Winooski Basin Clean Water Service Provider:
FY24 Round 4 Call for Proposals

The Central Vermont Regional Planning Commission, in its role as the Clean Water Service Provider for the Winooski Basin, is accepting applications for funding for non-regulatory, phosphorous reduction projects that improve water quality. Fiscal Year 2024 - Round 4 proposals are due by 4:00 PM on 9 May 2024. For more information, including submission details, see the Winooski Clean Water Service Provider webpage.

0. Project Eligibility

Please Review the following reference materials before completing your proposal:

- *FY23 Clean Water Initiative Program Funding Policy*
- *Act 76, Clean Water Service Provider Rule and Guidance & explanatory materials*

Is the portion of the project for which you seek funding both non-regulatory and voluntary? (i.e. not a required or compelled element of a regulatory permit or a legal settlement)? **(answer must be Yes to proceed)**	Yes
Does the project type meet the applicable definitions and minimum standards in the FY23 Clean Water Initiative Funding Policy? **(answer must be Yes to proceed)**	Yes

1. Applicant Information

Organization/Municipality Name: Vermont Land Trust
Primary Contact: Allaire Diamond
Title: Ecology & Restoration Program Director
Mailing Address: PO Box 850, Richmond VT 05477
Phone Number: 802-879-6672
E-mail Address: allaire@vlt.org

Has the proposing organization / municipality been pre-qualified to receive subcontracts / subgrants from the Central Vermont Regional Planning Commission serving in its capacity as the Winooski Basin Clean Water Service Provider?* * If you responded no to this question, please include Qualification Materials along with your funding proposal. See the Winooski Clean Water Service Provider webpage for more details.	Yes

2. Project Information

Project Title: John Fowler Rd. Winooski Berm Removal: Final Design and Implementation
Watershed Projects Database ID*: Pending; submitted 5/9/24. Project will have two WPD-IDs.

* Projects without a Watershed Projects Database ID will be evaluated. However, prior to receiving funding, a project must be entered into the Watershed Projects Database. See pages 11-13 of the FY23 Clean Water Initiative Funding Policy.

Select the most representative project type (according to Appendix B Project Types Table of the 2023 CWIP Funding Policy) from the dropdown list below.*

Floodplain/Stream Restoration – Implementation

* If there is more than one project type associated with the proposal, enter additional project types in the Project Description section below.

Project Phase for which you are seeking funding: Implementation

Project GPS coordinates (e.g. 44.26278, -72.58054):
44.28548, -72.41334
Project Sub-basin: Tributaries to Upper Winooski

3. Project Description

Describe the proposed project. Include the following: project history; the phosphorus reduction practices that will be developed, designed or implemented with the requested funds; ***details*** *of the project development activities, conceptual or final design plans and cost proposals (if available); and* ***references*** *to prior plans and studies that support the funding request. Propose a project schedule based on the milestones of the proposed project type. Assume a 7 May 2024 start date. (1000 words maximum)*

The project is a final design and implementation for a berm removal along the Winooski River just north (upstream and river left) of the John Fowler Rd. bridge in Marshfield. The berm extends across two properties: a state-owned (Vermont Fish & Wildlife) river access parcel along the road, and a bare land parcel owned by Tim and Marie Maclay, which has long been managed for hay. The berm impedes floodplain access by the Winooski as detailed in the included existing conditions & hydraulic analysis memo. The Maclay parcel was conserved with a River Corridor Easement in 2021 with the previous owners (Fairmont Farms). Vermont Land Trust is the current project manager and has retained Fitzgerald Environmental Associates to complete preliminary and 60% design, which was funded by the Winooski BWQC.

This site-specific design and analysis work determined that berm removal will reconnect approximately 4.6 acres of floodplain and increase connectedness from a 'moderate' to a 'high' level resulting in an expected long-term attenuation rate of 14.9 kg P/year across the reconnected floodplain area (3.24 kg/acre/year). We propose here to finalize the 60% design to a 100% design, refine wetland delineation, and then move to construction following those plans once necessary approvals, review, and permits are secured and a construction contractor has been retained according to necessary procurement policies. Earth from the berm will most likely be deposited on the Maclay property in areas determined by all project partners to be appropriate. We intend to continue to work closely with DEC staff including river and wetland scientists and the Winooski basin planner, as well as Vermont Fish & Wildlife staff as a project landowner.

The berm removal will be followed by a riparian planting as a separate project, to be coordinated by Friends of the Winooski River.

4. Staff Capacity & Past Experience

A list of key staff and a (brief) description of their role in the project. If any of the staff listed here were not included in your organization's pre-qualification materials, please attach a one-page resume describing their qualifications to the project proposal.

Name	Project Role
Allaire Diamond	Ecology & Restoration Program Director; Project Manager
Tyler Miller	Vice President for Land Activation; Project Oversight

Provide three examples of relevant past work. Include the Watershed Projects Database ID (if applicable), key staff and their role(s) in the project, a brief description of the project (phase, type, partners, etc.) and contact information for project references. Projects listed here should demonstrate the experience of the specific staff anticipated to work under this proposal.

Example Project 1:

Watershed Projects Database ID (if applicable): 9395
Project staff & their project role(s):

Allaire Diamond, Project Manager
Tyler Miller, Project Oversight

Project description (250 words max):

Oversee Fitzgerald Environmental Associates to develop a design for the removal of a dam on Crooked Creek, Colchester (Lake Champlain Direct watershed). This dam had a failing outlet that was causing excessive erosion and incision downstream.

Reference contact information:

Name: Evan Fitzgerald
Affiliation: Principal, Fitzgerald Environmental Associates
Phone: 802-999-1357
Email: evan @fitzgeraldenvironmental.com

Example Project 2:

Watershed Projects Database ID (if applicable): 10074
Project staff & their project role(s):

Allaire Diamond, Project Manager
Tyler Miller, Project Oversight

Project description (250 words max):

Coordinating with Fitzgerald Environmental Associates, run bidding and selection process and oversee construction for dam removal and stage zero wetland restoration on Crooked Creek in Colchester according to design (project 9395).

Reference contact information:

Name: Staci Pomeroy

Affiliation: Vermont DEC Rivers Program
Phone: 802-490-6191
Email: staci.pomeroy@vermont.gov

Example Project 3:

Watershed Projects Database ID (if applicable): n/a
Project staff & their project role(s):

Allaire Diamond, Project Manager
Tyler Miller, Project Oversight

Project description (250 words max):

Oversee the development of a preliminary engineering plan for floodplain restoration at the confluence of Mill Brook and the Winooski River in Jericho. The chosen alternative is an engineered logjam that will protect Rt. 117 while providing floodplain benefits, and is

Reference contact information:

Name: Roy Schiff
Affiliation: SLR Consulting
Phone: 802-882-8335
Email: rschiff@slrconsulting.com

5. Estimated annual total phosphorus load reduction (kg/yr)

Please review the Department of Environmental Conservation's Standard Operating Procedures (SOPs) for Tracking and Accounting of Phosphorous prior to completing this section.

For Developed Lands projects, estimate the annual phosphorous load reduction using the Department of Environmental Conservation's Stormwater Treatment Practice Calculator. Export the results from the calculator and include that information in the proposal package. For Natural Resource Restoration projects, estimate the annual phosphorous load reduction using the Department of Environmental Conservation's Interim Phosphorous Calculator Tool (v1.0). Save the results from the calculator and include them in the proposal package.

Enter the estimated annual total phosphorous load reduction (kg / yr):

14.9 kg/yr - please see Alternatives &

If the proposed project consists of project identification / assessment or development-phase work, provide details regarding the types of projects you intend to investigate and the anticipated phosphorus reduction benefits you expect the project(s) might achieve.

6. Project Budget

Develop a detailed budget with a cost breakdown of all project and administrative expenses. The budget should be itemized by Task with anticipated costs for personnel, equipment, materials, subcontracted services and other costs as appropriate. Be sure to request sufficient funding to complete the required milestones and deliverables (including project reporting) for the type of project being proposed. See the FY23 Clean Water Initiative Program Funding Policy for more information on the milestones required for the project type you are proposing.

Notes:
Mileage: Use the FY24 federal rate ($0.67 / mile)
Indirect: If you have a negotiated indirect rate, please use that. Otherwise, you may charge up to 10% on all APPLICANT costs and 10% on the first $50,000 of SUBCONTRACTORS costs.

Funding request
Amount of funding requested: $112,877.76 (see spreadsheet f
State matching funds: $0
Non-State matching funds: $0
Total project budget: $112,877.76

Future costs
If this proposal seeks funds for Preliminary (30%) or Final (100%) Design-phase work, please estimate anticipated future costs for subsequent project phases. Do not include this amount in the "Funding request" section above.

