Agenda Item IV.3

WATERSHED CONSULTING ASSOCIATES, LLC

Stormwater Management | Water Quality | Erosion Control

Town of Bristol, VT Stormwater Master Planning

PROPOSAL

July 26, 2018

Submitted To:
Claire Tebbs, Project Coordinator
Addison County Regional Planning Commission
14 Seminary St., Middlebury VT 05753

Submitted By:
Dana Allen, Water Quality Project Manager
Watershed Consulting Associates, LLC
208 Flynn Avenue, Suite 2H
P.O. Box 4413
Burlington, VT 05401

Addison County REGIONAL PLANNING COMMISSION

WATERSHED CONSULTING ASSOCIATES, LLC

July 26, 2018

Claire Tebbs, Project Coordinator
Addison County Regional Planning Commission
14 Seminary St., Middlebury VT 05753

RE: ***Stormwater Master Plan for Village Area in Bristol, Vermont***

Dear Claire:

Watershed Consulting Associates, LLC (WCA), with project partner Scott Michael Mapes, P.E., is pleased to submit this technical proposal and qualifications package for the Stormwater Master Plan for the Town of Bristol, VT.

Our team is a solid choice for this contract because;

- We understand the water quality issues driving this project and the regulatory framework that will require significant reductions in phosphorus discharges from developed lands.

- We have demonstrated experience working successfully to **complete innovative stormwater master plan projects** in several Vermont urban and rural communities, including Vergennes, Middlebury, Brandon, East Burke, Rutland, South Burlington, the Memphremagog Watershed, numerous towns in the Central Vermont Region, and St. Albans, to the satisfaction of our clients and the State Ecosystem Restoration Program.

- Our interdisciplinary experience allows our team to provide a **unique array of expertise and experience** necessary to meet the needs of this project – from initial project scoping to prioritization and solution design and implementation.

Our qualifications, experience, and drive for protecting our water resources in creative and effective ways sets us apart from our competitors. We are certain that our team will provide a superior deliverable, and that the Town of Bristol will recognize the quality and usefulness of our final product. We would be privileged to have the opportunity to work with you to develop a comprehensive stormwater master plan for the Town. Thank you for your time and consideration. We look forward to hearing from you.

Sincerely,

Andres Torizzo
WCA Principal

Dana Allen
Water Quality Project Manager

I. Project Background and Understanding

Bristol, Vermont is a small town located on a sandy plateau above the banks of the New Haven River, which flows to the Otter Creek and ultimately to Lake Champlain. While much of the landuse within the Town's boundaries is rural, there is a portion of the town which is more developed with village residential and light commercial landuses. This downtown village area is the primary focus of this project, specifically the stormwater subwatersheds mapped by the VT DEC labeled Bristol 3, 4, 7, 9, and 12.

The Town of Bristol is currently seeking to identify and prioritize stormwater retrofit sites with the goal of creating 3-5 sites for which 30% engineering design plans will be developed. This work is taking place in light of Act 64 and Lake Champlain Total Maximum Daily Load (TMDL) requirements which seek to reduce phosphorus loading to Lake Champlain via its tributaries though reductions in stormwater runoff pollution from developed surfaces. On a more local level, the 2012 Otter Creek Water Quality Management plan identified the New Haven River, the largest tributary to the Otter Creek at 116 square miles, as being 'stressed' as a result of sedimentation and aquatc habitat alterations from Weybridge upstream to the town of Bristol as a result of morphological instability (typically a result of high flow runoff events). The 'stressed' designation is also due to sedimentation and nutrient pollution from streambank erosion, channel instability, as well as agricultural runoff. Bacteria monitoring along the New Haven is ongoing. The Tactical Basin Plan specifically targets the reduction of stormwater runoff as one of its primary goals for the Town of Bristol.

Also of note, the plan describes the need to adopt zoning practices and regulations that would discourage development within river corridors given the tendency of some rivers, of which the New Haven is notably one, to adjust over time. On first review, the outfalls from the stormwater subwatersheds of concern in this project are all within the mapped River Corridor, precluding the ability to design retrofits in these locations. There may be some ability to create retrofits near the existing outfalls, however it seems as if respecting the river corridor will necessitate moving up into the subwatersheds to create more distributed stormwater management practices. Of note – the WCA and Scott Michael Mapes team has previously investigated retrofitting the Shaw's Supermarket site in Bristol in partnership with the property owner. It is likely that our relationship with this owner could lead to a successful concept design in which up to 3.92 acres of land, 2.84 acres of which is impervious, could be managed for stormwater.

Our team has been a leader in Vermont on stormwater master planning investigations. We developed a webinar series for the Vermont DEC on the Stormwater Master Planning Guidelines now being applied Statewide. We have also prepared the majority of the flow restoration plans for the stormwater-impaired watersheds in the State, and have also prepared several additional master plans along the Route 7 corridor and across the State. This knowledge and experience will allow us to be efficient, targeted, and focused for this assessment.

II. Project Team Qualifications

Watershed Consulting Associates, LLC (WCA), is pleased to submit this proposal and qualifications package. Our team is a wise choice because:

- Stormwater management and design is our **specialty and focus**.
- We have specialized experience showcasing **GSI and LID techniques** integrated with conventional grey retrofit solutions for stormwater master plan retrofit projects.
- **We are experts in an array of fields** needed to address the complexities of retrofits in priority watersheds-Hydrology, Hydrogeology, and Green Infrastructure
- Our team is familiar with **State of Vermont Stormwater Design Standards and Permitting** critical for assessing project feasibility at the initial planning phase, and tailoring solutions to the Town's needs.
- We have extensive **design experience** of stormwater retrofit solutions with **complex site constraints**

WCA is a leader in stormwater master planning in the State. A sample listing of ongoing and completed master plans is provided below:

Stormwater Master Plans	Flow Restoration Studies
✓ Vergennes ✓ Central Vermont (City and Town of Barre, Plainfield, Berlin, Woodbury, Calais, East Montpelier, Duxbury, Fayston, Moretown, and Warren) ✓ Harwood Union School (Duxbury) ✓ Fayston and Warren Elementary Schools (Fayston & Warren) ✓ Underhill (CCRPC) ✓ Park Street (Barre City; Friends of the Winooski) ✓ Quarry Hill and Sterling Hill (Barre Town / City; Friends of the Winooski) ✓ Brandon (Town of Brandon) ✓ Jericho (CCRPC) ✓ Town of Northfield GI retrofits (CVRPC) ✓ Tenney Brook / East Creek (RNRCD) ✓ Middlebury Downtown (Middlebury) ✓ Memphremagog Watershed (Memphremagog Watershed Association) ✓ Dishmill Brook (CNRCD) ✓ Lamoille small sites GSI assessment (LNRCD) ✓ College Street watershed (City of Burlington)	✓ Stevens Brook (St. Albans City, St. Albans Town, VTRANS) ✓ Rugg Brook (St. Albans City, St. Albans Town, VTRANS)) ✓ Allen Brook (VTRANS) ✓ Sunderland Brook (Essex / Colchester) ✓ Indian Brook (Essex) ✓ Potash Brook (South Burlington) ✓ Bartlett Brook (South Burlington) ✓ Munroe Brook (VTRANS) ✓ Upper Englesby (private client) ✓ Moon Brook (Rutland Town / VTRANS)

