Water Quality Restoration Formula Grant
Winooski Basin - Sub-grant Application Form
FY24 - Round 2

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 2 proposals are due by 4:00 PM on 13 December 2023. 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: Friends of the Winooski River
Primary Contact: Michele Braun
Title: Executive Director
Mailing Address: 21 Marvin St, Montpelier, VT 05602
Phone Number: 802-279-3771
E-mail Address: michele@winooskiriver.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: Nantanna Mill Stormwater Project
Watershed Projects Database ID*: 11623

* 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.*

Stormwater – Final Engineering Design

* 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: Final Design

Project GPS coordinates (e.g. 44.26278, -72.58054):
44.1539, -72.6553
Project Sub-basin: Dog River

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 an 8 January 2024 start date. (1000 words maximum)*

Project Background

This project proposes to complete a final engineering design for a stormwater retrofit for the Nantanna Mill and North Main Street drainage area in the Town of Northfield. The privately-owned mill complex houses a clothing company, a bakery, and a car repair business.

The mill buildings have 1.3 acres of roof area that drains to the municipal combined sewer system. The volume of roof drainage contributes surcharges to a system in which combined sewer overflows can release up to 0.51 pounds of total phosphorus per rain event. The Town has been systematically working to separate stormwater sources from their wastewater system to reduce pressure on the municipal wastewater treatment plant and eliminate overflow occurrences.

The property receives run-on from the adjacent highway and an upland residential area, as well as generating runoff from its own paved parking area. The project proposes to capture and treat runoff from 5.3 impervious acres that currently flow untreated to the Dog River. Adjacent to the mill property, there is a town-owned parcel with a small structure that was previously used to filter wool fibers before mill effluent was released to the river. The Town of Northfield has granted the use of this building for the installation of a sand filter for stormwater treatment.

Project Development

The Nantanna Mill site is not a designated 3-acre site under Vermont General Permit 3-9050. The sewer separation work being undertaken by the Town is voluntary, and neither the roof drain disconnection nor the stormwater treatment is required by the State. It is a high priority for the Town to improve stormwater management on this site by separating stormwater from the municipal wastewater system and treating overland runoff to reduce sediment, nutrient, and bacteria contributions to the Dog River, as part of their comprehensive sewer separation initiative.

Staff from the DEC Stormwater program asked Friends of the Winooski River to help the Town fund and manage this project, which exceeded municipal capacity. We obtained a Clean Water Block Grant from Watersheds United Vermont for preliminary design in late 2021, and following a competitive bid process, we contracted with Dufresne Group to complete the alternatives analysis and preliminary design. That project has just been completed.

Reference in Plans

As noted above, this project has long been a priority for the Town. The Northfield Area-Wide Plan completed in 2016 includes discussion of a petroleum sheen on the Dog River adjacent to this property, from an unknown source. Improved stormwater management on this property could contribute to a reduction in pollutants reaching the river.

The Dog River in West Berlin is listed as impaired by E. coli on the state's 2020 303(d) list, and historically the river has had frequent blooms of nuisance algae. There are two established public swimming areas on the river downstream from Northfield in West Berlin and Montpelier. The Dog is well known as a trout stream and provides recreation for anglers and boaters. Improving water quality in the Dog River will enhance aquatic habitat, make contact recreation safer, and reduce the

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
Michele Braun	Project Manager
Jim Pease	Technical Advisor

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): 9031

Project staff & their project role(s):

Michele Braun managed the grant for this project, and worked together with the Town and their consultant to advance the project in all phases from design through implementation.

Project description (250 words max):

Installation of an underground chamber system and swales in the Barre Town DPW parking lot to manage stormwater on the site in accordance with the 3-9050 permit.

Reference contact information:

Name: Chris Violette
Affiliation: Town of Barre, Town Manager
Phone: 802-479-9331
Email: cviolette@barretown.org

Example Project 2:

Watershed Projects Database ID (if applicable): NA

Project staff & their project role(s):

Michele Braun managed this project from the point of 60% design in October 2022 through implementation in 2023. The implementation cost was over $500,000, from five funders.

Project description (250 words max):

Replacement of an undersized and impassable culvert at the point where German Flats Road crosses Lockwood Brook.

Reference contact information:

Name: Jared Cadwell

Affiliation: Town of Fayston, Select Board Chair
Phone: 802-522-7438
Email: cadwelljared@gmail.com

Example Project 3:

Watershed Projects Database ID (if applicable): 8778
Project staff & their project role(s):

Michele Braun managed this project from identification through implementation.

Project description (250 words max):

Removal of Camp Wihakowi Dam and restoration of surrounding 4-acre floodplain.

Reference contact information:

Name: Julie Butler
Affiliation: US Fish & Wildlife Service
Phone: 802-233-1630
Email: julie_butler@fws.gov

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):

0.74

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 ($0.655 / 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: $35,439
State matching funds:
Non-State matching funds:
Total project budget: $35,439

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: $485,000 for construction phase

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?

  No

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

- 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.)? No

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

  No

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

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

No

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

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? No

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

- Interpretive signage:

- Educational meetings / workshops:

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.

- ◈ 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:

- ◈ 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.

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

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:

No

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: "Basin 8 Clean Water Service Provider Project Proposal – FY24, Round 2".

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 an 8 January 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 anthropogenic nutrient and organic pollution

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:	Stormwater - Final Engineering Design	
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	11623
Watershed Project Database Project Name	Nantanna Mills Stormwater Project

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	
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:**	
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? The sand filter installation will require municipal development review, including floodplain review. Ned Swanberg reviewed the project concept and commented that if the structure were constructed on the footprint of the existing structure (which is the selected alternative), then it may be permissible.	
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.

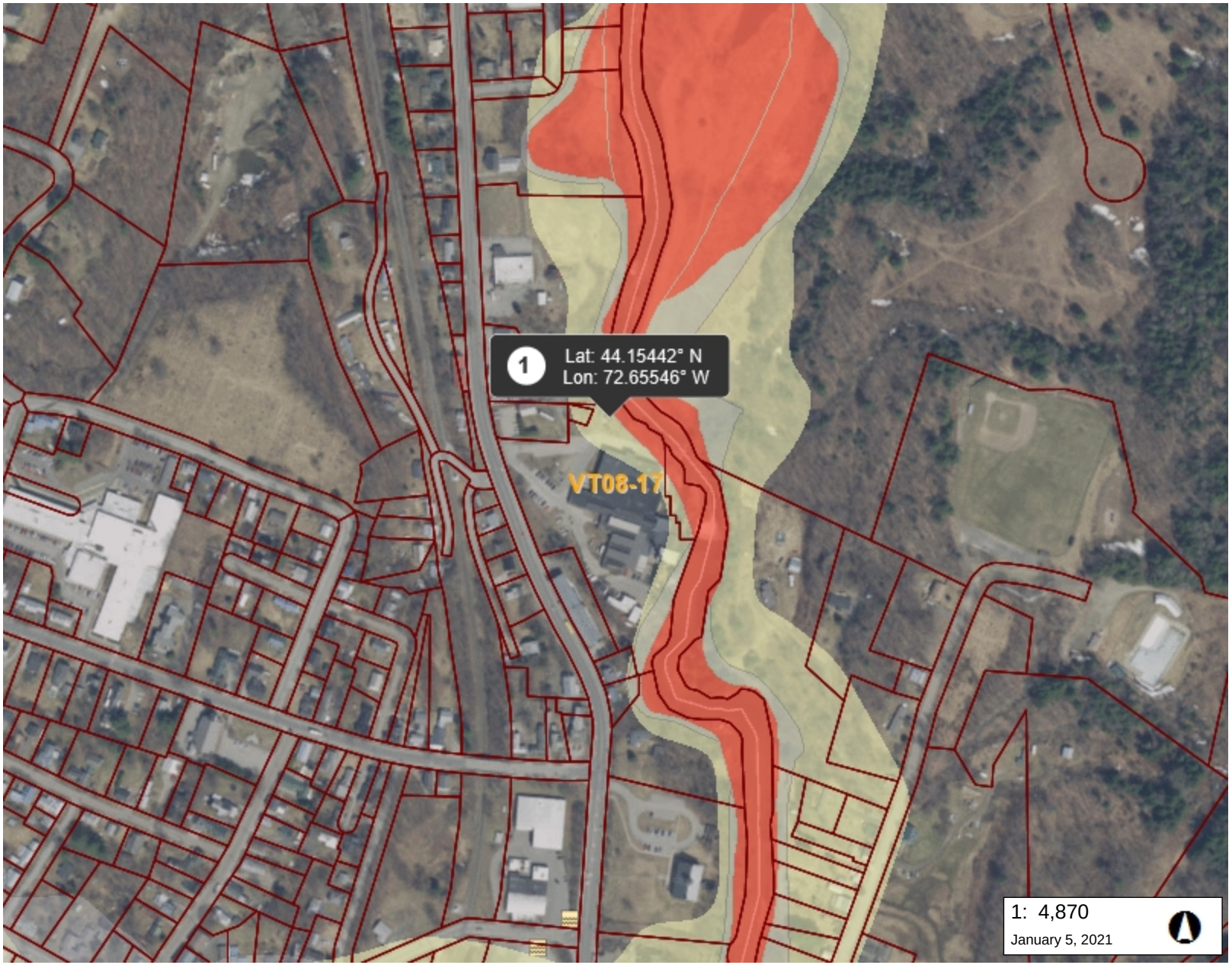
Please include a summary of the response here:

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

Nantanna Mill Stormwater Treatment

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Shoreland 100' Setback
- Shoreland 250' Setback
- Wetland - VSWI
  - Class 1 Wetland
  - Class 2 Wetland
  - Buffer
- Wetlands Advisory Layer
- River Main Stem Waterbodies
- WBID Watersheds
- Flood Hazard Areas (Only FEM
  - AE (1-percent annual chance floodp
  - A (1-percent annual chance floodpl
  - AO (1-percent annual chance zone feet)
  - 0.2-percent annual chance flood ha
- River Corridors (Aug 27, 2019)
- .5 - 2 sqmi.
- .25-.5 sqmi.
- Soils - Hydric
- Parcels (standardized)
- Act250 Permits **INCOMPLET
- Waterbody
- Stream/River
  - Stream
  - Intermittent Stream
- Town Boundary

NOTES

CWIP Screening Map

247.0 0 124.00 247.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 406 Ft. 1cm = 49 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Nantanna Mills Stormwater Separation and Treatment Final Design

Photo: Nantanna Mills site, municipal structure at far left

Nantanna Stormwater Separation & Treatment Final Design

Proposed Project Timeline

1. Project Kickoff February 2024
2. Stakeholder and regulator review of 60% design completed by September 30, 2024
3. 90% design completed by February 2025
4. Permits obtained and 100% design completed by June 30, 2025

FRIENDS OF THE Winooski

Michele Witten Braun

michele@winooskiriver.org

Executive Director, Friends of the Winooski River 2017

Organizational administration: financial management, insurance maintenance, grants management, policy compliance, board of directors support, fundraising, and personnel oversight

Project management of all large restoration projects, such as Dog River Park floodplain restoration, Camp Wihakowi dam removal, Barre Town Recreation Fields Bioretention, Lockwood Brook culvert replacement, and development and management of projects across all programs

Communications: publish web site, blog, newsletter, social media accounts, and outreach materials

Experience

Hazard Mitigation Planner **Town & Village of Northfield** **2015-2017**
Northfield, Vermont

* Obtained and managed $3 million in grants to acquire and demolish 18 flood-damaged homes and implement a floodplain restoration and public amenity project in the resulting riverfront open space

Planner/Zoning Administrator **Town & Village of Northfield** **2006-2015**
Northfield, Vermont

* Responsible for municipal land use planning, hazard mitigation planning, and implementation
* Secured grants to provide education to municipal boards, improve schools signage, engage the public in municipal plan update, and reconstruct village common pedestrian facilities
* Coordinated and supported municipal water and sewer department adoption of GIS

Project Associate **Green Mountain Institute for Environmental Democracy** **1996-2001**
Montpelier, Vermont

* Assisted states, cities, and non-profits with design and coordination of collaborative processes for improving public involvement in environmental planning.
* Developed group process agendas and facilitated meetings and collaborative planning processes

Education

Master of Science **University of Vermont** **1996**

* Natural Resources Planning
* Thesis: *Factors Affecting Farmer Participation in Federal Cost-Sharing Programs for Soil and Water Conservation*

Bachelor of Arts **Bowdoin College** **1991**

* Dual major: Government & Legal Studies and Romance Languages
* Diplôme d'Etudes Françaises, Deuxième Degré, University of Strasbourg, France 1990

Training

* Certified Floodplain Manager, 2012-2017

FRIENDS OF THE Winooski

Taylor Litwin

taylor@winooskiriver.org

EDUCATION

Master of Science, Environmental Humanities || University of Utah 2021

Thesis: *Albion Basin: A Case Study of Ecological Restoration in the Anthropocene*

Graduate Certificate, Global Sustainability || University of Utah 2020

Dual Bachelor of Science, Environmental Science and Geography || SUNY Oneonta 2017

EXPERIENCE

Stewardship Director, Cottonwood Canyons Foundation 2021-2023

- Secured grants from Utah Department of Agriculture, local governments, and corporate sponsors
- Coordinated the Invasive Weeds Management Program
- Organized large volunteer events including National Public Lands Day and National Trails Day
- Completed vegetation surveys for NEPA permitting applications relating to new trail construction
- Hired, trained, and supervised 4 seasonal crew members and over 120 volunteers
- Led snowshoe and ski field trips focused on ecological education for school groups

Environmental Humanities Graduate Fellow, University of Utah 2019-2021

- Assisted in event coordination in 2019, including green lunches and notable guest speakers
- Contacted prospective students who express interest in applying to the EH program

Vegetation Monitoring and Assessment Team, National Park Service, Moab, UT 2019

- Worked to restore native species and eradicate invasives in Canyonlands and Arches National Parks and Hovenweep/Natural Bridges National Monuments in riparian and grassland areas

Americorps Vista Member, Mālama Kauaʻi, Kilauea, HI 2018

- Streamlined grant application and management practices and secured grants
- Developed training materials and provided ongoing mentorship for 8 AmeriCorps members

Environmental Educator, NYS Dept. of Environmental Conservation, Delmar, NY 2017

- Developed 8 new educational programs including Beaver Lodges and Bird Adaptations
- Conducted routine invasive species removal of water chestnut and checks of 10 mile trail network
- Led High School research class of 12 students monitoring macroinvertebrates

Environmental Educator, The Wild Center, Tupper Lake, NY 2016

- Developed and implemented 6 new Live Animal programs
- Led Canoe and Stand Up Paddleboard tours, educating guests about river ecology and bog species
- Guided Green Technology tours explaining the functions of photovoltaic cells, biofiltration, pellet stove.

