

TOWN OF SHELBURNE
STORMWATER MANAGEMENT PROGRAM
VERMONT MS4 GENERAL PERMIT 3-9014 (2012)



Following are the components of the Town of Shelburne's Stormwater Management Plan. In addition to this written plan, the Town has adopted a number of ordinances and policies that will aid the Town in achieving its overall goal of improving the quality of the water. Copies of those ordinances and policies are available as appendices to this document or are on the Town website at www.shelburnevt.org.

The Town contains one stream that has been designated as impaired by stormwater, the Munroe Brook. While the Management Plan will be applied to the other water bodies in the Town, the Munroe Brook will get the most intense attention to implement best management practices (BMPs) for the Six Minimum Measures.

Minimum Control Measures

Public Education and Outreach

BMP 1-1 Maintain Stormwater Website (www.shelburnevt.org)

The Town maintains a website which contains general stormwater information as well as references to local ordinances and policies governing stormwater. The website also contains links to other websites for additional information.

BMP 1-a) 5 (a) Information relevant to local concerns

During the annual relicensing of dogs, the town provides an informational package concerning cleaning up after one's dog, along with a package of biodegradable pet waste bags.

BMP 1-2, 3 and 4

The Town has been involved in the RSEP since its inception. The purpose of the organization was to allow each MS4 to support education and outreach efforts on a much more intense basis than possible acting alone. Currently Marketing Partners is under contract to implement the RSEP Communications Plan goals through the media, co-sponsorship with UVM of a "Soil Test" campaign, maintenance of a website, utilizing Face book, an e-news letter and partnering with local organizations on stormwater related projects as well as a number of outreach public events. (A copy of the 2012-13 annual report is attached).

Rationale

The Town believes that the regional approach will provide the broadest education and outreach not likely to be achieved by the Town adopting an individual program.

Public Involvement and Participation

BMP 2 a)-4 Storm Drain Stenciling

The Town has added markers to each catch basin grate and checks them annually to assure that the markers are in place. New markers are attached annually where they are missing.

BMP 9 Stream Monitoring

The Town participates in meetings of the Chittenden County Stream Team (CCST), a multi-party collaborative to help the MS4s achieve compliance with the public involvement/participation requirements. Currently a contract with the Winooski Natural Resource Conservation District (WNRCD) is in place to provide various educational activities and outreach to the communities involved. The Stream Team currently has a project in Shelburne that includes two monitoring sites on the Munroe Brook. The CCST will provide reports as to the results of the stream monitoring.

BMP 2 a) 6 Stormwater watch group

The Town provided financial support to the Lewis Creek Association for the purpose of purchasing the equipment necessary for them to carry out stream monitoring. Currently, the Association plans to continue to monitor the McCabe's Brook and LaPlatte River through 2020. A copy of their plan is appended.

Rationale

The Town participates in the regional approach that appears to be very successful in reaching a broad segment of the public. The CCST and the Lewis Creek Association currently have monitoring programs on the Munroe Brook. The Town believes that using this more regional approach satisfies BMP's 1-8.

Illicit Discharge Detection and Elimination

BMP #1, 3, 6

The Town passed an Ordinance to Prohibit Non-Stormwater Discharges into the system. In 2009, the LaPlatte Watershed Partnership conducted an optical brightener study in catch basins and outfalls throughout Town. A total of 30 locations were investigated with the result of 2 positive samples. No source was identified and follow up occurs annually of these two locations and others during the Town inspections of those 9 discrete areas of Town that are under the 3-9010 Permits assigned to the Town.

BMP #2

The Town maintains and updates (based on new construction) a Stormwater System Map in conjunction with the Chittenden County Regional Planning Commission (CCRPC). This GIS based map provides a means to track activity throughout the system.

BMP # 4, 5

The Town through its Town Manager or Public Works Director will strengthen its detection plan through annual training of Public Works employees. Highway, Water and Wastewater employees spend a considerable amount of their time on the Town highways and are therefore in a position to detect and report illicit discharges. The Town will further develop a plan to actively scan areas that are more likely to be a source of illicit discharges. The ordinance is in place to allow enforcement if illicit discharges are found.

BMP #7

The Town will provide an annual report of its monitoring activities and any actions taken if illicit discharges are detected.

Rationale Statement

In conjunction with the CCRPC, the Town has located all outfalls in the Town with mapping and GPS locations. Planning staff will provide annual updates of new developments and outfalls for inclusion in the data base.

The Town has chosen to use ordinances as a means to prohibit and enforce illicit discharges. Observation by the public and reports to Town staff can provide opportunity for inspection and enforcement if necessary. Public works employees are in a position to observe possible illicit discharges for follow up by planning staff. The integrity of any government actions rely on enforcing all laws, ordinances and policies. Managers must require consistent investigation and enforcement when necessary.

Construction Site Stormwater Runoff Control

BMP#1, 2 and 3

In 2009-2012, the Town adopted amendments to the Shelburne Zoning and Subdivision Bylaws as well as the Public Works Specs. The previously adopted Storm Water Ordinance and the Public Works Specs contain requirements for construction site erosion control, inspection authority and enforcement measures.

The Town will continue to review its ordinances to seek additional effective measures to control waste such as discarded building materials, concrete truck wash out, chemicals, litter and sanitary waste at construction sites.

Town planning staff and Public Works employees received training in plan review and currently review all site plans for erosion and sediment control and are conducting site inspections. The Town Manager and Zoning Enforcement Officer are currently responsible for enforcement. The Town web site has information instructing the public on how to report stormwater related issues.

Rationale Statement

The Town has chosen to use policies and ordinances to provide erosion and sediment control at construction sites. This process is consistent with the ability of Town staff to review sediment and erosion control plans for each development during plan review and as references when staff is inspecting developments under construction.

The Town Manager is responsible for the overall program that is then carried out by public works and planning staff.

The ultimate measure of success is to have full compliance without the necessity of enforcement action. The number of sites receiving site plan review, the number of inspections and the number of enforcement actions taken are tracked on an annual basis. The result of a successful program will be reduced toxins in the stormwater runoff and a healthy population of aquatic species.

Post Construction Stormwater Management in New Development and Redevelopment

BMP c), (1) and (2) As previously noted, the Town reviewed the appropriate documents and determined that they were inadequate in terms of stormwater management. The Town adopted amendments to the Zoning and Subdivision Bylaws and Public Works Specs to provide effective tools to establish appropriate standards for inclusion in all site plans submitted to the Town in support of development.

BMP c) (3) The Town will initiate a review of these documents in support of various design options in support of improved stormwater management. Current regulation allow narrower streets in some circumstances and parking requirements can be waived if the applicant can provide a rationale such as shared parking or available public parking. This flexibility reduces the amount of impervious surface constructed by each project.

BMP d), e) and f) The Town currently has in place site plan review for any development. The review assures that all requirement for pre and post construction erosion and sediment control are in place. In addition, the Town requires bonds or letters of credit from developers in sufficient amount to ensure that developments are constructed in conformance with Town standards and according to requirements contained in the approval of the project. Prior to release of those funds, the Town must be satisfied that all construction, including that impacting stormwater, was as required. If necessary, the Town will use the funds to complete the project.

Rationale statement

The Town has chosen to use its ordinances to address post- construction runoff. For Shelburne this appears to be an efficient way to use the development review process and Town staff to inspect and enforce those regulations. It also provides for verification of those requirements if the Town receives complaints from members of the public.

The Town uses agreements with new developments for Town oversight of stormwater infrastructure operation and maintenance in cooperation with homeowner associations.

Prior to acceptance of roads, utilities and other infrastructure, the Town inspects the facilities for compliance with construction requirements. Bonds or letters of credit are not released until the project is in full compliance. The Town currently utilizes planning and public works staff for those inspections.

The Town's current policy allows assignment of all permits currently valid and in compliance with the conditions of the permit. Each facility covered by those permits receives an annual inspection and action to correct any areas requiring maintenance.

The Town's approach to this measure appeared to be logical considering the regulations in place and the staff available to implement the process. The Town has in place much of what the measureable goal would be: provide mechanisms and process for addressing post construction sediment and erosion control. The success of the program will be improved water quality.

Pollution Prevention/Good Housekeeping for Municipal Operations

GMP 6, b) (1)

Highway Maintenance

The Town has adopted a winter highway maintenance plan. Each plow truck is equipped with computer controls for proper calibration and spreading of deicing materials. Efforts have been made to reduce the amount of salt applied per lane mile by using melting enhancers to enable less salt to melt ice and snow at lower temperatures. The Town does not operate a snow storage area.

Sand use has decreased dramatically and is used only on about 2.5 miles of gravel road and during extreme cold temperatures at intersections and on hills.

The Town is engaged in annual spring street sweeping to reduce the amount of sand and other roadside debris that may enter the storm water system. The Town also actively participates in the annual Green Up Day.

Storm water catch basins are inspected annually and the sumps are cleaned as needed. As part of the annual stormwater facility inspection, outfalls are also inspected and any required maintenance is provided.

The Town stores sand salt and other deicing agents inside a storage building.

Equipment Maintenance

All Town equipment is stored maintained inside the Town garage. The Town complies with all relevant regulations concerning disposal of contaminated products and waste fluids and materials. A sump and separator are in use to keep contaminants from reaching waters of the State. All equipment washing is done inside the Town garage.

Fueling

The Town has one above ground diesel fuel tank with proper cover and containment.

MCAP

The Town had an inspection under this program and is in compliance with its requirements.

Parks

The Town does not apply pesticides to its facilities. The fertilizer program uses fertilizer that does not contain phosphorus and use a slow release organic form of nitrogen. In addition to the promotion of controlling dog waste during the annual relicensure of dog, the Park and Recreation Department provide waste bags and collection facilities.

Wastewater Treatment Plants

The Town operates 2 wastewater treatment plants and is in compliance with the requirements of their licenses to prevent pollution from reaching the waters of the State.

Rationale

The Town continues to seek best management practices to assure that its facilities and operations do not contribute pollutants to the waters of the State. Each facility or operation has procedures in place to accomplish that goal. The Town Manager and department heads are responsible for assuring that staff is aware of these best practices. The Town will continue to implement and improve the processes and training of staff to assure continuous improvement in Town operations in relationship to possible stormwater pollution.

Each operation must continue to meet the goals set for compliance as the Town has worked over the past several years to meet the goals set forth in the MS4 Permit. These goal were set as necessary and achievable.

APPENDIX I
STORMWATER DISCHARGE ORDINANCE

8/10 2006
RECEIVED FOR RECORD 8 O'CLOCK 30 MINUTES
A.M. AND RECORDED IN BOOK 1 PAGE 30(1-13)
OF SHELBURNE Ordinance RECORDS
ATTEST *Colleen Tracy* CLERK

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TOWN of SHELBURNE, VERMONT

The Selectboard of the Town of Shelburne hereby ordains:

STORMWATER DISCHARGE ORDINANCE

SECTION 1. AUTHORITY.

This ordinance is adopted pursuant to 24 V.S.A. §3617 and Section 1.4(3) of the Town of Shelburne Charter. It shall be a civil ordinance within the meaning of 24 V.S.A. Chapter 59.

SECTION 2. PURPOSE.

The purpose of this ordinance is to provide for the health, safety, and general welfare of the citizens of the Town of Shelburne, Vermont through the regulation of non-storm water discharges to the storm drainage system to the maximum extent practicable as required by federal and state law. This ordinance establishes methods for controlling the introduction of pollutants into the storm drainage system in order to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process. The objectives of this ordinance are:

- (1) To regulate the contribution of pollutants to the storm drainage system by storm water discharges by any user.
- (2) To prohibit illicit connections and discharges to the storm drainage system.
- (3) To establish legal authority to carry out all inspection, surveillance, monitoring, and enforcement procedures necessary to ensure compliance with this ordinance.

SECTION 3. APPLICABILITY.

This ordinance shall apply to all water entering the storm drain system generated on any developed and undeveloped lands unless explicitly exempted by the Town.

SECTION 4. DEFINITIONS.

For the purposes of this ordinance, the following shall mean:

Authorized Enforcement Agency. Employees or designees of the Shelburne Department of Public Works are designated to enforce this ordinance.

Best Management Practices (BMPs). Schedules of activities, prohibitions of practices, general good house keeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to storm water, receiving waters, or storm water conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Clean Water Act. The federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.

Construction Activity. Activities subject to National Pollution Discharge Elimination System (NPDES) Construction Permits. These include construction projects resulting in land disturbance of one acre or more. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Direct Discharge. Any discharge that flows directly into the storm water system by means of a connected pipe.

Hazardous Materials. Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Discharge. Any direct or indirect non-storm water discharge to the storm drain system, except as exempted in Section 5 of this ordinance.

Illicit Connections. An illicit connection is defined as either of the following:

- (1) Any drain or conveyance, whether on the surface or subsurface that allows an illegal discharge to enter the storm drain system including but not limited to any conveyances that allow any non-storm water discharge including sewage, process wastewater, and wash water to enter the storm drain system and any connections to the storm drain system from indoor drains and sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved by an authorized enforcement agency or,
- (2) Any drain or conveyance connected from a commercial or industrial land use to the storm drain system that has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Indirect Discharge. Any discharge to the storm water system that first flows outside of the system and may enter the system through the process of

infiltration or through a drainage structure.

Industrial Activity. Activities subject to NPDES Industrial Storm Water Permits as defined in 40 CFR, Section 122.26 (b)(14).

National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit. means a permit issued by EPA (or by a State under authority delegated pursuant to 33 USC § 1342(b)) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Non-Storm Water Discharge. Any discharge to the storm drain system that is not composed entirely of storm water.

Person. Any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or as the owner's agent.

Pollutant. Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordinances, and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; and noxious or offensive matter of any kind.

Premises. Any building, lot, parcel of land, or portion of land whether improved or unimproved, including adjacent sidewalks and parking strips.

Storm Drainage System. Publicly-owned facilities by which storm water is collected and/or conveyed, including but not limited to any roads with drainage systems, municipal streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human-made or altered drainage channels, reservoirs, and other drainage structures.

Storm Water. Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation, and resulting from such precipitation.

Storm Water Management Plan. A document which describes the Best Management Practices and activities to be implemented by a person or business to identify sources of pollution or contamination at a site and the actions to eliminate or reduce pollutant discharges to storm water, storm water conveyance systems, and/or receiving waters to the maximum extent practicable.

Wastewater. Any water or other liquid, other than uncontaminated storm water, discharged from a facility.

Watercourse. Any perennial, intermittent or ephemeral stream, and any natural or human-made channel that carries storm water to any perennial, intermittent or ephemeral stream or the storm drainage system.

SECTION 5. DISCHARGE PROHIBITIONS.

5.1. Prohibition of Illegal Discharges.

No person shall discharge, cause to be discharged, or allow others under its control to discharge into the storm drainage system any pollutants or waters containing any pollutants, other than storm water. Nor shall any person fail to install or maintain on any property storm water management improvements or utilize any BMPs that are required pursuant to any land use permit issued by the Town of Shelburne. The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited except as described as follows:

- (1) The following discharges are exempt from discharge prohibitions established by this ordinance, unless the discharge results in a direct discharge and the discharge is identified as containing pollutants or chemicals that are required to be controlled by state or federal regulation:
 - (a) water line flushing,
 - (b) landscape irrigation or lawn watering,
 - (c) diverted stream flows,
 - (d) rising ground waters,
 - (e) uncontaminated ground water infiltration,
 - (f) uncontaminated pumped ground water,
 - (g) discharges from potable water sources,
 - (h) foundation drains,
 - (i) air conditioning condensation,
 - (j) uncontaminated irrigation water,
 - (k) uncontaminated springs,
 - (l) water from sump pumps,
 - (m) footing drains,
 - (n) individual residential (non-commercial) car washing,
 - (o) flows from riparian habitats and wetlands,
 - (p) dechlorinated swimming pool discharges, and
 - (q) street wash water.
- (2) Discharges or flow from firefighting, and other discharges specified in writing by the Shelburne Selectboard as being necessary to protect public health and safety.
- (3) Discharges associated with dye testing, however this activity requires a verbal notification to the Department of Public Works prior to the time of the test.
- (4) The prohibition shall not apply to any non-storm water discharge

permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the United States Environmental Protection Agency (EPA), provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted by the Department of Public Works for any discharge to the storm drain system.

5.2. Prohibition of Illicit Connections.

- (1) The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited.
- (2) This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

5.3. Waste Disposal Prohibitions

No person shall throw, deposit, leave, maintain, keep, or permit to be thrown, deposited, left, or maintained, in or upon any public or private property, driveway, parking area, street, alley, sidewalk, component of the storm drain system, or water of the U.S., any refuse, rubbish, garbage, litter, or other discarded or abandoned objects, articles, and accumulations, so that the same may cause or contribute to pollution. Wastes deposited in streets in proper waste receptacles for the purposes of collection are exempted from this prohibition.

5.4. Industrial and Construction Activity Discharges

- (1) Any person subject to an industrial or construction activity NPDES storm water discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the Director of Planning prior to the allowing of discharges to the storm drainage system.
- (2) The operator of a facility, including construction sites, required to have an NPDES permit to discharge storm water associated with industrial activity shall submit a copy of the Notice of Intent (NOI) to the Director of Planning at the same time the operator submits the original Notice of Intent to the EPA as applicable.
- (3) The copy of the Notice of Intent may be delivered to the Director of Planning either in person or by mailing it to:
Notice of Intent to Discharge Storm Water
Director of Planning
P.O. Box 88
5420 Shelburne Road
Shelburne, VT 05482
- (4) A person commits an offense if the person operates a facility that is discharging storm water associated with industrial activity without having submitted a copy of the Notice of Intent to do so to the Director

of Planning.

SECTION 6. STORMWATER MANAGEMENT REQUIREMENTS

6.1 Best Management Practices

The Director of Public Works will adopt requirements identifying Best Management Practices for any activity, operation, or facility which may cause or contribute to pollution or contamination of storm water, the storm drain system, or waters of the United States. The owner or operator of such activity, operation, or facility shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the municipal storm drain system or watercourses through the use of these structural and non-structural BMPs. Further, any person responsible for a property or premise that is, or may be, the source of an illicit discharge, may be required to implement, at said person's expense, additional structural and non-structural BMPs to prevent the further discharge of pollutants to the storm drainage system. Compliance with all terms and conditions of a valid NPDES permit authorizing the discharge of storm water associated with industrial activity, to the extent practicable, shall be deemed compliance with the provisions of this section. These BMPs shall be part of a storm water management plan (SWMP) as necessary for compliance with requirements of the NPDES permit.

6.2 Watercourse Protection

Every Person owning property through which a water course passes, or such person's lessee, shall not dump or dispose of trash, debris or other obstacles that would pollute, contaminate or significantly retard the flow of water through the watercourse . In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structures will not become a hazard to the use, function, or physical integrity of the watercourse. Riparian Buffers established as part of the development and required by Town regulations shall be maintained by the developer and all other subsequent property owners or associations within the development.

6.3 Notification of Spills

Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into storm water, the storm drain system, or waters of the United States, said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of such a release of hazardous materials said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the Director of Public Works in person or by phone or facsimile no later than the next business day. Notifications in person or

by phone shall be confirmed by written notice addressed and mailed to the Director of Public Works within 3 business days of the phone notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least 3 years. Failure to provide notification of a release as provided above is a violation of this ordinance.

6.4 Undocumented Discharges or Connections

Any drain or conveyance that has not been documented in plans, maps or equivalent, and which may be connected to the storm sewer system, shall be located by the owner or occupant of that property upon receipt of written notice of violation from the Town requiring that such locating be completed. Such notice will specify a reasonable time period within which the location of the drain or conveyance is to be determined, that the drain or conveyance be identified as storm sewer, sanitary sewer or other, and that the outfall location or point of connection to the storm sewer system, sanitary sewer system or other discharge point be identified. Results of these investigations are to be documented and provided to the Director of Public Works.

6.5 Elimination of Illegal Discharges

The Public Works Director may require by written notice that a person responsible for an illegal discharge immediately, or by a specified date, discontinue the discharge and, if necessary, take measures to eliminate the source of the discharge to prevent the occurrence of future illegal discharges.

6.6 Elimination of Illicit Connections

The Public Works Director may require by written notice that a person responsible for an illicit connection to the storm drain system comply with the requirements of this Ordinance to eliminate or secure approval for the connection by a specified date, regardless of whether or not the connection or discharges to it had been established or approved prior to the effective date of this Ordinance.

SECTION 7. COMPLIANCE MONITORING

7.1. Right of Entry: Inspection and Sampling.

The Director of Public Works, or other authorized representatives, shall be permitted to enter and inspect facilities subject to regulation under this ordinance as often as may be necessary to determine compliance with this ordinance.

- (1) If a discharger has security measures in force which require proper identification and clearance before entry into its premises, the discharger shall make the necessary arrangements to allow access to representatives of the Town.
- (2) Facility operators shall allow the Town ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an

NPDES permit to discharge storm water, and the performance of any additional duties as defined by state and federal law.

- (3) The Town shall have the right to set up on any permitted facility such devices as are necessary in the opinion of the Town to conduct monitoring and/or sampling of the facility's storm water discharge.
- (4) The Town has the right to require the discharger to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the discharger at its own expense. All devices used to measure storm water flow and quality shall be calibrated to ensure their accuracy.
- (5) Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the operator at the written or oral request of the Town and shall not be replaced. The costs of clearing such access shall be borne by the operator.
- (6) Unreasonable delays in allowing the Town access to a permitted facility is a violation of a storm water discharge permit and of this ordinance. A person who is the operator of a facility with an NPDES permit to discharge storm water associated with industrial activity commits an offense if the person denies the Town reasonable access to the permitted facility for the purpose of conducting any activity authorized or required by this ordinance.

7.2. Search Warrants.

If the Town has been refused access to any part of the premises from which storm water is discharged, and he/she is able to demonstrate probable cause to believe that there may be a violation of this ordinance, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this ordinance or any order issued hereunder, or to protect the overall public health, safety, and welfare of the community, then the Town may seek issuance of a search warrant from any court of competent jurisdiction.

SECTION 8. ULTIMATE RESPONSIBILITY.

The standards set forth herein and promulgated pursuant to this ordinance are minimum standards; therefore this ordinance does not intend or imply that compliance by any person will ensure that there will be no contamination, pollution, or unauthorized discharge of pollutants.

SECTION 9. RESPONSIBILITY FOR ADMINISTRATION.

The Department of Public Works shall administer, implement, and enforce the provisions of this ordinance. Any powers granted or duties imposed upon the Department of Public Works may be delegated in writing by the Director of Public

Works to persons or entities acting in the beneficial interest of or in the employ of the Town.

SECTION 10. VIOLATIONS, ENFORCEMENT, AND PENALTIES.

10.1. Violations.

It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this ordinance. Any person who has violated or continues to violate the provisions of this ordinance, may be subject to the enforcement actions outlined in this section or may be restrained by injunction or otherwise abated in a manner provided by law. In the event the violation constitutes an immediate danger to public health or public safety, the Town is authorized to proceed in the manner provided for in Section 11.