Watershed Consulting Associates (WCA), LLC is a Burlington Vermont-based environmental consulting firm specializing in stormwater management. WCA will be the prime consultant for this Project. WCA consists of a team of hydrologists, engineers, and water quality specialists with extensive experience in watershed investigation, stormwater retrofit evaluations, site design, H&H and water quality modeling, permitting, and GIS mapping & analysis. While many firms may offer stormwater management as one of many services, WCA recognizes that the growing complexity of the field now requires the highest level of attention to successfully keep on the forefront of new treatment designs and permitting requirements, and therefore, the field remains our exclusive focus. WCA is a short-list contractor in the fields of stormwater management and erosion control with VTRANS, and is a long-standing contractor with the State of Vermont Ecosystem Restoration Program. WCA is also a subcontractor on a General Environmental Services Contract through VTRANS as well as an Engineering Services contract through the City of Burlington, Vermont.

The following staff will be primarily involved with this project.

Andres Torizzo, Principal, has extensive experience with stormwater mapping, sampling, modeling, and design projects using GIS-based systems in Vermont and the NE Region. He is an excellent project manager, with the ability to manage multi-partner *interdisciplinary* project teams, while balancing the needs of clients and other stakeholders to complete sustainable high-quality deliverables. Mr. Torizzo has successfully completed numerous stormwater retrofit assessments and designs in Vermont communities for the VT ANR, VTrans, Municipalities, and private landowners. Mr. Torizzo holds an Undergraduate degree in Geological Sciences from Tufts University and a Masters Degree in Geography (Hydrology Focus) from the University of Colorado at Boulder. Mr. Torizzo has overseen all the Stormwater Master and Flow Restoration Plans developed at WCA.

Dana Allen, Water Quality Project Manager, holds an undergraduate degree in Geography and Environmental Studies from Middlebury College and a Master's of Science in Plant and Soil Science (focus in Water Quality and Ecological Landscape Design) from the University of Vermont. Mr. Allen has extensive GIS data collection and management experience, and has worked on a number of stormwater retrofit assessment projects with WCA. He is experienced with water quality sample collection and analysis from both point and non-point sources, specifically related to nutrient and bacterial pollution, and has a background in substrate nutrient removal for stormwater treatment. Mr. Allen worked on the Vergennes, Harwood Union School, Fayston and Warren Schools, Memphremagog Watershed, Dishmill Brook, East Creek – Tenney Brook, Brandon, Middlebury, Northfield, Burlington College Street, and Barre Park Street & Pouliot Avenue SWMPs.

Sean Brennan, Staff Scientist, completed a five-year engineering program between Saint Michael's College and the University of Vermont (UVM), earning a B.A. of Engineering with a minor in Mathematics from Saint Michael's, and a B.S. in Environmental Engineering from UVM. Mr. Brennan specializes in field-based work with a background in hydrology, as well as the planning and design of stormwater infrastructure. He also has research experience monitoring and modeling streambank stability in response to storm events in the Mad River Valley. Mr. Brennan has worked on the Vergennes, Central VT (I & II), Jericho, Underhill, and Vergennes SWMPs.

The following staff will not be assigned directly to this project, but will assist and support SWMP efforts where necessary.

Kerrie Garvey – GIS Manager, holds a Master's Degree in Natural Resources with a focus on fluvial geomorphology from the University of Vermont (UVM) where she used spatial analysis methods to quantify erosion and deposition associated with stream channel migration. She has extensive experience working with ArcGIS software, developing models and managing large datasets. She worked as a Research Specialist at UVM, developing ArcGIS models to assess road impacts on stream health and map imperious areas with a direct hydrologic connection to surface waters. Ms. Garvey also holds a B.S in Environmental Studies from Colby-Sawyer College and was employed for several years at a commercial GPS company developing and enhancing an extensive country-wide road network database for use in personal navigation devices.

Rebecca Tharp – Water Quality Program Manager comes to Watershed Consulting with an academic research and extension background studying stormwater treatment practices with a focus on green infrastructure. Ms. Tharp has been involved in project development, management, and installation, as well as scientific investigation of practice performance and development of regulatory standards.

At the VT Agency of Natural Resources, Ms. Tharp provided technical review for stormwater project applications. Ms. Tharp's specialties include in-field stormwater practice monitoring and evaluation, laboratory analytical methods, environmental pollutant measurement, scientific data analysis, communication with public and professional audiences, and measurement of learning outcomes.

Kateri Bisceglio, Water Quality Specialist, holds an B.S. in Environmental Science from Johnson State College, where she concentrated in water quality analysis and assessment. She has extensive experience working with water quality data, in particular phosphorus, chloride, WQ parameters for illicit discharge studies, and flow collection. With Watershed, she has been an integral team member in numerous stormwater master planning studies, as well as several illicit discharge projects, and is currently working on several water quality studies focused on chloride.

Scott Michael Mapes, P.E., Esq. (SMM) is a sole proprietor, in business since 1979. Scott is a Vermont Licensed Professional Engineer and a member of the Vermont Bar Association, both in good standing. SMM has provided engineering design consultation and legal counsel to public and private sector clients for nearly 30 years. Scott's experience in the field of water resource and stormwater assessment and wastewater treatment and design includes extensive site/soils evaluations, natural resource planning, mapping and impact assessment and associated land use design and permitting. SMM is a member of the Burlington Conservation Board and provides advisory as well as design services in the City of Burlington. He is a designer of innovative stormwater managements systems for 81 So. Williams Street, Ski Rack on Main Street, and Edmunds Elementary. He is VPA 2009 Citizen Planner of the Year and NNECAPA 2009 Citizen Planner of the Year, both for his work on the City Burlington Stormwater Task Force and rewrite of Chapter 26. The EPA also recognized the City of Burlington with a National Environmental Achievement Award 2009 for their Stormwater Ordinance Chapter 26 that Scott was part of. Finally, Scott is the Preservation Burlington 2010Ray O'Connor Award recipient for his significant contribution to the betterment of our community life through his efforts on Burlington Conservation Board.