Anticipated future funding:

7. Co-benefits

a) **ENVIRONMENTAL JUSTICE:** points are awarded when a project is located in a Census Block Group where one or more Environmental Justice Focus Population demographic conditions exist. *This value is calculated by the Clean Water Service Provider based on the project location.*

b) **ECOLOGICAL BENEFITS:** points are awarded when a project reduces sediment and / or non-phosphorous nutrient loads to stressed, altered, impaired or priority waterways to which it is hydrologically connected. *This value is calculated by the Clean Water Service Provider based on the project location.*

c) **ECOSYSTEM SERVICES:** points are awarded when a project moderates natural phenomena through carbon sequestration and flood resilience. *This value is calculated by the Clean Water Service Provider based on the type of project being proposed.*

d) **COMMUNITY BUILDING:** points are awarded when a project involves the community in data collection and decision-making, enhances the working landscape and provides recreational benefits. Please answer the following:

- Are there proposed efforts to meaningfully involve community members in planning, project development, decision-making and implementation?

  Yes

  If you answered Yes to the previous question, please describe the effort to involve community members:

  Landowners have been involved from the beginning and their valuable insight has helped guide the project. We are also working closely with Friends of the Winooski

- Does the project involve data collection by community members (e.g. citizen science initiative)? No

  If you answered Yes to the previous question, please describe the effort to involve community members in data collection:

- Is the project located on a parcel that is enrolled in the Use Value & Appraisal Program (aka the Current Use Program) (Contact the Clean Water Service Provider for assistance.)? Yes

- Does the project maintain / improve an existing recreational space?

  Yes

If you answered Yes to the previous question, please describe the maintenance or improvement of existing recreational space(s):

Part of the berm sits on land owned by Vermont Fish & Wildlife as a public fishing access. It will be improved through this project with riparian plantings and reduced

- Will the project result in new / expanded recreational opportunities?

Yes

If you answered Yes to the previous question, please describe the effort to create new or expand existing recreational opportunities:

This project will likely improve the quality of the fishing access at John Fowler Rd.

e) **EDUCATION:** An Education Co-Benefit is realized when a project includes aspects of public outreach designed to educate community members about the importance of phosphorus reduction and watershed health

- Will the project include an educational component? Yes

If you answered Yes to the previous question, please describe the educational component of the project below:

- Interpretive signage:

Vermont Land Trust and Vermont Fish & Wildlife will install interpretive signage on F&W land informing the public of the project and its benefits

- Educational meetings / workshops:

VLT will hold one public event or workshop that involves this project, either online or in person.

8. Other Considerations

a) **DESIGN LIFE:** The design life of the proposed project is: 15+ years

b) **LANDOWNER RELATIONS**

- PROPERTY OWNERSHIP: The project will be located on:

  both publicly- and privately-owned property.

- LANDOWNER SUPPORT: Provide a list of landowner support letters below. Please submit any letters or email from the landowner indicating their support for the project and awareness of their required commitment. Note date of letter/email and sender below.

  Already on file at CVRPC.

- OTHER: Include other information regarding landowner relations here.

c) **OPERATIONS & MAINTENANCE**

- COST ESTIMATE: Provide a quantitative estimate of operation & maintenance costs on an annual basis where available. If not available, please provide a qualitative estimate. The anticipated annual operations & maintenance expenses for this project are:
  $400
- O & M AGREEMENT: There is a signed operations & maintenance agreement for this project: No

  If you answered Yes to the previous question, please include a copy of the signed O & M Agreement in the proposal package.

- OTHER: Include any other information regarding the operations & maintenance agreement for this project.

d) **PERMITTING:** This project will require a permit: Yes

If you answered Yes to the previous question, please provide a list of the required permits, any issues anticipated in obtaining the permits and the status of the permit. If you have permit(s) for the project in hand, please include a copy of them in the proposal package.

Permitting needs will be determined in final design. The project may require an Arm

e) **BARRIERS:** Describe any potential barriers to completing this project and how you plan to manage those challenges:

We are unsure how archeological review may impact this project. We do not anticip

f) **HISTORIC SITE REVIEW:** Consult the Vermont Historic Sites spreadsheet and accompanying guidance in the State Historic Preservation Review section of the FY23 Clean Water Initiative Program Funding Policy to determine whether the proposed project will require Preliminary and Final Project Review by the Vermont Division of Historic Preservation. Include a copy of the completed Vermont Historic Preservation Project Review Form in the proposal package.

- The proposed project will require State Historic Preservation Review:

Yes

9. Proposal Submission

Assemble the following materials in the order listed into a single PDF and submit to Brian Voigt (voigt@cvregion.com) with the Subject line: "Winooski Basin Clean Water Service Provider Project Proposal – FY24, Round 4".

1. If your organization or municipality has not yet been pre-qualified as an eligible Basin 8 Clean Water Service Provider Clean Water Partner, please complete and submit a pre-qualification form along with your funding proposal.

2. Project proposal form (i.e. this document).

3. Include the following information in the order listed (please):
   a) Natural Resources Screening Form (see the FY23 Clean Water Initiative Program Funding Policy – Appendix A. Required for preliminary design, final design, or implementation phase projects.)
   b) Project Locator Map – applicants may use the Vermont Agency of Natural Resources Atlas to generate the Project Locator Map (Contact the Clean Water Service Provider for assistance.)
   c) Project Timeline – Propose a project schedule based on the milestones of the proposed project type. Assume a 2 July 2024 start date.
   d) Staff capacity – list key staff and their role(s) in the project. Attach one-page resumes for any staff listed in Section 4 of the Application Form who were not included in your pre-qualification materials.
   e) Completed DEC Interim Phosphorus Reduction Calculator Tool v1.0, or, for Developed Land Projects, report from DEC Stormwater Treatment Practice Calculator. (Contact the Clean Water Service Provider for assistance.)
   f) Detailed project budget with a cost breakdown of all project and administrative expenses. The project should be itemized by Task with anticipated costs for personnel, equipment, materials, subcontracted services and other costs as appropriate. Be sure to request sufficient funding to complete the required milestones and deliverables (including project reporting) for the type of project being proposed.
   g) Letter(s) of support from landowner(s) indicating their support for and awareness of the commitment required to advance / implement the project
   h) Signed Operations & Maintenance Agreement (if applicable)
   i) Permits – Attach approved project permits (if applicable).
   j) Historic Site Review - Use the spreadsheet and accompanying guidance in the State Historic Preservation Review section of the FY23 Clean Water Initiative Program Funding Policy to determine whether your clean water project will require Preliminary and Final Project Review by the Vermont Division of Historic Preservation. Attach a copy of the completed Vermont Historic Preservation Project Review Form.

APPENDIX A. CLEAN WATER INITIATIVE PROGRAM - PROJECT ELIGIBILITY SCREENING FORM

This fillable PDF form is designed to assist with project review by systematically walking through all eligibility criteria. It should be completed for all projects seeking funding for 30% + design or implementation work. It may be applied to projects seeking funding for assessment or development if helpful for determining their alignment with eligibility criteria 2, 3, 6, and 8.

Step 1: Conduct Eligibility Criteria #1 Screening: Project Purpose

Table 1A: Project Purpose	
From the drop-down list to the right, please select which of the four objectives of Vermont's Surface Water Management Strategy this project addresses. If multiple, please list below:	Minimize flood and fluvial erosion hazards

Step 2: Conduct Eligibility Criteria #2 Screening: Project Types and Standards

Table 2A: Project Types and Standards	
Please select the most representative project type from the drop-down list to the right.[1,2] If multiple BMPs are included in the project, please list below:	Floodplain/Stream Restoration - Preliminary Engineering D
Is the project type an eligible project type for the funding program you are applying to as listed in column B of the CWIP Project Types Table? (Answer must be YES to proceed)	Yes ◉ No ○
Does the project meet the project type definitions and minimum standards as provided in column C of the CWIP Project Types Table? (Answer must be YES to proceed)	Yes ◉ No ○
Will the project result in the standard performance measures, milestones, and deliverables as defined by project type in columns D-F of the CWIP Project Types Table? (Answer must be YES to proceed)	Yes ◉ No ○
Is the project listed as an ineligible project or activity in the CWIP Funding Policy? If Yes, please explain below how project meets the allowable exceptions within the CWIP Funding Policy. (Answer must be NO to proceed, unless reasonable justification is provided above)	Yes ○ No ◉

Step 3: Conduct Eligibility Criteria #3 Screening: Watershed Projects Database

Verify project has been recorded in the Watershed Project Database (WPD). Each project must have a Watershed Project Database number specific to the proposed project phase (for example,

[1] Note that Road/Stormwater Gully project-types must not otherwise be considered intermittent or perennial streams by the DEC Rivers Program and therefore project proponent must show documentation of this determination in order to select this project type.

[2] One project may include multiple best management practices (BMPs) that cross "project types." For example, a single project may include both stormwater and lake shoreland BMPs. Proponents should use their best judgement in selecting the most representative project type for the purposes of eligibility screening and reporting.

a final design will have a different WPD-ID from a preliminary design even if for the same project). If the project, or the specific phase, is not yet in the Watershed Project Database, follow directions provided in the CWIP Funding Policy to secure a WPD-ID. Please see CWIP Funding Policy for more information on the WPD-ID.