10.2. Notice of Violation.

Whenever the Town finds that a person has violated a prohibition or failed to meet a requirement of this ordinance, the Town may order compliance by written Notice of Violation to the responsible person. The Notice of Violation shall contain:

- (1) The name and address of the alleged violator;
- (2) The address when available or a description of the building, structure or land upon which the violation is occurring, or has occurred;
- (3) A statement specifying the nature of the violation;
- (4) A description of the remedial measures necessary to restore compliance with this ordinance and a time schedule for the completion of such remedial action
- (5) A statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;
- (6) A statement that the determination of violation may be appealed to the Selectboard by filing a written notice of appeal within seven (7) days of service of notice of violation; an
- (7) A statement specifying that, should the violator fail to restore compliance within the established time schedule, the work will be done by a designated governmental agency or a contractor and the expense thereof shall be charged to the violator.

Such notice may require without limitation:

- (1) The performance of monitoring, analyses, and reporting;
- (2) The elimination of illicit connections or discharges;
- (3) That violating discharges, practices, or operations shall cease and desist;
- (4) The abatement or remediation of storm water pollution or contamination hazards and the restoration of any affected property;
- (5) Payment of a fine to cover administrative and remediation costs; and
- (6) The implementation of source control or treatment BMPs.

10.3. Issuance of Municipal Complaint

If the violation has not been corrected pursuant to the requirements set forth in the Notice of Violation within thirty [30] days of its issuance, then the Director of Public Works may, in addition to taking any other action to address the violation, issue a municipal complaint pursuant to 24 V.S.A. §1977.

10.4. Waiver

Any person who declines to contest a municipal complaint and, within ten (10) days of issuance of the complaint, takes those actions necessary to correct the violation may pay a waiver fee to the Town Clerk within fifteen (15) days of issuance of the complaint as follows:

First offense	\$50
Second offense	\$100
Third offense	\$150
Fourth offense	\$250
Fifth and subsequent offenses	\$400

Offenses shall be counted on a calendar year basis.

10.5. Civil Fine for Ordinance Violation

Any person who fails to take the corrective action and pay the waiver fee provided for in Section 10.6 above shall be required to pay a civil fine in the amount set forth below :

First offense	\$100
Second offense	\$200
Third offense	\$300
Fourth offense	\$400
Fifth and subsequent offenses	\$500

Offenses shall be counted on a calendar year basis.

10.6. Injunctive Relief

In addition to any other remedy available to the Town to obtain compliance with this Ordinance, the Town may commence any appropriate civil action to seek an injunction or other appropriate relief, including an order authorizing the Town to enter upon the subject private property, take any and all measures necessary to abate the violation and/or restore the property, and recover from the property owner the Town's costs in performing such work.

10.7. Compensatory Action.

In lieu of enforcement proceedings, penalties, and remedies authorized by this ordinance, the Town may impose upon a violator, alternative compensatory actions, such as storm drain stenciling, attendance at compliance workshops, creek cleanup. etc.

SECTION 11. EMERGENCY SITUATIONS AND SUSPENSION OF STORM DRAIN SYSTEM ACCESS

11.1. Emergency Cease and Desist Orders

When the Town finds that any person has violated, or continues to violate, any provision of this ordinance, or any order issued hereunder, or that the person's past violations are likely to recur, and that the person's violation(s) has (have) caused or contributed to an actual or threatened discharge to the Storm Drainage System or waters of the United States which reasonably appears to present an imminent or substantial endangerment to the health or welfare of persons or to the environment, the Town may issue an order to the violator directing it immediately to cease and desist all such violations and directing the violator to:

- (1) Immediately comply with all ordinance requirements; and
- (2) Take such appropriate preventive action as may be needed to properly address a continuing or threatened violation, including immediately halting operations and/or terminating the discharge.

Any person notified of an emergency order directed to it under this Subsection shall immediately comply and stop or eliminate its endangering discharge. In the event of a discharger's failure to immediately comply voluntarily with the emergency order, the Town may take such steps as deemed necessary to prevent or minimize harm to the storm drainage system or waters of the United States, and/or endangerment to persons or to the environment, including immediate termination of a facility's water supply, sewer connection, or other municipal utility services. The Town may allow the person to recommence its discharge when it has demonstrated to the satisfaction of the Director of Public Works that the period of endangerment has passed, unless further termination proceedings are initiated against the discharger under this ordinance. A person that is responsible, in whole or in part, for any discharge presenting imminent endangerment shall submit a detailed written statement, describing the causes of the harmful discharge and the measures taken to prevent any future occurrence, to the Director of Public Works within seven [7] days of receipt of the emergency order. Issuance of an emergency cease and desist order shall not be a bar against, or a prerequisite for, taking any other action against the violator.

11.2. Suspension due to Illicit Discharges in Emergency Situations

The Town may, without prior notice, suspend storm drainage system discharge access to a person when such suspension is necessary to stop an actual or threatened discharge which presents or may present imminent and substantial danger to the environment, or to the health or welfare of persons, or to the storm drainage system or waters of the United States. If the violator fails to comply with a suspension order issued in an emergency, the Town may take such steps as deemed necessary to prevent or minimize damage to the storm drainage system or waters of the United States, or to minimize danger to persons.

SECTION 12. VIOLATIONS DEEMED A PUBLIC NUISANCE.

In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provisions of this ordinance is a threat to public health, safety, and welfare, and is declared and deemed a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

SECTION 13. REMEDIES NOT EXCLUSIVE.

The remedies listed in this ordinance are not exclusive of any other remedies available under any applicable federal, state or local law and it is within the discretion of the Town to seek cumulative remedies. The Town may seek to recover all attorney's fees, court costs and other expenses associated with enforcement of this ordinance, including sampling and monitoring expenses.

SECTION 14. COMPATIBILITY WITH OTHER REGULATIONS.

This ordinance is not intended to modify or repeal any other ordinance, rule, regulation, or other provision of law. The requirements of this ordinance are in addition to the requirements of any other ordinance, rule, regulation, or other provision of law, and where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule, regulation, or other provision of law, whichever provision is more restrictive or imposes higher protective standards for human health or the environment, shall control.

SECTION 15. SEVERABILITY.

The provisions of this ordinance are hereby declared to be severable. If any provision, clause, sentence, or paragraph of this ordinance or the application thereof to any person, establishment, or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this ordinance.

SECTION 16. EFFECTIVE DATE.

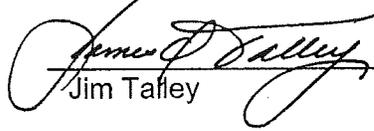
This ordinance shall be effective upon passage.

ADOPTED at Shelburne, Vermont this 8th day of August, 2006.

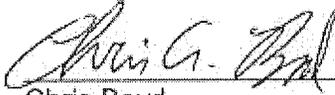
SHELBURNE SELECTBOARD



Chris Neme, Chairperson



Jim Talley



Chris Boyd

Bob Roesler

Jane Osborne McKnight

**END OF
DOCUMENT**

APPENDIX II
APPLICABLE ZONING REGULATIONS

From ZONING Regulations

Site Plan review

1900.3 Review Standards.

...

F. The adequacy of proposed construction erosion and sediment control, and post construction stormwater management facilities.

1900.4 Construction and Post-Construction Stormwater Management Requirements.

A. When a project proposes to disturb an area more than one acre in size while creating less than one acre of impervious surface and thus would not trigger the requirement for a state stormwater discharge permit, the project must comply with the Vermont Stormwater Management Manual to the maximum extent practicable. For the purposes of this subsection, the determination of compliance shall be assigned to the Shelburne Director of Public Works.

B. Irrespective of the size of the area of disturbance, the amount of stormwater and other surface waters leaving the project site shall be minimized by the site design. Any stormwater management measures, treatment practices, and/or infrastructure shall be designed in accordance with Article IV of the Town's Public Works Specifications and shall meet the regulations and standards of the Vermont Department of Environmental Conservation, and any other applicable Town regulations and standards.

C. During construction of any development exceeding 1,000 square feet of disturbed area, erosion prevention and sediment control measures shall meet the technical specifications of current rules and regulations put forth by the Vermont Department of Environmental Conservation.

Zoning districts

**ARTICLE V: STORMWATER-IMPAIRED WATERSHED
OVERLAY DISTRICT**

500 Purpose. It is the goal of this article is to protect water quality in watersheds where surface waters have been identified as being impaired due to water quality impacts from stormwater. New development projects and redevelopment projects, including those involving construction, alteration, or improvement exceeding 10,000 SF on previously developed land, may be subject to individual stormwater permit requirements under Environmental Protection Rules (EPR) Chapter 22 Stormwater Management Rule For Stormwater-Impaired Waters, promulgated by the Water Quality Division of the Vermont Agency of Natural Resources.

510 Applicability. The Stormwater-Impaired Watershed Overlay District shall be consistent with the boundaries of the Stormwater-Impaired Overlay Area, as depicted on the Zoning Overlay Map.

520 Special Review Requirements. Projects in this overlay district that result in a change in impervious surface area that triggers a new or renewed individual state stormwater permit shall provide documentation that the project is either exempt, or in compliance with EPR Chapter 22.

530 Application and Review Procedure. Projects in this overlay district that result in a change in impervious surface area shall either submit documentation that they

are exempt from the requirements of EPR Chapter 22, or submit a copy of their Individual Stormwater Permit Application and attachments (including plans, specifications, and calculations) to the Town of Shelburne.

SUBDIVISION REGULATIONS

800 The Commission shall evaluate any minor or major subdivision in accordance with the following standards:

(4) Whether the proposal includes adequate provision for erosion prevention and sediment control during construction; minimizing stormwater generation after construction; and adequate stormwater treatment after construction, as determined by a standard equivalent to that required under Section 1900.4 of the Town of Shelburne Zoning Bylaws.

810 SITE PRESERVATION, LANDSCAPING AND GRADING AND EXCAVATION

(3) Erosion and Sediment Control – The smallest practical area of land shall be exposed at any one time during development. The exposure should be kept to the shortest practical period of time. Land should not be left exposed during the winter months. Where necessary, temporary vegetation and/or mulching and structural measures may be required by the Commission to protect areas exposed during the development. Sediment basins (debris basins, desilting basins, or silt traps) shall be installed and maintained during development to remove sediment from runoff water and from land undergoing development. The permanent final vegetation and structure should be installed as soon as practical in the subdivision. Adequate and permanent measures shall be taken at culvert outfalls to minimize or prevent erosion and disruption of drainageway areas. The construction shall comply with state requirements for erosion prevention and sediment control

(5) Excavation and Grading - All excavation and filling required for construction of improvements meet the technical specifications of current rules and regulations put forth by the Vermont Department of Environmental Conservation. The entire area of work shall be brought to the required lines and grades by excavation or filling. Excavation material, if suitable, may be used in making embankments and in filling subgrade areas. A minimum of four (4) inches of topsoil shall be provided to cover finished slopes. All streets shall be graded from property line to property line to approved grade and cross-section.

970 STORMWATER MANAGEMENT

The following Stormwater treatment standards may apply to land development activities regulated under this bylaw, and where applicable, shall be applied as required and outlined in the Vermont Stormwater Management Manual, (Volumes I and II), latest revision.

- (A) Water Quality Treatment Standards
- (B) Channel Protection Treatment Standards
- (C) Groundwater Recharge Treatment Standards
- (D) Overbank Flood Protection Treatment Standards
- (E) Extreme Flood Protection Treatment Standards

Furthermore, the following requirements shall be complied with for all projects under the jurisdiction of this regulation:

(1) Low Impact Development Techniques – Substantial alterations to existing surface water drainage for the purpose of development are strongly discouraged. The designer of the project shall demonstrate to the Development Review Board that, where feasible, soils best suited for infiltration are retained and, where feasible, areas best suited to serve as natural stormwater management features are preserved.

(2) Removal of Surface Water - Drainage facilities serving the subdivision shall be located in the street right-of-way where feasible, or in perpetual unobstructed easements not less than 20 feet in width, and shall be designed to standards approved by the Town's Director of Public Works. In design of the drainage system, natural waterways and drainage ways shall be utilized to the fullest extent possible.

(3) Drainage Structure to Accommodate Development Upstream - Culverts or other drainage facilities shall, in each case, be large enough to accommodate potential runoff from the entire upstream drainage area or watershed, whether inside or outside the subdivision. The Development Review Board shall approve the design and size of facilities based on anticipated runoff under conditions of total potential development. The subdivider's engineer shall provide such information as the Commission deems necessary to the determination of the adequacy of the facilities.

(4) Responsibility for Downstream Drainage - The subdivider's engineer shall provide such information as the Development Review Board deems necessary to determine the effect of the subdivision on the existing downstream drainage facilities outside of the area of the subdivision. Where the Development Review Board anticipates that the additional runoff incident to the development of the subdivision will overload an existing downstream drainage facility so that there will be damage to private property or an increase in the expenditure of public funds, the Development Review Board shall not approve the subdivision until the subdivider agrees to the improvements deemed necessary by the Town to prevent such overload.

975 EROSION PREVENTION AND SEDIMENT CONTROL

(1) All land clearing that exposes bare earth, excavating, filling and stockpiling of earth materials associated with the development of subdivisions shall be conducted to maximize erosion prevention and sediment control.

(2) All construction projects must comply with applicable requirements of the State of Vermont Erosion Control and Sediment Control General Permit.

APPENDIX III
APPLICABLE PUBLIC WORKS SPECIFICATIONS

Town of Shelburne
Public Works Specifications

Adopted by Shelburne Selectboard
March 26, 2002
(Revised February 12, 2008)

1.10 EROSION PREVENTION AND SEDIMENT CONTROL

It shall be the Contractor's responsibility, in conjunction with the Developer, to control runoff, stabilize soil, and contain sediment to adequately prevent erosion and control sediment from leaving the project site during construction. The discharge of any sediment from land disturbance activities approved by the Town to any other property, the MS4 and/or surface waters is prohibited except in the case of an emergency activity that is immediately necessary for the protection of life, property or natural resources. All Erosion and Sediment Control practices shall follow *The Vermont Standards and Specifications for Erosion Prevention and Sediment Control* (2006). The Contractor/Developer shall prepare an Erosion Prevention and Sediment Control Plan, file Notices of Intent (NOI) and obtain a Construction Stormwater Permit as required by Vermont Agency of Natural Resources regulation and guidance.

PROCEDURES

2.1 POLICY

A. PRIOR TO COMMENCING CONSTRUCTION

Before commencing construction on the infrastructure of the subdivision or site plan the following steps must be taken:

1. All pertinent conditions of approval must be met.
2. All legal documents and the signed mylar must be recorded in the Land Records.
3. A preconstruction meeting must be held between the developer, his/her contractor and engineer, representatives of the Town departments involved (i.e. Water, Wastewater, Highway, Town Manager, Planning and Zoning), the Public Works Director, and any others deemed necessary. Four complete sets of construction drawings and specifications for the proposed work shall be prepared and furnished to the Director of Public Works prior to the meeting. The Developer shall provide an emergency contact list effective throughout the duration of the construction period. At this meeting Town departments shall submit a numbering system for each infrastructure item (manholes, hydrants, valves, etc.) on the project.
4. A letter of credit must be established with the Town, at no cost to the Town, in an amount to cover 100% of the estimated construction cost of the water and sewer utilities, road and stormwater management facilities, landscaping and any other items as may be applicable. This amount can be reduced, upon written request by the Developer to the Zoning Coordinator, as the work is completed and accepted.

Phased developments can bond by the phase to be built unless some part of the infrastructure must be installed as a whole in which case that part of the infrastructure must be bonded in its entirety.

The amount of the letter of credit will be determined from the Project Cost Estimate

Form, provided by the Town, or other approved form, which the Developer completes and submits to the Town for review and acceptance.

B. DURING CONSTRUCTION

Periodic inspections of the progress of construction will be conducted by Town staff in addition to those inspections requested by and required of the Developer. Any inspections requested by the Developer must be scheduled so as to allow for the required two (2) day notice to the Town staff. Notice shall be given to the Director of Public Works who will coordinate the inspections. See Inspection Schedule, Section 2.2, of these specifications, for a detailed list of required inspections for water, sewer, roads and stormwater management systems.

Should a change in the approved plans be desired by the Developer or Contractor, a Project Modification Form must be submitted to the Director of Public Works for Town review and approval. A copy of the form can be found in Forms and Schedules, Section 2.4B. No changes to the plans shall be made without prior written approval of the Town.

C. PRIOR TO ISSUANCE OF A CERTIFICATE OF OCCUPANCY

No certificates of occupancy will be issued for any structure until sewer and water connections are made and approved by the Town and until any other conditions imposed by the Town are met. No connections will be allowed until sewer and water systems are completed, tested and deemed acceptable by the Town.

D. COMPLETION OF PROJECT

Final Inspections: Upon completion of the infrastructure of a project, the Developer or Contractor shall contact the Director of Public Works to schedule a final inspection of the project. Any repairs or corrections required by the Town to bring the project into conformance with the approved plans and these specifications shall be made at the Contractor's expense and another final inspection scheduled once the necessary work is complete.

Release of Letter of Credit: Once the water and sewer utilities, road and stormwater management facilities and any other items covered by the letter of credit are completed to the satisfaction of the Town, and as-builts have been approved by the Town, the Developer may request, in writing, a reduction of the letter of credit. The entire letter of credit will not be released until the end of the warranty period specified in the letter of credit.

Town Assumption of Public Improvements: The Town will not take over any public improvements such as water and sewer lines or roads until the warranty period specified in the letter of credit has expired. This warranty period shall be a minimum of one (1) year. All applicable conditions of final Town approval of a project must be met and all outstanding bills due the Town must be paid before assumption of public improvements by the Town. Requests for the Town to take over any or all public improvements must be made in writing to the Town Manager.

2.2 INSPECTION SCHEDULE

A. EROSION AND SEDIMENT CONTROL

The Department of Public Works shall make inspections as hereinafter required and either shall approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the Erosion and Sediment Control Plan as approved. To obtain inspections, the applicant or their agent shall notify the Department of Public Works at least two working days before the following:

1. Start of construction.
2. Installation of sediment and erosion control measures.
3. Completion of site clearing.
4. Completion of rough grading.
5. Completion of final grading.
6. Close of construction season.
7. Completion of final landscaping.

B. ROADS

1. Two (2) days notice for all inspections shall be given to the Public Works Director, Highway Superintendent, or authorized representative.
2. A sample of all subbase and base materials will be tested by a testing lab approved by the Town in accordance with Note #3 of Figure 1, Type 1 Road (Street Details for the Subgrade), and sieve analysis to the 200 sieve for base materials for all changes in subgrade or base materials as required by the Shelburne Highway Department in conjunction with the Public Works Director, at the Developer's expense. The subbase and base compaction will be tested by AASHTO-T-99, Method A (Standard Proctor) test in fill sections at minimum intervals of every 500 to 1000 square feet of area and two feet (2') of depth and changes in material as required by the Shelburne Highway Department in conjunction with the Public Works Director at the Developer's expense. The responsibility for testing shall be the Developer's.
3. The Public Works Director, Highway Superintendent, or authorized representative will be notified forty-eight (48) hours in advance to inspect the construction of any and all roads at the following phases of construction:
 - a. Preparation of subbase;
 - b. Installation of base material;
 - c. Completion of finish grading;
 - d. Before and during the placement of the base coat of asphalt;
 - e. Before and during the placement of the top coat of asphalt.
4. The Shelburne Highway Superintendent and Public Works Director, as needed, or other authorized representative will inspect work during the placement of curbs, sidewalks, and driveway aprons.
5. Grades will be shot and verified by the Developer's engineer after the finished grading of

the road base, the placement of the base coat, and the placement of the top coat. The Shelburne Highway Superintendent, Public Works Director or authorized representative will be given 24 hours advance notice so they may be present during the taking of grade readings.

6. A final inspection will be taken after the completion of all roads, curbs, driveways, sidewalks, and/or bicycle paths. The following roadway general checklist will be used at final inspection:
 - a. Settlement, depression, or imperfections in finish surface;
 - b. Seeding and erosion control on cut and fill slopes;
 - c. Surface drainage (during a rainstorm);
 - d. General appearance;
 - e. Material testing results, lab reports, and record drawings complete and on file.
7. An inspection schedule for each project will be determined at the preconstruction meeting.

C. STORMWATER MANAGEMENT SYSTEMS

1. Two (2) days notice for all inspections shall be given to the Public Works Director or authorized representative.
2. No backfilling shall occur until the installation of stormwater treatment practices, pipes for stormwater conveyance and culverts are inspected and approved by the Shelburne Highway Superintendent, Public Works Director or authorized representative.
3. The Shelburne Highway Superintendent, Public Works Director or authorized representative shall inspect and approve all pipes for stormwater conveyance and culvert joints and connections to catch basins.
4. The Shelburne Highway Superintendent, Public Works Director or authorized representative shall inspect all catch basins during installation.
5. Other stormwater management facilities, such as grass channels, infiltration trenches, detention basins and ponds, shall be inspected during construction and upon completion.
6. All stormwater management facilities will be inspected upon completion of the project using the following general checklist:
 - a. Catch basins, manholes, and pipelines clean;
 - b. Ditches and outlets clean;
 - c. Erosion control measures completed per the approved plan;
 - d. General appearance;
 - e. Material testing results, lab reports, manufacturer's certificates, and record drawings complete and on file.
 - f. Global positioning system points have been documented for each structure

7. An inspection schedule for each project will be determined at the preconstruction meeting.

D. WATER DISTRIBUTION SYSTEMS

1. Two (2) days notice for all inspections and testing will be given to the Public Works Director, Water Superintendent, or authorized representative.
2. Two (2) days notice shall be given to the Public Works Director, Water Superintendent, or authorized representative so they may be able to inspect all materials on the site before construction begins.
3. The Shelburne Water Superintendent, Public Works Director or authorized representative shall be present when any connection to the existing water system is made and during the testing, flushing, disinfecting, and sampling of new mains.
4. The following water main general checklist will be used at the final inspection:
 - a. Valves, hydrants, and curb stops operating properly;
 - b. Valve box covers set at proper elevations;
 - c. General appearance;
 - d. Tie information and record drawings complete;
 - e. Material testing results, lab reports, manufacturer's certificates, pressure and leakage test results, disinfection test results, record drawings, and hydraulic analysis are complete and on file.
 - f. Global positioning system points have been documented for each structure
5. An inspection schedule for each project will be determined at the preconstruction meeting.

E. SANITARY SEWER SYSTEMS

1. Two (2) days notice for all inspections and testing will be given to the Public Works Director, Wastewater Superintendent, or authorized representative.
2. Two (2) days notice shall be given to the Public Works Director, Wastewater Superintendent, or authorized representative in order for them to inspect all materials on site before construction begins.
3. The Chief Operator of the Shelburne Wastewater Department, Public Works Director or authorized representative shall visit the site at least four (4) times during the construction of the project, not including material inspection or final air test and visual inspection.
4. The (project) Contractor shall make available all grade readings at the project site. A copy of complete grade readings and air test results shall be submitted to the Shelburne Wastewater Treatment Department.
5. The following sanitary sewer system general checklist will be used at the final inspection:

- a. Manholes, pipelines, and appurtenances clean;
 - b. Inverts and shelves completed to plans with smooth transitions;
 - c. Manhole frames and covers set at proper elevation;
 - d. General appearance;
 - e. Material testing results, lab reports, manufacturer's certificates, leakage and pump test results and record drawings complete and on file.
 - f. Global positioning system points have been documented for each structure
6. An inspection schedule for each project will be determined at the preconstruction meeting.
7. All piping shall be videoed at least 30 days after installation using a closed-circuit television (CCTV) system capable of recording in digital format. The CCTV software must be capable of documenting attributes of the pipe and give a rating of each attribute, and the line as a whole, based on Pipeline Assessment and Certification Program (PACP) standards. A copy of the video and all relevant reports shall be submitted to the Wastewater Department. Any defects found in design or workmanship shall be excavated and repaired at the contractor's expense.