GREENLEAF DESIGNS
ECOLOGICAL LANDSCAPE & GRAPHIC DESIGN

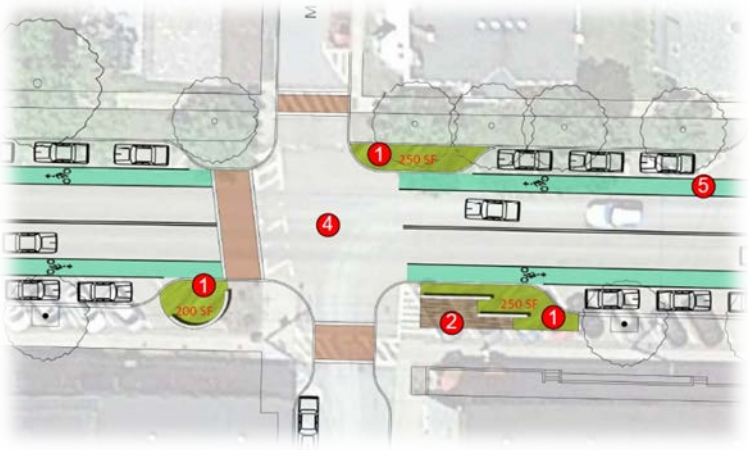
Holly Greenleaf, Freelance Designer, has diverse experience with stormwater management design and landscape visualization, specifically with green stormwater infrastructure. She is an excellent visual renderer, utilizing skills in graphic design, illustration, photo-simulation, and plant design, with acute attention to detail and a commitment to high quality graphics. Ms. Greenleaf has completed several stormwater-related visual rendering projects with WCA, including collaborations with Rutland High School, Fayston School, and Friends of the Mad River. She has also completed numerous visual rendering projects for VT ANR, VT DEC, VT Urban & Community Forestry Program, Nectar Landscape Design Studio, and Federation of Vermont Lakes and Ponds. Ms. Greenleaf holds an Undergraduate degree in Environmental Studies from the University of Vermont and is currently a Master's Candidate for a degree in Plant and Soil Science (Ecological Landscape Design Focus) from the University of Vermont.

III. Project Examples

Watershed Consulting Associates, LLC:

Vergennes Sanitary Sewer Mapping & Stormwater Master Plan, Vergennes, VT – 2017-2018

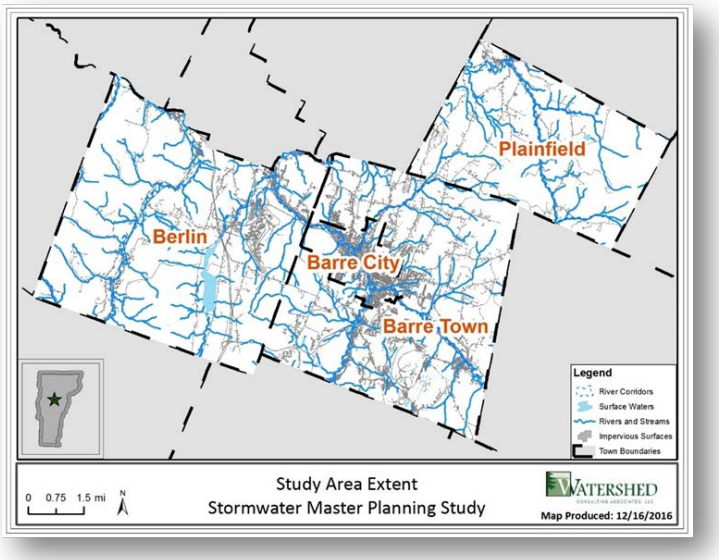
Contact: Mel Hawley, City Manager P: (802) 877-2841



WCA, along with project partners Lakeside Environmental Group (LEG) and Kevin Robert Perry of Urban Rain | Design, conducted a stormwater retrofit master plan and sanitary sewer mapping project for the City of Vergennes. The project entailed detailed site survey, Best Management Practice modeling and design, and the creation of site-specific planting plans for each site that took into account the flow regimes, soil types to be used in each BMP, and the stormwater runoff chemical characteristics expected for each site. WCA made use of a detailed prioritizatio and outreach process to select the final priority sites for concept design.

Central Vermont - Stormwater Master Plan, Central VT—2017 (Ongoing)

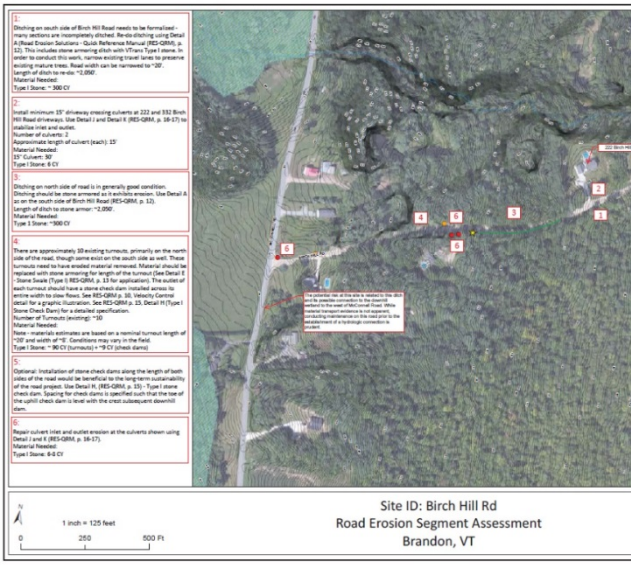
Contact: Dan Currier, Central Vermont RPC P: (802) 229-0389



WCA, in partnership with DuBois & King, Inc., is currently creating a stormwater master plan for the Town of Berlin, and the municipalities of Barre City, Barre Town, and Plainfield. Between 50 and 75 potential BMP project locations per municipality were identified and assessed in the field. These projects were ranked utilizing a project-specific matrix to identify a "Top 20" and "Top 5" list for each municipality. WCA also worked closely with municipal officials, attended Selectboard meetings, and interfaced with private landowners to seek local input in the development of these final project lists. WCA will provide cost estimates and 30% designs for these "Top 5" projects for each municipality (for a total of 20 designs. The ultimate goal of this project is to reducing phosphorus loading and sediment transport to the Winooski River, improving water quality and improving resiliency of these areas.

Town of Brandon - Stormwater Master Plan, Brandon, VT—2016-2017
Contact: Dave Atherton, Town of Brandon P: (802) 247-3635

The Town of Brandon received an Ecosystem Restoration Program grant to conduct a town-wide master planning study. WCA was hired to look at the Town's stormwater management retrofit opportunities. The project team gathered the necessary data, conducted preliminary desktop analysis, and field verified over 50 BMP opportunities. The Top 20 were selected, with 5 selected for final 30% design. Additionally, a concept rendering was developed for the Park Street neighborhood illustrating the potential streetscape bioretention features that WCA and project partner Aldrich and Elliott designed. WCA also conducted a road erosion assessment of 20 priority road segments and prioritized them. 5 sites were chosen to have final road erosion solutions developed for them.



