Stormwater Master Plan
Town of Concord, Vermont

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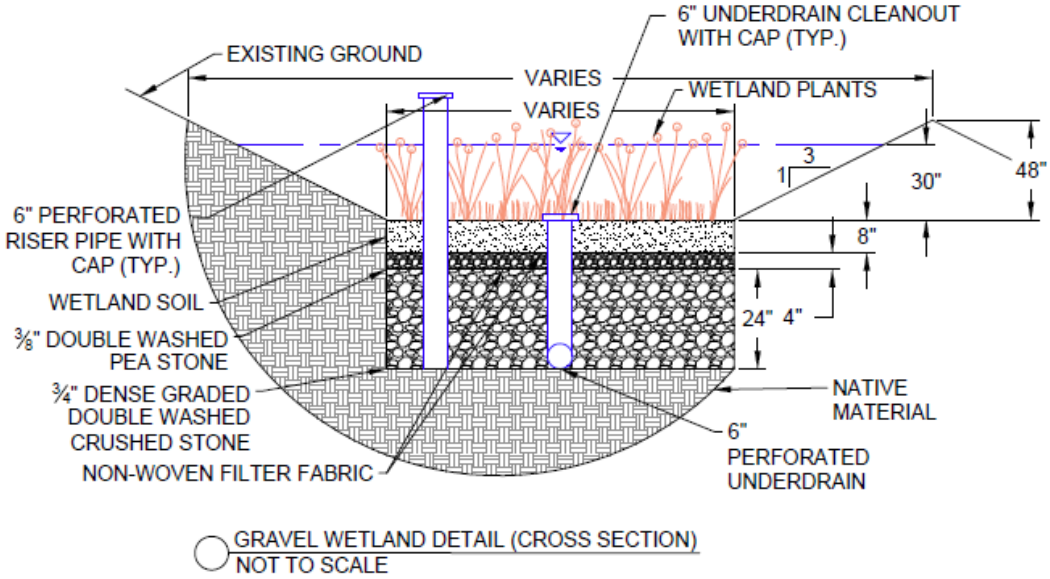

GRAVEL WETLAND DETAIL (CROSS SECTION)
NOT TO SCALE

PROJECT NO.

17-083

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Town of Concord, Vermont

Cover: Existing drainage ditch (left) and crushed cross-culvert (right) at the High Street-Folsom Avenue intersection; and proposed concept design for a gravel wetland to provide water quality treatment for runoff from upland areas adjacent to Folsom Avenue.

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Acknowledgements

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1. Introduction

Water knows no political boundaries, and thus evaluations of water quality tend to be undertaken within watershed boundaries and involve land areas in multiple towns. From a water quality perspective, it would be ideal to manage water resources along watershed lines—but the reality is that many decisions, particularly those about land use, are made at the level of towns or individual sites.

A Stormwater Master Plan is responsive to existing landscape characteristics across all watersheds within local political bounds. It connects land use, stormwater management, floodplain management, river management, and public infrastructure needs to more effectively address all of the issues which contribute to water quality impairment or improvement. Within this Plan, localized stormwater problems are examined at a larger scale (throughout the village center) to determine their relative contributions and aid in setting priorities for addressing challenges related to stormwater runoff. As adjoining municipalities also take increasingly comprehensive views of stormwater management issues and planning, these plans are one-stop resources that can improve coordination and increase opportunities for collaboration in meeting watershed-related needs across political boundaries.

1.1. Project Overview

As precipitation falls on an undisturbed, natural landscape and moves through the hydrologic cycle, it flows through a complex system of vegetation, soil, groundwater, and surface water. Natural events have shaped these components over time to create a system that can efficiently handle stormwater through evaporation, transpiration, infiltration, and runoff. Alterations to the landscape change the way it responds to precipitation events. Management of land use, rainfall, storm runoff, and surface water (streams and lakes) are interrelated, and the management practices chosen all influence water quality and stream health.

Watersheds are interconnected networks in which a change at any location can carry throughout the system. There are many factors that influence exactly how stormwater runoff from a particular site will affect other areas of the watershed. The degree and type of impact varies from location to location, but it can be significant relative to other sources of pollution. Stormwater runoff affects water quality, water quantity, habitat and biological resources, public health, and the aesthetic appearance of the receiving water. Stormwater controls, in contrast, are typically conceived and implemented on a project-by-project basis. These projects are analyzed for their individual stormwater impacts, not in the context of their impact on an interconnected hydrologic and hydraulic system. It is well documented, however, that the cumulative effects of individual land surface changes dramatically influence flooding conditions and contribute to water quality degradation (NRC 2009).

What is a watershed? A watershed is any area of land in which all water runoff from its surface flows to the same drainage point. Watersheds are sometimes referred to as drainage areas. Watersheds are important because they are the basic unit of analysis for all surface water management. They come in all shapes and sizes, and are defined based on the intended study area.

Watershed management practices have direct impacts on water quality both locally (in the Moose River) and in downstream waterbodies (the Connecticut River and ultimately the Long Island Sound). Decisions that affect land use have stormwater management ramifications and, in turn, impact all downstream water resources.

Vermont's streams, rivers and lakes are vital economic resources. The quality of local receiving waters affects both economic interests and quality of life in the surrounding areas. The local economy depends, in part, on the revenue gained from outdoor activities enjoyed in and on the water. Protecting the quality of surface waters is one of the most important commitments communities can make to protect the economic interests of residents.

Taken together, these elements emphasize the need for a holistic planning effort that considers the interconnected nature of land use, stormwater management, and river management in order to achieve overall watershed goals. The Vermont Department of Environmental Conservation (VTDEC) issued Vermont Stormwater Master Planning Guidelines in 2013 (most recently updated in June 2016) to provide a consistent framework for the many communities and stakeholders undertaking stormwater planning efforts—and critically, to make better use of limited dollars by targeting high priority stormwater projects. Concord's plan generally follows Template #2A from this guidance, "Hybrid site and community retrofit approach with green stormwater infrastructure stormwater management".

1.2. Project Goals

The ultimate objective of this stormwater master planning project is to support the Town and Essex NRCD in improving stormwater management, by providing a list of high priority water resource concerns and conceptual solutions that support the development and implementation of future restoration projects in an efficient and targeted manner.

This Stormwater Master Plan first incorporates information from existing plans and datasets to create resources to guide future stormwater management activities. The resulting stormwater management planning information and resources are included in Section 2 of this report.

This Stormwater Master Plan also:

- Provides a means for comparing anticipated benefits of individual stormwater improvement projects;
- Provides recommendations to address stormwater problems, including a prioritized list of problem areas that can assist the Town in directing resources to high priority projects; and
- Presents conceptual solutions for stormwater management measures in select high priority problem areas.

1.3. Problem Definition – Project Area and the Moose River

The Town of Concord is located in Essex County; the Town has a total area of 43.9 square miles and as of the 2010 census, the population of Concord was 1,235 (US Census Bureau 2018). The Moose River flows into town from the north and flows out to the west into neighboring St. Johnsbury. The eastern portion of the Town, including the village area (Figure 1, Appendix A), lies within the Passumpsic River watershed, which ultimately drains to the Connecticut River and eventually to Long Island Sound.

The Passumpsic River watershed encompasses a watershed area of about 507 square miles. The basin occupies much of Caledonia County, and minor portions of Essex, Orleans, and Washington Counties in Vermont. Approximately 77 percent of the watershed benefits from forested cover. Agricultural and urban (developed land and roads) land uses comprise 10% and 5% of the landscape, respectively. The water quality

issues identified in the Moose River tributary basin tend to be associated with elevated nutrient levels due to loadings from agricultural, developed land, and road runoff, and elevated *e. coli* concentrations potentially due to barnyard and other agricultural runoff in the Chesterfield Valley Brook drainage and from that brook to the Moose River mouth (VT DEC 2014).

2. Existing Plans and Data

Numerous and varied groups and individuals have invested considerable effort in evaluating different components of Concord's water, wastewater, and stormwater infrastructure; water resources; and the important interface between water resources and local land use decisions. At times, these evaluations followed watershed boundaries, and at other times they have followed political boundaries. The following sections identify these evaluations and highlight information most relevant to Concord and to developing a list of strategic, prioritized projects that could be undertaken to improve water quality and increase flood resilience. Geospatial pre-existing data are provided graphically on Figure 1 in Appendix A.

2.1. Watershed-Based Assessments

The ongoing assessments described below are generally led by the State of Vermont's Agency of Natural Resources (ANR). These include basin planning efforts, stream geomorphic assessment and in-stream water quality assessment work, and TMDL implementation, each of which are briefly described below where information is available for Concord.

2.1.1. Tactical Basin Planning

The main goal of tactical basin planning is to guide ANR in its own work and in collaborative projects with the public, municipalities, and other state and federal agencies. The basin plans have a five-year scope. The Town of Concord is located in the Passumpsic and Upper Connecticut River Basin (Basin #15), where a Tactical Basin Plan was adopted by ANR in June 2014. The central component of this plan is an implementation table with targeted actions to protect high quality waters and to address identified water quality issues. Objective 23 from that plan is to "Identify opportunities for increased treatment of separated stormwater before it is discharged to surface waters through the use of green stormwater infrastructure".

2.1.2. Other Vermont ANR-Sponsored Programs

Additional ANR-based data sources reviewed prior to the start of field visits for the purpose of locating potential stormwater problem areas (Section 3) included:

- Stream Geomorphic Assessments: Stream geomorphic assessments relevant to Concord, as noted in the 2014 Tactical Basin Plan (Table E.1), and available here: https://anrweb.vt.gov/DEC/SGA/finalReports.aspx.

2.2. Town-Wide Assessments and Programs

In addition to the watershed-based assessments, a number of assessments and datasets are developed on a municipality-by-municipality basis. These include direct feedback from the Town, work by the Vermont Agency of Transportation (VTrans) and Vermont Department of Environmental Conservation (DEC), and past and current planning initiatives.

- Direct Input from Town Staff: Per the Town road foreman, the town's biggest concerns regarding stormwater problem areas and non-point source pollution include runoff from steeply sloped

roadways in the village area north of U.S. Route 2, as well as with private drives and associated erosion.

- Vermont Agency of Transportation-Sponsored Programs: The VTrans online bridge and culvert inventory for Town-controlled bridges and culverts (available at https://www.vtculverts.org/) was reviewed prior to field screening and evaluation of potential stormwater problem areas (Section 3). The agency's Small Culverts Inventory dataset was also reviewed to assess VTrans-owned and controlled drainage infrastructure associated with U.S. Route 2 (http://vtransmaps.vermont.gov/webmaps.htm).
- Vermont DEC-Sponsored Programs: Portions of Concord's village area are served by closed-system stormwater infrastructure, which was mapped by Vermont DEC in 2014. Detailed stormwater infrastructure mapping and state-issued post-construction stormwater permitting records were examined in order to identify additional stormwater management opportunities. The infrastructure mapping data represent an important supplement to VTrans' online bridge and culvert inventories and were invaluable during evaluations of existing problem areas and retrofit opportunities (Section 3 and as further described below) (https://anrweb.vt.gov/DEC/_DEC/SWMapping.aspx?Folder=Town%20Reports%20and%20Maps\Concord).

In addition, the age, style, size, and upkeep of existing facilities permitted by DEC – particularly facilities constructed prior to 2002 – may make them candidates for improvement to enhance stormwater management capabilities. Post-construction stormwater management permits for the planning area (as available from the ANR Atlas at http://anrmaps.vermont.gov/websites/anra5/, "Stormwater Permits – Issued" data layer) were reviewed during field screening of potential stormwater problem areas (Section 3) and development of potential implementation projects (Section 4).

3. New Data Collection and Identification of Stormwater Problem Areas

One of the objectives of this plan is to make recommendations to improve the functioning of aging infrastructure, using GSI-type retrofits where appropriate. To achieve this goal, a thorough effort was made to identify existing problem areas, and then to evaluate existing conditions and potential solutions.

3.1. Identification and Initial Evaluation of Stormwater Problem Areas

Initially, we identified the location and nature of existing drainage problems and stormwater management concerns, and gathered field data for further analysis where appropriate. The approach to identifying potential problem areas included the following elements:

- Reviewing existing plans and data, as described in Section 2, and noting the location of any concerns related to stormwater
- Engagement with Town and State of Vermont staff
- Targeted site visits to verify problem areas during the spring of 2018, with a focus on:
  - Areas of existing development, and particularly the village center;
  - Areas where private property is impacting public property/ROW;
  - Areas of localized erosion.
- Documentation (with photos) of existing problem areas

A total of 20 problem areas and ideas for conceptual solutions were logged with a custom survey form developed by Stone, using Survey123 for ArcGIS and handheld mobile devices. This application facilitated consistent data collection across all locations. Retrofit summary sheets for all the problem areas identified were developed (Appendix B). Blank cells on the summary sheets indicate a lack of information available to sufficiently provide an answer. Figure 1 in Appendix A shows the drainage areas for each identified problem area or strategic retrofit opportunity.

4. Prioritization of Stormwater Management Opportunities and Decision Matrix

Stone completed a field screening that identified 20 stormwater management opportunities in the Town of Concord during the spring of 2018. The following section and accompanying tables builds upon the basic problem area descriptions and documentation included in the retrofit opportunity sheets (Appendix B). The first table (Table 1) includes documentation of drainage area characteristics, potential BMPs to be implemented, and the stormwater volume reduction and pollutant removal benefits that may be achieved by implementing the proposed improvements. An implementation matrix is presented (Table 2) then ranks each opportunity and proposed solution relative to existing environmental concerns, overall environmental priority, constructability, and ease of operation.

4.1. Drainage Area Characteristics and Retrofit Benefits

Key characteristics and assessment results for each identified stormwater problem area or strategic retrofit opportunity within the project area are summarized in Table 1. The following characteristics are included for each identified problem area or retrofit opportunity:

- Site ID (with locations shown on map and retrofit sheets)
- Site name
- Drainage area characteristics:
  - Primary Hydrologic Soil Group (HSG), as derived from the Essex County Soil Survey for the drainage area
  - Total drainage area (acres)
  - Impervious surfaces within the drainage area (in acres)
  - Percent impervious cover in the drainage area
- Drainage area runoff volumes and sediment loading estimates
  - Estimated Water Quality Volume (WQv) (in cubic feet) for the entire area draining to the proposed BMP, based on the 2017 VSMM Water Quality Treatment Standard's required runoff capture and treatment depth of 1 inch (VTDEC, 2017).
  - Estimated Hydrologic Conditions Volume / Channel Protection Volume, in cubic feet, based on the 2017 VSMM Channel Protection Standard's requirement to provide treatment for the difference in runoff volumes between pre-development and post-development site runoff for the one-year, 24-hour storm (VTDEC, 2017). The volumes reported in the table assume that the present condition represents the "post-development" condition.
  - Estimated sediment or total suspended solids (TSS) base load (lbs/year) for the WQv, calculated using the Simple Method approach and based on TSS loading rates for developed lands

developed by New Hampshire Department of Environmental Services[1] The average annual TSS concentrations provided for general residential development in the guidance (100 mg/L TSS) were applied in Table 1 for all drainage areas, consistent with guidance for systems that include driveways, access drives, and other transportation surfaces within larger developed areas (e.g., residential and commercial subdivisions).

- Estimated TSS load to be removed by proposed improvements on an annual basis (lbs/year), calculated based on the estimated TSS base load, annual runoff volume anticipated to be captured by proposed BMPs, and percent pollutant removal efficiencies for the proposed BMP types as included in EPA Region 1 guidance[2] (see table below).

TSS Removal Efficiencies by BMP Type, Assuming 1 Inch of Runoff Treated

BMP Type	BMP TSS Removal Efficiency %
Bioretention	99
Extended Dry Detention pond	45
Grass Swale	80
Gravel Wetland	97
Infiltration Chamber	100
Infiltration Trench	100
Porous Pavement (Asphalt)	92
Sand Filter	80
Surface Infiltration	100
Wet pond/ Created Wetland	77
Proprietary Hydrodynamic Separator	80

- Proposed Best Management Practices, cost estimates, and cost-benefit metrics:
  - Proposed BMP type
  - Proposed storage volume, or treatment capacity, assuming that the proposed BMP could be sized to treat the entire Water Quality Volume, or "first inch" of runoff. These volume estimates will be refined for retrofit opportunities that are chosen to advance to concept design.
  - Proposed BMP implementation cost, estimated on a price per cubic foot of storage basis. Costs for implementing proposed stormwater BMPs were estimated using the cost function employed in Vermont's Best Management Practice Decision Support System (BMPDSS), as well as current

[1] NH DES Appendix D, Typical Pollutant Event Mean Concentrations, available at https://www.des.nh.gov/organization/divisions/water/stormwater/documents/wd-08-20a_apxd.pdf

[2] 2015 Lake Champlain BMP Scenario Tool Requirements and Design. Technical report prepared by Tetra Tech for U.S. EPA Region 1, April 2015. Available at https://www.epa.gov/sites/production/files/2015-09/documents/lake-champlain-bmp-scenario-tool-report.pdf

installation cost estimates per cubic foot of BMP storage volume provided in 2016 guidance from U.S. EPA Region 1[3]. The costs are calculated based on the following equation:

- total cost = installation cost (I) + land cost (L) + fixed cost (F), where
- I = BMP installation cost per cubic foot (CF) of storage volume in 2016 dollars, updated to account for inflation to the year 2018, using a 2.5% inflation rate, specific to the practice type
- L = $0 as easement or land purchase costs for individual BMPs are not yet known
- F = project-specific estimate of design/permitting costs, estimated at 25% of construction costs.
- A cost adjustment factor was applied for each proposed BMP to account for anticipated and site-specific implementation challenges. The assumption made was that it would cost more to install a new BMP in a developed area (with more site constraints) than it would cost to install the same BMP in a previously undeveloped area. The unit-based BMP installation costs were developed using a cost adjustment factor or 1 (new BMP in undeveloped area). Proposed BMPs in most of the village area and at the school property were given an adjustment factor of 1.5; BMPs within or south of the US Route 2 right-of-way were given a cost adjustment factor of 2.0 to 2.5 to account for the complexity of VTrans's project development processes.

– TSS removal cost-benefit: The total implementation cost for each BMP was divided by the estimated total annual TSS load reduction, resulting in a cost per pound of TSS removed.
– Impervious area cost-benefit: The total implementation cost for each BMP was divided by the impervious area proposed to be treated through installation of the BMP, resulting in a cost per acre of impervious area treated.
– Stormwater treatment volume cost-benefit: The total implementation cost for each BMP was divided by the runoff volume proposed to be treated through installation of the BMP, resulting in a cost per cubic foot of runoff treated.

4.2. Implementation Matrix

Through the field screening, development of the retrofit opportunity datasheets, and desktop evaluation to define and refine drainage areas and their respective characteristics, Stone recorded observations about each site, which were used to develop a draft "implementation score" for each opportunity (Table 2) relative to the following criteria:

- **Existing environmental concerns** – score was assigned based on the type(s) of problems present, with 1 point added for each of the following concerns presented by the site's current condition: water quality concerns; infrastructure vulnerability; localized drainage issues/flooding; gullying resulting from existing drainage systems, and streambank or in-stream erosion. Although sites are generally anticipated to receive between 1 and 3 points, the maximum score a site can receive is 5.
- **Environmental priority –** relative environmental impact on nearest receiving water (e.g., proximity, location) and how "active" the problem area was during the site visit, with 1 being the smallest impact and 5 being the greatest impact.
- **Constructability –** relative ease with which a project could be implemented, including whether the recommended practice(s) could be constructed on publicly-owned land or with a willing landowner-partner, existing access to the site, and the amount of additional assessment and engineering design

[3] 2016 EPA Memorandum: Methodology for developing cost estimates for Opti-Tool. Technical memorandum prepared by Karen Matelska, EPA Region 1, February 20, 2016. Available at https://www3.epa.gov/region1/npdes/stormwater/ma/green-infrastructure-stormwater-bmp-cost-estimation.pdf

work that would be required to move the project to implementation. The maximum score a site can receive is 3, indicating a project that should move quickly and easily to implementation.

- **Ease of operation –** operational considerations, including amount and frequency of maintenance likely required, and whether maintenance activities will be straightforward to complete. The maximum score a site can receive is 3, indicating a project with infrequent maintenance needs that are easily completed.
- **TSS removal cost-benefit** – qualitative evaluation of the cost per pound of TSS removed by each proposed BMP, where a score of 3 indicates a cost-benefit of <$100 / lb TSS removed, a score of 2 indicates a cost-benefit of $101-300 / lb TSS removed, and a score of 1 indicates a cost-benefit of >$300 / lb TSS removed.