(Two days notice shall be given both the Shelburne Wastewater Treatment Department or the Public Works Director before air testing of the pipe and manholes.)

2.3 SUBMITTAL OF AS-BUILTS

Upon completion of all improvements, 5 complete sets of as-built drawings should be submitted to the Town. Drawings shall be detailed prints, drawn to scale and shall include a location map, site plan, and locations in plan and profile of all utilities, in addition to the following information.

A. ROADS

- 1. Accurate locations of all streets and storm lines, culverts, and other facilities.
- 2. For streets the following shall be shown:
 - a. Width of pavement from curb to curb or shoulder to shoulder;
 - b. Right-of-way dimensions for streets;
 - c. Width of sidewalks and bike paths;
 - d. Location of street lights;
 - e. Location of driveways;
 - f. Location and size of planter islands, if any;
 - g. Typical cross-section of streets installed;
 - h. Location of all underground electric, telephone, and television lines.

B. STORMWATER MANAGEMENT SYSTEMS

For stormwater management systems the following shall be shown:

- 1. Depth, size, location and type of all stormwater treatment practices, storm drain lines and

3. The road width shall have a minimum paved surface of twenty-eight feet (28'). Travel lanes shall be demarcated with fog lines.
4. Sidewalks and streetlights shall be required unless the Planning Commission determines that these are unnecessary.

Type I roads will require modification if soil conditions or high ground waters have the potential for creating an unstable subbase. If a soil has a plasticity index of more than six (6) and a liquid limit of more than twenty-five (25), or a sieve analysis, which shows more than 8% passing the #200 sieve, or the seasonal ground water table is within three feet (3') of finish grade, then a Type I modified road design shall be used. The Type I modified road serves the same function as the Type I road with the following changes:

1. The crushed gravel base is deepened from eighteen inches (18") to twenty-four inches (24").
2. Ground stabilization fabric is used on the subgrade.
3. Underdrain is required on both sides of the road. The underdrain shall be of sufficient size and depth to lower the water table two feet (2') below the road subgrade.

Type I roads have been developed to provide the Town of Shelburne with durable, safe and low maintenance arterial and collector roads. The twenty-eight (28') road width, sidewalks and streetlights provide space and illumination for traffic flow, parking and pedestrian movements. The enclosed stormwater management system with catch basins and curbs provides efficient stormwater collection without the high maintenance costs and safety hazards associated with ditches. Alternatives to the enclosed drainage system with catch basins and curbs may be proposed to the Public Works Director along with documentation that (1) it provides efficient stormwater collection without the high maintenance costs and safety hazards; and (2) it provides more effective stormwater treatment than a closed drainage system. The pavement and gravel thickness is sufficient to withstand heavy truck and car traffic without premature deterioration.

B. Type II Roads

Type II roads serve low density residential developments with less than 20 residences. They provide access links to Type I roads. The traffic volume on Type II roads consists mainly of trips to and from single family residences and agricultural commerce. Type II roads shall always be public roads.

The following is an outline of the major characteristics of a Type II road. These items, along with the specific design criteria provided in the Shelburne Development Specifications shall be included in the design of a Type II road.

1. The right-of-way width shall be sixty feet (60') unless a wider right-of-way is deemed necessary by the Shelburne Planning Commission.
2. Stormwater Management shall be provided by means of a closed drainage system with catch basins, unless an alternative stormwater management approach is proposed and

approved by the Public Works Director. The method by which drainage is directed to the catch basins will be reviewed on a case-by-case basis.

3. The road width shall be twenty-four feet (24') of pavement with two foot (2') gravel shoulders each side. Curbs with a twenty-eight feet (28') wide paved road width are an acceptable substitute.
4. Sidewalks and streetlights may be required and will be evaluated on a case-by-case basis by the Shelburne Planning Commission.

Type II roads will require modification if soil conditions or high ground water have the potential for creating an unstable subbase. The criteria for road subbase modification are the same as for Type I road base modification. A Type II modified road base will be the same as a Type II road base with the following exceptions:

1. The gravel base is deepened from eighteen inches (18") to twenty-four inches (24").
2. Ground stabilization fabric is used on the subgrade.
3. Underdrain is required on both sides of the subgrade. The underdrain shall be of sufficient size and depth to lower the water table two feet (2') below the road subgrade.

Type II roads have been developed to provide a standard for existing and proposed highways which will have low traffic volumes now and in the future. The twenty-four foot (24') paved width will be adequate for automobile traffic and the two foot (2') gravel shoulder width to either side will accommodate the occasional truck with safety. The enclosed stormwater management system with catch basins provides efficient stormwater collection without the high maintenance costs and safety hazards associated with ditches. Alternatives to the enclosed drainage system with catch basins may be proposed to the Public Works Director along with documentation that (1) it provides efficient stormwater collection without the high maintenance costs and safety hazards; and (2) it provides more effective stormwater treatment than a closed drainage system. The pavement and gravel thickness will withstand heavy agricultural trucks without premature deterioration.

3.3 SIDE SLOPES

Side slopes in street embankments shall descend one foot (1') vertically for at least three feet (3') horizontally (3 on 1). Side slopes in excavation in rock shall ascend six feet (6') vertically for at least one foot (1') horizontally (6 on 1). Where rock cuts have a face higher than ten feet (10') vertically, a three foot (3') berm shall be provided at each ten foot (10') level above the grade at the edge of the pavement.

Side slopes shall not be graded so as to extend beyond the limits of the road right-of-way onto land not part of the subdivision unless a suitable side slope easement has been properly established and granted by the affected property owner.

3.4 SOIL TESTS

Prior to submittal of a preliminary plan application, soil borings and/or test pits shall be made to

C. Construction Methods

Preparation of subgrade: Same as for Cement Concrete Sidewalk.

3.16 STREET SIDELINE MONUMENTS

A. Description

This item shall consist of installing street property sideline monuments at all street intersections and at all points of curve and/or tangency or other critical points in the street lines as will enable a land surveyor to correctly stake out any lot in the subdivision.

B. Materials

Reinforced concrete monuments shall be those as manufactured by S.T. Griswold, or equivalent, and shall be 4" x 4" x 36". The top shall have a marked center, which shall be the point of reference.

C. Construction Methods

The monuments shall be set vertically and to a depth so that the top of the monument will project one-half inch (1/2") above the surrounding ground surface. The monuments shall be set in place after all other street improvements are completed. The monument's location shall be established by a surveyor licensed to practice in the State of Vermont.

3.17 PLANTING OF TREES

The Planning Commission of the Town of Shelburne may require the planting of new trees in areas where no trees presently exist, within the area disturbed by new construction, or in an area in which substantial loss of trees has or will occur in the process of road construction.

Such trees shall be preferably of a type indigenous to the neighborhood. Such trees shall be planted in fertile or fertilized ground and shall be watered and nurtured after planting until growth is assured.

Trees shall have a minimum diameter of trunk at a point four feet (4') above the ground level of at least two inches (2"). They shall be planted at intervals of no more than sixty feet (60') on both sides of the street. Such trees shall be clear of any branches from a point of ground level to a point six feet (6') above ground level. All new trees shall be planted outside of the street right-of-way and utility, drainage, or other public easements.

3.18 STREET GUARD RAILS

This item shall consist of the construction of twelve gauge standard steel beam and post guard rail, conforming to the design indicated on the accepted drawings, Sections 621 and 728 of the Vermont Standard Specifications for Construction, and pages G-1 and G-1d of the Vermont Design Standards. A guardrail shall be erected when the height of fill at the shoulder point is more than ten feet (10') with a slope steeper than 1 on 3 or as ordered by the Town.

3.19 STREET NAME SIGNS

A. Description

This item shall consist of a street name sign with a 3lb/ft galvanized channel, installed in accordance with these specifications and as shown on the accepted drawings. The developer is responsible for the purchase and installation of street signs and poles.

B. Materials

The post shall consist of 3 lb/foot galvanized channel post.

C. Construction

The signpost shall have a total length of ten feet, six inches (10'6") with an approximate exposed length of eight feet, zero inches (8'0").

D. Erection

The sign post shall be set two feet, six inches (2'6") in the ground, and the backfill material shall be tamped to maximum density so that the post shall be plumb and rigid. The signpost shall be located in the mall between the sidewalk and the curb at a point, which will not interfere with pedestrian or vehicular traffic.

3.20 ROAD CUTS

All requests for road cuts for utility connections must be approved by the Highway Superintendent after application had been made on approved Town forms. Road cuts are only to be used where no other feasible alternative exists for connecting utilities to a development.

The Contractor shall notify the Highway Superintendent forty-eight (48) hours in advance of commencement of the work. The Highway Superintendent will inspect the work at various stages, including the initial cut, preparation of the sand base, installation of gravel base, and paving of the cut. All restored road cuts shall be guaranteed by the Contractor for two (2) years.

All other requirements notwithstanding, no road cuts will be allowed between October 15 and April 15.

3.21 UTILITY CUTS

In order to minimize the number of open cuts, which result in disturbances in the road base, all utilities crossing a Town road shall be installed in a sleeve.

In areas where there is no ledge, pipes six inches (6") in size or less shall be driven or bored under the road. If ground conditions make boring or driving impossible, then an open cut may be considered on a case-by-case basis. Pipes greater than six inches (6") in size may be installed in an

31.25%	37.5	(variety Pennfine, Manhattan, or similar varieties)
100%	120 pounds live seed per acre	

3.27 STUMP DISPOSAL

On any project in which site development requires the removal of tree stumps, the disposal of the stumps may be accomplished on site. On-site stump disposal plans shall be submitted to and approved by the Planning and Zoning Department.

Such plans shall show that the on-site disposal can be safely and effectively accomplished and will meet the following minimum guidelines:

1. Disposal sites shall be located on nearly level to moderately sloping lands (slopes less than 12 percent).
2. Disposal sites will not be located in or within 100 feet of flowing watercourses or streams or in actively eroding gullies or high seasonal ground water table.
3. Disposal sites shall not be located in flooded or flood-prone lands, marshes, or other aquifer recharge areas.
4. Stumps will be placed on the site in a single lift prior to backfilling. When additional stumps are to be deposited on the same site, each successive layer or lift of stumps will be backfilled.
5. Stumps deposited in drainage ways or depressions shall be backfilled and bermed so as to divert overland flows from the disposal area.
6. A minimum of two feet (2') of overburden will be placed over all disposal sites.
7. Disposal sites shall be located outside any planned development area of structures, utilities, parking areas, streets, rights-of-way or utility easements.
8. All disturbed surfaces shall be properly limed, fertilized, seeded, and mulched to provide stable, non-erosive, vegetated cover. Specific seeding recommendations and lime or nutrient requirements will be based on soil tests and site conditions on that location.

4.0 STORMWATER MANAGEMENT SYSTEM SPECIFICATIONS

4.1 DESCRIPTION

This item shall consist of catch basins, manholes, and pipe, meeting the specifications for the diameter of pipe required and installed as indicated on the approved drawings. Except where approved by the Planning Commission, stormwater management systems for new developments shall be underground. The sizing of stormwater management systems shall be based on detailed calculations of stormwater flows and shall be prepared under the direction of an Engineer registered in the State of Vermont.

For developments proposing more than one acre of impervious area (roofs, and all other areas covered by gravel, asphalt, concrete or other impervious materials), the Town will require calculations as part of the site plan or preliminary subdivision plan submittals. For developments proposing less than one acre of impervious area, the Town may also require calculations if stormwater discharge or sizing of the proposed stormwater system is a concern.

Stormwater calculations and stormwater management systems design shall conform with the most recent rules of the Vermont Agency of Natural Resources Department of Environmental Conservation Water Quality Division. Treatment of stormwater runoff shall be in accordance with The Vermont Stormwater Management Manual. The stormwater calculations shall also include, but may not be limited to, the following:

1. Determination of the pre-development and post-development stormwater discharges for the two (2) year and twenty-five (25) year twenty-four (24) hour storm events. The preferred methods of calculation are the Soil Conservation TR55 or TR20 stormwater models. Other methods may be acceptable and will be reviewed on a case-by-case basis by the Shelburne Highway Department in conjunction with the Town Engineer.
2. The calculations shall demonstrate that all elements of the stormwater collection system are sized to handle the twenty-five (25) year twenty-four (24) hour storm event without overflow or flooding. If detention basins are needed, the calculations shall demonstrate that the basin can limit the stormwater discharges from the twenty-five (25) year twenty-four (24) hour post-development storm to the level of the twenty-five (25) year twenty-four (24) hour pre-development storm. The calculations shall also demonstrate that the detention basin has an emergency outlet capable of transmitting the discharges from the twenty-five (25) year post-development storm without exceeding the capacity of the emergency spillway.
3. The calculations shall show that the twenty-five (25) year twenty-four (24) hour post-development stormwater discharge will not adversely impact the existing stormwater drainage facilities. If the twenty-five (25) year stormwater discharge adversely impacts existing storm drainage facilities, the Developer will be expected to eliminate the adverse impact or upgrade the existing facilities as part of the development.

4.2 MATERIALS

Types of pipe: Types of pipe that may be used for conveyance of stormwater are High-Density Polyethylene Pipe (H.D.P.E.), Reinforced Concrete Pipe (R.C.P.), Corrugated Galvanized Metal Pipe (C.G.M.P.), Polyethylene, Polyvinyl Chloride Pipe (P.V.C.), or an approved equal. Types of pipe that may be used for culverts are High-Density Polyethylene Pipe (H.D.P.E.), Corrugated Galvanized Metal Pipe (C.G.M.P.), or an approved equal. The Shelburne Highway Department will approve the types of pipe used.

Size: The minimum size of stormwater lines and culverts shall be fifteen inches (15"), including driveway culverts. The minimum depth of cover over the crown of a drainage pipe shall be three feet (3') except driveway culverts that may have twelve inches (12") minimum cover. Special considerations shall be made on a case-by-case basis for shallow ditches.

Catch basins shall have a minimum 36" diameter, but for structures with more than two (2) pipe penetrations, the catch basin diameter shall be a minimum of 48".

Corrugated galvanized metal pipe: Pipe shall conform to standard specification for C.G.M.P. pipe, to AASHTO, M190. Spiral metal pipe will not be allowed.

Corrugated Polyethylene Pipe: Corrugated Polyethylene pipe shall conform to AASHTO M294-90 type S.

Polyvinyl chloride pipe: Pipe shall conform to ASTM Specifications D3034 or F679, (PVC) sewer pipe and fittings, SDR35. Spiral wrap PVC will not be allowed. Rubber gaskets for PVC pipe shall conform to ASTM D-3212 and F-477.

Catch basins: Catch basins shall be constructed of reinforced concrete and shall be provided with cast iron frames and grates. For curbside installation, frames and grates shall be LeBaron LK120, LK120A (for grades exceeding 5%), or an approved equal. For areas outside curbing, frames and grates shall be LeBaron LK121. Precast risers and base sections shall conform to the Vermont Standard Specifications for Construction, Section 604 and shall conform to ASTM C913. There shall be a two foot (2') sump below the outlet invert in all storm manholes.

Frames shall be brought to grade with solid concrete risers at least 3", and no more than 10", thick with no more than 1 layer of shim brick allowed. Frames set higher than the top course of paving shall be removed and reset.

Joints between pipes and catch basin sections shall be caulked with oakum and sealed with cement mortar, smoothed on the inside, and built up with a heavy bead of excess mortar on the outside. All brickwork shall be constructed in accordance with the masonry specifications for sanitary sewers in these specifications.

The grating frames shall be set to final grade only after the base course paving has been completed.

Manholes: Manholes shall be constructed of reinforced concrete and shall be provided with cast iron frames and covers. Manhole covers and frames shall be 24" diameter Type C as manufactured by Lebaron or approved equal. Precast risers and base sections shall conform to the VTrans Standard Specifications for Construction, Section 604 and shall conform to ASTM C913. There

shall be a two foot (2') sump below the outlet invert in all storm manholes.

Frames shall be brought to grade with solid concrete risers at least 3", and no more than 10", thick with no more than 1 layer of shim brick allowed. Frames set higher than the top course of paving shall be removed and reset.

Joints between less than or equal to six inch (6") diameter pipes and manhole sections shall be either (1) caulked with oakum and sealed with cement mortar, smoothed on the inside, and built up with a heavy bead of excess mortar on the outside; or (2) utilize flexible manhole sleeves manufactured by Lock Joint or approved equal. Flexible manhole sleeves manufactured by Lock Joint or approved equal shall be provided at all mainline inlet and outlet pipe penetrations greater than six inch (6") diameter. All brickwork shall be constructed in accordance with the masonry specifications for sanitary sewers in these specifications.

The cover frames shall be set to final grade only after the base course paving has been completed.

Inlet and outlet control materials: At each stormwater pipe inlet and outlet, a combination of stone fill within the drainageway and riprap above the sides may be required for sufficient distance from the outlet to prevent scouring and erosion of the drainageway.

Stone fill and riprap shall conform to the materials specifications of the VTRANS Standards for Construction for stone fill (Section 706.04), and riprap (Section 706.03). The exact type of stone fill shall be determined by the Project Engineer based on the hydraulic conditions.

4.3 CONSTRUCTION METHODS

Erosion and Sediment Control: The Contractor shall take all practicable and necessary effort to control and prevent erosion and sediment transport during the construction of a project to surface waters of the State or to adjoining properties. No clearing, grading, cutting or filling shall commence until erosion and sedimentation control devices have been properly installed, in accordance with an approved plan between the area to be disturbed and adjacent property, water bodies, water courses and wetlands. Clearing and excavation required for installation of erosion and sedimentation control devices is allowed provided no activity occurs beyond five (5) feet of the control devices as specified on the approved plan.

Once properly installed erosion and sediment controls must be maintained until a permanent vegetative ground cover is established. Any site or portion thereof where work is not being performed as part of the current phase of development and which remains cleared for over thirty (30) days, shall be stabilized. All disturbed areas shall be permanently stabilized through the establishment of appropriate vegetative ground cover upon completion of development activities on the site.

Laying pipe: Stormwater piping and culverts shall be constructed in accordance with the Vermont Standard Specifications for Construction, Section 601, and on a trench bottom, prepared and bedded as shown on the drawings. Each pipe shall be checked just prior to laying to ensure that it is clear of all dirt and debris and shall be laid true to line and grade as indicated on the contract drawings. All joints shall be tight and inverts shall be continuous.

Metal pipe shall be firmly joined with coupling bands, concrete pipe joints shall be rubber gasket-type, and PVC pipe shall be joined with the standard push-on type using elastomeric gaskets.

Stormwater piping and culverts with water flow velocities greater than twelve feet (12') per second shall require special design that must be approved by the Shelburne Highway Department in conjunction with the Town Engineer.

Backfilling: All material for backfilling shall be free of roots, stumps, and frost. Backfill for all pipe lines shall be placed in six inch (6") layers, each layer being thoroughly compacted to not less than 95 percent of maximum dry density as determined by the AASHTO-T-99, Method A, Standard Proctor (by means approved by the Engineer). PVC pipe shall have a minimum of three feet (3') of cover over the crown of the pipe.

Pipe bedding: (asphalt-coated) corrugated galvanized metal pipe shall be bedded from the trench bottom to the centerline of the pipe to a height of two feet (2') above the top of the pipe with material excavated from the trench having no stones larger than two and a half inches (2 1/2") in the longest dimension. Should no excavated material be suitable, sand or gravel shall be used.

PVC pipe and HDPE shall be bedded with #2 pea stone and backfilled with material excavated from the trench (having no stones larger than three inches (3") in the longest dimension). Sand or gravel shall be used if no excavated material is suitable.

PVC pipe shall not be installed when the temperature drops below 32 degrees Fahrenheit or goes above 100 degrees Fahrenheit. During cold weather, the flexibility and impact resistance of PVC pipe is reduced. Extra care is required when handling PVC pipe during cold weather.

Flared End Sections: The Contractor shall construct flared end sections at the outfall end of all stormwater piping as shown on the approved plans. Rubble masonry headwalls may be used with approval of the Shelburne Highway Department and shall be constructed to conform to the Vermont Standard Specifications for Construction, Section 602.

Flared end sections shall conform to the Vermont Standard Specifications for Construction, Sections 710-711.

Stormwater Treatment Practices: Stormwater Treatment Practices (STP), if deemed necessary, shall be designed and constructed under the supervision of an Engineer registered in the State of Vermont. All STP shall meet the design criteria set forth in The Vermont Stormwater Management Manual, (Volumes I and II) latest version, and shall be adequate to achieve the required stormwater treatment standards contained therein. The Town of Shelburne will not own or maintain STP, unless a specific STP maintenance agreement has been negotiated and signed. If a STP is proposed, the Town will require that a Stormwater Management Plan containing both narrative and map(s) that clearly provide the following information be submitted as part of the site plan or preliminary subdivision plan review.

- (1) Contact Information - The name, address, and telephone number of all persons having a legal interest in the property and the tax reference number and parcel number of the property or properties affected.

- (2) Site Plan - A map indicating the location of existing and proposed buildings, roads, parking areas, utilities, structural stormwater management and sediment control facilities. The map will also clearly show proposed land use with tabulation of total lot size in acres, percentage of surface areas to be disturbed, percentage of both existing and proposed impervious surfaces, drainage patterns, locations of utilities, limits of clearing and grading, and all easements, including those easements necessary for required maintenance of all stormwater treatment practices. Detailing of outlet structures, erosion control, and a six foot (6') high chainlink fence around the perimeter of any detention basin the structure.
- (3) Base Map - A 1" = 200' topographic base map of the site which extends a minimum of 100' beyond the limits of the proposed development and indicates existing surface water drainage including streams, ponds, culverts, ditches, and wetlands and current land use including all existing buildings, utilities, roads, and significant natural and manmade features not otherwise shown.
- (4) Calculations - Sufficient engineering analysis to show that the proposed stormwater treatment practices are capable of controlling runoff from the site in compliance with the stormwater design manual. The analysis shall also include hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in the Vermont Stormwater Management Manual. Calculations that show the basin is capable of limiting the stormwater discharges from the ten (10) year twenty-four (24) hour post-development storm event to the ten (10) year twenty-four (24) hour pre-development storm event. The calculations shall also show the basin has an overflow outlet capable of discharging the stormwater from the twenty-five (25) year twenty-four (24) hour storm event.
- (5) Soils Report - If a stormwater treatment practice depends on the hydrologic properties of soils, such as infiltration basins, then a soils report shall be submitted. The soils report shall be based on on-site boring logs or soil pit profiles.
- (6) Specifications for basin earthwork conforming with Section 200 of the Vermont AOT Standard Specifications for Construction with maximum embankment slopes of 3:1.
- (7) The Developer shall submit proof that a proposed STP will be maintained. A statement to this effect shall be placed in the covenants of an individually owned lot. In the case of a subdivision, a landowners association shall be created to maintain the STP, unless a specific STP maintenance agreement has been negotiated and signed with the Town. The design and planning of all stormwater management facilities shall include detailed maintenance and repair procedures to ensure their continued function. These plans will identify the parts or components of a stormwater management facility that needs to be maintained. The maintenance and repair plan shall also include:
 - a) A Landscape Plan - The applicant must present a detailed plan for the management of vegetation at the site after construction is finished, including who will be responsible for the maintenance of vegetation at the site and what practices will be employed to ensure that adequate vegetation cover is preserved.
 - b) Maintenance Easements - The applicant must ensure access to all stormwater

treatment practices at the site for the purpose of inspection and repair by securing all of the maintenance easements needed on a permanent basis. These easements shall be recorded in the land records before the issuance of a Building Permit and will remain in effect even with transfer of title to the property. Access easement granted to the Town of Shelburne to the STP, if the STP will be impacting stormwater facilities owned or dedicated to the Town of Shelburne.