Training

- Utah State Noxious Weed Management Conference, St. George. (2023)
- Utah Master Naturalist: Utah State University (2022)
- Utah State Non-commercial Pesticide Applicators License: (2021)
- *QuickBooks* for Agriculture: Kauai Community College (2018)
- Federal Grant Writing for Nonprofits: NOAA Pacific Region (2018)
- Wilderness First Aid (WFA): National Outdoor Leadership School (2017)
- Early Childhood Educator Facilitator Training: Project Learning Tree (2017)
- Teachers on the Estuary Certified: NOAA (2017)
- Certified Interpretive Guide: National Association for Interpretation (2016)

FRIENDS OF THE Winooski

Samuel Puddicombe

samuel@winooskiriver.org

EDUCATION

The University of British Columbia, Vancouver, BC **2019**
Bachelor of Science in Global Resource Systems (B.Sc), Honors Standing
Thesis: *Soil Carbon Sequestration for British Columbia Vegetable Production*

The University of Vermont, Burlington, VT **2023**
Geographic Information Systems and Data Communication Professional Certificate

EXPERIENCE

Vermont Fish & Wildlife Department, Montpelier, VT *Technician* **2023**
- Conducted field work to monitor fish populations in ponds and streams.
- Created and used surveys to monitor stream banks, tree plantings, culverts, and dams.
- Synthesized extensive data sets.
- Created a GIS project to assess aquatic habitat quality.
- Supported a land acquisition project.

New Leaf Organics, Bristol, VT *Crew Lead* **2022**
- Assisted in running a 5-acre flower and vegetable farm.
- Primary tractor operator.
- Cover crop manager.
- Field crew supervisor.

Pumpkin Village Foods, Burlington, VT *Sales / Operations* **2020-2022**
- Operated sales, purchasing, accounting, and delivery for the VT branch of a local food distributor.
- Facilitated significant growth in sales and range of distribution.

Lamoille South Supervisory Union, Stowe, VT *Nordic Ski Coach* **2021-2022**

Laughing Crow Organics, Pemberton, BC *Field Crew* **2019**

Training
- UVM Soil Morphology (Fall 2021)
- UVM Pasture Management (Fall 2021)

Skills
- ArcGIS Pro / Survey123
- Excel / Data Management
- Google Workspace
- Quickbooks Online
- Soils Identification
- Basic Carpentry

James M. Pease – Environmental Scientist

Mr. Pease is a retired scientist formerly employed by the Vermont Department of Environmental Conservation, Watershed Management Division, Ecosystem Restoration Section. He was with VTDEC for 29 years, preceding that he was associated with the University of Vermont's Water Resources Center and the USDA Forestry Sciences Laboratory in Burlington. He is an avid hiker and a member of several trail organizations and has completed the Long Trail twice, the Northville-Lake Placid Trail, the NH 4000 footers and is close to completing the Appalachian Trail.

Select Accomplishments

- 2011-2022 VTDEC Clean Water Grants Program Manager
  - Implementation of a statewide stormwater grant program involving distribution of $2.2 million dollars in state funds and $3.8 million in federal funds for water quality and water resource improvement projects.
  - Prepared and successfully acquired $.75 million in grants or financial assistance for partner municipalities.
- 2016 University of Vermont Outstanding New Service-Learning Faculty Award.
- 2006 and 2013 American Society of Civil Engineers, Engineering Excellence Award
  Co-honoree with Forcier Aldrich & Associates and Aldrich and Elliott Associates.
- 2001 EPA-New England Water Works Association Water Supplier Business Partnership Honors Award – Co-honoree with Champlain Water District and Shearer Chevrolet.
- 2000, 2003, 2006 Governor's Award for Environmental Excellence in Pollution Prevention
  Co-honoree with Onion River Farm (Griswold Farm) (2000), City of South Burlington (2003), Chittenden County Regional Stormwater Education Program (2006).

Select Publications

- *Vermont Stormwater Master Planning Guidelines*, VTDEC, 2019.
- *Status Report Orphan Stormwater System Grant Project*, Reports to the Vermont State Legislature, March 2007 & March 2008.
- *Options for Municipal Roles and Responsibilities in Stormwater Management*, Report to the Vermont State Legislature, March 2002.
- *Urban Nonpoint Pollution Source Assessment of the Greater Burlington Area*, Lake Champlain Basin Program of the New England Interstate Water Pollution Control Commission, 1997.

Experience

Municipal Technical Assistance / Federal Municipal Separate Storm Sewer System National Pollutant Discharge Elimination System Permit Coordinator – 2000 to 2010
State of Vermont, Water Quality Division, Stormwater Section, Waterbury, Vermont

Nonpoint Pollution Source Coordinator/Aquatic Biologist – 1992 to 1999
New England Interstate Water Pollution Control Commission/State of Vermont, Water Quality Division, Waterbury, Vermont

Education

MS, Biology 1985
University of Virginia, Charlottesville, Virginia.

BA, Botany 1979
University of Vermont, Burlington, Vermont.

Stormwater Treatment Practice Calculator

Identification

Date	3/23/2023
WPD ID	11623
STP Name	Sand Filter

Loading Information

Drainage Area	5 - Winooski River	
Impervious Area	3.057	acres
Pervious Area	1.178	acres

STP Information

STP Type	Sand Filter w underdrain	
Storage Volume	1755	ft^3
Infiltration Rate	3.5	in/hr
Filter Course Depth	24	in

Estimated Phosphorus Reduction

Load	3.69	kg/year
STP Capacity	0.16	in
Efficiency	20.08	%
Reduction	0.74	kg/year

Nantanna Mills Stormwater Final Design Budget

		Units	Rate	Total
1	FWR staff time	72	$ 38.40	$ 2,765
2	Mileage	80	$ 0.655	$ 52
3	Engineering Contract	1	$ 29,400	$ 29,400
	a. Project Kickoff Meeting *b. Stakeholder and regulator review of 60% design* *c. 90% design completion* *d. Permits obtained* *e. Construction-ready plans completion*			
	subtotal			*$ 32,217*
4	Indirect			$ 3,222
	TOTAL			**$ 35,439**

1. Staff time estimate based on past design projects, and actual wage rate including fringe

2. Mileage estimate based on distance from FWR office to project site. Assumes 4 trips to the site: kickoff, regulator visit(s), meeting(s) for stakeholder feedback.

3. Based on estimate provided by Dufresne Group

4. De minimis indirect rate of 10%

Michele Braun <michele@winooskiriver.org>

RE: DUE TODAY: Nantanna Stormwater Grant Application

1 message

Jeff Schulz <jschulz@northfield.vt.us> Wed, Dec 13, 2023 at 12:34 PM
To: Michele Braun <michele@winooskiriver.org>, Kevin Lord <KLord@efwall.com>, Jim Russo <jrusso@northfield.vt.us>, Robert Lord <rlord@efwall.com>
Cc: "cc: Jim Pease" <jimpeasevt@gmail.com>

Hello Michele,

This project is a priority for the Town of Northfield as part of its sewer separation and clean water efforts. We support the Friends of the Winooski's efforts and this grant application for the project.

Thank you.

Jeff

Jeff Schulz, Northfield Town Manager

802-485-9822

From: Michele Braun <michele@winooskiriver.org>
Sent: Wednesday, December 13, 2023 8:08 AM
To: Kevin Lord <KLord@efwall.com>; Jeff Schulz <jschulz@northfield.vt.us>; Jim Russo <jrusso@northfield.vt.us>; Robert Lord <rlord@efwall.com>
Cc: cc: Jim Pease <jimpeasevt@gmail.com>
Subject: DUE TODAY: Nantanna Stormwater Grant Application

Good morning!

I need a statement of support **today** for the final design of this project from EF Wall and the Town.

Thank you

Michele

Michele Braun <michele@winooskiriver.org>

RE: Nantanna Stormwater project

1 message

Robert Lord <RLord@efwall.com> Wed, Dec 13, 2023 at 2:20 PM
To: Michele Braun <michele@winooskiriver.org>
Cc: Jim Pease <jimpeasevt@gmail.com>, Jeff Schulz <jschulz@northfield.vt.us>, Jim Russo <jrusso@northfield.vt.us>, Kevin Lord <KLord@efwall.com>

Good afternoon Michele ,

Please consider this email as a notice that College Town Industrial Plaza (CTIP) supports the grant application process for the final design of

the storm water / sewer separation at our property located at 7 Belknap Avenue in Northfield Vermont.

Should you have any questions or concerns, please contact our office.

Thanks

Robert P. Lord Jr

Partner

College Town Industrial Plaza LLP

PO Box 763

Barre, VT 05641

P 802-479-1013

F 802-479-1019

Alternatives Report for

NANTANNA MILLS STORMWWATER TREATMENT

NORTHFIELD, VERMONT

October 23, 2023

Submitted to:
Friends of the Winooski River
Michele Braun
P.O. Box 777
Montpelier, VT 05601

DUFRESNE GROUP
CONSULTING ENGINEERS

Springfield, VT | Barre, VT | St. Johnsbury, VT | Manchester Center, VT | 802.674.2904 | info@dufresnegroup.com | dufresnegroup.com

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

NANTANNA MILLS STORMWATER TREATMENT
ALTERNATIVES REPORT
FRIENDS OF THE WINOOSKI RIVER
October 23, 2023

1.0 Summary

1.1 Objective

The Nantanna Mills site was selected for evaluation based on the objective to:

1. Reduce the volume of stormwater entering the municipal wastewater system from this site.
2. Maximize the treatment of the water quality volume of stormwater from the catchment area that includes this site before it reaches the Dog River.
3. Design a treatment practice that is consistent with the 2017 Vermont Stormwater Management Manual.

The Nantanna Mills site has 1.06 acres of impervious contributing stormwater to the sewer collection system from roof drains and catch basins that are connected to the sewer service for the building or connected directly into the Town's sewer main that goes across the property. The site also has 1.57 acres of impervious that is separated with 1.29 acres that is directly discharged to the river through a closed channel collection system and 0.28 acres of impervious that directly discharges from the roof to the river. As part of a project in 2019, owners obtained a stormwater permit to treat 0.31 acres prior to the collection system using two Contech Filterra bioretention units that are not designed to infiltrate.

The Nantanna Mills site also has a discharge from the Northfield separated stormwater collection system that services approximately 2.66 acres of offsite impervious contributing area. The impervious area has been approximated based on the existing separated collection area contributing to this discharge and potential expansion to areas that are currently serviced by the Town's combined sewer collection system. Lidar contouring was utilized to determine the potential total collection area for this discharge location.

Based on existing site contamination, the Nantanna Mills site has been identified as not suitable for infiltration practices.

1.2 Scope of Work

The scope of work for this project includes:

- Evaluation of alternatives for stormwater treatment for the site.
- Development of cost estimates.
- Identification of the recommended alternative.
- 30% Design plan development.
- Right-of-way and property boundary research.
- 90% Project Report.

1.3 Recommendations

Due to the large contributing area, as shown in Figure 1, which results in high flows coupled with the limited area available for treatment and the contamination of the site, a limited number of treatment devices are available that have the capacity to treat the1-inch rain event. As a result, only three stormwater treatment devices were reviewed:

- Hancor HDPE Stormwater Quality Unit
- Sand Filter Unit
- Vortechs Separator Stormwater Quality Unit

The Hancor HDPE stormwater quality unit is constructed of an HDPE housing that includes a series of weirs designed to create a sediment chamber and floatables chamber. Performance is generally measured on total suspended solids (TSS), which is rated at a minimum of 80%.

