
D	14,666 (37%)	725 (30%)
Total	40,273	2,350

3.0 Stormwater Management Planning Library

3.1 Mapping Data

VTDEC Municipal Roads Program

Road Erosion Inventories (REI) for the Villages of Cambridge and Jeffersonville were conducted by the Lamoille County Planning Commission (LCPC) in 2018. The REI was developed for municipalities to fulfill requirements of the VTDEC Municipal Roads General Permit (MRGP). In this inventory, municipal roads are broken up into 100-meter (328 ft) segments with unique identification numbers. The segments deemed hydrologically connected to surface waters 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 566 hydrologically connected segments inventoried in the Town of Cambridge, 132 (23%) did not meet MRGP standards and 152 (27%) partially met MRGP standards (link). Roads in the town with segments that did not meet or partially met MRGP standards included Bryce Road, Williamson Road, and Upper Pleasant Valley Road. High priority segments identified in the REI are important opportunities to reduce erosion and sediment loading to receiving waters. The Cambridge REI includes four outfall assessments, three of which have gully erosion present. These outfalls were considered as potential sites for improvements.

Light Detection and Ranging (LiDAR)

LiDAR returns for Cambridge were collected in a series of flights conducted during 2014 and 2017 as part of the VT LiDAR Initiative. The 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.

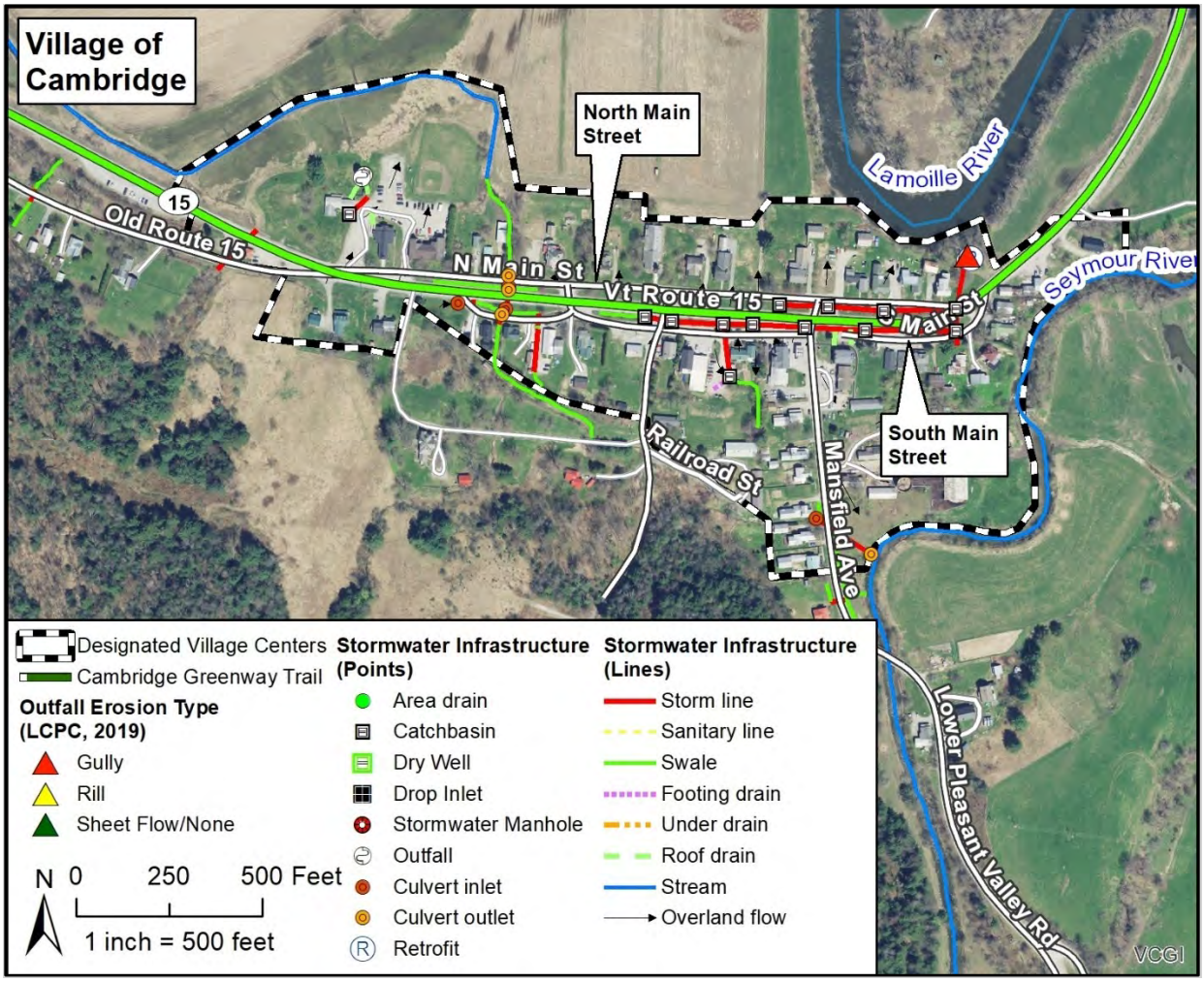
Municipal Bridge and Culvert Data

Culvert and bridge data collected by the Lamoille County Planning Commission (LCPC) for town roads in Cambridge and Jeffersonville are available online (https://vtculverts.org/). The dataset includes the structure dimensions and overall conditions but does not include the presence/absence of erosion. While most culverts were rated as fair to excellent, a few were rated as poor, critical or urgent There are failing culverts on Main St. South, Williamson Rd., Upper Pleasant Valley Rd., Pratt rd., W Farm Rd., and Deer Run Hts, as well as others.

Village of Cambridge Stormwater Infrastructure Mapping Project

This dataset was produced by the Vermont Agency of Natural Resources (VTANR) Ecosystems restoration program in February 2012 and is available online (link). The Stormwater Mapping Project documents the connectivity of stormwater infrastructure on private and public land within the Village of Cambridge. The data show the paths of stormwater from different areas of impervious surface (Figure 2). This dataset was crucial in the implementation of the SWMP as it includes information on all stormwater features within the village center. The report includes one project recommendation to reduce erosion and sediment loading into the Lamoille River at the stormwater outfall at the northeast corner of the Village.

Figure 2: Cambridge Stormwater Infrastructure Map

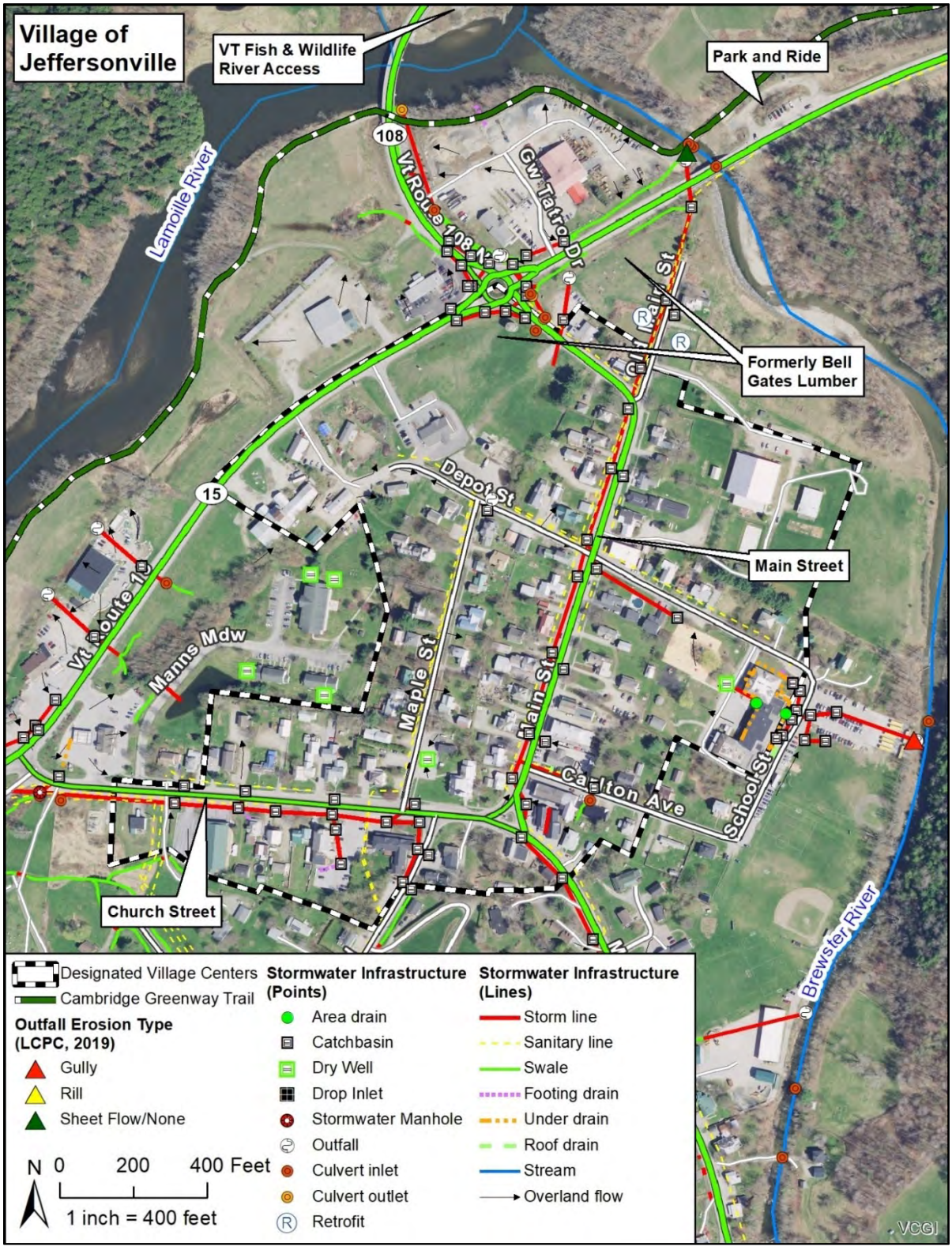


Village of Jeffersonville Stormwater Infrastructure Mapping Project

The Jeffersonville Stormwater Mapping Project was produced by the VTANR Ecosystems restoration program in February 2012 and is available online (link). It includes data that is equivalent to the Cambridge Stormwater Mapping Project. These maps of stormwater infrastructure within the village centers inform the SWMP of the current stormwater situation and draw attention to areas in need of remediation. The report includes one project recommendation to treat stormwater runoff from a large drainage area prior to discharging to the Brewster River.

As part of field visits to the Bell Gates property it has been noted that the stormwater infrastructure mapping in this area of the Village may not be accurate or complete. Since this property is a focal area for conceptual designs, our team investigated stormwater infrastructure in the field and coordinated with the Village to improve the mapping in this area as was necessary. Any infrastructure mapping updates resulting from our work will be shared with VTDEC.

Figure 3: Jeffersonville Stormwater Infrastructure Map



Natural Resources Conservation Service (NRCS) Soils Survey

The NRCS soil 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 on where high flow volumes will occur during major storm events. This dataset can also be used to inform BMP designs and location. BMPs proposed for areas upgradient of areas that are at high risk of flooding may have the potential to reduce downstream flooding and erosion issues. Project prioritization was informed by flood hazard potentials to mitigate flood damage within the Village centers.

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

Lamoille Tactical Basin Plan

The Tactical Basin Plan for the Lamoille River was prepared by the Vermont Agency of Natural Resources in 2016 (VTDEC, 2016). The basin plan catalogs current surface water quality conditions, stressors, and recommended actions for water quality restoration. The Lamoille River Basin includes 15 subwatersheds, one of which is the Brewster River in the middle section of the Lamoille Basin. The Brewster River flows through the Village of Jeffersonville to the Lamoille River. The 19.8 square-mile area of the Brewster River watershed is made up of 8% Agricultural, 5% Developed, and 84% Forested Land, and includes the Village of Jeffersonville and Smuggler's Notch ski resort. Jeffersonville has historically experienced extreme flooding from the Brewster River including in the spring of 2011, which damaged homes, businesses, and roads. Stressors in the middle section of the Lamoille Basin include toxic leaching, acidity from atmospheric deposition, encroachment, channel erosion, land erosion, flow alteration, and nutrient runoff from agriculture. The Tactical Basin Plan prioritizes river corridor protection, stormwater treatments, and flood modelling and mitigation for the Brewster River. The Tactical Basin Plan draws focus to a number of potential projects in our study area including preliminary designs for floodplain restoration at the confluence of the Brewster and Lamoille Rivers (ID#9067), dam removal of retrofit in the Brewster River at Smuggler's Notch Resort (ID#1098), and Flood Mitigation Projects (ID#2002).

Jeffersonville Flood Resilience Plan

The Jeffersonville Flood Resilience Plan, prepared by LCPC, aims to inform development on impacts to flood resilience and flood risk. The five areas in which development is expected are: The Village of Cambridge, Cambridge Junction, the Smuggler's Notch Ski Area, the Industrial Area, and Jeffersonville. The ski area is of concern because it lies upstream of the Village of Jeffersonville, giving it the potential to affect flood patterns in the main village area. This flood mitigation plan also informs historic structures of their flood risks, and the ways that flood damage can be reduced or prevented. Scenic and Archaeological resources should also be protected under the advice of the flood resilience plan. Green Infrastructure and Low Impact Development are prioritized to address stormwater runoff within the Village of Jeffersonville. Implementation of this plan will include the production of a wetland inventory for the Village of Jeffersonville, limitation to development within the 100-year floodplain, and connection of the Cambridge Greenway to the Lamoille Valley Rail Trail.

Phase 2 Stream Geomorphic Assessment (SGA) of the Brewster River Corridor

The Brewster River Corridor Plan was produced by FEA in 2015 (FEA, 2015). This report documents geomorphic stressors to the Brewster River channel and recommends specific remediation efforts at sites that are ranked according to their ecological benefits and hazard mitigation priority. This documentation will be used to prioritize SWMP sites to maximize the benefits to impaired parts of the Brewster River. Potential projects on the Brewster River are shown in Figure 4.

Flood Damage

The Brewster River Phase 2 assessments showed that the Brewster River corridor was heavily affected by 2011 flooding. The flooding released large volumes of coarse sediment and woody debris into the channel. These changes resulted from stream bed and bank erosion and mass failure valley erosion. The channel is still adjusting to these geomorphic changes in some reaches.

Overall Stream Stability and Habitat Conditions

A summary of the geomorphic and habitat conditions is provided below in Table 4. Overall, the stream conditions are fair to good for those river reaches assessed in more detail in the field. Where the Brewster River flows through Jeffersonville, the conditions are fair due to channel alterations and widening with stretches of good conditions where the river has maintained or regained natural meanders.

Figure 4: Phase 2 SGA projects, more info on sites in Table 4

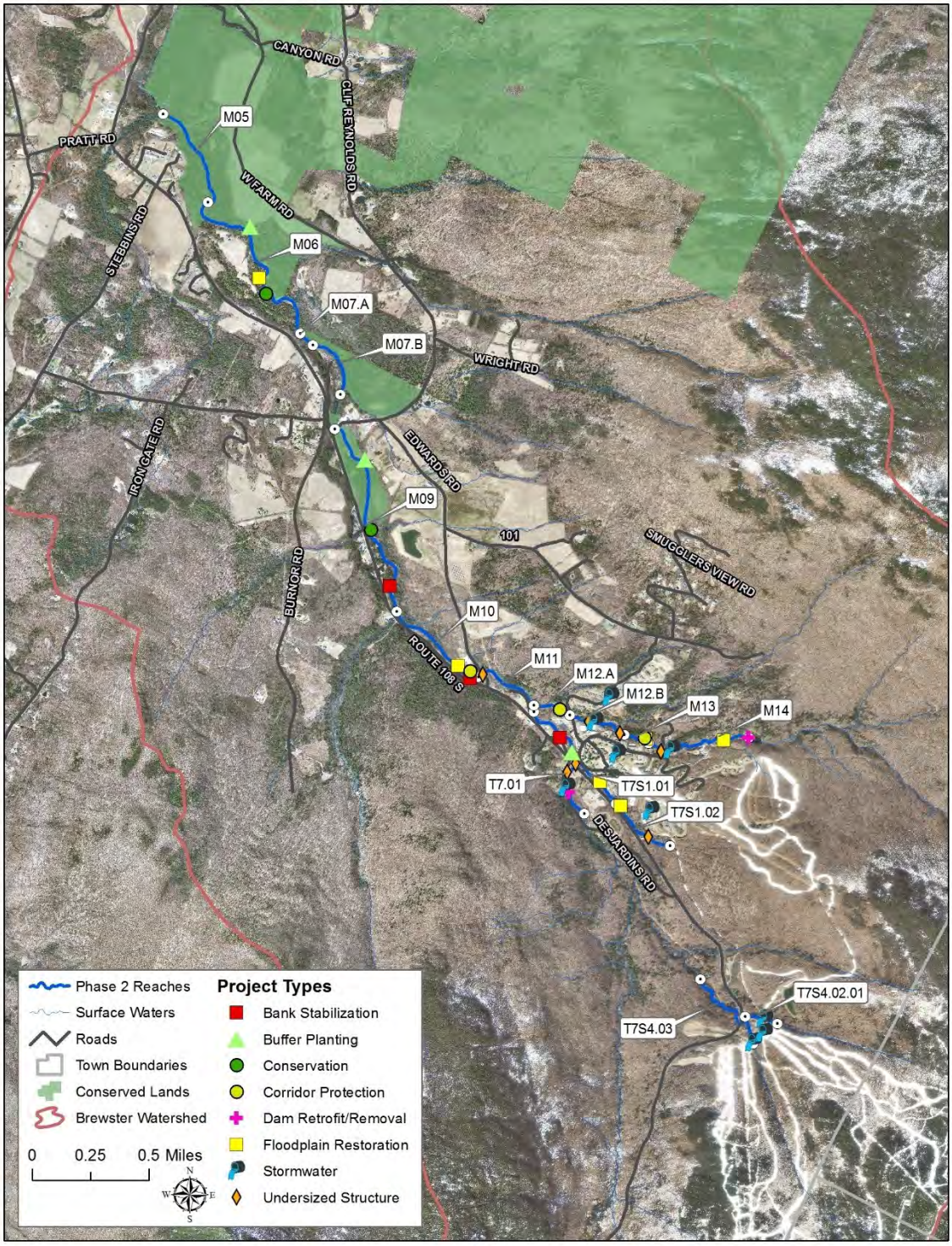


Table 4: SGA reaches and selected attributes in Cambridge, VT. (See Figure 4 for locations) (FEA, 2014)

Stream	Reach	Reference Stream Type	Existing Stream Type	Confinement Type	Habitat Condition	Geomorphic Condition	Notes
Brewster River	M05	C	C	Broad	Good	Good	
	M06	C	C	Broad	Good	Fair	Braiding
	M07.B	B_c	B_c	Broad	Fair	Fair	
	M09	C	C	Broad	Fair	Fair	
	M10	C_b	B_c	Broad	Fair	Fair	
	M11	C	B_c	Very Broad	Fair	Fair	
	M12.A	C	D	Broad	Fair	Poor	Alluvial Fan
	M12.B	B_c	F	Broad	Fair	Fair	
	M13	B_c	D	Broad	Fair	Fair	
	M14	B_c	F	Broad	Fair	Poor	
7th Tributary	T7.01	B_c	F	Broad	Fair	Fair	
First Tributary to T7	T7S1.01	C_b	F	Very Broad	Poor	Poor	
First Tributary to T8	T7S1.02	B	B	Broad	Fair	Fair	
2nd Tributary to T7S4	T7S4.02.01	A	A	N Confined	Good	Good	
4th Tributary to T7	T7S4.03	A	A	S Confined	Good	Good	
Lamoille River	R08	C	C	Broad	Fair	Fair	
	R09	C	C	Broad	Fair	Fair	

Seymour River Corridor Plan

The Seymour River Corridor Plan was produced by Bear Creek Environmental, LLC in 2018. The Seymour River enters the Lamoille from the south in the Village of Cambridge. This plan identifies 59 potential restoration, conservation, and flood resiliency projects along the Seymour River. These projects were considered under the SWMP as they relate to the Village.