- c) Maintenance Agreement - The applicant must execute a maintenance agreement binding on all subsequent owners of land served by an on-site stormwater management measure. The maintenance agreement shall specify the required maintenance for all stormwater treatment practices, along with a maintenance schedule specifying when and how often maintenance is performed on the stormwater treatment practices.
- d) Maintenance Records - The applicant shall be required to maintain records that verify that all required maintenance was performed in conformance to the approved Stormwater Management Plan. The records shall be maintained by the applicant and subsequent owner(s), and shall be made available to the Department of Public Works upon request.

Before a Certificate of Occupancy is issued, the Project Engineer shall submit to the Zoning Coordinator, certification that the STP has been constructed in accordance with the approved plans and is functioning properly.

4.4 TESTING AND INSPECTION OF STORMWATER MANAGEMENT SYSTEMS AND CATCH BASINS

Before testing and inspection, the Contractor shall clean all storm drains, manholes, and catch basins with a sewer vacuum. All other stormwater management systems shall be appropriately cleaned. After cleaning, all sumps shall be pumped dry. The Shelburne Highway Superintendent, in conjunction with the Town Engineer, shall visually inspect all pipes and structures for compliance with the Shelburne Development Specifications. Defects, if noted, shall be corrected by the Contractor at no expense to the Town of Shelburne.

Before inspection, the Contractor shall grade, stabilize, and seed (as necessary) all stormwater management system components.

The construction of crushed gravel subbase and base paving shall not be allowed until the stormwater system meets the requirements of the Shelburne Development Specifications.

5.0 WATER DISTRIBUTION SPECIFICATIONS

5.1 DESCRIPTION

This item shall consist of the work required for the complete construction of water mains and shall include valves, tees, hydrants, elbows, reducers, and all other appurtenances necessary for a complete water main system as indicated in the accepted drawings. All material and installations shall be approved by the Shelburne Water Department.

5.2 COMPLIANCE

All water line installations shall be constructed in accordance with the requirements established in the Department of Environmental Conservation Water Supply Rule 21 and the Town of Shelburne Development Specifications.

5.3 APPLICATIONS

Applications for water service shall be made on printed forms furnished by the Water Department, and the applicant shall agree to conform to any and all Water Department regulations concerning use of the service and of the water provided. A fee designated as a hook-on fee shall be paid in full at the time an application is made for service. The hook-on fee shall be such an amount as is designated from time to time in the "Schedule of Rates, Fees and Charges". Approval of a water service application does not relieve the applicant from attaining all necessary State and Federal permits.

Prior to any service connection being made to the water main, the Shelburne Water Superintendent or his/her designee shall be given at least two (2) working days notice in order that the work can be scheduled for inspection. All service connections will be made during normal working hours and no connection shall be allowed on Saturdays, Sundays, or legal Town holidays. If the Superintendent or his/her designee has not been properly notified and the work has proceeded, the Superintendent or his/her designee may require the completed work to be uncovered for examination at the owner's expense.

The property owner/agent shall agree, as a condition of receiving approval for connection to the Shelburne water system, to restore the streets, sidewalks, curbs, electrical lines, grassed or open areas or other features to their original condition after the installation of said water line.

5.4 MATERIALS

Piping materials: Piping materials proposed for construction shall be pre-approved by the Shelburne Water Department.

- A. Ductile Iron Pipe: Tyton Ductile Iron Class 52 meeting AWWA Specifications C151 and ANSI Specification A 21.51 or latest revision; cement-lined, tar-coated. All ductile iron pipe shall be protected against corrosion by installing polyethylene encasement in accordance with the Ductile Iron Pipe Research Association (DIPRA) requirements and the American National Standard for Polyethylene Encasement for Ductile Iron Pipe Systems ANSI/AWWA C105/A21.5.
- B. Polyvinyl Chloride (PVC) Plastic Piping: PVC Pressure Class 200 (DR 14) meeting AWWA Specifications C900 or latest revision; with cast-iron-pipe equivalent OD; with plain or gasket bell end. Bare copper or aluminum tracer wire not less than 0.10 inch in

APPENDIX IV

**CHITTENDEN COUNTY STORMWATER PUBLIC INVOLVEMENT AND
PARTICIPATION PROGRAM**

MOU

**CHITTENDEN COUNTY
REGIONAL STORMWATER PUBLIC INVOLVEMENT AND
PARTICIPATION PROGRAM
MEMORANDUM OF UNDERSTANDING
FOR THE PERIOD JULY 2011 THROUGH JUNE 2016**

This Memorandum of Understanding ("MOU") establishes an agreement among the Parties (as specified in Section 1) for a group of Municipal Separate Storm Sewer Systems ("MS4s") to contract to operate a Regional Stormwater Public Involvement and Participation Program ("Program") that conforms with and satisfies the relevant requirements regarding Minimum Control Measure Two ("Public Involvement and Participation") of the Phase II NPDES Permit for Program Years 2011 -2016), as established in General Permit 3-9014 (MS4 Permit") as continued or renewed by the Vermont Department of Environmental Conservation ("VTDEC").

1. **Parties to the MOU** – The parties to this agreement are:

- a. **MS4s** – the undersigned municipal MS4s and non-traditional MS4s and any other MS4 that may execute this agreement following approval of that MS4's inclusion as a party to this MOU by a majority of the voting members of the Stream Team Steering Committee as defined in Section 2.a. below and
- b. **Lead Agency** – the Chittenden County Regional Planning Commission ("CCRPC"), unless a majority of the Steering Committee favors a different lead agency or the CCRPC no longer wishes to act as the Lead Agency and withdraws its services pursuant to Section 9 below.

2. **Steering Committee**

- a. **Composition** – The voting members of the Steering Committee shall consist of one representative from each of the MS4s who are full level signatory members to this Agreement as designated by each MS4. The voting members may, by a majority vote, invite organizations to appoint a representative to serve as a non-voting, advisory member of the Steering Committee.
- b. **Duties** – The voting members of the Steering Committee shall advise the Lead Agency on the development and performance of Program Services and on matters bearing on the administration of this agreement. The Steering Committee will attempt to meet quarterly or more often as needed.

3. **Lead Agency**

- a. **Duties** – The Lead Agency will provide Services in terms of administering this MOU and agreements with contractors (including executing contracts, receiving and disbursing funds, and monitoring the provision of services) on behalf of the MS4s. The Lead Agency may also provide other Services (including, but not limited to, public involvement and participation activities, public relations, grant writing, etc.) as directed by the Steering Committee and at a level consistent with each year's Program Budget as described in Section 6.a.

b. **Compensation** – The MS4s agree to compensate the Lead Agency for the actual costs of performing Duties defined in Section 3.a. Compensation for Duties shall not exceed ten (10%) percent of the Program Budget as specified in Section 6 without prior approval of a majority of the Steering Committee. Personnel charges for Lead Agency staff shall be calculated at a rate of salary plus fringe.

4. **Selection of Primary and Sub-Contractors** – In general, the Steering Committee shall competitively bid for contract(s) for Program Services that collectively satisfy the requirements for Minimum Control Measure Two (“Public Involvement and Participation”) of the Phase II NPDES Permit for Program Years 2011 – 2016 as established by the MS4 Permit and as defined in Section 5. All contracts shall be awarded based on qualifications, price, and the ability of the entity to provide services that meet the relevant MS4 Permit requirements. Contracts may be up to 5 years in length and shall include, but not be limited to, language specifying the right of the Committee to cancel a contract if services are not being adequately provided and language specifying that payments to contractors shall be made only for services rendered.

Contracting for services under this MOU will comply with the Fair Employment Practices and Americans with Disabilities Act: the Steering Committee agree to comply with the requirement of Title 21 V.S.A Chapter 5, Subchapter 6, relating to fair employment practices, to the full extent applicable. The Steering Committee shall also ensure, to the full extent required by the Americans with Disabilities Act of 1990 that qualified individuals with disabilities receive equitable access to the services, programs, and activities provided by the Steering Committee under this MOU. This provision will also be included in all contracts and subcontracts executed under this MOU involving state or federal funds.

The Steering Committee recognizes the important contribution and vital impact which small businesses have on the state’s economy. In this regard, the Steering Committee will ensure a free and open bidding process that affords all businesses equal access and opportunity to compete. The Steering Committee also recognizes the existence of businesses owned by minorities and women and will make a good faith effort to encourage these firms to compete for contracts involving state or federal funds.

5. **Program Services** – The Steering Committee, assisted by the Lead Agency and contractor(s), will implement a public involvement and participation campaign known as the Chittenden County Stream Team (CCST) that satisfies the relevant requirements of Minimum Control Measure Two (“Public Involvement and Participation”) of the Phase II NPDES Permit for Program Years 2011 – 2016), as established by the MS4 Permit, in accordance with Section 5.a.

- a. **Program Content** – The Program Content for each Program Year will be as approved by a majority of the Steering Committee. Annual Program elements will include, at a minimum:
- i. operation of the Program’s website www.ccstreamteam.org or its equivalent.
 - ii. the hosting and/or organization of workshops, projects and other events to engage the public.

- iii. the recruitment of volunteers to engage in and promote public involvement and participation.
- iv. end of MS4 permit year annual reporting on Minimum Control Measure 2 compliance efforts to the MS4s for inclusion in MS4 annual reports to ANR.

6. **Program Budget, Costs, and Payments**

a. **Program Budget**

- 1. The annual Program Budget shall consist of the sum of the annual \$1,800 payment for each Program Year made by participating MS4s plus any other funds available to the Program by majority vote of the Steering Committee as specified in Section 6.c below. Prior to February of every year, the Steering Committee shall adopt a Program Budget governing expenditures for the subsequent program year. Budget categories shall include, but not be limited to: Lead Agency Duties, Contractual Services and Expenses.

- b. **Participating MS4 Maximum Annual Costs and Payments** – Except as otherwise provided for in this section, each MS4 that is a party to this MOU shall by July 30 of each program year make a single annual payment of \$1,800 to pay for Program Services (as defined in Section 5) and Lead Agency Services (as defined in Section 3.a.). In the event that costs are less than anticipated or that grants or other funding sources become available, a majority of the voting members of the Steering Committee may decide to reduce each MS4's payment by an equal amount or to credit the following Program Year assessment to each MS4. Any MS4 is allowed to join in prior to April 1, 2012 without penalty. The Steering Committee may require additional dues from new members joining on or after April 1, 2012 to help defray program development costs incurred since the Program's inception.

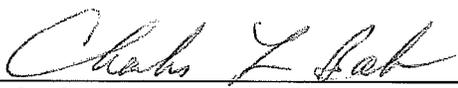
- c. **Other Funds** – Any funds made available to the Program shall be dedicated to reducing the annual costs of each MS4 participating in the Program, except as a majority of the voting members of the Steering Committee may decide.

- d. **Excess Funds** – Any funds remaining at the end of a Program Year shall be carried over to the next Program Year, unless a majority of the voting members of the Steering Committee decides otherwise. Following the payment for all Program Services and Lead Agency Services at the end of Program Year 2016, any funds remaining shall be carried forward for successive years where Program Services continue under successive agreements. Any funds refunded to the MS4s participating in this MOU shall be refunded based upon a prorated portion depending upon the number of months of participation by that MS4, except that any additional payments made by a member beyond its \$1,800 annual payment shall be first refunded in full.

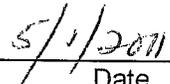
7. **Contracts Required** – All contracts with Contractors to provide Program Services shall be conditioned upon approval by a majority of the voting members of the Steering Committee and consistent with Section 4 above.

8. **MS4 Withdrawal Prohibited** – No MS4 that is a party to this MOU may withdraw from this MOU, except for early termination as defined in Section 10 of this MOU.
9. **Termination of Lead Agency**
The CCRPC or the Steering Committee by a majority vote of its full membership may elect to terminate the Agreement for Lead Agency Services by providing 90 days written notice to the other party.
10. **Early Termination** – This MOU shall become null and void with no further obligation of the parties if:
- a. a majority of the voting members of the Steering Committee does not approve one or more contracts for the provision of Program Services within 120 days after execution of this MOU or
 - b. VTDEC determines that the Program outlined in this MOU does not meet the relevant requirements for Minimum Control Measure Two (“Public Involvement and Participation”) of the Phase II NPDES Permit for Programs Years 2011 – 2016) and the parties to this MOU are unable to craft a Program to satisfy VTDEC.
11. **Automatic Termination** – This MOU will terminate at the end of Program Year 2016.
12. **Amendment** – Unless a specific section of this MOU provides otherwise, this MOU may be amended only upon the unanimous consent of all of the Parties.
13. **Counterparts** – This MOU may be executed in multiple counterparts, each of which is deemed an original and all of which constitute one and the same document. Each such counterpart may be a facsimile or PDF copy and such facsimile or PDF copy shall be deemed an original.

Signature of Lead Agency



Charles Baker, Executive Director
Chittenden County Regional Planning Commission



Date

Signatures of Members

Gene Richards, Interim Director of Aviation
Burlington International Airport

Date

Steven Goodkind, Director of Public Works
The City of Burlington Department of Public Works

Date

Bryan K. Osborne, Director of Public Works
The Town of Colchester

Date

Dennis E. Lutz, PE, Public Works Dir. / Town Engineer
The Town of Essex

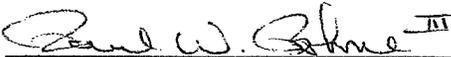
Date

Authorized Signer
The Village of Essex Junction

Date

Brian M. Palaia, Town Manager
The Town of Milton

Date


Paul Bohne, Town Manager
The Town of Shelburne

3/28/13
Date

Bob Rusten, Interim Temporary City Manager
The City of South Burlington

Date

Brian Searles, Secretary of Transportation
The Vermont Agency of Transportation

Date

Linda Seavey, Director, Campus Planning Services
The University of Vermont

Date

Richard McGuire, Town Manager
The Town of Williston

Date

Katherine Decarreau, City Manager
The City of Winooski

Date

APPENDIX V

**CHITTENDEN COUNTY REGIONAL STORMWATER
EDUCATION PROGRAM**

MOU

**CHITTENDEN COUNTY
REGIONAL STORMWATER EDUCATION PROGRAM
MEMORANDUM OF UNDERSTANDING
FOR THE PERIOD MARCH 10, 2013 THROUGH MARCH 9, 2018**

This Memorandum of Understanding ("MOU") establishes an agreement among the Parties (as specified in Section 1) for a group of Municipal Separate Storm Sewer Systems ("MS4s") to contract to operate a Regional Stormwater Education Program ("Program") that conforms with and satisfies the relevant requirements regarding Minimum Control Measure One ("Public Education and Outreach") of the Phase II NPDES Permit for Program Years 2013--2018), as established in General Permit 3-9014 (2012) (MS4 Permit") as continued or renewed by the Vermont Department of Environmental Conservation ("VTDEC").

1. **Parties to the MOU** – The parties to this agreement are:

- a. **MS4s** – the undersigned municipalities and other entities and any other MS4 that may execute this agreement following approval of that MS4's inclusion as a party to this MOU by a 2/3rds majority of the voting members of the Steering Committee and
- b. **Lead Agency** – the Chittenden County Regional Planning Commission ("CCRPC"), unless a majority of the Steering Committee favors a different lead agency or the CCRPC no longer wishes to act as the Lead Agency.

2. **Steering Committee**

- a. **Composition** – The voting members of the Steering Committee shall consist of one representative from each of the MS4s who are signatory to this Agreement as designated by each MS4. The voting members may, by a 2/3rds majority vote, invite one or more other organizations to each appoint a representative to serve as a new member, a non-voting member or as an advisory member of the Steering Committee. Such organizations may include, but not be limited to, the Lake Champlain Committee, the Champlain Water District, the Chittenden Solid Waste District, other MS4s, or other municipalities.
- b. **Duties** – The voting members of the Steering Committee shall advise the Lead Agency on the development and performance of Program Services and on matters bearing on the administration of this agreement. The Steering Committee will endeavor to meet, quarterly or more often as needed.

3. **Lead Agency**

- a. **Duties** – The Lead Agency will provide Administrative Services in terms of administering this MOU and agreements with contractors (including executing contracts, receiving and disbursing funds, and monitoring the provision of services) on behalf of the MS4s. The Lead Agency shall not provide services related to this program for entities outside of the MS4 signatories. Additional coordination shall be only at the direction of the Steering Committee or its chair. The Lead Agency may also provide other Non-Administrative services (including, but not limited to, public education and outreach activities, public relations, grant writing, web site editing, etc.) as

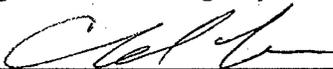
directed by the Steering Committee and at a level consistent with each year's Program Budget as described in Section 6.a. The Lead Agency is not a guarantor that services will be performed.

- b. **Compensation** – The MS4s agree to compensate the Lead Agency for the actual costs of performing Administrative and Non-Administrative duties defined in Section 3.a. Compensation shall be for hourly wages, appropriate overhead and expenses. Compensation for Administrative Duties shall not exceed ten (10%) percent of the Program Budget as specified in Section 6 without prior approval of a simple majority of the Steering Committee present at the time of the vote or by email response. Personnel costs for Lead Agency staff engaged in Administrative or Non-Administrative Duties shall be calculated at a rate of salary plus fringe. The Lead Agency shall submit invoices no more frequently than monthly. Invoices shall provide a description of work tasks completed by the Lead Agency for that billing period with sufficient detail to the satisfaction of the steering committee.
4. **Selection of Contractors** – In general, the Steering Committee shall competitively bid for contract(s) for Program Services that collectively satisfy the requirements for Minimum Control Measure One ("Public Education and Outreach") of the Phase II NPDES Permit for Program Years 2013 – 2018 as established by the MS4 Permit and as defined in Section 5. All contracts shall be awarded based on qualifications, price, and the ability of the entity to provide services that meet the relevant MS4 Permit requirements. However, upon consent of the majority of the voting members of the Steering Committee present, the RSEP may waive the bid process for select contracts. Contracts may be up to 5 years in length and shall include, but not be limited to, language specifying the right of the RSEP to cancel a contract if services are not being adequately provided and language specifying that payments to contractors shall be made only for services rendered.
 5. **Program Services** – The Steering Committee, assisted by the Lead Agency and contractors, will implement a media advertising campaign and provide stormwater education services that satisfy the requirements of Minimum Control Measure One ("Public Education and Outreach") of the Phase II NPDES Permit for Program Years 2013 – 2018), as established by the MS4 Permit, in accordance with Section 5.a..
 - a. **Program Content** – The Program Content for each Program Year will be as defined in the Communications Plan for that year as approved by a majority of the Steering Committee. Annual Program elements will include, at a minimum: 1) operation of the Program's website, www.smartwaterways.org or its equivalent, 2) the hosting of occasional educational seminars open to the public concerning stormwater pollution prevention and related topics, and 3) advertisements in various media.
6. **Program Budget, Costs, and Payments**
 - a. **Program Budget**
 - 1) The annual Program Budget shall consist of the sum of the annual \$5,000 payments for a given Program Year made by participating MS4s plus any Public Participation payment as described below in Sections 6b and 6c, respectively.
 - 2) Prior to March 1st of every year, the Steering Committee shall adopt a Program Budget governing expenditures for the subsequent program year. Budget categories shall include, but not be limited to: Lead Agency Administrative Duties, Lead Agency Non-Administrative Duties, Media Advertising Purchases, Media Marketing Consulting Services, and Other Contractual Services.

- b. **Participating MS4 Maximum Annual Costs and Payments** – Except as otherwise provided for in this section or in section 12c, each MS4 that is a party to this MOU shall by July 30 of each program year make a single annual payment of \$5,000 to pay for Program Services (as defined in Section 5) and Lead Agency services (as defined in Section-3.a.). In the event that costs are less than anticipated or that grants or other funding sources become available, a majority of the voting members of the Steering Committee may decide to reduce each MS4's payment by an equal amount. The Steering Committee may require additional dues from new members joining after March 9, 2013 to help defray program development costs incurred since the Program's inception.
 - c. **Public Participation Payments** – Any payments made by an MS4 (regardless of whether or not the MS4 is a Party to this MOU) to the Lead Agency as a part of compliance with Section 4.2.2.1 of the MS4 Permit (governing payments in lieu of undertaking specific Public Involvement/Participation Activities) shall pay for Program Services as defined in Section 5.
 - d. **Other Funds** – Any funds made available to the Program other than Participating MS4 Costs and Payments (pursuant to Section 6.b.) or Public Participation Payments (pursuant to Section 6.c.) shall be dedicated to reducing the annual costs of each MS4 participating in the Program, except as a majority of the voting members of the Steering Committee may decide.
 - e. **Excess Funds** – Any funds remaining at the end of a Program Year, less any earmarked set aside funds (such as survey funds, etc), shall be carried over to the next Program Year, unless a 2/3rds majority of the voting members of the Steering Committee decides otherwise. Following the payment for all Program Services and Lead Agency services at the end of Program Year 2018, any funds remaining shall be carried forward for successive years where program services continue under successive agreements. Any funds refunded to the MS4s participating in this MOU shall be refunded based upon a prorated portion depending upon the number of months of participation by that MS4, except that any additional payments made by a member beyond its \$5,000 annual payments shall be first refunded in full, except for payments made in lieu of performance of Minimum Measure #2.
 - f. **In-Kind Services** – Program Services (as defined in Section 5) that are provided by a member may be used to offset the Participating MS4 Costs and Payment of that member by such amount as may be determined by a majority of the voting members of the Steering Committee.
7. **Contracts Required** – All contracts with Contractors to provide Program Services shall be conditioned upon approval by a 2/3rds majority of the voting members of the Steering Committee.
 8. **Withdrawal Prohibited** – No MS4 that is a party to this MOU may withdraw from this MOU, except for early termination as defined in Section 9 of this MOU. Early termination of a signatory may be considered by the Steering Committee with 12 months' notice of withdrawal for cause and with a 2/3rds majority approval of the voting members of the Steering Committee
 9. **Early Termination** – This MOU shall become null and void with no further obligation of the parties if:
 - a. a majority of the voting members of the Steering Committee does not approve one or more contracts for the provision of Program Services within 90 days after execution of this MOU or

- b. VTDEC determines that the Program outlined in this MOU does not meet the requirements for minimum control measure #1 ("Public Education and Outreach") of the Phase II NPDES Permit for Programs Years 2013 – 2018) and the parties to this MOU are unable to craft a Program to satisfy VTDEC.
 - c. alternate contractual arrangements for MM1 compliance are developed and a vote to dissolve this MOU is approved by a 2/3^{rds} majority approval of the voting members of the Steering Committee.
10. **Automatic Termination** – This MOU will terminate at the end of Program Year 2018.
11. **Amendment** – Unless a specific section of this MOU provides otherwise, this MOU may be amended only upon the unanimous consent of all of the Parties.
12. **Adding New MS4 Entities** – New MS4 entities shall be allowed to become party to this MOU with a 2/3^{rds} majority approval of the voting members of the Steering Committee. The new party agrees to:
- a. pay for costs directly associated with re-evaluation and reconfiguration of the Program's existing Communications Plan to ensure that planned media advertising purchases appropriately cover the geographic area served by their MS4, unless waived by a 2/3^{rds} majority approval of the voting members of the Steering Committee. The new MS4 shall coordinate this work with the Lead Agency and RSEP Chair using existing RESP program contractors.
 - b. The new MS4 obtains approval from the permitting agency indicating that their participation in the established Program would satisfy their requirements under minimum control measure #1 ("Public Education and Outreach") of the Phase II NPDES Permit for Programs Years 2013 – 2018)
 - c. The new MS4 makes five additional annual payments of \$ 500.00 to the Program in recognition of Program development costs incurred since the program's inception.
13. **Counterparts** – This MOU may be executed in multiple counterparts, each of which is deemed an original and all of which constitute one and the same document. Each such counterpart may be a facsimile copy and such facsimile copy shall be deemed an original.