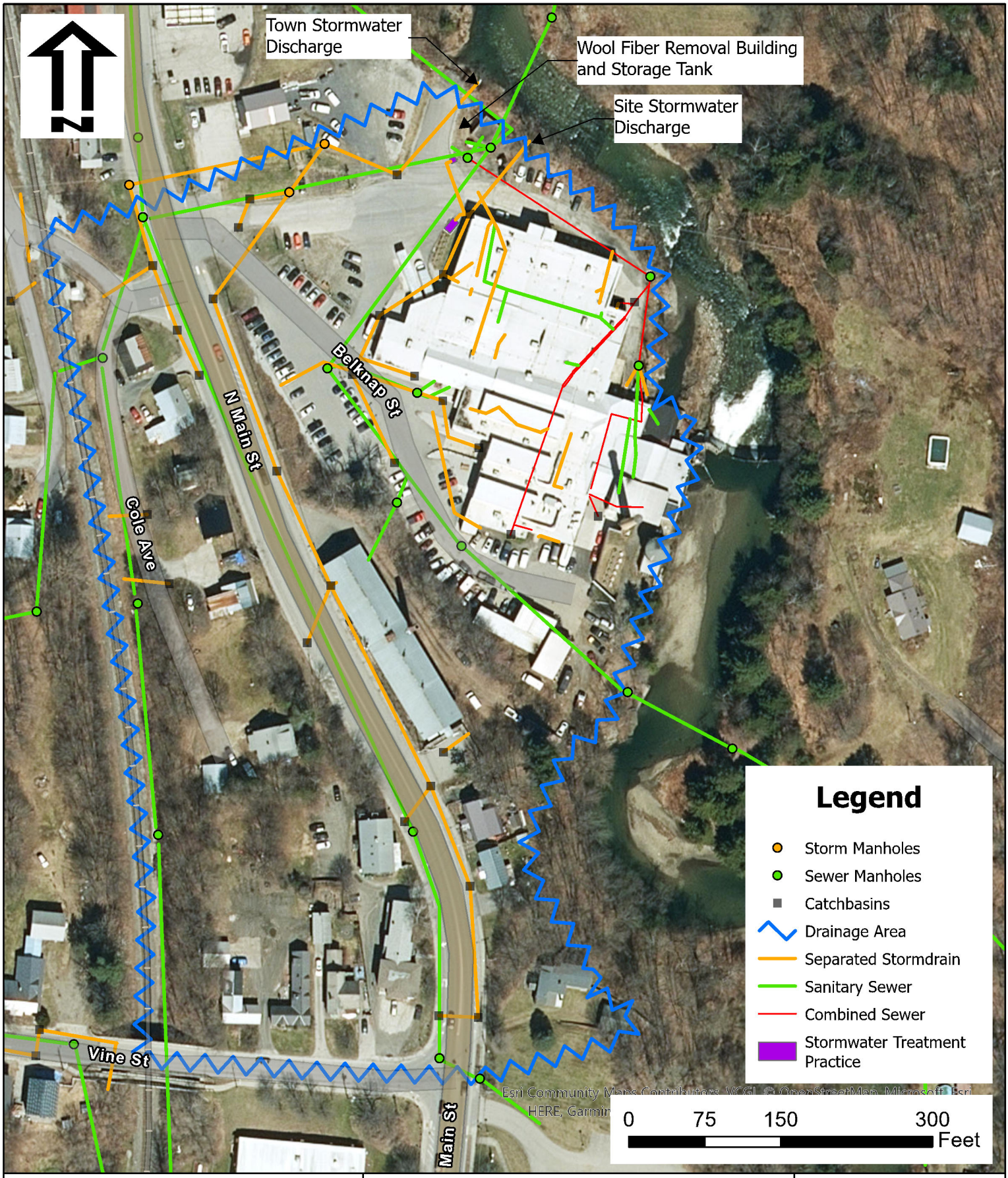
The sand filter unit is a site constructed filter that improves water quality through settling and filtration through media. The proposed unit would use the existing wool fiber removal building for a pretreatment settling chamber and the existing storage tank to contain media and to ensure that the filter does not infiltrate contaminants from the existing site into the groundwater. The EPA has tested this practice for numerous contaminant removals including total phosphorus. The study documented that the practice removes 84% TSS, 40% phosphorus and 14% total nitrogen.

The Vortechs stormwater quality unit is hydrodynamic separator that induces a swirling motion to settle suspended solids from the stormwater, while flow controls capture and retain trash, debris, sediment, and hydrocarbons. Performance measurements are generally limited to TSS, which is a minimum of 80% for this unit.

2.0 Existing Conditions

The existing site has a portion of combined sewer system which will require that some separated storm collection system be constructed to deliver stormwater from the site to the discharge location on the Dog River. While the Town owned collection system is currently separated and services approximately 10.5 acres of land comprised primarily of residential neighborhoods with an impervious surface area of approximately 4.23 acres, as shown in Figure 1. Based on Lidar contouring and existing culverts in place, stormwater west of the railroad bed is directed through open and closed channel flow to the north of the Nantanna Mills site to an unknown discharge location.

HydroCAD modeling was completed to estimate the peak stormwater flow for a 1-inch rain event at this discharge point. It was determined that all treatment devices should be capable of treating a minimum of 7.44 cfs. Refer to Appendix A for detailed calculations.



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Email: info@dufresnegroup.com
Home page: http://www.dufrensegroup.com

FIGURE 1

NANTANNA MILLS
EXISTING SITE LAYOUT AND DRAINAGE AREA

NORTHFIELD, VERMONT

PROJECT NO. 3122006
PROJECT MJR. AJD
SCALE AS SHOWN
DATE OCT 23, 2023

2.1 Collection System

Collection Devices:
All stormwater is currently collected using roof drains or catch basin structures located within the drainage area. The system has approximately 29 catch basins. Based on existing information, there are 3 catch basins that discharge to drainage swales that contribute to other catch basins, 15 catch basins on the Town owned separated storm water collection system, 8 catch basins on the site owned separated storm water collection system, and 4 catch basins on the site that contribute to the combined sewer collection system.

Roof runoff from the offsite drainage area sheet flows to collection devices, while the roof runoff from the Nantanna Mills building is collected through both sheet flow and roof drains. The building is constructed of multiple level flats and pitched roofs with some roof drains contributing to the separated storm system and the rest of the roof drains contributing to the combined sewer system.

Transmission:
Stormwater from separated roof drains and catch basins is carried in storm drain pipes along North Main Street and the Nantanna Mills property where it discharges in to the Dog River. Stormwater from combined roof drains and catch basins is conveyed to the wastewater treatment facility in the combined sewer collection system.

EPA Published Event Contaminant Concentrations:
EPA through the National Pollutant Discharge Elimination System (NPDES) has published the following estimated concentrations for contaminants in municipal stormwater:

- Total suspended solids: 56 mg/L
- Total phosphorus: 0.15 mg/L
- Total nitrogen: 1.2 mg/L

3.0 Alternatives and Recommendations

To treat the stormwater runoff in the system, three different treatment devices were reviewed. A summary of the treatment devices is included below.

3.1 Alternatives

1. Hancor HDPE Stormwater Quality Unit

   The Hancor Storm Water Quality Units are constructed of high-density polyethylene pipe and utilize baffles to capture solids and sediments as stormwater flows through the units. The largest unit available has a capacity of 6.23 cfs. Therefore, multiple units would be required for this application. This would allow for a unit to be installed that was

designated for site stormwater and a unit designated for Town stormwater.

The project, as shown in Figure 2, would involve installing approximately:

- 390-lf stormwater collection around and on the southwest side of the building: This would remove multiple catch basins on the south side of the building.
- 325-lf stormwater collection on northeast side of the building: This will disconnect multiple catch basins on the east side of the building from the sanitary sewer.
- 100-lf sanitary sewer on northeast side of the building: This will allow for the removal of the sewer holding tank.
- (2) 48-inch diameter 40-lf Hancor units

The estimated treatment capabilities are outlined in Table 1 and for more information on the Hancor Storm Water Quality Units, see Appendix B.

Table 1
Hancor Storm Water Treatment Capabilities

	Nantanna Mills Site	Town Collection
Storm Flow Rate (cfs)	3.73	3.77
Maximum Treated Flow Rate (cfs)	3.94	3.94
Total Storm Volume (ac-ft)	0.163	0.165
Estimated TSS per Storm (mg)	11,259,192	11,397,344
Removed (80%) TSS per Storm (mg)	9,007,354	9,117,875
Estimated phosphorus per Storm (mg)	30,159	30,529
Removed phosphorus (43%) per Storm (mg)	12,968	13,127
Estimated nitrogen per Storm (mg)	241,268	244,229
Removed nitrogen per Storm (mg)	Unknown	Unknown

Maintenance:

- Two manhole access points from which a vacuum truck can remove sediment and solids retained in the structure.
- Floatables and sediment are retained in the first chamber, floatable oils and greases retained in the second chamber.
- No mechanical parts.

Advantages:

- Simple operation
- Ease of maintenance

Disadvantages:

- Low capacity requires multiple units
- External bypass required

N. MAIN STREET

REMOVE 4" VC STORM DRAIN
INSTALL 18" HDPE STORM DRAIN

CUT IN BYPASS MANHOLE
ON EXISTING STORMDRAIN

EXISTING 18" HDPE
FROM TOWN COLLECTION

EXISTING 18" RCP

CLEAN AND FILL
SUBSURFACE TANK
WITH COMMON FILL

48" DIAMETER 40 LF HDPE
HANCOR STORM WATER
QUALITY UNIT

EXISTING 18" HPDE
TO REMAIN AS OVERFLOW
DISCHARGE

NEW 12" HDPD TREATED
WATER DISCHARGE

REMOVE STRUCTURE, CLEAN
AND FILL SUBSURFACE
WITH COMMON FILL

EXISTING 24" RCP
TO REMAIN AS OVERFLOW
DISCHARGE

CUT IN BYPASS MANHOLE
ON EXISTING STORMDRAIN

48" DIAMETER 40 LF HDPE
HANCOR STORM WATER
QUALITY UNIT

NEW 12" HDPD TREATED
WATER DISCHARGE

DOG RIVER

0+50

0+00

DUFRESNE GROUP
CONSULTING ENGINEERS
Suite 200, 56 Main Street
Springfield, Vermont 05156
Tel: (802) 674-2904 Fax: (802) 674-2913
E-mail: info@dufresnegroup.com
Home page: www.dufresnegroup.com

Project #	3122006
Project Mgr.	AJD
Design	EAE
Drawn	EAE
Checked by	R.E. DUFRESNE
Date	OCT 23, 2023
Scale	AS SHOWN
Approved by	APPROVED BY

NANTANNA MILLS
STORMWATER TREATMENT

ALTERNATIVE 1
HANCOR STORMWATER QUALITY TREATMENT OPTION

NORTHFIELD, VERMONT

FIG 2

DWG. NO. 3122006-proposed.dwg

SHEET 1 OF 1

FILE: J:\Northfield VT\3122006 Nantanna Mill Complex\CAD\3122006-proposed.dwg Oct 23, 2023 - 12:00pm

2. Sand Filter Unit

The Sand Filter Unit has been sized to match the size of the existing storage tank, which exceeds the 1-inch WQv storm. The Fiber Removal Facility pretreatment settling chamber provides 2,600-gallons of storage and with three baffle walls, 37.2 minutes of detention time. There are several modifications that can be made to the basic sand filter design to improve treatment, including iron-enhanced sand. However, the availability and cost would need to be determined prior to selection. The University of Vermont is currently testing drinking water treatment residuals as a more readily available filtration media.

The project, as shown in Figure 3, 4 and 5, would involve installing approximately:

- 390-lf stormwater collection around the southwest side of the building: This would remove multiple catch basins on the south side of the building.
- 325-lf stormwater collection on northeast side of the building: This will disconnect multiple catch basins on the east side of the building.
- 200-lf sanitary sewer on northeast side of the building: This will allow for the use of the sewer holding tank for stormwater.
- Renovation of the Filter Removal Facility building for pretreatment and the Filter Removal Facility holding tank into a sand filter unit.

The estimated treatment capabilities are outlined in Table 2 and for more information on the Sand and Organic Filters, see Appendix C.

Table 2
Sand Filter Unit Treatment Capabilities

	All Stormwater
Storm Flow Rate (cfs)	7.44
Total Storm Volume (cf)	14,244
Maximum Treatment Volume over 48 hrs (cf)	18,427.5
Estimated TSS per Storm (mg)	22,587,320
Removed TSS (84%) per Storm (mg)	18,973,349
Estimated phosphorus per Storm (mg)	60,502
Removed phosphorus (40%) per Storm (mg)	24,201
Estimated nitrogen per Storm (mg)	484,014
Removed nitrogen (14%) per Storm (mg)	67,762

Maintenance:

- Debris and sediment are retained in the pretreatment chamber and need to be removed regularly either manually by shovels and brooms or through use of a Vac-Con truck.
- Sand filter media may need to be replaced as needed
- No mechanical parts.

Advantages:

- Simple operation
- Ease of maintenance
- Exceeds treatment volume
- Additional treatment possible with sand alternatives

Disadvantages:

- Sand media may need replacement periodically

N. MAIN STREET

REMOVE 4" VC STORM DRAIN
INSTALL 18" HDPE STORM DRAIN

EXISTING FIBER REMOVAL FACILITY BUILDING AND STORAGE TANK TO BE CONVERTED TO SAND FILTER WITH PRETREATMENT FOR MORE DETAIL SEE FIGURE 4 FOR PARTIAL PLAN

CONNECT TO TOWN STORMDRAIN COLLECTION SYSTEM

EXISTING 18" RCP

EXISTING 24" RCP

NEW 8" PVC SANITARY SEWER

NEW 18" HDPE STORMDRAIN

CAP EXISTING SEWER TO BE ABANDONED AND CONNECT ALL KNOWN STORM DRAINS TO NEW SEPARATED STORM COLLECTION

DOG RIVER

DUFRESNE GROUP
CONSULTING ENGINEERS
Suite 200, 56 Main Street
Springfield, Vermont 05156
Tel: (802) 674-2904 Fax: (802) 674-2913
E-mail: info@dufresnegroup.com
Home page: www.dufresnegroup.com

Project #	3122006
Project Mgr.	AJD
Design	EAE
Drawn	EAE
Checked by	R.E. DUFRESNE
Date	OCT 23, 2023
Scale	AS SHOWN
Approved by	APPROVED BY

NANTANNA MILLS
STORMWATER TREATMENT

ALTERNATIVE 2
PROPOSED SAND FILTER
OVERALL SITE PLAN

NORTHFIELD, VERMONT

FIG 3

DWG. NO. 3122006-proposed-op

SHEET 1 OF 1

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CORE EXISTING CATCH BASIN AND DIRECT STORMWATER TO NEW TREATMENT SYSTEM

CAP EXISTING STORMDRAIN AND ABANDON IN PLACE

NEW 18" HDPE STORMDRAIN

2.0' CLEAN WASHED SAND FILTER WITH UNDERDRAIN SYSTEM ON TOP OF EXISTING CONCRETE WASTEWATER STORAGE TANK

6" PVC UNDERDRAIN

CUT IN NEW STORM MANHOLE ON EXISTING 18" HDPE DISCHARGE

18" HDPE OVERFLOW

CONCRETE WALL ATTACHED TO TOP OF EXISTING ABANDONED SEWER STORAGE TANK

STONE LINED LEVEL SPREADER

CAP ALL PIPES AND ABANDON MANHOLE IN PLACE

NEW 24" HDPE STORMDRAIN

EXISTING WOOL FIBER REMOVAL FACILITY TO BE RETROFITTED FOR PRETREATMENT

4'x1' WEIR (TYP ALL CHAMBERS)

