STORMWATER MANAGEMENT PLAN FOR ST. ALBANS TOWN

FINAL REPORT

Stone Project ID 14-053

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Prepared for:

Friends of Northern Lake Champlain
P.O. Box 58
Swanton, VT 05488
Tel. / 802.524-9031
E-Mail / denisefnlc@gmail.com

Prepared by:

Stone Environmental, Inc.
535 Stone Cutters Way
Montpelier, VT 05602
Tel. / 802.229.4541
E-Mail / sei@stone-env.com

STONE ENVIRONMENTAL INC

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1. INTRODUCTION

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

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

1.1. Project Background

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

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

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

Watershed management practices have direct impacts on water quality in local creeks and streams (such as Jewett Brook, Rugg Brook, and Stevens Brook), as well as downstream waterbodies (St. Albans Bay and, ultimately, Lake Champlain). Any decisions that affect land use have stormwater management ramifications and, in turn, impact all downstream water resources. The findings of one recent study (Troy et al. 2007) suggest that “land-use changes in the Basin have increased phosphorus levels in Lake Champlain, especially conversion of agricultural areas and forests to developed uses.”

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

Taken together, these elements emphasize the need for a holistic planning effort that considers the interconnected nature of land use, stormwater management, and river management in order to achieve overall watershed goals.

1.2. Project Goals

In the section of St. Albans Town's 2012 Town Plan that highlights natural resources and the environment, stormwater runoff is identified as a threat to water quality that the town "is [addressing] and will continue to address," specifically noting that the Town should take "a careful and logical approach to storm water management."

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

This Stormwater Management Plan first incorporates information from existing plans and datasets to create a single, town-specific resource to guide future stormwater management activities. The resulting Stormwater Management Planning Library, included as Appendix B, is a valuable resource for water quality-related work in St. Albans Town.

This Stormwater Management Plan also:

- Identifies stormwater-related areas of active erosion or other sources of sediment that are being delivered directly to water bodies in the Town of St. Albans;
- Develops recommendations to address stormwater problems, including:
  - A list of problem areas that can assist stakeholders in directing resources to high priority projects;
  - Conceptual solutions for high-priority problem areas (Section 4.3), and
  - Potential revisions to town ordinances that would encourage consideration of stormwater management opportunities as development and redevelopment projects are pursued locally.

The Town has already taken a number of actions in response to the draft list of problem areas that was provided in August 2014, including applying for and receiving funding from the Lake Champlain Basin Program and the Better Backroads Program that will be used to remediate several concerns during the 2015 construction season.

2. GENERAL DESCRIPTION OF THE STUDY AREAS

The Town of St. Albans is located in Franklin County in northwest Vermont. The town has a total area of 60.6 square miles, of which 37.6 square miles (62%) is land and 23.0 square miles (38%) is water. As of the 2010 U.S. Census, the population of the town was 5,999. The "water component" of St. Albans Town consists of a number of rivers, streams and lakes, including Lake Champlain, St. Albans Bay, and portions of the Jewett Brook, Stevens Brook, Rugg Brook, and Mill River watersheds, as well as several tributaries to the Missisquoi River (see Figure 1 in Appendix A for a map of watershed boundaries). Development in the area is primarily concentrated near the City of St. Albans and along the shores of St. Albans Bay and Lake Champlain.

The western three-quarters of St. Albans Town drains either to St. Albans Bay (including the portions of town within the Jewett Brook, Stevens Brook, Rugg Brook, and Mill River watersheds) or directly to Lake Champlain. Relatively small areas in the northeast corner of town are in the Missisquoi River watershed, and drain to that river and ultimately to Missisquoi Bay. Each of these watersheds is described below, and watershed boundaries are shown on Figure 1 in Appendix A.

2.1. Jewett Brook

Jewett Brook is a low-gradient stream that confluences with Stevens Brook in the Black Creek Swamp in St. Albans Town shortly before emptying into St. Albans Bay. The headwaters of Jewett Brook and roughly two square miles of the brook's watershed are located in Swanton. The Jewett Brook watershed's area is approximately 8 square miles and is dominated by agricultural land use. Jewett Brook is considered to be an "impaired" waterbody, meaning it does not currently meet water quality standards. The state has identified the pollutants of concern as sediment, nutrients, and *E. coli* bacteria, and has attributed these pollutants primarily to agricultural runoff. Within one to three years (roughly 2014-2016), the State of Vermont will develop a TMDL for Jewett Brook (VTDEC 2014).