Signature of Lead Agency



Charles Baker, Executive Director
Chittenden County Regional Planning Commission

5/1/13

Date

Signatures of Members

Gene Richards, Interim Director of Aviation
Burlington International Airport

Date

Steven Goodkind, Director of Public Works
The City of Burlington Department of Public Works

Date

Bryan K. Osborne, Director of Public Works
The Town of Colchester

Date

Dennis E. Lutz, PE, Public Works Dir. / Town Engineer
The Town of Essex

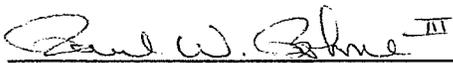
Date

Authorized Signer
The Village of Essex Junction

Date

Brian M. Palaia, Town Manager
The Town of Milton

Date



Paul Bohne, Town Manager
The Town of Shelburne

3/28/13
Date

Bob Rusten, Interim Temporary City Manager
The City of South Burlington

Date

Brian Searles, Secretary of Transportation
The Vermont Agency of Transportation

Date

Linda Seavey, Director, Campus Planning Services
The University of Vermont

Date

Richard McGuire, Town Manager
The Town of Williston

Date

Katherine Decarreau, City Manager
The City of Winooski

Date

APPENDIX VI

**CHITTENDEN COUNTY REGIONAL STREAM TEAM
SUMMARY OF ACTIVITIES
JANUARY-DECEMBER 2012**

MCM #2

Chittenden County Stream Team

Summary of Activities: January-December 2012

Prepared by Winooski Natural Resources Conservation District

In the fall of 2009, the MS4 communities began to explore collaborative approach to fulfilling their Minimum Control Measure #2 permit requirement. At the request of these MS4s, the Chittenden County Regional Planning Commission (CCRPC) applied for and received two grants totaling \$22,500. Using these grants, CCRPC assisted the MS4s in developing a regional pilot project called the Chittenden County Stream Team (CCST). In its pilot year, CCST created a logo, launched a website and Facebook page, surveyed local residents, hosted a number of workshops, and completed a variety of local projects. The success of the pilot project led to the formal adoption of the CCST program in 2011 by eleven of the MS4 communities including Burlington, South Burlington, Williston, Winooski, Shelburne, Milton, Essex, Essex Junction, the University of Vermont, VTrans and the Burlington Airport. The program was put out to bid and awarded to the Winooski Natural Resources Conservation District (WNRCD), a regional entity focused on natural resource protection and management. Under the guidance of the participating MS4s, the WNRCD completed a second successful year in fulfilling MCM2 requirement.

In 2012, the CCST template evolved to focus activities on three target towns per year. This year, they included Shelburne, Winooski, and Milton. A targeted approach aims to strengthen relationships in select areas and inspire greater involvement and capacity by volunteers. Similarly, we focused volunteer opportunities on four main categories in order to increase quality. They include: stream clean ups, Adopt-a-Rain Garden programming, water quality monitoring, and flow monitoring. Numbers of participants in activities were low in two of the targeted towns for 2012, Milton and Shelburne, though their participation in outreach was high. The time spent in 2012 doing much-needed outreach and cultivating community connections is paying off for the planning period of 2013 as we have already heard from a number of contacts in both Milton and Shelburne about an interest in partnering on stream clean-ups, water quality monitoring and rain garden installations. Hence, we believe that town focus may be best achieved over a two-year rolling basis with the first year dedicated to general outreach and building connections and the second year allowing time to implement identified projects with a stronger volunteer base. Using this model, CCST would move into to hands-on project phase with Milton and Shelburne in 2013 and increase outreach and community connections in Essex, Essex Junction and Williston in preparation for on-the-ground project implementation in those towns in 2014.

This report summarizes CCST activities in the 2012 calendar year. Demographic data about participant numbers from each town is presented in tabular form following the narrative. It is important to note that recorded numbers of participants refer to those who chose to sign up for our mailing list and give identifying information. In many cases, CCST events involved greater numbers of participants that could not be tracked. Methods to increase greater participant tracking will be employed in 2013 and will include proven methods such as gift incentives and mapping exercises where event participants who do not wish to sign up for a mailing list can identify their "watershed address" on a large map with stickers.

Social Media

Facebook – Facebook is just one of the tools that CCST uses to disseminate information to the public about workshops, events, and projects. It is updated on a regular basis and continues to grow at a steady pace. During the latter half of 2012, the number of 'likes' received on the CCST Facebook page grew to 66, a 29% increase from 2011. The most represented group of followers is women between the ages of 35-44. As indicated in the attached summary table, the greatest percentage of these likes came from Burlington residents.

CCST Website –After a redesign in 2011, the website was used extensively in 2012 as a means to communicate with the public about general CCST information, impaired watershed locations, upcoming events and workshops, volunteer opportunities, and helpful resources. Of particular note in 2012 was the use of the website for sharing citizen-gathered water quality data – an important method for continued community involvement. Similar to the Facebook page, the website is updated on a regular basis. In total, there were 802 website visits from 557 unique visitors with an average amount of time spent on the site at 3 minutes 28 seconds. People viewed an average of 3.75 pages on each visit with a spike in overall visits following events and workshops. In the summer months of June, July and August the site received 186 views with 109 (58.6%) of them coming from new visitors.

Because we began gathering this data in December of 2011, we cannot compare this year’s web traffic with a previous year. However, it is notable that the total number of visitors to the site in December 2011 was just 15, compared to 45 in December 2012, a three-fold increase.

E-News – Quarterly email newsletters to our growing mailing list is another way by which CCST connects with the public. Emails include regional news, information about upcoming events and volunteer opportunities, and tips and resources. In 2012 the mailing list increased from 170 to 244 individuals. CCST E-News open rate is high 40-45%. The typical open rate for similar industries is between 20-25% according to research completed by Mail chimp.

Organizational Partnerships – One stated goal of CCST is to partner with other community organizations in order to broaden and strengthen our community ties. Some strong partnerships were forged this year, including a collaboration with the Winooski School District and the Department of Corrections who have agreed to take a leadership role in rain garden maintenance near their facilities. A local landscaper has agreed to donate plants when available to our rain garden efforts. In 2012 alone, Ann Pearce provided CCST with dozens of iris, lobelia and native grasses. Additionally, the Lake Champlain Land Trust and Lake Champlain Sea Grant pledged their support in on-the-ground projects with CCST in the form of staff and volunteer time and planning.

Projects

Chamberlin School Rain Garden II – After a successful rain garden installation at the Chamberlin School in South Burlington in 2011, fourth grade teacher Chris Provost was keen to install another one with his incoming class. In September, over 40 South Burlington fourth graders, four volunteers and two teachers removed soil from a space adjacent to the school that receives roof runoff. Then the students filled the area in with more sponge-like sand, compost and topsoil before carefully planting over 50 donated rain garden plants into a 150 square foot garden space. With this garden addition, all runoff from the school’s front most roof area is captured onsite rather than flowing into the parking lot and nearby storm drains. The gardens will continue to serve as an educational tool for the school in future years as we prepare to install educational signage on site. A story about this project was included in South Burlington’s Town Newspaper, “The Other Paper.” (Article attached).

Landry Park Rain Garden Cleanup - Winooski’s Landry Park had a three-teired roadside rain garden installed by UVM’s Sea Grant in 2008. Since then the garden has fallen into disrepair with significant weed growth, dying trees and overgrown shrubs. This garden is on the CCST’s list of public rain gardens looking for adopters. To engage with local residents and in order to give the garden an initial boost prior to adoption, CCST coordinated with three Winooski Middle and High School classes and local residents to prune, weed, clean mulch and replant the garden in September. The clean up was successful and included over 60 volunteers on two work days. A local gardener donated iris to replace other perennials that failed to thrive in the tough conditions. The garden has since been adopted by a local high school teacher and his students and will be maintained in the coming seasons by those young stewards.

Farrel Street Rain Garden Cleanup- A well-placed infiltration garden buffers the stormwater-impaired Potash Brook from the Regional Correctional Facility’s parking area in South Burlington. The garden was damaged during some

construction at the facility during the 2011 winter months. CCST stepped in to coordinate a volunteer work day to redesign the garden, weed, plant with new stock and mulch. The successful event culminated in a beautified and functional rain garden. Since then, CCST has been in conversations with the work crew leaders at the Correctional Facility who have agreed to donate time to maintain the garden in the 2013 season.

Water Quality Monitoring- The Chittenden County Stream Team recruited five volunteers to collect biweekly water quality samples at eleven sites on Centennial, Englesby, Indian, Morehouse, Muddy and Potash Brooks during the summer of 2012. These streams suffer from sedimentation, excessive nutrient loads, high temperatures, bacteria, and other urban pollutants. A total of five samples were collected at each site during the season and were analyzed for turbidity, total phosphorous, total nitrogen, and chloride. The CCST also sampled for total suspended solids (TSS), total phosphorous, total nitrogen, and chloride at five of these sites during a rain event on 8/12/12. A complete list of the specific sampling sites as well as testing results can be found at ccstreamteam.org.

Salmon Hole Cleanup – CCST organized a cleanup of Salmon Hole in Winooski/Burlington on May 5th in conjunction with WVPD. This event was attended by 9 volunteers, including Vermont’s Attorney General, Bill Sorrel.

Longmeadow Flow Monitoring - After a season of difficulty with weir fastening and barometric pressure logger operation, flow monitoring finally began in a storm drain in the Shelburne Longmeadow Drive neighborhood that drains to the stormwater impaired Munroe Brook. Local volunteers are gathering barometric pressure and level data biweekly and monitoring precipitation with a rain gauge at the site. The data gathered from this site over the next year will provide us with baseline information about flow from this neighborhood’s impervious surfaces to the impaired waterway and as residents install low impact development practices, we should be able to track the impact on runoff volume in real time.

Adopt-a-Rain Garden- In 2012, CCST finalized the adoption of 8 public rain gardens out of a total of 9. A combination of targeted event-driven outreach in areas with gardens in need in addition to web-based and event tabling to share information about the program aided in the successful adoption of so many gardens. Volunteers are supported with access to materials and plants as well as weed and trash disposal.

Outreach

Ice Cream Social Kickoff – On April 19th in Winooski, CCST hosted an ice cream social kickoff event. Over 50 people stopped by for ice cream and were given information about stormwater and ways to get involved in the local community. Arcana tabled the event, sharing tips on how to plant a rain garden and where to purchase appropriate species.

Burlington Kids Day – In May we tabled this event where dozens of children took part in our moving water game and five residents signed up for our newsletter. One Burlington resident reached at this event subsequently volunteered with a rain garden cleanup activity at Farrel St. and became a rain garden adopter in his neighborhood at Callahan Park.

Friends of the Hort Farm Plant Sale – This well-attended event introduced us to the chair of the Friends of the South Burlington Library, six area residents who signed up for the newsletter and about a dozen others who we shared information with. Conversations with the Board Chair of the South Burlington Library initiated a large rain garden project that is currently underway to absorb parking area runoff.

South Burlington Farmers Market – CCST tabled this weekly market on two occasions, June 17th and August 5th. In all, nine people signed up for our newsletter and we offered a group of residents suggestions for managing stormwater in their Burlington neighborhood that drains directly to Lake Champlain.

Milton Youth Activities Fair – CCST tabled this annual event on September 11th. We shared information with Milton residents and gathered suggestions about where to focus a stream cleanup or rain garden installation in the town. Thirty people stopped by the booth and fourteen people signed up for the mailing list.

Burlington Rain Garden Workshop- In September, CCST invited local residents to learn about rain gardens – and help clean one up – at Burlington’s Lake Champlain Waterfront. This event attracted 10 people and included several UVM students, encouraged by their ecological landscape design professor to attend. Workshop attendees went home with information on residential-scale low impact development practices and where to access materials to get a project started.

Activities Summary

Outreach Activities Participation											
Activity	Location	Participant-Residents/Town									Total
		Burlington	South Burlington	Essex	Essex Jct.	Milton	Shelburne	Williston	Winooski	Other/Unknown	
Facebook ('likes')	N/A	29	4	0	1	0	1	3	3	25	66
E-News Mailing List	N/A	42	23	8	12	14	3	14	22	108	246
Website Visits	N/A	294	22	24	0	5	2	13	27	415	802
Ice Cream Social Kickoff	Winooski	3	5	1	1		0	2	16	6	34
Kids Day	Burlington	25	0	0	0	0	0	0	0	2	27
Friends of the Hort Farm Plant Sale	S. Burlington	1	3	1	1	0	0	0	0	0	6
S. Burlington Farmers Market	S. Burlington	0	4	1	0	0	0	0	0	4	9
Milton Youth Activities Fair	Milton	0	1	0	0	27	0	0	0	2	30
Rain Garden Workshop	Burlington	6	2	1	0	0	0	0	1	0	10
	Total	400	64	36	15	46	6	32	69	562	1230

Hands-on Projects Participation											
Event	Location	Participant-Residents/Town									Total
		Burlington	South Burlington	Essex	Essex Jct.	Milton	Shelburne	Williston	Winooski	Other/Unknown	
Salmon Hole Clean Up	Winooski	7	0	0	1	0	0	1	0	0	9
Chamberlin School Rain Garden II	S. Burlington	0	46	0	0	0	0	0	0	0	46
Landry Park Rain Garden Clean Up	Winooski	2	2	0	0	0	0	0	61	6	71
Farrel St. Rain Garden Clean Up	S. Burlington	4	0	0	0	0	0	0	0	0	4
Water Quality Monitoring/ Training	Burlington, S. Burlington, Winooski, Williston, Essex, Essex Jct.	3	1	0	0	0	0	0	0	1	5
Longmeadow Flow Monitoring	Shelburne	0	0	0	0	0	2	0	0	0	2
Adopt-a-Rain Garden	Burlington, S. Burlington, Winooski, Williston, Essex Junction	3	0	0	0	0	0	7	6	0	16
	Total	19	49	0	1	0	2	8	67	7	153

*Note: These numbers reflect participants who chose to sign up for our mailing list and give identifying information. Many of these events reached greater numbers of untracked participants.

**Hands-on projects for Milton and Shelburne are planned for spring 2013.

"The Other Paper" front page article about Chamberlin Rain Garden f



Students Link Learning to Real-World Science

Home » Education » Students Link Learning to Real-World Science

Thursday September 13, 2012

Share

Like

0

2

On a steamy, summer-like Thursday afternoon, 4th grade students in Chris Provost's class were busy putting textbook science concepts into practice outside their own school. The students energetically and happily took turns hauling wheelbarrows full of soil from a nearby pile and depositing it into what will become the school's second rain garden. The process of developing the garden ties directly into what they are learning about erosion in science class.

According to Rebecca Tharp, Water Resources Manager at the Winooski Natural Resources Conservation District, "The Chamberlin Rain Garden project is funded by the Chittenden County Stream Team (costreamteam.org) and Let It Rain (wvm.edu/sea/grant/let-it-rain). The project began last fall (2011) with a S. Burlington school teacher inspired to link the classroom learning of his 4th graders to real-world science and community service in action. Provost noticed that the water that pours off of the roof at the entrance to the school was pouring onto the sidewalk and onto the parking lot where it picked up speed, volume and pollutants as it raced toward the storm drain. Runoff from impervious surfaces is a major water quality concern in Vermont and contributes to poor water quality, stream impairment, phosphorus loading in Lake Champlain and stress on fisheries. Reducing the volume of that water is as easy as encouraging it to infiltrate close to where it lands. In the case of Chamberlin, that is happening with the installation of rain gardens at the base of their downspouts where permeable soils and plants inhabit a landscape depression. This natural holding area allows water to slowly percolate into the soil where pollutants are filtered out and pathogens are removed. Even better, that water that would be a nuisance and a threat becomes a resource as it recharges ground water and contributes to consistent and slow release of a cleaner water source to our waterways."

After the first rain garden was installed last fall the water no longer pooled or ran into the walking and parking areas and to the storm drain. Instead, that runoff goes directly to the garden where it soaks in and contributes to a beautiful landscaping feature near the

APPENDIX VII

**RELATED PROJECTS AND STUDIES COMPLETED IN
CONJUNCTION WITH
THE LEWIS CREEK ASSOCIATION**

**Shelburne Stormwater Mitigation Best Management Practice (BMP)
Design and Implementation Project
Shelburne, VT**

January 10, 2013



Prepared for:

**LaPlatte Watershed Partnership
Lewis Creek Association
Charlotte, VT**

Prepared by:

**Milone & MacBroom, Inc.
South Burlington, VT**

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Acknowledgements

This project was funded by a grant from Vermont's Ecosystem Restoration Program to Lewis Creek Association (2012-ERP-3-03). This project was conceived by Bill Hoadley to improve stormwater management, and who contributed reviews and guidance throughout the project. Andrea Morgante of the LaPlatte Watershed Partnership, in conjunction with Marty Illick of the Lewis Creek Association, coordinated this project. Bernie Gagnon, Public Works Director for the Town of Shelburne, contributed firsthand knowledge of the swales and roadside drainage patterns and provided valuable information on implementation. Jim Pease of the VT ANR Ecosystem Restoration Program provided guidance and oversight.



1.0 Introduction

1.1 Project Background

The Town of Shelburne has been installing stormwater pipes in place of grass-lined channels (commonly referred to as drainage swales) at the request of property owners. The request to install a pipe is typically made for safety (eliminate a steep eroding ditch) or aesthetics (remove the channel depression in the lawn). Swale replacement may be a good alternative in some cases, yet in others it would be preferable to retain the swale and the associated water quality benefits. Swales are a stormwater best management practice due to their ability to: (1) slow the movement of stormwater; (2) allow for the settling of fine sediment; and (3) take up nutrients for growing grass. In summary, swales are an effective measure for the protection of water quality. The many water quality benefits of grass swales have been well-demonstrated through a variety of studies such as the Jordan Cove National Monitoring Study (Dietz and Clausen 2007).

Piped stormwater collection and transport systems do not have the same water quality benefits as swales. Although the water is moved out of sight, the runoff in pipes moves quickly leading to more extreme high and low flows in receiving waters. Pipes eliminate infiltration and do not provide treatment of the water as it travels to a discharge point leading to sediment and nutrient release to downstream waters.

Shelburne is one of nine municipal separate storm sewer system (MS4) towns in Vermont. The MS4 rule requires towns to reduce the discharge of pollutants to the maximum extent practicable, to protect water quality, and to satisfy appropriate water quality requirements of the Clean Water Act. Munroe Brook in Shelburne is designated as impaired on the Vermont 303(d) list (VTDEC 2012) from its confluence with Shelburne Bay to 2.8 miles upstream due to failure to support aquatic life. The TMDL for Munroe Brook was approved on August 21, 2008. The underlying cause of this impairment detailed in the TMDL has been attributed to impacts of stormwater runoff. The goal of the TMDL is to address the controlling factors of watershed sediment production by setting high flow reduction targets, and to enhance habitat by setting base flow targets. These include:

- Decreasing flow at Q 0.3% by 6% (roughly estimated as 8 acre-feet)
- Increasing flow at Q 95% by 9% (roughly estimated as 0.2 acre-feet)

In 2006, the Town of Shelburne constructed a stormwater treatment system at Hullcrest Park. Its purpose was to reduce the impacts of stormwater runoff from the Oak Hill-Martindale, Juniper Ridge-Woodbine Road, and Birch Road neighborhoods on the North Branch of Munroe Brook. The system was designed to treat the runoff from the water quality volume (i.e., runoff from a 0.9-inch storm) and reduce the peak discharge for a 1-year, 24-hour storm event. Excess flow



from larger storm events would bypass the treatment system and enter the stream. The system was designed to remove up to 80 % of the total suspended solids (TCE 2005). The groundwater recharge treatment standard was to be met using the existing grass lined channels and through the use of rooftop disconnection credits and rooftop infiltration (TCE 2005). The volume calculated for recharge to be met in this way was calculated to be 0.33 acre-feet.

1.2 Project Goals and Objectives

The goals of the project are to:

1. Assist the Town with the development and implementation of improved designs of piped stormwater systems to reduce erosion, equalize stormwater runoff flows, enhance ground water recharge, remove sediment, and reduce nutrient loading and
2. Document/analyze the effectiveness of existing swales over a range of soils and slopes in mitigating the effects of stormwater runoff that can be used both in Shelburne and other Towns.

1.3 Project Approach

This project explored the use of swales versus pipes to convey residential roadside stormwater flows. The overall outcome of the project was to create a process and associated tools for screening a site for suitability for a swale, a pipe, or an alternative stormwater BMP. This project has helped illustrate when swales are most appropriate and provides options for maintaining the stormwater benefits of a swale system in the case that a pipe system is installed. Specific tasks, tools, and deliverables completed include:

- A hydrologic modeling exercise to quantify differences in infiltration and water quality when a swales are converted to pipes;
- A screening matrix to guide decision-making on the appropriateness of a swale versus a pipe at a particular location based on characteristics of the site;
- Field observations of existing swales in the Town of Shelburne and creation of a GIS map of existing swales that includes other stormwater components that were previously mapped;
- Initial screen result for all existing swales illustrating their suitability for retention as a swale or conversion to a pipe;
- A list of BMPs spanning the spectrum between swales and pipes with information on appropriate site conditions for each technology to serve as a guide during Town/landowner decision-making;



- Conceptual designs, material lists, and unit pricing for four BMPs that preserve the water quality benefits of swales to provide alternatives for future implementation; and
- A preliminary design for a high-priority swale conversion site that included a perforated pipe conveyance system and other features that increase infiltration and stormwater treatment.