CORE EXISTING STRUCTURE

CORE EXISTING STRUCTURE NEW 8" PVC SEWER

NEW 18" HDPE STORMDRAIN

10' 0 5' 10'

(IN FEET)

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NANTANNA MILLS
STORMWATER TREATMENT

ALTERNATIVE 2
PROPOSED SAND FILTER
PARTIAL PLAN

NORTHFIELD, VERMONT

FIG 4

DWG. NO. 3122006-proposed-op

SHEET 1 OF 1

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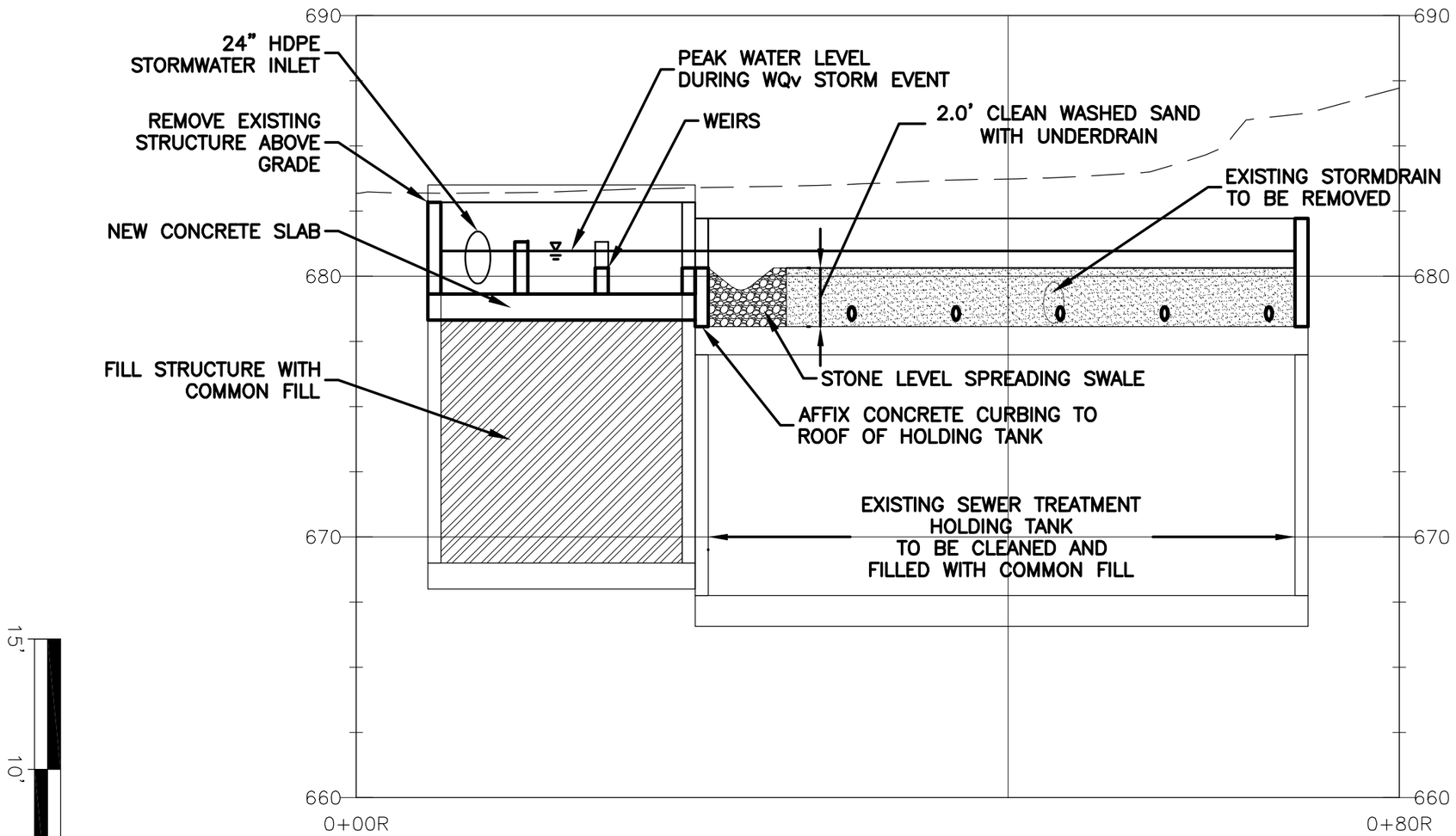

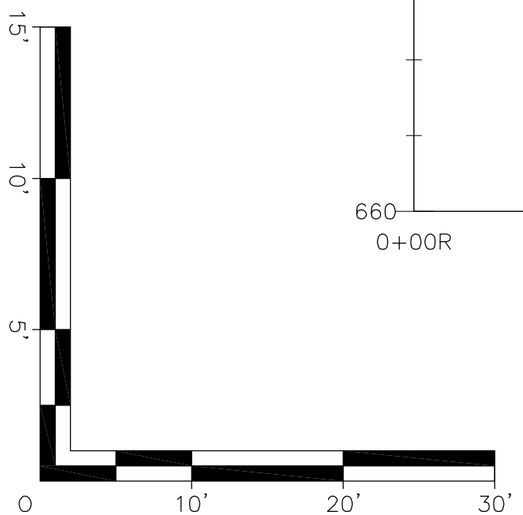

NOTES

1. EXISTING SEWER TREATMENT HOLDING TANK HAS TWO ACCESS HATCHES. CONTRACTOR TO USE HATCHES TO CLEAN AND FILL TANK TO THE BEST OF THEIR ABILITY. ADDITIONAL ACCESS HOLES MAYBE REQUIRED.

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Scale	AS SHOWN
Approved by	APPROVED BY

NANTANNA MILLS
STORMWATER TREATMENT

ALTERNATIVE 2
SAND FILTRATION UNIT
SECTION 1

NORTHFIELD, VERMONT

FIG 5

DWG. NO. 3122006-proposed-op

SHEET 1 OF 1

3. Vortechs Stormwater Quality Unit

The Vortechs treatment unit is available in several sizes. The Vortechs unit is housed in a concrete tank that uses centrifugal force to separate solids and sediment from stormwater followed by weirs to prevent solids, sediment and oils from discharging from the treatment unit.

The project, as shown in Figure 6, would involve installing approximately:

- 390-lf stormwater collection around the southwest side of the building: This would remove multiple catch basins on the south side of the building.
- 325-lf stormwater collection on northeast side of the building: This will disconnect multiple catch basins on the east side of the building from the sewer.
- 200-lf sanitary sewer on northeast side of the building: This will allow for the use of the sewer holding tank for stormwater.
- Removal of the Fiber Removal Facility building and installation of Vortech Separator in its location. Sewer holding tank could be filled.

The estimated treatment capabilities are outlined in Table 3. For more information on the Vortech Separators, see Appendix D.

Table 3
Vortech Separator Treatment Capabilities

	All Stormwater
Storm Flow Rate (cfs)	7.44
Maximum Treated Flow Rate (cfs)	14.0-17.5
Total Storm Volume (cf)	14,244
Estimated TSS per Storm (mg)	22,587,320
Removed TSS (80%) per Storm (mg)	18,069,856
Estimated phosphorus per Storm (mg)	60,502
Removed phosphorus per Storm (mg)	
Estimated nitrogen per Storm (mg)	484,014
Removed nitrogen per Storm (mg)	

Maintenance:
- Three manhole access points from which a vacuum truck can remove sediment and solids retained in the structure.
- Floatables and sediment are primarily retained in the first chamber.
- There are no mechanical items to replace within the treatment unit.

N. MAIN STREET

REMOVE 4" VC STORM DRAIN
INSTALL 18" HDPE STORM DRAIN

EXISTING 18" RCP

CONNECT TO TOWN STORMDRAIN COLLECTION SYSTEM

EXISTING 18" HDPE TO REMAIN AS OVERFLOW

REMOVE EXISTING BUILDING AND INSTALL VORTECHS SEPARATOR

EXISTING 24" RCP TO REMAIN AS OVERFLOW

NEW 8" PVC SANITARY SEWER

NEW 18" HDPE STORMDRAIN

DOG RIVER

NOTES

1. CONTRACTOR TO WORK WITH PROPERTY OWNER TO IDENTIFY ALL ROOF DRAINS, TRENCH DRAINS AND ANY OTHER COLLECTION STRUCTURES THAT ARE NOT IMPACTED BY WASTEWATER THAT CAN BE CONNECTED TO THE STORMWATER COLLECTION SYSTEM.

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Project #	3122006
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NANTANNA MILLS
STORMWATER TREATMENT

ALTERNATIVE 3
VORTECH SEPARATOR
OVERALL SITE PLAN

NORTHFIELD, VERMONT

FIG 6

DWG. NO. 3122006-proposed-op

SHEET 1 OF 1

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Advantages:

- High Capacity
- Simple operation
- Low maintenance requirements
- EPA, ETV, NSF Joint Verification

Disadvantages:

- Separate bypass structure required
- Limited phosphorus and nitrogen removal data available

3.2 Summary of Alternatives

Several treatment units that provide nutrient removal were reviewed prior to selecting these options for consideration, however nutrient treatment units, like the Jellyfish Filter Manhole, have higher installation and maintenance costs. A summary of the alternatives is presented below in Table 4. Additional cost estimate information is included in Appendix E.

	Hancor HDPE Stormwater Quality Units (2)	**Sand Filter Unit**	**Vortech Stormwater Quality Unit**
Storm Flow Rate (cfs)	7.5	7.44	7.44
TSS Removal (kg)	22.7	22.6	22.6
Phosphorus Removal (mg)	26,095	24,201	Unknown
Nitrogen Removal (mg)	Unknown	67,762	Unknown
Construction Costs	$515,000	$355,000	$530,000
Cost/lb of Phosphorus Removal	$8,956,525	$6,647,940	

Note: The construction costs for the alternatives were developed based on costs provided by treatment unit suppliers and recent projects in the area.

3.3 Recommended Alternative

The alternatives for stormwater treatment were reviewed with the Friends of the Winooski for ease of maintenance and applicability. Ease of maintenance should be a high priority because improperly maintained stormwater treatment devices lose treatment efficiency. A summary of the considerations for each unit is presented below:

Hancor HDPE Stormwater Quality Unit:
The Hancor stormwater quality unit would require two units to treat the stormwater runoff that will be received at this location. Removed phosphorus is based on phosphorus that is bound to suspended solids and the amount of dissolved phosphorus and nitrogen removal is unknown.

Sand Filter Unit:
The Sand Filter Unit provides a sediment basin to allow for easy removal of sediment that has accumulated, while providing an advanced contaminant removal through the sand filter. Documented removal of both phosphorus and nitrogen with flexibility for future use of alternative filtration media to provide advanced treatment.

Vortechs:
The Vortechs unit has the capacity to provide treatment at high flow rates and is compact enough to fit without disturbing any existing site components.

Maintenance of the unit could easily be incorporated into the Town's current maintenance program, however overall treatment capabilities have not been documented beyond TSS and floatables removal.

The recommended treatment unit is the Sand Filter incorporating the Wool Fiber Removal Facility and Tank.

4.0 Operation and Maintenance

4.1 Frequency

Recommendations for maintenance of the Sand Filter include inspections a minimum of two times per year in the spring and fall, but more frequent in areas where road sanding occurs. During the first few years of operation, it is recommended that the system be inspected every month but no less frequently than quarterly to determine the rate of accumulation of solids and then semi-annually if determined to be appropriate from quarterly inspections.

If maintenance is not performed, sediments may accumulate outside the sediment chamber which may cause clogging in the sand filter and result in removal and replacement of media material. All chambers should be checked for sediment accumulation during regular inspections.

4.2 Handling of sediments

There is no evidence that the trash and sediment that collects in the treatment practice could come into contact with sanitary sewer. Any oil or other hydrocarbons collected are most easily removed utilizing adsorbent pads. Sediments should be disposed of in accordance with State recommendations.

5.0 Location

The location proposed for the stormwater treatment device is limited by existing infrastructure and property ownership. A preliminary location near the existing separated outfall has been chosen. The Town owns the property that the Wool Fiber Removal Facility and Tank is constructed on. A copy of the property information is attached in Appendix F.

6.0 Permitting

The proposed treatment device will improve the quality of stormwater discharged to the Dog River. The plans and basis of design will be provided to the Friends of the Winooski. The plans and basis of design should be sent to the Stormwater Program for comment. However, there is no standard permitting process for treatment on existing impervious areas.

There are no mapped wetlands within 50 feet of the area that will be disturbed therefore wetlands permitting is not anticipated.

The site will need to go through Section 106 review based on the National Historic Preservation Act using the process outlined in 36 CFR Part 800. This process uses a four-step process to verify and minimize adverse effects on historic areas.