2.2. Rugg Brook

Rugg Brook flows into the northwest corner of Georgia from St. Albans Town, and confluences with the Mill River in Georgia before draining into St. Albans Bay. Rugg Brook originates on Bellvue Hill southeast of St. Albans City. The headwater portions of the watershed to the east and south originate in primarily forested areas, but the brook quickly emerges into low density residential development and agricultural areas. Rugg Brook is considered to be impaired by stormwater from river mile 3.1 and extending upriver approximately 1.6 miles (VTDEC 2014). The majority of the stormwater impaired portion of the Rugg Brook watershed is located in the Town of St. Albans, with smaller portions located in the City of St. Albans to the north, and southern portions in the Towns of Fairfield and Georgia in Franklin County. In the middle and lower portions of the stormwater impaired watershed, Rugg Brook travels through more highly developed residential and industrial land uses. There is a diversion structure on Rugg Brook in the City of St. Albans, which shunts water from Stevens Brook to Rugg Brook during high flows in order to protect the City from flooding. This structure increases the volume of storm flows for all downstream reaches of Rugg Brook. This Stormwater Master Plan did not identify or evaluate potential problems area within the stormwater impaired portion of the watershed, as that work will be completed as part of a larger regulatory effort to develop a Flow Restoration Plan for that portion of the brook.

2.3. Stevens Brook

Stevens Brook drains an area of approximately 14.7 square miles in Swanton, St. Albans Town, and St. Albans City, joining with Jewett Brook in the Black Creek Swamp before emptying into St Albans Bay. Stevens Brook is considered to also be an "impaired" waterbody. From its mouth to river mile 6.5, the state has identified the pollutants of concern as sediment, nutrients, and *E. coli* bacteria, and has attributed these pollutants primarily to agricultural runoff, as well as morphological instability and combined sewer overflows. Within one to three years (roughly 2014-2016), the State of Vermont will develop a TMDL for Stevens Brook (VTDEC 2014). A TMDL for the upper section of Stevens Brook has already been developed for river mile 6.8 upstream to river mile 9.3, where the stream is designated as impaired by stormwater runoff. This Stormwater Master Plan did not identify or evaluate potential problems area within the stormwater impaired portion of the watershed. As with Rugg Brook, this work will be completed as part of a larger regulatory effort to develop a Flow Restoration Plan. In addition, a half-mile section of Stevens Brook downstream of LaSalle Street is listed as impaired for metals as a result of sediment contamination from the St. Albans Gas and Light hazardous waste site; however, development of a TMDL for this portion of Stevens Brook is over 8 years in the future (VTDEC 2014).

2.4. Mill River

The Mill River watershed includes approximately 16.7 square miles and includes small portions of St. Albans Town, Fairfax, and Fairfield, in addition to northern half of the Town of Georgia. The river originates near the St. Albans Reservoir and flows out into St. Albans Bay. Land use in the watershed is dominated by agricultural and light to heavy residential development. Mill River is considered to be an "impaired" waterbody, meaning it does not currently meet water quality standards. The state has identified the pollutants of concern as sediment, nutrients, and *E. coli* bacteria, and has attributed these pollutants primarily to agricultural runoff and streambank erosion. Within four to eight years (roughly 2016-2020), the State of Vermont will develop a TMDL for Mill River (VTDEC 2014).

2.5. Lake Champlain Direct Drainage

A significant portion of western and northern St. Albans Town – Hathaway Point and Maquam Shore – drains directly to Lake Champlain. This area includes a significant number of seasonal homes, and is characterized as very flat with numerous wetlands. In addition, a significant portion of the land around Hathaway Point and Maquam Shore meets the State's definition of primary agricultural soils and is in active farming.

2.6. Other Watersheds in St. Albans Town

Relatively small areas in the northeast corner of town are in the Missisquoi River watershed, including portions of the Hungerford Brook and Dead Creek watersheds, each of which drain to the Missisquoi River and ultimately to Missisquoi Bay.