Rutland High School – 100% Retrofit Design, Rutland VT—2017
Contact: Nanci McGuire, District Manager, Rutland NRCD P: (802) 775-8034

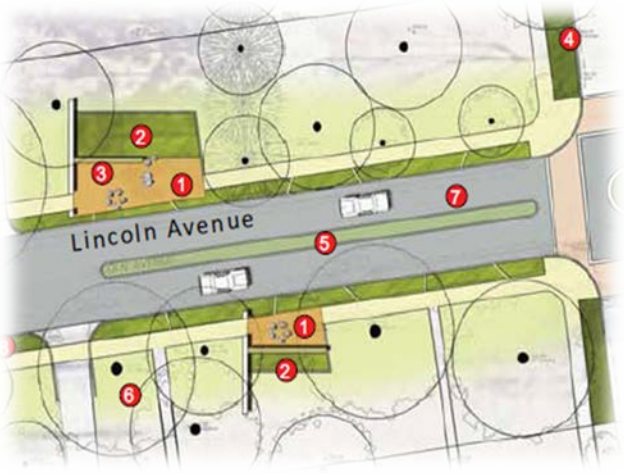
WCA developed a stormwater retrofit design, in partnership with Aldrich & Elliott, for a stormwater retrofit to treat the parking lot at the Rutland High School and Stafford Technical Center. The parking lot is split between the East Creek and Moon Brook watersheds. The portion that drains to East Creek passes through an undersized dry pond before entering the stormwater sewer. This project will create a gravel wetland to treat the water quality volume. The practice is designed to aesthetically enhance the entrance to the school. Watershed developed 100% concepts as well as a photo simulation for the gravel wetland.

Middlebury Downtown - Stormwater Master Plan, Middlebury, VT—2016
Contact: Claire Tebbs, Addison County RPC P: (802) 388-3141

Watershed Consulting Associates, LLC, in partnership with Urban Rain | Design and Lakeside Environmental Group, conducted a stormwater master plan for a portion of downtown Middlebury as part of a VT DEC Ecosystem Restoration Program grant administered by the Addison County Regional Planning Commission. Extensive watershed mapping was performed as part of this project to support hydrologic, hydraulic, and pollutant loading modeling to site, size, and prioritize projects with the drainage area. URD prepared three separate sheets showing potential stormwater management and green streets features. WCA, after meeting with the ACRPC and the Town of Middlebury Public Works and Planning Department, created three 30% designs for implementation with the ultimate goal of reducing phosphorus loading to tributaries of the Otter Creek.

East Creek – Tenney Brook Stormwater Master Plan, Rutland, VT—2014
Contact: Nanci McGuire, District Manager, Rutland NRCD P: (802) 775-8034

The Rutland NRCS, in partnership with the Town and City of Rutland, contracted WCA and local partners Lakeside Environmental Group (LEG), along with landscape architect Kevin Robert Perry of Urban Rain | Design, to develop a comprehensive stormwater master plan (SWMP) for the East Creek – Tenney Brook watershed to address water quality stressors and combined sewer overflow issues faced by the Town and City. The project involved development of a comprehensive data dictionary of existing water quality reports and GIS Data, the identification of need for new data for future projects, and extensive modeling for site selection using H&H and water quality parameters. Based on the results of the analysis and input from project partners, sites were prioritized and the top 20 sites were selected, for which 10 initial engineering (30%) site designs were developed. These sites were modeled and ranked using a comprehensive matrix, developed by WCA that takes into account each project's water quality and quantity benefits, costs, as well as the aesthetic, education, recreational, and other benefits provided by each project.



Vignette from an integrated stormwater streetscape design developed for the East Creek.

IV. Scope of Work

Task 1a – Kickoff Meeting

A kickoff meeting will be held with the Bristol SWMP Steering Committee to discuss the project. This meeting will establish a primary point of contact for the project. We will also discuss with the Steering Committee any known stormwater issues (outfalls causing excessive erosion, pollution hot spots, or other stormwater-related issues within the Town), as well as any development projects currently under-way or being planned where stormwater management features could be easily incorporated into the development process. This information will be used to guide our initial field work.

We will also discuss a project timeline with the Steering Committee and establish deadlines for Task Deliverables to supplement the deadlines proposed in this Proposal.

Deliverable:	Kickoff Meeting Minutes, Project Schedule
Date:	August 31, 2018

Task 1b – Data Acquisition and Review – Data Library Development

Initially we will conduct a desktop assessment of the study area, involving a thorough review of existing GIS resources and associated attribute data including storm sewer infrastructure, subwatershed delineations, soils classifications, and impervious area landuse delineations (if available).

We will also review relevant studies (Otter Creek Water Quality Management Plan, etc.) where applicable to gain an understanding of any water quality issues in Bristol specifically.

This data will be compiled into a data library of relevant GIS data, maps (as necessary) and a table, with appendices, summarizing any relevant studies, dates of publication, and any data gaps noted that will need to be rectified for the study.

Deliverable:	Digital data library, summary memo detailing data including origina, content, utility, and any missing data identified.
Date:	September 31, 2018

Task 2 – Existing Conditions Analysis

Task 2a – Desktop Assessment:

We will conduct a desktop assessment of the data collected in Task 1b, involving a thorough review of existing GIS resources and associated attribute data including those listed above as well as any other pertinent data identified. This data will be used to identify and map:

- stormwater subwatersheds with particularly high impervious cover
- stormwater subwatersheds that are more directly connected to water bodies (direct pipes to streams or via overland flow).
- areas where build-out studies (as available) have predicted major development where stormwater impacts may be worse in the future
- parcels with ≥3 acres of impervious cover without a current stormwater permit as these parcels will likely be subject to future stormwater permitting with forthcoming regulations
- properties with older stormwater permits that will be required to upgrade them under the forthcoming stormwater regulations (so-called ‘1-‘ and ‘2-‘ permits)

- more developed road segments appropriate for Green Stormwater Infrastructure (GSI) practices utilizing a methodology adapted from the "Promoting Green Streets" report published by the River Network (July, 2016)

Using this data, potential locations for stormwater best management practices (BMPs) will be identified across the study area. A point location will be generated for each site identified from this desktop work as well as all problem areas identified by the town so that they can be easily located and investigated in the field. It is expected that approximately 15-25 sites will be identified for further investigation.

Screening for natural resource constraints such as wetlands or hydric soils, floodplain or floodway concerns, and river corridor or stream buffers will also be a part of desktop assessment. These feasibility concerns will be noted for each potential project. All parcels that contain ≥3 acres of impervious cover without a current stormwater permit will be identified as part of this work. As this would have been a task that each municipality would have needed to complete in the near future due to Act 64 regulations, this dataset that will be provided to the municipality for their use in future planning will save them significant future effort. Additionally, older stormwater permit sites will be identified for possible retrofit. While this will be a requirement in the future, performing this work now will enable community stakeholders to begin to work with these sites in the near term.

This data will be used to prepare field maps with layers such as parcels, stormwater infrastructure, and soil types, for targeting field investigations of potential stormwater management sites. Additionally, we will use this time to develop an app for hand-held device use to use in the field for information collection that will facilitate the mapping and photo-documentation of potential retrofit sites.

Deliverable:	Map of Potential Retrofit Sites (15-25 sites), Follow-Up Meeting and Summary Memo.
Date:	November 31, 2018

Task 2b – Field Assessment:

Once the desktop data has been collected and analyzed and field maps and the data collection app prepared, we will conduct initial field visits, preferably in the company of Steering Committee members with particular knowledge of sites that are suffering from adverse impacts due to stormwater to assess them for retrofit feasibility. This field day will also be used to identify parcels of public property, public rights of way, or other pieces of property with potentially willing landowners where stormwater retrofits could be installed.