7.0 Additional Recommended Measures

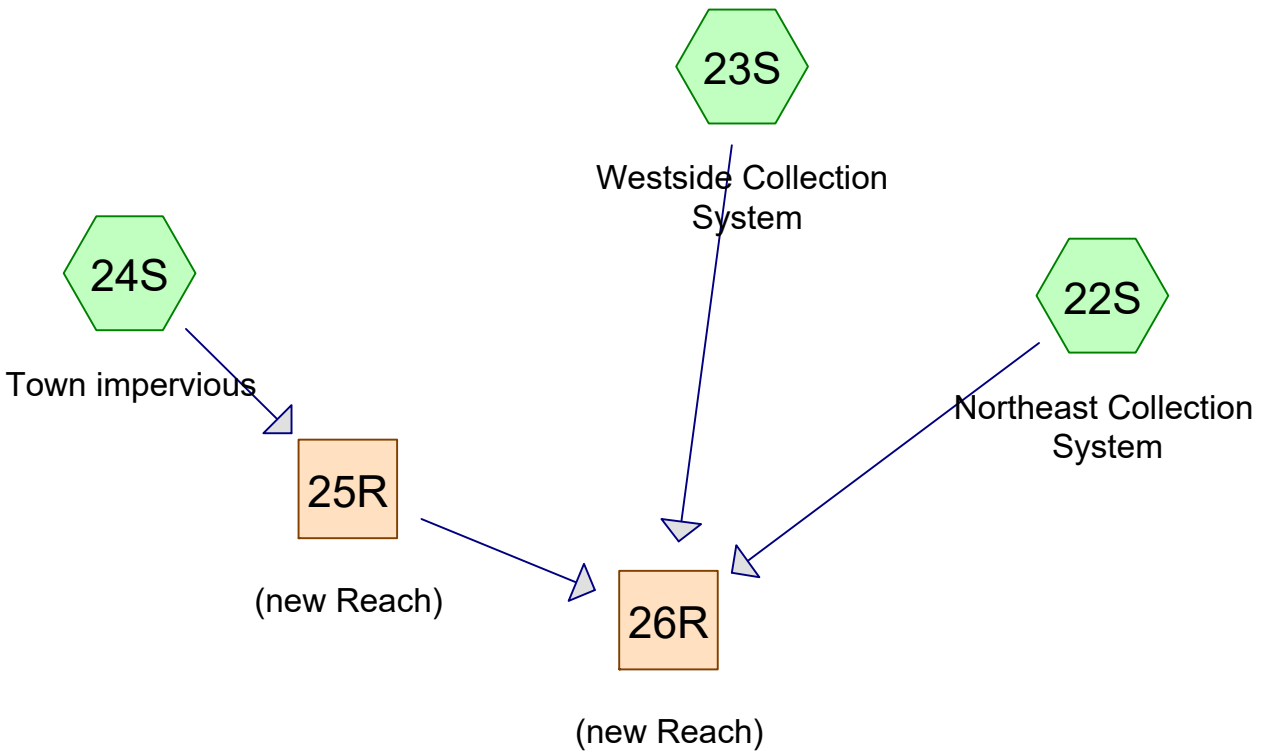
Due to the site conditions, size and impervious nature of the area contributing flows to the outfall and the space available for a treatment device, the level of treatment achieved by some other systems was not possible in this application. Therefore, it is recommended that the State and Town consider some other options for reducing the contaminant load reaching the outfall. These measures could include:

- Public education and notification through signage;
- Work with area schools to develop programs to educate students;
- Educate pet owners about the impact of pet waste;
- Small-scale integrated management practices applied throughout the collection system.

The best way to prevent contamination of our waterways is to prevent contamination from entering the storm drain system. Public education programs are the most effective measures to achieve this goal.

Appendix A

- HydroCAD model Stormwater Runoff Calculations



Subcat Reach Pond Link

Routing Diagram for Appendix A_Runoff Model_with town area
Prepared by Dufresne Group, Printed 9/14/2023

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.581	98	Paved parking, HSG B (22S, 23S, 24S)
5.581	**98**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
5.581	HSG B	22S, 23S, 24S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
5.581		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	5.581	0.000	0.000	0.000	5.581	Paved parking	22S, 23S, 24S
0.000	**5.581**	**0.000**	**0.000**	**0.000**	**5.581**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	22S	0.00	0.00	240.0	0.0200	0.013	0.0	18.0	0.0
2	23S	0.00	0.00	740.0	0.0200	0.020	0.0	18.0	0.0
3	24S	0.00	0.00	1,071.0	0.0512	0.013	0.0	12.0	0.0
4	25R	496.90	487.90	81.2	0.1108	0.013	0.0	12.0	0.0
5	26R	0.00	-0.60	30.0	0.0200	0.013	0.0	24.0	0.0

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment22S: NortheastCollection Runoff Area=33,990 sf 100.00% Impervious Runoff Depth=0.79"
Flow Length=240' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=0.99 cfs 0.051 af

Subcatchment23S: WestsideCollection Runoff Area=92,955 sf 100.00% Impervious Runoff Depth=0.79"
Flow Length=740' Slope=0.0200 '/' Tc=6.0 min CN=98 Runoff=2.71 cfs 0.141 af

Subcatchment24S: Town impervious Runoff Area=116,167 sf 100.00% Impervious Runoff Depth=0.79"
Flow Length=1,401' Tc=6.0 min CN=98 Runoff=3.38 cfs 0.176 af

Reach25R: (new Reach) Avg. Flow Depth=0.37' Max Vel=12.97 fps Inflow=3.38 cfs 0.176 af
12.0" Round Pipe n=0.013 L=81.2' S=0.1108 '/' Capacity=11.86 cfs Outflow=3.36 cfs 0.176 af

Reach26R: (new Reach) Avg. Flow Depth=0.64' Max Vel=8.14 fps Inflow=7.05 cfs 0.368 af
24.0" Round Pipe n=0.013 L=30.0' S=0.0200 '/' Capacity=31.99 cfs Outflow=7.02 cfs 0.368 af

Total Runoff Area = 5.581 ac Runoff Volume = 0.368 af Average Runoff Depth = 0.79"
0.00% Pervious = 0.000 ac 100.00% Impervious = 5.581 ac

Summary for Subcatchment 22S: Northeast Collection System

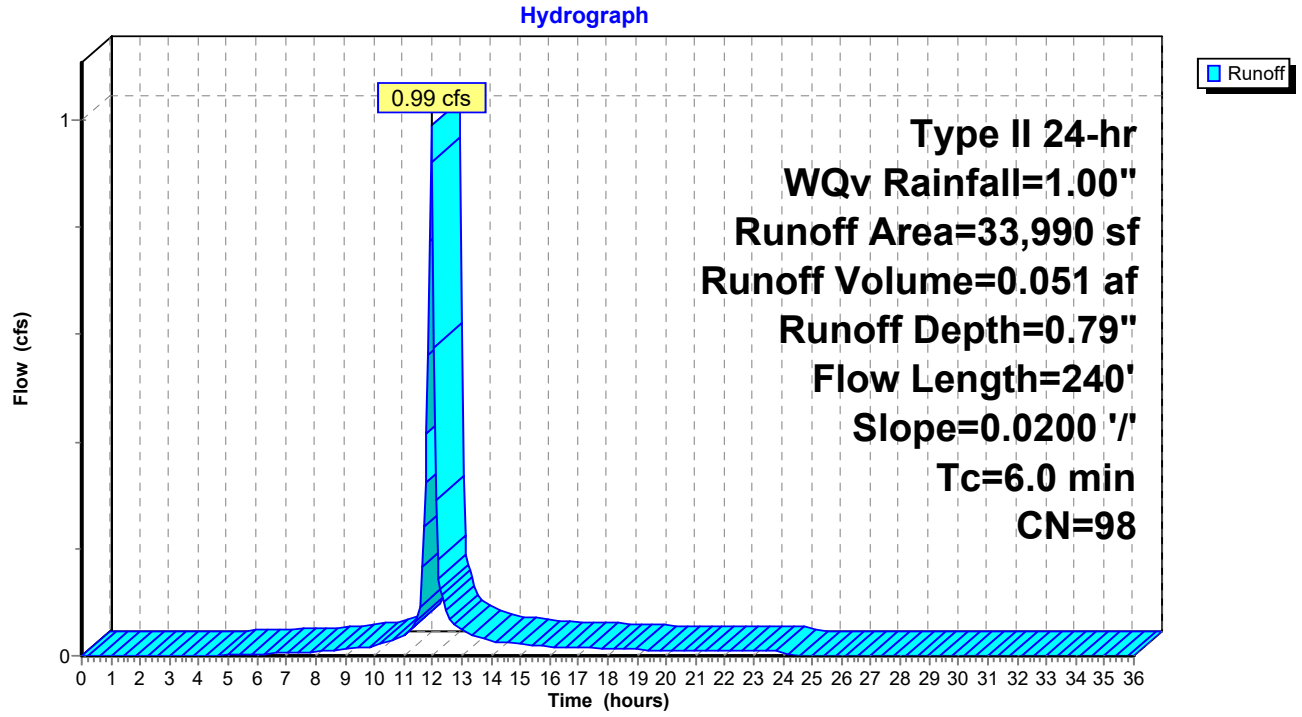
Runoff = 0.99 cfs @ 11.96 hrs, Volume= 0.051 af, Depth= 0.79"
Routed to Reach 26R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (sf)	CN	Description
33,990	98	Paved parking, HSG B
33,990		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	240	0.0200	8.41	14.86	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.5	240	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 22S: Northeast Collection System



Summary for Subcatchment 23S: Westside Collection System

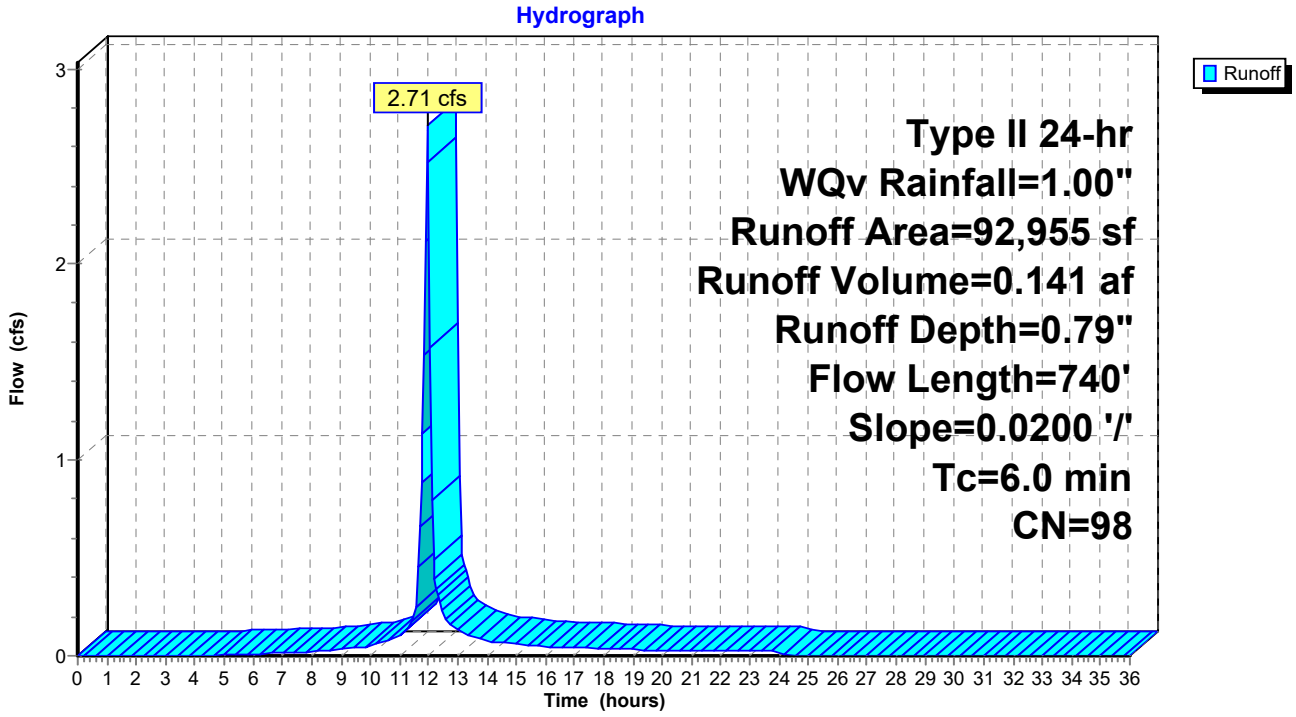
Runoff = 2.71 cfs @ 11.96 hrs, Volume= 0.141 af, Depth= 0.79"
Routed to Reach 26R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (sf)	CN	Description
92,955	98	Paved parking, HSG B
92,955		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	740	0.0200	5.46	9.66	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.020 Corrugated PE, corrugated interior
2.3	740	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 23S: Westside Collection System



Summary for Subcatchment 24S: Town impervious

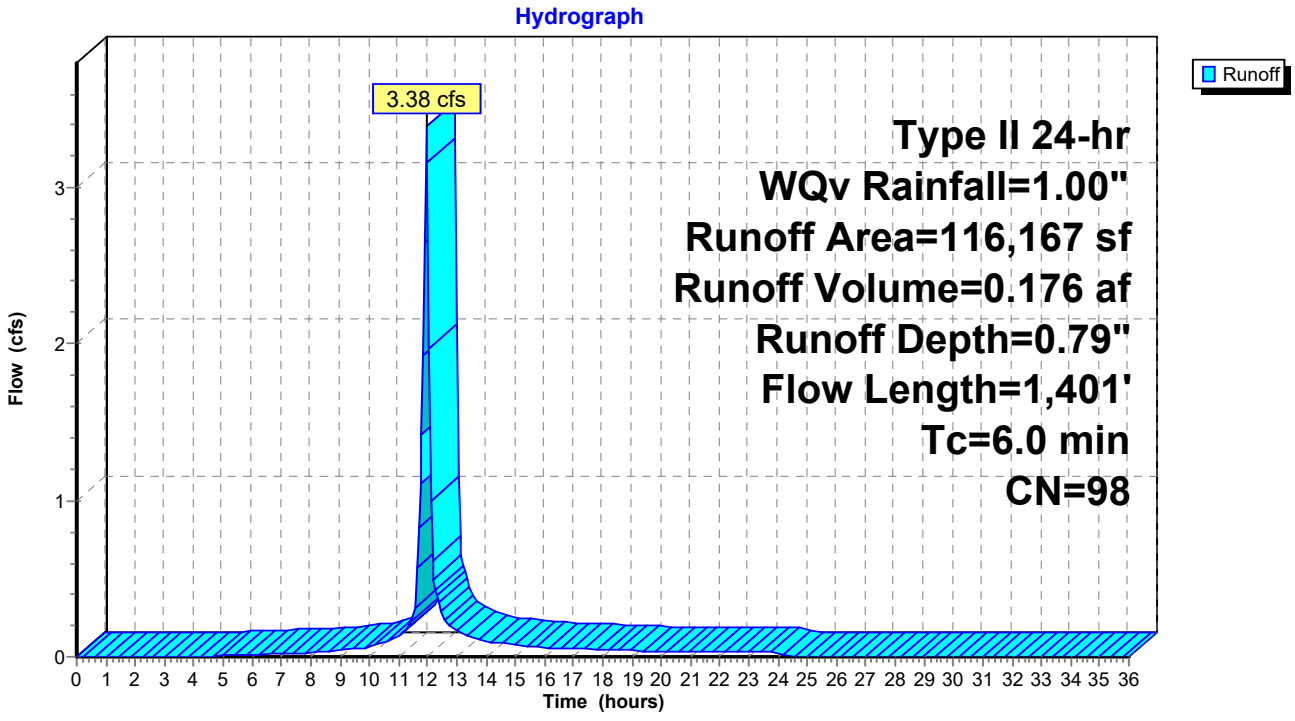
Runoff = 3.38 cfs @ 11.96 hrs, Volume= 0.176 af, Depth= 0.79"
Routed to Reach 25R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (sf)	CN	Description
116,167	98	Paved parking, HSG B
116,167		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0200	0.85		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.7	310	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.7	1,071	0.0512	10.26	8.06	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.8	1,401	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 24S: Town impervious