The type of ownership of each project location, an initial indication of project cost, and the amount of additional engineering that will be needed for implementation are also presented in the matrix. These measures are not included currently in the score tabulated for each potential project, but are qualitatively scored as follows:

Project Type "key":

A Private property
B State property or right-of-way
C Public property (town-owned land or right-of-way)
D Hybrid; part public land, part private land

Estimated Implementation Cost "key":

L less than $10,000
M $10-$50,000
MH $50-$100,000
H more than $100,000

Need for Additional Engineering "key":

L Project can be implemented without formal engineering
M Project requires some amount of engineering design to ensure proper sizing
H Project requires full engineering

Table 1. Summary of Drainage Area Characteristics and Retrofit Benefits

Site ID	Site Name	Drainage Area Characteristics, Runoff Volumes, and Sediment Base Load Estimates								Proposed BMPs, Storage Volumes, and Sediment Load Reduction Estimates					Implementation Cost Estimates and Cost-Benefit Metrics							
		Primary Soil HSG	Drainage Area (acres)	Developed Impervious Area (acres)	Developed Pervious Area (acres)	% Impervious	Estimated WQv (CF)	Estimated HCv / CPv (CF)	Estimated Total Base TSS Load (lbs/year)	Proposed BMP Type	BMP TSS Removal Efficiency (%)	Proposed Storage Volume (CF)	Estimated TSS Load Reduction (lbs/year)	Estimated TSS Load Post Treatment (lbs/year)	BMP Unit Construction Cost (2018 $/CF)	BMP Construction Cost Estimate (2018 $)	BMP Design / Permitting Costs (2018 $)	Cost Adjustment Factor	Total Implementation Cost (2018 $)	TSS Cost-Benefit ($/lb TSS removed)	Impervious Area Cost-Benefit ($/acre treated)	Stormwater Volume Cost-Benefit ($/CF treated)
1	Town office bioswale	B / D	0.39	0.31	0.08	80	1,090	780	86	Bioretention	99%	1,090	85	0.86	$10.56	$12,000	$3,000	1.5	$22,500	$264	$72,115	$20.64
2	High Street sedimentation basin and endwall upgrade	B	0.90	0.18	0.72	20	750	1,570	198	Grass Swale	80%	750	159	40	$4.00	$3,000	$750	1.5	$5,625	$35	$31,250	$7.50
3	High Street extension bioretention	B	0.78	0.16	0.62	20	650	480	172	Bioretention	99%	650	170	1.7	$10.56	$7,000	$1,750	1.5	$13,125	$77	$84,135	$20.19
4	High Street and high Street extension bio	B / D	1.43	0.29	1.14	20	1,190	870	315	Bioretention	99%	1,190	312	3.1	$10.56	$13,000	$3,250	1.5	$24,375	$78	$85,227	$20.48
5	High Street, base-of-hill retrofit	B	12.37	2.47	9.90	20	10,330	26,750	2,727	Gravel Wetland	97%	10,330	2,645	82	$6.00	$62,000	$15,500	2	$155,000	$59	$62,652	$15.00
6	Post office and superintendents office	B / D	0.77	0.24	0.53	31	920	960	170	Infiltration Chamber	100%	2,800	170	0.0	$23.12	$65,000	$16,250	2.5	$203,125	$1,197	$846,354	$72.54
7	Folsom Ave and High Street bioretention	B	7.06	1.41	5.65	20	5,890	4,180	1,556	Bioretention	99%	5,890	1,541	16	$10.56	$63,000	$15,750	1.5	$118,125	$77	$83,658	$20.06
8	Concord Park bioretention	B / D	0.22	0.04	0.18	20	180	130	49	Bioretention	99%	180	48	0.48	$10.56	$2,000	$500	1.5	$3,750	$78	$85,227	$20.83
9	Concord Museum / Rte 2 gravel wetland	B	8.97	1.79	7.18	20	7,490	19,380	1,978	Gravel Wetland	97%	7,490	1,918	59	$6.00	$45,000	$11,250	2.5	$140,625	$73	$78,386	$18.78
10	Route 2 inlet and outfall repair	B / D	0.05	0.05	0.00	100	190	40	12	No New BMP Proposed	0%	190	0	12	$0.00	$0	$0	0	$0	$0	$0	$0.00
11	Town clerk office outfall repair	B / D	0.01	0.01	0.00	100	30	0	2	No New BMP Proposed	0%	30	0	2.2	$0.00	$0	$0	0	$0	$0	$0	$0.00
12	Fire and Rescue swirl separator	B	18.06	3.61	14.45	20	15,080	39,070	3,982	Hydrodynamic Separator	80%	15,080	3,185	796	$4.18	$64,000	$16,000	2	$160,000	$50	$44,297	$10.61
13	Shadow Lake Road bridge abutment stabilization	B	0.23	0.12	0.12	50	420	390	51	No New BMP Proposed	0%	420	0	51	$0.00	$0	$0	0	$0	$0	$0	$0.00
14	School gym rooftop disconnection	B / D	0.05	0.05	0.00	100	180	90	11	Infiltration Trench	100%	180	11	0.00	$8.53	$2,000	$500	1.5	$3,750	$334	$73,529	$20.83
15	School gym gravel parking retrofit	B	0.05	0.05	0.00	100	170	90	11	Bioretention	99%	170	10	0.11	$10.56	$2,000	$500	1.5	$3,750	$358	$78,125	$22.06
16	School gym parking lot bio 2	B / D	0.17	0.17	0.00	100	590	350	37	Bioretention	99%	590	37	0.37	$10.56	$7,000	$1,750	1.5	$13,125	$354	$77,206	$22.25
17	School gym rooftop disconnection 2	B / D	0.05	0.05	0.00	100	170	90	11	Infiltration Trench	100%	170	11	0.00	$8.53	$2,000	$500	1.5	$3,750	$340	$75,000	$22.06
18	School access drive sedimentation basin	B / D	0.77	0.70	0.07	91	2,430	1,660	170	Grass Swale	80%	2,430	136	34	$4.00	$10,000	$2,500	1.5	$18,750	$138	$26,786	$7.72
19	School front entry bio retention	B / D	0.15	0.14	0.01	93	480	90	33	Bioretention	99%	480	33	0.33	$10.56	$6,000	$1,500	1.5	$11,250	$344	$80,357	$23.44
20	School campus water quality retrofit	B	2.05	1.20	0.85	59	4,320	1,220	452	Gravel Wetland	97%	4,320	438	14	$6.00	$26,000	$6,500	2	$65,000	$148	$54,167	$15.05

Table 2. Stormwater Opportunity Prioritization and Implementation Matrix

Site ID	Site Name	Need	Proposed Approach	Web Soil Survey Mapped HSG	Existing Environmental Concerns (scale 1-5)	Environmental Priority (scale 1-5)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	TSS Removal Cost Effectiveness (Scale 1-3)	Implementation Score	Project Type	Estimated Implementation Cost	Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering	Advance to Concept Design?
1	Town office bioswale	Retrofit opportunity	Instal a bioretention area or bioswale retrofit at the western edge of the parking lot to capture and treat run off from half of the building roof and the entire parking lot.	B / D	1	1	3	2	3	10	C	M	Y	M	
2	High Street sedimentation basin and endwall upgrade	Stabilization and Retrofit opportunity	The closed drainage system carrying primarily upland ru off across High Street has been recently upgraded, but there is no endwall and the surrounding fill is eroding. Repair erosion and install a small sedimentation basin to trap road material.	B	2	3	3	3	3	14	C	L	N	L	
3	High Street Extension bioretention	Retrofit opportunity	Install a small bioretention area or swale to manage run off from a portion of the homes, driveways, and gravel road - essentially what does not drain to the existing drop inlet.	B	1	1	3	2	3	10	D	M	Y	M	★
4	High Street and High Street extension bio	Retrofit opportunity	Install bioretention or a gravel wetland to manage runoff from High Street Extension cross culvert and steep portion of High Street.	B / D	2	2	2	2	3	11	D	M	Y	H	
5	High Street, base-of-hill retrofit	Retrofit opportunity	Install a water quality practice upstream of existing culvert inlet for storm line running beneath park. This is on private property, and so the culvert inlet location could not be field located.	B	2	2	2	2	3	11	D	H	Y	H	★
6	Post office and superintendents office green space stabilization	Retrofit opportunity	There is a limited opportunity to reduce sediment entering the catch basin in front of the post office, possibly as simple as stabilizing or paving the green space instead of having sediment transport from tree lawn to catch basin. Install porous pavers in the "greenspace" to improve water quality and reduce runoff volume.	B / D	1	2	1	1	2	7	B	L	Y	M	★
7	Folsom Ave and High Street bioretention	Stabilization and Retrofit opportunity	Capture runoff from upper Folsom Ave and east end of high Street below cross culvert in green space. Route overflow down slope to park. Existing cross culvert is undersized and outlet appears to be crushed and in the traveled way. Project cost estimate only includes estimation for water quality treatment.	B	4	5	2	2	3	16	B	H	Y	H	★
8	Concord Park bioretention	Retrofit opportunity	Install bioretention area to treat run off from Folsom Ave, instead of or in addition to the proposed retrofit higher in the drainage area above. Cost and benefit calculations assume this practice is only managing runoff from its drainage, not from #7 above.	B / D	2	2	3	2	3	12	C	L	Y	M	★
9	Concord Museum / Rte 2 gravel wetland	Retrofit opportunity	Redirect outfall pipe from Rte 2 drainage system to a new treatment practice west of museum building. Bench above outfall does not have wetland vegetation. Outfall could not be located.	B	3	4	1	2	3	13	D	H	Y	H	
10	Route 2 inlet and outfall repair	Repair opportunity	Inlet is short circuited and outfall pipe is exposed, 15 inch corrugated metal. Pipe outlet not visible from right of way.	B / D	3	2	1	3	0	9	B	L	N	L	
11	Town clerk office outfall repair	Repair opportunity	Keep an eye on this. Outlet pipe from Rte 2 drainage may be separating just south of parking Lot guard rail.	B / D	2	2	1	3	0	8	B	L	N	L	

Site ID	Site Name	Need	Proposed Approach	Web Soil Survey Mapped HSG	Existing Environmental Concerns (scale 1-5)	Environmental Priority (scale 1-5)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	TSS Removal Cost Effectiveness (Scale 1-3)	Implementation Score	Project Type	Estimated Implementation Cost	Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering	Advance to Concept Design?
12	Fire and Rescue swirl separator	Retrofit opportunity	Install a hydrodynamic separator or similar water quality practice in parking area between fire and rescue and the Moose River. This would reduce sediment transport to the river but is located in the river corridor and probably the mapped floodplain, so feasibility constraints are substantial.	B	2	3	1	2	3	11	C	H	N	H	
13	Shadow Lake Road bridge abutment stabilization	Stabilization and Retrofit opportunity	Runoff from shadow Lake Road and Fire & Cescue parking is running down the south side of the road and eroding next to the abutment of the bridge. Install turn outs and stabilize erosion at abutment.	B	3	3	3	2	0	11	C	L	N	L	
14	School gym rooftop disconnection	Retrofit opportunity	Remove gutter and downspout from a portion of the gym roof, and use a French drain to treat and potentially infiltrate some water before it discharges to parking lot and driveway.	B / D	2	3	2	3	1	11	C	L	Y	M	
15	School gym gravel parking retrofit	Retrofit opportunity	Install a small bioretention area or other water quality practice in the north east corner of the parking lot to treat run off from a portion of the gravel parking. Very limited opportunity; most of the parking lot runoff travels to #16 below.	B	2	1	3	2	1	9	C	L	Y	M	
16	School gym parking lot bio 2	Retrofit opportunity	Install small sedimentation basin or potentially bioretention at head of stone lined channel leaving gym parking lot. Area available is very limited, may not be able to manage much volume without impacting parking and traveled way.	B / D	2	3	2	2	1	10	C	M	Y	M	
17	School gym rooftop disconnection 2	Retrofit opportunity	Gutter no longer exists, and makeshift stabilization practice appears to have been installed. Space is extremely limited but there may be an opportunity to improve by installing an infiltration trench or catch basin.	B / D	2	2	2	2	1	9	C	L	Y	M	
18	School access drive sedimentation basin	Retrofit opportunity	There is an opportunity to install a small water quality practice next to the excess drive. Runoff travels along the edge of the drive and then downslope onto an adjacent property through a stone lined channel. Space is extremely limited, and existing green belt appears to be used for occasional parking.	B / D	1	2	2	2	2	9	C	M	Y	M	
19	School front entry bio retention	Retrofit opportunity	Install a small bioretention area in island to treat run off from a portion of the access drive.	B / D	2	2	2	2	1	9	C	M	Y	M	
20	School campus water quality retrofit	Retrofit opportunity	Install forebay and gravel wetland for water quality treatment for the majority of the drainage from the school reaching school Street and leaving campus via 18 inch plastic cross culvert.	B	4	5	2	2	2	15	B	MH	Y	H	

5. Conceptual Solutions for High Priority Stormwater Problems and Opportunities

Initially, the prioritization of the identified problem areas and opportunities (Section 4) resulted in 10 of the identified sites being assigned an implementation score of 11 or higher. In consultation with Essex NRCD and Town staff, this list was further narrowed to a total of three projects for development of conceptual designs, encompassing five identified problem areas/opportunities. Final selection was based on size of the treatment opportunity, extent to which an existing erosion or water quality treatment problem could be successfully addressed, as well as property owner/stakeholder interest.

The five opportunities advanced into three conceptual designs (Appendix C) were:

- Area 3, High Street Extension (bioretention area)
- Area 5, High Street, base-of-hill Retrofit (stormwater collection, subsurface detention / infiltration, and stormline upgrade)
- Area 6, Post Office and Superintendents Office Green Space Stabilization (stormline upgrade and green space restoration in connection with Area 5 improvements)
- Area 7, Folsom Ave. and High Street (drainage improvements and gravel wetland)
- Area 8, Concord Park (stormwater collection, subsurface detention / infiltration, and stormline upgrade in connection with Area 7 improvements)

For each of the proposed concept designs, a brief description of the proposed restoration design is presented, followed by an opinion of probable cost for implementation. Unit costs are based on Vermont Agency of Transportation (VTrans) 2 year average unit prices, ranging from July 2015 to June 2017(https://vtrans.vermont.gov/sites/aot/files/estimating/documents/2YearEnglishAveragedPriceList11.pdf), and adjusted based on recent construction projects managed by Stone staff.

For two of the concept designs, stormwater drainage and green infrastructure improvements are proposed as part of larger full-depth roadway reconstruction projects, as the Town intends to complete full-depth reconstruction of the portions of both High Street and Folsom Avenue between U.S. Route 2 and High Street Extension in future years. In these cases, construction and implementation costs are separated by project component and likely funding source. A brief discussion of likely implementation funding sources follows the concept design narrative below.

5.1. Area 3, High Street Extension (Bioretention)

At this location, runoff from an approximately 0.78-acre drainage area flows from the adjoining houses, gravel driveways, and gravel road, ultimately reaching the intersection of High Street Extension and High Street and flowing down a steep slope towards US Rte. 2. Installing a water quality treatment practice, ideally one that can infiltrate some portion of the runoff reaching this location, would reduce the volume and improve quality of runoff currently causing damage downslope along High Street.

The proposed retrofit for this site is a small bioretention area to provide water quality treatment and limited infiltration capacity, with stable overflow to the adjoining culvert outlet conveying runoff downslope. The design standard used for this retrofit was best-fit treatment of the water quality volume for the contributing drainage area (0.78 acres). Full compliance with the WQv treatment standard would manage 1.0" of rain in a 24-hour period and at full water quality treatment, this practice has the potential to prevent 170 lbs/year of sediment, measured as total suspended solids or TSS, from entering receiving waters (Table 1) At this site, it is possible to site a bioretention area that will manage 100% of the WQv or a total of 650 ft^3 of runoff. A 30% design plan is provided in Appendix C.

5.1.1. Cost Estimates and Revised Benefit Metrics

A preliminary implementation cost estimate is provided below (Table 3). This amount differs from the amount initially projected for this site (Table 1), as design-specific amounts and costs were developed to support this high-priority retrofit concept. Cost-benefit metrics were adjusted based on the design-specific cost estimate.

The estimated cost for implementation of this project is $6,800.

- The cost per pound of sediment treated is $80.00.
- The cost per impervious acre treated is $42,500.
- The cost per cubic foot of runoff treated is $10.50.

Table 3. High Street Extension Bioretention – Opinion of Probable Cost – 30% Design

	ITEM	AMOUNT		UNIT COST	TOTAL
HIGH STREET EXTENSION	CLEARING AND GRUBBING	1	LS	$2,500.00	$2,500
	PROJECT DEMARCATION FENCING	40	LF	$0.83	$34
	GEOTEXTILE FOR SILT FENCE	14	SY	$4.28	$60
	COMMON EXCAVATION AND GRADING	30	CY	$9.75	$293
	TRANSPORT EXCAVATED MATERIAL OFFSITE	30	CY	$10.00	$300
	STONE FILL, TYPE II	5	CY	$44.64	$224
	1" DENSE GRADED DOUBLE WASHED CRUSHED STONE	3	CY	$40.00	$120
	BIORETENTION SOIL MEDIA	5	CY	$30.00	$150
	WOOD MULCH	1	CY	$50.00	$50
	PLANTINGS	7	SY	$50.00	$350
	SEED	3	LB	$7.08	$22
	HAY MULCH	3	LB	$0.30	$1
				CONSTRUCTION TOTAL	***$4,104***
				FINAL DESIGN (25%)	***$1,026***
				STAKE OUT (5%)	***$205***
				MOBILIZATION / DEMOBILIZATION (10%)	***$410***
				CONSTRUCTION OVERSIGHT (10%)	***$410***
				CONTINGENCY (15%)	***$616***
				TOTAL (ROUNDED TO NEAREST $100)	***$6,800***

5.1.2. Permitting Needs

Anticipated permitting needs are summarized below.

Construction Stormwater Permit: Disturbance at this site is not anticipated to require a construction stormwater permit. Construction activities should still be conducted in accordance with the requirements and guidance of the Vermont DEC's *Low Risk Site Handbook for Erosion Prevention and Sediment Control*.

Operational Stormwater Permit: No operational stormwater permit is anticipated to be required.

Local Permitting: No local permits are anticipated.

Other Permits:

No Act 250 permitting review or actions are anticipated to be required.

Wetlands and river corridor or Stream Alteration permitting are not anticipated for this project.

No work is proposed within the VTrans right-of-way, so no State Highway Access and Work Permit (19 VSA 1111) will be required.

5.1.3. Next Steps

A meeting was held with the project stakeholders (Town staff, Selectboard, and Essex NRCD) and all indicated willingness to proceed with design work for this retrofit. Unfortunately, the property owner recently passed away and future ownership of both the parcel where the retrofit is sited, and the up-slope residential properties are under the same ownership. Attempts to reach the property owners have not yet been successful. Further work will involve confirming landowner willingness to proceed with the design, and refinement of the retrofit design with respect to size and layout to maximize water quality treatment.

5.2. Area 5 High Street Base-of-Hill Retrofit, and Area 6 Post Office and Superintendents Office

There is an opportunity to integrate stormwater management improvements with planned full-depth roadway reconstruction on High Street, from its intersection with High Street Extension to U.S. Route 2. At this location, runoff from an approximately 0.77-acre drainage area centered on High Street enters a closed drainage system without treatment near the U.S. Route 2 intersection, and ultimately is discharged to the Moose River. Runoff traveling down the steeply sloping portion of High Street ponds at the intersection and on the sidewalk in front of the post office, where a cut has been made in the curb at Area 6 (Figure 2) to direct runoff into the catch basin.

In addition, runoff from a 12.4-acre, largely undeveloped upland area is conveyed across High Street (near Area 2 on Figure 2), where it flows downslope and enters a closed drainage system, where it is conveyed southwest beneath the park and High Street, ultimately discharging into a catch basin on U.S. Route 2 in front of the post office. This stormline is undersized and in critically poor condition. Installing water quality treatment retrofits that can ideally infiltrate some portion of the runoff from existing developed impervious cover draining to and along the steeply sloping portion of High Street would reduce the volume and improve quality of runoff flowing to the river. Meanwhile, providing safe conveyance for upland clean-water flows now entering the undersized pipe north of the park and monument will improve the resilience of both the proposed water quality improvements and other downstream storm drainage and transportation infrastructure during larger storm events.

The limited space available to site surface green infrastructure practices, such as bioretention or gravel wetlands, in one of the few community gathering spaces in the Village center, led the team to instead propose an "invisible green infrastructure" concept consisting of subsurface infiltration or detention chambers in the

green space west of the existing monument. Water quality pre-treatment is provided by deep-sump catch basins along High Street, followed by infiltration and water quality treatment in subsurface infiltration chambers with gravel reservoirs, with overflow to the existing closed drainage system. The design standard used for this retrofit was best-fit treatment of the water quality volume for the contributing drainage area along High Street (0.53 acres). Full compliance with the WQv treatment standard would manage 1.0" of rain in a 24-hour period; this practice has the potential to prevent 170 lbs/year of TSS from entering receiving waters (Table 1) At this site, it is possible to site a series of infiltration chambers that will manage 100% of the WQv or 2,800 ft^3 of runoff. A 30% design plan is provided in Appendix C.

1.1.1 Cost Estimates and Revised Benefit Metrics

A preliminary implementation cost estimate is provided below (Table 4 and Table 5). This amount differs from the amount initially projected for this site (Table 1), as design-specific amounts and costs were developed to support this high-priority retrofit concept. Separate implementation cost estimates are provided for stormwater treatment and roadway reconstruction improvements. Cost-benefit metrics were adjusted based on the design-specific cost estimates for stormwater improvements only.

The estimated cost for implementation of this project is $387,400.

- The cost per pound of sediment treated is $1,591.
- The cost per impervious acre treated is $99,850.
- The cost per cubic foot of runoff treated is $96.60.