Flood Damage

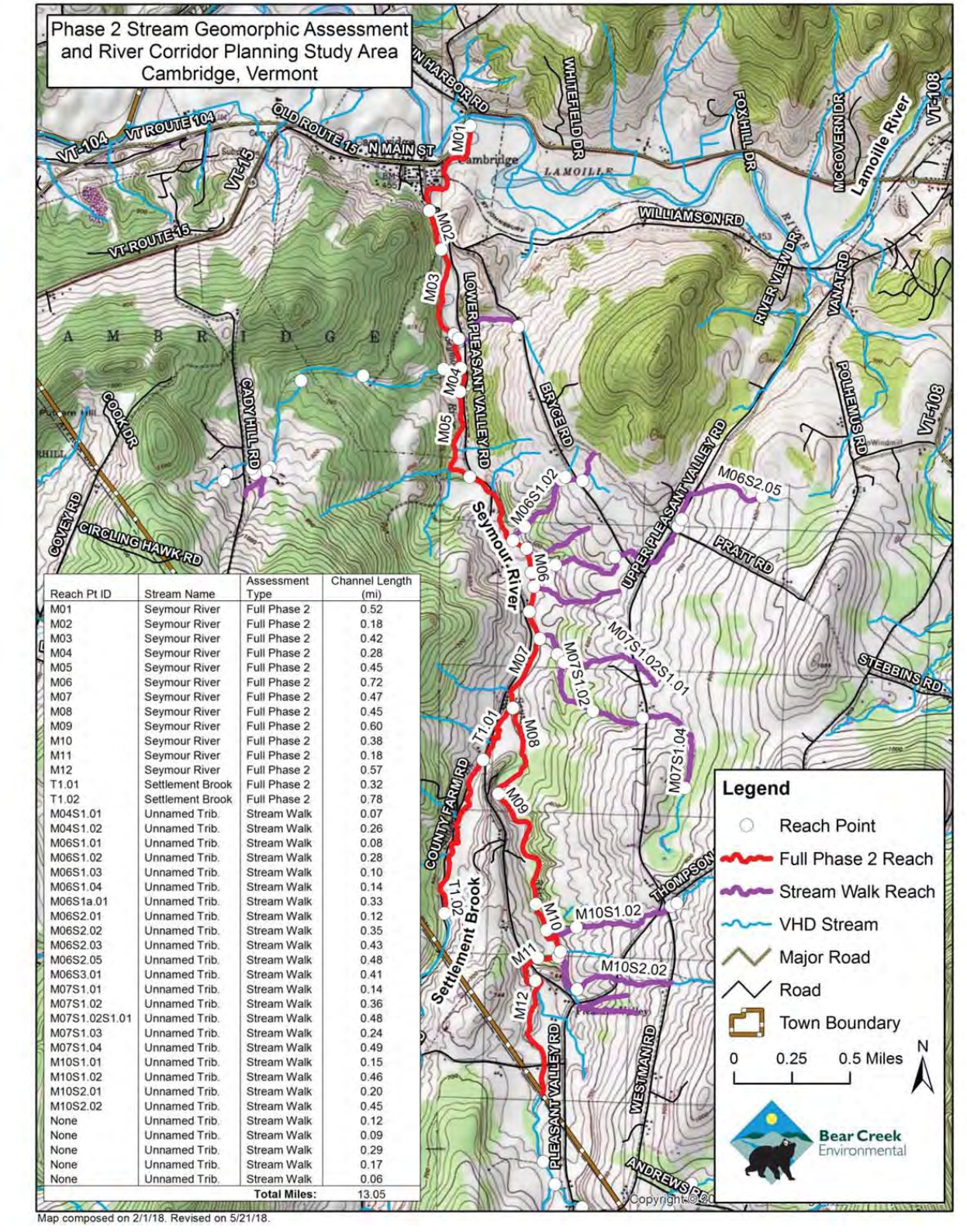
Cambridge has experienced severe flooding from the Lamoille River and the Seymour River. The most severe flooding within the village center from the Seymour River occurs along Pleasant Valley Road which

runs along the edge of the river. The risk of flooding threatens residences, businesses, and property along the river.

Overall Stream Stability and Habitat Conditions

Major stressors on the Seymour River include channel straightening, bank armoring, erosion, lack of buffers, and encroachment. Lack of bank and buffer vegetation are major stressors on the habitat condition along the river. There is also a lack of large woody debris in the downstream reaches of the river which harms the habitat conditions further.

Figure 5: Map of Phase 2 SGA assessed segments of the Seymour River (Bear Creek Environmental, 2018)



Reach Pt ID	Stream Name	Assessment Type	Channel Length (mi)
M01	Seymour River	Full Phase 2	0.52
M02	Seymour River	Full Phase 2	0.18
M03	Seymour River	Full Phase 2	0.42
M04	Seymour River	Full Phase 2	0.28
M05	Seymour River	Full Phase 2	0.45
M06	Seymour River	Full Phase 2	0.72
M07	Seymour River	Full Phase 2	0.47
M08	Seymour River	Full Phase 2	0.45
M09	Seymour River	Full Phase 2	0.60
M10	Seymour River	Full Phase 2	0.38
M11	Seymour River	Full Phase 2	0.18
M12	Seymour River	Full Phase 2	0.57
T1.01	Settlement Brook	Full Phase 2	0.32
T1.02	Settlement Brook	Full Phase 2	0.78
M04S1.01	Unnamed Trib.	Stream Walk	0.07
M04S1.02	Unnamed Trib.	Stream Walk	0.26
M06S1.01	Unnamed Trib.	Stream Walk	0.08
M06S1.02	Unnamed Trib.	Stream Walk	0.28
M06S1.03	Unnamed Trib.	Stream Walk	0.10
M06S1.04	Unnamed Trib.	Stream Walk	0.14
M06S1a.01	Unnamed Trib.	Stream Walk	0.33
M06S2.01	Unnamed Trib.	Stream Walk	0.12
M06S2.02	Unnamed Trib.	Stream Walk	0.35
M06S2.03	Unnamed Trib.	Stream Walk	0.43
M06S2.05	Unnamed Trib.	Stream Walk	0.48
M06S3.01	Unnamed Trib.	Stream Walk	0.41
M07S1.01	Unnamed Trib.	Stream Walk	0.14
M07S1.02	Unnamed Trib.	Stream Walk	0.36
M07S1.02S1.01	Unnamed Trib.	Stream Walk	0.48
M07S1.03	Unnamed Trib.	Stream Walk	0.24
M07S1.04	Unnamed Trib.	Stream Walk	0.49
M10S1.01	Unnamed Trib.	Stream Walk	0.15
M10S1.02	Unnamed Trib.	Stream Walk	0.46
M10S2.01	Unnamed Trib.	Stream Walk	0.20
M10S2.02	Unnamed Trib.	Stream Walk	0.45
None	Unnamed Trib.	Stream Walk	0.12
None	Unnamed Trib.	Stream Walk	0.09
None	Unnamed Trib.	Stream Walk	0.29
None	Unnamed Trib.	Stream Walk	0.17
None	Unnamed Trib.	Stream Walk	0.06
		Total Miles:	13.05

3.3 Town Planning and Permitting

2018 Cambridge Town Plan

The Cambridge Town Plan was developed in 2018 by the Lamoille County Planning Commission, and adopted by the village in the same year. It aims to promote community development while maintaining the residential, rural, business, and recreational benefits of the Village of Cambridge. The work done under the Stormwater Master Plan must adhere to the goals of the town plan. Policies in this plan include: incorporating stormwater BMPs, mitigating river/road conflicts by upsizing bridges and culverts, and restoring floodplains. These policy goals will help make the town more resilient to flooding and stormwater events.

Village of Jeffersonville Municipal Plan

The Municipal Plan for the Village of Jeffersonville was adopted by the Jeffersonville Village Trustees on June 17, 2019. This plan divides Jeffersonville into four land use areas: the Village Core, the Village Residential Area, the Route 15 Corridor Area, and the Conservation/Open Space Area. Current and future land uses in each of the areas are defined to guide future development. The acceptable future uses in each area reflect the resources in each. The village core is meant to serve as a combination of residential and commercial area while the Route 15 corridor is meant to allow uninterrupted traffic, and the conservation/open space area is not meant to be developed in the future. Projects identified in Jeffersonville will adhere to the goals of the municipal plan, and support development in the regions in which it acceptable.

Jeffersonville Bicycle and Pedestrian Master Plan

The Jeffersonville Bicycle and Pedestrian Master Plan aims to improve bicycle and pedestrian infrastructure within the Village of Jeffersonville. The accompanying scoping study investigated ROW width, roadway features, Traffic data, Historic/Archaeological features, Natural Resources and other environmental parameters. With these factors in mind, areas in need of upgraded bicycle and Pedestrian infrastructure were identified and prioritized. Specific areas where bike/pedestrian infrastructure is needed include Main Street, School Street, Carlton Avenue, Upper Pleasant Valley Road.

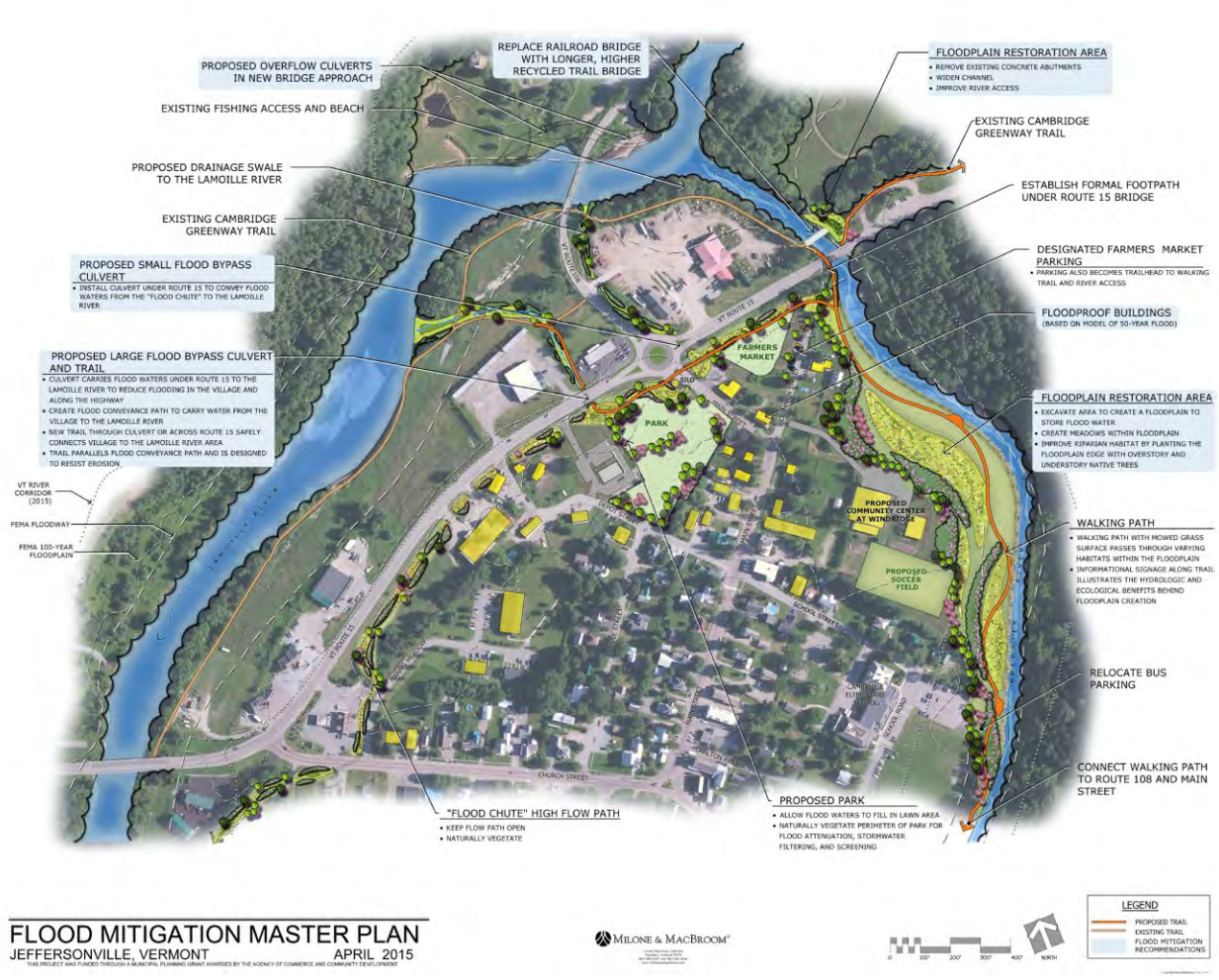
Bell Gates Long Term Management Plan

The LCPC has implemented a plan to use the site of the previous Bell Gates lumber mill as a functional floodplain/park. This central area near the roundabout is now known as the “Silo Space” and will be used as a public park and parking area to promote pedestrian travel throughout the village. One of the goals of the Silo Space Planning Committee is to “design public spaces that will collect and infiltrate stormwater runoff.” There are also nearby private landowners who are open to using their greenspace for stormwater infrastructure. This planning provides space in which to construct BMPs for the SWMP that will make the Town of Cambridge and the Village of Jeffersonville more resilient to high flow events.

Jeffersonville Flood Hazard Modeling and Project Identification and Flood Mitigation Master Planning

Milone & MacBroom conducted a hydraulic analysis in the Village of Jeffersonville to understand flood patterns and identify potential flood mitigation options in 2015. This study identified and prioritized projects that have the highest flood mitigation capacity and specifically informed the Jeffersonville Hazard Mitigation Plan. Two projects identified in this plan were constructed, while others are in various stages of implementation planning. The Cambridge Greenway Trail / Railroad Bridge was replaced with a larger structure and the channel construction was removed to restore a part of the original floodplain. A flood relief culvert was installed under Route 15 to improve drainage of surface waters within the village center out to the Lamoille River. Concept design is underway to increase floodplain connectivity at the confluence of the Lamoille and Brewster Rivers. Additional flood mitigation projects were identified including reconnection of floodplain along the Brewster River within the village and installation of overflow culverts under the Lamoille River Route 108 bridge embankment. A Flood Mitigation Master Plan map was created to help with public outreach (Figure 6).

Figure 6: 2015 Flood Mitigation Master Plan for Jeffersonville.



3.4 Data Gaps

The data sources and information describing stormwater and watershed management in the Town of Cambridge are thorough and primarily up to date. The stormwater infrastructure mapping was completed in 2012, there may have been important updates to the drainage systems within the two villages in recent years.

4.0 Stormwater Problem Areas

One of the primary objectives of the SWMP is to address "concerns of runoff, flooding, streambank erosion, and water quality" within the Town of Cambridge. FEA and SLR completed approximately ten field tours of the project area and hosted numerous meetings with Town, Village, LCPC, and VTANR staff 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. The priority assessment areas identified in the project scope were the focus of the field assessment effort. The priority areas are listed below (abbreviations are shown in parentheses):

- JV: Village of Jeffersonville (14 projects)
- CV: Village of Cambridge (11 projects)

A total of 25 stormwater problem areas were identified and assessed in the field (see maps in Appendix A and table in Appendix B). We grouped the problem areas into four (4) project categories described below.

- **Green Stormwater Infrastructure (GS) Installation/Retrofit –** Opportunity to reduce sediment and nutrient loads through the installation of a new stormwater best management practice (BMP). Sites where nutrient and sediment reductions could be improved through the retrofit of existing stormwater BMPs.
- **Road Erosion Mitigation –** Areas of high sediment and nutrient loading due to road, embankment, and ditch erosion.
- **Gully Stabilization –** Areas of severe erosion from concentrated stormwater runoff.
- **Streambank/Floodplain Restoration –** Problem areas where stream bank or bed erosion is a significant nutrient and sediment source, or where floodplain access is limited, particularly during more frequent flooding events.

4.2 Evaluation and Prioritization of Problem Areas

The 25 projects described in the master project table (Appendix B) were prioritized based on the potential for each project to improve water quality, reduce environmental impact, project feasibility, and co-

benefits. Estimated project cost and the phosphorus removal efficiency ($/lb of P) were included. We followed the Unified and Non-Unified Scoring Prioritization for Stormwater Master Plans document developed by VTDEC (VTDEC, 2018). The Unified Prioritization 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. Total scores were out of a maximum of 50 points (Table 5). Two scoring categories are not applicable to road erosion/road drainage projects, which had a maximum score of 44 points. The projects in the Unified Prioritization Project Table in Appendix B ranged from a low score of 18 to 33 points. The projects in the Non-Unified Prioritization Project Table in Appendix B ranged from a low score of 12 to 21 points. The four projects that were pre-selected for 30% conceptual design development were excluded from the master project table.

Figure 7: Project CV-11 had the highest score (21 out of 30) in the Non-Unified Prioritization. The project is located at the outlet of a culvert that drains much of the Cambridge Village center. The last segment of the culvert has failed, and a large gully has formed with erosion that extends to the edge of the Lamoille River. When the Lamoille River experiences elevated flow, this gully has been observed to backfill with water. The opportunity to treat a large volume of water and a very high sediment/nutrient load warranted a 10% design for this project.

Table 5: Unified scoring prioritization for stormwater master plans, developed by VTANR (VTDEC, 2018).

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)		

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 2014-2017 LiDAR elevation surface.
- **Aerial Photography** – We used the 0.15 m imagery collected in 2018 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 2012 with detailed mapping of stormwater infrastructure throughout both Village centers.
- **NRCS Soils** – We used the Windsor County 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 Connected 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 19 projects that could be assessed for a GSI treatment volume or erosion volume are described in the Unified Prioritization Project Table (Appendix B). These projects were prioritized based on the potential for each project to improve water quality, reduce environmental impact, project feasibility, and co-benefits. 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.