3. EXISTING PLANS AND DATA

Numerous and varied groups and individuals have invested considerable effort in evaluating St. Albans Town's water resources, and the important interface between water resources and local land use decisions. At times, these evaluations have followed watershed boundaries, while at other times they have followed political boundaries. The following sections identify evaluations completed over the past ten years, with emphasis on work most relevant to the Town of St. Albans, and on efforts to develop a list of strategic, prioritized projects that could be undertaken to improve water quality in and around the Town. A detailed review of each assessment is included as Appendix B of this report.

3.1. Watershed-Based Assessments

The ongoing assessments described below are generally led by the State of Vermont's Agency of Natural Resources (ANR). These include:

- Basin planning efforts, the main purpose of which is to guide ANR in its own work and in collaborative projects with the public, municipalities, and other state and federal agencies. The basin plans have a five-year scope. The *Northern Lake Champlain Direct Drainages Water Quality Management Plan*, last revised in 2009, overviews water resources and identifies concerns and threats to water quality for the area beginning at the Ferrisburgh and Charlotte town line and ending at the Canadian border, and all Vermont surface waters that drain directly into this section of the Lake except for three major river watersheds (the Missisquoi, Winooski and the Lamoille river watersheds). The State initiated the next round of Tactical Basin Planning for the Northern Lake Champlain Direct Drainages in 2013 to identify water resource concerns as well as high priority actions for the protection and restoration of the basin's surface waters. This new Tactical Basin Plan will build on efforts identified in the 2009 basin plan.

- Stream geomorphic assessment work, undertaken to understand the natural tendencies of a particular reach of stream or river, its current condition, and what changes may be anticipated in the future. Stream geomorphic assessments have been completed for Hungerford Brook, Jewett Brook, Stevens Brook, and Rugg Brook.

- Water quality assessment work, including both in-lake and in-stream water chemistry assessments, has been completed at numerous sites in St. Albans Town. The Lake Champlain Long-Term Water Quality and Biological Monitoring Program began in 1992 and has continued each year since then. The program includes 22 in-lake monitoring stations spread throughout the basin, including a station in St. Albans Bay (station 40). In addition, since 1979, in-lake water samples have been collected in St. Albans Bay by volunteer monitors. In 2004-2005, water samples were collected by the St. Albans Bay Association at up to 15 sites in the St. Albans Bay watershed; five of these sites are located in St. Albans Town and are not in stormwater-impaired watersheds. Three of the locations were in the Stevens Brook watershed, and two were in the Jewett Brook watershed.

- Total Maximum Daily Load (TMDL) development, to establish the maximum amount of a pollutant (e.g., bacteria, nutrients, excess stormwater flows) that a waterbody can assimilate and still meet state-established water quality standards. TMDLs are based on the relationship between pollution sources and in-stream or in-lake water quality conditions. A TMDL addresses a single pollutant or stressor for a waterbody, so more than one TMDL may need to be developed for a particular receiving water. The previously approved Lake Champlain phosphorus TMDL is currently under review by EPA Region 1, and may ultimately require the application of additional best management practices (BMPs) throughout the Lake Champlain watershed. As previously noted, portions of the Stevens Brook and Rugg Brook watersheds in St. Albans Town have been designated as impaired by stormwater runoff, and TMDLs for both watersheds were developed and approved by the U.S. EPA in February 2009. Flow restoration planning efforts are now underway for the stormwater-impaired portions of both watersheds.

A number of other assessments have been conducted in the St. Albans Bay watershed in an effort to better understand the profound effects of phosphorus pollution in this area of the lake. These include landscape modeling efforts, as well as detailed evaluations of internal phosphorus loading in St. Albans Bay. The goals and key findings of each of these studies are summarized in Appendix B.

3.2. Town-Wide Assessments and Programs

In addition to the watershed-based assessments, a number of data sources are developed on a municipality-by-municipality basis. These are important to fold into any effort to develop a list of strategic, prioritized projects that could be undertaken to improve water quality in and around St. Albans Town. These include direct feedback from the Town, work by the Vermont Agency of Transportation (VTrans), and past and current planning initiatives.