2.0 Hydrology Modeling and Infiltration Calculations (originally published 4/10/2012)

The existing conditions hydrology model used for design of the stormwater treatment system in the Hullcrest and Hedgerow Neighborhoods of Shelburne, Vermont was obtained and recreated to explore the influence of grass-lined swales relative to stormwater pipes. The model was reviewed to identify where swales were entered in the subbasins in the model and preliminary swale mapping was provided by Bill Hoadley. Swales were converted to pipes for the entire model to see how the peak flow rate and volume entering and discharging from the existing stormwater treatment system in Hullcrest Park changed for the storm generated by a 0.9-inch rainfall (i.e., the water quality storm) and the 1-year flood (i.e., the channel protection storm). The swale to pipe conversion affected the hydrology modeling by changing the timing (i.e., time of concentration and reach routing) of how stormwater moves through the subbasins. The modeling results show minimal influence of swale to pipe conversion (Table 1). For example, the peak flow for the water quality storm increase by 0.1 cubic feet per second (cfs) during swale conversion and the runoff volume does not change or slightly decreases. A small increase in flow and volume is observed for the channel protection storm.

Table 1: Summary of Modeling Results

	DESIGN ^		ALL PIPES ^^		CHANGE ^^^		
Pipes (ft)	10,298		12,723		2,425		
Swales (ft)*	3,425		1,000		-2,425		
	Inflow^^^^		Inflow		Inflow		
	Q (cfs)	V (ac-ft)	Q (cfs)	V (ac-ft)	Q (cfs)	V (ac-ft)	V (cf)
Water Quality	0.72	2.40	0.82	2.40	0.10	0.00	-43.56
Channel Protection	8.72	3.91	8.89	3.93	0.17	0.01	653.40

*Tc calculations changed in upper basin to represent swale conversion in upper basin. Does not include 1,000 linear feet of swale conversion due modeling limitation (Tc < 1 min).

^Values taken from TCE design report appendix.

^^Values taken from TCE hydrologic model (HydroCad) recreated by MMI (HydroGraphs).

^^^Change is determined by subtracting all pipe scenario from design scenario.

^^^^Inflow and outflow to treatment system at watershed outlet.

Note: Design Water Quality Volume is 1.40 ac-ft, taken as the storm from 0.9 inches of rain.
Design Channel Protection Volume is 1.56 ac-ft, taken as the 1-year storm event.



LaPlatte McCabe's Thorp Kimball Holmes RiverWatch Collaborative 2010-2020

Site ID	Site Location	Site Latitude	Site Longitude	Upstream Area (mi2)	Staff Gauge	Sentinal/Focus	Focus Years	E. coli	Chloride	TSS	Turbidity	Total Phosphorus	Dissolved Phosphorus	Total Nitrogen
MB 02	MB02 - McCabe's Brook at Harbor Road	44.38305	-73.23853	4.57	Y	S/F	2010-2015	X	X	X	X	X	X	X
MB 02a	MB 02a - McCabe's Brook upstream from School Street neighborhood	44.37502	-73.23881			F	2010-2015	X	X	X	X	X	X	X
MB 03	MB03 - McCabe's Brook at Bostwick Road	44.36892	-73.23566			F	2010-2015	X	X	X	X	X	X	X
MB 04	MB04 - McCabe's Brook at Route 7	44.36230	-73.23461			F	2010-2015	X	X	X	X	X	X	X
MB 04a	MB04a - McCabe's Brook at Teddy Bear Access Road	44.36086	-73.23405	3.31	Y	S/F	2010-2015	X	X	X	X	X	X	X
MB 05	MB05 - McCabe's Brook at Lime Klin Road	44.34582	-73.22868			F	2010-2015	X	X	X	X	X	X	X
LP 01	LaPlatte River, trail from end of Yacht Haven Drive	44.3945	-73.22879			F	2018-2020	X	X	X	X	X	X	X
LP 02	LaPlatte River, Route 7 bridge north of Sheburne Village. Right bank under bridge.	44.38707	-73.22515			F	2018-2020	X	X	X	X	X	X	X
LP 03	LP03 - LaPlatte River at Falls Road	44.37022	-73.21577	44.8		S/F	2018-2020	X	X	X	X	X	X	X
LP 04	LaPlatte River, Spear St. bridge (at Gecewitz). Left bank, 3 meters downstream of bridge.	44.355	-73.19382			F	2018-2020	X	X	X	X	X	X	X
LP 05	LP05 - LaPlatte River at Carpenter Road	44.34176	-73.18383	31.2		S/F	2018-2020	X	X	X	X	X	X	X
LP 06	LaPlatte River, Dorset St. bridge. Right bank, upstream end of bridge.	44.33839	-73.17097			F	2018-2020	X	X	X	X	X	X	X
LP 07	LaPlatte River, Leavenworth Rd. North bridge. Left bank at downstream end of bridge.	44.33887	-73.14931			F	2018-2020	X	X	X	X	X	X	X
LP 08	LP08 - LaPlatte River below Hinesburg STP Outfall	44.33319	-73.12618			F	2018-2020	X	X	X	X	X	X	X
LP 09	LP09 - LaPlatte River above Hinesburg STP Outfall	44.33395	-73.12598	17.7		S/F	2018-2020	X	X	X	X	X	X	X
LP 10	LP10 - LaPlatte River at Silver St	44.32524	-73.11015	8.94		F	2018-2020	X	X	X	X	X	X	X

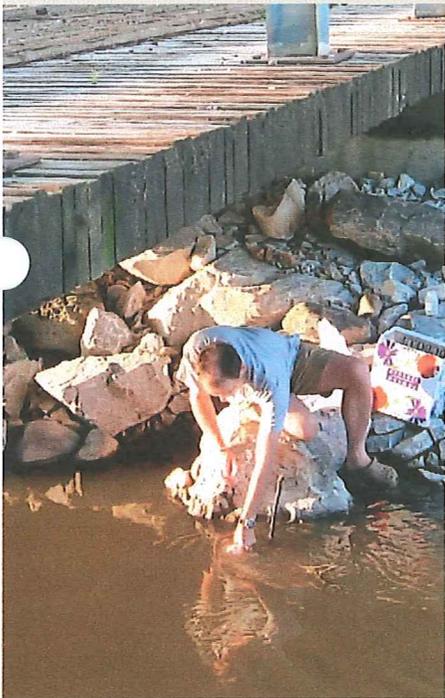
LaPlatte McCabe's Thorp Kimball Holmes RiverWatch Collaborative | 2010-2020

Site ID	Site Location	Site Latitude	Site Longitude	Upstream Area (mi ²)	Staff Gauge	Sentinal Focus	Focus Years	E. coli	Chloride	TSS	Turbidity	Total Phosphorus	Dissolved Phosphorus	Total Nitrogen
T 01	Thorp Brook, West of Greenbush Rd	44.273073	-73.255597	2.93	Y	S/F				X	X	X	X	X
T 02	Thorp Brook, East Branch: South of Champlain Co-Housing Road	44.290703	-73.249991			F				X	X	X	X	X
T 1.5	Tributary to Thorp Brook at East Thompson's Point Rd	44.281086	-73.251489											
TW 01	Tributary to Thorp Brook south and East of T 01	44.273119	-73.251489											
T 03	West Tributary Thorp Brook: South side of E. Thompson's Point Rd	44.282732	-73.262495											
T 3.5	West Tributary South Branch Thorp Brook, near source, North of T 03 and Upstream from public mound system	44.288539	-73.265942											
K 01	Kimball Brook, Town Line Rd	44.257767	-73.259469											
K 02	Kimball Brook, East of Greenbush Rd	44.258356	-73.249661	1.87	Y	S/F				X	X	X	X	X
H 01	Behind the tennis court of Charlotte Town Beach, downstream from impoundment pond on the main branch of Holmes Brook. Upstream from HT.	44.332689	-73.279539	3.84	P	S/F	2010-2015	X		X	X	X	X	X
HT 01	The first tributary feeding into Holmes Brook upstream from the mouth. Downstream from Mouth.	44.331389	-73.280556	1.71		F		X		X	X	X	X	X

NOTES: All McCabe's and Holmes monitoring to target 6 high flows May through November

WATER QUALITY IN THE LAPLATTE WATERSHED

- **An introduction to water quality science**
- **Research results, 2004 – '10**
- **Recommended actions**



LaPlatte Watershed Partnership

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martylewiscreek@gmavt.net

*With support from State of Vermont's
LaRosa Volunteer Water Quality Monitoring
Analytical Partnerships Program, Champlain
Water District, Town of Shelburne*

Introduction

The LaPlatte watershed and Shelburne Bay are beautiful, natural aquatic communities that provide important wildlife habitat and have high recreational value. The watershed includes approximately one hundred and seventy four miles of river channel and tributaries that drain a fifty-three square mile area mainly in Hinesburg, Charlotte and Shelburne before discharging into Shelburne Bay of Lake Champlain.



The Mouth of the LaPlatte River

Clean water in the LaPlatte watershed and Shelburne Bay is important for several reasons:

- To support thriving diverse aquatic and terrestrial communities in the watershed.
- To minimize nuisance algal blooms and aquatic weed populations, including invasive plants such as European frogbit.
- For the people who live in and use the watershed and the Bay for fishing, swimming and boating.
- As a source of drinking water for 68,000 customers in Burlington and surrounding towns.

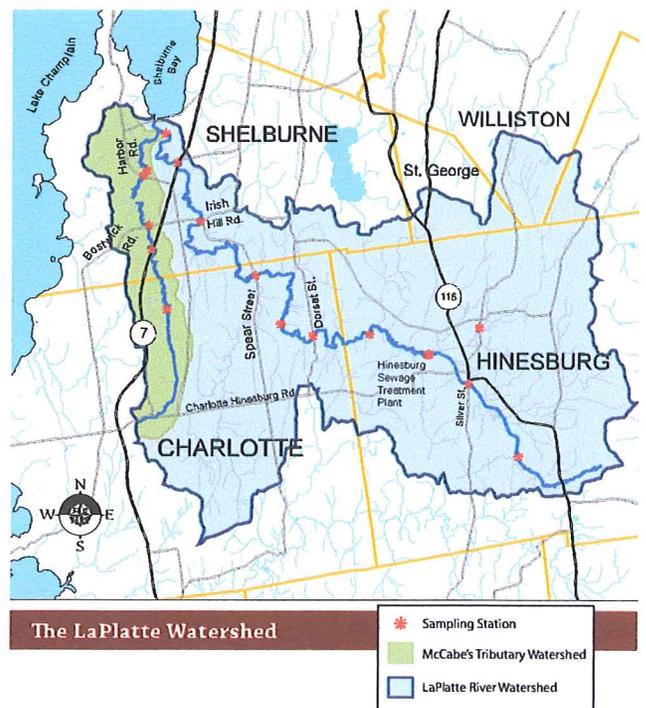
Sediment and nutrient loads from stream bank erosion and agricultural and urban runoff enter the rivers and streams that discharge to Shelburne Bay. Concentrations often exceed limits set or proposed by the State of Vermont to protect stream life and esthetic quality. Some of these streams are listed by the State as impaired. The LaPlatte River is the major tributary entering Shelburne Bay and the largest source of the Bay's nutrients. In recent years, phosphorus concentrations in the Bay have often exceeded the limits set by the state to protect water quality.

The State of Vermont has established Water Quality Standards that are designed to provide a yardstick against which to:

- Evaluate water quality in rivers, streams and lakes.
- Identify areas that need mitigation or protective action.

LaPlatte Watershed Partnership volunteers have been monitoring water quality in the LaPlatte River and its tributaries since 2004. Today, we know there is significant degradation of water quality in the River and Bay. This report summarizes the results of our water quality monitoring and research on the LaPlatte River and its major tributary, McCabe's Brook, through 2010.

The LaPlatte Watershed Partnership expects to continue monitoring the health of the LaPlatte watershed for



many years, building on results to date and learning from the work of long-running watershed organizations such as the Lewis Creek Association. Accordingly, this report also includes our recommendations for future monitoring and research. This is designed to improve our understanding of key factors impacting the health of the watershed and Shelburne Bay and, hopefully, to measure future improvements in water quality.

Improving water quality in the LaPlatte River and McCabe's Brook watersheds requires action at two levels:

- By individual homeowners and watershed citizens.
- By the town governments of Charlotte, Shelburne and Hinesburg.

This report includes calls to action for both groups.

Vermont Water Quality Standards

The Vermont Water Quality Standards were established in 1999. These standards were based on water quality requirements for both human use and aquatic life, and were developed for both lakes and rivers. Together with biological assessments, they provide a basis for measuring and evaluating water quality and for identifying impaired, threatened and pristine waters. The standards for streams currently include turbidity, nitrate and *Escherichia coli* (*E. coli*). In addition, total phosphorus and total nitrogen criteria have been proposed to protect aquatic life in streams.

The standards also stipulate that total phosphorus and nitrogen loadings from streams to lakes shall be limited so that they will not help accelerate eutrophication or stimulate the growth of aquatic biota in ways that prevent the full range of uses of Vermont's lakes and rivers. The current Vermont Water Quality Standards for open waters like Lake Champlain include total phosphorus.

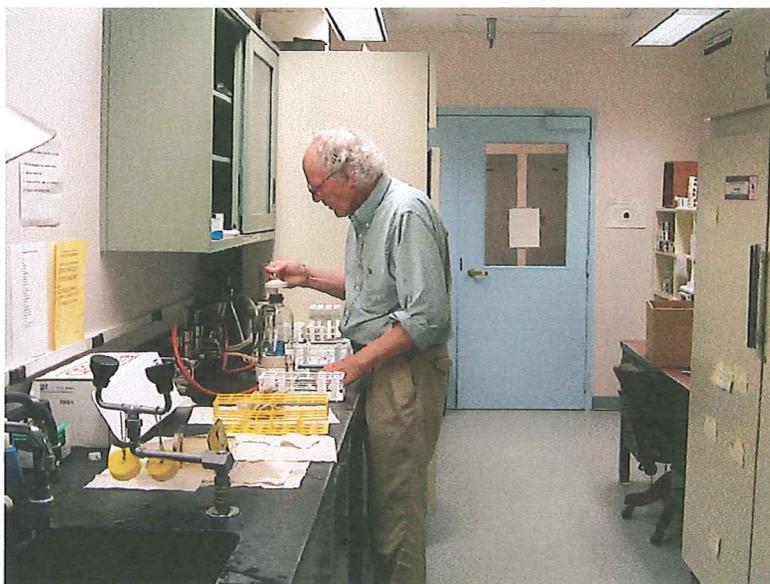
Water Quality Measurements

The LaPlatte Watershed Partnership has focused primarily on monitoring of four key water quality indicators: suspended sediment, phosphorus, nitrogen and *E. coli*.

Suspended Sediment

Suspended sediment in Vermont streams is measured as solids or turbidity. The Vermont Water Quality Standard is 25 nephelometric turbidity units (NTUs) in class B streams, like the LaPlatte, designated for warm water fish. Suspended sediment level is an important parameter for streams and lakes because it:

- Limits visibility in water which can be hazardous to swimmers and boaters.
- Limits photosynthesis by reducing light penetration in surface waters.



Analyzing Water Samples

- Settles to the bottom of streams and lakes, and damages habitat for aquatic animals and breeding areas for fish.
- Acts as a vehicle for the transport of phosphorus to and within streams, and subsequently to Shelburne Bay and Lake Champlain, especially in watersheds where fertilizer has been applied to fields.

Phosphorus

Phosphorus is an essential plant nutrient which can also stimulate growth of nuisance aquatic plants and algae in streams and lakes. It is generally considered to be the major nutrient limiting or stimulating the growth of algae and aquatic plants in Lake Champlain. Reducing the load of phosphorus discharged into Lake Champlain from its tributaries – including the LaPlatte River and McCabe’s Brook - will slow the rate of algae growth and entrophication in the lake.

Phosphorus in Vermont streams and lakes is generally measured as total phosphorus. The Vermont Water Quality Standard is 0.014 mg/l as phosphorus in the open waters of Lake Champlain and Shelburne Bay. The proposed in-stream standard is 0.044 mg/l as phosphorus as measured during low flow stream conditions.

Nitrogen

Nitrogen, like phosphorus, is an essential plant nutrient and, either alone or together with phosphorus, can limit or stimulate algal and plant growth in streams and lakes. So, to protect the LaPlatte River system and Lake Champlain, it is important to limit nitrogen loading in the LaPlatte watershed.

Nitrogen in Vermont streams is generally measured as nitrate and as total nitrogen. The Vermont Water Quality Standard for nitrate is 5mg/l as nitrogen. The proposed standard for total nitrogen is 0.75 mg/l as nitrogen.



Taking Water Samples in McCabe’s Brook

Escherichia coli

E.coli is generally a harmless bacterium found normally in the intestinal tracts of warm-blooded animals. It is not generally found in the natural environment. Its presence in the environment is, therefore, considered an indicator for possible fecal contamination and presence of other intestinal organisms capable of causing intestinal disease. When *E. coli* counts are shown to exceed the Vermont Water Quality Standard, beaches are closed to protect human health.

E. coli in Vermont streams is measured as the most probable number (MPN) of *E. coli* bacteria in 100 ml of water. The Vermont standard for *E. coli* is no greater than 77 organisms/100 ml.

Summary of Monitoring Results, 2004 – '10

Water quality samples were taken monthly, with occasional exceptions, starting in May or June and ending in October or November, at sampling stations on the LaPlatte River and McCabe's Brook:

- **LaPlatte River.** Sampling stations at Yacht Haven Drive, Shelburne Road, Falls Road, Spear Street, Carpenter Road, Dorset Street, Leavenworth Road, Below Hinesburg Sewage Treatment Plant, Above Hinesburg Sewage Treatment Plant and Silver Street.
- **McCabe's Brook.** Sampling stations at Harbor Road, Bostwick Road, Route Seven, Teddy Bear Access and Lime Kiln Road.

Program volunteers also sampled Mud Hollow Brook in Charlotte and Patrick Brook in Hinesburg on several occasions.

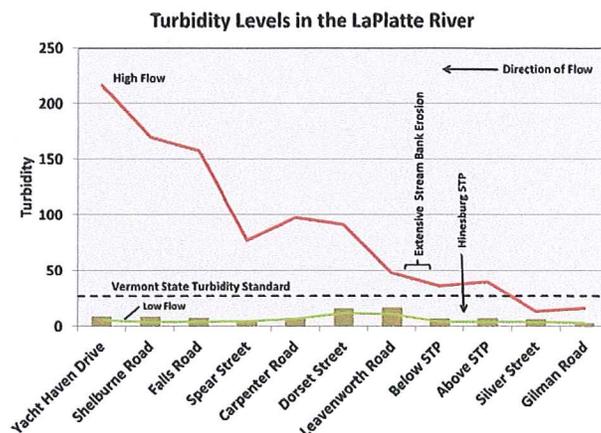
Suspended Sediment & Turbidity

Turbidity levels increase in the LaPlatte River between the Hinesburg sewage treatment plant (STP) outfall and Leavenworth Road as a result of stream bank erosion after which they decrease downstream. Levels generally fall below the Vermont standard, but can exceed it greatly when it rains.

LaPlatte River

Sediment loads in the LaPlatte River:

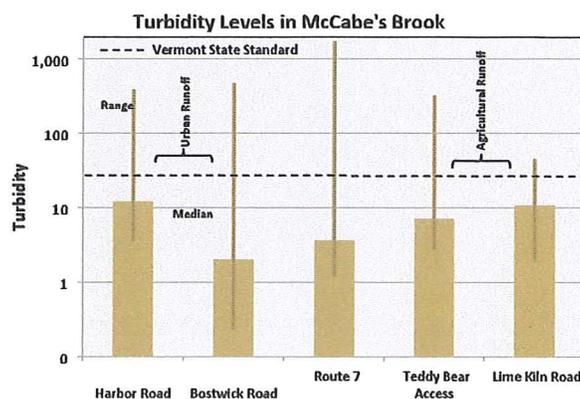
- Constitute the main source of phosphorus in the river and its discharge into Shelburne Bay.
- Are generally low during low flows, but still influence phosphorus concentrations where stream bank erosion is prevalent.
- Increase greatly when flows increase and rise continuously to very high levels during periods of high flow.



McCabe's Brook

McCabe's Brook is listed under Part C of the State of Vermont's list of priority surface waters outside the scope of section 303(d) of the Clean Water Act. This identifies McCabe's Brook as in need of further assessment based on elevated turbidity affecting aquatic life.

- Turbidity levels exceed the Vermont standard in about 15% of all samples from Lime Kiln Road to Harbor Road. Sources appear to be erosion, bank failures and runoff from cultivated fields.
- The greatest increases in turbidity levels occur between Bostwick Road and Harbor Road where Vermont standards are exceeded in nearly half the samples analyzed. The most likely sources are drainage from the School Street neighborhood and Shelburne Village.
- Suspended sediment loadings can reach very high levels during high flows.



Phosphorus

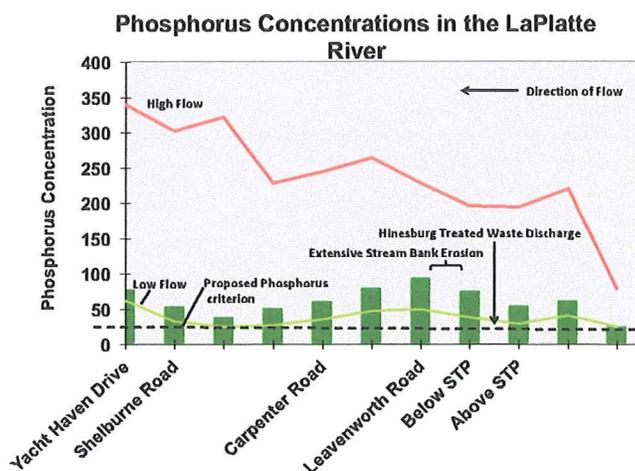
Phosphorus concentrations in the LaPlatte River tend to mirror turbidity levels. Sources include the Hinesburg sewage treatment plant outfall, but much more important, stream bank erosion and agricultural runoff, especially during high flows. The bulk of phosphorus entering Shelburne Bay and Lake Champlain occurs during rain events where high flows and high phosphorus concentrations caused by agricultural runoff and stream bank erosion act together to cause high loadings. Phosphorus concentrations in Shelburne Bay in recent years frequently exceed the Vermont Water Quality Standard of 0.014 mg/l.

LaPlatte River

Total phosphorus concentrations in the LaPlatte River are heavily influenced by sediment loadings and:

- Consistently exceed proposed criterion at most locations throughout the river.
- Reach their highest levels where stream bank erosion occurs and where urban runoff impacts the lower reaches.
- Rise continuously and to very high levels during periods of high runoff.

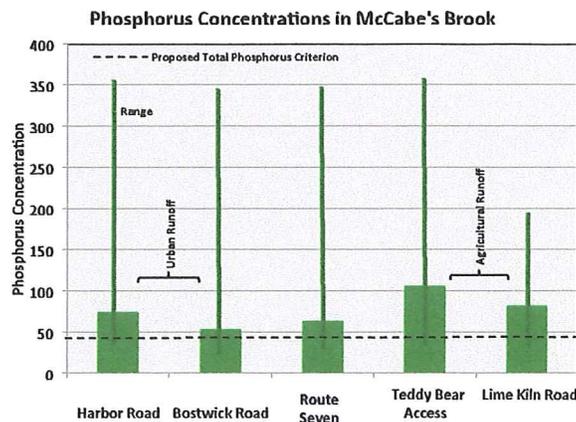
Total phosphorus levels in Mud Hollow were analyzed in 2008 and exceed the proposed state criterion at all times.