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 (2016 $) and adjustment factors 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 (WCA, 2018). The unit cost estimates include an 8% total inflation adjustment for 2017-2020 based on the Consumer Price Indicator Inflation Calculator (Table 6). 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	9.49
Dry Pond	4.87
Grass Conveyance Swale	4.32
Rain Garden (no underdrain)	16.72
Rain Garden (with underdrain)	16.72
Subsurface Infiltration	6.76
Surface Infiltration	6.75
Wet Pond	7.35

Table 7: Site Type Cost Adjustment

Site Type	Cost Multiplier
Existing BMP retrofit	0.25
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

4.3 Non-Unified Evaluation and Prioritization of Problem Areas

Areas identified during field tours of the study area where the primary project recommendation was not stormwater treatment infrastructure (e.g., road erosion stabilization, gully stabilization, and undersized culvert replacements) were assigned several numerical scoring metrics that are weighted to assist in prioritizing each project based on water quality benefits, project feasibility, maintenance requirements, costs, and any additional benefits. The maximum possible score is 30 and the individual site scores ranged from 12 to 21. Each category is described below and includes a description of the scoring for each criterion.

Final evaluation criteria summarized in the Non-Unified Prioritization Project Table (Appendix B) are described below:

- Water Quality Benefits (15 points total)
  - **Nutrient Reduction Effectiveness (4 points)** – Degree of nutrient removal potential with project implementation, this accounts for both the existing nutrient loads and the removal efficiency and capacity of the proposed treatment. Nutrient loading was quantified based on the watershed size, the land cover types, and percent impervious surfaces, and the effectiveness was based on the treatment efficacy of the potential mitigation options appropriate for the space and location of the treatment area.
    - 0 points – No nutrient source and/or no increased treatment
    - 1 point – Minor nutrient source and/or minor increase in treatment
    - 2 points – Moderate nutrient source with some increase in treatment
    - 3 points – Moderate nutrient source with significant increase in treatment
    - 4 points – Major nutrient source with significant increase in treatment
  - **Sediment Reduction Effectiveness (4 points)** – Degree of sediment removal potential with project implementation, this accounts for both the existing sediment loads and the removal efficiency and capacity of the proposed treatment. Sediment loading was quantified based on the watershed size, the land cover types, and percent impervious surfaces, and the effectiveness was based on the treatment efficacy of the potential mitigation options appropriate for the space and location of the treatment area.
    - 0 points – No sediment source and/or no increased treatment
    - 1 point – Minor sediment source and/or minor increase in treatment
    - 2 points – Moderate sediment source with some increase in treatment
    - 3 points – Moderate sediment source with significant increase in treatment
    - 4 points – Major sediment source with significant increase in treatment
  - **Drainage Area (1 point)** – Approximate drainage area to site is greater than 2 acres
  - **Impervious Drainage (3 points)**– Approximate area of impervious surfaces draining to the site.
    - 0 points – Area of impervious surfaces is less than 0.25 acres
    - 1 point – Area of impervious surfaces is 0.25-0.5 acres
    - 2 points – Area of impervious surfaces is 0.5-1.0 acres
    - 3 points – Area of impervious surfaces is >1.0 acres
  - Connectivity to Surface Waters (3 points)
    - 0 points – All stormwater infiltrates on site
    - 1 point – Stormwater receives some treatment before reaching receiving waters
    - 2 points – Stormwater drains into drainage infrastructure that directly outlets to receiving waters (assumes no erosion or additional pollutant loading to discharge point)

        - 3 points – Stormwater drains directly into receiving waters (typically stormwater draining directly into a large wetland is assigned 2 points)
- Landowner Support (2 points)
    - 0 points – Project is located on private property, no contact with landowner
    - 1 point – Project is on Town or State property with no contact
    - 2 points – Project has been discussed and is supported by landowner
- Operation and Maintenance Requirements (2 points)
    - 0 points – Project will require significant increased maintenance effort
    - 1 point – Project will require some increased maintenance effort
    - 2 points – Project will require no additional maintenance effort
- **Cost and Constructability (6 points) –** This score is based on the overall project cost (low score for high cost) and accounts for additional design, permitting requirements, and implementation considerations, such as site constraints and utilities, prior to project implementation.
- **Additional Benefits (5 points total) –** Description of other project benefits, total score is roughly a count of the number of additional benefits. Additional benefits considered in the prioritization are as follows:
    - **(1) Chronic Problem Area** – The site requires frequent maintenance and/or is an ongoing problem affecting water quality
    - **(2) Seasonal Flooding** – The site is affected by or contributes to seasonal flooding
    - **(3) Educational** – The site provides an opportunity to educate the public about stormwater treatment practices
    - **(4) High Visibility** – The site is highly visible and will benefit from aesthetically designed treatment practices
    - **(5) Infrastructure Conflicts** – The stormwater problem area is increasing erosion or inundation vulnerability of adjacent infrastructure (i.e. roads, buildings, etc.)
    - **(6) Drains to Connected Stormwater Infrastructure** – The site drains into a larger stormwater conveyance system that is less likely to receive downstream treatment
    - **(7) Reduces Thermal Pollution** – Project implementation will reduce the risk of thermal loading from runoff to receiving surface waters
    - **(8) Improves BMP Performance** – Project implementation will improve the performance of existing stormwater treatment practices that receive runoff from the site
    - **(9) Peak Flow Reduction** – Project implementation will significantly reduce stormwater peak flows leaving the site
    - **(10) Enhances Lakeshore Natural Communities** – Project implementation will promote a native vegetated lakeshore buffer and/or provide wildlife habitat along the lakeshore

4.4 Conceptual Designs

FEA and SLR attended 10 meetings with LCPC, VTrans, VTANR, landowners, and representatives and staff from the Town and Villages to discuss project prioritization and selection of 4 projects for 30 % conceptual design development and 6 projects for 10 % conceptual design development (Appendices C and D).

FEA and SLR developed 30% conceptual designs which include:

- Site plans with contours, existing stormwater infrastructure, and proposed design elements
- Where relevant, hydrologic and hydraulic modeling data of the contributing drainage areas and proposed BMP sizing and design specifications
- Typical details for proposed practices
- Preliminary cost opinions

The projects selected for 30% conceptual design were:

1. **Project JV-01 – Cambridge Greenway Path off VT Route 15:** The outside of a bend in the Lamoille River has repeatedly eroded to the east and necessitated relocation of the Greenway Path. Stabilizing this bank is a priority for the Town.
2. **Project JV-03 – VT Route 108 Fish and Wildlife Access:** Large gravel parking lot in the floodplain is draining directly into the Lamoille River. This is a large sediment source and the Town and Fish and Wildlife are interested in both stormwater improvements and floodplain restoration.
3. **Project JV-04 – VT Route 15 Jeffersonville Park & Ride:** This large gravel parking lot has widespread minor erosion from local runoff and stormwater from Route 15.
4. **Project JV-11 – Bell Gates Property Parking Lot:** Impervious surfaces from Depot St. and old Bell Gates parking lot and infrastructure drain into green space slated for community gardens and recreational space.

FEA and SLR developed 10% designs which include site maps and typical details for the proposed treatment systems. The projects selected for 10% conceptual design were:

1. **Project JV-05 – Intersection of Church Street and Mann's Meadow:** A low point in the sidewalk along Church Street pools stormwater and freezes over in the winter causing a safety hazard for those trying to walk to the Mobil Station.
2. **Project JV-09 – Church Street in front of the Post Office:** Catch basins on either side of Church Street have minor sediment build-up on the pavement. This highly visible site accepts stormwater from a mostly impervious drainage area in the Village Center.
3. **Project JV-13 – Intersection of VT-108 and Old Main Street:** Sediment builds up on the side of the road where stormwater pools in a low point. An existing sidewalk blocks water from draining out of the area.

4. **Project CV-07 – Mansfield Avenue:** An old, unused sidewalk is overgrown with grass and fills with stormwater then drains into a system that outlets directly into the Seymour River. There have been local reports of frequent flooding associated with this poorly draining sidewalk.
5. **Project CV-10 – East End of South Main Street:** Sheet erosion from VT Route 15 and South Main Street deposits sediment in the green space in between the two roads. A catch basin in this green space accepts a high sediment load which is transported to the Lamoille River.
6. **Project CV-11 – North of VT Route 15:** An outfall draining most of the Cambridge Village Center's area has created a large gully that extends to the bank of the Lamoille River. At least one segment of the culvert has broken. This is a major sediment source to the Lamoille River.

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 Cambridge. For each project recommendation, we provided a preliminary cost estimate and nutrient/sediment treatment estimates to assist Village and Town representatives in 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 LCPC continues to work with the Villages and Town and VTDEC to secure funding for the high priority projects described in Appendices B, C, and D. Landowner outreach should be completed for all projects that are not on Town land or right-of-way. The BMP installation/retrofit opportunities identified in the Unified Prioritization Matrix represent a potential phosphorus load reduction of approximately 70 lb/year. Based on our review and preliminary designs and our experience with previous SWMP efforts, we feel that the projects listed in Appendix D should be considered for further development and implementation.

6.0 References

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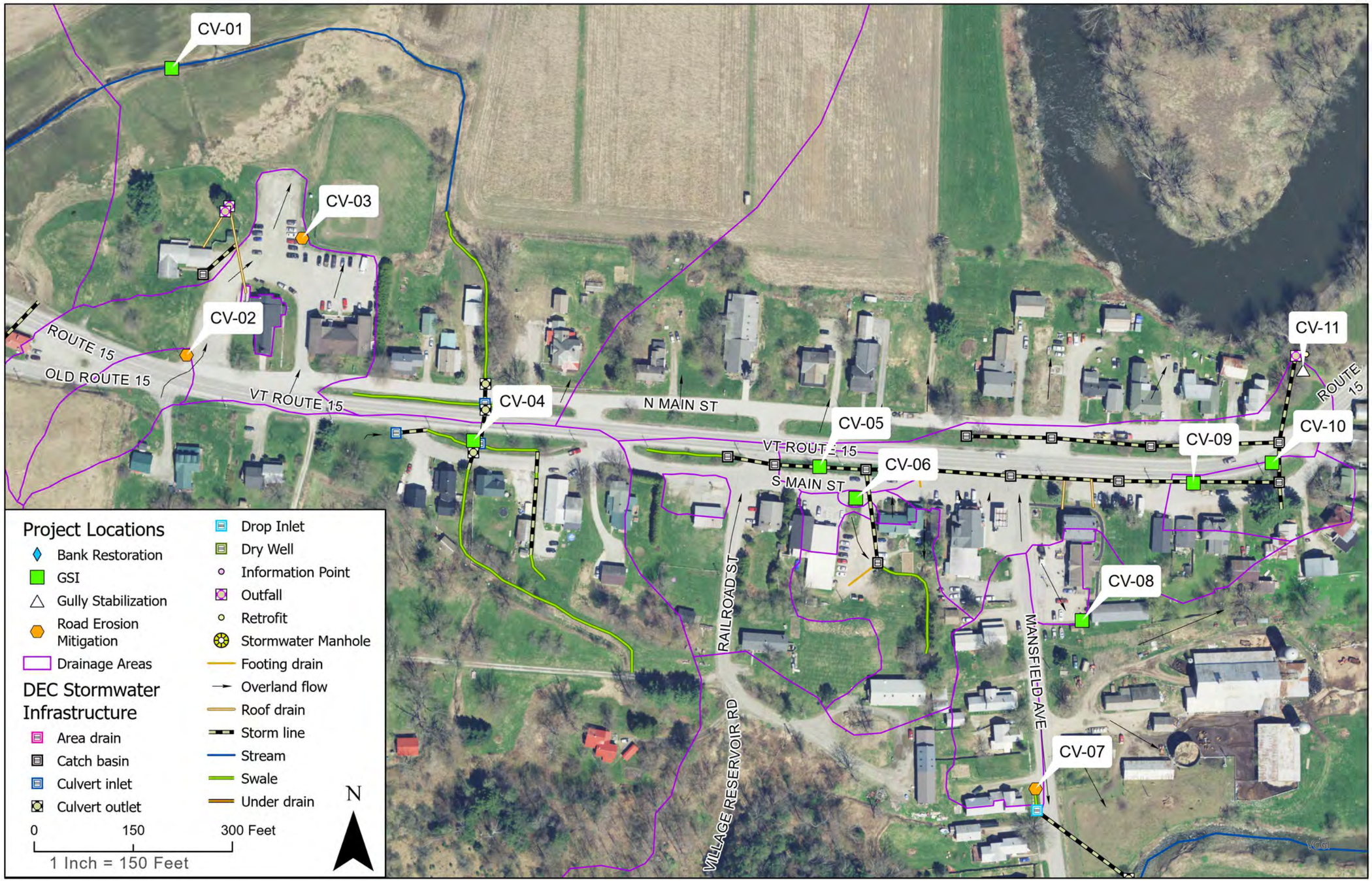
VTrans, 2017, E911 Road Centerlines. *Vermont Center for Geographic Information.* Accessed in June 2020.

VTDEC (Vermont Department of Environmental Conservation). 2018. Unified Scoring Prioritization for Stormwater Master Plans

VTDEC (Vermont Department of Environmental Conservation), 2020, Standard Operating Procedures for Tracking & Accounting of Stormwater Permit Programs: Municipal Roads General Permit (MRGP). June 1, 2020

APPENDIX A

Project Location Maps
(11”x17”)



Fitzgerald Environmental Associates, LLC.
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Colchester, VT 05446
Tel: 802.876.7778
www.fitzgeraldenvironmental.com

Notes:

Site visits conducted:
July - October, 2020

Cambridge SWMP

Cambridge Village Project Locations

FCP Drawn	JHB Checked
Scale	1" = 150 ft.
Date	9/8/2021
SHEET NO.	1

Project Locations

- Bank Restoration
- GSI
- Gully Stabilization
- Road Erosion Mitigation
- Drainage Areas

DEC Stormwater Infrastructure

- Area drain
- Catch basin
- Culvert inlet
- Culvert outlet
- Drop Inlet
- Dry Well
- Information Point
- Outfall
- Retrofit
- Stormwater Manhole
- Footing drain
- Overland flow
- Roof drain
- Storm line
- Stream
- Swale
- Under drain

0 300 600 Feet

1 Inch = 300 Feet

N

JV-01
JV-02
JV-03
JV-04
JV-05
JV-06
JV-07
JV-08
JV-09
JV-10
JV-11
JV-12
JV-13
JV-14
JV-15
JV-16
JV-17
JV-18
JV-19

ROUTE 108 N
GW TATRO DR
ROUTE 15
ROUTE 108 S
E MAIN ST
OLD MAIN ST
VT ROUTE 15
ROSS LN
ROUTE 15
DEER RUN HTS
MCGOVERN DR
DEPOT ST
MAPLE ST
SCHOOL ST
CARLTON AVE
WILLIAMSON CT
WILLIAMSON CT
MILL ST
UPPER PLEASANT VALLEY RD
CHURCH ST
LAMOILLE VIEW LN
MIHEAN DR
MANN'S MDW
ROUTE 15

VCGI

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Notes.

Site visits conducted:
July - October, 2020

Cambridge SWMP
Jeffersonville Village Project Locations

Drawn: FCP	Checked: EPF, JHB
Scale: 1" = 300 ft.	
Date: 9/8/2021	
SHEET NO.: 2	

APPENDIX B

Project Prioritization Tables
(11”x17”)

Stormwater Master Plan - Cambridge
Unified Prioritization Project Table
September 30, 2021

Note: 4 projects were pre-selected for 30% conceptual design development and were not included in the following prioritization tables (JV-01, JV-03, JV-04, JV-11)