- In meetings with Stone Environmental, Town officials indicated that many of their current areas of highest priority and concern were located within the stormwater-impaired watersheds of Stevens and Rugg Brooks. Town officials identified 8 areas of concern that had been flagged during a previous erosion study (Watershed Consulting, 2010), many of which are related to localized flooding and undersized culverts. See Figure 7 and Table 4 in Appendix B for a map and table of concern areas and priority projects, as well as a map of the locations of concerns identified.
- VTrans-sponsored programs, including both routine inspections of bridges and culverts and grant opportunities provided by the Better Backroads Program, have identified a number of potential projects to protect existing infrastructure whose implementation would also improve stormwater management.
- Four sections of St. Albans Town's 2012 Town Plan relate to stormwater management: Land Use (Chapter 3); Transportation (Chapter 4); Historic, Scenic and Natural Resources (Chapter 5); and Facilities, Utilities and Services (Chapter 7). Specifically, the Land Use section contains "general development standards" that apply to all proposed development in the Town of St. Albans. These standards include minimum environmental considerations for all development proposals, including that projects must adhere to the Town's Stormwater Management Plan standards; Erosion Control Plan standards, especially for access permits and construction sites; landscape screening; and stream and wetland set-backs and standards.

4. STORMWATER PROBLEM AREAS

One of the goals of this plan is to "develop a comprehensive list of stormwater problems." To achieve this goal, a thorough effort was made to identify existing problem areas, and then to evaluate existing conditions and potential solutions.

4.1. Identification of Problem Areas

The first task was to identify the location and nature of existing drainage problems and stormwater management concerns, and to gather field data for further analysis where appropriate. The approach to identifying potential problem areas included the following elements:

- Reviewing existing plans and data, as described in Section 3, and noting the location of any concerns related to stormwater
- Engagement with local officials, including:
  - March 24, 2014 kick-off meeting with the Town Planner, Public Works Director, and Regional Planner from Northwest Regional Planning Commission
  - September 17, 2014 follow-up meeting with the Town Planner and Public Works Director
- Targeted site visits to verify problems areas (May and June 2014)
- Documentation (with photos) of existing problem areas

A "problem area data sheet" was developed and used as a guide to ensure that consistent information was collected as site visits were completed. Nearly 40 potential problem areas were identified and geo-located. The data sheets for all of the problem areas identified in St. Albans Town are provided in Appendix C of this report.

4.2. Evaluation of Problem Areas

Working from the list of potential problem areas, the Consultant Team visited each potential problem area to directly observe the site. Where an unresolved problem was found, photos were taken of any areas of active erosion, and observations were recorded about the source or cause.

Each problem area was given a score with the intent of generally assessing the severity of existing problems, removing low priority problem areas from the dataset, and providing general guidance on the relative order in which the problems should be addressed when considered town-wide (Appendix C). Scores were assigned as follows:

Level	Classification
1	Outside of project scope, or infeasible to remedy due to project size.
2	Stable, but problem could escalate with future change in surrounding land use.
3	Small to moderate erosion and/or drainage problems are present; issues could be readily addressed.
4	Significant erosion and/or drainage problems are present; issues may be readily addressed.

4.3. Conceptual Solutions to High Priority Problem Areas

Initially, 19 of the identified problem areas were assigned a Level 3 or 4. However, following the September follow-up meeting, the Town applied for and received funding to address six of the high-priority problem areas that were originally identified. These problem areas were reclassified as Level 2, with a note in the description of the observed conditions regarding the funding and planned construction schedule. The remaining 13 problem areas that were assigned a Level 3 or 4 classification were subject to more detailed investigation. The first phase of the investigation involved desktop analysis to determine:

- Drainage area contributing to the known problem,
- Underlying soils, with particular attention to the presence of highly erodible soils (e.g., $k > 0.17$),
- Location of any existing stormwater infrastructure,
- Proximity to the nearest surface water feature,
- Whether the Town identified the area as a priority area for planned future growth, and
- Potential location or locations most suitable for stormwater treatment practices, taking into account topography and existing development (if any).

A map of each high-priority problem area including all of these features was prepared (Appendix D). These sites were revisited to further investigate treatment potential and gather information for conceptual solutions, including more detailed information on the contributing drainage area, soil conditions, and traffic and pedestrian flow. These data were collected in order to better evaluate anticipated water quality benefits and constructability. In some locations, conceptual solutions were not developed for one of the following reasons:

- The stormwater concerns involve issues where it would not be appropriate for the Town to assume a leadership role (e.g., wholly on private property);
- The stormwater concern did not rise to the level of demanding immediate action.