McCabe's Brook

Total phosphorus concentrations in McCabe's Brook are heavily influenced by sediment loadings and:

- Exceed the proposed Vermont criterion for Class B warm water streams in most samples.
- Reach very high levels during rain events.
- Appear to reflect changing patterns of cropping in three fields that drain into in upstream reaches between Lime Kiln Road and Vermont Teddy Bear.
- Are influenced by stream bank erosion in downstream reaches.
- Increase between Bostwick and Harbor Roads where the stream flows through wetlands and receives storm water runoff from Shelburne's central town area.

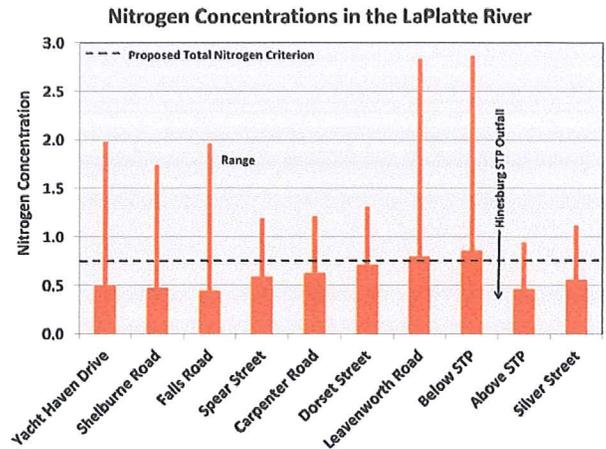


Nitrogen

Nitrogen concentrations are generally low in the LaPlatte watershed and decrease at downstream locations as a result of dilution.

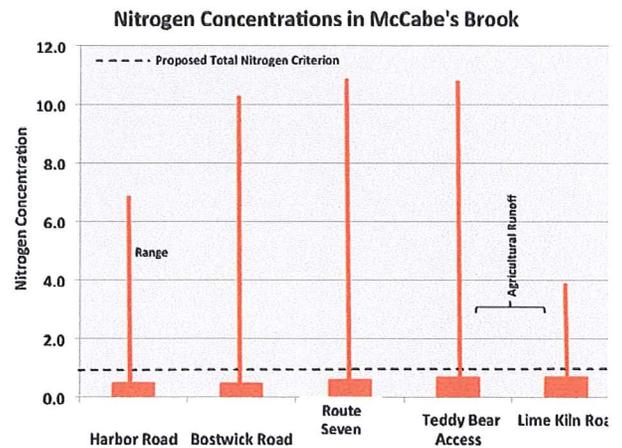
LaPlatte River

- Total nitrogen concentrations often exceed the proposed Vermont standard below the Hinesburg sewage treatment plant.
- Concentrations fall below the proposed standard downstream from Dorset Street.
- Total nitrogen concentrations in Mud Hollow Brook were tested in 2008 and consistently exceeded the proposed State criterion.



McCabe's Brook

- During rain events, total nitrogen and nitrate concentrations may far exceed the Vermont standards in McCabe's Brook as a result of agricultural runoff.
- Median total nitrogen concentrations tend to remain slightly below the proposed Vermont State criterion.
- Total nitrogen concentrations exceed proposed standards at times, however, and very high total nitrate concentrations, far exceeding the proposed Vermont state criterion, have been observed downstream from agricultural fields.
- Consistently low ratios of nitrogen to phosphorus concentrations indicate that phosphorus is present in excess.

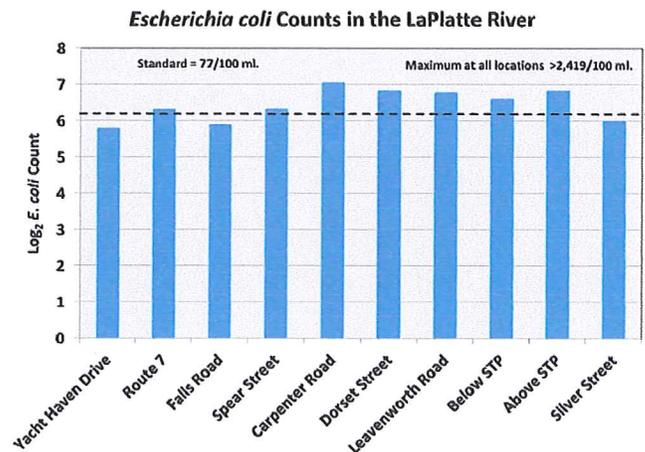


E. coli

Escherichia coli counts are often high throughout the LaPlatte watershed and generally exceed the Vermont standard. Counts are highest following rains.

LaPlatte River

- *E. coli* counts exceed the State standards most of the time where influenced by urban runoff and waste discharges.
- Based largely on these data, the State has designated as bacteriologically impaired the LaPlatte River from its mouth upstream to the Hinesburg sewage treatment plant outfall and a three-mile reach of its tributary, Mud Hollow Brook. The State has established a bacterial Total Maximum Daily Load for the impaired reaches. This determines the reduction in *E. coli* counts that will be necessary to meet water quality standards.
- Agricultural operations and the general lack of riparian buffers are likely sources of bacterial contamination.



- On-site septic systems and storm water runoff from developed areas are other potential sources.

McCabe's Brook

- *E. coli* counts tend to exceed State standards and to increase where farm and urban runoff and treated sewage enter the stream.

Nutrient and Sediment Loadings

In 2010, staff gages were installed at five locations: three on the LaPlatte River and two on McCabe's Brook. Flow measurements at these gages will help determine nutrient and sediment loadings and the locations of major sources that impact loadings discharged to Shelburne Bay. First year results confirmed the value of flow data as a tool to place pollutant sources into perspective; they also helped clarify needs for future volunteer training.

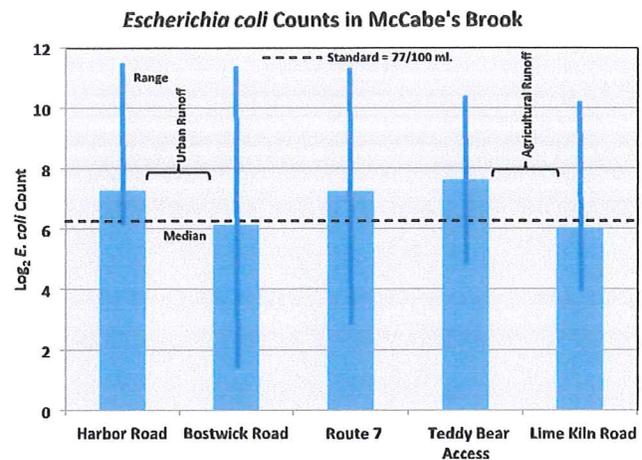
Episodic Events

High sediment and nutrient loadings from streams discharging into Shelburne Bay are generally associated with the high runoff and high flows that occur during and after rain storms. Two events on July 10, 2007 (following several days of rain) and August 4, 2010 (during heavy rains) illustrate the potential dramatic impact of such events in McCabe's Brook.

On August 4, 2010, sediment and phosphorus concentrations were exceptionally high at the Route Seven sampling station located downstream from two massive bank failures. Collapse and sloughing of such embankments is common over a stretch of McCabe's Brook both upstream and downstream from Route Seven. This event illustrates the role of stream bank collapse and erosion on sediment loadings which settle downstream and damage habitat.

The improved water quality generally observed at Bostwick Road is likely the result of filtering of the water as it flows through gravel and sand deposits.

The reach of McCabe's Brook extending from Lime Kiln Road to the Vermont Teddy Bear access road receives drainage from agricultural lands. In general, during years when fields are cultivated, phosphorus concentrations increase over this reach of the stream. When fields are not under cultivation, phosphorus concentrations decrease.



High Embankment Collapse, McCabe's Brook

During a rain storm on July 10, 2007, phosphorus concentrations increased to extremely high levels driven by an exceptional increase in the concentration of particulate phosphorus. There was also a simultaneous increase in the total nitrogen concentration to extremely high levels, far exceeding Vermont State standards, driven largely by an increase in the nitrate concentration. This striking impact was observed at all downstream stations. This event illustrates:

- The impact of agricultural practices on stream water quality.
- The impact of agricultural practices on nutrient loadings to the lake.
- The need to implement best management practices on agricultural lands.



Storm Water Drain

Next Steps for Town Officials and Watershed Residents

The research results presented here make the case for improving water quality in the LaPlatte watershed. The goal is to create a healthy aquatic environment in the watershed and Shelburne Bay. Reaching this goal will require changes in town policies and practices as well as coordinated action among town governments. It will also require changes in the way Shelburne, Charlotte and Hinesburg residents manage their yards, gardens, farms and forests. These changes are designed to prevent nutrients, soil and pollutants from entering the LaPlatte River and its tributaries.

For Town Officials

The LaPlatte Watershed Partnership recommends that town ordinances, plans and policies be changed to incorporate best watershed management practices based on corridor plans as described in some detail in “LaPlatte River Corridor Plans, LWP 2006-2011,” <http://www.lewiscreek.org/laplatte-watershed-studies> and summarized here.

Storm Water Management

Conventional storm water systems transport nutrients and pollutants from urban roads, parking lots, yards and gardens to streams and rivers. They should be replaced with grass-lined channels, known as swales, wherever possible. Swales provide important benefits to streams because they:

- Remove nutrients and pollutants.



Presentation to Shelburne Selectboard

- Recharge groundwater.
- Slow down and also reduce stream loads when it rains.
- Increase stream levels and flows during droughts.
-

The LaPlatte Watershed Partnership recommends that town governments:

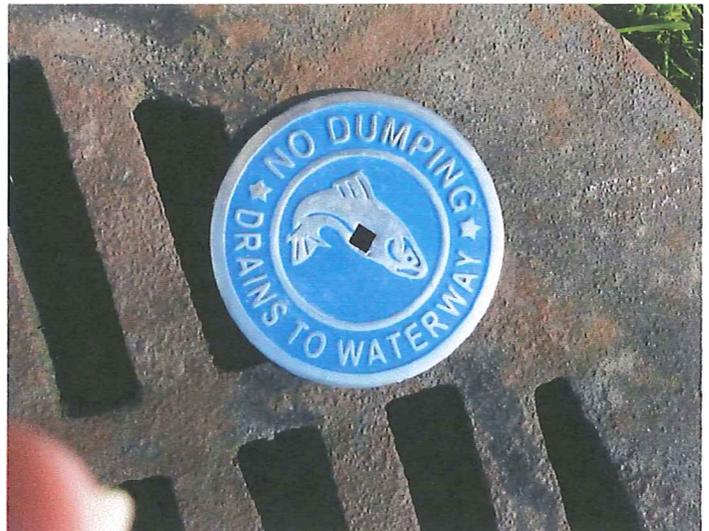
- Inventory and evaluate all private and public storm water systems and create the legal and financial capacity that is needed to upgrade all systems.
- Require low impact development in priority sub-watersheds. These developments will produce minimal increase in storm water hydrologic and pollutant loadings over predevelopment conditions.
- Disconnect impervious surfaces and all storm water outflows from storm drains and waterways.
- Create buffers along roadside ditches.
- Manage roadside ditching and drainage to ensure stability beyond town rights-of-way.

Road Maintenance

The design and maintenance of roads, culverts and ditches has a major impact on the amounts of runoff, sediment and chemicals that are carried into streams and rivers. It also impacts flow rates, stream bank erosion and fish movement.

We recommend that town governments:

- Establish and apply protective road standards that are designed to improve water quality.
- Minimize salt use on roads. Salt concentrations in our local streams are generally highest in the early summer. Although salt levels do not yet threaten stream life in our towns, they have done so elsewhere. Prevention is important.
- Maintain grass or stone-lined roadside ditches along all town roads.
- Upgrade roads, bridges and culverts near streams to provide for fluvial geomorphic compatibility and aquatic organism passage.
- Establish schedules for roadside ditch maintenance that allow for rapid re-vegetation. The goal is to minimize the potential for erosion from bare soil.
- Use coarser gravels for road sanding, reduce overall sand applications and emphasize slow speeds for safe winter travel.
- Use sediment trapping structures and other practices to prevent roadside ditches from discharging directly into waterways.



Storm Water Drain

Stream Buffers

Natural buffers along stream banks play a key role in improving water quality. The cultivated fields, lawns, roads and parking lots that border streams, rivers and Lake Champlain do nothing to reduce pollution and the run off that causes nuisance algal blooms and increased growth of aquatic weeds. The alternatives are wide buffer zones, planted in trees, shrubs and perennial grasses, from which pets and livestock are excluded.

These natural buffers have many benefits because they:

- Absorb run-off of nutrients and other chemicals.
- Keep stream temperatures lower.
- Trap sediment and reduce erosion during times of heavy rainfall and flooding.
- Provide wildlife habitat and corridors.

Land Use Practices

Our research has confirmed the impact that land use practices have on water quality in the LaPlatte watershed. Nutrients in fertilizers reach waterways and nourish nuisance algal growth in the LaPlatte and the Lake. Both problems are exacerbated by soil erosion. Toxic chemicals accumulate through the food chain, harm aquatic life and can render fish unsuitable for human consumption. We recommend:

- Minimizing fertilizer applications and the use of weed and pest control chemicals to reduce concentrations of these substances in storm water runoff.
- Stabilizing stream banks and flood plains by planting trees and shrubs. Their root systems strengthen stream banks and floodplains, help trap sediment during flooding and provide shade which reduces stream temperatures.
- Taking a forest inventory and making forest conservation and protection a priority.
- Completing a soils inventory and setting priorities to protect and conserve soils with high infiltration capacity.
- Allowing streams to regain their natural channel dimensions, slope and planform.
- Reduce the rate of development in areas where there is no sanitary sewer access and where soils are not well suited for septic disposal.



Cattle Don't Belong in Rivers

For Watershed Citizens

Improving water quality in the LaPlatte watershed requires action from Shelburne, Charlotte and Hinesburg town governments. Individual actions are essential as well.

Lawns, Gardens and Septic Systems

Run off from lawns and gardens travels to roadside ditches and waterways. These areas can be managed to reduce run-off and to minimize the amounts of harmful materials entering waterways.

- Cut lawns no shorter than three inches.
- Minimize use of lawn fertilizers and focus on building healthy soil.
- Replace chemical fertilizers and pesticides with organic products to maintain soil fertility and control weeds and insect pests.
- Reduce lawn areas and save on maintenance by planting trees, shrubs and ground covers.
- Use new, more-advanced on-site septic technologies.

Agricultural Land

Cultivated fields lose nutrients and soil to erosion and run-off. These problems can be mitigated in several ways:

- Create buffers planted to perennial grasses, trees and shrubs between agricultural fields and waterways.
- Favor perennial crops and pastures whenever possible.
- Use cover crops and green manures in rotation to build soil fertility and avoid exposing bare soil for extended periods of time.



Streambank Erosion, Upper LaPlatte River

Driveways, Private Roads and Parking Lots

These impervious surfaces are maintained by homeowners, condominium associations and other organizations. They should be managed in ways that prevent run-off from entering waterways. Examples include:

- Maintain grass-lined ditches along driveways and private roads.
- Divert drainage from driveways and ditches to permeable surfaces such as lawns, fields and forests.
- Disconnect drainage pipes from direct discharge into town road ditches and streams.
- Consider replacing paved parking lots with porous materials (such as pervious concrete, gravel-pure or porous asphalt) to minimize run-off and retain rainwater onsite.
- Minimize salt use during the winter.

Program Support

Laboratory support has been provided through the State of Vermont's LaRosa Volunteer Water Quality Monitoring Analytical Partnerships program. The Champlain Water District provided support for the analysis of particle size. The Town of Shelburne provided financial support for laboratory supplies, establishment of flow gaging stations, data analysis and review and public education under special environmental projects. Quality assurance under the monitoring program is carried out following the protocols contained in the State's EPA approved Vermont General Quality Assurance Project Plan for Volunteer, Educational and Local Community Monitoring and Reporting.

Volunteers have given 2,000 hours and collected more than 7,000 water samples since 2004. The Laplatte Watershed Partnership recognizes and thanks all of them: Lucy Blanton, Lisa Godfrey, Walter Gundel, Bill Hoadley, Bob Hyams, Matt Mainer, Pat Mainer, Ray Mainer, Susan Moegenburg, Andrea Morgante, Hans Puck, Judy Puck, John Quinney, Ed Sengle, Anna Speidel, Jon Trefry.

Recommendations for Additional Research, Training and Outreach

The LaPlatte Watershed Partnership can undertake monitoring and research to assess progress in protecting the resources of the LaPlatte watershed, supporting implementation of best management practices, and planning and informing the public about water quality and related issues in the watershed.

Based on results to date, The LaPlatte Watershed Partnership recommends that future monitoring and research includes these activities:

Research

- Conduct additional research to identify sources of suspended sediments in the reaches between Lime Kiln Road and Vermont Teddy Bear, and between Bostwick and Harbor Roads.
- Investigate Accepted Agricultural Practices (AAPs) and Best Management Practices (BMPs) for agricultural fields
- Recommend improved practices in order to reduce discharge of nutrients from agricultural fields to McCabe's Brook
- Continue monitoring of turbidity and total suspended solids because of their importance to aquatic life, aesthetic quality and phosphorus loadings in the LaPlatte River and Shelburne Bay.
- Use total suspended solids data and the results of fluvial geomorphic studies to recommend ways to mitigate erosion.
- Continue flow studies to better understand relationships between total and dissolved phosphorus, turbidity, total suspended solids and particle size.
- Working with USDA, NRCS, and other agencies to assess the extent of agricultural waste application through improved nutrient management planning.
- Renew and extend E. coli monitoring and research to pinpoint sources and assess improvements.



Taking Water Samples in McCabe's Brook

Volunteer Training

- Continue to improve quality control procedures with volunteers and program coordinators.
- Enlist volunteers to read staff gages on a daily basis and to measure rainfall.

Outreach and Action

- Develop the capacity to respond to and act on exceptional results in a timely manner.
- Use results of geomorphic and water quality studies, along with floodplain reconnaissance, to help formulate land management policies and to draft land use and basin plans.
- Use research results to improve planning by Regional Planning Commissions and towns.

LaPlatte Watershed Partnership Resources

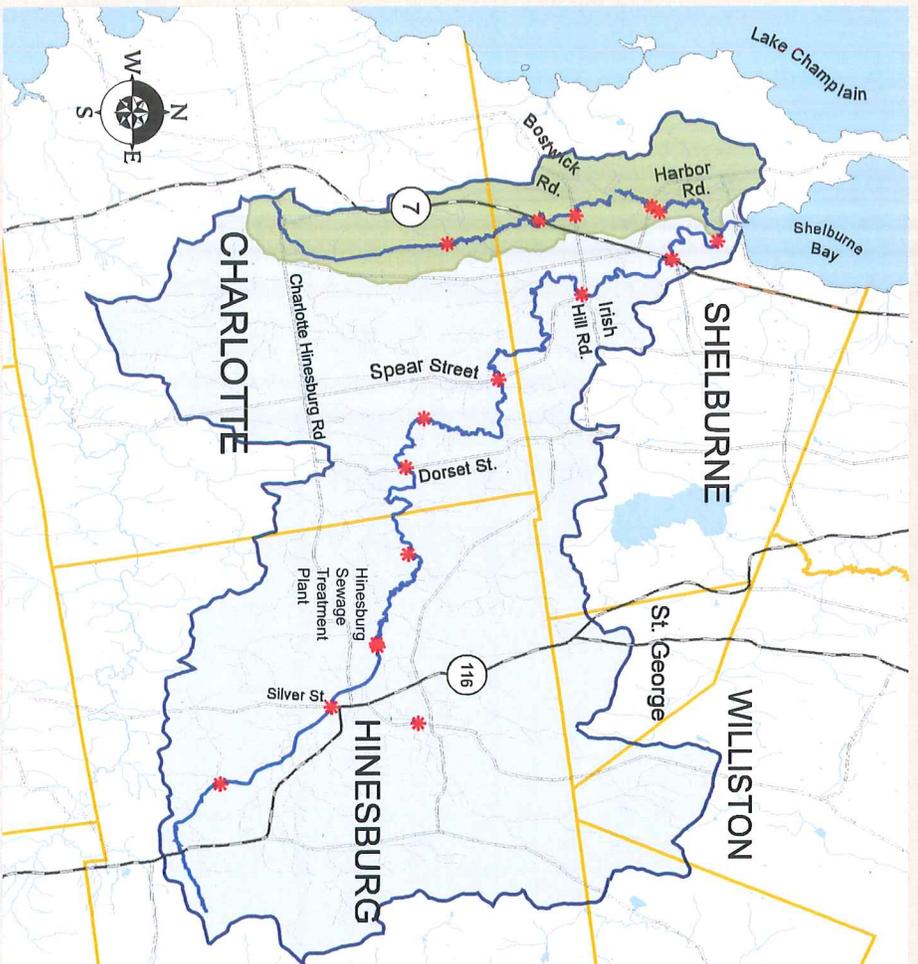
The research summarized here has been more fully described in several reports prepared for the Water Quality Section of the Vermont Department of Environmental Conservation and the Town of Shelburne:

- Water Quality Supplement LaPlatte River: 2010 Data and Pilot Flow Study.
- Water Quality Supplement McCabe's Brook Watershed: 2010 Data in Context and Pilot Flow Study.
- Water Quality Supplement: LaPlatte Watershed 2008

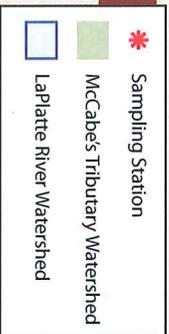
In addition, the LaPlatte Watershed Partnership has published several studies that address water quality in the LaPlatte. These include:

- LaPlatte Corridor Plans for the towns of Hinesburg, Shelburne and Charlotte.
- The LaPlatte Storm Water Report (with Town Maps).
- The LaPlatte River Watershed Culvert Study.
- LaPlatte Management Alternatives for Hinesburg Village.

These studies are all available on the Lewis Creek Association web site: www.lewiscreek.org.



The LaPlatte Watershed



This brochure was produced by the LaPlatte Watershed Partnership with funding support from the Town of Shelburne. Additional support for the monitoring program was provided by the State of Vermont's LaRosa Volunteer Water Monitoring Analytical Partnerships program, the Champlain Water District and the Department of Environmental Conservation.

PHOTOS: A. W. Hoalley, JGN, MacWorks. Printed on recycled paper, 50% post-consumer recycled content.

What's Up with the LaPlatte?



Is the LaPlatte harming Lake Champlain?



Why does the LaPlatte run brown when it rains?



Should we worry about high E. coli counts?

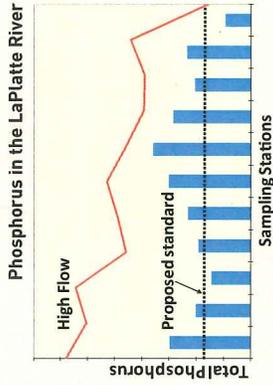
The LaPlatte River and its tributary, McCabe's Brook, drain a 53 square mile area mainly in Hinesburg, Charlotte and Shelburne, and discharge into Shelburne Bay (see map, back cover). Clean water in the river and Bay is important for aquatic life, fishing, boating, swimming and drinking water supply. But, all's not well with the LaPlatte.