Project #	Project Type	Location	Description	Preliminary Recommendations	Total Acreage	Impervious Acreage	% Impervious	Tracking Table 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 %
CV-01	GSI	Field north of St. Mary's Church	Long vegetated swale/ditch in the floodplain mapped as a blue-line stream. Drains CV-02, CV-03, and CV-04. Area is inundated during flood events.	Modify ditch to create a large, shallow wetland treatment system.	105.59	4.67	4%	62.30	34,421	Created Wetland	16000	19.89	0	19.89	0	2	0	1	$ 35,300	$ 1,775	2	4	33	50	66%
CV-04	GSI	Main street south in front of the Craft Nook	Sufficient room for a flow through BMP if 18" maple is removed. Large drainage area. Potential for additional treatment area if the road access to the east is closed off and utilized for stormwater.	Flow through created wetland system in existing ditch. Could also add a bioswale if area to the east is converted to stormwater treatment.	72.76	1.87	3%	40.24	19,315	Created Wetland	1,200	4.75	0.4	5.15	0	3	0	1	$ 16,500	$ 3,203	1	2	30	50	60%
CV-05	GSI	Main street south between railroad street and mansfield ave.	Green space between Route 15 and Main St. South. Snow storage concerns. Very small drainage area.	Install bioretention swale with overflow to existing stormline. Snow storage concerns.	0.27	0.21	78%	0.55	735	Rain Garden (no underdrain)	400	0.48	0	0.48	0	3	1	1	$ 12,500	$ 25,826	0	4	21	50	42%
CV-06	GSI	Main street south between railroad street and mansfield ave.	24" riser that appears to be a dry well, no pre-treatment, some room adjacent. Current grading does not drain well, with standing water on pavement. Very small drainage area.	Add pre-treatment rain garden around dry well.	0.10	0.08	80%	0.22	280	Subsurface Infiltration	300	0.13	0	0.13	0	0	2	1	$ 1,200	$ 9,091	2	4	25	50	50%
CV-07	GSI	Mansfield Ave	The existing sidewalk is in poor condition and is lower than the adjacent front yards and road leading to prolonged ponding. Basement flooding is a recurring issue. One drop inlet is located along the sidewalk but is elevated and does not fully drain the area. A water line is located between the sidewalk and road.	Replace the sidewalk with a gravel trench with an underdrain tied in to the drop inlet.	1.60	0.60	38%	2.00	2,251	Filter	600	0.55	0	0.55	0	2	1	1	$ 25,000	$ 45,455	1	7	22	50	44%
CV-08	GSI	Post office on Mansfield Ave.	Post office and apartment parking lot drain to corner of paved parking lot, minimal erosion.	Install rain garden along edge of parking lot.	0.26	0.25	96%	0.64	864	Rain Garden (no underdrain)	500	0.55	0.04	0.59	0	0	2	1	$ 5,000	$ 8,475	2	1	25	50	50%
CV-09	GSI	Eastmost segment of Main street south	Standing water in low point of pavement.	Could add rain garden or pave driveway and add catchbasin	0.42	0.20	48%	0.62	730	Rain Garden (no underdrain)	400	0.51	0.04	0.55	0	1	2	1	$ 12,500	$ 22,894	1	4	22	50	44%
JV-05	GSI	Church Street at the entrance of the Mann's Meadow Apts	Northeast side of driveway floods. Runoff from Church Street onto Manns Meadow.	Raise walkway elevation and add a small culvert. Install a small treatment feature between sidewalk and road. Adjust the driveway curve radius to slow traffic.	0.28	0.24	88%	0.62	837	Rain Garden (no underdrain)	400	0.55	0	0.55	0	1	1	1	$ 12,500	$ 22,727	1	3	18	50	36%
JV-06	GSI	Manns Meadow	A large dry detention basin with no apparent outlet (infiltrating) was constructed under permit 4097-9010.R. Site grading does not appear to direct much runoff to the basin, no other drainage infrastrcture was observed.	Assess options to direct more runoff to the basin, possibly from the Mobile station or Route 108.	2.50	1.43	57%	4.11	5,126	Surface Infiltration	15000	2.42	0	2.42	0	0	1	1	$ 63,300	$ 26,157	2	0	19	50	38%
JV-07	GSI	Church Street	Runoff from roadway drains directly to a catch basin, connected to the Lamoille River.	Install small bioretention feature around Catch basin as space allows. Need to check potential underground utility conflicts.	0.19	0.15	80%	0.40	538	Rain Garden (no underdrain)	200	0.33	0	0.33	0	1	1	1	$ 6,300	$ 19,091	1	3	19	50	38%
JV-08	GSI	Church Street	Stormwater flows along the edge of road to the catch basin and does not spread onto the adjacent green space due to a berm along the edge of pavement.	Remove berm to allow stormwater to enter green space; install small bioretention as space allows. Need to check potential underground utility conflicts.	0.22	0.16	73%	0.44	563	Rain Garden (no underdrain)	200	0.35	0	0.35	0	3	0	0	$ 6,300	$ 17,898	1	3	20	50	40%
JV-09	GSI	Church Street	Runoff from Church Street and Post Office parking lot drain directly to catch basin connected to River. Cross-walk has safety issues.	Bump out at Crosswalk to slow traffic. Add small bioretention features around both catch basins	0.54	0.41	76%	1.10	1,451	Rain Garden (no underdrain)	600	0.95	0	0.95	0	3	1	0	$ 18,800	$ 19,873	1	5	24	50	48%
JV-10	GSI	Corner of Maple St and Depot St	Stormwater flows along the edge of Maple Street to north and enters a catch basin on the corner of Depot St.	Opportunity to treat stormwater in small green space in between Maple St edge of road and paved sidewalk.	0.97	0.51	53%	1.52	1,842	Surface Infiltration	100	0.37	0	0.37	0	3	2	1	$ 4,800	$ 12,834	1	2	23	50	46%
JV-12	GSI	Jeffersonville Library on main street	Downspouts from library roof leading onto grass.	Rain gardens next to library on either side. Educational value, lesser water quality benefit.	0.04	0.04	98%	0.11	138	Rain Garden (no underdrain)	100	0.24	0	0.24	0	3	2	1	$ 2,600	$ 10,744	1	4	26	50	52%
JV-13	GSI	Intersection of main street and old main street	Water ponding along east side of road with some erosion, no connection to stormline on west side of road. Streetscaping opportunity to address road safety issues. **Opportunity for additional sediment removal structure (swirl separator) to add pre-treatment to the proposed subsurface infiltration project on the Tatro Property.**	Install small bioretention or surface infiltration feature in green space. Potential to reroute Main St storm line to green space to add underground pre-treatment for propsed Tatro project. Water ponding along east side of road with some erosion, no connection to stormline on west side of road. Streetscaping opportunity to address road safety issues. Opportunity for additional sediment removal structure (swirl separator) to add pre-treatment to the proposed subsurface infiltration project on the Tatro Property.	0.24	0.19	79%	0.51	664	Surface Infiltration	300	0.44	0	0.44	0	3	1	1	$ 6,900	$ 15,682	1	4	24	50	48%
JV-15	GSI	Corner of Main St. and School St.	Catch basin in grassed area has small berm around it and does not receive much runoff from Main Street. There is a hydrant nearby.	Divert runoff coming down Main Street into enhanced green space/street scaping prior to entering catch basin. Consider removing paved walkway for safety and additional treatment space.	1.03	0.52	50%	1.56	952	Rain Garden (no underdrain)	200	0.73	0.08	0.806	0	3	1	0	$ 8,800	$ 10,918	1	4	28	50	56%
JV-16	GSI	Cambridge historical society, school street	Downspout from Historical Society building roof discharges to grassed area sloped towards the road.	Install a small rain garden and/or rain barrel at the downspout. Potential for education value.	0.02	0.01	59%	0.07	36	Rain Garden (no underdrain)	20	0.04	0	0.04	0	3	2	1	$ 1,000	$ 22,727	1	4	21	50	42%
JV-17	GSI	School street	Low point with a catch basin drains gravel parking lot and playground and the adjacent roof.	Raise catch basin and add infiltrating bioretention feature.	1.42	0.98	69%	2.68	3,459	Rain Garden (no underdrain)	600	1.58	0	1.58	0	3	2	1	$ 19,300	$ 12,184	1	4	30	50	60%
JV-18	GSI	School street	Catchbasin draining into playground, small drainage area and very little water quality impact	Enhance infiltration with a small basin.	0.04	0.03	81%	0.11	105	Rain Garden (no underdrain)	50	0.09	0	0.09	0	3	2	1	$ 1,500	$ 17,045	1	2	19	50	38%
JV-19	GSI	Community Center	Runoff from half of the large roof and portions of the gravel parking lot flow to a low point near a smaller buidling and continue north to a grass swale to the floodplain. A small treatment swale is located along the east edge of the parking, however current grading does not direct much runoff to the swale.	Install a grassed swale to collect rooftop runoff, install a culvert under the driveway, enhance the grassed swale for storage and infiltration near the outlet of the existing treatment swale from the parking lot	0.94	0.60	64%	1.67	2,131	Surface Infiltration	1500	0.88	0.2	1.08	0	0	1	1	$ 15,700	$ 14,537	1	2	24	50	48%

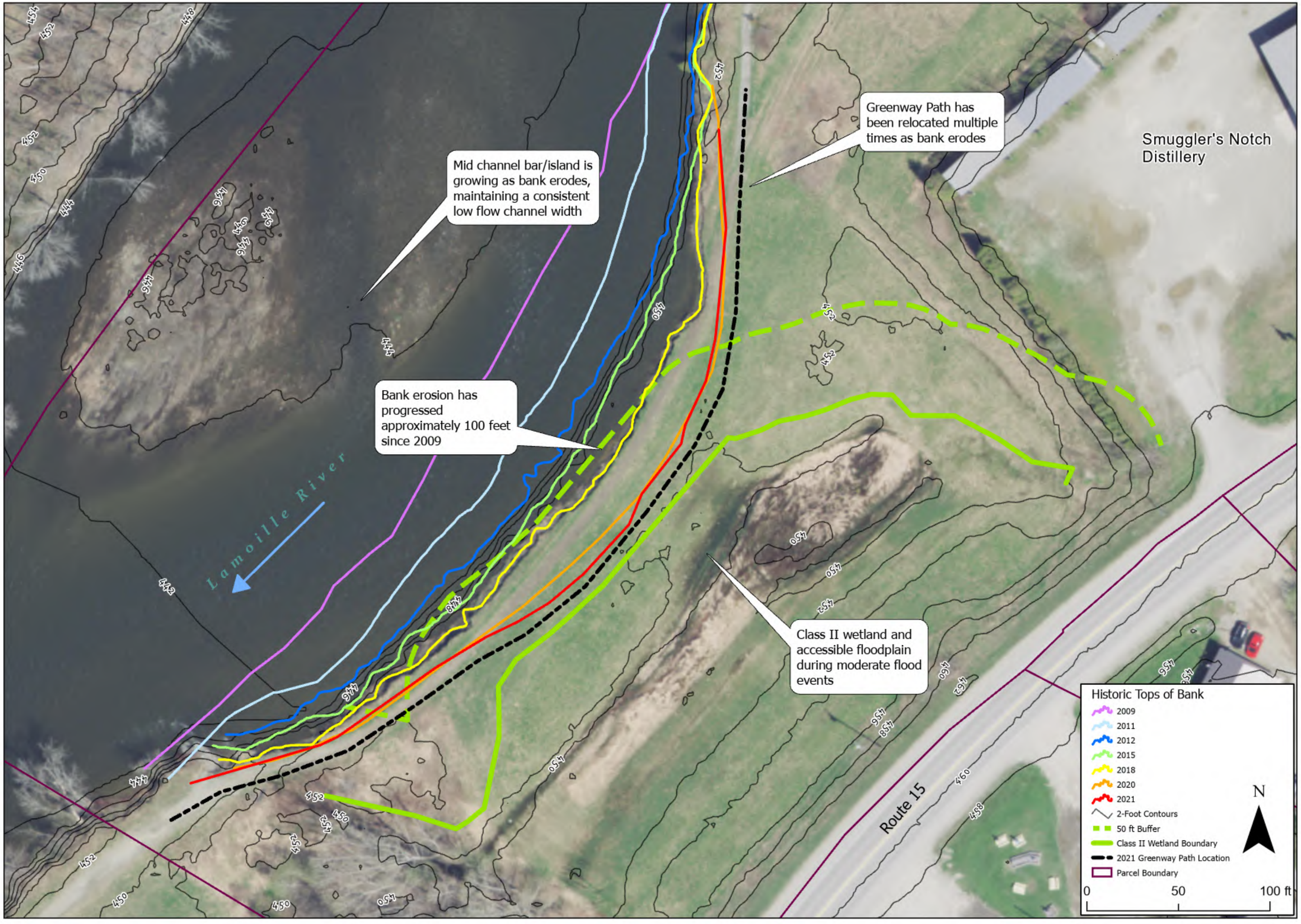
Stormwater Master Plan - Cambridge
Non-Unified Prioritization Project Table
September 30, 2021

Additional Benefits Codes	CPA	SF	E	IC	SW	BMP	HV	TH	PF	L
	Chronic Problem Area	Seasonal Flooding	Educational	Infrastructure Conflicts	Drains to Connected Stormwater Infrastructure	Improves Existing BMP Performance	High Visibility	Reduces Thermal Pollution	Peak Flow Reduction	Enhance Lakeshore Natural Communities

								Water Quality Benefits										
Project/ Photo ID	Project Type	Town	Location	Observer	Date Assessed	Description	Preliminary Recommendations	Nutrient Reduction	Sediment Reduction	Drainage Area	Impervious Drainage	Connectivity to Surface Waters	Landowner Support	O&M Requirements	Cost and Constructability	Additional Benefits	Additional Benefits Score	Total Score
								4	4	1	3	3	2	2	6		5	30
CV-02	Road Erosion Mitigation	Cambridge	St Mary's Church parking lot	FCP, JHB	7/20/2020	Elevated grading along the edge of the driveway causes the roadside swale to flow across gravel parking with moderate erosion. Water misses turn into grassed swale to CB.	Add swale into a culvert that leads into the existing swale to drain the parking lot more effectively and prevent concentrated flow along the edge of the driveway.	1	2	0	1	1	0	1	5	CPA	1	12
CV-03	Road Erosion Mitigation	Cambridge	St Mary's Church parking lot	FCP, JHB	7/20/2020	Runoff continues along parking bypassing small swale, flow in and along driveway has moderate erosion	Direct water into swale with new swale or into existing catchbasin that is not receiving water.	1	2	0	2	1	0	1	4	CPA	1	12
CV-10	Road Erosion Mitigation	Cambridge	Intersection of Main street south and route 15	FCP, JHB	7/20/2020	Lots of sediment on road likely from construction.	Add grass swale along road to provide a stable conveyance to the existing catch basin.	0	1	0	1	0	2	2	5	SW, HV	2	13
CV-11	Gully Stabilization	Cambridge	East end of Cambridge village center	FCP, JHB	7/20/2020	Large gully draining most of eastern portion of Village into Lamoille. Usually mostly submerged by Lamoille water when water levels are normal. Lots of woody debris from Lamoille flooding, Erosion: 5x2x20 feet in gully and 3.5 cuyd above gully.	Add stone lining at top of gully and along surface low paths above gully. Armored splash pool at outlet.	3	3	1	3	3	2	1	3	CPA, IC	2	21
JV-02	Floodplain Restoration	Jeffersonville	G.W. Tatro property along Lamoille River bank	EPF		The property is located at the confluence of the Brewster and Lamoille Rivers and historic fill has been placed on over 4 acres to create an elevated location for businesses at the inner bend of the Lamoille River.	The fill and buildings have disconnected the river from its floodplain, removed most of the vegetation, and eliminated flood storage.Removing fill and replanting a riparian forest over a portion of the filled area would restore the floodplain function.	2	2	1	3	3	2	2	2	CPA, SF, PF	3	20

APPENDIX C

30% Conceptual Designs
(11”x17” and 24"x36"**)**



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Notes
-Contours based on 0.7-M LiDAR DEM
-Historic tops of bank based on remote review of aerial imagery. 2020 and 2021 based on FEA survey
-Wetland boundary and classification confirmed with VTDEC, October 2020

Cambridge Greenway Path
Bank Erosion (JV-01)
Existing Conditions
Lamoille River
Jeffersonville, VT

Drawn	Checked
FCP	EPF

Scale: 1" = 50 ft.

Date: 6/28/2021

SHEET NO.: 1

Alternative 2:
Install J-Hooks extending to mid-channel bar
(See Sheet 4)

Alternative 1:
Toe wood stabilization
(See Sheet 3)

Greenway Path will be located in riparian buffer and wetland/wetland buffer

Install plantings to establish a forested riparian buffer and wetland/wetland buffer

Alternatives 1 & 2:
Shape bank to 2H:1V slope and establish vegetative cover

Class II wetland and accessible floodplain during moderate flood events

Smuggler's Notch Distillery

Lamoille River

Route 15

2021 Top of Bank
2-Foot Contours
50 ft Buffer
Class II Wetland Boundary
2021 Greenway Path Location
Parcel Boundary

N

0 50 100 ft

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Notes
-Contours based on 0.7-M LiDAR DEM
-Historic tops of bank based on remote review of aerial imagery. 2020 and 2021 based on FEA survey
-Wetland boundary and classification confirmed with VTDEC, October 2020

Cambridge Greenway Path Bank Erosion (JV-01) Stabilization Alternatives

Lamoille River
Jeffersonville, VT

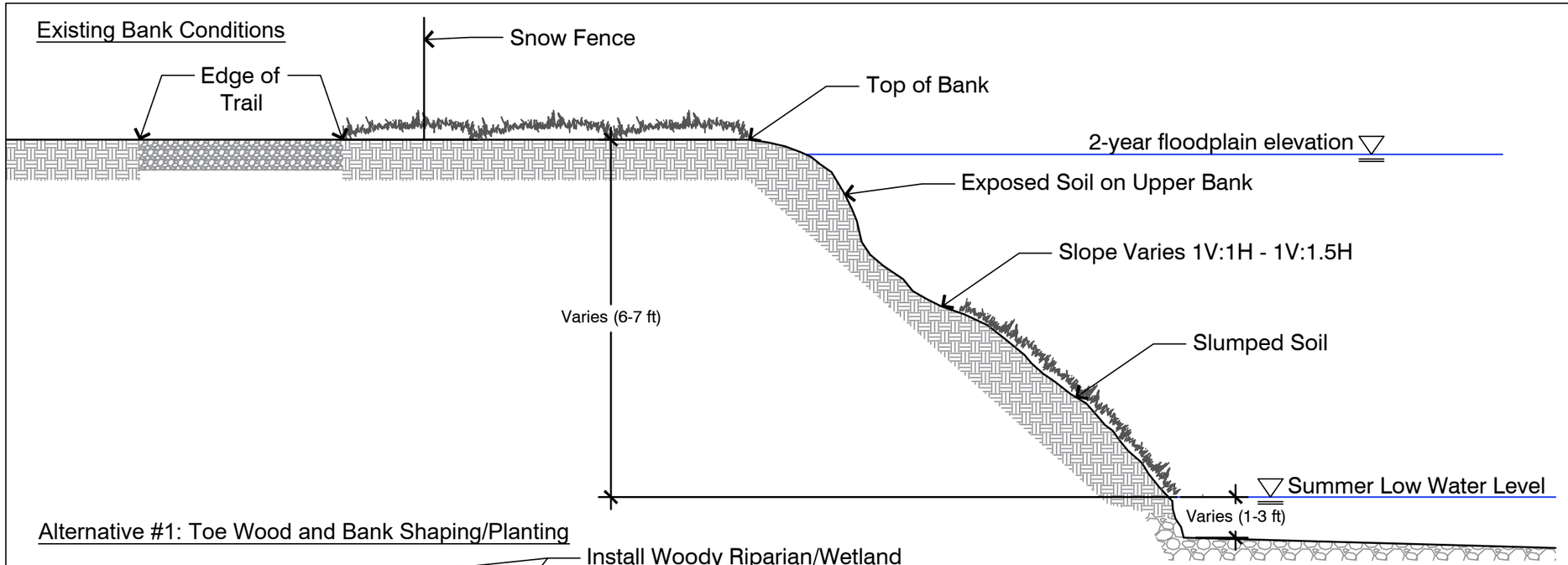
Drawn	Checked
FCP	EPF

Scale: 1" = 50 ft.