Once all of the field work has been completed a field data sheet will be created with a photo of the retrofit site, a management practice type and description, along with any potential auxiliary benefits (aesthetic, educational, traffic calming, etc.) or potential constraints (presence of utilities, access for construction, operation and maintenance issues, etc.).

Deliverable:	Map of sites visited, field data sheets for each site, summary memo
Date:	December 31, 2018

Task 3 – Project Prioritization:

Using the field assessment information prioritization factors, other prioritization factors will be considered as well including drainage area size (approximate), severity of pollutant runoff (qualitative), road segment priority based on inventory assessment, and other factors. See the table below for factors used. This information will be used to prioritize these initial sites. This will result in a prioritized table.

Table 1: Preliminary ranking criteria used to prioritize projects.

Criteria	Description	Score
Drainage Area Size	L - Large	25
	M - Medium	10
	S - Small	5
Pollutant Load Reduction Potential	H - High	25
	M - Medium	10
	L - Low	5
Impervious Area %	H - High	25
	M - Medium	10
	L - Low	5
Proximity to Water	H – High (closer to water)	25
	M - Medium	10
	L – Low (farther from water)	5
Hydrologic Soil Group	A - High infiltration potential	25
	B - Moderate infiltration potential	10
	C/D - Low or no infiltration potential	0
Land Owner	Municipality Owned (Parcels or Road ROW)	25
	Participatory Private / VTrans	10
	Unknown Private	0
	Non-Participatory Private	-25
Parcel with ≥3 acres of impervious cover, no permit or expired permit	Yes	15
	No	0

The map, field data sheets, and prioritization table will be used in a follow-up meeting with the Steering Committee to obtain the Committee's input on each site regarding feasibility and desire to see them implemented. From this initial list, 3-5 sites will be chosen for additional retrofit design to the 30% level. Additional work will include infrastructure verification, drainage area delineation, modeling for flow volume, peak discharge rate, pollutant load (sediment, phosphorus, and bacteria), and prioritization.

Once the follow-up meeting has taken place, we will write a short memo describing the process for initial site selection as well as the process by which the final sites were selected with Steering Committee input. This memo will be delivered to the Steering Committee after the follow-up meeting.

Deliverable: Prioritization table, summary memo (detailing prioritization criteria)
Date: March 31, 2019

Task 4 – Restoration (30% Concepts) Plans:

Using the priority sites agreed upon during the Steering Committee's follow-up meeting, the project team will conduct additional field visits to verify and refine stormwater infrastructure data (verifying pipe connections, catch basin locations, etc.), refine drainage area delineations with both best available topographic information (LiDAR contours available from VCGI) and field observations of actual drainage breaks. For each site's drainage area, we will generate detailed landuse GIS data layers to be used for pollutant loading and hydrologic and hydraulic modeling using WinSLAMM and HydroCAD modeling programs. Modeling will allow us to predict the approximate pollutant loading and flow reduction potentials for each site's retrofit practice. We will use this information to design retrofits for each location.

Initial retrofit 'sketch concepts' will be developed for discussion with the Steering Committee. These concepts may include potential alternative retrofit designs where appropriate. This level of design is intended to convey a good idea of the final potential practice, or practices, without proceeding to a far level of design. Once the Steering Committee and other involved stakeholders have had a chance to weigh in on these sketch concepts, more detailed 30% concepts will be developed.

Figure 1: Preliminary concept of a retrofit for the Shaw's area in Bristol developed in partnership with the property owner. Because of our relationship with the property owner, this site would have a high probability of becoming a priority retrofit design site.

For the detailed 30% concepts, site-specific survey will be conducted where necessary to support design.
These 30% plans will be of sufficient detail to show layout, approximate final grading (where necessary), infrastructure placement and type, planting plans (if applicable), and any associated sections or details. These plans will not be sufficient for construction on their own but should be of sufficient detail for planning purposes and application for grant funding for implementation funds. To support these plans, the project team will conduct site surveys using total station equipment to generate detailed topography, feature location, and utility infrastructure information.

Our project team will also generate detailed photo simulations of any Best Management Practices (BMPs) that will have a visual impact on the landscape. These could include bioretention, gravel wetland, infiltration basin, or other above-ground BMPs. In the case of subterranean practices such as stormwater infiltration chambers or dry well systems, we are not necessarily proposing to create photo simulations though could if the Steering Committee feels it would be helpful. We have found that these photo simulations are very helpful in achieving public buy-in for retrofits and are well worth the effort spent in creating them.

For any sites specifying infiltration, soil infiltration tests will be conducted to verify that soils are of sufficient quality to allow for infiltration as specified under the Vermont Stormwater Management Manual.

Prior to finalizing the 30% plans, the project team will submit the plans to the Steering Committee for review and comment to ensure that anything designed will be feasible from the Steering Committee's point of view. Once approved by the Committee, the project team will finalize the plans with any changes suggested by the Steering Committee and prepare cost projections for each practice to include the cost of time and materials to construct the practice, as well as any costs associated with final design, permitting, and construction oversight.

The project team will also model each practice in WinSLAMM (Windows Source Loading and Management Module) which is used to predict pollutant load reductions from drainage areas based on landuse, soils, and stormwater management practices.

Once completed, we will conduct a preliminary permit review to determine any potential permit needs for the retrofits. We will screen for Act 250, River Corridor, Wetlands, Stormwater, and Local permit needs. A permit summary will be part of the deliverables for this task.

WCA is familiar with VT DEC's guidelines for 30% concept design and will work to ensure that our deliverables meet or, in the case of preliminary permit review, exceed DEC standard guidelines.

Deliverable:	3-5 30% concept plans and photo simulations as appropriate, cost projections, permit summaries, summary memo (to include modeled pollutant reductions)
Date:	September 31, 2019

Task 5 – Final Stormwater Master Plan:

The process will be summarized in a final document that will detail the selection and design processes. Information from each of the previous memos will be included where necessary and appropriate. Final summaries for each chosen 30% design site will be included, along with any additional recommendations the project team may have for the town.