Table 4. Area 5 High Street Base-of-Hill Retrofit and Area 6 Post Office and Superintendents Office Stormwater Improvements – Opinion of Probable Cost – 30% Design

	ITEM	AMOUNT		UNIT COST	TOTAL
HIGH STREET - STORMWATER AND GREEN INFRASTRUCTURE	CLEARING AND GRUBBING	1	LS	$5,000.00	$5,000
	PROJECT DEMARCATION FENCING	500	LF	$0.83	$415
	GEOTEXTILE FOR SILT FENCE	165	SY	$4.28	$707
	COMMON EXCAVATION FOR CATCH BASINS AND MANHOLES	100	CY	$9.75	$975
	COMMON EXCAVATION FOR INFILTRATION CHAMBERS	195	CY	$9.75	$1,902
	TRENCH EXCAVATION	295	CY	$15.11	$4,458
	EXCAVATION OF SURFACES AND PAVEMENTS	6	CY	$22.87	$138
	TRANSPORT EXCAVATED MATERIAL OFFSITE	596	CY	$10.00	$5,960
	PRECAST REINFORCED CONCRETE MANHOLE WITH CAST IRON COVER	5	EA	$3,730.80	$18,654
	DEEP-SUMP PRECAST REINFOIRCED CONCRETE CATCH BASIN WITH CAST IRON GRATE	6	EA	$4,500.00	$27,000
	PORTLAND CEMENT CONCRETE SIDEWALK, 5 INCH	40	SY	$72.35	$2,894
	18" CPEP (SL)	220	LF	$44.00	$9,680
	24" CPEP (SL)	310	LF	$57.86	$17,937
	3/4" DENSE GRADED DOUBLE WASHED CRUSHED STONE FOR INFILTRATION CHAMBERS	152	CY	$40.00	$6,080
	NON-WOVEN FILTER FABRIC FOR INFILTRATION CHAMBERS	564	SY	$19.39	$10,936
	NON-WOVEN ISOLATOR ROW FABRIC	51	SY	$19.39	$989
	WOVEN ISOLATOR ROW FABRIC	41	SY	$10.34	$424
	STORMTECH SC-310 INFILTRATION CHAMBERS	81	EA	$500.00	$40,500
	SEED	12	LB	$7.08	$85
	MULCH	12	LB	$0.30	$4
				CONSTRUCTION TOTAL	***$154,738***
				FINAL DESIGN (25%)	***$38,685***
				SCREENING INFILTRATION AREA FOR HISTORIC CONTAMINATION (LS)	***$7,500***
				PERMITTING (5%)	***$7,737***
				STAKE OUT (5%)	***$7,737***
				MOBILIZATION / DEMOBILIZATION (10%)	***$15,474***
				CONSTRUCTION OVERSIGHT (10%)	***$15,474***
				CONTINGENCY (15%)	***$23,211***
				TOTAL (ROUNDED TO NEAREST $100)	***$270,600***

Table 5. Area 5 High Street Base-of-Hill Retrofit and Area 6 Post Office and Superintendents Office Roadway Reconstruction – Opinion of Probable Cost – 30% Design

	ITEM	AMOUNT	UNIT COST		TOTAL
HIGH STREET ROADWAY RECONSTRUCTION	PROJECT DEMARCATION FENCING	925	LF	$0.83	$768
	GEOTEXTILE FOR SILT FENCE	310	SY	$4.28	$1,327
	COMMON EXCAVATION FOR PAVING	580	CY	$9.75	$5,655
	TRANSPORT EXCAVATED MATERIAL OFFSITE	580	CY	$10.00	$5,800
	SUBBASE OF DENSE GRADED CRUSHED STONE (ASSUMED 18" THICK ROADBASE)	420	CY	$31.69	$13,310
	BITUMINOUS CONCRETE PAVEMENT (ASSUMED 6" THICK)	140	TON	$134.45	$18,823
	VERTICAL GRANITE CURB	675	LF	$34.03	$22,971
				CONSTRUCTION TOTAL	***$68,654***
				FINAL DESIGN (25%)	***$17,164***
				PERMITTING (5%)	***$3,433***
				STAKE OUT (5%)	***$3,433***
				MOBILIZATION / DEMOBILIZATION (10%)	***$6,865***
				CONSTRUCTION OVERSIGHT (10%)	***$6,865***
				CONTINGENCY (15%)	***$10,298***
				TOTAL (ROUNDED TO NEAREST $100)	***$116,800***

5.2.1. Permitting Needs

Anticipated permitting needs are summarized below.

Construction Stormwater Permit: If the stormwater improvements and full-depth roadway reconstruction are completed simultaneously, which is recommended, the project may require a Construction Stormwater Permit. The site should qualify for an Erosion Prevention and Sediment Control permit (3-9020) under the Low Risk categorization if the following guidelines are followed:

- Less than 2 acres of disturbance at any one time.
- All disturbed soils must be stabilized (temporary or final) within 7 days.
- Runoff from the site must pass through a 50' vegetated buffer prior to entering any water of the State.
  - If this buffer cannot be maintained due to the immediate down-grade presence of the closed drainage systems along U.S. Route 2, risk mitigation factors including minimizing disturbed earth exposure in any location to less than 7 days before implementing stabilization may be employed to maintain a Low Risk categorization.

Operational Stormwater Permit: No operational stormwater permit is anticipated to be required.

Local Permitting: No local permits are anticipated.

Other Permits:

No Act 250 permitting review or actions are anticipated to be required.

Wetlands permitting is not anticipated for this project.

River Corridor permitting is not anticipated for this project. The proposed retrofits are located outside of the mapped River Corridor, and while no electronic mapping of the AE flood zone (1-percent annual chance floodplain with elevations) is available, the River Corridor mapping encompasses both the FEMA floodplain and adjustments to account for fluvial erosion hazards. A site visit with Rivers Program staff to discuss design and permitting options is not necessary at this stage.

Any work within the VTrans right-of-way will require a State Highway Access and Work Permit (19 VSA 1111) or will be required to be completed by VTrans personnel or contractors. It is anticipated that tie-in with the existing catch-basins, whether to connect lines associated with the proposed retrofit practice and stormline improvements, or to install a new catch-basin at the intersection with U.S. Route 2 and repair the sidewalk in front of the post office, will require an 1111 permit and coordination with VTrans.

5.2.2. Next Steps

A meeting was held with the project stakeholders (Town road foreman, Selectboard, and Essex NRCD) and all indicated a willingness to proceed with design work for this retrofit. The majority of this design can be implemented primarily within the Town's right-of-way and in the village park, provided that the existing monument and septic system for the Town Office are avoided. Multiple attempts by the Town road foreman to contact the private property owner where the inlet for the drainage pipe is located were not successful, and further efforts are warranted. Further work will involve refinement of the retrofit design with respect to size and layout to maximize water quality treatment while minimizing utility conflicts. Preliminary evaluation of the area proposed for infiltration for historic site contamination is also warranted. While no contamination has been documented, VTrans right-of-way mapping shows that the area of the existing park and monument was a gas station in the 1960s.

5.3. Area 7 Folsom Ave. and High Street, and Area 8 North Concord Park

Stormwater from an approximately 7.06-acre drainage area is conveyed via overland flow and a grass channel to a culvert at the intersection of High Street and Folsom Avenue. The ditch intercepts runoff from a steeply sloping gravel driveway, and is actively eroding and filling with sediment, requiring reshaping after most major storms. The culvert at the intersection is undersized and the outlet, which is crushed, conveys runoff to the surface of Folsom Avenue, where it flows down a steep slope and deposits sediment along the roadway and into the closed drainage system at the U.S. Route 2 intersection. The poor condition of this ditch, culvert, and portion of roadway was the impetus for initiation of this Stormwater Master Plan.

There is an opportunity to integrate stormwater management improvements with planned full-depth roadway reconstruction on Folsom Avenue, from its intersection with High Street to U.S. Route 2.

The proposed retrofits for this site follow a treatment-train approach throughout the drainage area. Stone lining the swales on both sides of the existing driveway and right-sizing the driveway culvert at the upslope end of this drainage area will reduce the sediment loading reaching any downstream water quality practice. The culvert crossing High Street Extension will be directed to a gravel wetland in the flat green space southwest of the High Street Extension-Folsom Avenue intersection to water quality treatment, with overflow to a newly constructed closed drainage system conveying runoff south along Folsom Ave. The closed drainage system will include deep sump catch basins to provide water quality pre-treatment for runoff from the paved portion of Folsom Avenue, followed by infiltration and water quality treatment in subsurface infiltration chambers with gravel reservoirs in the green space on the eastern edge of North Concord Park, with overflow to the existing closed drainage system at the intersection with U.S. Route 2 and ultimately, discharge to the Moose River.

The design standard used for this retrofit was best-fit treatment of the water quality volume for each of the contributing drainage areas (7.06 acres for Area 7, and an additional 0.22 acres for Area 8). Full compliance with the WQv treatment standard would manage 1.0" of rain in a 24-hour period. Within the combined drainage areas, it is possible to site both a gravel wetland that will manage 100% of the WQv or 5,890 ft^3 of runoff and a subsurface infiltration practice that will manage 100% of the WQv from the paved portion of Folsom Avenue or 180 ft^3 of runoff. A 30% design plan is provided in Appendix C.

5.3.1. Cost Estimates and Revised Benefit Metrics

Preliminary implementation cost estimates are provided below. The amounts differ from the amount initially projected for the sites (Table 1), as design-specific amounts and costs were developed to support this high-priority retrofit concept. Separate implementation cost estimates are provided for project components potentially eligible for Better Roads or Municipal Roads Grants-in-Aid funding (Table 6, stone lining of swales and culvert improvements), stormwater and green infrastructure improvements (Table 7), and roadway reconstruction (Table 8). Cost-benefit metrics were adjusted based on the design-specific cost estimate for stormwater improvements only.

The estimated cost for implementation of this project is $514,500.

- The cost per pound of sediment treated is $205.00
- The cost per impervious acre treated is $243,800.
- The cost per cubic foot of runoff treated is $53.80.

Table 6. Area 7 Folsom Ave. and High Street and Area 8 Concord Park, Stone Lining and Culvert Improvements – Opinion of Probable Cost – 30% Design

	ITEM	AMOUNT	UNIT COST		TOTAL
FOLSOM AVENUE - CULVERTS AND STONE LINING	CLEARING AND GRUBBING	1	LS	$2,500.00	$2,500
	PROJECT DEMARCATION FENCING	550	LF	$0.83	$457
	GEOTEXTILE FOR SILT FENCE	183	SY	$4.28	$784
	COMMON EXCAVATION FOR DITCHES	100	CY	$9.75	$975
	TRENCH EXCAVATION	50	CY	$15.11	$756
	TRANSPORT EXCAVATED MATERIAL OFFSITE	150	CY	$10.00	$1,500
	18" CPEP (SL)	90	LF	$44.00	$3,960
	CAST-IN-PLACE CONCRETE HEADWALL	1	EA	$8,000.00	$8,000
	STONE FILL, TYPE II FOR DITCH STABILIZATION	100	CY	$44.64	$4,464
	STONE FILL, TYPE II FOR CHECK DAMS	10	CY	$44.64	$447
	SEED	6	LB	$7.08	$43
	MULCH	6	LB	$0.30	$2
				CONSTRUCTION TOTAL	***$23,888***
				FINAL DESIGN (25%)	***$5,972***
				PERMITTING (5%)	***$1,194***
				STAKE OUT (5%)	***$1,194***
				MOBILIZATION / DEMOBILIZATION (10%)	***$2,389***
				CONSTRUCTION OVERSIGHT (10%)	***$2,389***
				CONTINGENCY (15%)	***$3,583***
				TOTAL (ROUNDED TO NEAREST $100)	***$40,700***

Table 7. Area 7 Folsom Ave. and High Street and Area 8 Concord Park, Stormwater and Green Infrastructure – Opinion of Probable Cost – 30% Design

	ITEM	AMOUNT	UNIT COST		TOTAL
FOLSOM AVENUE - STORMWATER AND GREEN INFRASTRUCTURE	CLEARING AND GRUBBING	1	LS	$2,500.00	$2,500
	PROJECT DEMARCATION FENCING	170	LF	$0.83	$142
	GEOTEXTILE FOR SILT FENCE	57	SY	$4.28	$244
	COMMON EXCAVATION FOR GRAVEL WETLAND	300	CY	$9.75	$2,925
	COMMON EXCAVATION FOR CATCH BASINS AND MANHOLES	120	CY	$9.75	$1,170
	COMMON EXCAVATION FOR INFILTRATION CHAMBERS	85	CY	$9.75	$829
	TRENCH EXCAVATION	390	CY	$15.11	$5,893
	TRANSPORT EXCAVATED MATERIAL OFFSITE	895	CY	$10.00	$8,950
	PRECAST REINFORCED CONCRETE MANHOLE WITH TRASH RACK AND 24" CAST IRON GRATE	1	EA	$6,000.00	$6,000
	PRECAST REINFORCED CONCRETE MANHOLE WITH CAST IRON COVER	6	EA	$3,730.80	$22,385
	DEEP-SUMP PRECAST REINFORCED CONCRETE CATCH BASIN WITH CAST IRON GRATE	6	EA	$4,500.00	$27,000
	18" CPEP (SL)	1480	LF	$44.00	$65,120
	STONE FILL, TYPE II FOR GRAVEL WETLAND FOREBAY	10	CY	$44.64	$447
	3/4" DENSE GRADED DOUBLE WASHED CRUSHED STONE FOR GRAVEL WETLAND	120	CY	$40.00	$4,800
	3/4" DENSE GRADED DOUBLE WASHED CRUSHED STONE FOR INFILTRATION CHAMBERS	68	CY	$40.00	$2,720
	3/8" DOUBLE WASHED PEA STONE	20	CY	$45.00	$900
	WETLAND SOIL	40	CY	$50.00	$2,000
	6" UNDERDRAIN PIPE	155	LF	$24.62	$3,817
	6" UNDERDRAIN CLEANOUT WITH CAP	3	EA	$125.00	$375
	6" PERFORATED RISER WITH CAP	3	EA	$125.00	$375
	WETLAND PLANTS	180	SY	$50.00	$9,000
	NON-WOVEN FILTER FABRIC FOR GRAVEL WETLAND	180	SY	$19.39	$3,491
	NON-WOVEN FILTER FABRIC FOR INFILTRATION CHAMBERS	250	SY	$19.39	$4,848
	NON-WOVEN ISOLATOR ROW FABRIC	24	SY	$19.39	$466
	WOVEN ISOLATOR ROW FABRIC	19	SY	$10.34	$197
	STORMTECH SC-310 INFILTRATION CHAMBERS	31	EA	$500.00	$15,500
	SEED	6	LB	$7.08	$43
	MULCH	6	LB	$0.30	$2
				CONSTRUCTION TOTAL	***$192,139***
				FINAL DESIGN (25%)	***$48,035***
				PERMITTING (5%)	***$9,607***
				STAKE OUT (5%)	***$9,607***
				MOBILIZATION / DEMOBILIZATION (10%)	***$19,214***
				CONSTRUCTION OVERSIGHT (10%)	***$19,214***
				CONTINGENCY (15%)	***$28,821***
				TOTAL (ROUNDED TO NEAREST $100)	***$326,700***

Table 8. Area 7 Folsom Ave. and High Street and Area 8 Concord Park, Roadway Reconstruction – Opinion of Probable Cost – 30% Design

	ITEM	AMOUNT	UNIT COST		TOTAL
FOLSOM AVENUE – ROADWAY RECONSTRUCTION	PROJECT DEMARCATION FENCING	910	LF	$0.83	$756
	GEOTEXTILE FOR SILT FENCE	305	SY	$4.28	$1,306
	COMMON EXCAVATION FOR PAVING	680	CY	$9.75	$6,630
	TRANSPORT EXCAVATED MATERIAL OFFSITE	680	CY	$10.00	$6,800
	SUBBASE OF DENSE GRADED CRUSHED STONE (ASSUMED 18" THICK ROAD BASE)	525	CY	$31.69	$16,638
	BITUMINOUS CONCRETE PAVEMENT (ASSUMED 6" THICK)	341	TON	$134.45	$45,848
	VERTICAL GRANITE CURB	740	LF	$34.03	$25,183
				CONSTRUCTION TOTAL	***$103,161***
				FINAL DESIGN (25%)	***$25,790***
				PERMITTING (5%)	***$5,158***
				STAKE OUT (5%)	***$5,158***
				MOBILIZATION / DEMOBILIZATION (10%)	***$10,316***
				CONSTRUCTION OVERSIGHT (10%)	***$10,316***
				CONTINGENCY (15%)	***$15,474***
				TOTAL (ROUNDED TO NEAREST $100)	***$175,400***

5.3.2. Permitting Needs

Anticipated permitting needs are summarized below.

Construction Stormwater Permit: If the stormwater improvements and full-depth roadway reconstruction are completed simultaneously, which is recommended, the project may require a Construction Stormwater Permit. The site should qualify for an Erosion Prevention and Sediment Control permit (3-9020) under the Low Risk categorization if the following guidelines are followed:

- Less than 2 acres of disturbance at any one time.
- All disturbed soils must be stabilized (temporary or final) within 7 days.
- Runoff from the site must pass through a 50' vegetated buffer prior to entering any water of the State.
  - If this buffer cannot be maintained due to the immediate down-grade presence of the closed drainage systems on U.S. Route 2, risk mitigation factors including minimizing disturbed earth exposure in any location to less than 7 days before implementing stabilization may be employed to maintain a Low Risk categorization.

Operational Stormwater Permit: No operational stormwater permit is anticipated to be required.

Local Permitting: No local permits are anticipated.

Other Permits:

No Act 250 permitting review or actions are anticipated to be required.

Wetlands permitting is not anticipated for this project.

River Corridor permitting is not anticipated for this project. The proposed retrofits are located outside of the mapped River Corridor, and while no electronic mapping of the AE flood zone (1-percent annual chance floodplain with elevations) is available, the River Corridor mapping encompasses both the FEMA floodplain and adjustments to account for fluvial erosion hazards. A site visit with Rivers Program staff to discuss design and permitting options is not necessary at this stage.

Any work within the VTrans right-of-way will require a State Highway Access and Work Permit (19 VSA 1111) or will be required to be completed by VTrans personnel or contractors. It is anticipated that tie-in with the existing catch-basin to connect lines associated with the proposed retrofit practice and stormline improvements will require an 1111 permit and coordination with VTrans.

5.3.3. Next Steps

A meeting was held with the project stakeholders (Town road foreman, Selectboard, and Essex NRCD) and all indicated willingness to proceed with design work for this retrofit. This design can be implemented largely within the Town's right-of-way and in North Concord Park, which is Town property. The Town Road Foreman, as of this writing (December 27), is working to contact the owner of the open land where the gravel wetland is proposed. Further work will involve refinement of the retrofit design with respect to size and layout to maximize water quality treatment while minimizing utility conflicts.

6. Funding Sources for Implementation

Potential funding sources for project implementation are briefly described below.

6.1. Vermont Clean Water Initiative Program Ecosystem Restoration Grants

The Clean Water Initiative Program (CWIP) funds priority projects that restore and protect rivers, streams, lakes, ponds, and wetlands from nonpoint source runoff and associated nutrient and sediment pollution. Vermont municipalities, regional organizations, nonprofit associations, citizen groups, and state agencies are eligible to receive grants. Ecosystem Restoration Grants support the design and construction of water pollution abatement and control projects that target nonpoint sources of pollution. Projects must be in the DEC Watershed Projects Database (https://anrweb.vt.gov/DEC/cleanWaterDashboard/WPDSearch.aspx) prior to grant application deadlines; the next application review deadline is anticipated to be March 11, 2019. As of the July 2018 Ecosystem Restoration Grant round, a minimum $20,000 grant size (exclusive of local match) is required to be eligible for funding. Local match is not required, but it is encouraged and incentivized during the grant application process. This vehicle is now intended as a resource for those projects that don't "fit" other grants (VTrans, Agency of Agriculture, Food, and Markets, Municipal Roads Grants-In-Aid). Additional information is available at https://dec.vermont.gov/watershed/cwi/grants/ecosystem-restoration#Ecosystem%20Restoration.

6.2. Clean Water Design and Implementation Block Grants

This grant vehicle provides support for statewide partners, such as Regional Planning Commissions and NRCDs, to administer a program that supports completion of design and implementation clean water improvement projects identified on the DEC Watershed Projects Database. This program was started in 2017, and the state's NRCDs were awarded a total of $500,000 to design and implement projects in Year 1 of this pilor program. Funding and applications for Year 2 are currently in development, and it appears that in Year 2 design *or* design plus implementation projects will be eligible for funding. In Year 1, projects proposed for design had to also be constructed (originally by June 2019; now extended to December 2019). More information is available at https://dec.vermont.gov/watershed/cwi/grants/ecosystem-restoration#Clean%20Water%20Block.

6.3. Vermont Better Roads Grant Program

The Vermont Agency of Transportation provides grant funding to support projects on municipal roads that improve water quality and result in maintenance cost savings. The grant funds are provided by the VT Agency of Transportation with partnership through the Vermont Agency of Natural Resources. The Vermont Better Roads Program promotes the use of erosion control and maintenance techniques that save money while protecting and enhancing water quality around the State. Funds, subject to legislative allocation, are distributed as grants to municipalities to address town erosion problems. Eligible projects in the 2018 grant round included Road Erosion Inventory completion (up to $8,000), correction of road-related erosion problems or stormwater mitigation/retrofit for gravel or paved roads (up to $20,000), correction of stream

bank, lakeshore, or slope related problems (up to $40,000), or structure/culvert installation for large structures (36" or larger, up to $60,000). The next grant round under this program, for FY2021, is anticipated to be announced in August 2019, with an application deadline in October. Additional information is available at https://vtrans.vermont.gov/highway/better-roads.

6.4. Municipal Roads Grants-in-Aid

In partnership with Vermont's regional planning commissions, the Clean Water Initiative Program offers grant funds to aid municipalities in implementing best management practices on municipal roads to improve water quality. Practices eligible for funding under this pilot project include drainage ditch installation and upgrades, turnouts, removal of high road shoulders, and stabilization of drainage culverts and catch basin outlets, and on Class 4 roads, stabilization of gully erosion. Projects must target sections of roads that are "hydrologically-connected" — road segments that are next to or cross streams, wetlands, lakes, or ponds. All municipalities required to comply with the Municipal Roads General Permit are eligible to enroll. The amount of funding awarded to each participating municipality is based on its number of hydrologically connected road miles and number of participating municipalities. The Town of Concord already makes good use of this program, through coordination with Essex NRCD, and it would be well suited to funding the improvements proposed in the northern portions of the Area 7 Folsom Ave. and High Street concept (Section 5.3). The next deadline to enroll is anticipated in June 2019; more information at https://www.vapda.org/gia/.

6.5. VTrans Transportation Alternatives Program Grants

The Transportation Alternatives Program (Act 38 of 2017) stipulates that all program grant funds for SFY18 and SFY19 are reserved for municipalities for environmental mitigation projects relating to stormwater and highways, including eligible salt and sand shed projects. It is not yet clear if the use of this program for stormwater mitigation will continue in SFY20. Projects must have a transportation link.