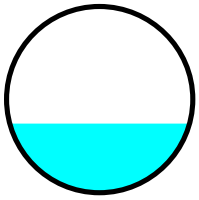
Summary for Reach 25R: (new Reach)

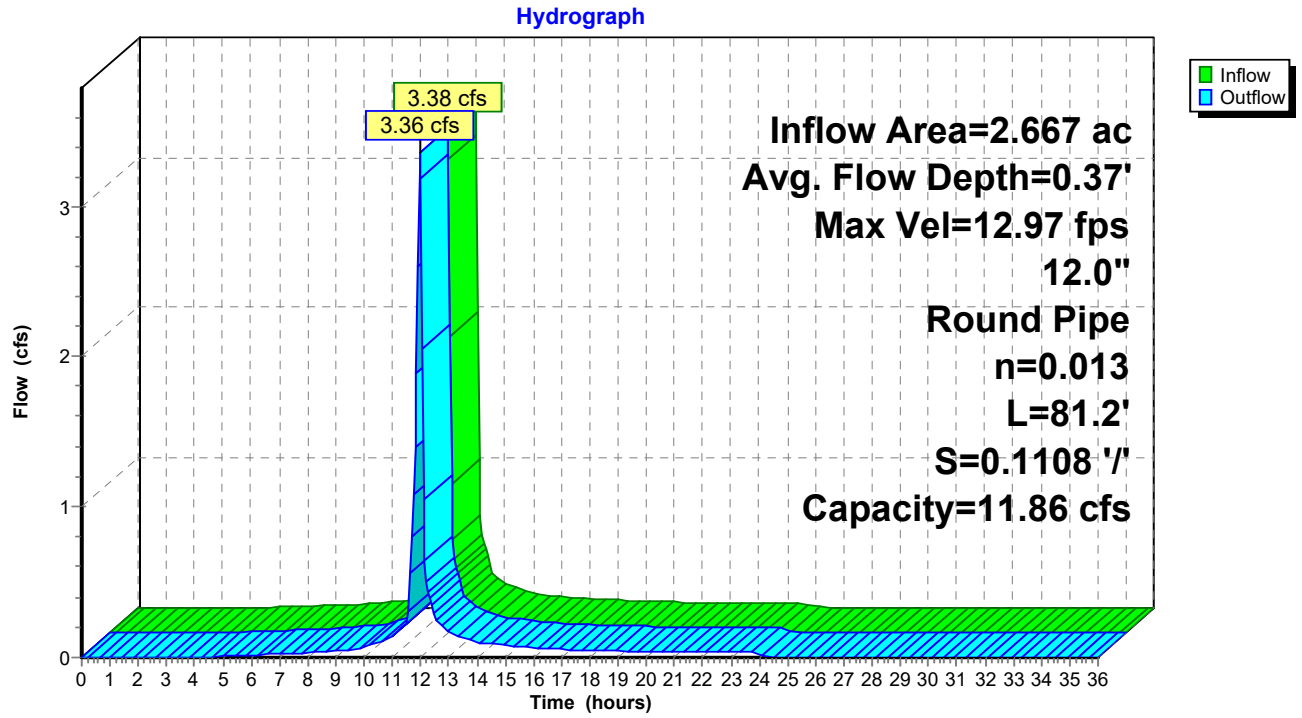
Inflow Area = 2.667 ac,100.00% Impervious, Inflow Depth = 0.79" for WQv event
Inflow = 3.38 cfs @ 11.96 hrs, Volume= 0.176 af
Outflow = 3.36 cfs @ 11.97 hrs, Volume= 0.176 af, Atten= 1%, Lag= 0.2 min
Routed to Reach 26R : (new Reach)

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.97 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.79 fps, Avg. Travel Time= 0.4 min

Peak Storage= 21 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.37' , Surface Width= 0.96'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 11.86 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 81.2' Slope= 0.1108 '/'
Inlet Invert= 496.90', Outlet Invert= 487.90'





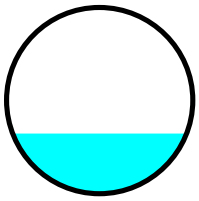
Summary for Reach 26R: (new Reach)

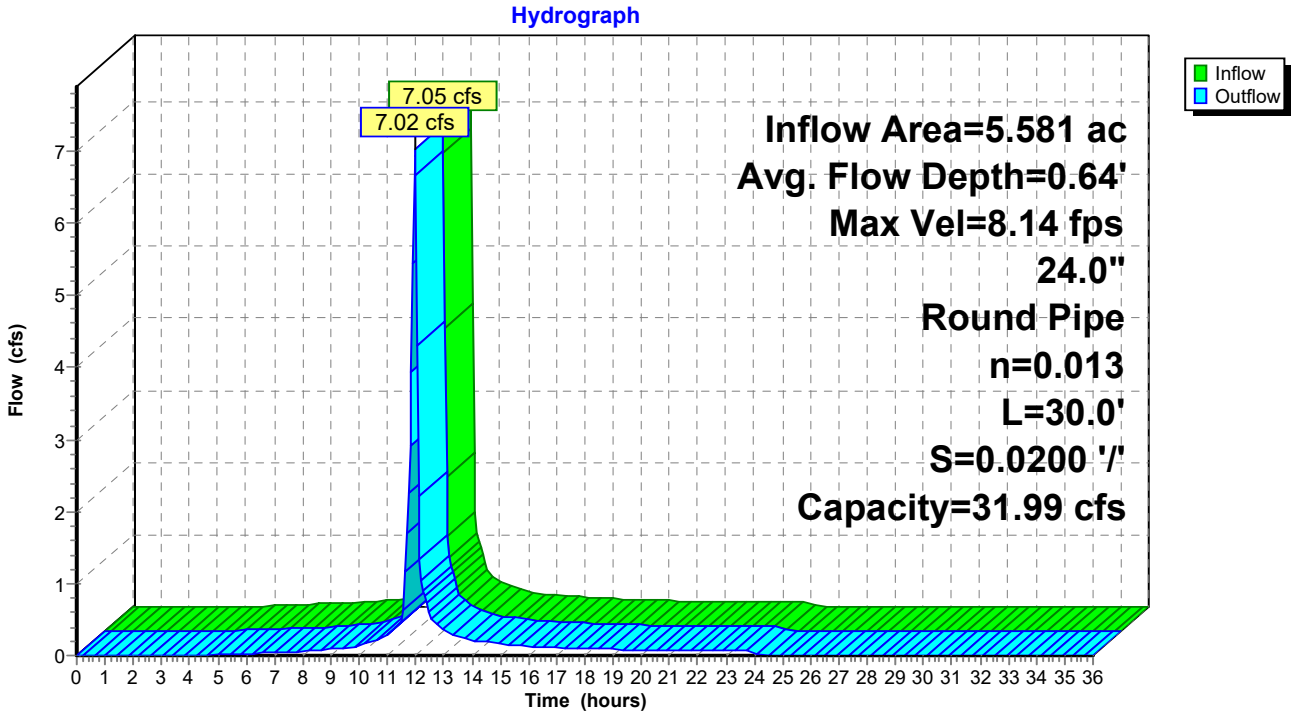
Inflow Area = 5.581 ac,100.00% Impervious, Inflow Depth = 0.79" for WQv event
Inflow = 7.05 cfs @ 11.97 hrs, Volume= 0.368 af
Outflow = 7.02 cfs @ 11.97 hrs, Volume= 0.368 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.14 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.36 fps, Avg. Travel Time= 0.2 min

Peak Storage= 26 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.64' , Surface Width= 1.86'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 31.99 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 30.0' Slope= 0.0200 '/'
Inlet Invert= 0.00', Outlet Invert= -0.60'





Appendix B

- Hancor HDPE Stormwater Quality Unit Information

ADS STORM WATER QUALITY UNIT PRODUCT SPECIFICATION

Scope
This specification describes 36- through 60-inch (900 to 1500 mm) Storm Water Quality Units for use in on-site point source storm water treatment applications.

Requirements
Storm Water Quality Units shall have a smooth interior and annular exterior corrugations meeting the requirements of ASTM F2737.

The unit shall have at least three containment zones, each zone separated from the next by use of a weir or baffle plate

Weir and baffle plates shall be welded at all interfaces between the plate and water quality unit. First weir plate shall incorporate a saw tooth design and shall be reinforced with stiffeners positioned horizontally on the downstream side of the plate to be retained.

Storm Water Quality Units shall provide adequate clean-out and inspection access.

Joint Performance
Connections for the bypass line and the unit shall utilize the same joint quality as specified for the main storm sewer pipe. Couplers for the bypass line may be either split couplers, in-line bell couplers, snap couplers, bell-bell couplers, or welded bell couplers.

Material Properties
Material for pipe and fittings used to produce Storm Water Quality Units shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch (100 to 250 mm) diameters, and 435400C for 12- through 60-inch (300 to 1500mm) diameters as defined and described in the latest version of ASTM D3350. The pipe material shall be evaluated using the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively. All smooth baffle and weir plates shall be high density polyethylene.

Build America, Buy America (BABA)
ADS Storm Water Quality Unit, manufactured in accordance with ASTM F2737, complies with the requirements in the Build America, Buy America (BABA) Act.

Installation
Installation shall be in accordance with the ADS recommended installation guidelines, utilizing a class I (ASTM D2321) structural backfill material or flowable fill (CLSM –Controlled Low Strength Material). Contact your local ADS representative or visit www.adspipe.com for the latest installation instructions.

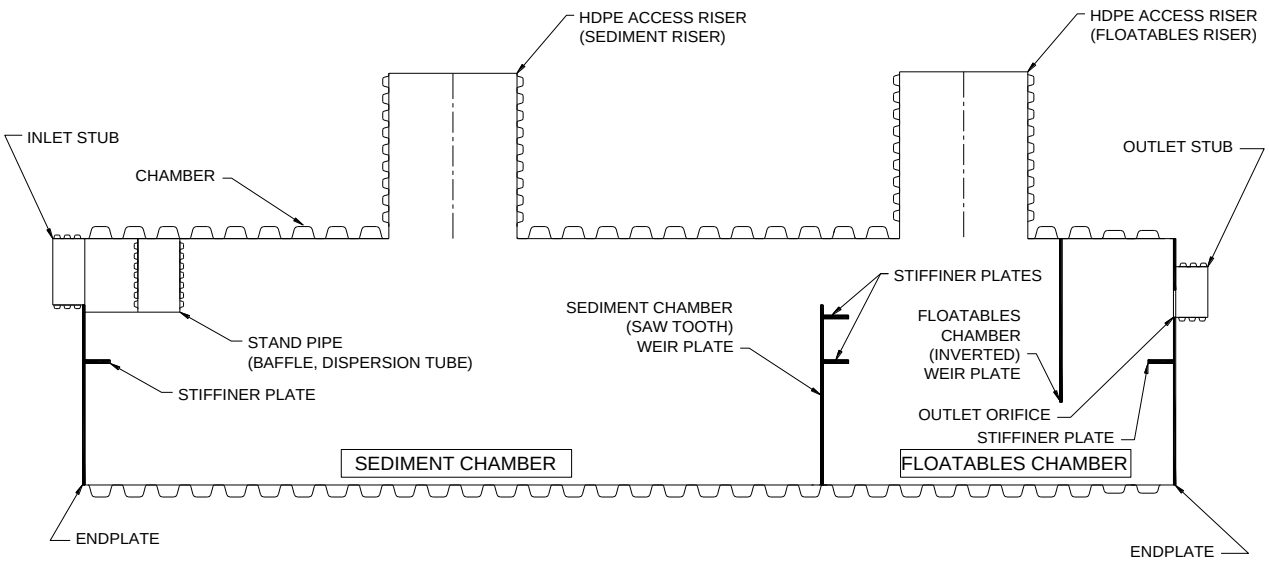
Performance
Water Quality Units shall remove a minimum of 80% of the first flush total suspended solids (TSS) based on flow rates and corresponding sieve sizes shown in Table 1. Water Quality units shall be installed “offline” to prevent re-suspension of solids in high flow situations. Offline installation shall be constructed utilizing an ADS By-Pass structure. Flow through the unit shall be controlled by an orifice fabricated on the outlet end of the structure.