Deliverable:	Final Stormwater Master Plan (to include all previously generated information/maps/data, and concept plans).
Date:	November 28. 2019

Task 6 – Project Completion:

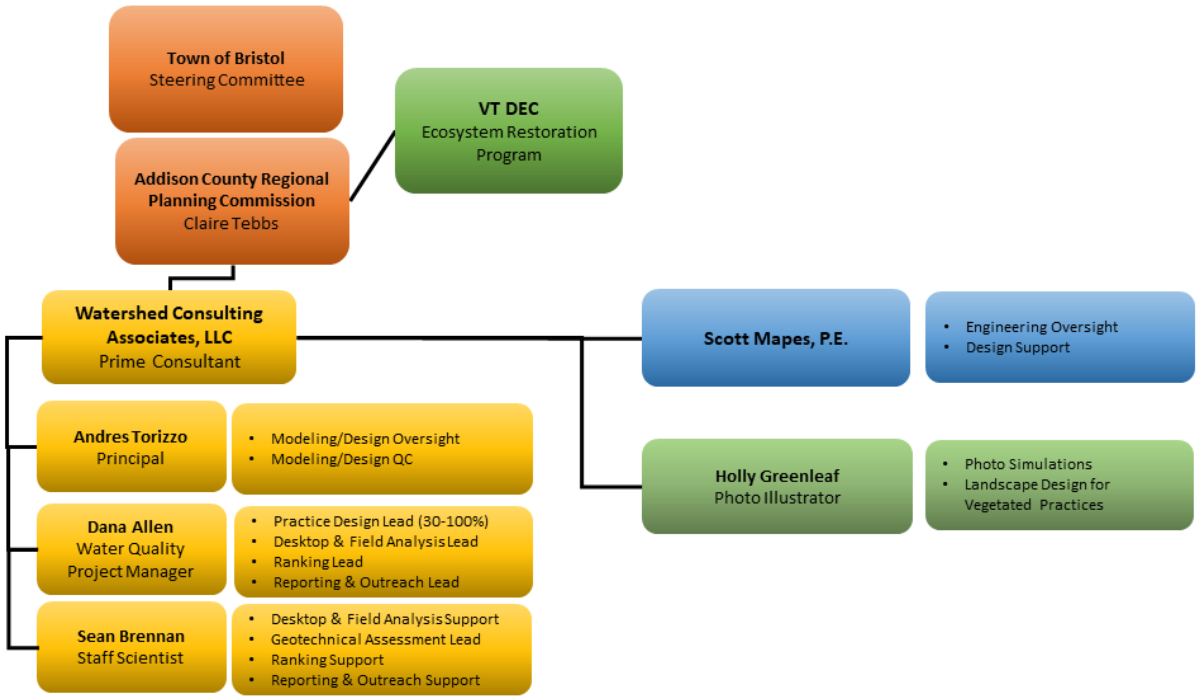
A VT DEC standard BMP report template will be filled out for each of the 30% concept design sites, which will include preliminary cost projections for the concepts at 30%. The Project Team will also conduct a public presentation in partnership with the Steering Committee.

Deliverable:	VT DEC BMP Report Template for each concept site, Public Presentation
Date:	December 15, 2019

V. Project Schedule

Project Task	2018					2019										
	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Task 1a - Kickoff Meeting																	
Task 1b - Data Acquisition & Review - Data Library																	
Task 2a - Desktop Assessment																	
Task 2b - Field Assessment																	
Task 3 - Project Prioritization																	
Task 4 - Restoration (30% Concepts) Plans																	
Task 5 - Stormwater Master Plan																	
Task 6 - Projection Completion																	

VI. Project Organization



VII. References

Pam DeAndrea, Senior GIS Planner
Central Vermont Planning Commission
deandrea@cvregion.com
Phone: (802) 229-0389

Mel Hawley, City Manager

City of Vergennes
mhawley@vergennes.org
Phone: (802) 877-2841

Nanci McGuire, District Manager, Rutland NRCD
nanci.mcguire@vt.nacdnet.net
Phone: (802) 775-8034

VIII. Project Team Resumes (following pages)

Andres Torizzo
Principal Hydrologist

LinkedIn http://www.linkedin.com/pub/andres-torizzo/15/861/981/

Mr. Torizzo is President and Principal Hydrologist of Watershed Consulting Associates, LLC (WCA), a firm specializing in stormwater management consulting services. Mr. Torizzo has worked for State agencies and numerous municipal and private entities on operational stormwater management and erosion-sediment control design and permitting issues, in a range of settings including linear transportation, commercial, industrial, residential, and agricultural.

Mr. Torizzo's specialties include stormwater mapping and inventory, illicit discharge detection and elimination (IDDE), stormwater hydrologic & hydraulic modeling, stormwater pollutant load modeling, retrofit design, low-impact development design, and Total Maximum Daily Load implementation (TMDL) investigations.

EDUCATION

M.A.	2002, Geography, University of Colorado at Boulder
B.A.	1998, Geological Sciences, Tufts University

PROFESSIONAL EXPERIENCE

2005-Present	Watershed Consulting
2002-2005	Ross Environmental
2002	Pioneer Environmental
1998-2002	U.S. Geological Survey, Water Resources Division

PROFESSIONAL CERTIFICATIONS

Certified Professional in Erosion and Sediment Control (CPESC) # 3318.

Certified Inspector of Sediment and Erosion Control (CISEC) # 48.

Certified Erosion, Sediment, and Stormwater Inspector (CESSWI) # 179.

Certified Professional in Stormwater Quality (CPSWQ) #119.

Recognized as proficient in Construction Site Stormwater Management by the IECA.

PROFESSIONAL AFFILIATIONS

Center for Watershed Protection Association
International Erosion Control Association

SELECTED PROJECT EXPERIENCE

Potash Brook Flow Restoration Plan (2014-2016) – Worked for the City of South Burlington, VT and the Vermont Agency of Transportation on a Flow Restoration Investigation for the stormwater-impaired Potash Brook watershed.

Kennedy Drive Pond Retrofit Design, VT (2017-2018) – Designed stormwater retrofits for the Kennedy Drive stormwater ponds in South Burlington, VT for flow-based TMDL compliance.

Sunderland and Indian Flow Restoration Plans (2014-2016) – Worked for the Town of Essex, VT to develop a Flow Restoration Plan for the stormwater-impaired Indian and Sunderland Brooks in Essex, Essex Junction, and Colchester, VT.

Drafting of Municipal Stormwater Management Rules (2015-2016) – In collaboration, developed rules and procedures for regulation of stormwater during development activities and protection of stream corridors in St. Albans.

Handy Apartments, Essex Junction, VT, Private Developer (2008-2010) – Designed a porous asphalt system for a proposed multi-unit apartment complex in a stormwater-impaired watershed, according to University of New Hampshire Stormwater Center design specifications. Responsible for runoff modeling and analysis, porous system design, and Village stormwater permit.

SPECIAL TRAINING

Raising the Bar: Green Stormwater Infrastructure Planning and Design Workshop, Burlington, VT, April 2014. Lead organizer and technical presenter.
Source Loading and Management Model (WINSLAMM) Training, University of Wisconsin Extension, Baltimore, MD, April 2012.
Permeable Pavement Design, Installation, and Maintenance, Center for Watershed Protection Webcast, November 2010.

Dana Allen
Water Quality Project Manager

Mr. Allen is currently the Water Quality Project Manager for Watershed Consulting Associates in Burlington, VT. Watershed Consulting specializes in stormwater management and erosion control design and permitting throughout Vermont and New England. In his role with Watershed Consulting, Mr. Allen has worked with State and local governmental officials, non-profit organizations, and private industry on operational stormwater management design and permitting, bioretention design and management, and hydrologic and hydraulic modeling.