In total, seven conceptual solutions were developed to address problem areas that were assigned a Level 3 or 4 classification. The following sections describe each of the conceptual solutions.

4.3.1. La Cresta Drive at High Street (Problem Area ID: SB-13)

Roadside ditches in the highlighted areas shown in Figure 1, below, are actively eroding. Sediment has largely plugged the culvert which conveys stormwater from along La Cresta Drive under High Street. In follow-on conversations with the Town, the Public Works Director indicated that the area of active erosion extends further to the west, between Howard Estates and Ashton Drive.

Conditions along La Cresta Drive could be improved by reshaping the roadside ditch and applying appropriate stabilization measures. La Cresta Drive has a slope in excess of 5%, so the ditch should be stone lined. Timber or stone check dams could also be used to slow runoff. In addition, installing headwalls at the inlet to the cross-culvert, and providing a rock-lined splash pool at the culvert outlet, would help address the erosion concern. It may be that these measures will sufficiently slow the stormwater runoff to mitigate the erosion between Howard Estates and Ashton Drive, but this area should be more fully evaluated, assuming access to private property can be obtained.

Figure 1. La Cresta Drive Problem Area. Significant roadside erosion was observed in the area highlighted in yellow.

4.3.2. Highgate Commons Plaza (Problem Area ID: SB-15A)

A portion of the parking lot between Key Bank and the Highgate Commons Plaza was recently "depaved," as part of a stormwater permit application (6597-9015) for redevelopment filed by the McDonalds restaurant located immediately to the south of this lot (Figure 2). The depaved area resulted in the reduction of the impervious surface on the site by 20.3%. The depaved area has been restored to grass, but opportunities remain to enhance the treatment provided to stormwater runoff directed to this green space.

Although there is a curb cut along the back edge of the Key Bank parking lot, stormwater runoff simply flows through the curb cut as concentrated flow, and travels over the grass to a drop inlet. If the grass area were reshaped to create a depression, runoff from a significant proportion of the adjoining impervious areas could be attenuated before being discharged to the unnamed tributary to Stevens Brook. However, it will be important to evaluate the depth to seasonal high groundwater as part of any design, as the NRCS soil survey maps for this area indicate that groundwater could be as high as within 12 inches of the ground surface.

Figure 2. High priority problem area at Highgate Commons Plaza; evidence of recent removal of impervious surface is visible in the aerial image.

4.3.3. Industrial Park Road (Problem Area ID: RB-01)

Runoff from slightly less than seven acres within the St. Albans Town Industrial Park is eventually captured and conveyed via a swale in the median of Industrial Park Road, as shown in Figure 3. A stormwater discharge permit was issued for the Industrial Park (4262-9010), and several entities are identified as permit-holders, including the Town of St Albans. The existing swale has a V-shape, as opposed to the preferable parabolic shape, and is eroding at the bottom. In addition, several failed check dams within the western section of swale are causing the swale banks to slump.

The ditches should be reshaped and new check dams installed. It may be that timber check dams will be better suited to this application. The NRCS soil survey maps for this area indicate that the underlying soils may be poorly drained, and thus solutions that encourage infiltration, such as the construction of a bioswale, are unlikely to be viable.