Table 3A. WPD-ID	
Watershed Project Database ID number assigned	8401 (needs confirmation; may need reentry)
Watershed Project Database Project Name	Proposed Berm Removal Upper Winooski 33

Step 4: Conduct Eligibility Criteria #4 Screening: Natural Resource Impacts[3]

Agency of Natural Resources (ANR) permit screening for natural resource impacts includes 1) an initial desktop review to identify which ANR permitting programs should be contacted, 2) a review by the relevant ANR permitting staff, and 3) a response summary from the project proponent addressing any permitting staff concerns. [4]

1) **Table 4. Natural Resource Impacts** facilitates a high-level desktop review of the most likely ANR permits to apply to clean water projects. Project proponents should answer all the questions to identify likely permit needs. [5] Please note that "project site" may include both the active restoration location as well as any additional impact footprint related to staging, site access, or storage of waste or disposed materials.
2) If responses to the **Table 4. Natural Resource Impacts** desktop review trigger a permitting staff consultation, **Table 4** provides appropriate contact information.
    a. Proponents should send the identified permitting staff the following:
        i. The watersheds project database identification number (WPD-ID) (if available),
        ii. Project location (GPS coordinates)
        iii. Summary of proposed scope of work, and
        iv. Any other relevant information they request that will be utilized in their review.
    b. **Proponents should clarify they are seeking permitting staff input on potential permitting needs, permit-ability of proposed scope of work, and other design considerations but they are NOT seeking a formal permit determination.**
    c. Project proponents must attempt to communicate with the permitting staff and provide them with at least thirty days to review the project and provide a

[3] Easements and Riparian Buffer Plantings are excluded from this eligibility requirement/step.

[4] In cases where this screening may have already occurred in a prior project phase, project proponents may supply attachments or links to relevant permit needs assessment documents in place of completing Table 4.

[5] Entities selected for funding are expected to perform due diligence to ensure all applicable permits (including non-ANR state, local, and federal permits) are discovered and secured prior to implementation. The ANR Permit Navigator and an Environmental Compliance Division Community Assistance Specialist can help confirm ANR permitting needs for any projects once selected for funding.

response. Project proponents are encouraged to perform this screening during a project development phase as opposed to during a project solicitation round to allow for more time for feedback. Permitting feedback may be up to one year old.

3) Proponents should summarize permitting staff feedback and how the proposed scope of work will address this at the bottom of **Table 4**. Specifically, please include:
   a. Which permits or permit amendment are needed or might be needed? [6]
   b. What type might be needed? (e.g., a general or individual permit[7])?
   c. What concerns were voiced by permitting staff?
   d. How will the proposed scope of work address these concerns?[8]

Table 4A: Natural Resource Impacts		
I. Act 250 Permits		
1. Have any Act 250 (Vermont's Land Use and Development Control Law) Permits been issued in the project site's parcel location?[9]	Yes ○	No ◉
If ***yes,*** please provide the permit number and list any water resource issues or natural resource issues found[10]: **PermitNumber:** **ResourceIssues:** _____ If ***yes,*** use the Water Quality Project Screening Tool to identify the appropriate regulatory contact for an Act 250 consultation. **Regulatory Point of Contact Name/Position:**		
II. Lake and Shoreland		
1. Is the project site located within 250 feet of the mean water	Yes ○	No ◉

[6] Occasionally permit staff may indicate they need a field visit or to see more completed designs prior to making a permit need determination.

[7] Design phase projects that require an individual wetlands permit must have the permit in hand at the close of the final design phase. Implementation phase projects must have the individual permit in hand to be eligible for funding.

[8] Examples could include planned design changes or inviting permitting staff to stakeholder meetings.

[9] An Act 250 Permit is required for certain categories of development, such as subdivisions of 10 lots or more, commercial projects on more than one acre or ten acres (depending on whether the town has permanent zoning and subdivision regulations), and any development above the elevation of 2,500 feet. The ANR Atlas Clean Water Initiative Program Grant Screening tool can help answer this yes/no question. Follow the instructions on the link above to identify whether your project is located on an Act 250 parcel. Note that the layer to activate in ANR Atlas is now named "Clean Water Initiative Program Grant Screening."

[10] Note that Act 250 permit amendments may require more extensive review of project impacts to natural resources including wildlife habitat, significant natural communities, and riparian zones. Please consult with the Act 250 District Coordinator regarding the nature and scope of that review and what bearing it may have on your project design.

level (shoreline) of a lake or pond? [11]	
If ***yes***, you might need either a Shoreland Protection Act Permit or a Lake Encroachment Permit. Use the Water Quality Project Screening Tool to find the Lakes and Ponds Program contact for your project's region. **Regulatory Point of Contact Name/Position:**	
III. Rivers, River Corridors, and Flood Hazard Areas	
1. Is there any portion of the project site located within 100' of a river corridor and/or mapped Federal Emergency Management Agency (FEMA) flood hazard area[12]? (e.g. a stormwater pond's pipe draining into a river corridor area)? Any permanent excavation/filling or construction within a flood hazard area or river corridor may trigger regulatory requirements through municipal bylaws or through state authorities.	Yes ◉ No ○
If ***yes***, you will need to speak with a Floodplain Manager. Use the Water Quality Project Screening Tool to find the Floodplain Manager for your project's region. **Regulatory Point of Contact Name/Position:** Ned Swanberg, Floodplain Manager	
2. Is any portion of the project site within a perennial river or stream channel? [13]	Yes ○ No ◉
If ***yes***, you will need to speak with a Stream Alteration Engineer. Use the Water Quality Project Screening Tool to find the Stream Alteration Engineer for your project's region. **Regulatory Point of Contact Name/Position:**	
IV. Wetland	

[11] The ANR Atlas Clean Water Initiative Program Grant Screening tool can help answer this yes/no question. Follow the instructions on the link above to identify whether your project is located in the jurisdictional zone to trigger a Lakeshore permit. Note that the layer to activate in ANR Atlas is now named "Clean Water Initiative Program Grant Screening."

[12] FEMA mapped Flood Hazard Areas are not available statewide on the ANR Natural Resources Atlas. For projects located in Grand Isle, Franklin, Lamoille, Addison, Essex, Orleans, Caledonia, and Orange Counties, maps are available via the FEMA Flood Map Service Center: https://msc.fema.gov/portal/home. ANR Floodplain Managers are available to provide technical assistance if needed.

[13] Stream Alteration Permits regulate all activities that take place within perennial river and stream channels. Examples of regulated activities include streambank stabilization, dam removal, road improvements that encroach on streams, and bridge/culvert construction or repair. The ANR Atlas Clean Water Initiative Program Grant Screening tool can help answer this yes/no question. Follow the instructions on the link above to identify whether your project is located in the jurisdictional zone to trigger a Stream Alteration permit. Note that the layer to activate in ANR Atlas is now named "Clean Water Initiative Program Grant Screening."

1. Does the Wetland Screening Tool[14] provide a result of wetlands likely, very likely, or present at the project site?	Yes ◉ No ○
2. Does your project site involve land that is in or near an area that has any of the following characteristics: o Water is present – ponds, streams, springs, seeps, water filled depressions, soggy ground under foot, trees with shallow roots or water marks? o Wetland plants, such as cattails, ferns, sphagnum moss, willows, red maple, trees with roots growing along the ground surface, swollen trunk bases, or flat root bases when tipped over? o Wetland Soils – soil is dark over gray, gray/blue/green? Is there presence of rusty/red/dark streaks? Soil smells like rotten eggs, feels greasy, mushy or wet? Water fills holes within a few minutes of digging? (See Landowners Guide to Wetlands for additional information on identifying wetlands onsite.)	Yes ◉ No ○ Not Sure ○

If you answered ***yes*** or ***not sure*** to either of the above questions, you will need to contact your District Wetlands Ecologist using the Wetland Inquiry Form. The District Wetlands Ecologist can help determine the approximate locations of wetlands and whether you need to hire a Wetland Consultant to conduct a wetland delineation. Alternatively, if you answered ***yes*** or ***not sure*** to either of the above questions, you can simply budget for a Wetland Consultant in the proposed scope of work. Any activity within a Class I or II wetland or wetland buffer zone (minimum of 100 feet and 50 feet respectively) which is not exempt or considered an "allowed use" under the Vermont Wetland Rules requires a permit. All permits must go through review and public notice process, which takes at minimum 6 weeks for a General Permit and 5 months for an Individual Permit.

Regulatory Point of Contact Name/Position:

Shannon Morrison, Wetland Ecologist

1. Is your project a Wetland Restoration project type?	Yes ○ No ◉

If you answered yes, under the Vermont Wetland Rules you will need an "allowed use" determination from the DEC Wetlands Program. Contact your District Wetlands Ecologist using the Wetland Inquiry Form.