EDUCATION

M.Sc.	Plant and Soil Science, University of Vermont
B.A.	2005, Geography and Environmental Studies, Middlebury College

PROFESSIONAL EXPERIENCE

2013-Present	Watershed Consulting
2010-2013	Graduate Research Assistant, UVM
2005-2010	Contractor, GIS Consulting

Mr. Allen's specialties include the sampling and analysis of water from both point and non-point sources for nutrient pollution assessment and management, Geographic Information Systems database creation, analysis, and management for water quality and hydrologic modeling, pollutant modeling, Low-Impact Development design and water quality sampling, and stormwater permit preparation.

SELECTED PROJECT EXPERIENCE

Vergennes Sanitary Mapping and Stormwater Master Plan (2017-2018) – Conducted detailed mapping of Vergennes' sanitary sewer in an effort to mitigate combined sewer overflows due to intrusion of groundwater. Assessed the City's stormwater sewer system for potential retrofits to better manage stormwater runoff, as well as improve traffic and pedestrian access on Main Street.

Town of Brandon Stormwater Master Plan (2016-2017) – Worked with Town of Brandon to develop 5 30% plans for stormwater management, include a streetscape renovation to improve stormwater flows and aesthetics. Assessed several miles of rural roads for stormwater impacts and management opportunities.

Town of Northfield – 100% Design for Stormwater Retrofit (2018) – Developing design for a large sub-surface stormwater chamber system underneath a publicly-owned parcel of land in Northfield, VT to manage a large, developed drainage area.

Lamoille County Natural Resources Conservation District – Eden and Hyde Park AOP Projects (2015-2017) – Managed Aquatic Organism Passage projects for two structures in Eden and Hyde Park. Conducted initial site surveys, analyzed soil and bedrock conditions, developed models for hydrologic and hydraulic conditions for both fish passage and high flow passage. Assisted in the development of final designs for both structures, including cost estimation and permitting requirements.

Cambridge Elementary School – Stormwater Master Plan (2015 – 2016) – Working in conjunction with the Lamoille County Regional Planning Commission and the Cambridge Elementary School, developed a full design for an innovative sub-surface chamber and infiltration basin system to manage nearly 4 acres of impervious surface. Created a plan for numerous, distributed GSI practices on the school campus.

Middlebury Downtown – Stormwater Master Plan (2015-2016) – Partnered with the Addison County Regional Planning Commission to develop a stormwater master plan for a portion of downtown Middlebury as part of a VT DEC Ecosystem Restoration Program (ERP) grant.

Sean Brennan E.I.T.
Water Quality Engineer

Sean Brennan is currently a Water Quality Engineer at Watershed Consulting Associates, LLC, a Vermont-based firm specializing in stormwater management to protect and preserve natural surface water resources. Mr. Brennan completed a five-year engineering program between Saint Michael's College and the University of Vermont (UVM), earning a B.A. of Engineering with a minor in Mathematics from Saint Michael's, and a B.S. in Environmental Engineering from UVM.

Mr. Brennan specializes in field-based work with a background in hydrology, as well as the planning and design of stormwater infrastructure. He also has research experience monitoring and modeling streambank stability in response to storm events in the Mad River Valley.

EDUCATION

B.S. 2016, Environmental Engineering
University of Vermont

B.A. 2015, Liberal Studies
Saint Michaels College

PROFESSIONAL EXPERIENCE

June 2016 - Present
Watershed Consulting Associates, LLC

Seasonally 2012 - 2016
StructureTone Inc.

Summer 2014 & 2015
VT EPSCoR: Research on Adaptations to Climate Change Program
Research Intern

SELECTED PROJECT EXPERIENCE

Other Towns Illicit Discharge Detection and Elimination Study, Statewide, VT (Ongoing) – Conducting dry weather surveys of stormwater outfalls across the State. Collecting samples from flowing infrastructure and analyzing for a series of water quality parameters indicative of typical illicit discharges. Compiling, organizing, and interpreting data to assist with planning next steps in the study process. *Staff Scientist.*

Lincoln Street Stormwater Mitigation Project, Essex Junction, VT (2016) – Completed stormwater mitigation project for the Town of Essex Junction as part of the UVM Engineering Department's senior design requirement. Performed hydrological assessment of the area and designed a bioretention system to successfully mitigate stormwater runoff to a nearby stream. *Staff Scientist.*

Stream Bank Stability Research, Mad River Valley, VT (2014-2015) – Conducted extensive research on streambank stability on the Mad River and its tributaries. Several soil characteristics were quantified in order to build and run models in BSTEM, the USDA's Bank Stability and Toe Erosion Modeling program. The models were verified and calibrated through the monitoring of streambank failures using real-time accelerometers with respect to stream and groundwater levels measured by pressure transducers and monitoring wells. *Staff Scientist.*

SELECTED PRESENTATIONS

Brennan, S. 2016. Coupling Fieldwork with Computer Modeling to Simulate Stream Bank Failure in the Mad River Valley, Vermont EPSCoR Student Research Symposium, EPS-1101317, March 29, Burlington, VT.

Brennan, S. 2015. The Quantification of Added Cohesion due to Vegetation in the Mad River Valley, Vermont EPSCoR Student Research Symposium EPS-1101317, March 30, Burlington, VT.

Scott Michael Mapes, P.E., Esq.

P.O. Box 5517
Burlington, VT 05402
802-864-8100
SMMapes@aol.com

Education:

Vermont Law School, South Royalton, Vermont. August 1984-May 1987. Juris Doctor.
Norwich University, Northfield, Vermont. August 1975-May 1979. Bachelor of Science in Environmental Technology. Magna cum laude. Epsilon Tau Sigma Honor Society. Vermont Society of Professional Engineers Scholarship, 1979.
Missisquoi Valley Union High School, Swanton, Vermont. June 1975. Summa cum laude. National Honors Society So., Jr. and Sr. years.

Expertise:

Engineering design, planning and project management for general civil engineering projects including water and wastewater system site evaluation and design; site and soils analyses; natural resource mapping and planning; stormwater site evaluation and design; state and local permitting; legal analyses and consultation on Vermont's environmental and land use permit regulations and laws.

Legal Experience:

Legal Advisor, sole practitioner, Burlington, VT. Provide legal opinions, advice and consultation regarding Vermont's state and local environmental and land use permits to private and public sector clients, October 1988-Present. Licensed to practice law in VT since October 1988.

Judicial Clerk, student intern for the Honorable Frederick W. Allen, Chief Justice, Vermont Supreme Court, Montpelier, VT, January 1987-April 1987.

Research Assistant, Environmental Law Center, South Royalton, VT. Perform research under the direct supervision of Dr. Richard O. Brooks, Professor and Director of the Environmental Law Center. Develop a solid waste management scheme for the State of Vermont and provide legal basis for its implementation. September 1986-December 1986.

Law Clerk, Vermont Department of Agriculture, Montpelier, VT. Interpret statutes and prepare regulatory programs in accordance with Vermont's Administrative Procedures Act. Assist in administrative, civil and criminal proceedings. May 1985-August 1985.