Volunteers with the LaPlatte Watershed Partnership have been measuring water quality in the LaPlatte River and McCabe's Brook watersheds since 2004. Here's what we've learned.

Phosphorus

Phosphorus enters the LaPlatte River at the Hinesburg sewage treatment plant and downstream where stream banks erode and where McCabe's Brook receives drainage from cornfields and pasture. Phosphorous levels:

- tend to exceed proposed standards throughout the river
- reach their highest levels where stream bank erosion and urban runoff occur
- increase continuously from upstream to downstream locations and rise to very high levels during periods of heavy rain

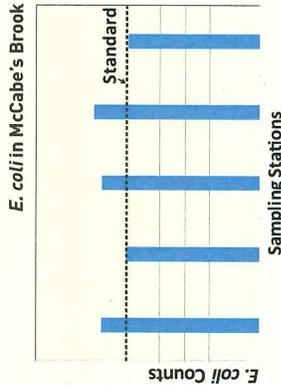


Phosphorus concentrations in Shelburne Bay often exceed the Vermont water quality standard for the Bay. The result is increased growth of nuisance aquatic plants and algae and worsening water quality in Lake Champlain and Shelburne Bay.

E. coli

The bacterium *Escherichia coli* (*E. coli*) is not naturally found in aquatic habitats. It lives in the intestines of warm-blooded animals. So, when *E. coli* is found in streams and lakes, this points to fecal contamination and may indicate that other harmful bacteria are present. *E. coli* counts:

- are often high throughout the LaPlatte watershed especially after rain
- are higher where treated sewage and run-off from towns and farms enters the streams

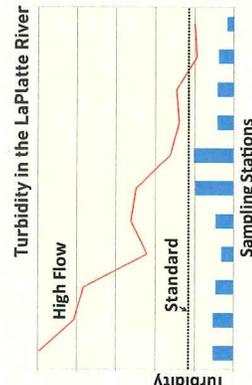


When *E. coli* counts exceed the Vermont water quality standards, beaches are closed to protect human health.

Suspended Sediment

Turbidity is caused by suspended sediment — the brown stuff we see in the rivers and Bay after heavy rains. Suspended sediment limits photosynthesis, damages habitat for aquatic animals, harms breeding areas for fish and transports phosphorus to Lake Champlain. Suspended sediment:

- is the main source of phosphorus in the river and Shelburne Bay
- is at very high levels after heavy rains



Suspended sediment is generally below the Vermont standard in the LaPlatte watershed. **However, levels exceed the Vermont standard when it rains and at places where stream bank erosion is high.**

Do Something Now!

Improving water quality in the LaPlatte watershed and Shelburne Bay will take many years. And that's why we should start right now. Watershed citizens and town governments can help prevent soil erosion and stop phosphorous and nitrogen runoff from lawns, roofs, roads and farms.

Watershed Citizens

- divert drainage from driveways to permeable surfaces
- reduce lawn areas – plant trees and shrubs
- create buffers between streams and lawns or fields
- cut lawns three inches high and minimize fertilizer use
- move drainage pipe outlets away from streams, road-side ditches and storm drains
- talk to your town officials about water quality



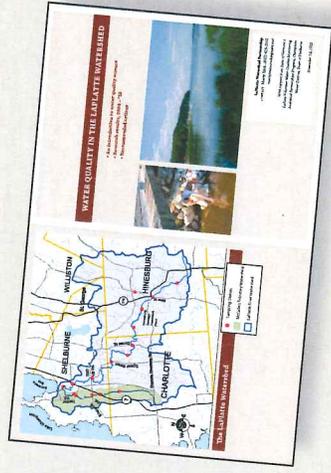
Town Governments

- include recommendations of the LaPlatte Water Quality Report and LaPlatte River Corridor Plans in town plans and policies (LWP 2006-2011, <http://www.lewiscreek.org/laplatte-watershed-studies>)
- apply protective road standards
- maintain grass or stone-lined swales and ditches along town roads
- use less fertilizer, pest control chemicals and road salt on town land and roads
- allow streams to regain their natural channel dimensions, slope, and flow
- protect streams from storm water run-off from roads and parking lots
- plant trees and shrubs to stabilize stream banks and flood plains
- maintain stream bank buffers



Learn More

Go to www.lewiscreek.org for the publication, "Water Quality in the LaPlatte Watershed," an introduction to water quality science and a summary of research results from 2004-'10.



Contact

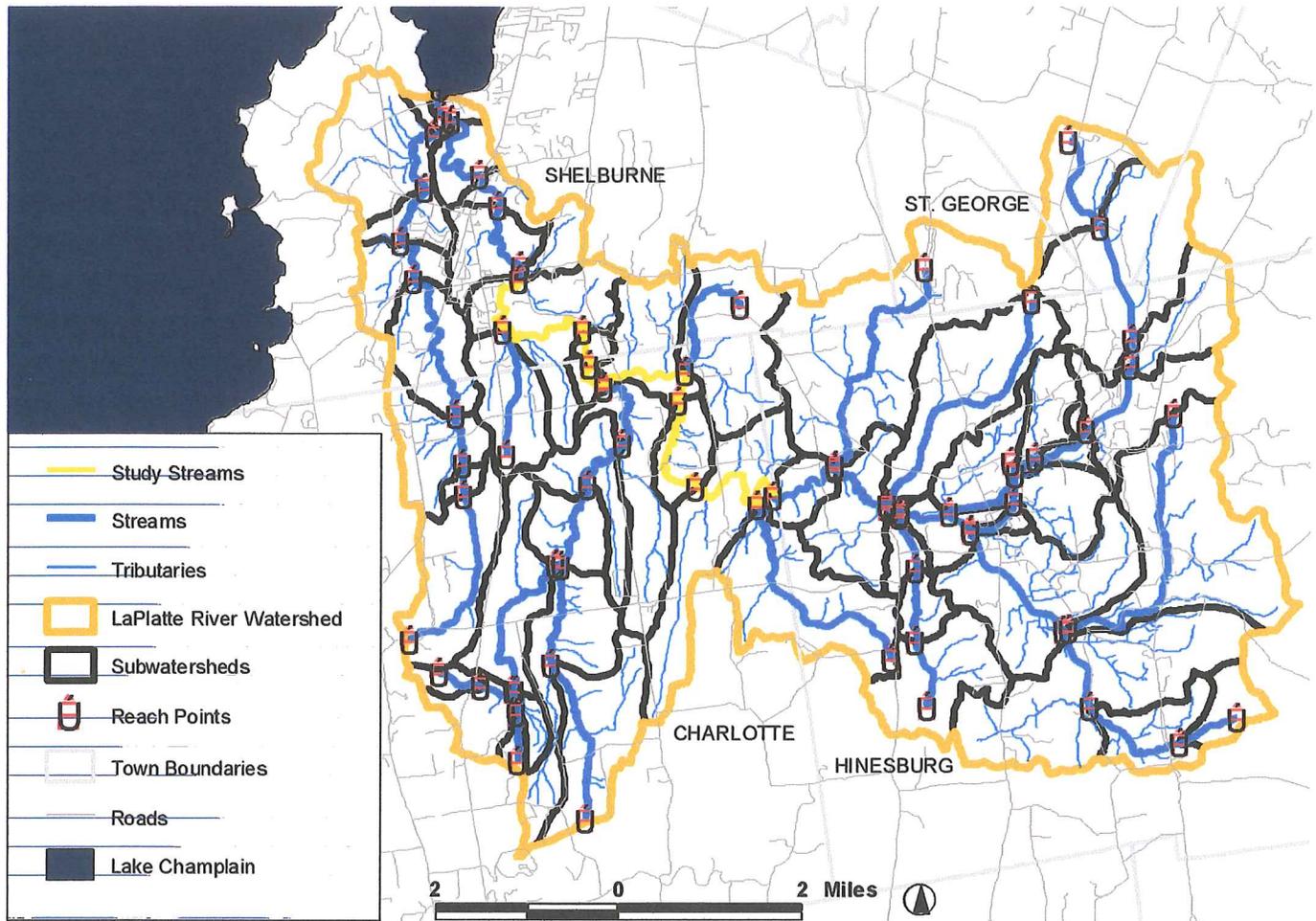
LaPlatte Watershed Partnership

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LaPlatte River Corridor Plan Reaches M6 – M11 Towns of Charlotte and Shelburne, Vermont



Prepared by the LaPlatte Watershed Partnership
April, 2008

Map of the River Corridor Plan
Reaches M0 - M1
Town of Charlotte and Shelburne, Vermont



Map of the River Corridor Plan
Reaches M0 - M1
Town of Charlotte and Shelburne, Vermont

LaPlatte Watershed Partnership

**Water Quality Supplement
LaPlatte River**

2010 Data and Pilot Flow Study

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Prepared for

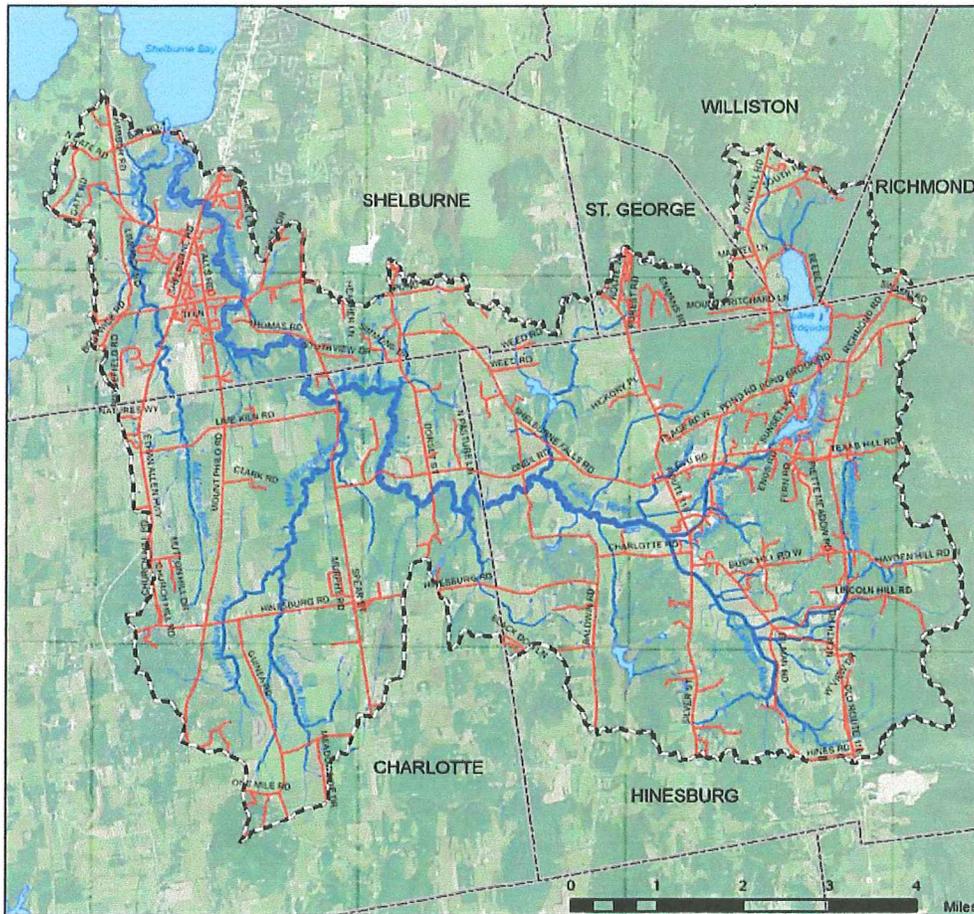
**Water Quality Section
Vermont Department of Environmental Conservation**

and

**The Town of Shelburne, Vermont
April, 2011**

LaPlatte River Watershed Culvert Study Chittenden County, VT

September 3, 2010



Prepared for:
LaPlatte Watershed Partnership
Lewis Creek Association
Hinesburg, VT

Prepared by:
Milone & MacBroom, Inc.
South Burlington, VT

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Acknowledgements

This project was funded by a Vermont Clean and Clear Grant to the Lewis Creek Association (CC 2009-RCG-3-04). Andrea Morgante of the LaPlatte Watershed Partnership, in conjunction with Marty Illick of the Lewis Creek Association, coordinated this project. Pam Brangan of the Chittenden County Regional Planning Commission provided GIS data and project guidance. Bernie Gagnon, Public Works Director for the Town of Shelburne, contributed firsthand knowledge of the structures in Shelburne. Junior Lewis, road foreman for the Town of Charlotte, provided information on structures and existing maintenance of structures in Charlotte. Mike Anthony, Road Commissioner for Town of Hinesburg, contributed information on structures in Hinesburg.



Executive Summary

Road and stream networks cross at many locations and bridges and culverts are used to carry roadways over stream channels. These structures create fixed points in river channels that naturally tend to move on the landscape and typically are much smaller than the channel width. Undersized structures can lead to excessive flooding and erosion as water, sediment, debris, and ice cannot naturally pass through the structure. Inadequate bridges and culverts are risks to public safety and limit fish passage fragmenting aquatic habitat.

In the LaPlatte River watershed (area = 53 square miles) 136 miles of roads and 174 miles of rivers exists. The road density is thus 2.6 miles of road per square mile of watershed and the river density is 3.3 miles of river channel per square mile of watershed. A total of 165 stream crossings were identified in the watershed not including driveways, trails, or unmapped roads. Many more crossings are located on smaller streams due to their higher abundance in the watershed than larger streams (52% of the stream length in watershed is 1st order; 9% of is 5th order).

Bridges and culverts are regulated by the State of Vermont under 10 VSA Chapter 41 and the US Army Corps of Engineers under Section 404 of the Clean Water Act (Vermont General Permit). Stream crossing projects typically require a state level review, although if the drainage area is less than one square mile no state permits apply. In general, regulations do not apply to structures on smaller headwater tributaries. These streams are highly fragmented in part because structures are unregulated. Headwater streams pose design challenges for crossings as they typically carry little flow yet can be required to convey large flood waves and debris flows during intense storm events.

Three bridge and culvert databases exist in Vermont including:

- Vermont Agency of Natural Resources (VTANR) Bridge and Culvert Assessment that is part of the Vermont Stream Geomorphic Assessment;
- Vermont Agency of Transportation (VTRANS) Database; and
- Vermont Online Bridge and Culvert Inventory Tool (VOBCIT).

These three inventories were compiled and reviewed for the Laplatte River watershed. The VTrans and VOBCIT databases inventory culverts, but provide little information to guide replacement or improvement of structures. The VTANR assessment measures specific variables that can indicate instabilities or incompatibility with stream processes and limitations of fish passage. The VTANR assessment information was used to create an improvement matrix that documents deficiencies and provides suggestions for design to be used during future structure replacement.



The State of Vermont has been proactive in creating a design manual for improving structures for aquatic organism passage (Bates and Kirn 2009). The design guidelines generally attempt to make crossings as invisible to fish as possible. The recommendations in the state include:

- Spanning 1.25 times the bankfull channel width;
- Embedding the culvert 20-40% of its height into the stream bed to maintain natural bed materials in the structure and limit the chance of forming an outlet drop;
- Matching structure and channel slope; and
- Limiting floodplain fill.



**PHASE 2 GEOMORPHIC ASSESSMENT AND CORRIDOR PLANNING
MCCABE'S BROOK WATERSHED
CHARLOTTE AND SHELBURNE, VERMONT**

FEBRUARY 10, 2012



Prepared for:

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MMI #3452-13

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APPENDIX D: MCCABE'S OVERVIEW MAP

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The project was funded by the Lewis Creek Association through its grant with the Lake Champlain Basin Program. Marty Illick of the Lewis Creek Association coordinated this project in association with Andrea Morgante of the LaPlatte Watershed Partnership. Technical assistance was provided by Gretchen Alexander and Sacha Pealer of the Vermont Department of Environmental Conservation, Vermont Rivers Program and Eric Howe of the Lake Champlain Basin Program.



EXECUTIVE SUMMARY

The purpose of this study is to provide site level assessments to inform stream corridor planning and riparian management recommendations.

McCabe's Brook is a tributary of the LaPlatte River that flows through Charlotte and Shelburne, draining to Shelburne Bay. Shelburne Bay is a drinking water source for Chittenden County, so sediment and nutrient loading to the Bay is a concern. This project consisted of a Stream Geomorphic Assessment of McCabe's Brook (watershed area = 6.2 square miles, length = 8.3 miles) and river corridor planning to identify potential projects for conservation or restoration.

McCabe's Brook headwaters are dominated by flat wetlands in a primarily agricultural area in Charlotte. The upper reaches have significant impacts including historic channel straightening and dredging due to agricultural practices. The upper fluvial reaches were found to be in good or reference geomorphic condition, and are stable without significant transformational processes occurring. In Shelburne, the channel is in closer proximity to development and roads. The channel is in various stages of incision, widening, and planform change in this area. Downstream of the undersized Route 7 culvert, the channel has departed from a reference C-type channel to an F-type and was found to be in poor condition. Assessed stream segments were identified to have good to fair overall physical habitat conditions.

Encroachments and channel modifications have been identified in the river corridor. There has been channel straightening in the upper watershed (T1.08), near Route 7 (T1.05A & T1.05B), and Shelburne Village (T1.03). Residential and municipal development in Shelburne Village has encroached on the channel. Undersized culverts are impacting sediment transport and aquatic organism passage at Route 7, Bostwick Road, Lime Kiln Road, and small farm crossings.

River conditions are being impacted by changes in hydrology caused by land use conversion away from natural vegetative cover. McCabe's Brook subwatersheds have low to moderate amounts of impervious cover except at the village center of Shelburne where impervious cover is up to 20%. Most subwatersheds have urban land cover of 9% or higher. Agriculture also influences stormwater runoff and sediment production and there is a high percentage of agriculture in all subwatersheds. A large number of stormwater inputs were identified in Shelburne Village (T1.03, T1.05B) and from the rural area near Lime Kiln Road (T1.06A). Previous water quality analysis as part of another project indicates that agricultural practices are likely impacting water quality downstream of Limekiln Road.

River corridor planning has led to general watershed recommendations for improvement of Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection, Buffer Establishment and Protection, and Stream Crossings. Site specific projects have been identified and prioritized based on the potential improvement in the river condition (Table ES-1). A constriction of the river channel and floodplain by the Route 7 embankment has been identified to be contributing to channel destabilization and creation of mass failures of the valley wall. Creation of a new compound channel and floodplain is recommended to remove the constriction and restore natural river processes while protecting Route 7. Bostwick Road is located at a critical break in slope in the valley and downstream of a massive sediment supply. Replacement is recommended because the culvert is undersized and created a sediment delta upstream, disrupting sediment supply to downstream reaches and potentially increasing incision downstream.



Table ES-1: Project Identification Table Ten Priority Projects.

Priority Rank	River Segment / Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Project Benefits
1	T1.05B/A #1	Route 7: The road embankment completely fills the floodplain at the crossing location. Downstream of the crossing the river turns and flows parallel to the embankment, where it is severely constricted by the embankment fill. Mass failures have resulted upstream and downstream of the constriction. Armor at toe of Route 7 embankment has some damage.	Remove Constriction / Floodplain Restoration: Remove constriction caused by embankment. Route 7 is a major travel corridor and unlikely to be re-routed or accommodate a narrower embankment. Explore creation of a compound channel with floodplain using undeveloped land on the opposite bank.	Improved sediment transport; reduced erosion risk; Improved floodplain attenuation.
2	T1.05A #4	Bostwick Road Culvert: This culvert is undersized and completely filling the floodplain with a tall embankment. The structure is accumulating debris upstream and has a very large cobble and gravel delta extending a few hundred feet upstream. Scour is occurring downstream and an outlet drop of 0.5 ft blocks AOP.	Replace Structures - The Bostwick Road culvert should be replaced with a larger structure than can accommodate sediment and flood water movement along with AOP.	Wildlife habitat connectivity; sediment continuity; reduce erosion risk.
3	T1.03 #3	At the Shelburne Town Garage and Wastewater Treatment Plant on Turtle Lane the riparian buffer is narrow and lacking natural vegetation. The buildings are less than 100 ft from river. Fill is visible at the top of the bank and storage of materials is in the floodplain. The riparian buffer is narrow and non-existent in locations.	Plant Stream Buffers / Restore Floodplain - Remove storage of materials and fill from the riparian zone behind the buildings. Plant woody stream buffers in riparian areas.	
4	T1.05B #5	Route 7: Culvert is undersized and the embankment fills the floodplain. Sediment is accumulating upstream.	Replace Structure - Replace culvert with a larger structure that will accommodate sediment transport.	Improved habitat. Wildlife habitat connectivity.
5	T1.08 #3	Pizzagalli Property: A farm road runs parallel to the channel. The road is raised and blocks access to the left floodplain. There is evidence of periodic dredging along with road maintenance. The channel has the form of a straight, wide, featureless ditch at the edge of the road. Natural vegetation and shade is minimal due to road location.	Restore Wetland Channel - Reconnect channel to left wetlands. This could mean abandoning or removing road where it prevents access to adjacent wetlands. Recommend no more dredging in channel. Work with landowner to allow for passive restoration of the channel by allowing natural vegetation to grow on the banks and not ditching.	Improved habitat; Improve adjacent wetland attenuation.
6	T1.07B/A + T1.06B #3	Nordic Farm: River Corridor is primarily undeveloped and forested. The riparian area is in good condition and protections should be put in place to ensure that this will not be lost to future land use changes.	Protect River Corridors - Preserve these "in-regime" reaches by preventing future encroachment. The property has an easement with the Vermont Land Trust already. Work with landowners to secure specific protections for the river corridor.	Improve floodplain attenuation; Reduce channel erosion.



Priority Rank	River Segment / Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Project Benefits
7	T1.04B #1	This reach is exhibiting incision and planform change. Erosion is occurring and the channel will continue to meander as it reaches equilibrium. It has reduced floodplain connectivity due to moderate incision. This would be an attenuation asset, located downstream of a reach that is out of its sediment regime.	Protect River Corridors - This reach flows through a primarily undeveloped forested riparian area. Protection of this corridor will allow the river to meander as necessary to reach equilibrium, continue to provide habitat and water quality functions, and prevent unnecessary flood and erosion risks.	Improved habitat; improved water quality.
8	T1.02B #1	This reach is very close to Lake Champlain and therefore management directly impacts the Bay and Lake. The majority of the river corridor and a large amount of the subwatersheds has been conserved, but specific land management should be investigated for compatibility with the river and lake.	Protect River Corridors - Work with landowners to manage inputs of runoff and sediment to river.	Improved water quality.
9	T1.08 #6	A small partially breached run-of-river dam is located upstream of a farm ford on the Nordic Farm property near the downstream end of the reach. The remaining stone structure impounds the river approximately 600 feet upstream. Impoundment is covered in thick algae that would smother natural species.	Remove Structure - Removal of remaining stone spillway and rubble would remove the impoundment and restore natural sediment and organism passage.	Restore channel to natural conditions; improve habitat.
10	T1.08 #1	This reach has a significant amount of agriculture in the corridor. The wetland has been straightened and natural vegetation has been lost post agriculture. The section near and upstream of Hinesburg Road has residential development encroaching on the wetland.	Protect Wetland Corridors - Work with landowners to protect identified wetland areas from additional development or active agriculture.	Improved habitat; improved water quality.