Regulatory Point of Contact Name/Position:

V. Fish and Wildlife

State law protects endangered and threatened species. No person may take or possess such species without a Threatened & Endangered Species Takings permit. 1. **Does your project involve cutting down trees larger than 5 inches in diameter in any of the following towns?** Addison, Arlington, Benson, Brandon, Bridport, Bristol, Charlotte, Cornwall, Danby, Dorset, Fair Haven, Ferrisburgh, Hinesburg, Manchester, Middlebury, Monkton, New Haven, Orwell, Panton, Pawlet, Pittsford, Rupert, Salisbury, Sandgate, Shoreham, Starksboro, St. George, Sudbury, Sunderland, Vergennes, Waltham, West Haven, Weybridge, Whiting	Yes ○ No ◉

[14] To view the Wetland Screening Tool introduction video, see https://youtu.be/6lv5en0AB1o

2. Is the project site within 1 mile of a mapped[15] Significant Natural Community or Rare, Threatened, or Endangered Species?	Yes ◉ No ○
If *yes* to either of the above questions, connect with the VT Fish and Wildlife department (everett.marshall@vermont.gov 802-371-7333) to discuss your project and any necessary permitting. **Regulatory Point of Contact Name/Position:** Everett Marshall	
VI. Stormwater	
1. Will the project disturb more than an acre of land during construction, add or redevelop impervious surface, create new development or otherwise require a Stormwater permit?	Yes ○ No ◉
If *yes*, forward to the appropriate Stormwater specialist to ensure necessary permitting. Use the Water Quality Project Screening Tool to find the Stormwater specialist for your project's region. **Regulatory Point of Contact Name/Position:**	
VII. Solid Waste	
2. Will you be creating any debris (including construction and demolition waste, stumps, brush, untreated wood, concrete, masonry, and mortar) with your project that you intend to bury on site? [16]	Yes ○ No ◉
If yes, connect with the Waste Management & Prevention Division (dennis.fekert@vermont.gov 802-522-0195) to discuss your project and any necessary permitting. **Regulatory Point of Contact Name/Position:**	
Provide below or attach a narrative summary of Table 4 findings. Please include: a. Which permits or permit amendment are needed or might be needed? b. What type might be needed? (e.g. a general or individual permit)? c. What concerns were voiced by permitting staff? d. How will the proposed scope of work address these concerns?	
Is the project, as proposed, reasonably considered permit-able by all applicable	Yes ◉ No ○

[15] Find both of these layers on the ANR Atlas under Atlas Layers/Fish and Wildlife. Use the Measurement tool to 1) Plot Coordinates for your project 2) select the coordinates from the left panel 3) select the Radius Tool 4) click on your project location 5) Indicate 1 mile distance 6) look for overlap with either of these mapped layers.

[16] If your project will result in the transfer and disposal of debris (including construction and demolition waste, stumps, brush, untreated wood, concrete, masonry and mortar), you do not need a permit from this office as long as you hire a licensed solid waste hauler and bring the material to a certified facility.

ANR permitting programs? (Answer must be Yes to continue)	

Step 5: Conduct Eligibility Criteria #5-8 Screenings

Table 5A. Eligibility Criteria 5-8	
Landowner and Operation and Maintenance Responsible Party Support. Project identifies and demonstrates commitment from a qualified and willing operation and maintenance responsible party. Project demonstrates landowner support for the proposed project phase. (Answer must be YES to proceed)	Yes ◉ No ○
Budget. Project budget includes ineligible expenses. (Answer must be NO to proceed)	Yes ○ No ◉
Leveraging. Proposed leveraging meets required leveraging levels (if applicable), meets the definition of leveraging, and comes from eligible sources (Answer must be YES or N/A to proceed)	Yes ○ No ○ N/A ◉
Funding Program Specific Eligibility. Project meets additional funding program eligibility requirements*. Please list applicable funding program below: (Answer must be YES to proceed) *If Water Quality Restoration Formula Grant, complete Step 6 below	Yes ◉ No ○

Step 6: Screening Projects on Agricultural Lands (Water Quality Restoration Formula Grants Only)

For Water Quality Restoration Formula Grant projects, please complete the following information as part of your Funding Program Specific Eligibility Screening (Criteria 8). Please note this must be completed for all projects located on agricultural lands regardless of project type. See CWIP Project Types Table for eligible project types.

Table 6A. Screening Projects on Agricultural Lands	
1. Is the proposed project located on a jurisdictional farm operation[17]? Complete a preliminary review to	○ **Yes** - Proceed to next question below.

[17] Jurisdictional farm operations are required to meet Vermont's Required Agricultural Practices (RAPs).

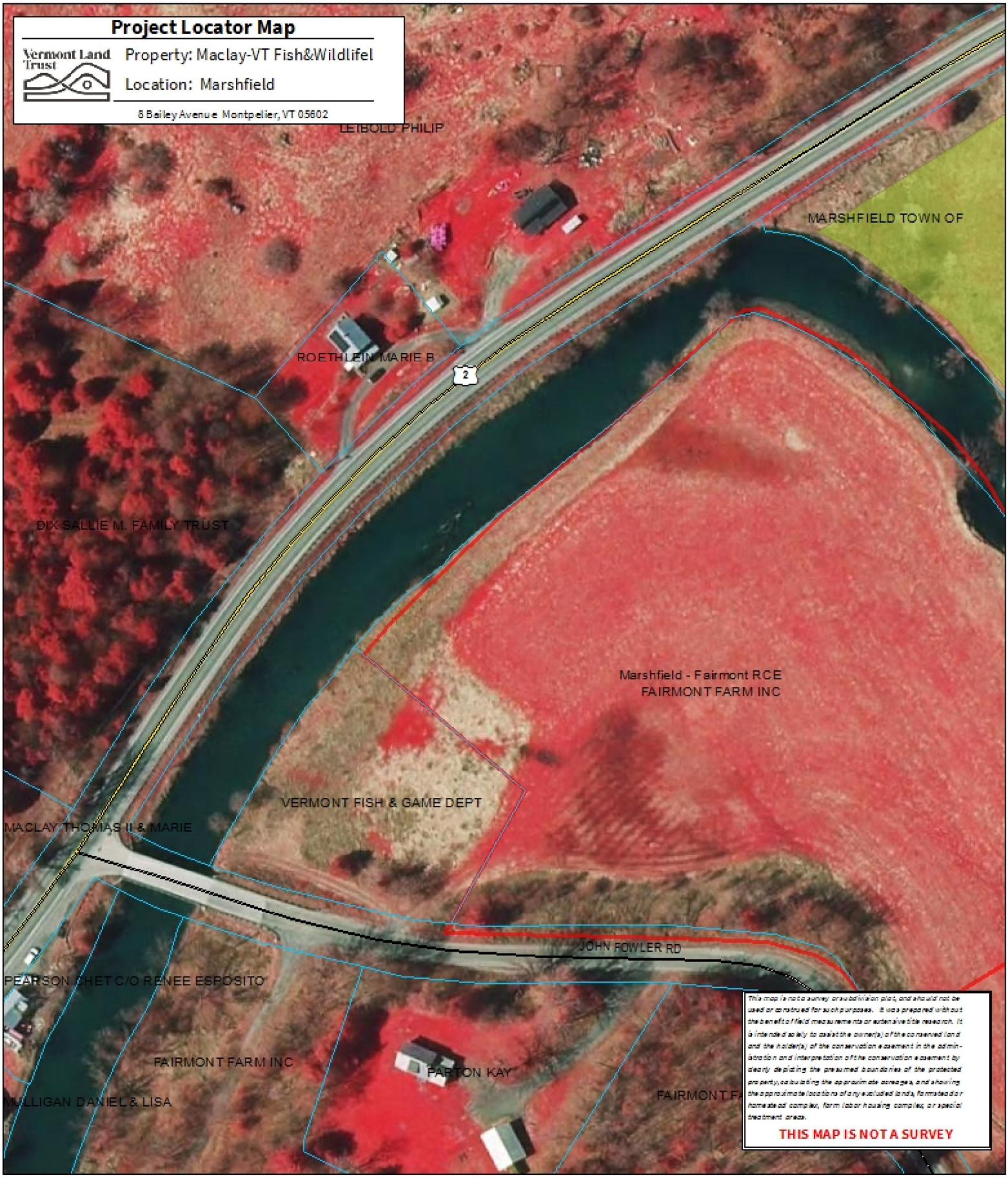
determine if it is a jurisdictional farm operation, and any case that requires consultation with AAFM will occur via the farm determination process. Please note this form must be submitted by the farm operation/landowner seeking the determination.	◉ **No**[18] - There is no additional requirements related to agricultural review for these projects.
2. Is the proposed project an agricultural project? Examples of agricultural projects include but are not limited to Production Area Practices – (e.g. Waste Storage Facilities, Heavy Use Area, Diversion) Fence, Livestock Exclusion, Filter Strip, Cover Crop, Reduced Tillage, Manure Injection, Rotational Grazing. Please note this is not an exhaustive list of all agricultural practices.	○ **Yes** - Agricultural Projects on jurisdictional farms are not an eligible project type. You can provide a referral to an applicable state or federal agricultural assistance program, or a local organization. ◉ **No** - The natural resource, innovative, or other project type will require an agricultural project review and approval from the Vermont Agency of Agriculture, Food and Markets (VAAFM) to ensure a consistent approach on farms statewide that follows rules, regulations, and laws in place. Please follow Steps 1 & 2 below. **Step 1** - Please submit a detailed description of the project, project site, project details, landowner, farm operation, and any other relevant information to VAAFM at AGR.WaterQuality@Vermont.gov . **Step 2** - Once you complete this Agricultural Project Review, please allow 30 days for a response. Once that response has been received, please include a summary of the response in the next section.