Engineering Experience:

Consulting Engineer, sole practitioner, Burlington, VT. Water supply, wastewater disposal and treatment design; site and soils analyses; erosion prevention and sediment control plans; stormwater impact review and assessment and stormwater treatment and design; natural resource planning and impact assessments; and prepare state and local environmental and land use permit applications. February 1984-Present. VT Professional Engineer License #5007.

Associate Engineer, JH Stuart Associates, Burlington, VT. May 1979-February 1984.

Life long resident of Vermont. Long time soccer player, coach and administrator.

GREENLEAF DESIGNS
ECOLOGICAL LANDSCAPE & GRAPHIC DESIGN

Burlington, Vermont
greenleafholly@gmail.com
(802) 535-8737

HOLLY GREENLEAF

Freelance Designer

Ms. Greenleaf is an ecological landscape designer, specializing in stormwater management design and landscape visualization. She is currently a Master's Candidate for a degree in Plant and Soil Science from the University of Vermont, studying Ecological Landscape Design with a research focus on green stormwater infrastructure.

Ms. Greenleaf has partnered with Watershed Consulting Associates (WCA) on numerous projects to visually render landscape changes related to stormwater management, erosion control, and green infrastructure, collaborating with non-profit organizations and state and local government officials. She specializes in photo-simulation, illustration, graphic design, and plant design to depict future landscape scenarios to clients.

EDUCATION

M.Sc. Candidate	Plant and Soil Science, University of Vermont (UVM)
B.A.	2014, Environmental Studies, UVM

PROFESSIONAL EXPERIENCE

2014-Present	Landscape Designer & Consultant
2016-Present	Graduate Research & Teaching Assistant, UVM

Selected Project Experience

Friends of the Mad River Video Graphics, WCA (2018) - Developed photo-simulations of stormwater best management practices for homeowners and conceptual infographics for visualizing watersheds and stormwater flow paths for a public outreach and education video project.

Shady Rill Stream Buffer Improvements, WCA (2018) - Created photo-simulations of stream buffer improvements for Shady Rill Picnic Area, including native riparian buffer, access relocation, and infiltration steps.

Rutland High School Stormwater Retrofit, WCA (2018) - Depicted stormwater retrofits for the parking lot, including a swale, bioretention cell, and gravel-bed wetland with photo-simulation renderings.

Fayston Elementary School Gravel Wetland Retrofit, WCA (2018) - Illustrated a proposed gravel wetland retrofit using photo-simulation to show views from the road and proposed vegetation changes.

Urban Resilient Rights-of-Way, VT Urban & Community Forestry Program, VT ANR, (2017-Present) - In collaboration with Vermont towns, developing visual renderings of green stormwater infrastructure in the public ROW to provide education and outreach materials to improve municipal stormwater management.

Lake Wise Program Evaluations and Design Recommendations, VT DEC (2016) - Proposed lakeshore restoration design recommendations for state parks and private properties, including conceptual diagrams and photo-simulations of proposed best practices for stormwater management, erosion control, and public use.

VT Agricultural Resilience in a Changing Climate Research Initiative, UVM (2014-2016) - As a research assistant, studied the use of landscape visualizations (photo-simulations) of agricultural best management practices for climate change adaption on Vermont farms to communicate complex landscape changes.

Selected Presentations

"Utilizing landscape visualizations of bioretention in the public right-of-way to understand perceptions about maintenance and visual appeal of green stormwater infrastructure." **International Low Impact Development Conference**, AWRI, ASCE, Nashville, TN. August 12-15, 2018.

"Visualizing Green Stormwater Infrastructure (GSI) to understand maintenance capacities of Vermont towns and aesthetic preferences of Vermont municipal officials." **Lake Champlain Research Conference**, Lake Champlain Basin Program (LCBP), Burlington, VT. January 8, 2018

"Using Place-based Landscape Visualizations for Stakeholder Communication about Agricultural Adaptation to Climate Change." **American Water Resources Association Summer Specialty Conference**: Climate Change Solutions: Collaborative Science, Policy, and Planning for Sustainable Water Management, Tysons, VA. June 26, 2017.

IX. Project Budget

Task	Key Team Member Roles	Person Hours	Direct Labor Cost	Overhead Rate (134%)	Profit	Hourly Rate	Cost
Task 1 - Kickoff Meeting & Data Acquisition & Review - Data Library Development							
Task 1a - Kickoff Meeting	D. Allen	3	$48	$65	$11	$125	$374
	S. Brennan	3	$35	$47	$8	$90	$269
	Mileage			60			$33
Task 1b - Data Acquisition & Review - Data Library Development	A. Torizzo	1	$60	$81	$14	$155	$155
	D. Allen	2	$48	$65	$11	$125	$250
	S. Brennan	6	$35	$47	$8	$90	$540
	Mileage						$0
						Subtotal TASK 1.	**$1,620**
Task 2 - Existing Conditions Analysis							
Task 2a - Desktop Assessment	A. Torizzo	4	$60	$81	$14	$155	$620
	D. Allen	8	$48	$65	$11	$125	$1,000
	S. Brennan	16	$35	$47	$8	$90	$1,440
Task 2b - Field Assessment	D. Allen	12	$48	$65	$11	$125	$1,500
	S. Brennan	16	$35	$47	$8	$90	$1,440
	Mileage			120			$65
						Subtotal TASK 2.	**$6,065**
Task 3 - Project Prioritization							
Task 3 - Project Prioritization	A. Torizzo	1	$60	$81	$14	$155	$155
	D. Allen	8	$48	$65	$11	$125	$1,000
	S. Brennan	12	$35	$47	$8	$90	$1,080
						Subtotal TASK 3.	**$2,235**
Task 4 - Restoration (30% Concepts) Plans							
Task 4 - Restoration (30% Concepts) Plans	A. Torizzo	8	$60	$81	$14	$155	$1,240
	D. Allen	16	$48	$65	$11	$125	$2,000
	S. Brennan	25	$35	$47	$8	$90	$2,250
	H. Greenleaf	16	$29	$39	$7	$75	$1,194
	S. Mapes	22	$58	$78	$14	$150	$3,307
	Mileage			120			$65
						Subtotal TASK 4.	**$10,057**
Task 5 - Stormwater Master Plan							
Task 5 - Stormwater Master Plan	D. Allen	8	$48	$65	$11	$125	$1,000
	S. Brennan	10	$35	$47	$8	$90	$900
						Subtotal TASK 5.	**$1,900**
Task 6 - Project Completion							
Task 6 - Project Completion	A. Torizzo	4	$60	$81	$14	$155	$620
	D. Allen	8	$48	$65	$11	$125	$1,000
	S. Brennan	8	$35	$47	$8	$90	$720
	Mileage			60			$33
						Subtotal TASK 6.	**$2,373**
	Person Hours Project Total	**517**				**Mileage Total**	**$196**
Grand Total							**$24,250**