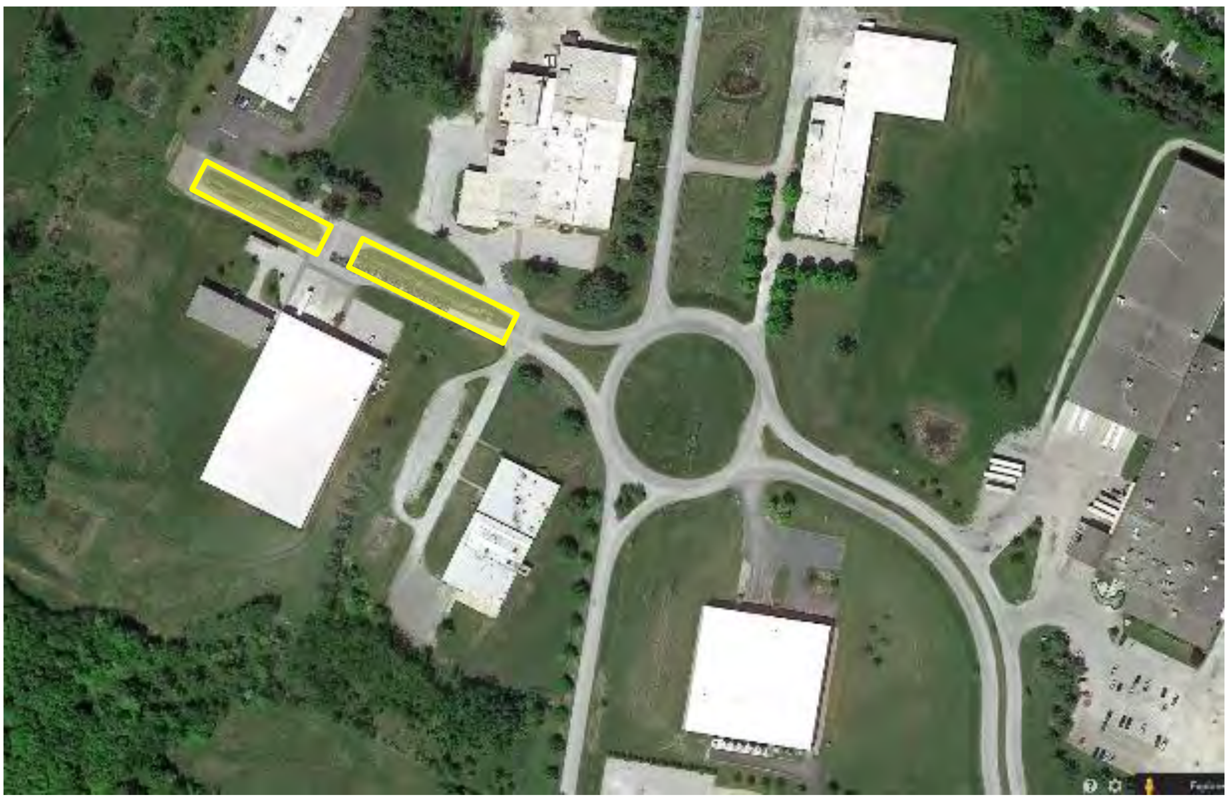

Figure 3. Industrial Park Road Problem Area. Priority areas for stormwater retrofits are highlighted in yellow.

4.3.4. Cedar Hill Road (Problem Area ID: RB-04)

Active erosion was observed in the ditch that runs along Cedar Hill Road from Charbonneau Drive to Route 7 (shown in yellow on Figure 4). In addition, the headwalls at the culvert inlet and outlet appear to be improperly installed, and insufficient backfill behind the headwalls is exacerbating erosion.

Although planned and existing development along Charbonneau Drive received coverage under a stormwater permit from the State (4597-9015), Cedar Hill Road and the four lots fanning out from the cul-de-sac visible in Figure 2 are not currently subject to state jurisdiction.

Soils in this area are characterized by the NRCS soil survey maps as having significant infiltrative capacity, but also as being highly erodible. The ditch should be reshaped and additional stabilization measures, including rock lining and check dams, should be added. Given the quality of soils in the vicinity of Cedar Hill Road, the homeowners should be encouraged to consider rain gardens or other simple disconnection practices that would allow rainwater to infiltrate on site; potential areas are indicated in purple in Figure 4.

Figure 4. Cedar Hill Road Problem Area. A priority area for stormwater retrofits is highlighted in yellow; areas suitable for rain gardens or other simple disconnection practices are shown in purple.

4.3.5. Samson Road (Problem Area ID: LC-01)

Four culverts along Samson Road were identified in the VTrans bridge and culvert inventory as being in "critical" condition. During the field work completed as part of this project, it was observed that the culverts had been recently replaced and that the areas around two of the new culverts – including a catch basin inlet located approximately 120 feet north of Waters Edge Drive, as well as the culvert outlet to Lake Champlain located approximately 720 feet north of Waters Edge Drive – were actively eroding.

The catch basin grate (location indicated in yellow in Figure 5) should be raised in order to prevent the headcut that has formed in the ditch on either side of the catch basin. Once the grate is raised, the ditch should be reshaped and stabilized.