Federal funding through this program has a cap of $300,000 per project at an 80% federal / 20% local split. For projects treating comingled runoff from highways and other sources such as roofs and parking lots, federal funds can only be used to treat the proportionate amount of the runoff from the highway system. This a reimbursement program, so municipalities must submit invoices for completed work to be reimbursed appropriately up to the grant amount. All projects must be completed or all federal funds will be required to be paid back. The announcement of funding availability for this grant program usually becomes available in late August, with applications due in mid-October. More information is available at https://vtrans.vermont.gov/highway/local-projects/transport-alt.

6.6. VTrans Municipal Highway and Stormwater Mitigation Grants

The Municipal Highway and Stormwater Mitigation Program was established in 2017 and is intended for larger environmental mitigation-related projects (generally over $250,000 in construction cost). Similar to the current allocation of the Transportation Alternatives Program Grants, eligibility is restricted to "any environmental mitigation activity, including pollution prevention and pollution abatement activities and mitigation to address stormwater management, control, and water pollution prevention or abatement related to highway construction or due to highway runoff". There is no cap on funding for individual projects, and applications are accepted for scoping/planning or for design and construction (no design-only projects). Design and construction projects must be completed or federal funds will be required to be paid back. This is also a reimbursement program. Program announcement for this grant typically occurs in mid-June, with applications due in mid-July and project awards announced in August. More information is available at https://vtrans.vermont.gov/highway/Municipal-Highway-and-Stormwater-Mitigation-Program.

7. Recommendations

This document represents an extensive effort to identify and evaluate stormwater problem areas and strategic retrofit opportunities throughout Concord's village area. A total of five high priority stormwater improvement projects were advanced to concept design. These conceptual solutions all represent improvements that the Town could pursue directly, or could work with partners to pursue funding to address.

The practices and projects identified in this plan individually and collectively can have a substantial benefit for water quality, resilience to larger storm events, and increased awareness and interest in stormwater management generally. While the high-priority concepts stand to provide some of the more substantial benefits, the Town and its partners are encouraged to move forward with the additional retrofits and practices outlined here (Appendix E includes a summary of these projects to be uploaded into VTDEC's Watershed Projects Database for tracking). These potential improvements have been identified through a planning process encouraged and recognized by VTDEC, so they will be good candidates for implementation funding through the VTDEC Clean Water Fund grant program (Section 6 and dec.vermont.gov/watershed/cwi/cwf).

Beyond addressing the specific problem areas identified in this plan, there are often opportunities to improve management of stormwater runoff that arise as part of routine municipal projects, such as the substantial reconstruction of a road surface or intersection. Grant funds may be available to cover the incremental cost of addressing stormwater runoff as part of such projects, if stormwater management is considered early enough in the design process and does not exceed regulatory thresholds for state stormwater permits. Any party choosing to advance one of these priority projects will likely need to consult on a case-by-case basis with the VT DEC Stormwater Program to determine whether or not a specific project will be subject to state jurisdiction. Regardless, it is often significantly more cost-effective and efficient to incorporate stormwater management measures into a planned municipal project as compared to the construction of a stand-alone stormwater management retrofit.

Finally, we recommend that all project partners keep up with "current events" related to implementation of the Lake Champlain Phosphorus TMDLs, where programs are being implemented statewide as part of addressing impairments in that portion of the State's waters. For example, under the forthcoming Developed Lands General Permit, parcels and common plans of development with more than 3 acres of impervious surface that has either never been permitted, or was permitted for operational stormwater before 2002, will be required to obtain permit coverage and develop new retrofits to treat stormwater from their impervious surfaces. Fortunately, the Concord village area does not have any areas of existing impervious cover large enough to be potentially designated under this program. However, in 2022, the jurisdictional threshold for operational stormwater permitting (for new or expanded impervious cover) is expected to drop from its current one-acre threshold to half an acre – potentially impacting a larger range of future projects in the village and elsewhere in the Town.

8. References

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Appendix A. Maps

Sources: Roads, Hydrography, Infrastructure, Soils, Hydrography, Administrative Boundaries: VCGI
Basemap: ESRI World Imagery

0 105 210 420 Feet

N

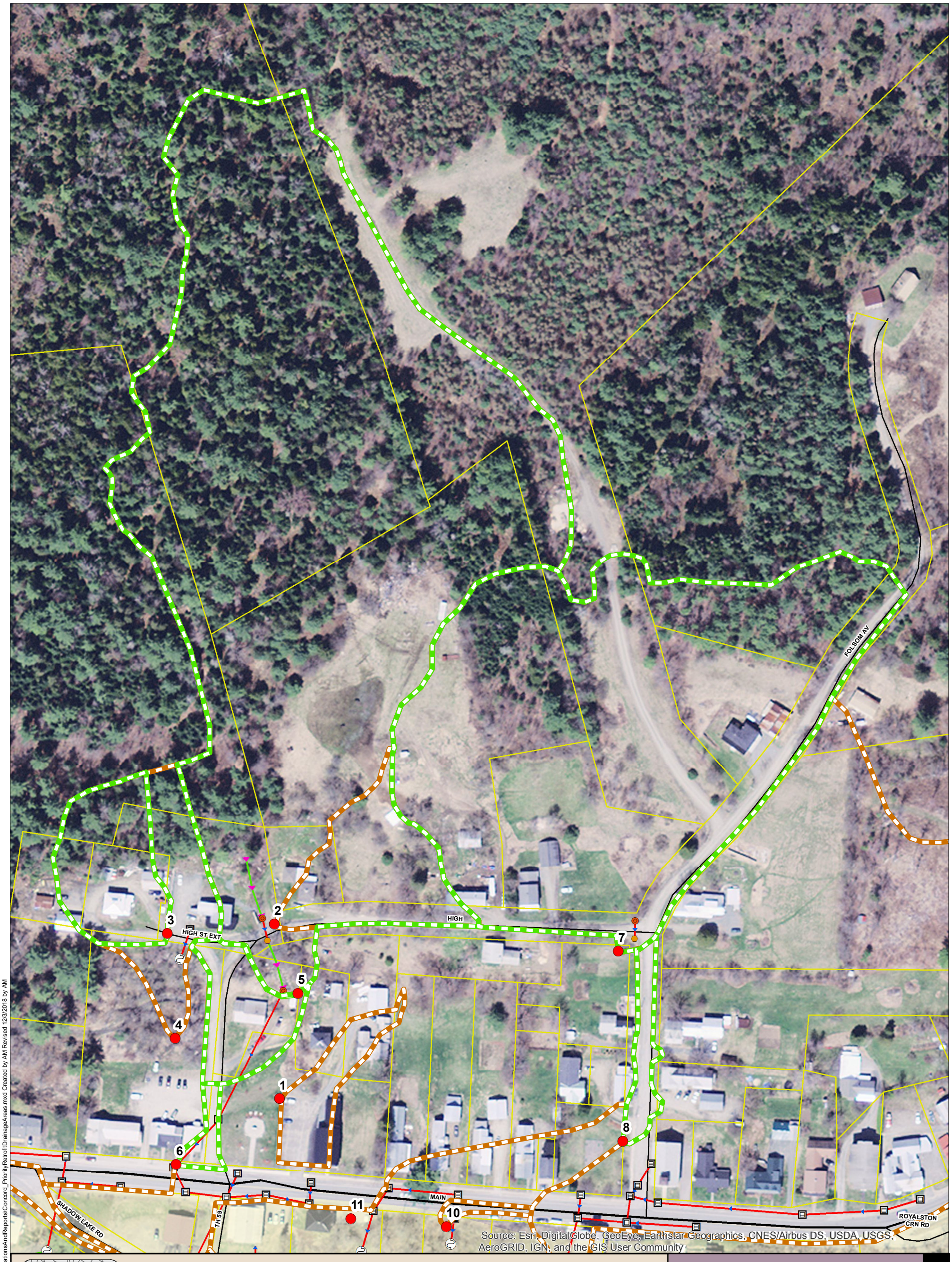
STONE ENVIRONMENTAL

Base Map and Retrofit Opportunities

Figure 1

Concord Stormwater Master Planning

O:\Proj-17\WRM\17-083 Essex NRCD Concord SW\GIS\MapDocuments\PresentationsAndReports\Concord_Base.mxd Created by AM Revised 6/29/2018 by AM, Reviewed by KM



Legend

- Retrofit Locations
- High Priority Retrofit Drainage Areas
- Retrofit Drainage Areas
- Existing, Catchbasin
- Existing, Culvert inlet
- Existing, Culvert outlet
- Existing, Drop Inlet
- Existing, Outfall
- Existing, Storm line
- Existing, Swale
- Parcel boundaries (2008)
- River Corridor

Sources: Roads, Hydrography, Infrastructure, Soils, Hydrography, Administrative Boundaries: VCGI
Basemap: ESRI World Imagery

0 60 120 240 Feet

N

STONE ENVIRONMENTAL

High Priority Retrofit Opportunities

Figure 2

Concord Stormwater Master Planning

O:\PROJ-17\WRM\17-083 Essex NRCD Concord SW\GIS\MapDocuments\PresentationsAndReports\Concord_PriorityRetrofitDrainageAreas.mxd Created by AM Revised 12/3/2018 by AM

Appendix B. Retrofit Opportunity Sheets

Project: Town of Concord Stormwater Master Plan Retrofit Summary Sheet

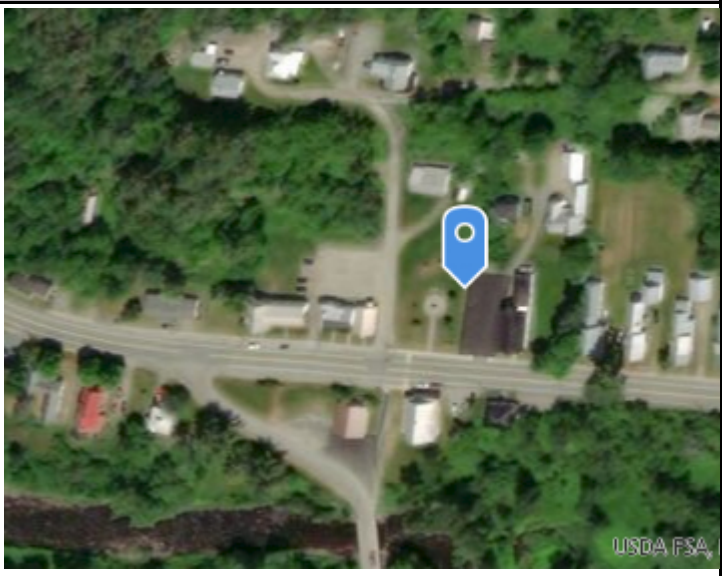
ID#: 1

Name: Town office bio swale

Concept Description:

Installing a bio retention or bio swale retrofit at the western edge of the parking lot would capture and treat run off from half of the building roof and the entire parking lot.

Notes/Feasibility:



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public
Land Use Type:	Institutional
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	Office Roof , Paved Parking or Driveway , Lawn, Low Compaction

SIZING INFORMATION	
Drainage Area (ac):	
Impervious Area (ac):	
Practice Area Available (ft^2):	
Existing Head Available?	Yes

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Bioretention, Basin , Bioretention, Dry Swale
Non-Structural Controls:	Educational signage
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		Conflicts:	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	Yes	Land Use:	No
Demonstration:	Yes	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

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Assessed by: amacrellis_stone_env

ID# 1, Image 1

ID# 1, Image 2

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 2

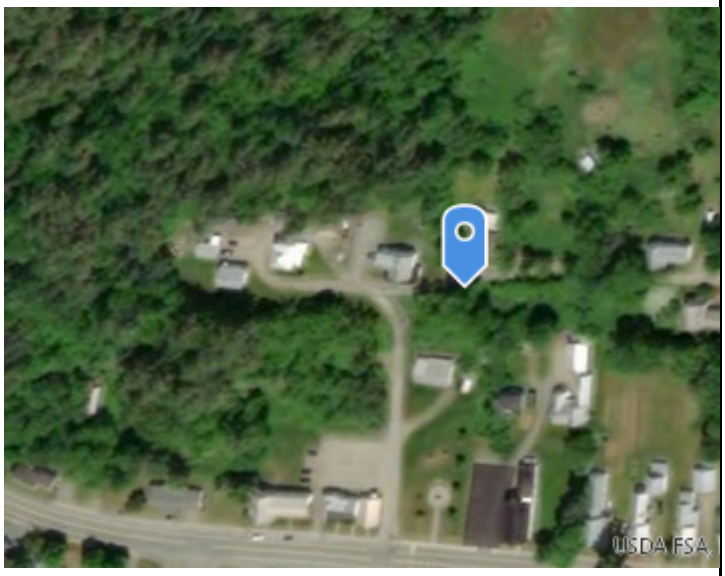
Name: High Street sedimentation basin and endwall upgrade

Concept Description:

The closed drainage system carrying primarily upland undeveloped land runoff across High Street has been recently upgraded, but there is no endwall and the surrounding fill is eroding. install a small sedimentation basin to trap road material.

Notes/Feasibility:

Space available for sedimentation basin is limited. It may also be possible to reshape and Stoneline the northside ditch on high Street but upgrade slope is steep and area in right of way is limited



GENERAL SITE INFORMATION

Site Contact Info:	
Ownership:	Public and private
Land Use Type:	SF Residential (>1 ac. lots)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients , Leaf dumping area
Soils:	
Use in Retrofit DA:	Pitched Residential Roof, Gravel Parking or Driveway, Gravel Road, Lawn, Low Compaction

SIZING INFORMATION

Drainage Area (ac):	0.9
Impervious Area (ac):	
Practice Area Available (ft^2):	300
Existing Head Available?	Yes, basin would overflow via stone outlet to existing catch basin

RETROFIT DETAILS

Project Candidate:	Ok
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Ditch stabilized-stone lining, Rill erosion repair, Plunge Pool, Headwall repair, Check Dam
Non-Structural Other:	
Maintenance Burden:	Low

Benefits:		**Conflicts:**	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	No
Demonstration:	No	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	Yes
		Wetlands:	No
Other:		Other:	

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Assessed by: amacrellis_stone_env

ID# 2, Image 1

ID# 2, Image 2

ID# 2, Image 3

ID# 2, Image 4

ID# 2, Image 5

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 3

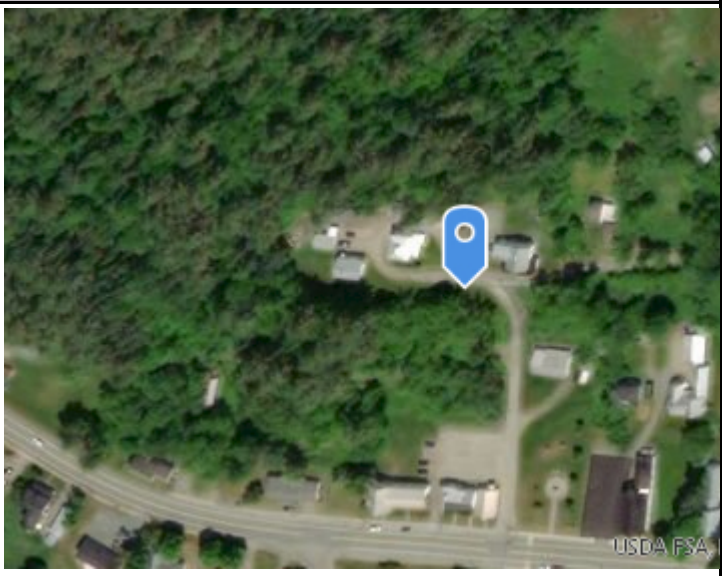
Name: High Street Extension bioretention

Concept Description:

Install a small bioretention area or swale to manage run off from homes driveways and gravel road.

Notes/Feasibility:

steep slope to South may limit possibilities. Some of the run off may already be disconnected to the south. Opportunity is to manage run off before it reaches steep slope on high Street.



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public and private
Land Use Type:	Single Family Residential (<1 ac. lots)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	Pitched Residential Roof, Gravel or Compacted Parking or Driveway, Gravel Road, Lawn, Low Compaction

SIZING INFORMATION	
Drainage Area (ac):	0.78
Impervious Area (ac):	
Practice Area Available (ft^2):	500
Existing Head Available?	Yes, with possible overflow to CB on the north side of road

RETROFIT DETAILS	
Project Candidate:	Ok
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Bioretention, Basin , Bioretention, Dry Swale
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		Conflicts:	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	Yes	Land Use:	No
Demonstration:	No	Utilities:	Yes
Repair:		Polluted:	No
Reuse:	No	High WT:	Yes
		Wetlands:	No
Other:		Other:	

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Assessed by: amacrellis_stone_env

ID# 3, Image 1

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 4

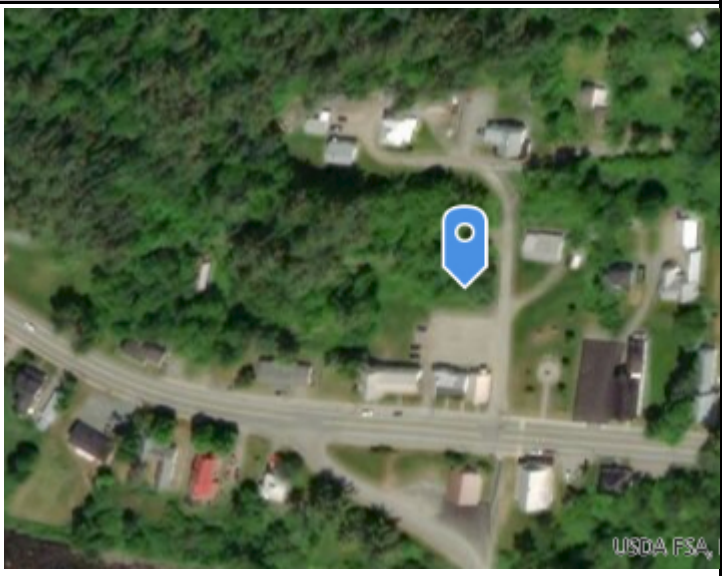
Name: High Street and high Street extension bio

Concept Description:

Install bioretention or gravel wetland to manage run off from High Street Extension cross culvert and steep portion of high Street.

Notes/Feasibility:

Space appears to be adequate south of vast Trail, but trail culvert may need to be upsized. Drainage area to be managed is small.



GENERAL SITE INFORMATION

Site Contact Info:	
Ownership:	Unknown
Land Use Type:	Single Family Residential (<1 ac. lots)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	Pitched Residential Roof , Gravel or Compacted Parking or Driveway , Gravel Road , Pervious, Undeveloped , Lawn, Low Compaction

SIZING INFORMATION

Drainage Area (ac):	1.43
Impervious Area (ac):	
Practice Area Available (ft^2):	4000
Existing Head Available?	Yes

RETROFIT DETAILS

Project Candidate:	Undecided
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Bioretention, Basin , Wetland, Constructed Subsurface Gravel
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		**Conflicts:**	
Storage:	Yes	Soils:	No
Water Quality:	Yes	Access:	Yes
Recharge:	No	Land Use:	No
Demonstration:	No	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 11:49 AM

Assessed by: amacrellis_stone_env

ID# 4, Image 1

ID# 4, Image 2

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 5

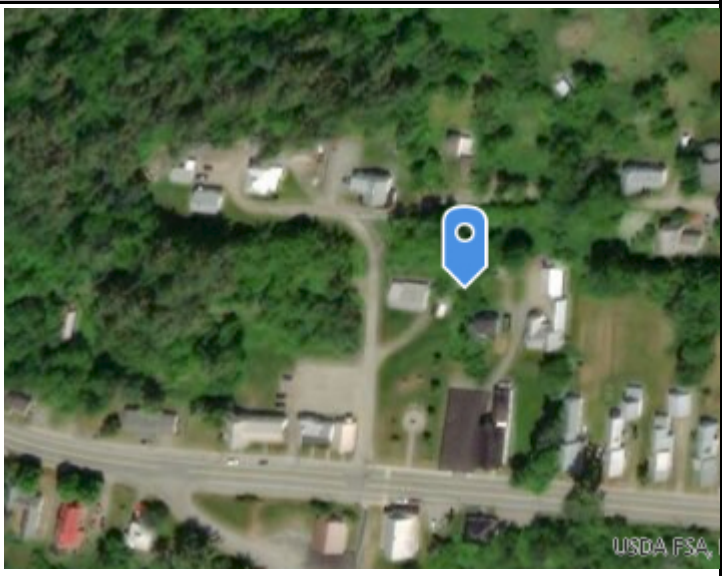
Name: High Street, base-of-hill retrofit

Concept Description:

Install a water quality practice upstream of existing culvert inlet for storm line running beneath park.

Notes/Feasibility:

On private property, could not locate storm line inlet.



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public and private
Land Use Type:	Single Family Residential (<1 ac. lots)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients , Yard waste/debris , Leaf dumping area
Soils:	
Use in Retrofit DA:	Pitched Residential Roof , Gravel or Compacted Parking or Driveway , Gravel Road

SIZING INFORMATION	
Drainage Area (ac):	12.37
Impervious Area (ac):	
Practice Area Available (ft^2):	4500
Existing Head Available?	