Agricultural Project Review Status & Summary:	
Check as Applicable	**Status**
☐	Submitted/ Pending
☐	Approved
☐	Denied

[18] Note CWIP's Agricultural Pollution Prevention project type eligibility is limited to land where owner or operator is not a jurisdictional farm (i.e., not required to meet the Required Agricultural Practices (RAPs)). As such, projects that meet the definition of the Agricultural Pollution Prevention project type in the Appendix B. Project Types Table are not subject to review by VAAFM.

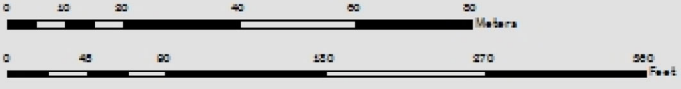
Please include a summary of the response here:

Please note that it is expected that all projects with the status "submitted/pending" will be "approved" prior to a project approval for funding.



Project area extends NE from the bridge, 600-1000' on the south/east side of the Winooski River.

Scale:1:1,300



Winooski Basin Water Quality Council Updated 3/23/2021

Preliminary Engineering Design Budget-John Fowler Rd. Berm Removal

Gray cells auto-calculate, do not edit. Enter in white cells only.

Personnel (Name, Title)	Tasks/Responsibilities	Hours	Hourly Rate	Total Salary Expense	Leverage amount	Amount requested
Allaire Diamond, Ecologist	Project management/completion, Coordination with landowners and partners, Project reporting	15	$86.92	$1,303.80	$0.00	$1,303.80
Tyler Miller, Vice President for Land Activation	Project oversight	5	$108.12	$540.60	$0.00	$540.60
Maggie Herrick, Bookkeeper	Invoicing	5	$61.21	$306.05	$0.00	$306.05
Personnel Subtotal				**$2,150.45**	**$0.00**	**$2,150.45**

Anticipated Travel	Purpose	Miles	Mileage Rate	Total Travel Expense	Leverage amount	Amount Requested
VLT staff	Travel to site	80	$0.67	$53.60		$53.60
		0	$0.00	$0.00	$0.00	$0.00
Travel Subtotal				**$53.60**	**$0.00**	**$53.60**

Contractual/Construction	Description/Use	# of Units	Unit Cost	Total Contract. Expense	Leverage amount	Amount Requested
Consultant - Fitzgerald Environmental	Final Design and Permitting	1	$15,000.00	$15,000.00	$0.00	$15,000.00
Consultant TBD - Archeology	Archeology Study if needed	1	$7,500.00	$7,500.00	$0.00	$7,500.00
Contractual Subtotal		0		**$22,500.00**	**$0.00**	**$22,500.00**
Project subtotal				**$24,704.05**	**$0.00**	**$24,704.05**

Indirect Costs	Indirect Rate	Cost related to Indirect rate	Total Indirect cost	Leverage amount	Amount Requested
If rate is above 10%, provide documentation indicating the reason	10%	$24,704.05	$2,470.41	$0.00	$2,470.41
Indirect Subtotal			**$2,470.41**	**$0.00**	**$2,470.41**
		Totals	**$27,174.46**	**$0.00**	**$27,174.46**

Notes:

Winooski Basin Water Quality Council Updated 3/23/2021

Implementation - John Fowler Rd Berm Removal

Gray cells auto-calculate, do not edit. Enter in white cells only.

Personnel (Name, Title)	Tasks/Responsibilities	Hours	Hourly Rate	Total Salary Expense	Leverage amount	Amount requested
Allaire Diamond, Ecologist	Project management/completion, Coordination with landowners and partners, Construction oversight, Project reporting	40	$86.92	$3,476.80	$0.00	$3,476.80
Tyler Miller, Vice President for Land Activation	Project oversight	5	$108.12	$540.60	$0.00	$540.60
Mead Binhammer, Project Director	Conservation easement oversight related to the berm removal	6	$83.74	$502.44	$0.00	$502.44
Maggie Herrick, Bookkeeper	Invoicing	5	$61.21	$306.05	$0.00	$306.05
Personnel Subtotal				**$4,825.89**	**$0.00**	**$4,825.89**

Anticipated Travel	Purpose	Miles	Mileage Rate	Total Travel Expense	Leverage amount	Amount Requested
VLT staff	Travel to site	360	$0.67	$241.20		$241.20
		0	$0.00	$0.00	$0.00	$0.00
Travel Subtotal				**$241.20**	**$0.00**	**$241.20**

Contractual/Construction	Description/Use	# of Units	Unit Cost	Total Contract. Expense	Leverage amount	Amount Requested
Consultant - Fitzgerald Environmental Associates	Construction Oversight, Bid Support, Pre-construction meeting	1	$15,000.00	$15,000.00	$0.00	$15,000.00
Consultant - TBD. Cost opinion provided by FEA	Mobilization, staging, excavation, erosion control, mulching, seeding conservation and wetland seed, demobilization	1	$57,845.00	$57,845.00	$0.00	$57,845.00
Contractual Subtotal		0		**$72,845.00**	**$0.00**	**$72,845.00**
Project subtotal				**$77,912.09**	**$0.00**	**$77,912.09**

Indirect Costs	Indirect Rate	Cost related to Indirect rate	Total Indirect cost	Leverage amount	Amount Requested
If rate is above 10%, provide documentation indicating the reason	10%	$77,912.09	$7,791.21	$0.00	$7,791.21
Indirect Subtotal			**$7,791.21**	**$0.00**	**$7,791.21**
		Totals	**$85,703.30**	**$0.00**	**$85,703.30**

Notes:

Total Funding Request for Final Design & Implementation
$112,877.76

Timeline	Date
Commence Final Design	July 2024
Determine Permitting Needs and Secure Permits	July-September 2024
Final Design Complete	September 2024
Secure Construction Contractor	Fall or Winter 2024 (depending on desired construction timing, fall vs spring)
Construction	Fall 2024 or Spring 2025
Riparian Buffer Planting (separately funded)	Immediately following construction

MEMORANDUM

To: Allaire Diamond, VLT Ecologist

From: Rodrigue Spinette, PhD, Jordan Duffy, PE, CPESC, Joe Bartlett, CFM, Evan P. Fitzgerald, CPESC, CFM

Re: Alternatives Analysis and Concept Restoration Design - Winooski River Floodplain Restoration in Marshfield, Vermont

Date: May 7, 2024

1 Introduction

Fitzgerald Environmental Associates (FEA) was retained by Vermont Land Trust (VLT) to develop a preliminary engineering design for a berm removal along the Winooski River just north of the John Fowler Road Bridge in Marshfield, VT. Following our field survey of the site and the development of existing conditions plan sets and hydraulic models (refer to the Existing Conditions Memorandum dated 2/9/24), we examined the effect of different restoration practices to increase floodplain access and the potential benefits in terms of sediment and phosphorus removal.

2 Hydrology and Hydraulics

2.1 Hydrology

To better understand Winooski River discharge at the project location under different flood scenarios, we examined recurrence interval flows predicted using regional regression equations for Vermont (Olson, 2014; Dunne & Leopold, 1978), and flows predicted using gauge data on the Winooski River downstream of the project site (USGS 04286000 WINOOSKI RIVER AT MONTPELIER, VT) analyzed using USGS Peak Fq Software and scaled using drainage area. In addition, we compared these flow predictions to the flows reported for this reach of the Winooski River in the most recent FEMA Flood Insurance Study for Washington Country, VT (FIS # 50023CV001A - 50023CV003A).

Table 1 and Figure 1 below summarize the peak flow results from the various hydrological prediction models and sources. While the model results span a range of values for any given storm, we observed good agreement between the models except for the USGS gauge data set. This may be explained by the distance that separates the location of the USGS gauge station to our project site and the significant scaling that was applied to the flows to account for the difference in drainage area at the two locations (Marshfield site = 92 sq mi., USGS Gauge station = 397 sq. mi.). The flow correlation between the two sites may be too weak to be reliable.