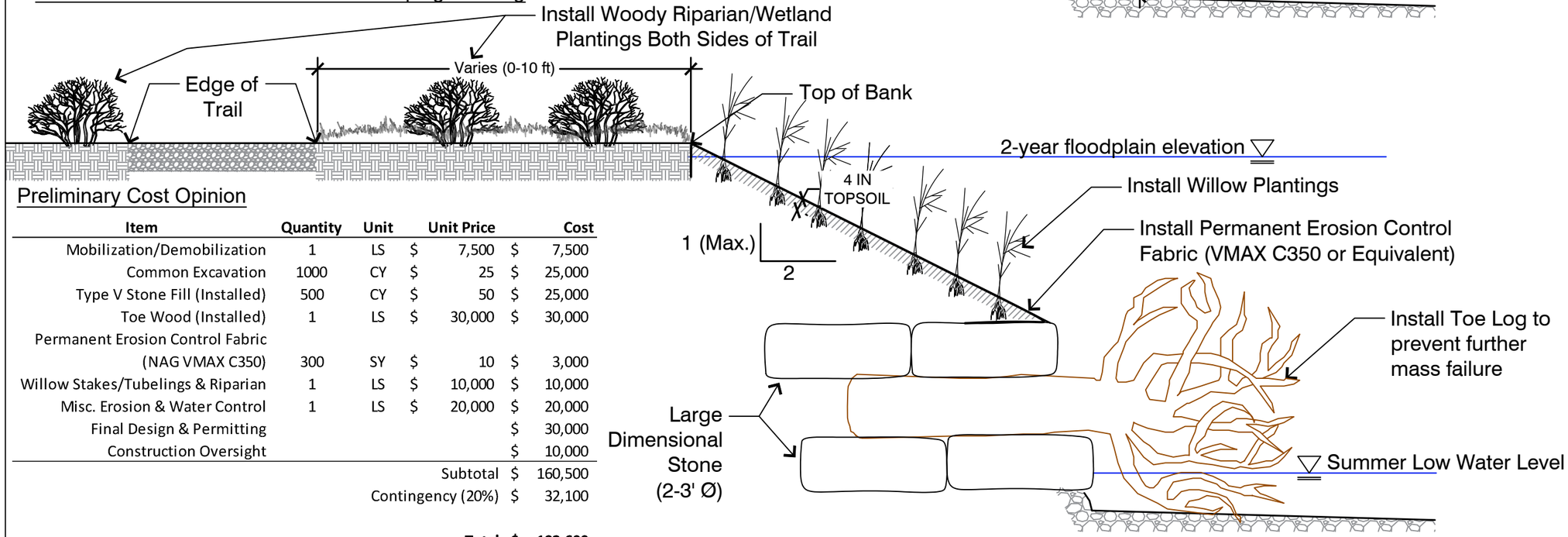
Date: 6/28/2021

SHEET NO.: 2

Existing Bank Conditions



Alternative #1: Toe Wood and Bank Shaping/Planting



Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 7,500	$ 7,500
Common Excavation	1000	CY	$ 25	$ 25,000
Type V Stone Fill (Installed)	500	CY	$ 50	$ 25,000
Toe Wood (Installed)	1	LS	$ 30,000	$ 30,000
Permanent Erosion Control Fabric (NAG VMAX C350)	300	SY	$ 10	$ 3,000
Willow Stakes/Tubelings & Riparian	1	LS	$ 10,000	$ 10,000
Misc. Erosion & Water Control	1	LS	$ 20,000	$ 20,000
Final Design & Permitting				$ 30,000
Construction Oversight				$ 10,000
			Subtotal	$ 160,500
			Contingency (20%)	$ 32,100
			Total	**$ 192,600**

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Notes: Typical Cross Sections based on field survey by FEA (2021).

Cambridge Greenway Path
Bank Erosion (JV-01)
Stabilization Alternatives

Lamoille River
Jeffersonville, VT

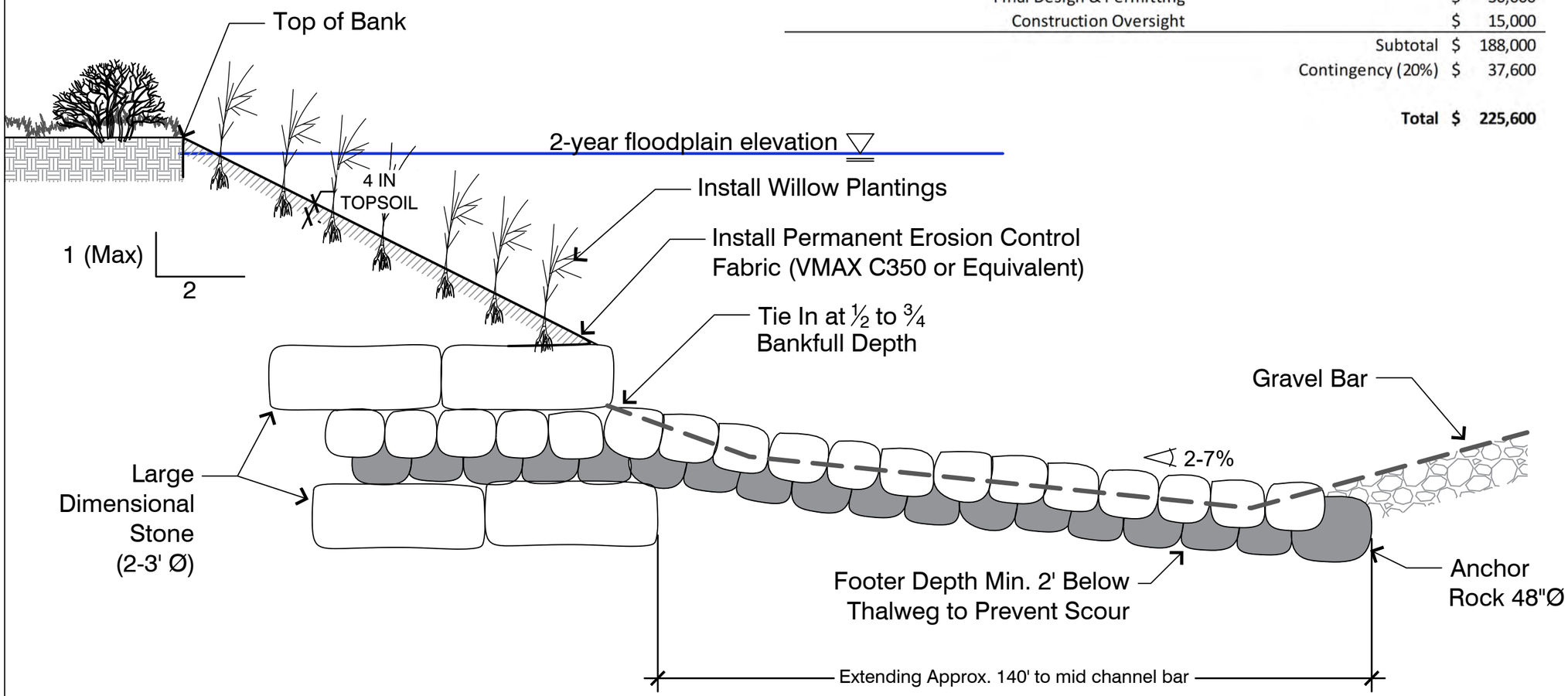
FCP/EHB	EPF
DRAWN	CHECKED

Not to Scale
SCALE

August 2, 2021
DATE

SHEET 3
SHEET NO.

Alternative #2: J-Hook and Bank Shaping/Planting



Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
Common Excavation	1000	CY	$ 25	$ 25,000
Type V Stone Fill (Installed)	500	CY	$ 50	$ 25,000
J-Hooks (Installed)	1	LS	$ 50,000	$ 50,000
Permanent Erosion Control Fabric (NAG VMAX C350)	300	SY	$ 10	$ 3,000
Willow Stakes/Tubelings & Riparian Plantings	1	LS	$ 10,000	$ 10,000
Misc. Erosion & Water Control	1	LS	$ 20,000	$ 20,000
Final Design & Permitting				$ 30,000
Construction Oversight				$ 15,000
			Subtotal	$ 188,000
			Contingency (20%)	$ 37,600
			Total	**$ 225,600**

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Notes: Typical Cross Sections based on field survey by FEA (2021).

Cambridge Greenway Path
Bank Erosion (JV-01)
Stabilization Alternatives

Lamoille River
Jeffersonville, VT

FCP/EHB	EPF
DRAWN	CHECKED

Not to Scale
SCALE

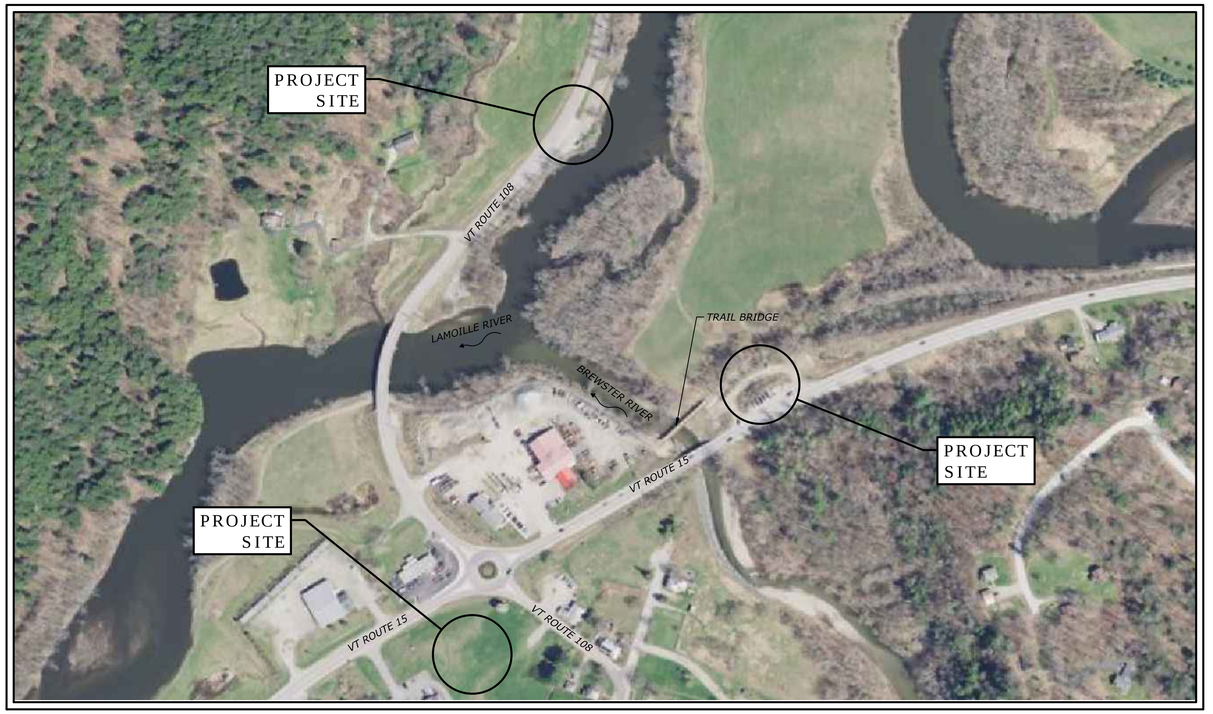
August 2, 2021
DATE

SHEET 4
SHEET NO.

JEFFERSONVILLE STORMWATER
STORMWATER MASTER PLAN

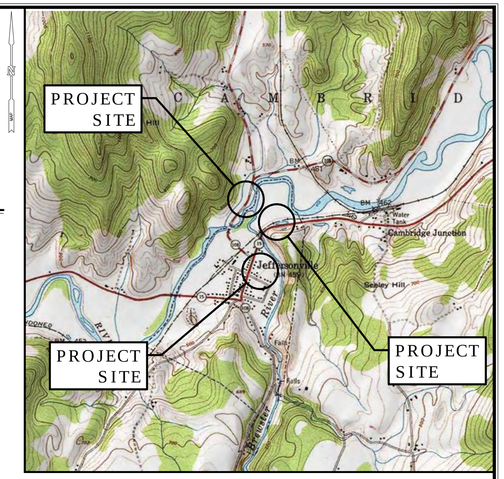
JEFFERSONVILLE, VERMONT

CONCEPT DESIGN
AUGUST 26, 2021



PROJECT SITE VICINITY MAP:

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



LOCATION MAP:

0' 1000' 2000'
0 1/2" 1"
SCALE 1" = 2000'

PREPARED FOR:

LAMOILLE COUNTY REGIONAL PLANNING COMMISSION
52 PORTLAND STREET
MORRISVILLE, VT 05661

LIST OF DRAWINGS

NO.	NAME	TITLE
01	--	TITLE
02	EX-1	PARK AND RIDE SITE PLAN - EXISTING CONDITIONS
03	EX-2	FISH & WILDLIFE SITE PLAN - EXISTING CONDITIONS
04	EX-3	BELL GATES SITE PLAN - EXISTING CONDITIONS
05	PR-1	PARK AND RIDE SITE PLAN - PROPOSED CONDITIONS
06	PR-2	FISH & WILDLIFE SITE PLAN - PROPOSED CONDITIONS
07	PR-3	BELL GATES SITE PLAN - PROPOSED CONDITIONS

PREPARED BY:

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Know what's **below.**
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PARK AND RIDE SITE PLAN (JV-04) - EXISTING CONDITIONS

JEFFERSONVILLE STORMWATER
STORMWATER MASTER PLAN

JEFFERSONVILLE, VERMONT

CONCEPT DESIGN

DESCRIPTION	DATE	BY

Scale: 0' 10' 20' / 0 1/2" 1"

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JCL	DJO	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=20'
DATE: AUGUST 26, 2021
PROJECT NO.: 4294-06
SHEET NO.: 02 OF 07
SHEET NAME: EX-1

LEGEND

- CONTOUR
- EDGE OF PAVEMENT
- APPROX. ROW
- APPROX. PROPERTY LINE
- EDGE OF GRAVEL
- TREELINE
- EDGE OF TRAIL
- FP — FEMA 100-YEAR FLOODPLAIN LIMIT
- FW — FEMA FLOODWAY LIMIT
- OHW — ORDINARY HIGH WATER
- RIVER CENTERLINE
- FENCE
- GUARDRAIL
- UTILITY POLE
- BORING LOCATION
- STREET LAMP

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DESCRIPTION	DATE	BY

CONCEPT DESIGN

FISH & WILDLIFE SITE PLAN (jv-03) - EXISTING CONDITIONS

JEFFERSONVILLE STORMWATER
STORMWATER MASTER PLAN

JEFFERSONVILLE, VERMONT

JCL	DJO	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=20'

DATE: AUGUST 26, 2021

PROJECT NO.: 4294-06

SHEET NO.: 03 OF 07

EX-2

SHEET NAME

CONCRETE BOX CULVERT
LENGTH=54'
RISE=4' SPAN=20'

EXISTING PLANTINGS

SIGN

25+74.07

25+00

ARTESIAN WELL

PCB CONTAMINATED SOILS

WSO

EXISTING LOW AREA WHERE WATER COLLECTS. DETERMINED NOT TO BE A CLASS 2 WETLAND BY VTDEC. FUTURE ALTERATION WOULD NEED TO BE CLEARED WITH USACOE.

EXISTING SWALE

DRILLED WELL

"TILE" WELL

"TILE" WELL

WSO

HYDRANT

UNION BANK

SILO

MW-1
MW-2
MW-3
MW-5
MW-6
MW-7
MW-8

GRASS
GRAVEL
STONE RETAINING WALL
GRASS SWALE
MAIL BOX
SWALE
JEFFERSONVILLE EASEMENT
DEPOT STREET

LEGEND

- CONTOUR
- EDGE OF PAVEMENT
- APPROX. ROW
- APPROX. PROPERTY LINE
- EDGE OF GRAVEL
- TREELINE
- EDGE OF TRAIL
- FP — FEMA 100-YEAR FLOODPLAIN LIMIT
- FW — FEMA FLOODWAY LIMIT
- OHW — ORDINARY HIGH WATER
- RIVER CENTERLINE
- FENCE
- GUARDRAIL
- UTILITY POLE
- BORING LOCATION
- STREET LAMP

0' 10' 20'
0 10" 1'

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DESCRIPTION	DATE	BY

CONCEPT DESIGN

BELL GATES SITE PLAN (JV-11) - EXISTING CONDITIONS

JEFFERSONVILLE STORMWATER
STORMWATER MASTER PLAN

JEFFERSONVILLE, VERMONT

JCL	DJO	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=20'

DATE: AUGUST 26, 2021

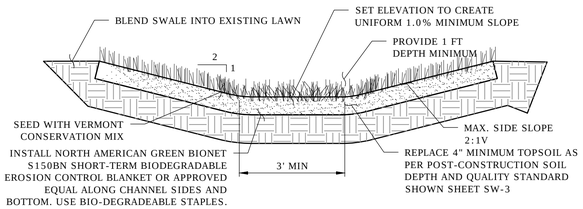
PROJECT NO.: 4294-06

SHEET NO.: 04 OF 07

SHEET NAME: EX-3

LEGEND

EXISTING		PROPOSED
70	CONTOUR	
	EDGE OF PAVEMENT	
	APPROX. ROW	
	APPROX. PROPERTY LINE	
	EDGE OF GRAVEL	
	TREELINE	
	EDGE OF TRAIL	
FP	FEMA 100-YEAR FLOODPLAIN LIMIT	
FW	FEMA FLOODWAY LIMIT	
OHW	ORDINARY HIGH WATER	
	RIVER CENTERLINE	
	FENCE	
	GUARDRAIL	
	UTILITY POLE	
	BORING LOCATION	
	STREET LAMP	☼



GRASS-LINED SWALE

NOT TO SCALE

Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 5,000	$ 5,000
Common Excavation	55	CY	$ 25	$ 1,375
Trucking	55	CY	$ 20	$ 1,100
Stone Lined Outlet Swale	132	LF	$ 25	$ 3,300
HDPE Riser	1	EA	$ 1,200	$ 1,200
Stone (1 - 2" crushed)	2	CY	$ 40	$ 80
6" Perforated PVC	25	LF	$ 20	$ 500
Parking Lot Grading	1	LS	$ 2,000	$ 2,000
Construct Entrance Island	1	LS	$ 2,000	$ 2,000
Signage	1	LS	$ 2,000	$ 2,000
Seed and Mulch	3	EA	$ 500	$ 1,500
Misc. Erosion Control	1	LS	$ 1,000	$ 1,000
Final Design & Permitting				$ 15,000
Construction Oversight				$ 10,000
			Subtotal	$ 46,055
			Contingency (20%)	$ 9,210
			Total	**$ 55,265**

*Designation of Parking Stalls Not Included

BIO-INFILTRATION AREA

NOT TO SCALE

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CONCEPT DESIGN

PARK AND RIDE SITE PLAN (JV-04) - PROPOSED CONDITIONS

JEFFERSONVILLE STORMWATER STORMWATER MASTER PLAN

JEFFERSONVILLE, VERMONT

JCL	DJO	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=20'

DATE: AUGUST 26, 2021

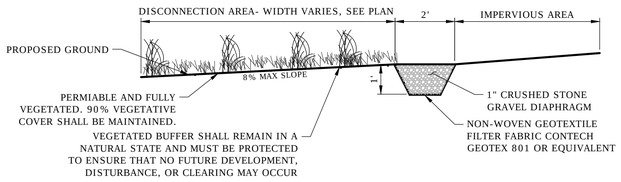
PROJECT NO.: 4294-06

SHEET NO.: 05 OF 07

SHEET NAME: **PR-1**

LEGEND

EXISTING		PROPOSED
310	CONTOUR	
	EDGE OF PAVEMENT	
	APPROX. ROW	
	APPROX. PROPERTY LINE	
	EDGE OF GRAVEL	
	TREELINE	
	EDGE OF TRAIL	
FP	FEMA 100-YEAR FLOODPLAIN LIMIT	
FW	FEMA FLOODWAY LIMIT	
OHW	ORDINARY HIGH WATER	
	RIVER CENTERLINE	
	FENCE	
	GUARDRAIL	
	UTILITY POLE	
	BORING LOCATION	
	STREET LAMP	