RETROFIT DETAILS	
Project Candidate:	Undecided
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Bioretention, Basin , Wetland, Constructed Subsurface Gravel
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		Conflicts:	
Storage:	Yes	Soils:	No
Water Quality:	Yes	Access:	Yes
Recharge:	No	Land Use:	No
Demonstration:	No	Utilities:	Yes
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

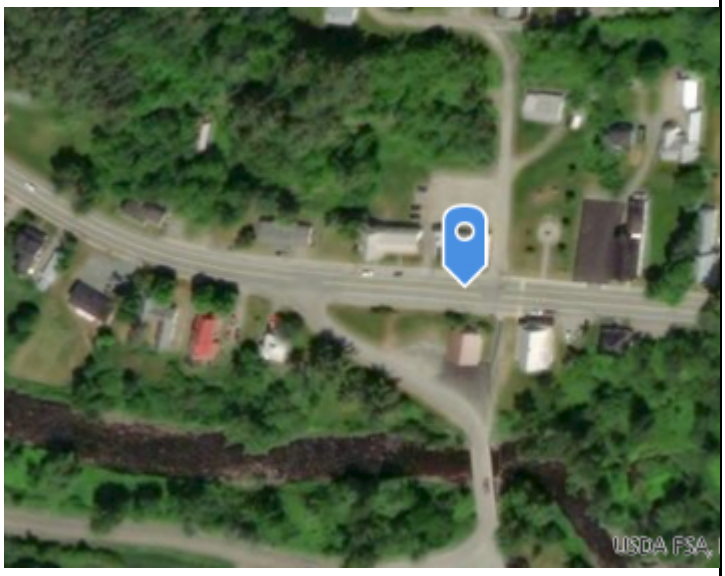
Date: 06/15/2018 12:44 PM

Assessed by: amacrellis_stone_env

ID# 5, Image 1

ID#: 6

Name: Post office and superintendents office green space stabilization



Concept Description:

There is a limited opportunity to reduce sediment entering the catch basin in front of the post office. Possibly as simple as stabilizing or paving the green space instead of having sediment transport from tree lawn to catch basin.

Notes/Feasibility:

Existing tree lawn is only 18 inches wide. Opportunity to improve conditions with the grass are limited.

GENERAL SITE INFORMATION

Site Contact Info:	
Ownership:	Public
Land Use Type:	Commercial , Transport-Related (roadway or ROW)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients , Metals (Cu, Zn, Pb, e.g., transportation)
Soils:	
Use in Retrofit DA:	Commercial Roof , Paved Road, Moderate Traffic , Lawn, Compacted , Pervious, road right-of-way, compacted

SIZING INFORMATION

Drainage Area (ac):	0.068
Impervious Area (ac):	
Practice Area Available (ft^2):	
Existing Head Available?	

RETROFIT DETAILS

Project Candidate:	Ok
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Permeable Solid Pavers
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		**Conflicts:**	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	No
Demonstration:	No	Utilities:	Yes
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	This is in the route 2 Vtrans right of way.

Date: 06/15/2018 12:12 PM

Assessed by: amacrellis_stone_env

ID# 6, Image 1

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 7

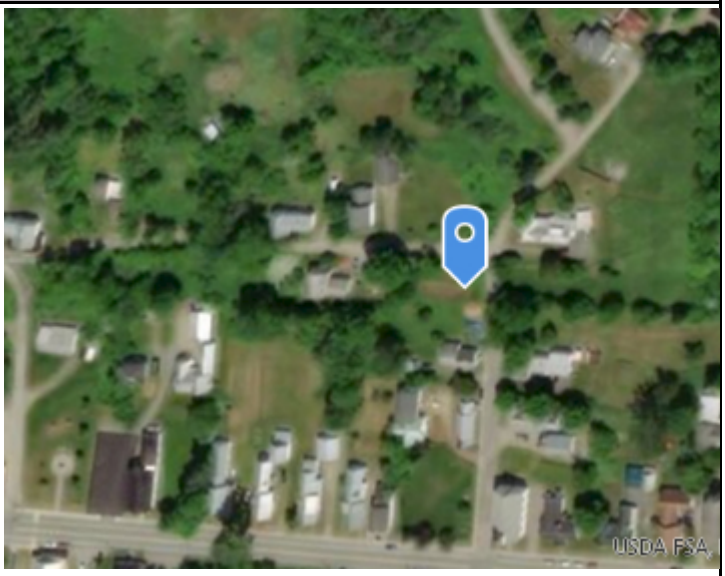
Name: Folsom Ave and High Street bioretention

Concept Description:

Capture runoff from upper Folsom Ave and east end of high Street below cross culvert in green space. Overflow down slope to park. Existing cross culvert is undersized and outlet appears to be crushed and in the traveled way.

Notes/Feasibility:

Green space south of intersection likely private.



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public and private
Land Use Type:	Single Family Residential (<1 ac. lots)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	Pitched Residential Roof, Gravel Parking or Driveway, Gravel Road, Lawn, Low Compaction, Pervious, Undeveloped

SIZING INFORMATION	
Drainage Area (ac):	7.06
Impervious Area (ac):	
Practice Area Available (ft^2):	2100
Existing Head Available?	Yes, this is a good location to manage upper portion of watershed.

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Ditch stabilized with stone lining (>5-8% slope) , Culvert repair or replacement , Culvert headwall repair , Pre-treatment Forebay , Bioretention, Basin
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		Conflicts:	
Storage:	Yes	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	Yes	Land Use:	No
Demonstration:	No	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 12:44 PM

Assessed by: amacrellis_stone_env

ID# 7, Image 1

ID# 7, Image 2

ID# 7, Image 3

ID# 7, Image 4

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 8

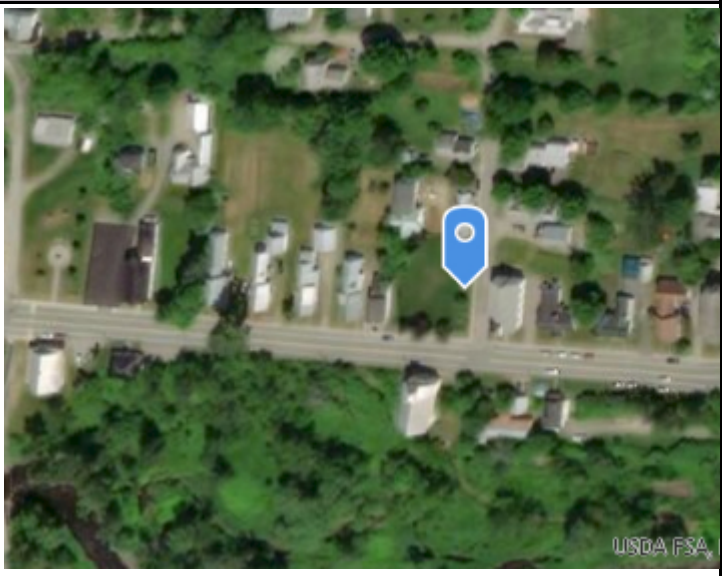
Name: Concord Park bioretention

Concept Description:

Install bioretention area to treat runoff from Folsom Ave, instead of or in addition to the proposed retrofit higher in the drainage area above (#7).

Notes/Feasibility:

At minimum, the lower part of the roadway could be captured, as well as runoff from a few rooftops and driveways adjacent.



GENERAL SITE INFORMATION

Site Contact Info:	
Ownership:	Public
Land Use Type:	Park
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	HIstoric/Institutional Roof, Lawn, Low Compaction, Gravel Road, Paved Road, Low Traffic, Gravel Driveway

SIZING INFORMATION

Drainage Area (ac):	0.22
Impervious Area (ac):	
Practice Area Available (ft^2):	2000
Existing Head Available?	Yes. Overflow would need to go to one of the existing catch basins

RETROFIT DETAILS

Project Candidate:	Yes, high-priority
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Pre-treatment Forebay, Bioretention, Basin, Wetland, Constructed Subsurface Gravel
Non-Structural Controls:	Educational signage
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		**Conflicts:**	
Storage:	Yes	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	No
Demonstration:	Yes	Utilities:	Yes
Repair:		Polluted:	No
Reuse:	No	High WT:	Yes
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 01:11 PM

Assessed by: amacrellis_stone_env

ID# 8, Image 1

ID# 8, Image 2

ID# 8, Image 3

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 9

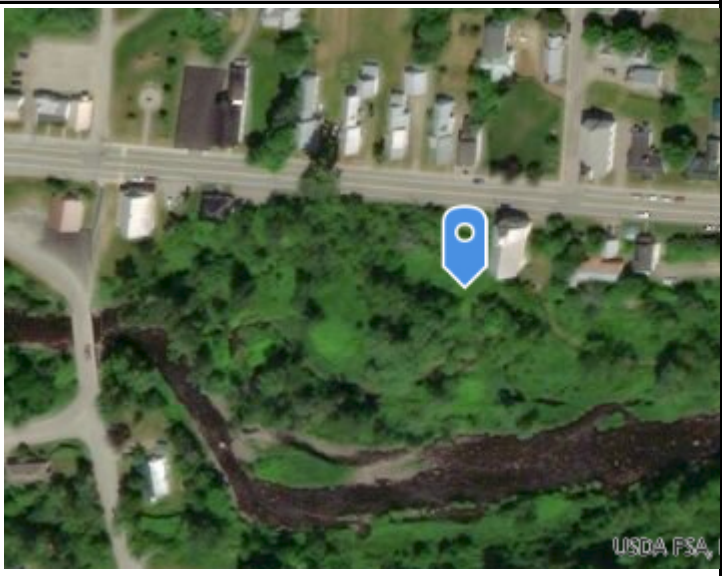
Name: Concord Museum / Rte 2 gravel wetland

Concept Description:

Redirect outfall pipe from Rte 2 drainage system to a new treatment practice west of museum building. Bench above outfall does not have wetland vegetation. Outfall could not be located.

Notes/Feasibility:

Existing manhole leading to outfall is brick, outfall pipe is 15 inch VCP. Upgrade would be required. All or part of retrofit in VTrans right of way.



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public and private
Land Use Type:	Institutional , Transport-Related (roadway or ROW) , Single Family Residential (>1 ac. lots)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients , Metals (Cu, Zn, Pb, e.g., transportation)
Soils:	
Use in Retrofit DA:	HIstoric/Institutional Roof, Paved Road, Moderate Traffic, Paved and Gravel Parking or Driveway, Pitched Res. Roof

SIZING INFORMATION	
Drainage Area (ac):	8.97
Impervious Area (ac):	
Practice Area Available (ft^2):	5000
Existing Head Available?	Yes

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Pre-treatment Forebay , Wetland, Constructed Subsurface Gravel
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		Conflicts:	
Storage:	Yes	Soils:	No
Water Quality:	Yes	Access:	Yes
Recharge:	No	Land Use:	No
Demonstration:	Yes	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	Yes
		Wetlands:	Yes
Other:		Other:	

Date: 06/15/2018 01:21 PM

Assessed by: amacrellis_stone_env

ID# 9, Image 1

ID# 9, Image 2

ID# 9, Image 3

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 10

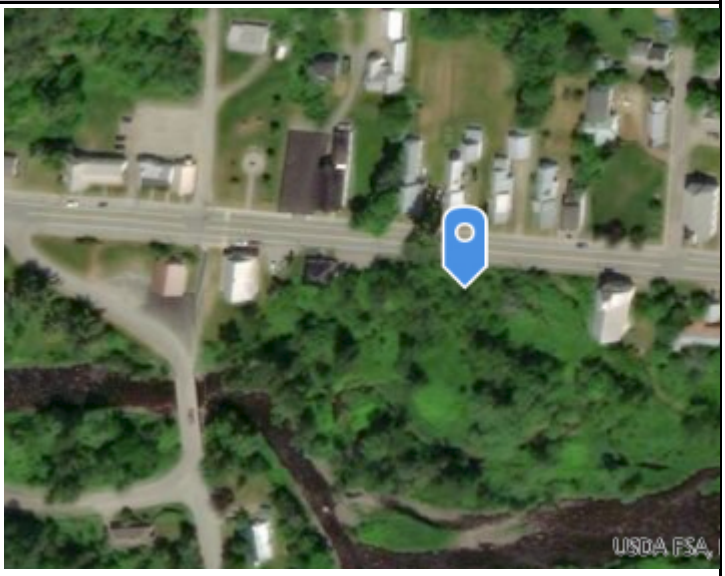
Name: Route 2 inlet and outfall repair

Concept Description:

Inlet is short circuited and outfall pipe is exposed, 15 inch corrugated metal. Pipe outlet was not visible from right of way; end-of-pipe stability not assessed.

Notes/Feasibility:

Not in town's control, but potentially impacting infrastructure and water quality.



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public
Land Use Type:	Transport-Related (roadway or ROW)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment, Nutrients, Metals (Cu, Zn, Pb, e.g., transportation)
Soils:	
Use in Retrofit DA:	Paved Road, Moderate Traffic
SIZING INFORMATION	
Drainage Area (ac):	0.054
Impervious Area (ac):	
Practice Area Available (ft^2):	
Existing Head Available?	

RETROFIT DETAILS	
Project Candidate:	No
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Culvert headwall repair, Outfall stabilization, Culvert repair or replacement
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Low

Benefits:		Conflicts:	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	Yes
Recharge:	No	Land Use:	No
Demonstration:	No	Utilities:	Yes
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	Yes
Other:		Other:	

Date: 06/15/2018 01:29 PM

Assessed by: amacrellis_stone_env

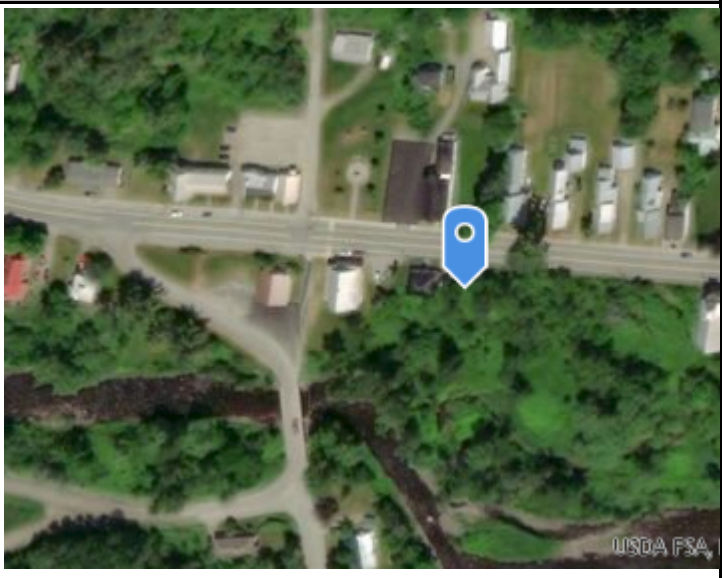
ID# 10, Image 1

ID# 10, Image 2

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 11

Name: Town Clerk office outfall repair



Concept Description:

Keep an eye on this. Outlet pipe from Rte 2 drainage may be separating just south of parking Lot guard rail.

Notes/Feasibility:

Outfall is perched, but erosion appears minimal. Pipe at outlet is in good condition.

GENERAL SITE INFORMATION

Site Contact Info:	
Ownership:	Public
Land Use Type:	Institutional, Transport-Related (roadway or ROW)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment, Nutrients, Metals (Cu, Zn, Pb, e.g., transportation)
Soils:	
Use in Retrofit DA:	Pitched Residential Roof, Paved Parking or Driveway, Paved Road, Moderate Traffic

SIZING INFORMATION

Drainage Area (ac):	
Impervious Area (ac):	
Practice Area Available (ft^2):	
Existing Head Available?	

RETROFIT DETAILS

Project Candidate:	No
New BMP / Retrofit Existing:	
Proposed Retrofit Practice(s):	Outfall stabilization, Culvert repair or replacement
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Low

Benefits:		**Conflicts:**	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	No
Demonstration:	No	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 01:37 PM

Assessed by: amacrellis_stone_env

ID# 11, Image 1

ID# 11, Image 2

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 12

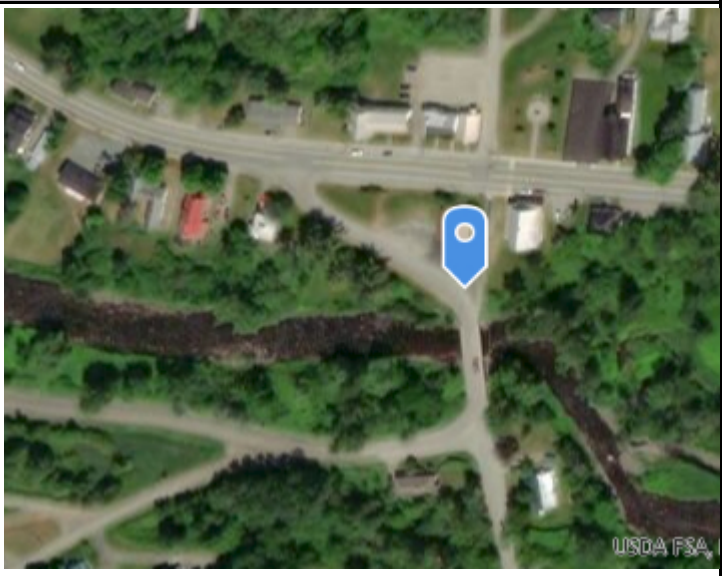
Name: Fire and Rescue swirl separator

Concept Description:

Potentially install swirls separator or similar water quality practice in parking area between fire and rescue and the Moose River. This would reduce sediment transport.

Notes/Feasibility:

this opportunity would improve water quality, but has significant constraints including river coorridor and flood plain/floodway..



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public
Land Use Type:	Commercial, Institutional, Transport-Related (roadway)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment, Nutrients, Metals (Cu, Zn, Pb, transportation)
Soils:	
Use in Retrofit DA:	Multi-Family Roof, HIstoric/Institutional Roof, Paved and Gravel Parking, Paved Road, Moderate Traffic, Lawn, Low Compaction

SIZING INFORMATION	
Drainage Area (ac):	18.06
Impervious Area (ac):	
Practice Area Available (ft^2):	1000
Existing Head Available?	Heck yes.

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Pre-treatment Proprietary Device
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Moderate

Benefits:		Conflicts:	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	No
Demonstration:	No	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	Yes
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 01:52 PM

Assessed by: amacrellis_stone_env

ID# 12, Image 1

ID# 12, Image 2

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

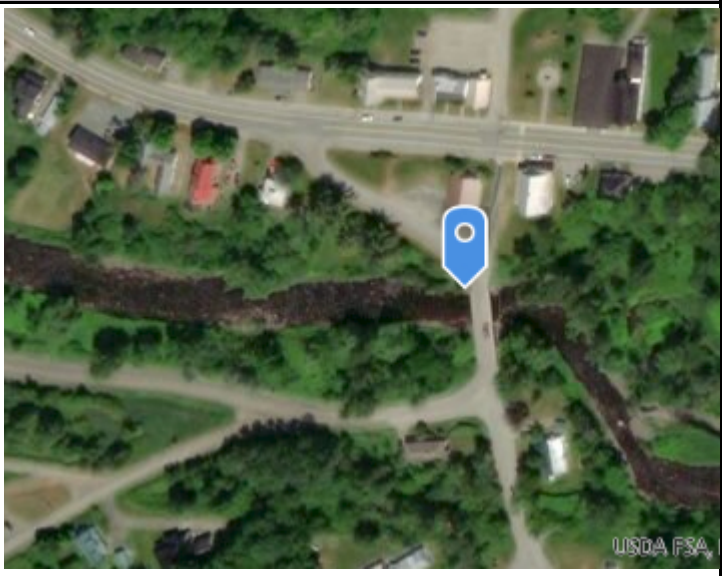
ID#: 13

Name: Shadow Lake Road bridge abutment stabilization

Concept Description:

Run off from shadow Lake Road and fire and rescue parking is running down the south side of the road and eroding next to the abutment of the bridge. Install turn outs and stabilize erosion at abutment.

Notes/Feasibility:



GENERAL SITE INFORMATION

Site Contact Info:	
Ownership:	Public
Land Use Type:	Transport-Related (roadway or ROW)
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment, Nutrients, Metals (Cu, Zn, Pb, e.g., transportation)
Soils:	
Use in Retrofit DA:	Paved Parking or Driveway, Paved Road, Low Traffic

SIZING INFORMATION

Drainage Area (ac):	0.23
Impervious Area (ac):	
Practice Area Available (ft^2):	
Existing Head Available?	

RETROFIT DETAILS

Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Ditch stabilized with vegetation and disconnection to turn-outs or cross culverts (>5-8% slope), Outfall stabilization
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Low

Benefits:		**Conflicts:**	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	No
Demonstration:	No	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 03:32 PM

Assessed by: amacrellis_stone_env

ID# 13, Image 1

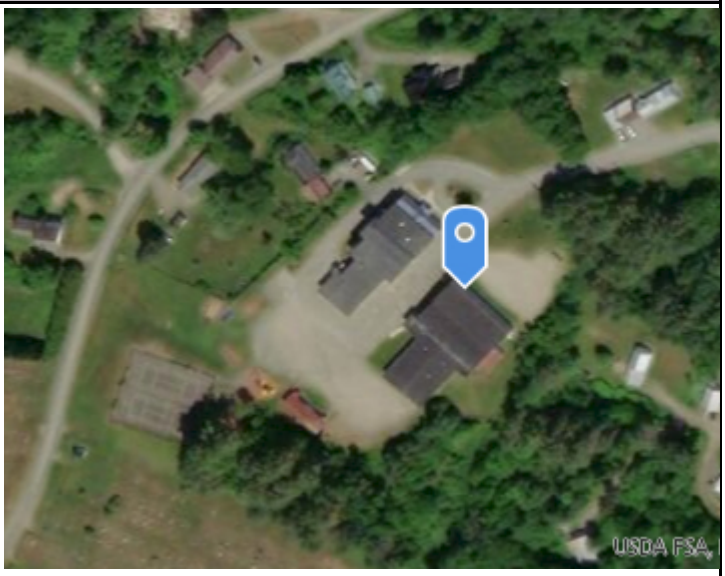
ID# 13, Image 2

ID# 13, Image 3

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 14

Name: School gym rooftop disconnection



Concept Description:

Consider removing gutter and downspout from a portion of the gym roof and using a French drain to treat and potentially infiltrate some water before it discharges to parking lot and driveway.