Table 1: Storm Water Quality Unit Dimensions and Specifications (based on mathematical calculations)

I.D. (in)	Inlet Size (in)	Outlet Size (in)	Length (ft)	Treated Flow Rate (cfs)	Sediment Volume (ft^3)	Floatables Volume (ft^3)	Sieve Size
36	10	10	20	1.50	65	30	140
	10	10	40	2.38	137	63	140
	10	10	20	0.70	65	30	200
	10	10	40	1.60	137	63	200
42	12	12	20	1.73	83	38	140
	12	12	40	3.66	175	81	140
	12	12	20	0.86	83	38	200
	12	12	40	1.83	175	81	200
48	12	12	20	2.26	116	55	140
	12	12	40	3.94	245	115	140
	12	12	20	1.13	116	55	200
	12	12	40	2.39	245	115	200
60	15	15	20	2.95	183	87	140
	15	15	40	6.23	385	184	140
	15	15	20	1.47	183	87	200
	15	15	40	3.12	385	184	200

ADS STORM WATER QUALITY UNIT

(Unit configuration & availability subject to change without notice. Product detail may differ slightly from actual product appearance.)



Appendix C

- Sand and Organic Filter Information

Stormwater Best Management Practice

Sand and Organic Filters

Minimum Measure: Post Construction Stormwater Management in New Development and Redevelopment
Subcategory: Filtration

Description

Sand and organic filters provide water quality improvements through settling and filtration. A sand filter typically consists of two chambers: a settling chamber and a filter bed with sand or other filtering media. As stormwater flows into the settling chamber, large particles settle out, and the filtering media then remove finer particles and other pollutants. There are several modifications of the basic sand filter design, including the surface sand filter, underground sand filter, perimeter sand filter and various organic media filters. Some versions even have distinct names, like the Austin Sand Filter, the Washington D.C. Sand Filter and the Delaware Sand Filter. These filters operate on the same basic design of settling, then filtration. Design engineers have modified the traditional surface sand filter to fit sand filters into more challenging sites (e.g., underground and perimeter filters) or to improve pollutant removal (e.g., organic media filter).

Applicability

Sand filters are suitable for most regions of the country and most types of sites. Some site constraints favor specific versions over others (see “Siting and Design Considerations” below).

Regional Applicability

Sand filters are suitable for cold climates, but surface or perimeter filters will not be effective during the winter months. Using an alternative conveyance measure such as a weir system between the settling chamber and filter bed may avoid freezing associated with the traditional standpipe. Where possible, the filter bed should be below the frost line. Some sand filter variations (e.g., organic filters) should not operate during the winter, as organic media can become completely impervious when frozen. Using a larger underdrain system to encourage rapid draining in winter may help limit freezing of the filter bed.

In cold and arid climates, design engineers should also consider the size of the settling chamber. In cold climates that practice road sanding, this additional sediment load can take up as much as half the storage volume. In arid climates, sand filters are not widely used; in these climates, designers may need to make similar accommodations to account for the naturally higher sediment loads in these regions.

A sand filter under construction.

Urban Areas

Urban areas are usually densely developed places in which little pervious surface is present. Sand filters are generally good options in these areas because they consume little space, particularly if they are underground.

Stormwater Hot Spots

Sand filters that incorporate liners or sit on poorly infiltrating soils are often a good option to treat discharge from stormwater hot spots due to the treatment they provide and their limited potential to contaminate groundwater. Organic media are an effective adsorbent of many hotspot pollutants, such as metals and hydrocarbons. In all cases, design engineers should follow local regulations regarding treatment requirements for stormwater hotspots.

EPA-832-F-21-031I
December 2021

Stormwater Retrofit

Sand filters are a good option to achieve water quality goals in retrofit studies where space is limited, because they take up very little surface space and have few physical site restrictions. However, they are not suitable for treating stormwater flows from large drainage basins, as they often have limited hydraulic capacity.

Common Terms

Stormwater hot spots are areas where land use or activities generate highly contaminated stormwater discharge, with pollutant concentrations exceeding those typically found in stormwater. Examples include gas stations, vehicle repair areas and waste storage areas.

A **stormwater retrofit** is a stormwater management practice (usually structural) put into place after development or construction of a stormwater control to improve water quality, protect downstream channels, reduce flooding or meet other specific objectives that did not exist at the time of original construction.

Pretreatment plays an important role in stormwater treatment. Pretreatment structures, installed immediately upgradient to a stormwater control, reduce flow rates and remove sediment and debris before stormwater enters a stormwater control. This helps to improve the stormwater control's pollutant removal efficiency and reduces maintenance requirements.

Cold Water (Trout) Streams

Some aquatic species in cold water streams, notably trout, are extremely sensitive to changes in temperature. Sand filters may be a good treatment option for cold water streams. However, design engineers should consider site-specific placement, as the sun can warm pooling water within a surface sand filter. To protect aquatic life, designers may consider shortening the detention time for surface sand filters that discharge to cold waterbodies. Underground and perimeter sand filter designs have little potential for warming because they are not exposed to the sun.

Siting and Design Considerations

Drainage Area

Sand filters are best for smaller sites: up to 10 acres for surface sand filters, up to 5 acres for organic filters, and up to 2 acres for underground and perimeter filters (MDE, 2009). Designers have used sand filters for larger drainage areas (up to 100 acres), but these systems tend to clog easier, causing stormwater to overwhelm or bypass the system entirely.

Slope

Sand filters are suitable for sites with mild to moderate slopes, as they generally require 4 to 8 feet of head (elevation drop) to promote flow through the system. Smaller versions, sometimes called "pocket filters," can function with as little as 2 feet of head, though their capacity is lower. Sand filters can be challenging or impractical to construct on flat terrain.

Soils/Topography

Design engineers can install sand filters on almost any soil, including poorly infiltrating soils. In soils with high infiltration rates, engineers can design sand filters to exfiltrate into the surrounding soil to promote groundwater recharge. If groundwater contamination is a concern or if soils have low infiltration rates, design engineers can incorporate an impermeable liner with an underdrain. All options provide water quality treatment.

Groundwater

Designers should provide at least 2 feet of separation between the bottom of the filter and the seasonally high groundwater table. This design feature allows for sufficient hydraulic head within the system and prevents structural damage from prolonged inundation.

Pretreatment

Pretreatment is an important part of the sand filter. It happens in the sedimentation chamber, where the coarsest particles settle out and thus do not reach the filter bed. A common practice is to provide at least 25 percent of the water quality volume in a dry or wet sedimentation chamber as pretreatment to the filter system. (The water quality volume is the amount of stormwater from a single storm event that the control measure will treat. Although regulations vary by location, most approximate this quantity as the volume the control measure receives from a 1-inch storm event.)

Although pretreatment is highly recommended, not all locations require it, especially for smaller sand filters (e.g., at sites smaller than half an acre) (City of Portland, 2016; MDE, 2009; SPU, 2017. Design engineers should always follow local specifications.

Treatment

Treatment design features help enhance the ability of a stormwater control to mitigate or remove pollutants of concern. Design engineers may choose media based the desired hydraulic conductivity, desired pollutant removal performance, or targeting of specific pollutants. Custom media blends are now available in many locations that provide very specific performance characteristics. For example, certain organic amendments can promote denitrification and provide sorption sites to bind pollutants like phosphorus, metals and hydrocarbons (Hirschman et al., 2017). Design engineers should consult local stormwater authorities to identify approved media sources for specific applications.

The volume of the treatment component generally depends on the water quality volume, with the requirement that it be able to temporarily store a certain percentage. For example, in Maryland, the pretreatment and treatment components together should be able to store at least 75 percent of the water quality volume (MDE, 2009), while in Seattle the requirement is 91 percent (SPU, 2017). The design engineer should size the filter bed area using Darcy's law or an approved equivalent method, which relates the velocity of fluid through a medium to the hydraulic head and the medium's hydraulic conductivity. Designers may use multiple layers of different media in a sand filter, depending on the targeted flow rate and targeted pollutants. They should also incorporate a factor of safety to account for a possible decrease in permeability over time (e.g., NJDEP, 2014).

Conveyance

A properly designed sand filter should convey stormwater in a manner that minimizes erosion and provides for the design flow rate through the system. Ideally, vegetated filter strips or grass swales can achieve some stormwater treatment during conveyance to and from the filter. In many cases, sand filters are offline systems, meaning they use flow splitters to divert part of the stormwater flow from the main conveyance feature. One exception is the perimeter filter: all flows enter the system in this design, but larger flows overflow to an outlet chamber and are not treated. Every sand filter (with the rare exception of pure exfiltration filters) has an underdrain below the filter bed. An underdrain is a perforated pipe system in a gravel bed, installed on the bottom of the filter, that collects and conveys filtered stormwater.

Maintenance

Table 1 presents typical maintenance requirements. Design engineers can incorporate certain features to make regular maintenance easier. They should provide easy access to filtering systems, especially pretreatment components to allow for regular sediment removal. For underground sand filters, they should also follow the Occupational Safety and Health Administration's confined space rules.

Table 1. Typical maintenance activities for sand filters.

Activity	Timeframe
Remove trash and debris, including clippings from regular landscaping activities	After storm events or as needed, at least semi-annually
Inspect for structural damage and leaks	Annually
Inspect for evidence of erosion	After storm events or as needed, at least annually
Inspect to ensure stormwater is not bypassing the unit	After storm events or as needed, at least annually
Repair or replace damaged parts	As necessary
Clear sediment from sediment chamber	If sediment accumulates to half the chamber volume
Replace filter media	As necessary, as indicated by prolonged periods of pooling water over the filter bed during dry weather

Sources: MassDEP, 2008; MDE, 2009

Landscaping

Landscaping can add to both the aesthetic value and the treatment ability of stormwater controls. Sand filters generally need minimal landscaping, although surface sand filters and organic media filters may have a grass cover. In all filters, designers need to ensure that the contributing drainage has dense vegetation to reduce sediment loads and that debris from regular landscaping activities (e.g., grass or shrub clippings) do not flow into the filter.

Limitations

Sand filters are not appropriate for large drainage areas, do not provide flood control and generally do not protect stream channels from erosion. Sand filters that do promote groundwater recharge are not suitable in areas with high groundwater tables. In addition, sand filters need frequent maintenance, and underground and perimeter versions are out of sight so can be easy to forget.

Effectiveness

Filters typically provide pollutant removal rather than retention or detention. In some cases, where local soil and groundwater conditions allow, they can also achieve groundwater infiltration. Sand filters effectively remove most pollutants with the exception of nitrates which can both pass through the filter untreated or even be produced within the filter through the mineralization of organic nitrogen (various media amendments can remedy this; see Hirschman et al., 2017). Table 2 summarizes removal efficiencies for sand filters.

Table 2. Percent reductions in pollutant concentrations for sand filters.

Parameter	Units	Median Influent EMC	Median Effluent EMC	Percent Reduction
Total suspended solids	mg/L	56	9.0	84%
Fecal coliform	MPN/100 mL	900	400	56%
Total arsenic	µg/L	0.91	0.74	19%
Total cadmium	µg/L	0.30	0.08	73%
Total chromium	µg/L	2.0	1.0	50%
Total copper	µg/L	10	5.5	45%
Total iron	µg/L	642	210	67%
Total lead	µg/L	10	1.7	83%
Total nickel	µg/L	3.3	2	39%
Total zinc	µg/L	63	14	78%
Total phosphorus	mg/L	0.15	0.09	40%
Total nitrogen	mg/L	1.2	1.1	14%
Nitrate+nitrite (as nitrogen)	mg/L	0.35	0.57	-63%

Source: Clary et al., 2017
EMC = event mean concentration

Cost Considerations[1]

Table 3 summarizes average costs from multiple projects for installing and maintaining surface and underground sand filters. Costs are in terms of acres of impervious surface treated. The initial costs include pre-construction (site discovery, surveying, design, planning) and construction (labor, materials, installation) costs. The cost of maintenance activities includes regular maintenance, intermittent repair and associated inspection/monitoring costs.

[1] Prices updated to 2019 dollars. Inflation rates obtained from the Bureau of Labor Statistics CPI Inflation Calculator website: https://data.bls.gov/cgi-bin/cpicalc.pl.

Table 3. Average sand filter costs per acre of impervious surface treated.

Stormwater Control	Total Initial Cost	Annual Maintenance Costs
Surface sand filter	$56,000	$1,700
Underground sand filter	$64,000	$1,900

Source: King & Hagan, 2011

Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

References

City of Portland. (2016). *2016 City of Portland stormwater management manual.*

Clary, J., Jones, J., Leisenring, M., Hobson, P., & Strecker, E. (2017). *International Stormwater BMP Database: 2016 summary statistics*. Alexandria, VA: Water Environment and Reuse Foundation.

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Maryland Department of the Environment (MDE). (2009). *2000 Maryland stormwater design manual*.

Massachusetts Department of Environmental Protection (MassDEP). (2008). *Massachusetts stormwater handbook and stormwater standards.*

New Jersey Department of Environmental Protection (NJDEP). (2014). *Stormwater BMP manual: Sand filters*.