Table 1. Total discharge (cfs) as a function of annual exceedance probability, AEP (%)

Flood Recurrence Interval (Years)	Annual Exceedance Probability (%)	Total Discharge (cfs)			
		USGS Streamstats (Olson 2014)	Dunne & Leopold (1978)	USGS Gauge	FEMA FIS
1	100%			537	
1.5	67%			1221	
2	50%	2108	2192	1496	
5	20%	3172	3217	2317	
10	10%	3963	4197	2978	4553
25	4%	5106	5875	3986	
50	2%	6068		4860	7588
100	1%	7072		5851	9010
500	0.20%	9841			13515

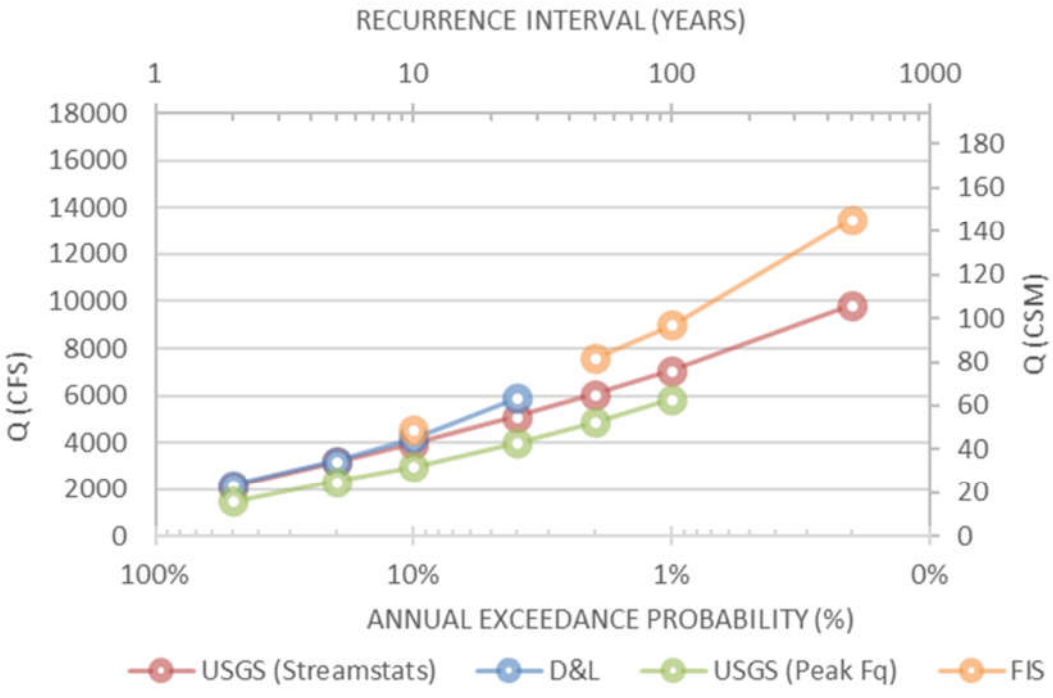


Figure 1. Total discharge as a function of annual exceedance probability

Values from all the models, except for the USGS gauge data, were averaged to yield values of peak discharge that were then used in our hydraulic model. As described below, hydraulic models were run in both steady and unsteady flow conditions. For steady flow analysis, flows were constant throughout the model run with a value set at the peak discharge obtained from our analysis of hydrology at the site. For unsteady flow analysis, flows fluctuated over a 48-hr hydrograph (figure 2) with a peak flow matching the peak discharge.

2.2 Hydraulics

FEA used HEC-RAS 6.3.1 software (USACE, 2022) to create a two-dimensional (2D) model of the Winooski River, its floodplain and areas immediately surrounding the study area.

We created a floodplain digital elevation model (DEM) for the study area using high-resolution (0.7 m) LiDAR elevation surfaces from a 2014 dataset covering Washington County. We loaded the DEM into RAS Mapper as the base terrain for setting up the HEC-RAS model. Because the LiDAR method does not capture data below the water surface when depth exceeds a few inches, FEA adjusted the terrain in the model using elevation measurements that were field collected in December of 2023 with a Trimble Geo7x GPS (centimeter grade accuracy) and Nikon NPL-322+ Total Station (2 second accuracy). This type of correction was applied to the Winooski River main channel. Additional adjustments were made to the terrain to correct LiDAR artifacts due to dense herbaceous cover in the floodplain. Tall and dense grasses typical of hay fields can affect the return signal of the LiDAR thus producing a ground elevation which is erroneously higher than the true ground elevation. Field survey data that we collected in 2023 confirmed this artifact and adjustments were made to our terrain model accordingly. This correction was applied to the floodplain areas on the Fairmount Farm parcel (south of the river) and those on the Town of Marshfield parcel (north of the river) where vegetation cover is heavily dominated by herbs and forbs.

The 2D flow area in our model was parameterized as follows:

- We created a 2D mesh flow area that covers the Winooski River and its floodplains, extending approximately a half mile upstream and downstream of the John Fowler Road bridge.
- We generated computation points for a base mesh with a 40-foot spacing. Breaklines and refinement regions were employed to define areas with a narrower mesh spacing where higher velocities occur in the model or where a detailed examination of flow behavior was desired.
- Breaklines were drawn along the river center line and roadways to align the 2D mesh with topographic features to improve flow predictions.
- We assigned floodplain and channel roughness values (Manning's N values) using a high-resolution (0.5-meter grid) land cover layer (UVM SAL, 2019). We assigned roughness values to each land cover class that ranged from 0.02 (paved roads) to 0.08 (medium density brush and willows or forested floodplain) following Chow (1959) and Arcement et al. (1989). Manning's values were adjusted manually in RAS mapper as needed to match existing conditions as closely as possible.

We ran the hydraulic model two different ways. The first was with a quasi-steady state flow hydrograph at a 1-second computation interval, entering the same (peak) flow for each time step (Table 2). The second

was with an unsteady flow hydrograph based on a real storm event recorded at the USGS gauge station in East Montpelier between December 17th 2023, and December 20th 2023, and adjusted to produce a discharge at the peak of the hydrograph matching the peak flows determined by our hydrological analysis (Figure 2). In both cases, we used normal depth downstream boundary condition and Diffusion Wave equation set.

Table 2. Modelled peak discharge as a function of annual exceedance probability

Flood Return Interval (Years)	AEP (%)	Modelled Peak Discharge (cfs)
1	100%	1167
1.5	67%	1658
2	50%	2150
5	20%	3195
10	10%	4238
25	4%	5491
50	2%	6828
100	1%	8041
500	0.20%	11678

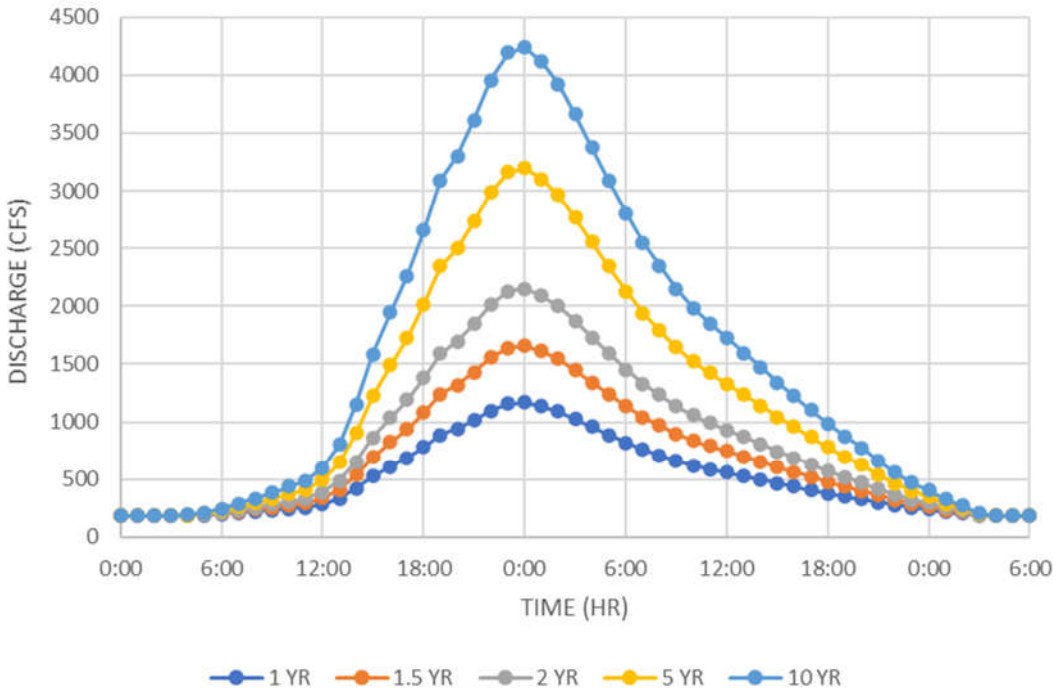


Figure 2. Unsteady flow hydrograph model inputs as a function of recurrence interval

3 Results

3.1 Existing Conditions

Under existing conditions, our model indicates that the waters of the Winooski river access the floodplain on the Fairmount Farm parcel starting with the 1-year storm. When total discharge equals 1,000 cfs or less, the floodplain is not accessed. At 1,167 cfs (peak flow for the 1-year storm), flood waters barely begin to access the floodplain, topping the berm at the top of bank wherever an elevation dip exists and very slowly filling the floodplain behind it. Floodplain access increases rapidly and significantly in storms larger than the 1-year storm. In addition, our model indicates that US Route 2 and the northwestern portion of the John Fowler bridge flood in 25-year storm or larger.