Notes/Feasibility:

South east portion of the roof is directed to a natural area.

GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public
Land Use Type:	Forest
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment, Nutrients
Soils:	
Use in Retrofit DA:	Commercial Roof, Gravel or Compacted Parking or Driveway, Paved Parking or Driveway, Lawn, School or Institutional Campus

SIZING INFORMATION	
Drainage Area (ac):	0.051
Impervious Area (ac):	0.051
Practice Area Available (ft^2):	100
Existing Head Available?	

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Infiltration, Surface or Subsurface Trench
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Low

Benefits:		Conflicts:	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	Yes	Land Use:	No
Demonstration:	Yes	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 03:32 PM

Assessed by: amacrellis_stone_env

ID# 14, Image 1

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 15

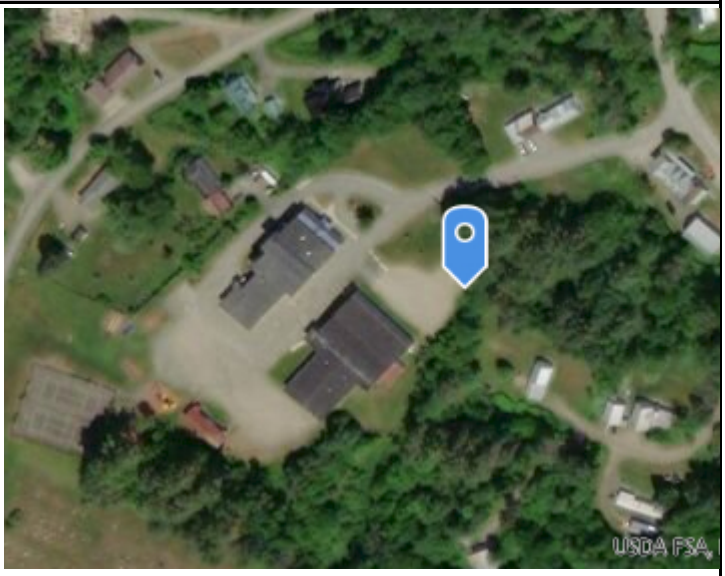
Name: School gym gravel parking retrofit

Concept Description:

Install a small bio retention area or other water quality practice in the north east corner of the parking lot to treat run off from a portion of the gravel parking

Notes/Feasibility:

Low priority. Only a small portion of the parking likely drains to this corner.



GENERAL SITE INFORMATION

Site Contact Info:	
Ownership:	Public
Land Use Type:	Forest
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	Gravel or Compacted Parking or Driveway

SIZING INFORMATION

Drainage Area (ac):	0.048
Impervious Area (ac):	0.048
Practice Area Available (ft^2):	300
Existing Head Available?	

RETROFIT DETAILS

Project Candidate:	Ok
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Pre-treatment Forebay , Bioretention, Basin
Non-Structural Controls:	Educational signage
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		**Conflicts:**	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	Yes	Land Use:	No
Demonstration:	Yes	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	Yes
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 03:32 PM

Assessed by: amacrellis_stone_env

ID# 15, Image 1

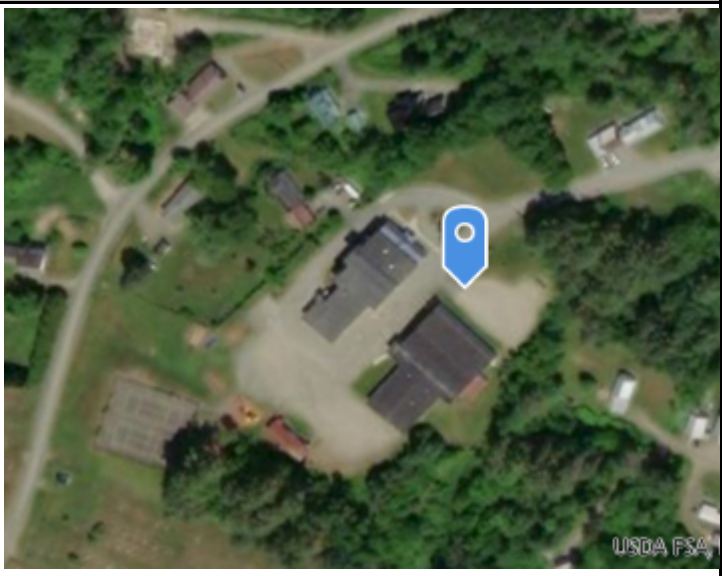
Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 16

Name: School gym parking lot bio 2

Concept Description:

Install small sedimentation basin or potentially bioretention at head of stone lined channel leaving gym parking lot.



Notes/Feasibility:

Very limited area available, but would have good water quality benefit.

GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public
Land Use Type:	School parking
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	Gravel or Compacted Parking or Driveway

SIZING INFORMATION	
Drainage Area (ac):	0.17
Impervious Area (ac):	0.17
Practice Area Available (ft^2):	500
Existing Head Available?	

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Pre-treatment Forebay , Bioretention, Basin
Non-Structural Controls:	Educational signage
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		Conflicts:	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	No
Demonstration:	Yes	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	Yes
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 03:32 PM

Assessed by: amacrellis_stone_env

ID# 16, Image 1

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

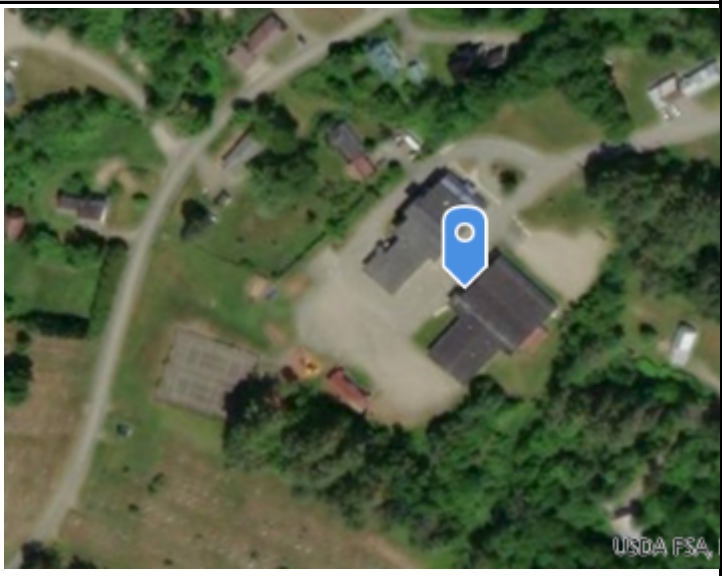
ID#: 17

Name: School gym rooftop disconnection 2

Concept Description:

Gutter no longer exists, and makeshift stabilization practice appears to have been installed. Space is extremely limited but there may be an opportunity to improve.

Notes/Feasibility:



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public
Land Use Type:	Forest
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	Commercial Roof

SIZING INFORMATION	
Drainage Area (ac):	0.05
Impervious Area (ac):	0.05
Practice Area Available (ft^2):	100
Existing Head Available?	

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Infiltrating Catch Basin, Infiltration, Surface or Subsurface Trench
Non-Structural Controls:	Educational signage
Non-Structural Other:	
Maintenance Burden:	Low

Benefits:		Conflicts:	
Storage:	No	Soils:	Yes
Water Quality:	Yes	Access:	No
Recharge:	Yes	Land Use:	No
Demonstration:	Yes	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	Yes
		Wetlands:	No
Other:		Other:	

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Assessed by: amacrellis_stone_env

ID# 17, Image 1

ID# 17, Image 2

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 18

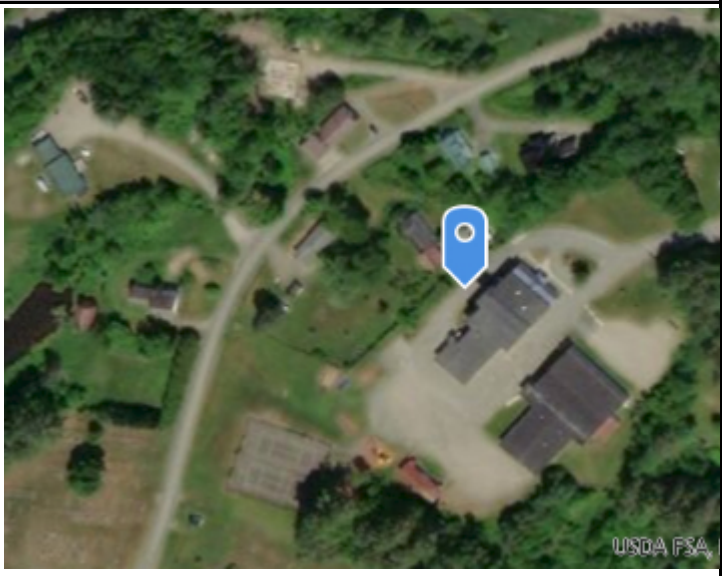
Name: School access drive sedimentation basin

Concept Description:

There is an opportunity to install a small water quality practice next to the access drive. Runoff travels along the edge of the drive and then downslope onto an adjacent property through a stone lined channel.

Notes/Feasibility:

Space is extremely limited and appears to be used for occasional parking.



GENERAL SITE INFORMATION

Site Contact Info:	
Ownership:	Public
Land Use Type:	Forest
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	Paved Parking or Driveway , Gravel or Compacted Parking or Driveway

SIZING INFORMATION

Drainage Area (ac):	0.77
Impervious Area (ac):	0.7
Practice Area Available (ft^2):	200
Existing Head Available?	

RETROFIT DETAILS

Project Candidate:	Ok
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Pre-treatment Forebay
Non-Structural Controls:	
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		**Conflicts:**	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	Yes
Demonstration:	Yes	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 03:31 PM

Assessed by: amacrellis_stone_env

ID# 18, Image 1

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 19

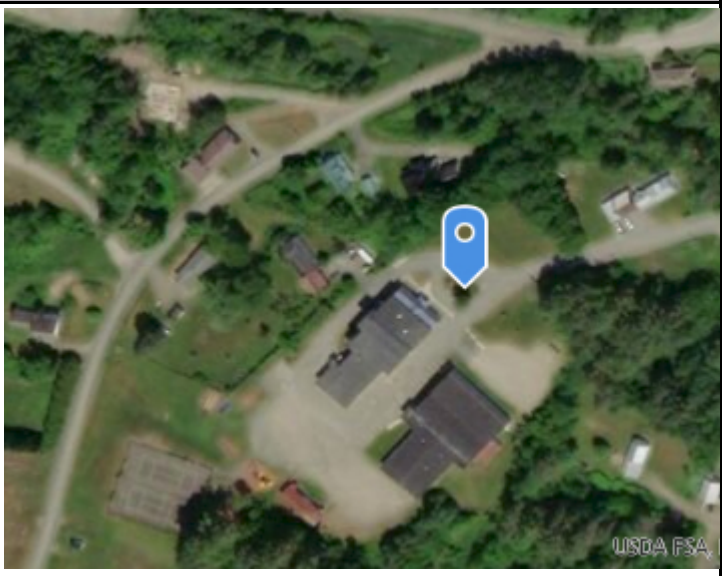
Name: School front entry bio retention

Concept Description:

Install a small bioretention area in island to treat runoff from a portion of the access drive.

Notes/Feasibility:

Area available is small, but catch basin for overflow readily available.



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public
Land Use Type:	Forest
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	HIstoric/Institutional Roof , Paved Parking or Driveway , Lawn, School or Institutional Campus

SIZING INFORMATION	
Drainage Area (ac):	0.15
Impervious Area (ac):	0.14
Practice Area Available (ft^2):	600
Existing Head Available?	Head out is adequate; may be difficult to direct runoff in.

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Pre-treatment Forebay , Bioretention, Basin
Non-Structural Controls:	Educational signage
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		Conflicts:	
Storage:	No	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	Yes	Land Use:	No
Demonstration:	Yes	Utilities:	No
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	No
Other:		Other:	

Date: 06/15/2018 03:31 PM

Assessed by: amacrellis_stone_env

ID# 19, Image 1

Project: Concord, Vermont Stormwater Master Plan Retrofit Summary Sheet

ID#: 20

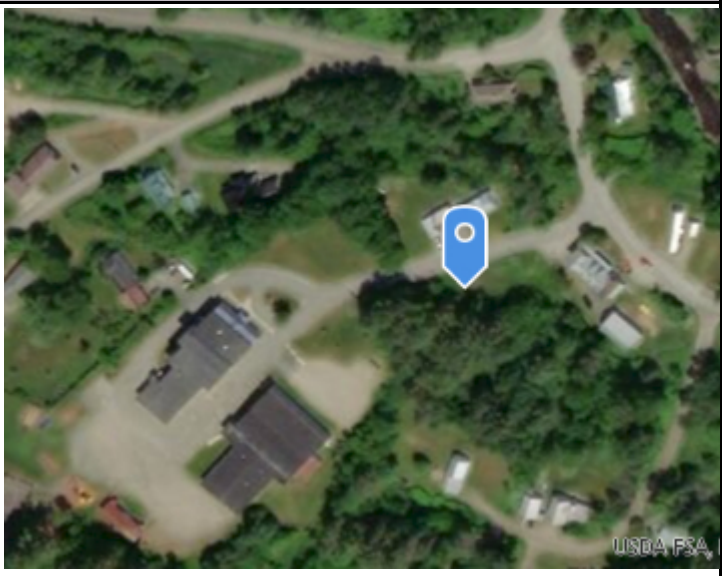
Name: School campus water quality retrofit

Concept Description:

Install forebay and gravel wetland for water quality treatment for the majority of the drainage from the school reaching school Street and leaving campus via 18 inch plastic cross culvert..

Notes/Feasibility:

Probably the best site for water quality treatment, but not on school property.



GENERAL SITE INFORMATION	
Site Contact Info:	
Ownership:	Public and private
Land Use Type:	Forest
Land Use Detail:	
Existing BMP on Site?	No
Is site a hotspot?	No
Sources/pollutants:	Sediment , Nutrients
Soils:	
Use in Retrofit DA:	HIstoric/Institutional Roof, Paved and Gravel Parking or Driveway, Lawn, Campus

SIZING INFORMATION	
Drainage Area (ac):	2.05
Impervious Area (ac):	
Practice Area Available (ft^2):	5500
Existing Head Available?	Could be a challenge. Culvert invert is about 48 inches below roadway. Open area best suited is elevated, runoff leaves site via eroding ditch.

RETROFIT DETAILS	
Project Candidate:	Yes
New BMP / Retrofit Existing:	New BMP
Proposed Retrofit Practice(s):	Pre-treatment Forebay , Wetland, Constructed Subsurface Gravel
Non-Structural Controls:	Educational signage
Non-Structural Other:	
Maintenance Burden:	Medium

Benefits:		Conflicts:	
Storage:	Yes	Soils:	No
Water Quality:	Yes	Access:	No
Recharge:	No	Land Use:	No
Demonstration:	Yes	Utilities:	Yes
Repair:		Polluted:	No
Reuse:	No	High WT:	No
		Wetlands:	Yes
Other:		Other:	

Date: 06/15/2018 03:31 PM

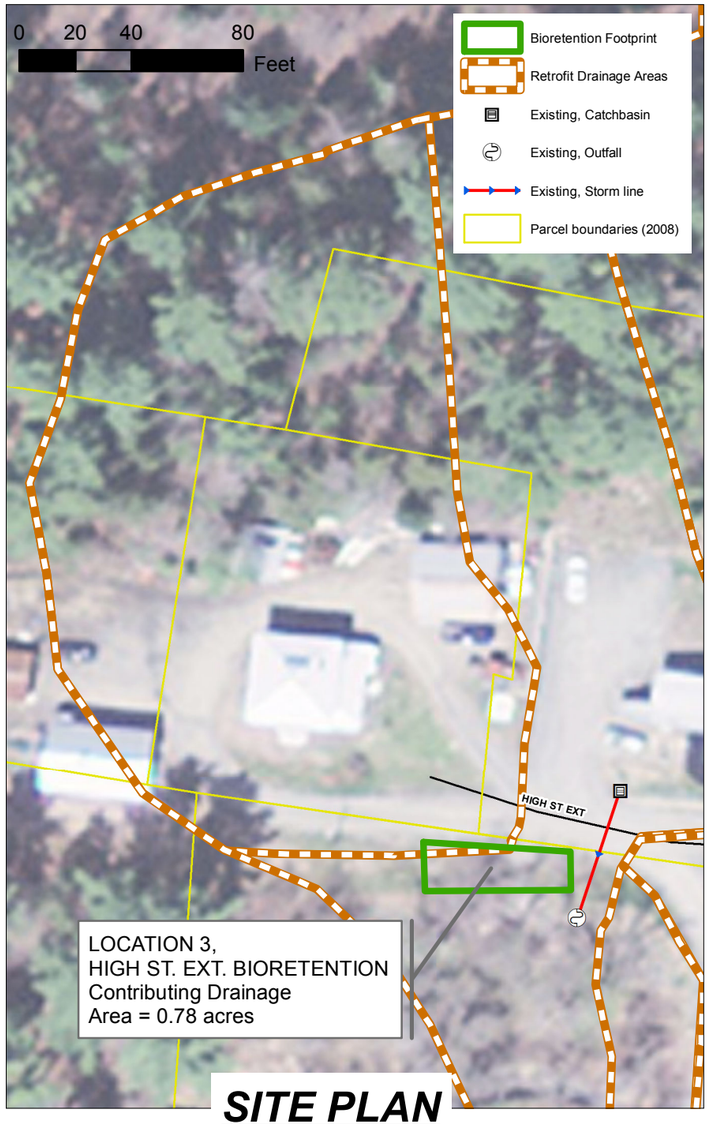
Assessed by: amacrellis_stone_env

ID# 20, Image 1

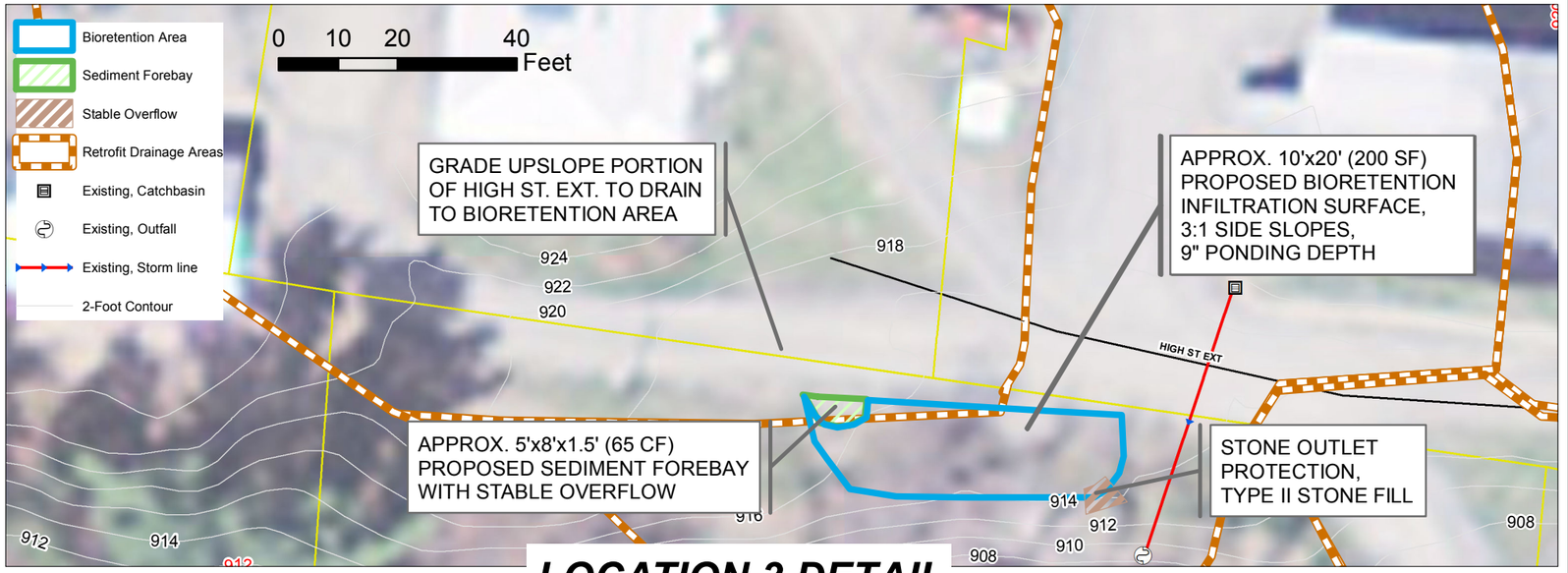
ID# 20, Image 2

ID# 20, Image 3

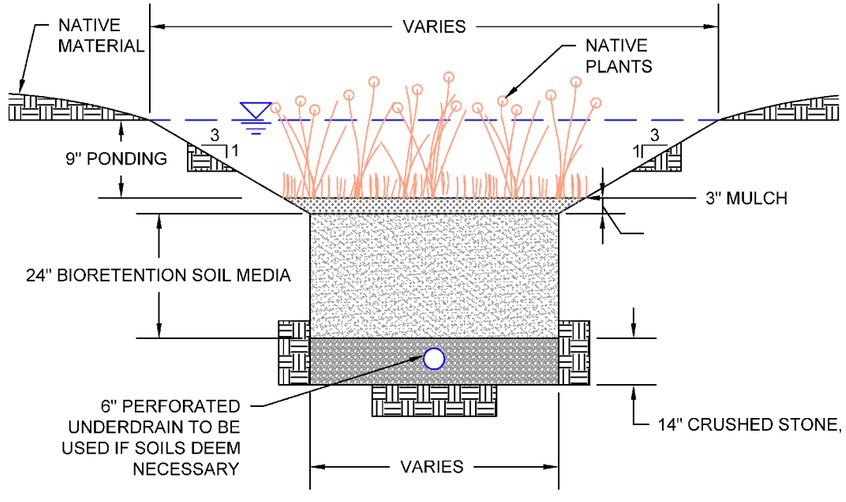
Appendix C. Concept Designs for Priority Stormwater Problem Areas



SITE PLAN



LOCATION 3 DETAIL



TYPICAL SECTION (NOT TO SCALE)

NOTES

1. *This practice will collect and treat runoff that flows from High Street Extension, as well as contributing rooftops and driveways.*
2. *Basis of design: To provide water quality treatment and removal of sediment and nutrients form stormwater runoff via collection of the Water Quality Volume (first inch of runoff). Depending on soil conditions, an underdrain may be utilized, which is marked as optional in the standard detail.*
3. *Bioretention area sizing calculations:*
   Contributing pervious area: 0.62 acres
   Contributing impervious area: 0.16 acres
   Water quality volume for the 90% (1-inch) storm: 650 CF
4. *The owner of the property where the bioretention facility is proposed passed away in late 2018. As of January 2019 an administrator had been appointed but future ownership of the subject property, and thus willingness to proceed with final design and construction, is not known.*
5. *Orthophotos, parcel boundaries, and existing stormwater infrastructure mapping obtained from the Vermont Center for Geographic Information (VCGI), and confirmed by Stone.*
6. *Parcel boundaries do not represent a boundary survey and should be considered approximate.*

O:\PROJ-17\WRM\17-083 Essex, NRCD Concord SW\GIS\MapDocuments\PresentationsAndReports\Concord_Concept_3_v2.mxd Created by AM. Revised 3/7/2018 by AM. Reviewed by BAM

DRAWING CREDITS
Drawn On:11/20/2018
Drawn By: ANM
Checked On: 12/3/2018
Checked By: BAM
Project No.: 17-083

REVISIONS

#	Date	Drwn	Chk'd	App'd	Description
1	3/7/2019	ANM	BAM	ANM	Added note regarding change in property owner during project term.