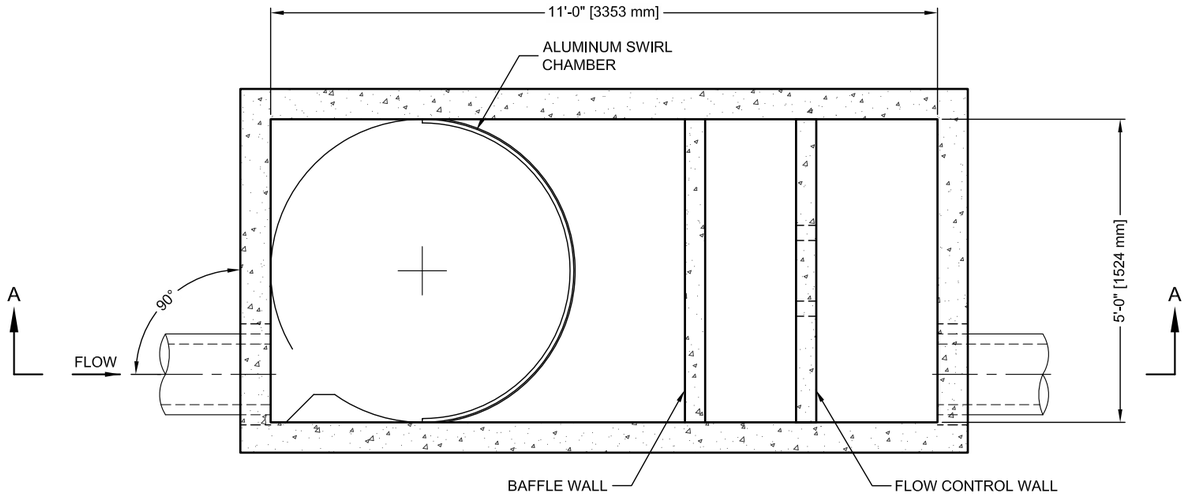
Seattle Public Utilities (SPU). (2017). *City of Seattle stormwater manual* (Vol. 2).

Disclaimer

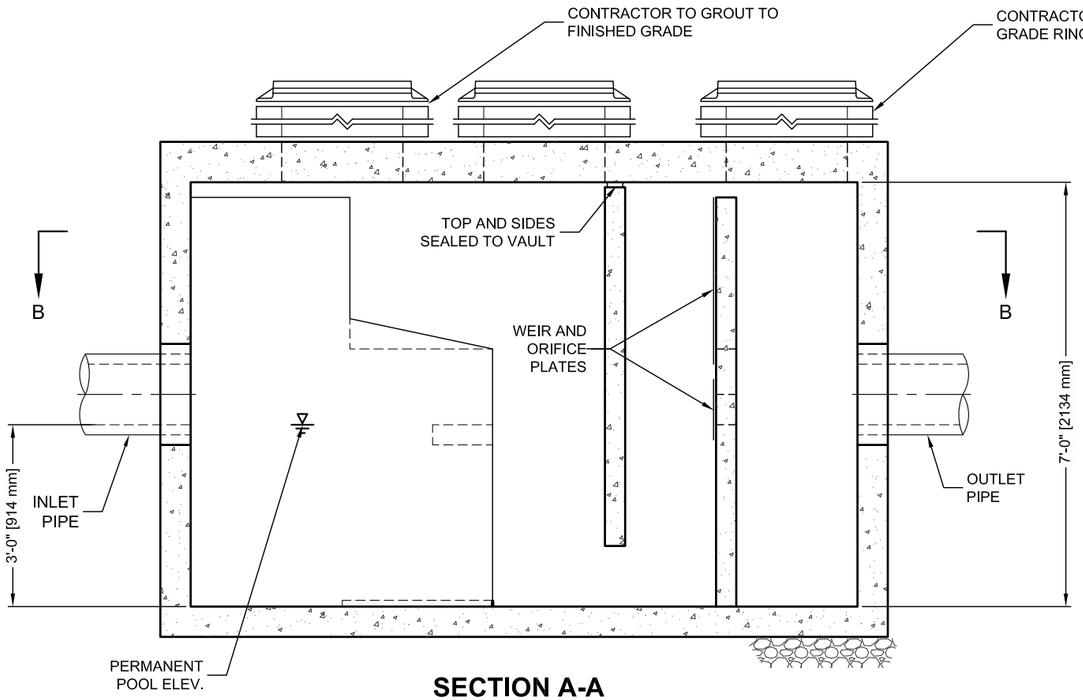
This fact sheet is intended to be used for informational purposes only. These examples and references are not intended to be comprehensive and do not preclude the use of other technically sound practices. State or local requirements may apply.

Appendix D

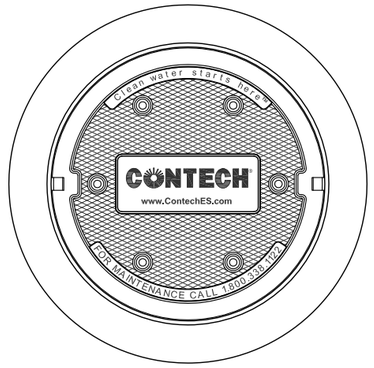
- Vortechs Information



SECTION B-B



SECTION A-A



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

VORTECHS 3000 DESIGN NOTES

VORTECHS 3000 RATED TREATMENT CAPACITY IS 4.5 CFS, OR PER LOCAL REGULATIONS. IF THE SITE CONDITIONS EXCEED RATED TREATMENT CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD INLET/OUTLET CONFIGURATION IS SHOWN. FOR OTHER CONFIGURATION OPTIONS , PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (CFS)	*
PEAK FLOW RATE (CFS)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
4. VORTECHS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET AASHTO M306 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. INLET PIPE(S) MUST BE PERPEDICULAR TO THE VAULT AND AT THE CORNER TO INTRODUCE THE FLOW TANGENTIALLY TO THE SWIRL CHAMBER. DUAL INLETS NOT TO HAVE OPPOSING TANGENTIAL FLOW DIRECTIONS.
7. OUTLET PIPE(S) MUST BE DOWN STREAM OF THE FLOW CONTROL BAFFLE AND MAY BE LOCATED ON THE SIDE OR END OF THE VAULT. THE FLOW CONTROL WALL MAY BE TURNED TO ACCOMODATE OUTLET PIPE KNOCKOUTS ON THE SIDE OF THE VAULT.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE VORTECHS STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

Vortechs®

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

VORTECHS 3000 STANDARD DETAIL

Appendix E

- Cost Estimates

Nantanna Mills - Alternate 1
Hancor HDPE Stormwater Quality Units
Cost Estimate

Item No.	Description	Quanitity	Units	Unit Cost	Total Cost
1	8" PVC Sewer	100	LF	$ 95	$ 9,500
2	12-inch HDPE	110	LF	$ 81	$ 8,910
3	15-inch HDPE	160	LF	$ 90	$ 14,400
4	18-inch HDPE	625	LF	$ 106	$ 66,250
5	Catch Basin	60	VF	$ 750	$ 45,000
6	Sewer Manhole	20	VF	$ 900	$ 18,000
7	Storm Manhole	20	VF	$ 900	$ 18,000
8	Trench Pavement	925	SY	$ 70	$ 64,750
9	Structure Core	1	EA	$ 1,500	$ 1,500
10	HDPE Treatment Unit	2	EA	$ 30,000	$ 60,000
11	Tank Demolition - Concrete Removal	245	CY	$ 225	$ 55,125
12	Excavation over tank	565	CY	$ 20	$ 11,300
13	Tank Demolition - Void refill	1570	CY	$ 25	$ 39,250
14	Building Demolition	460	SF	$ 20	$ 9,200
15	Building Demolition - void refill	265	CY	$ 25	$ 6,625
16	Miscellaneous Work & Cleanup	1	LS	$ 87,190	$ 87,190
				Total Construction Cost	**$ 515,000**
				Legal, Fiscal, Admin (3%)	$ 15,450.00
				Engineering (20%)	$ 103,000.0
				Contingency (20%)	$ 103,000.0
				Total Project Cost	**$ 736,450**

Nantanna Mills - Alternate 2
Sand Filter Unit
Cost Estimate

Item No.	Description	Quantity	Units	Unit Cost	Total Cost
1	8" PVC Sewer	200	LF	$ 100	$ 20,000
2	18" HDPE Stormdrain	885	LF	$ 106	$ 93,810
3	24" HDPE Stormdrain	30	LF	$ 145	$ 4,350
4	6" PVC Underdrain	250	LF	$ 15	$ 3,750
5	Sewer Manhole	8	VF	$ 900	$ 7,200
6	Storm Manhole	15	VF	$ 900	$ 13,500
7	Catch Basin	50	VF	$ 750	$ 37,500
8	Core Structure	5	EA	$ 1,500	$ 7,500
9	Trench Pavement	660	SY	$ 70	$ 46,200
10	Building Demolition	460	SF	$ 20	$ 9,200
11	Concrete	45	CY	$ 700	$ 31,500
12	Washed Sand	130	CY	$ 45	$ 5,850
13	Stone	20	CY	$ 50	$ 1,000
14	Structure Fill	140	CY	$ 25	$ 3,500
15	Excavation	575	CY	$ 20	$ 11,500
16	Miscellaneous Work & Cleanup	1	LS	$ 59,272	$ 59,272
				Total Construction Cost	**$ 355,000**
				Legal, Fiscal, Admin (3%)	$ 10,650.00
				Engineering (20%)	$ 71,000.0
				Contingency (20%)	$ 71,000.0
				Total Project Cost	**$ 507,650**

Nantanna Mills - Alternate 3
Vortech Stormwater Quality Unit
Cost Estimate

Item No.	Description	Quanitity	Units	Unit Cost	Total Cost
1	8" PVC Sewer	200	LF	$ 95	$ 19,000
2	15-inch HDPE	175	LF	$ 91	$ 15,925
3	18-inch HDPE	715	LF	$ 105	$ 75,075
4	24-inch HDPE	70	LF	$ 133	$ 9,310
5	Catch Basin	50	VF	$ 750	$ 37,500
6	Sewer Manhole	15	VF	$ 900	$ 13,500
7	Storm Manhole	10	VF	$ 900	$ 9,000
8	Trench Pavement	925	SY	$ 70	$ 64,750
9	Structure Core	4	EA	$ 1,500	$ 6,000
10	Contech Vortech VX-3000-DTL	1	EA	$ 70,000	$ 70,000
11	Tank Demolition - Concrete Removal	245	CY	$ 225	$ 55,125
12	Excavation over tank	565	CY	$ 20	$ 11,300
13	Tank Demolition - Void refill	1570	CY	$ 25	$ 39,250
14	Building Demolition	460	SF	$ 20	$ 9,200
15	Building Demolition - Void refill	200	CY	$ 25	$ 5,000
16	Miscellaneous Work & Cleanup	1	LS	$ 90,065	$ 90,065
				Total Construction Cost	**$ 530,000**
				Legal, Fiscal, Admin (3%)	$ 15,900.00
				Engineering (20%)	$ 106,000.0
				Contingency (20%)	$ 106,000.0
				Total Project Cost	**$ 757,900**

Appendix F

- Property Line Information

RICHARD W. BELL
LAND SURVEYING, INC.
297 SOUTH MAIN ST.
BARRE, VERMONT 05641
802-479-9262 C 802-793-5037
EMAIL RBELLLS@RBELL-LANDSURVEYOR.COM

Report of Survey Research

To: Dufresne Group

Subject: Easements and Right-of-ways pertaining to College Town Industrial Plaza, Northfield, VT

Easements of Record

1. B. 186, P. 261, Vermont Easement Deed, Kevin B. Lord, et als, to Cynthia M. and Richard E. Piro. Pipeline Easement as depicted on attached deed.

2. B. 181, P. 806, Easement Deed, Robert P. Lord, et als, to Village of Northfield. Pipeline and maintenance for all wastewater and stormwater.

3. B. 79, P. 85, Warranty Deed of Frank Wall and Robert P. Lord to College Town Industrial Plaza. "a non-exclusive easement and right-of-way for occasional ingress and egress from grantees' lands from and to Belknap Street. See WDL Plan "College Town Industrial Plaza".

4. B. 79, P. 93, Warranty Deed of Robert P. Lord and E. Frank Wall to W. Thomas Anderson and Edward J. Kiniry, d/b/a Nantana Mill Dam Partnership. "Together with a 12 foot right-of-way for pedestrian and vehicular egress and ingress over the existing travelled way known as Belknap Street.

5. B. 64, P. 193, Vermont Quit Claim Deed of Northfield National Bank now First National Bank to Eugene E. and Margaret F. Provost. "Subject to a drainage easement as now located"," with rights to enter upon said land for the purpose of repairing and maintaining said drainage outlet".

6. B. 64, P. 195, Vermont Quit Claim Deed of Northfield National Bank now First National Bank to Vermont Industrial Development Authority (Nantana Mill Property). "Subject to a right-of-way located on the southwest side of Belknap Street running to the property formerly owned by the Vermont Hosiery and Machinery Company". "Also drainage easement of the Village of Northfield".

7. B. 58, P. 374, Warranty Deed of Northfield Mills Inc. To Village of Northfield. Conveys "a small parcel of land." "Also an easement consisting of the right to construct and maintain an 18" reinforced concrete drainage pipe to cross the lands of the grantor." See project #F 78(12), North Main Street widening project.

8. B, 37, P. 146, Warranty Deed of Rabideau Lumber Co. To Vermont Hosiery and Machinery Co. "A right of way from the North end of the above described premises across our remaining land, northerly to the road used by us, and thence westerly to said street".

9. B. 61, P. 59, Easement Deed of Northfield Mills Co. Inc. and Meinard and Co. to Village of Northfield. "To dig a ditch theron, and therein construct, repair, replace, and forever maintain a pipeline and appurtanances, involving a 10 foot right of way (5 foot each side of centerline) to be used for pipes to convey water and sewage".

10. B. 54, P. 523, Right of Way, Easement Deed of Northfield Mills Co., Inc. To Green Mountain Power Corp. "An Easement to construct, reconstruct, repair, maintain, operate and patrol, for the transmission of high and low voltage electric current a line of poles". "To clear and keep cleared a strip along said line not exceeding 100 feet in width".

11. B. 103, P. 91, Warranty Deed of Nantana Mill Dam Partnership to Thomas J. Stue and Shannon Davenport. "A 12 foot right-of-way for pedestrian and vehicular egess and ingress over the existing traveled way known as Belknap Street", "continues over an existing footpath generally to and along the westerly bank of the Dog River". "Together with a right-of-way for pedestrian and vehicular egress and ingress over an existing 12 foot traveled way lying north of the Northfield Mill". "Also included herewith are water and flowage rights of the Grantors in and to the Dog River".