DISCONNECTION TO VEGETATED BUFFER

NOT TO SCALE

Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 5,000	$ 5,000
Structure Removal	1	LS	$ 2,000	$ 2,000
Stone (1" crushed)	10	CY	$ 50	$ 500
Fencing	185	LF	$ 25	$ 4,625
Gravel and Pavement Removal	425	CY	$ 26	$ 11,050
Trucking	425	CY	$ 20	$ 8,500
Topsoil	150	CY	$ 50	$ 7,500
Construct Entrance	1	LS	$ 2,000	$ 2,000
Signage	1	LS	$ 2,000	$ 2,000
Riparian Plantings	1	LS	$ 10,000	$ 10,000
Seed and Mulch	1	LS	$ 1,000	$ 1,000
Misc. Erosion Control	1	LS	$ 1,000	$ 1,000
Final Design & Permitting				$ 15,000
Construction Oversight				$ 10,000
			Subtotal	$ 80,175
			Contingency (20%)	$ 16,040
			Total	**$ 96,215**

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FISH & WILDLIFE SITE PLAN (JV-03) - PROPOSED CONDITIONS

JEFFERSONVILLE STORMWATER STORMWATER MASTER PLAN

JEFFERSONVILLE, VERMONT

CONCEPT DESIGN

JCL	DJO	RKS
DESIGNED	DRAWN	CHECKED

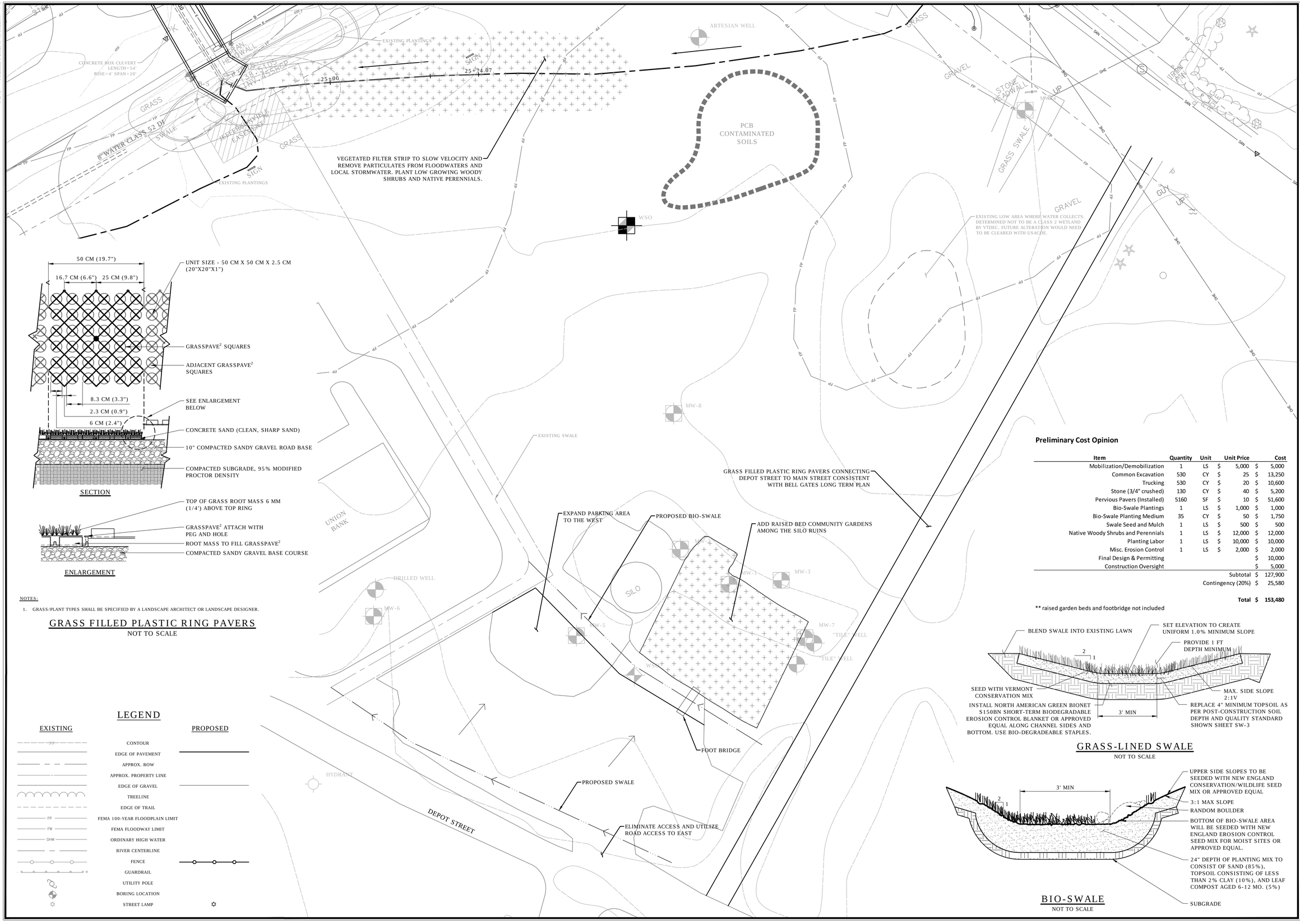
SCALE: 1"=20'

DATE: AUGUST 26, 2021

PROJECT NO.: 4294-06

SHEET NO.: 06 OF 07

SHEET NAME: **PR-2**



NOTES:

1. GRASS/PLANT TYPES SHALL BE SPECIFIED BY A LANDSCAPE ARCHITECT OR LANDSCAPE DESIGNER.

GRASS FILLED PLASTIC RING PAVERS

NOT TO SCALE

LEGEND

EXISTING		PROPOSED
310	CONTOUR	
	EDGE OF PAVEMENT	
	APPROX. ROW	
	APPROX. PROPERTY LINE	
	EDGE OF GRAVEL	
	TREELINE	
	EDGE OF TRAIL	
FP	FEMA 100-YEAR FLOODPLAIN LIMIT	
FW	FEMA FLOODWAY LIMIT	
OHW	ORDINARY HIGH WATER	
	RIVER CENTERLINE	
	FENCE	
	GUARDRAIL	
	UTILITY POLE	
	BORING LOCATION	
	STREET LAMP	

Preliminary Cost Opinion

Item	Quantity	Unit	Unit Price	Cost
Mobilization/Demobilization	1	LS	$ 5,000	$ 5,000
Common Excavation	530	CY	$ 25	$ 13,250
Trucking	530	CY	$ 20	$ 10,600
Stone (3/4" crushed)	130	CY	$ 40	$ 5,200
Pervious Pavers (Installed)	5160	SF	$ 10	$ 51,600
Bio-Swale Plantings	1	LS	$ 1,000	$ 1,000
Bio-Swale Planting Medium	35	CY	$ 50	$ 1,750
Swale Seed and Mulch	1	LS	$ 500	$ 500
Native Woody Shrubs and Perennials	1	LS	$ 12,000	$ 12,000
Planting Labor	1	LS	$ 10,000	$ 10,000
Misc. Erosion Control	1	LS	$ 2,000	$ 2,000
Final Design & Permitting				$ 10,000
Construction Oversight				$ 5,000
			Subtotal	$ 127,900
			Contingency (20%)	$ 25,580
			Total	**$ 153,480**

** raised garden beds and footbridge not included

GRASS-LINED SWALE

NOT TO SCALE

BIO-SWALE

NOT TO SCALE

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DESCRIPTION	DATE	BY

BELL GATES SITE PLAN (JV-11) - PROPOSED CONDITIONS

JEFFERSONVILLE STORMWATER STORMWATER MASTER PLAN

JEFFERSONVILLE, VERMONT

CONCEPT DESIGN

JCL	DJO	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=20'

DATE: AUGUST 26, 2021

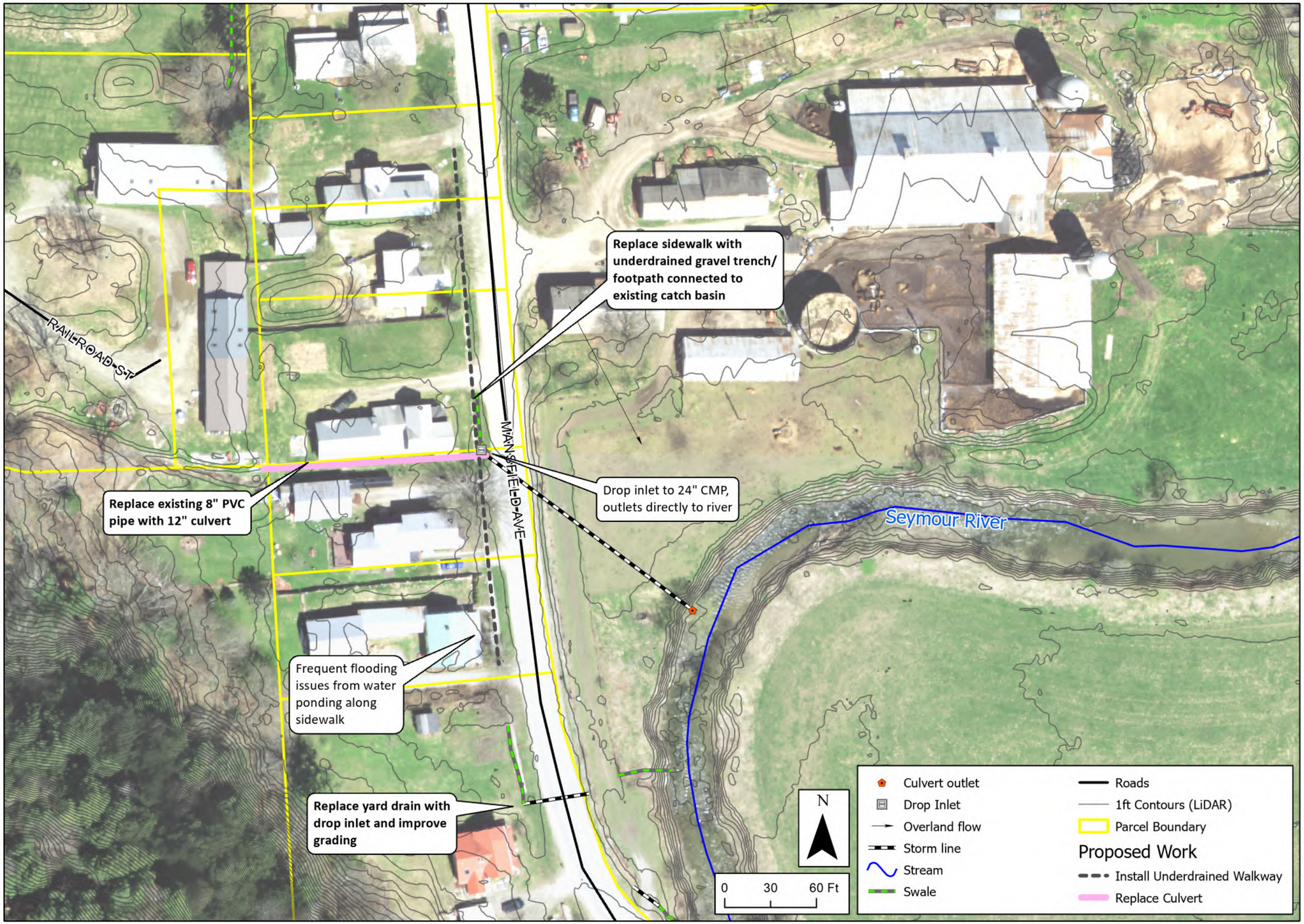
PROJECT NO.: 4294-06

SHEET NO.: 07 OF 07

SHEET NAME: PR-3

APPENDIX D

10% Conceptual Designs
for 6 Projects
(11”x17”)



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Tel: 802.876.7778
www.fitzgeraldenvironmental.com

Notes
-Contours based on 0.7-M LiDAR DEM
- Site survey completed 5/21/21

Cambridge Village Stormwater Master Plan

Preliminary Concept Design 10%

JHB	EPF
Drawn	Checked

Scale: 1" = 60 ft.

Date: 6/9/2021

CV-07

SHEET NO. 1

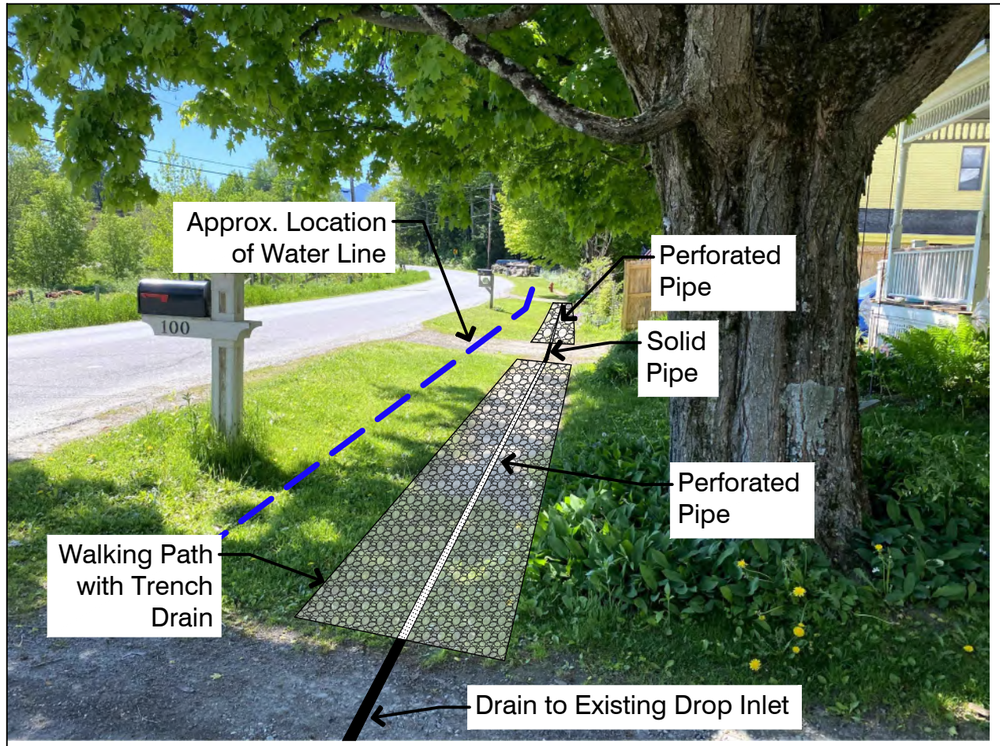
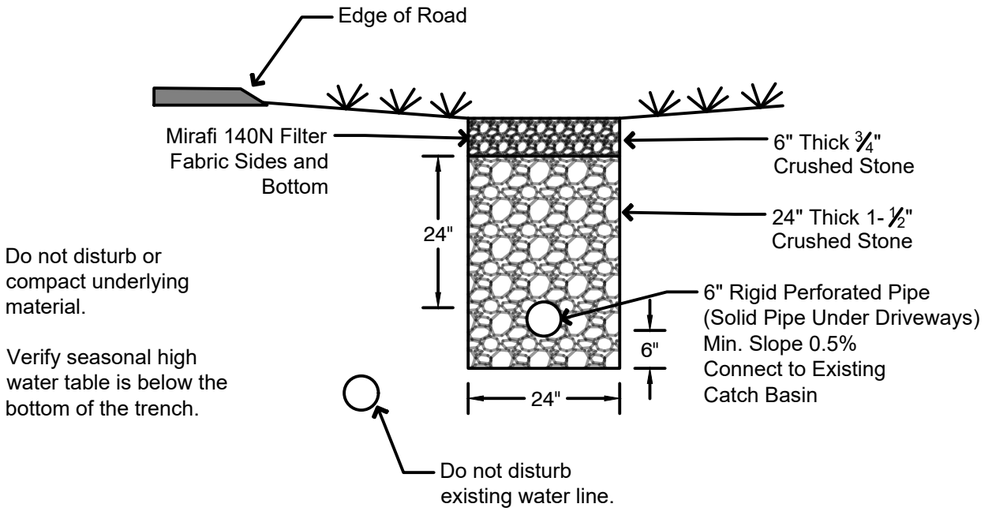


Photo 1. Proposed Underdrained Gravel Trench at CV-07

Preliminary estimated cost of project implementation: $25,000 - $50,000



Do not disturb or compact underlying material.

Verify seasonal high water table is below the bottom of the trench.

Underdrained Gravel Trench Typical Detail
N.T.S.

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Notes:

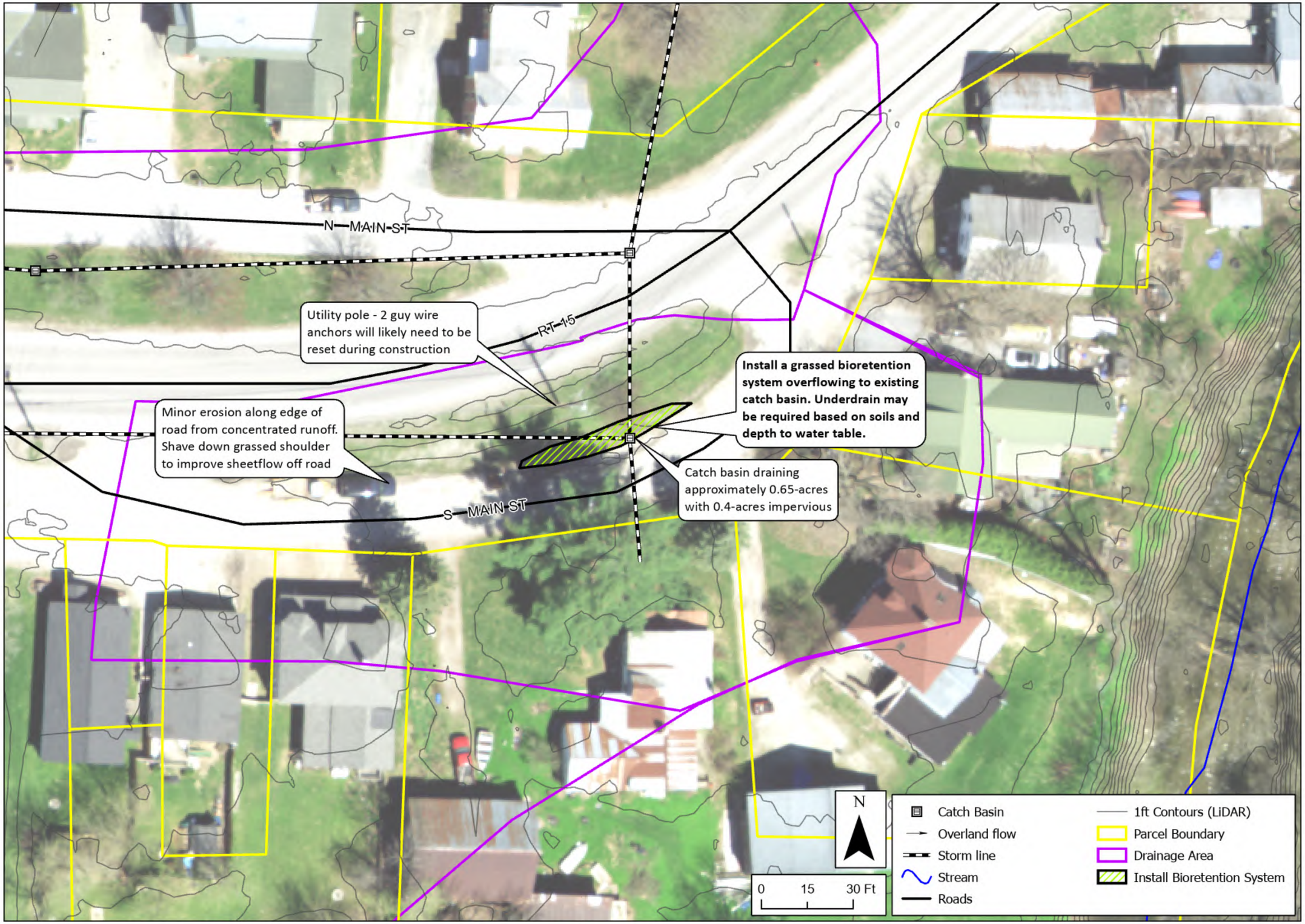
Cambridge Village Stormwater Master Plan
Preliminary Concept Design 10%

EHB	JHB
DRAWN	CHECKED

As Shown
SCALE

August 2, 2021
DATE

CV-07
Sheet 2
SHEET NO.