These model results are consistent with observations made by the current landowners and other locals who report flooding of the field in the project area with a frequency approaching once a year. In recent times, the field was flooded during the historic events of July 2023 (≈ 500-year storm) that affected significant portions of the Winooski River valley. The field flooded in a smaller storm that occurred in December of 2023 (≈ 15-year storm) and it also flooded in a storm event that occurred in March 2024 (≈ 3-year storm). Documentations of these flooding events (photos, videos, firsthand experiences of flooding extents) are generally consistent with our model results.

3.2 Alternatives

Because our analysis of existing conditions confirmed frequent flooding of the Fairmount Farm parcel field, our examination of alternatives quickly focused on restoration practices that would not only improve floodplain access, which is already good, but more importantly maximize the potential of that floodplain access to attenuate sediment and phosphorus. To that end, two practices were examined: removal of the berm at the top of bank of the Winooski River and riparian buffer planting.

Berm removal was assumed over the entire length of the berm with a final elevation matching that of the floodplain area behind it in the field. Although partial removal was contemplated in the early phases of the project, the idea was not pursued further because no clear or substantial benefit could be expected from it compared to the full berm removal. The berm is modest in size, poorly vegetated, and easily accessible for excavation. Buffer planting was assumed over a width of 50 ft extending perpendicularly from the top of bank towards the hay field, with native trees and shrubs planted at an approximately 10 ft spacing. The effect of the planting on the water flows was modelled by increasing Manning's roughness coefficient over the area from 0.035 to 0.05. This increase is somewhat conservative because the vegetative cover, once established and dense, would be expected to support higher Manning's values.

As expected, our model indicated that the berm removal improved access to the floodplain but only did so in smaller storms, from the 1-year to the 5-year storm. For 10-year storms or larger, the existing berm is impeding water flows so little that differences between existing and proposed conditions become insignificant. Our model runs of unsteady state storms (Figure 2) indicate that between 24.5 and 186 acre-feet of additional water crosses the top of bank location at the eastern end of the field and travels over the floodplain when comparing existing and proposed conditions (Figure 3).

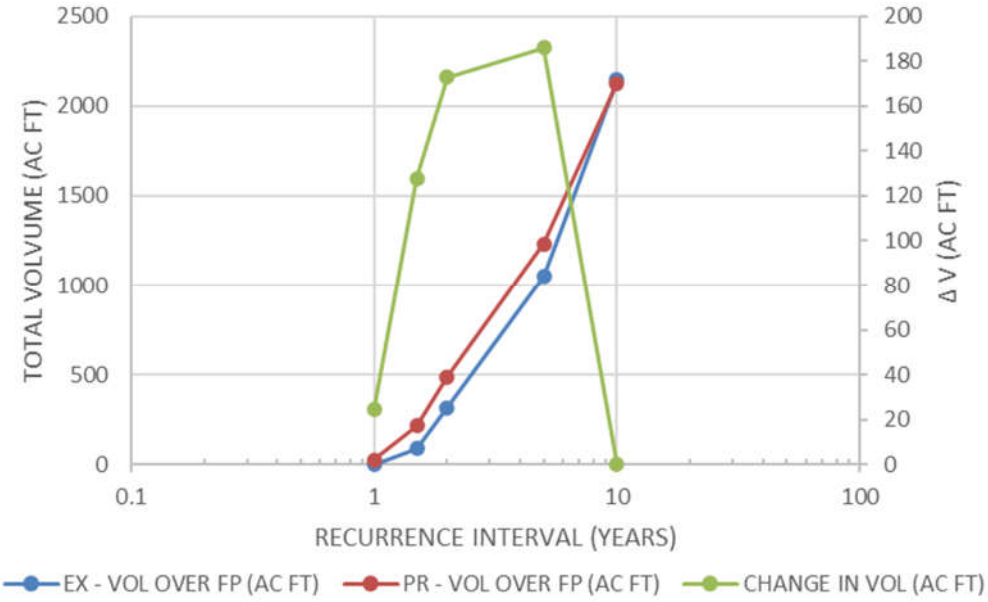


Figure 3. Change in water volume transport over floodplain between existing and proposed conditions as a function of storm recurrence interval. Results are generated from unsteady state model runs.

While a larger volume of water is accessing the floodplain in 1-year to 5-year storms comparing existing and proposed conditions, it is important to consider the velocity at which the water travels over the floodplain. As water velocities increase, the minimum size of particles expected to deposit or settle out of the water column will increase. The Hjulstrom diagram which describes the relationships between erosion, transportation and deposition of sediments as a function of flow velocity indicates that deposition of silt particles ($D < 0.003$ in) and sand particles (0.003 in $< D < 0.1$ in) will cease at velocities greater than about 0.016 ft/s and 0.36 ft/s respectively.

We examined velocity distributions over the floodplain for peak flow conditions of 1-year to 10-year flood events (Figure 4 and Table 3). Figure 4 shows the average water velocity over the inundated floodplain as a function of total discharge (i.e. channel flow + over bank flow). As the figure shows, when water accesses the floodplain at low levels (1000 cfs under proposed conditions, 1167 cfs under existing conditions), average velocities over the floodplain remain low and these conditions support deposition of sand particles. As total flows increase so do flows in the floodplain. However, water velocities in the floodplain also increase and eventually rise to a level that prevents deposition of smaller sand particles and allows only the deposition of larger particles such as gravel and cobbles. Based on this analysis, we predict that flows corresponding to peak flows in 1-year to 1.5-year flood events would provide significant capacity for sand removal under existing and proposed conditions. At larger peak discharge flows, velocities over the floodplain are likely too high to provide significant sediment deposition, except for a few areas (edge of inundation boundary, backwater areas). In the context of an unsteady flow analysis where flows increase, peak and then decrease back down to baseline, water velocities conducive to deposition of sand particles in any reasonably large flood event (Return Interval >1 year) would occur on the rising leg of the hydrograph when the floodplain first gets accessed and on the falling leg of the hydrograph when flows and velocities have dropped back down to low levels.

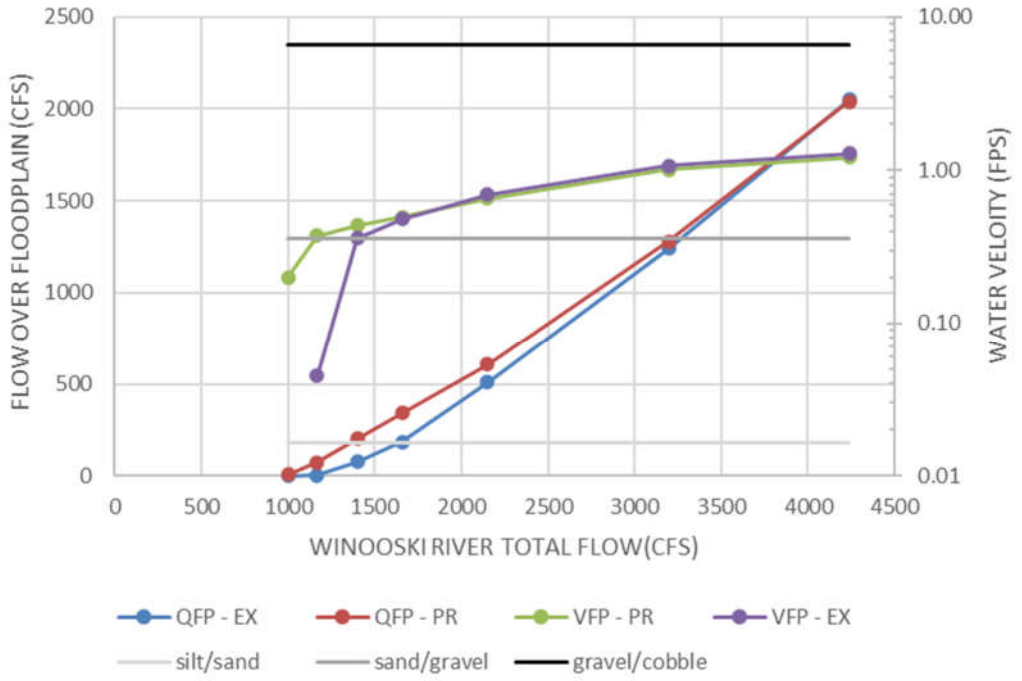


Figure 4. Flow over floodplain and average velocity in inundated floodplain under proposed and existing conditions as a function of total discharge. Results generated from quasi-steady state model runs.

Table 3. Inundated floodplain areas and floodplain water velocities under proposed conditions as a function of total discharge. Results generated from quasi-steady state model runs.