DRAWING SCALE

CONCEPTUAL - NOT FOR CONSTRUCTION

N

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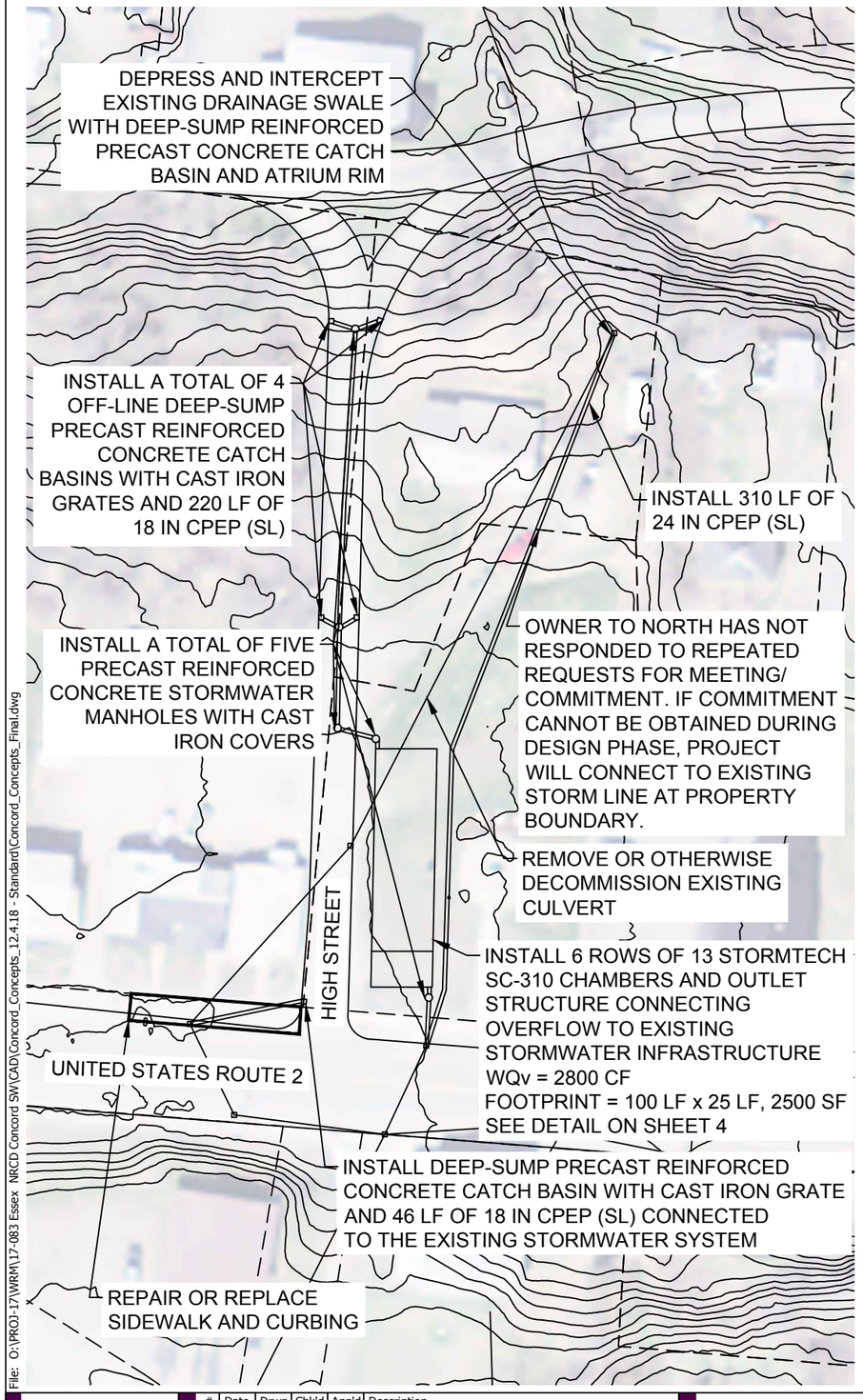
802.229.4541 / info@stone-env.com / www.stone-env.com

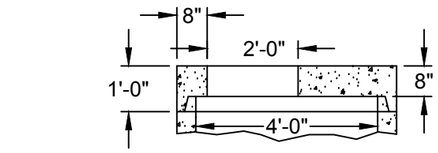
TOWN OF CONCORD
STORMWATER MASTER PLAN
AREA 3, HIGH STREET EXTENSION BIORETENTION
CONCORD, VERMONT

FIGURE NO. 1



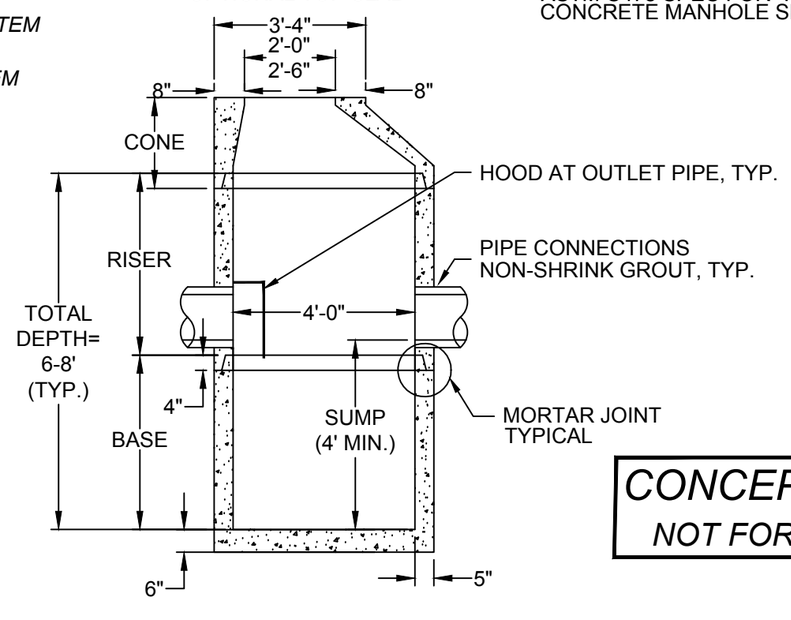
LEGEND

- *2-FT CONTOUR*
- *PARCELS*
- *EDGE OF PAVEMENT*
- *EDGE OF GRAVEL*
- *PROPOSED STORMWATER SYSTEM*
- *STORMWATER SWALE*
- *EXISTING STORMWATER SYSTEM*
- *STORMWATER CATCH BASIN*
- *STORMWATER MANHOLE*



OPTIONAL TOP SLAB

NOTES:
1. CONCRETE: 4,000 PSI MINIMUM AFTER 28 DAYS.
2. REINFORCED STEEL CONFORMS TO LATEST ASTM A185 SPEC. 0.12 SQ. IN./LINEAL FT. AND 0.12 SQ. IN. (BOTH WAYS) BASE BOTTOM.
3. H-20 DESIGN LOADING PER AASHTO HS-20-44; ASTM C478 SPEC FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS."



DEEP-SUMP PRECAST CONCRETE REINFORCED CATCH BASIN DETAIL
NOT TO SCALE

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

Notes:

1. *This practice will collect and treat runoff from High Street and contributing rooftops and driveways using deep-sump catch basins and infiltration chambers.*
2. *Basis of Design: To provide water quality treatment and remove sediment and nutrients from stormwater runoff via collection and infiltration of the Water Quality Volume (WQv = first inch of runoff). Volume reduction at the outfall is a secondary benefit.*
3. *Infiltration chambers have been sized based upon the WQv from High Street and contributing pervious areas.*
4. *Infiltration Chambers sizing calculations:*
   Contributing pervious area: 0.53 acres
   Contributing impervious area: 0.24 acres
   WQv for the 90% (1-inch) storm: 2,800 CF
5. *Orthophotos, parcel boundaries, and existing stormwater infrastructure mapping obtained from the Vermont Center for Geographic Information (VCGI), and confirmed by Stone.*
6. *Parcel boundaries do not represent a boundary survey and should be considered approximate.*
7. *This concept design assumes full-depth reconstruction and paving of High Street from U.S. Route 2 north to the intersection with High Street Extension as shown in the layout.*
8. *Soil screening will be required during final design to determine whether contamination is present at the site of the infiltration chambers, due to historic use as a gas station.*
9. *The leach field serving the Town Office building is believed to be located beneath the monument. Location to be confirmed during final design.*

File: O:\PROJ-17\WRM\17-083 Essex NRCD Concord SW\CAD\Concord_Concepts_12.4.18 - Standard\Concord_Concepts_Final.dwg

DRAWING CREDITS
Drawn On: 11/26/2018
Drawn By: BAM
Checked On: 12/04/2018
Checked By: ANM
Project No.: 17-083

REVISIONS

#	Date	Drwn	Chk'd	App'd	Description

DRAWING SCALE
0 60 120 Feet
1 INCH = 60 FEET

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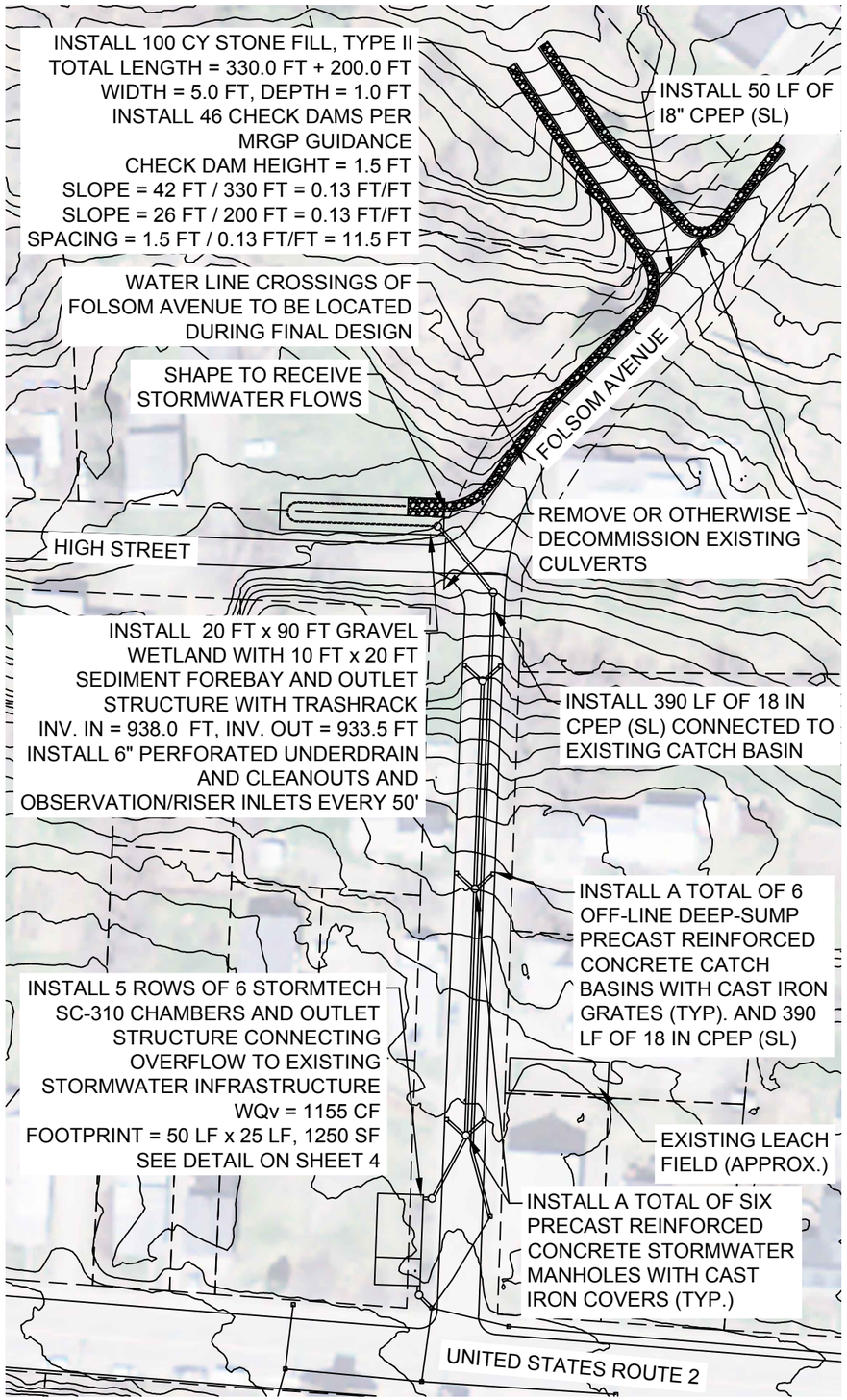
802.229.4541 / info@stone-env.com / www.stone-env.com

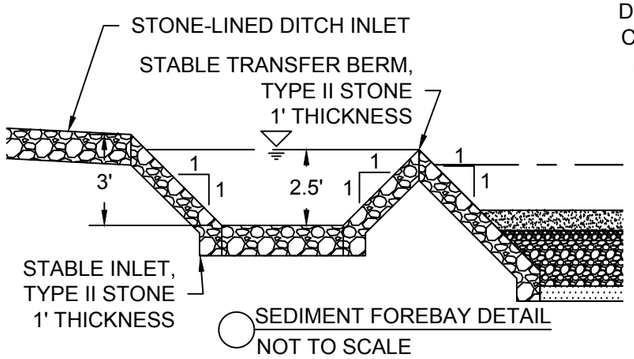
TOWN OF CONCORD
STORMWATER MASTER PLAN
AREAS 5-6, HIGH STREET INFILTRATION
CONCORD VERMONT

FIGURE NO. 2

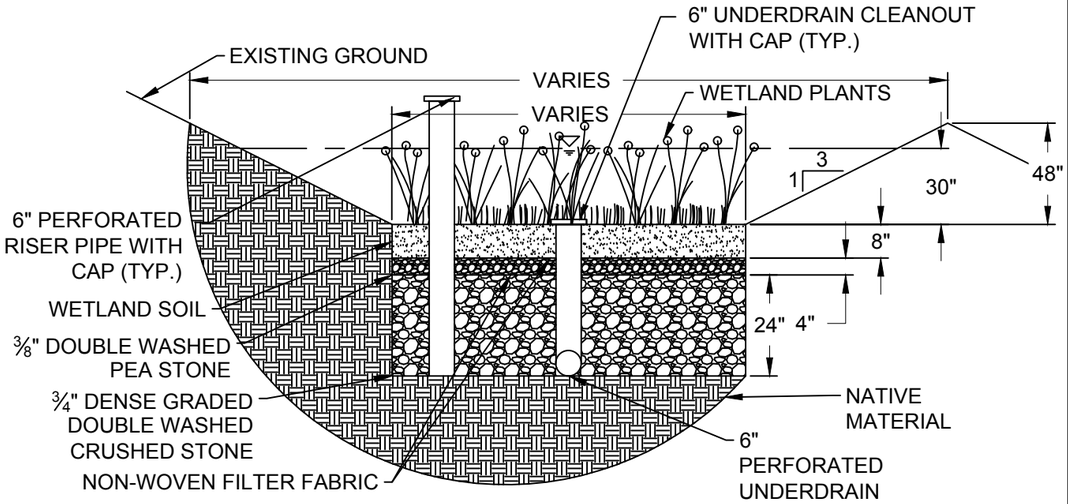


LEGEND

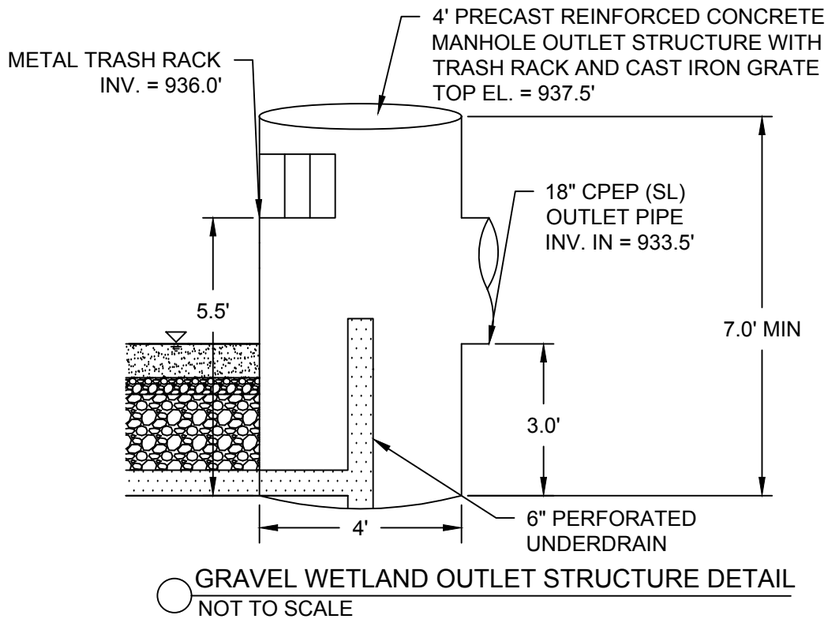
- *2-FT CONTOUR*
- *PARCELS*
- *EDGE OF PAVEMENT*
- *EDGE OF GRAVEL*
- *PROPOSED STORMWATER SYSTEM*
- *STORMWATER SWALE*
- *EXISTING STORMWATER SYSTEM*
- *STORMWATER CATCH BASIN*
- *STORMWATER MANHOLE*



SEDIMENT FOREBAY DETAIL
NOT TO SCALE



GRAVEL WETLAND DETAIL (CROSS SECTION)
NOT TO SCALE



GRAVEL WETLAND OUTLET STRUCTURE DETAIL
NOT TO SCALE

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

Notes:

1. *These practices will collect and treat runoff from Folsom Avenue, High Street, upland drainage areas, and contributing rooftops and driveways using gravel wetlands, deep-sump catch basins, and detention/infiltration chambers.*

2. *Basis of Design: To provide water quality treatment and remove sediment and nutrients from stormwater runoff via collection and infiltration of the Water Quality Volume (WQv = first inch of runoff). Volume reduction at the outfall is a secondary benefit.*

3. *Infiltration Chambers sizing calculations, assuming chambers only manage runoff from the paved portion of Folsom Avenue:*
   Contributing pervious area: 0.20 acres
   Contributing impervious area: 0.12 acres
   WQv for the 90% (1-inch) storm: 1155 CF

4. *The Gravel Wetland manages unpaved roads and a larger, vegetated drainage area. Is designed to manage approximately 7400 CF, which is 29% of the first inch of runoff.*
   Contributing pervious area: 5.92 acres
   Contributing impervious area: 1.14 acres
   WQv for the 90% (1-inch) storm: 25,520 CF

5. *Orthophotos, parcel boundaries, and existing stormwater infrastructure mapping obtained from the Vermont Center for Geographic Information (VCGI), and confirmed by Stone.*

6. *Parcel boundaries do not represent a boundary survey and should be considered approximate.*

7. *This concept design assumes full-depth reconstruction and paving of Folsom Avenue between U.S. Route 2 and High Street.*

File: O:\PROJ-17\WRM\17-083 Essex NRCD Concord SW\CAD\Concord_Concepts_12.4.18 - Standard\Concord_Concepts_Final.dwg

DRAWING CREDITS
Drawn On: 11/26/2018
Drawn By: BAM
Checked On: 12/04/2018
Checked By: ANM
Project No.: 17-083