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Preliminary Concept Design 10%

JHB	EPF
Drawn	Checked

Scale 1" = 30 ft.

Date 8/2/2021

CV-10

SHEET NO. 1

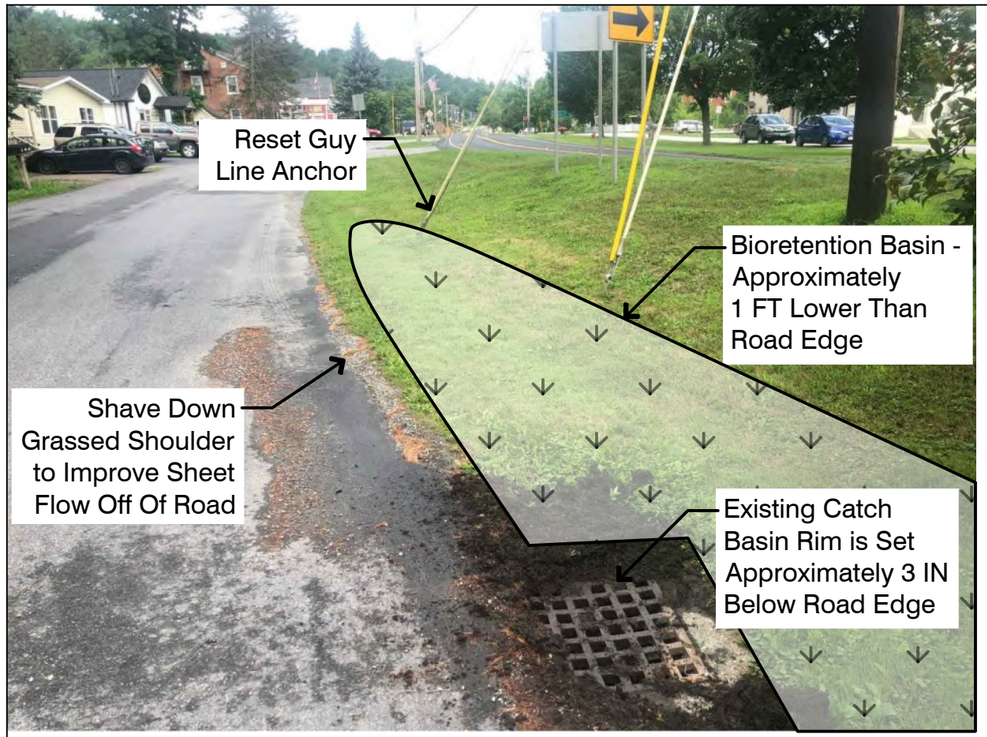
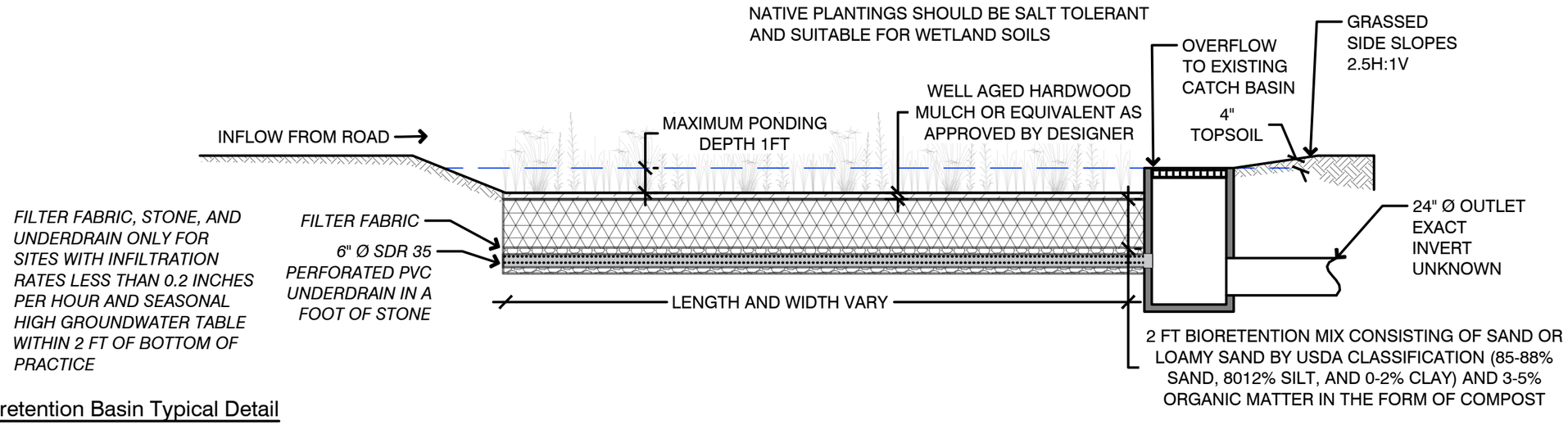


Photo 1. Proposed Bioretention Basin at CV-10

Preliminary estimated cost of project implementation: $15,000 - $25,000



FILTER FABRIC, STONE, AND UNDERDRAIN ONLY FOR SITES WITH INFILTRATION RATES LESS THAN 0.2 INCHES PER HOUR AND SEASONAL HIGH GROUNDWATER TABLE WITHIN 2 FT OF BOTTOM OF PRACTICE

Bioretention Basin Typical Detail
N.T.S.

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EHB	JHB
DRAWN	CHECKED

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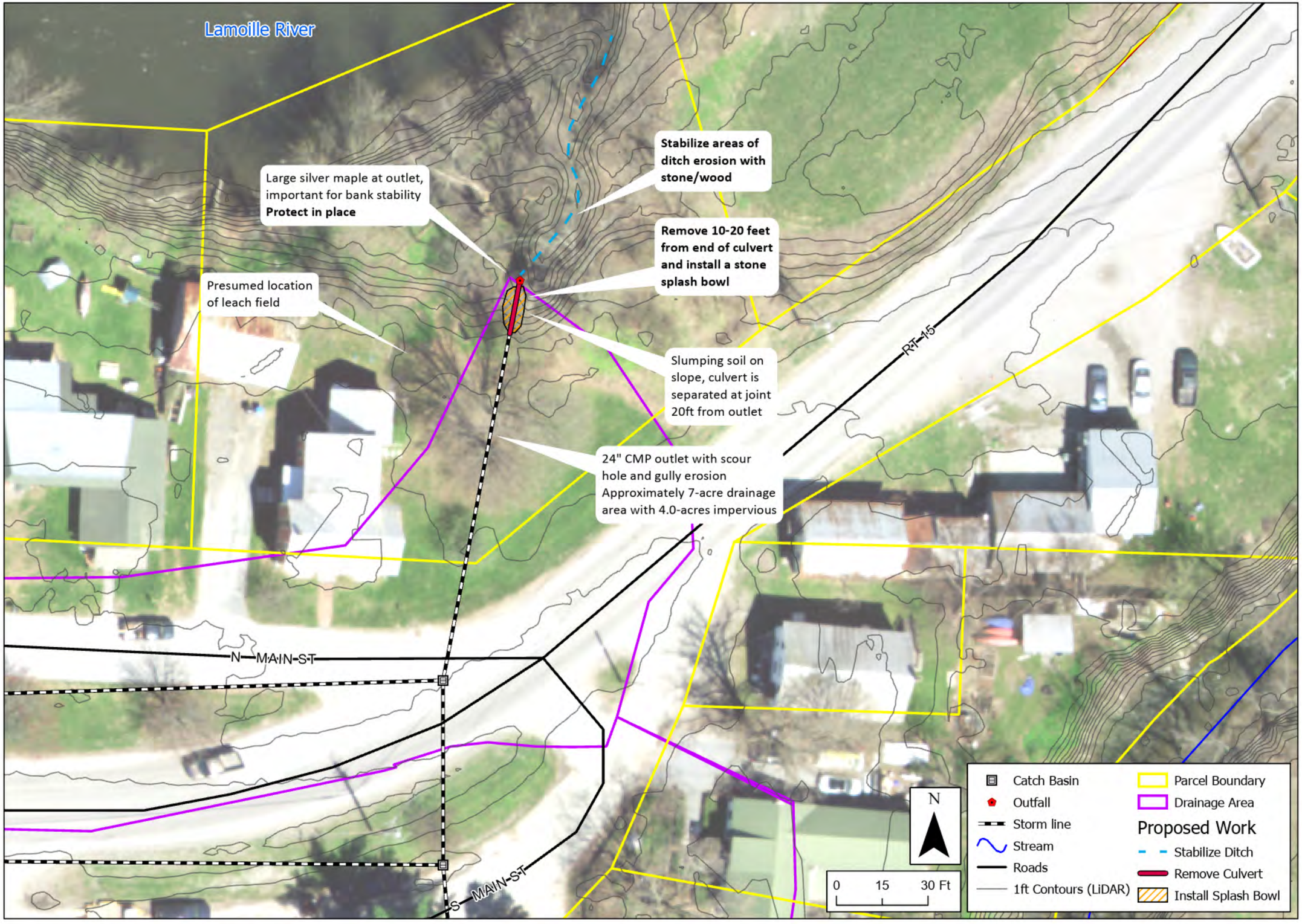
SCALE

August 2, 2021
DATE

CV-10
Sheet 2
SHEET NO.



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- Site survey completed 5/21/21

Cambridge Village
Stormwater Master Plan

Preliminary Concept Design 10%

JHB	EPF
Drawn	Checked

Scale: 1" = 30 ft.

Date: 8/2/2021

CV-11

SHEET NO. 1

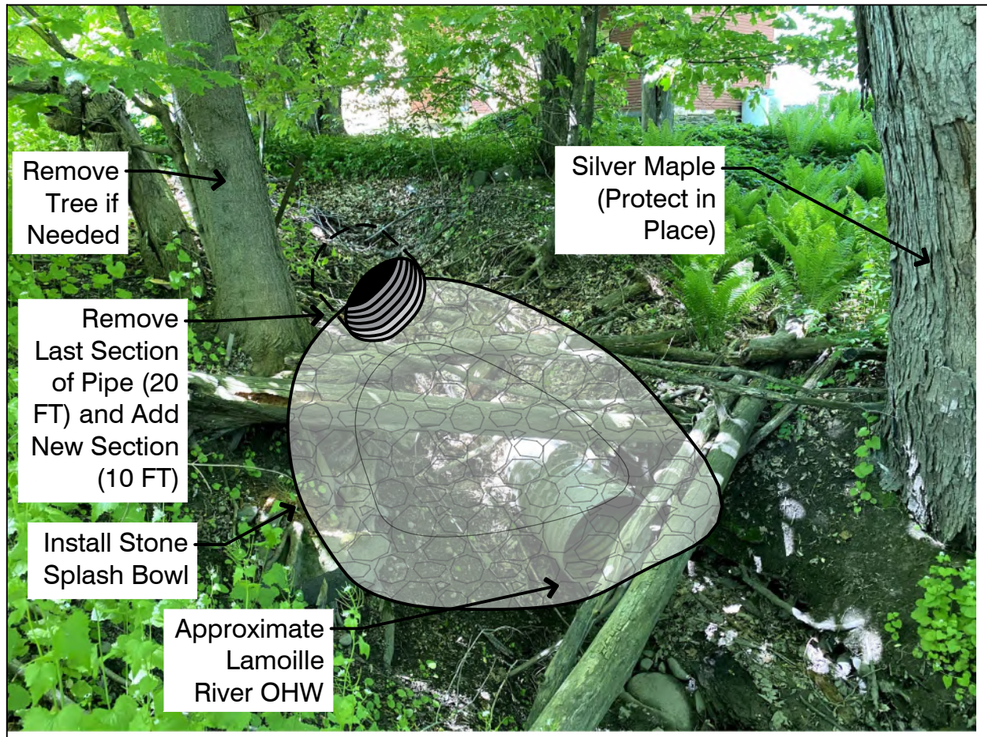
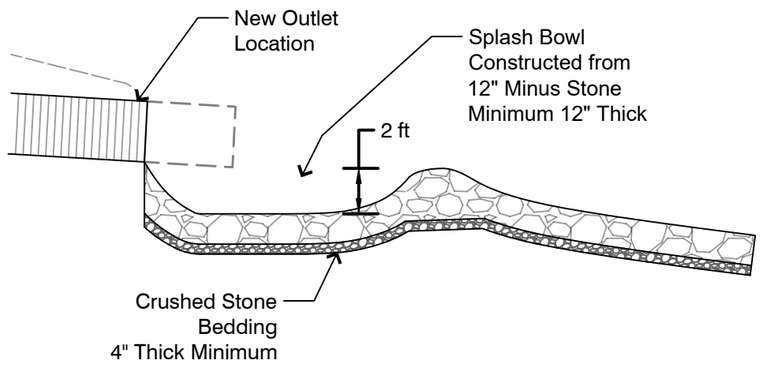


Photo 1. Proposed Outlet Protection at CV-11

Photo 2. Example of Stone Splash Bowl Outlet Protection

Preliminary estimated cost of project implementation: $15,000 - $25,000



Stone Splash Bowl Typical Detail
N.T.S.

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August 2, 2021
DATE

CV-11 Sheet 2
SHEET NO.

Option B:
Improve swale grade to convey overflow north to existing Mann's Meadow treatment system

Raise sidewalk and add culvert or equivalent

Raise sidewalk

Option A:
Install 2 catch basins and tie into existing stormwater system

Install bioretention or infiltration basin (grass)

Mann's Meadow

Church Street

Catch Basins
Culvert Inlet
Stormwater Manhole
Overland flow
Sanitary line
Storm line
Swale
Under drain
Drainage Areas
Parcel Boundaries
1-ft Contours (LiDAR)
Install Bioretention System

N

0 30 60 Ft

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Jeffersonville Village Stormwater Master Plan
Preliminary Concept Design 10%

Drawn	Checked
FCP	EPF

Scale: 1" = 30 ft.

Date: 8/2/2021

JV-05

SHEET NO. 1

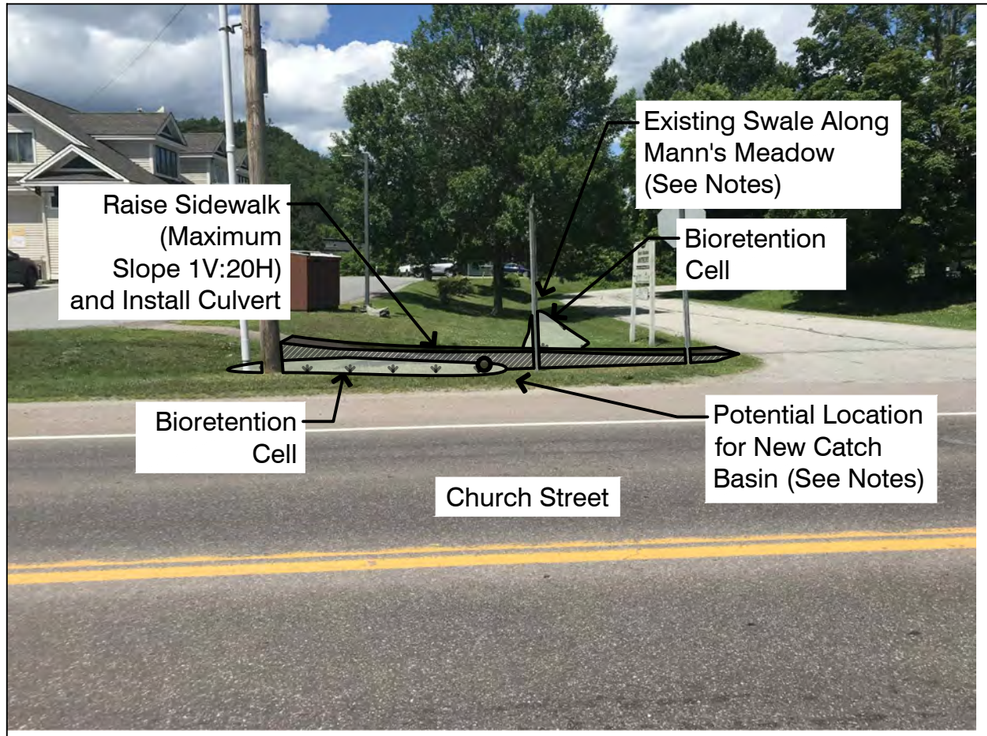
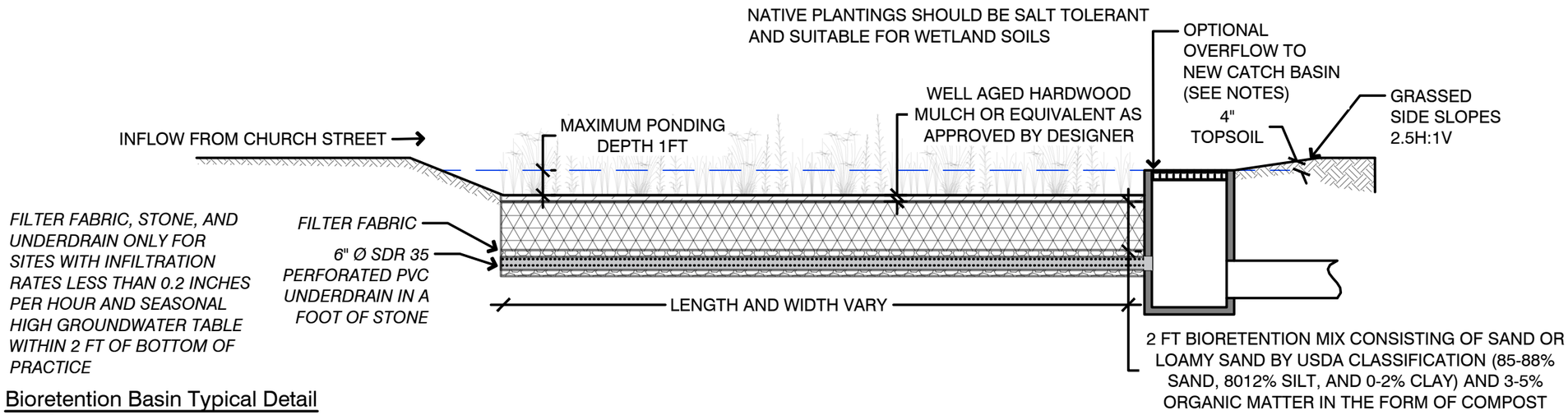


Photo 1. Proposed Bioretention Cells at JV-05

Preliminary estimated cost of project implementation: $10,000 - $20,000

Notes.