Flood Return Interval (Years)	AEP (%)	Modelled Total Discharge (cfs)	Inundated Floodplain Area (Ac)	Minimum Floodplain Velocity (ft/s)	Maximum Floodplain Velocity (ft/s)	Mean Floodplain Velocity (ft/s)
-	-	1000	1.51	0.000	0.794	0.200
1	100	1167	1.97	0.000	0.960	0.375
-	-	1400	2.92	0.000	1.177	0.435
1.5	67%	1658	3.66	0.000	1.348	0.494
2	50%	2150	4.35	0.001	1.649	0.653
5	20%	3195	4.73	0.014	2.226	1.010
10	10%	4238	4.93	0.031	2.653	1.214

4 Estimated Phosphorus Removal

The area of reconnected floodplain is approximately 4.6 acres. The VTDEC Functioning Floodplains Initiative (FFI) Tool provides a methodology for estimating total phosphorus (TP) retention on reconnected floodplains (Table 4). This methodology was informed by field-based floodplain research in Vermont and indicates that connected floodplains attenuate between 10-20 lb P/acre/year. FEA's site-specific hydraulic modeling and flood observations from others indicate the floodplain is currently connected at a "moderate" level. Removal of the earthen berm would increase floodplain connectivity to "high" resulting in an expected long-term attenuation rate of **2.3 kg P/acre/year**. Given the 4.6-acre floodplain area this would equate to 10.6 kg P/year.

Table 4. Estimated P Load Reduction due to Improved Floodplain and Riparian Wetland Storage Indicated by a Change in Floodplain Connectivity (Schiff et al., 2023)

	Default TP Storage Credits (kg/ac/yr)*		
	Low to High	Low to Moderate	Moderate to High
Initial	9.1	6.8	4.5
Future (50%)	4.5	3.2	2.3

	Default TP Storage Credits (lb/ac/yr)*		
	Low to High	Low to Moderate	Moderate to High
Initial	20	15	10
Future (50%)	10	7	5

*To be updated by project specific measurements or future research.

FEA performed additional site-specific analysis using hydrologic and hydraulic modeling to refine the P attenuation estimate for the project. The analysis relies on 3 pieces of information:

1. the estimated annual increase in the volume of floodwaters flowing over the floodplain at a discharge that would allow for sediment deposition (1,658 cfs) during small and moderate floods (i.e., up to the 5-year flood), as a result of the berm removal.
2. A typical concentration of Total Phosphorus (TP) for Winooski River floodwaters based on recent sampling data. We assumed 0.3 mg/L.
3. The TP removal efficiency of connected floodplains based on recent research as summarized in the Chesapeake Bay Program's Nutrient Crediting Protocols (CSN, 2020). We assumed a 30% removal rate.

The results of our analysis are summarized in Table 5. FEA's detailed hydraulic analysis resulted in a TP removal of 14.9 kg/year, which equates to **3.24 kg/acre/year**. This falls within the range of predicted TP storage crediting from the FFI in Table 4. FEA recommends that this project-specific estimate be used by the Clean Water Service Provider for the P credit associated with the project.

Table 5. Estimated P Removal of Reconnected Floodplain

Flood Frequency	Δ Treatable Volume of Floodwaters (acre-ft)*	Δ Total Phosphorus (kg) in Treatable Volume*	Flood Exceedance Probability	Annual Treatable TP (kg)	Assumed Floodplain Removal Efficiency	TP Removed by Flood Event (kg)
1-year	636	9.1	100%	9.1	30%	2.7
1.5-year	1,595	22.8	66%	15.1	30%	4.5
2-year	2,038	33.0	50%	16.5	30%	5.0
5-year	3,189	45.6	20%	9.1	30%	2.7
				Estimated Total TP Removal (kg/year):		**14.9**

* The change in treatable floodwater volume and TP mass associated with a range of flood discharges between 1,000 cfs (overbank flow) and 1,658 cfs (above which velocities do not allow for sediment deposition on the floodplain), as a result of the berm removal project.

5 Conclusions and next steps

The conditions found at this site are typical of many sites in Vermont. Historic agricultural land use adjacent to large rivers has resulted in landscape alterations that are detrimental to floodplain functions and water quality. In this case, a berm at the edge of a field on the bank of the Winooski River is compromising floodplain access in small sized storms. More importantly, management of the riverbank and associated floodplain impact important floodplain functions including habitat and the potential for sediment/nutrient removal.

Next steps in this study will include further examination of the project viability in terms of water quality benefits and appropriate sources of funding, and a preliminary cost opinion for full implementation. If the project is determined to be viable and fundable, further development of the proposed plan set (60% then 100%) will allow engagement with regulatory agencies, support permitting, and provide a blue print to construction.

List of Attachments

Attachment 1: 30% Concept Design Plans

Attachment 1: Preliminary Cost Opinion

Literature Cited

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Chesapeake Stormwater Network (CSN), 2020. Consensus Recommendations to Improve Protocols 2 and 3 for Defining Stream Restoration Pollutant Removal Credits, October 27, 2020 Prepared by: David Wood and Tom Schueler.

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Olson, S. A., 2014, Estimation of Flood Discharges at Selected Annual Exceedance Probabilities for Unregulated, Rural Streams in Vermont, United States Geologic Survey, USGS Scientific Investigations Report 2014-5078.

Schiff, R., E. Fitzgerald, M. Kline, K. Underwood, E. Boardman, J. Stryker, B. Patterson, R. Diehl, E. Roy, J. C. Louisos, B. Wemple, D. Rizzo, G. Alexander, and S. Pomeroy, 2023. The Vermont Functioning Floodplain Initiative (FFI) User Guide (Version 2.1). Prepared by SLR Consulting, Fitzgerald Environmental, Fluvial Matters, Stone Environmental, South Mountain Research & Consulting, and the University of Vermont in collaboration with the Vermont Department of Environmental Conservation and Others, Montpelier, VT.

USACE (US Army Corps of Engineers), 2018. HEC-RAS River Analysis System, Version 6.2. Available at: https://www.hec.usace.army.mil/software/hec-ras/download.aspx

VTDEC, 2006. Vermont Regional Hydraulic Geometry Curves. Appendix J of the Vermont Stream Geomorphic Assessment Protocol Handbooks: Remote Sensing and Field Surveys Techniques for Conducting Watershed and Reach Level Assessments. Vermont Agency of Natural Resources, Department of Environmental Conservation, Division of Water Quality, River Management Program, Waterbury, VT.

VERMONT

Vermont Fish & Wildlife Department
1 National Life Drive, Davis 2
Montpelier VT 05620-3702
http://www.vtfishandwildlife.com/

Agency of Natural Resources

[phone] 802-828-1000
[fax] 802-828-1250

Date: June 12, 2023

RE: VFWD Support for berm removal

To Whom It May Concern:

The Vermont Fish and Wildlife Department supports removing a man-made berm along the Winooski River near Fowler Road and US2 in Marshfield. The berm extends between a VFWD parcel and the adjoining privately owned farm field. The berm prevents the field from flooding and maintains an artificially straight channel. This section of the Winooski River has few pools and poor fish habitat, and removing the berm is expected to improve the habitat by restoring naturally river processes, as well as reducing flood risks downstream.

VFWD would like to see natural river process and a natural plant community restored on its parcel, and supports these efforts on the adjoining private parcel. VFWD is prepared to support this project by allowing access to the VFWD parcel to remove the berm, as well as providing help with technical assistance and planning. VFWD can also help with restoring natural vegetation by providing seeds from native trees for use in hydroseeding of exposed soils.

Cordially,

Will Eldridge| Aquatic Habitat Biologist
Vermont Fish and Wildlife Department
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802-585-4499 cell

Allaire Diamond

From: Marie Maclay <mmbikermom@gmail.com>
Sent: Monday, June 12, 2023 8:52 PM
To: Allaire Diamond
Subject: Re: Quick note giving support for studying berm removal

Hello Allaire. Sorry for the late notice getting back to you. Yes, we support the project, especially if the been material can be put elsewhere on the field where it is real low.

Marie

On Mon, Jun 12, 2023, 2:29 PM Allaire Diamond <Allaire@vlt.org> wrote:

> Hello Tim and Marie,
>
> It was great to meet you last week and have the chance to talk through details of removing the berm along the Winooski River. I was able to pull together a budget for doing study and preliminary design for the berm removal project, and am going to submit this later this afternoon. This is just a preliminary piece of work, which will give all of us some alternatives to consider and decide how to proceed. Then I will seek additional funds for that construction/excavation work.
>
> I'm writing to request a quick email stating your support for us to pursue this preliminary design effort as the landowner. If possible, I'd love to include that with the submission today, but please send it along as soon as you are able. You can just reply to this email stating that you support the design project. I'm also happy to answer any further questions you might have at this time – give me a call (802-879-672)or email.
>
> Thank you so much, and I look forward to hearing from you!
>
> Allaire
>
> Allaire Diamond (she/her)
>
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