REVISIONS

#	Date	Drwn	Chk'd	App'd	Description

DRAWING SCALE
0 80 160 Feet
1 INCH = 80 FEET

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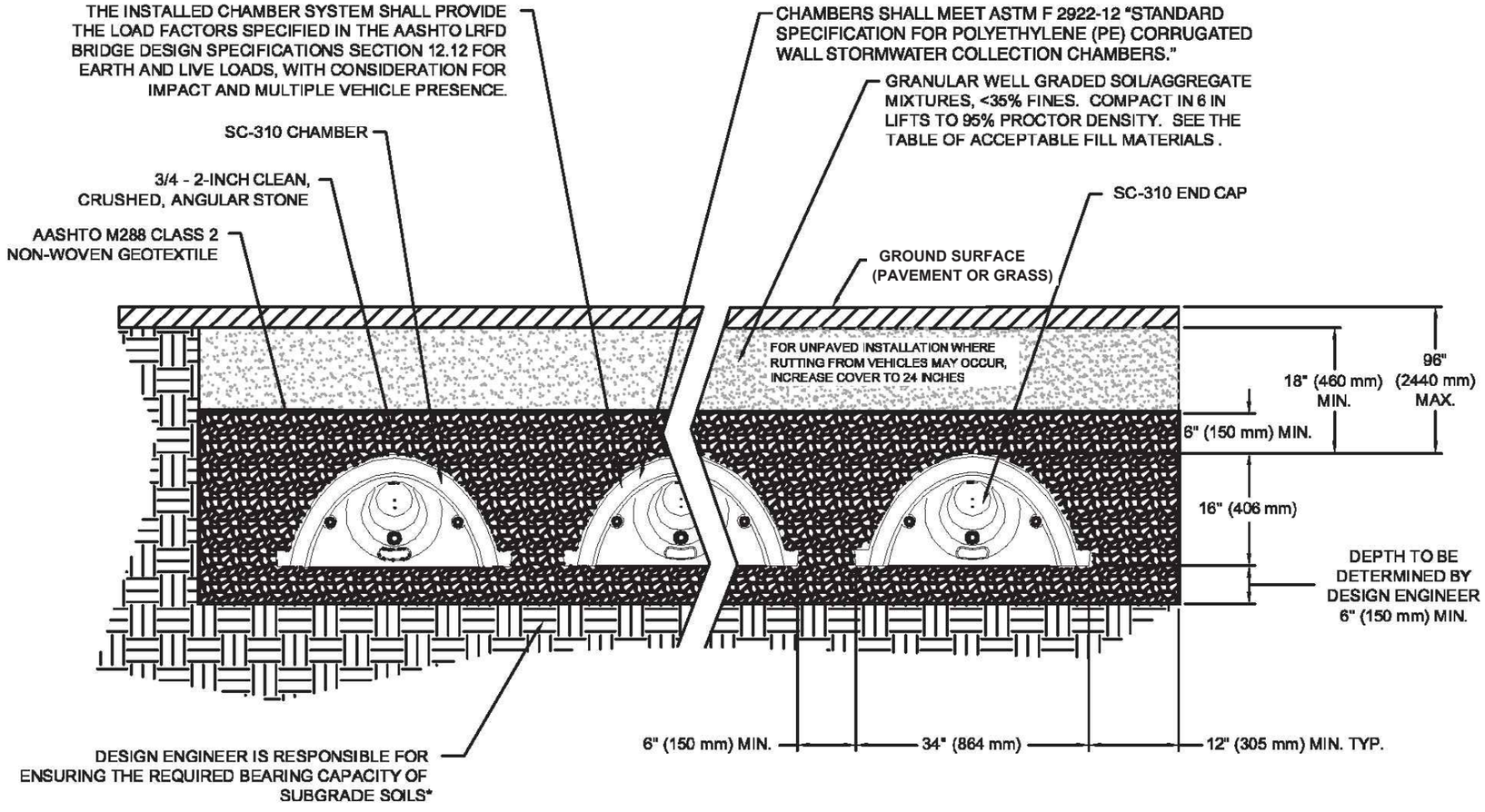
TOWN OF CONCORD
STORMWATER MASTER PLAN
AREAS 7-8, FOLSOM AVE. GRAVEL WETLAND & INFILTRATION
CONCORD VERMONT

FIGURE NO. 3



THIS CROSS SECTION DETAILS THE REQUIREMENTS NECESSARY TO SATISFY THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS USING STORMTECH CHAMBERS

CONCEPTUAL STORMTECH SC-310 DETAIL
NOT TO SCALE, NOT FOR CONSTRUCTION, FOR EXAMPLE ONLY

File: O:\PROJ-17\WRM\17-083 Essex NRCD Concord SW\CAD\Concord_Concepts_12.4.18 - Standard\Concord_Concepts_Final.dwg

DRAWING CREDITS
Drawn On: 03/05/2019
Drawn By: BAM
Checked On: 03/05/2019
Checked By: ANM
Project No.: 17-083

REVISIONS

#	Date	Drwn	Chk'd	App'd	Description

DRAWING SCALE

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802.229.4541 / info@stone-env.com / www.stone-env.com

TOWN OF CONCORD
STORMWATER MASTER PLAN
STORMTECH DETAIL
VERMONT CONCORD

FIGURE NO. 4

Appendix D. Stakeholder Meetings and Letters of Commitment

Selectboard Office
P.O. Box 317
Concord, VT 05824
(802)695-2910, ext.21
(802)284-2009

Concord Selectboard Regular Meeting Minutes

Tuesday, December 5, 2017 @ 6:00pm
Municipal Building

Official Copy

Selectboard
George Morehouse-Chairman
Chris Fournier-Vice-Chairman
Harold Lunnie
Bill Humphrey
Mike Sorrell

Selectboard Admin. Asst.
Susan LaMadeleine

Assessor
Bill Krajeski

Treasurer
Audra Girouard-Absent

Town Clerk
Cynthia Gaboriault

Road Commissioner
Dane Thorgalsen

Planning/Zoning Board
Cynthia Stuart

Stone Environmental
Kevin McCaffery

Animal Control Officer
Gigi Losh

Citizens
George Worthington
John Finnigan
Ted Gilman
(KATV)

CALEX Representative
Stephen West-Fisher

Essex County Natural Resources Conservation
Heather Robinson

Called to Order

George called the meeting to order at 6:00pm

George added item CALEX to the agenda and moved Stone Environmental from last item to first item under New Business.

Approval of Agenda

Chris made a motion to approve the agenda with the added item of CALEX and the change concerning Stone Environmental. Bill 2nd. Motion passed 5-0.

Approval of November 7, 2017 Regular Meeting Minutes

Mike made a motion to approve the November Minutes. Chris 2nd. Motion passed 5-0.

Citizen's Concerns

George presented a letter from Irving Priest and Sara Bierbaum for the Board to review concerning their dismay about the penalties imposed by the Town for filing the Homestead Declaration late.

John Finnigan, Oregon Road expressed concerns about the conditions in the winter on Oregon Road. He would like to see more salt used. Dane will look into.

Old Business

Town Clerk

Cindy stated to the Board that the Town Clerk's Office still has the odor. She requested that the Board resolve the problem.

Road Commissioner

Dane informed the Board that they are a truck down due to repairs. Truck should be fixed by Friday or Monday at the latest.

Assessor

Bill presented the Board with six Errors and Omissions Requests. He reviewed each request with the Board individually;

1. Geoffrey Gore, parcel 00387-003 and 00380-001, Chris made a motion to approve. Harold 2nd. Motion passed 5-0.
2. Anthony & Judith Willey, parcel 00171, Chris made a motion to approve. Bill 2nd. Motion passed 5-0.
3. Perry & Nancy LaPotin, parcel 00772, Bill made a motion to approve. Mike 2nd. Motion passed 4-0. George abstained.
4. Doris Morton, parcel 00765, Chris made a motion to approve. Harold 2nd. Motion passed 4-0. George abstained.
5. James & Susan MacPhee, parcel 00611, Chris made a motion to approve. Bill 2nd. Motion passed 5-0.
6. SolarSense VT II LLC, parcel 00551-001, Chris made a motion to approve. Bill 2nd. Motion passed 5-0.

Chris made a motion to ratify the Board's decision to approve the Errors and Omissions for Richard Benedict, parcel 00642 and Joanne, Richard Jr. & Gregory Benedict, parcel 00643. Bill 2nd. Motion passed 5-0.

Town Treasurer-Absent

New Business

Stone Environmental

Heather Robinson from Essex County Natural Resources Conservation and Kevin McCaffrey from Stone Environmental reviewed with the Board the Professional Services Agreement for the upcoming Folsom Avenue Stormwater Project. They will be starting survey work before the snow. Chris made a motion to retain Stone Environmental based on scheduling constrains. Mike 2nd. Motion passed 5-0.

CALEX

The Board and Stephen West-Fisher discussed whether to enter into a contract with CALEX for the 2019 Budget in the amount of $19,143.00 for ambulance services or to continue as an appropriation line item. In 2017, CALEX asked for an amount of $12,350.00, 2018 $17,908.00 and for 2019, $19,143.00.

Chris made a motion that since the Budget for 2018 contained an appropriation and moved that the 2019 Budget enter CALEX as an appropriation for $19,143.00 and waive the signature process. Mike 2nd. Motion passed 4-1.

Folsom Common

Cynthia gave a presentation to the Board regarding the playground project. She requested approval of the proposal to be able to move forward with the project. Chris made a motion that the Board approves the proposal for the playground project and gives it's blessing to move forward. Mike 2nd. Motion passed 5-0.

Town Meeting/ Informational Meeting

The Board discussed when the meeting should be held in 2018. Bill made a motion that the informational meeting be held on February 24, 2018 at 10:00am. Mike 2nd. Motion passed 5-0.

Planning/Zoning Board Update

Cynthia stated to the Board that Alan Smith, Zoning Administrator has sent a letter to the owners on the property located at 210 Main Street in regards to what is being done about the building which is half torn down. There has not been a response as of yet. Also, Cynthia advised the Selectboard that Stuart Gray has retired from the PB/ZB and they are seeking a replacement.

Animal Control Officer-Ratify

Gigi Losh introduced herself to the Board as the new Animal Control Officer. Chris made a motion to ratify the decision to appoint Gigi Losh as the new Animal Control Officer. Mike 2nd. Motion passed 5-0.

Dog Warrant

The dog warrant was presented to the Board for approval and signatures. Chris made a motion to approve and sign the Dog Warrant. Bill 2nd. Motion passed 5-0.

Proclamation Request

George referred the request to Cynthia Stuart since it pertains to Concord School.

Employee Handbook Revisions

The changes to the Handbook where reviewed by the Board. Bill made a motion to approve the recent amendments to the Personnel Policies and Rules Handbook. Mike 2nd. Motion passed 5-0.

Other-none

Executive Session: If discussion warrants, and the Board so votes, some items may be held in Executive Session.

Mike made a motion to go into Executive Session at 6:57pm to discuss personnel issues. Chris 2nd. Motion passed 5-0.

Out of Executive Session at 7:15pm.

Budget Meeting

Budget meeting will be held Wednesday, December 13, 2017 at 6:00pm in the Municipal Building.

Adjournment

Mike made a motion to adjourn at 7:20pm. Harold 2nd. Motion passed 5-0.

Respectfully submitted,

Date: 1/2/2018

George Morehouse-Chairman

Bill Humphrey

Chris Fournier-Vice-Chairman

Absent
Mike Sorrell

Absent
Harold Lunnie

Posted: December 11, 2017

Town of Concord Stormwater Stakeholder Meeting
January 25, 2019

Minutes

Meeting was called to order by George Morehouse
In Attendance:
Dane, Amy, George, Ben, and Jim

- Amy presented the SWMP, and stated no changes to high street. Amy expressed no major concerns remaining.
- George had asked if there was a spring during the walk around on High Street. We do not recall seeing a spring. Amy would like to reiterate in the next step to assess utilities. George stated there are water lines on Folsum Ave.
- Amy said she would like to follow up with Hazard Site Team to assess if there is a concern.
- George stated a portion of the Garage was located at the monument and found that there wasn't anything when they put the slab in for the monument.
- Amy stated it wasn't on the Hazard Waste Inventory.
- Jim recommended checking with Pollution Source Inventory.
- Ben asked would it be something with a Brownsfield Grant? Amy stated it would be for Abandoned Industrial.
- Jim asked if your relationship with St. Johnsbury is pertinent in removing sediment from the catch basins. Dane stated that the state never cleans out the Catch Basins but has a shaken hand agreement with St. J.
- Jim asked if you will have a section 111 permit with VTRANS.
- Ben mentioned we should look at a time-frame that is reasonable.
- Heather mentioned that we should do the 100% design for both High and Folsum Ave.
- Jim and Ben agreed, Heather and Amy may have to do two separate applications.
- Discussion was back and forth about DEC Block Grant. Jim reiterated that the new DEC Block Grant is incentivized.
- We moved to reviewing Folsum Ave concept design. Jim was concerned about plowing into the Gravel Wetland and discussion about alternatives for the two pipes coming down the road and recommending a weir structure.
- Jim asked is it a paved road or dirt road.
- It was noted in the future the road would be paved with catch basins.
- Jim stated in terms of ranking this project there is a greater emphasis on treatment.
- Ben said if your saving on pipe but treatment of is the same.
- Jim asked the town who would do the work for the pipe installation. Dane replied yes, if possible. Jim asked if it would be cheaper to constructed one pipe instead of two.
- Amy explained what an isolator was on the chamber system.
- George stated that the house on the east side has a spring that has a water line. Amy said the water line will be addressed during final design. .
- Jim asked about the playground and if it can be moved? George stated it is fairly new playground which was installed last year.

- Mention that match is coming in a few different ways in construction, and paving, and George mentioned $14,000 for possible match for the DEC Block Grant and mentioned to Ali that the Town is committed to the project. And match isn't necessarily needed.
- Apply for Better Roads Grant this fall.
- A landowner agreement from the Town for Feb. 3rd Selectboard meeting. For both properties.

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Selectboard Office
P.O. Box 317
Concord, VT 05824
(802)695-2910, ext.21
(802)284-2009, Fax

LANDOWNER PARTICIPATION AGREEMENT

The Essex County Natural Resources Conservation District (ECNRCD) and the Town of Concord are completing a Stormwater Master Plan for the Concord village area, with funding provided through a Vermont DEC Ecosystem Restoration grant.

During the development of Concord's Stormwater Master Plan, the property located at 155 High Street was identified as a location where a best management practice (BMP) that would manage runoff from the northern portion of Folsom Avenue could potentially be designed and constructed, resulting in reduced sediment loading and improved roadway safety along the southern, steeper portion of Folsom Avenue.

This grant requires ECNRCD to secure a written commitment of the landowner's willingness to proceed with design, and possible construction, of any BMP located on private property.

The landowner agrees that if and as the development of this BMP moves forward, access to the property will be allowed for ECNRCD or the Town of Concord to:

- Evaluate site and design options, and to observe construction and operation of the BMP.
- Conduct maintenance during the life span of the practice.

Access to the site shall be secured through consultation with the landowner to determine a mutually agreeable date and time for access.

The landowner will not be responsible for design or construction costs, nor for operation and maintenance responsibility, unless the landowner so chooses and makes an agreement with the Town of Concord to this effect.

Landowner — Date: 1/24/19

Heather Johnson
Essex County Natural Resources Conservation District — Date: 1/24/19

George Morehouse
Town of Concord — Date: 1/25/19

RECEIVED
JAN 24

Appendix E. Batch Input File for VTDEC Tracking

ProjectName	ProjectDescription	ProjectType	ProjectTypeID	SGA reach	Latitude	Longitude	Notes	Towns	SubBasin	Partners	PotentialFundingSources	ParentProjecID	Priority Type	Rating
Concord-Area 1-Town office bioswale	Install a bioretention area or bioswale retrofit at the western edge of the Concord Town Office parking lot to capture and treat run off from a 0.39-acre drainage area, including 0.31 acres of impervious surface (half of the building roof and the entire parking lot).	Stormwater - Preliminary Design	3		44.4291272	-71.88827089		Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	Medium
Concord-Area 2-High Street sedimentation basin and endwall upgrade	On High Street, repair erosion and install a small sedimentation basin to trap road material and install headwall and endwall. Drainage area to the sedimentation basin is 0.9 acres, with 0.18 acres impervious. The sediment basin addresses runoff from High Street that reaches a large cross culvert carrying primarily upland runoff from a wooded, 10-acre drainage across High Street. The cross culvert was recently upgraded, but there is no endwall and the surrounding fill is eroding.	Stormwater - Final Design	53		44.4298619	-71.88829285	Municipal Roads grants-in-aid may be a supplemental funding source for this improvement if needed	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Municipal budget	3207	Stormwater Master Plan	Medium
Concord-Area 3-High St. Extension bioretention	Install a small bioretention area or swale to manage runoff from homes, driveways, and gravel road, providing water quality treatment for a 0.78-acre drainage area and 0.29 acres of impervious surface.	Stormwater - Final Design	53		44.4298247	-71.88892223	Town is on board to implement, but property owner recently passed away and thus landowner participation not confirmed before end of project.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	High
Concord-Areas 5&6-High St base-of-hill retrofit, Post Office-Rte. 2 green space stabilization	Install clean water diversion and subsurface infiltration chambers in coordination with planned full-depth reconstruction of steeply sloping portion of High Street. Replace undersized and degraded existing pipe, directing clean upland runoff from a 10-acre drainage (see Area 2 in this Plan) to US Rte 2 closed drainage. Install new closed drainage system and infiltration or detention chambers to treat a 0.53-acre drainage area, including 0.24 acres of impervious surface. Improvments will address both sediment loading from existing gravel and paved roads, and erosion, sedimentation ,and ponding issues experienced in front of the Post Office and in the High Street / VT Route 2 intersection.	Stormwater - Final Design	53		44.4295694	-71.88815803	Area 5 and Area 6 preferred alternatives were combined into a single 30% design, including collection and treatment of runoff from existing paved road; which will be reconstructed in coordination with stormwater treatment improvements. Clean upland runoff to be directed to US Rte 2 closed drainage ultimately to Moose River.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program, Better Roads	3207	Stormwater Master Plan	High
Concord-Area 7 &8 - Folsom Ave and High St gravel wetland, Concord Park infiltration	Capture runoff from upper Folsom Ave and the east end of high Street north of intersection, treating runoff from a 7.06-acre drainage area with 1.14 acres impervious in a gravel wetland. Overflow from the gravel wetland is routed into a new closed drainage system down the paved portion of Folsom Ave to US Route 2 closed drainage. Construct new stormwater collection and infiltration or detention chambers to treat runoff from paved and steeply sloping portion of Folsom Ave, treating a 0.2-acre drainage and 0.12 acres of impervious. Project to be implemented in coordination with paved road reconstruction on Folsom Ave.	Stormwater - Final Design	53		44.4297366	-71.88627524	Area 7 and Area 8 preferred alternatives combined into a single 30% design, including treatment of runoff from existing unpaved road (upper portion of Folsom Ave.) by a gravel wetland, and collection and collection and treatment of runoff from existing paved road using infiltration chambers. Paved road segment will be reconstructed in coordination with stormwater treatment improvements. Overflow from both practices to be directed to US Rte 2 drainage and ultimately to Moose River.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program, Better Roads	3207	Stormwater Master Plan	High
Concord-Area 9-Concord Museum / Rte 2 gravel wetland	Redirect outfall pipe from Rte 2 drainage system to a gravel wetland practice west of museum building, treating runoff from an 8.97-acre drainage area and 1.79 acres of impervious surface.	Stormwater - Preliminary Design	3		44.4283381	-71.88674433	This project is down-system of Areas 7 and 8 and requires substantial VTrans input. VTrans District personnel not interested in the project when approached in 2018. Bench above outfall does not have wetland vegetation.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	Low

ProjectName	ProjectDescription	ProjectType	ProjectTypeID	SGA reach	Latitude	Longitude	Notes	Towns	SubBasin	Partners	PotentialFundingSources	ParentProjecID	Priority Type	Rating
Concord-Area 14-School gym rooftop disconnection	Remove gutter and downspout from a portion of the gym roof, and use a French drain to treat and potentially infiltrate some water before it discharges to parking lot and driveway, treating 0.05 acres of impervious surface.	Stormwater - Preliminary Design	3		44.4264756	-71.89021296	Due to school consolidation, none of the school-campus opportunities were advanced during stormwater plan development.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	Low
Concord-Area 16-School gym parking lot bioretention 2	install small sedimentation basin or potentially bioretention at head of stone lined channel leaving gym parking lot, managing 0.17 acres of impervious surface. Area available is very limited, may not be able to manage much volume without impacting parking and traveled way.	Stormwater - Preliminary Design	3		44.4265795	-71.89012612	Due to school consolidation, none of the school-campus opportunities were advanced during stormwater plan development.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	Low
Concord-Area 17-School gym rooftop disconnection 2	Gutter no longer exists, and makeshift stabilization practice appears to have been installed. Space is extremely limited but there may be an opportunity to improve by installing an infiltration trench or catch basin, managing runoff from 0.05 acres of impervious surface.	Stormwater - Preliminary Design	3		44.4263951	-71.89045005	Due to school consolidation, none of the school-campus opportunities were advanced during stormwater plan development.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	Low
Concord-Area 18-School access drive sedimentation basin	There is an opportunity to install a small water quality practice next to the access drive, managing runoff from a 0.77-acre drainage area with 0.7 acres of impervious cover. Runoff travels along the edge of the drive and then downslope onto an adjacent property through a stone lined channel. Space is extremely limited, and existing green belt appears to be used for occasional parking.	Stormwater - Preliminary Design	3		44.4267382	-71.89083584	Due to school consolidation, none of the school-campus oportunities were advanced during stormwater plan development.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	Low
Concord-Area 19-School front entry bioretention	Install a small bioretention area in island to treat run off from a portion of the access drive, managing runoff from a 0.15-acre drainage area with 0.14 acres of impervious surface.	Stormwater - Preliminary Design	3		44.4268273	-71.89020033	Due to school consolidation, none of the school-campus oportunities were advanced during stormwater plan development.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	Low
Concord-Area 20-School campus water quality retrofit	Install forebay and gravel wetland for water quality treatment for the majority of the drainage from the school, treating a 2.05-acre drainage area and 1.2 acres of impervious surface.	Stormwater - Preliminary Design	3		44.4268879	-71.88923664	Due to school consolidation, none of the school-campus oportunities were advanced during stormwater plan development.	Concord	Moose River	Concord Town, Essex County Natural Resources Conservation District	Ecosystem Restoration Program	3207	Stormwater Master Plan	Medium