1. System Overflow Options:
   A) Install two new catch basins and tie-in to existing drainage system.
   B) Direct overflow north to the grassed swale along Mann's Meadow to the private stormwater system (Permit #4097-9010.R)



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Bioretention Basin Typical Detail
N.T.S.

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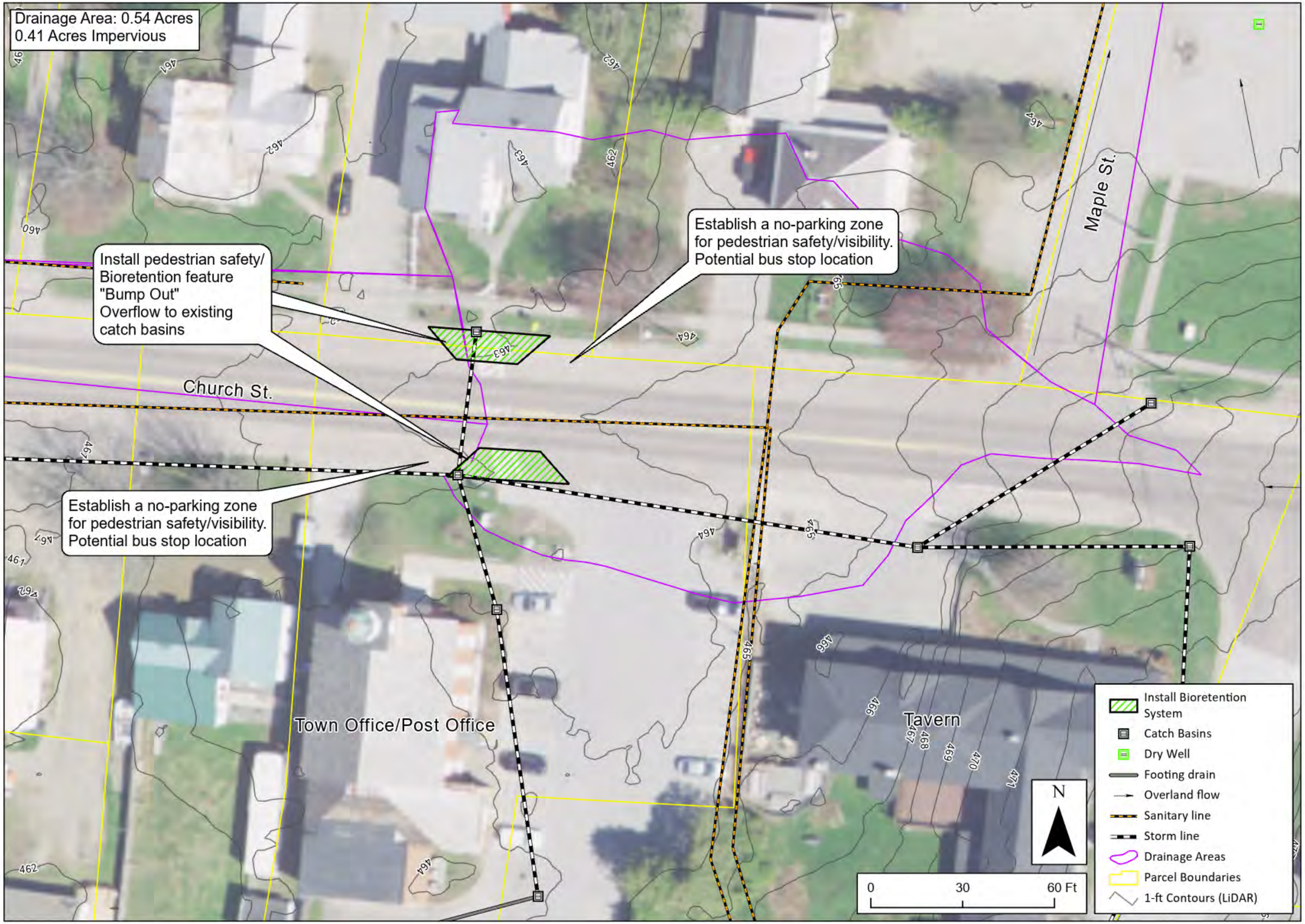
JV-05
Sheet 2
SHEET NO.



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-Stormwater Infrastructure mapping by VTDEC

Jeffersonville Village
Stormwater Master Plan
Preliminary Concept Design 10%

Drawn	Checked
FCP	EPF

Scale: 1" = 30 ft.

Date: 8/2/2021

JV-09

SHEET NO. 1

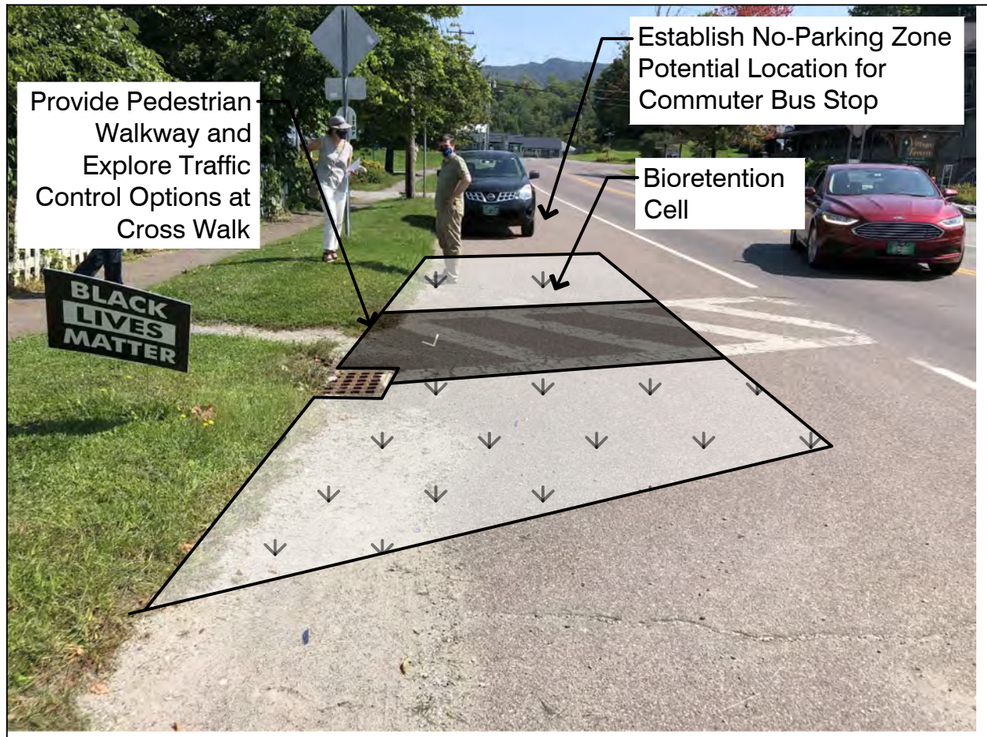
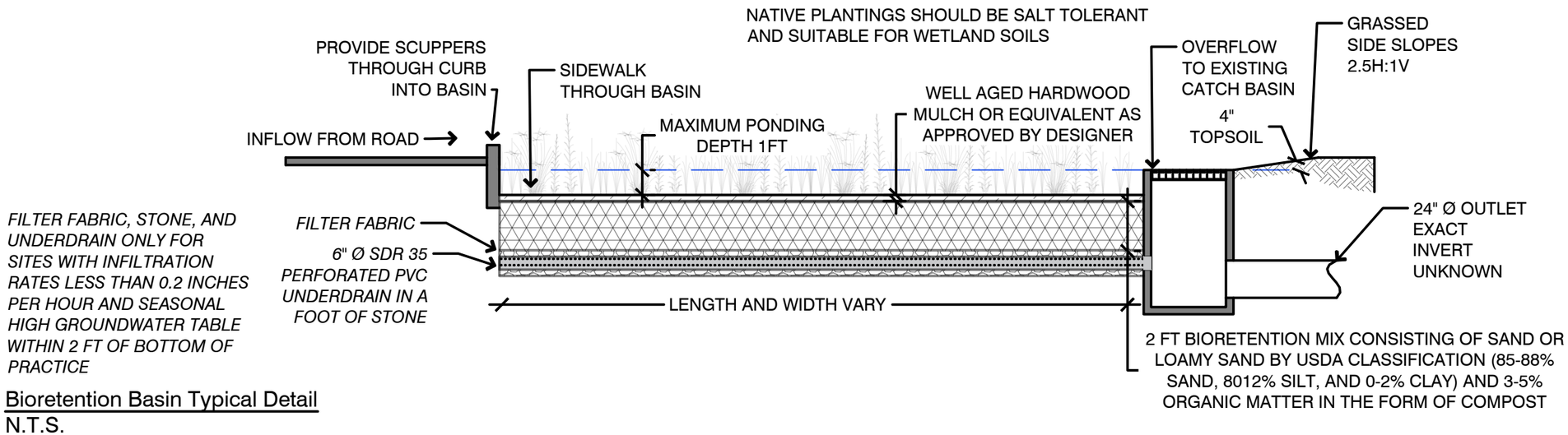


Photo 1. Proposed Bioretention Cells at JV-09

Preliminary estimated cost of project implementation: $25,000 - $50,000



Bioretention Basin Typical Detail
N.T.S.

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Notes:

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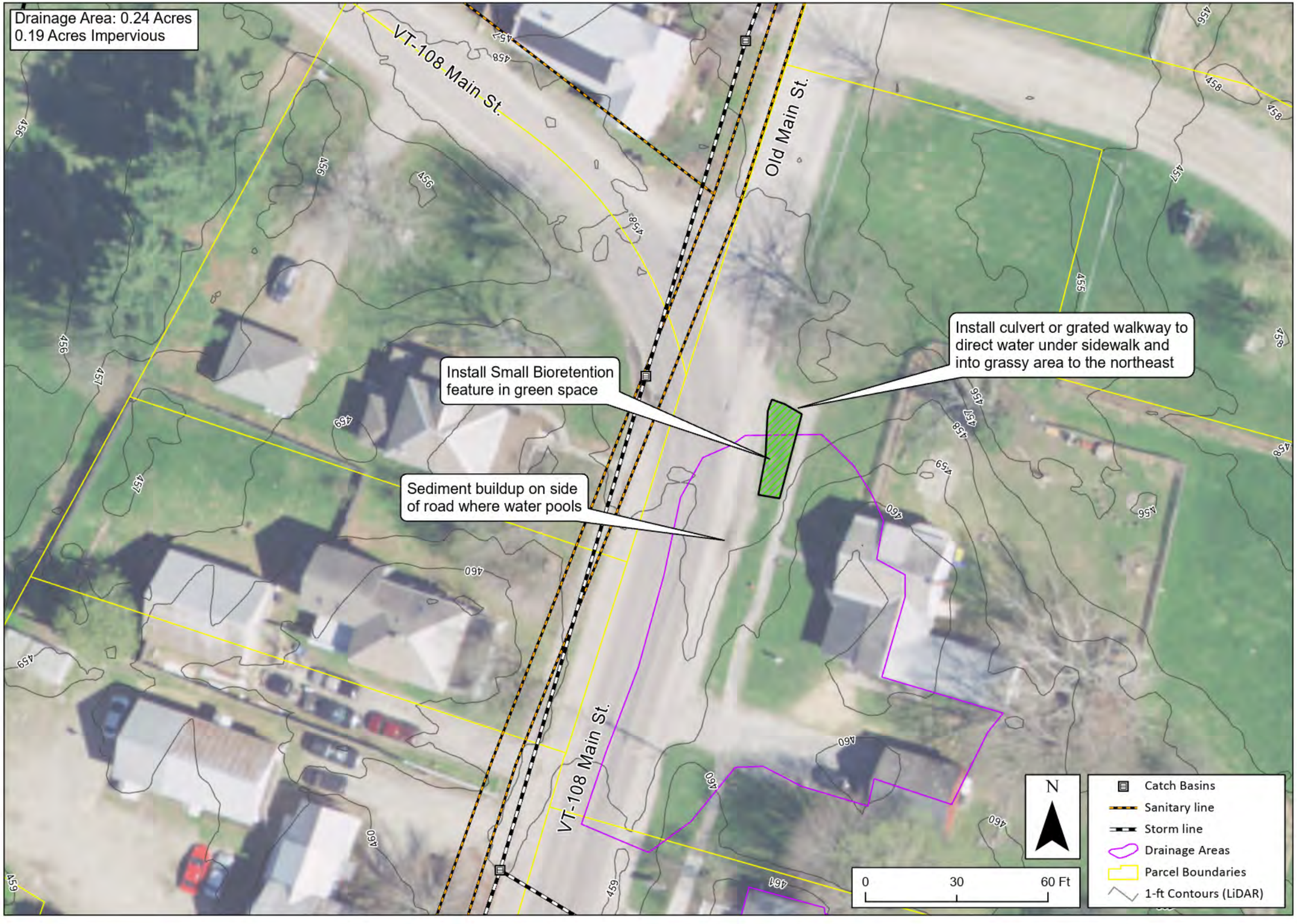
JV-09
Sheet 2
SHEET NO.



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Stormwater Master Plan
Preliminary Concept Design 10%

Drawn	Checked
FCP	EPF

Scale: 1" = 30 ft.

Date: 8/2/2021

JV-13

SHEET NO. 1

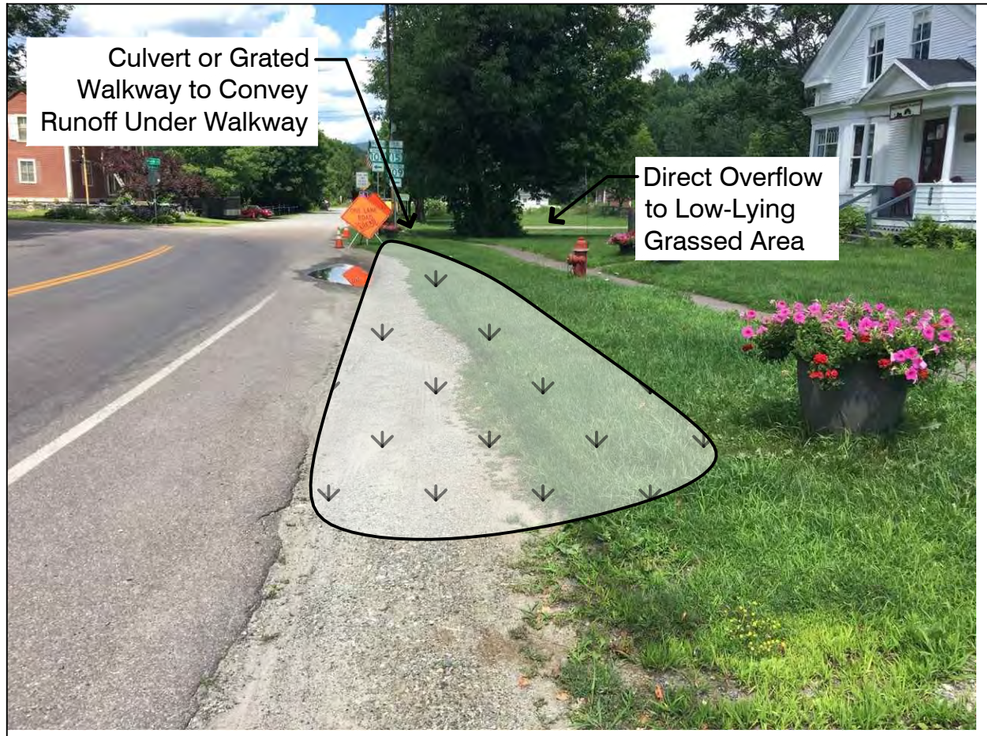
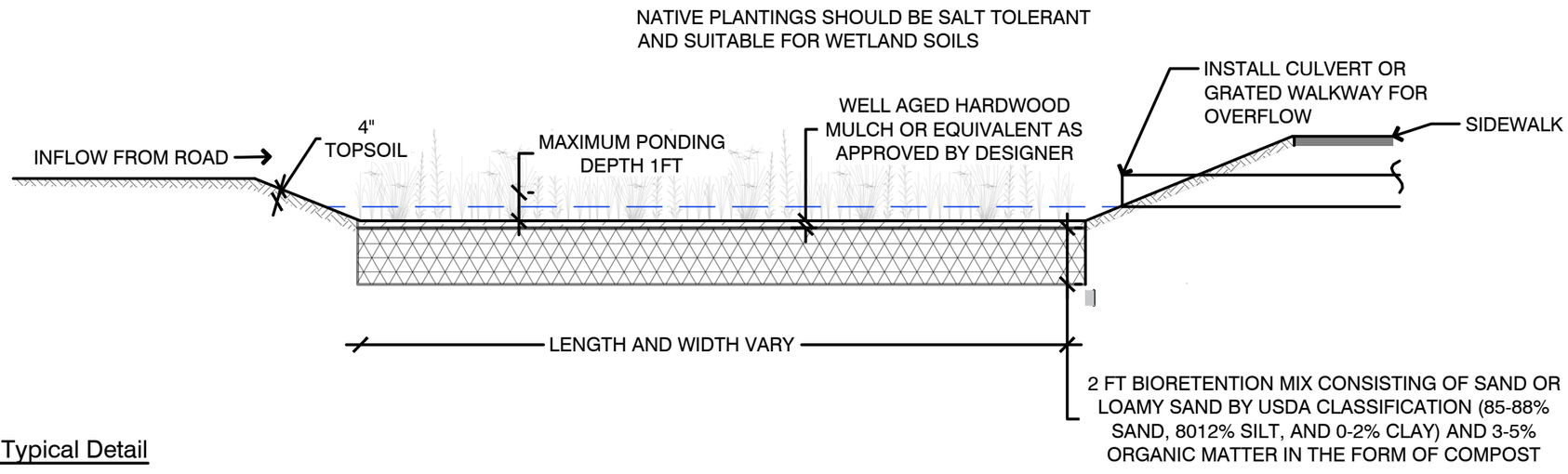


Photo 1. Proposed Bioretention Basin at JV-13

Preliminary estimated cost of project implementation: $10,000 - $20,000



Bioretention Basin Typical Detail
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SCALE

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JV-13
Sheet 2
SHEET NO.