The culvert outlet (location highlighted in purple in Figure 5) needs a robust headwall, capable of withstanding wave action. It is unclear if a headwall was constructed when the culvert was installed and has already failed, or if gravel piled over the downstream end of the culvert at the road shoulder was moved by lake waters.

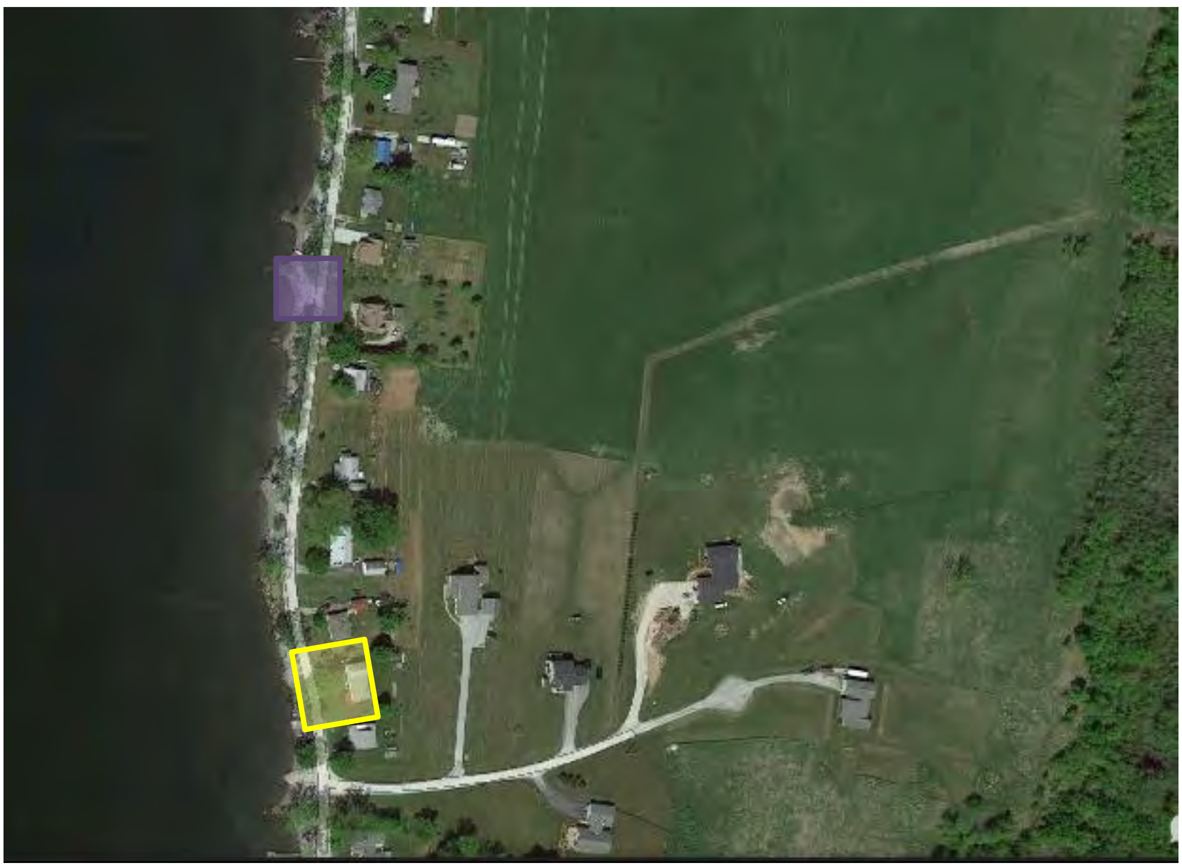

Figure 5. Samson Road Problem Areas.

4.3.6. Brigham Road at Lake Road (Problem Area IDs: SAB-04 and SAB-05)

There are two sections of discontinuous culvert located along the east side of Brigham Road, highlghted in yellow in Figure 6. It is unclear why culverts are necessary in this area. In consultation with the adjacent landowner, consideration should be given to daylighting the drainage along Brigham Road by removing these culverts entirely.

There is active erosion at the outlet of the cross-culvert to the west of Brigham Road (indicated in purple in Figure 6), that takes flow under Lake Road. The culvert is too short, and erosion has begun to undermine the road shoulder. The culvert should be replaced with a longer culvert, and a splash pad should be installed at the outlet.

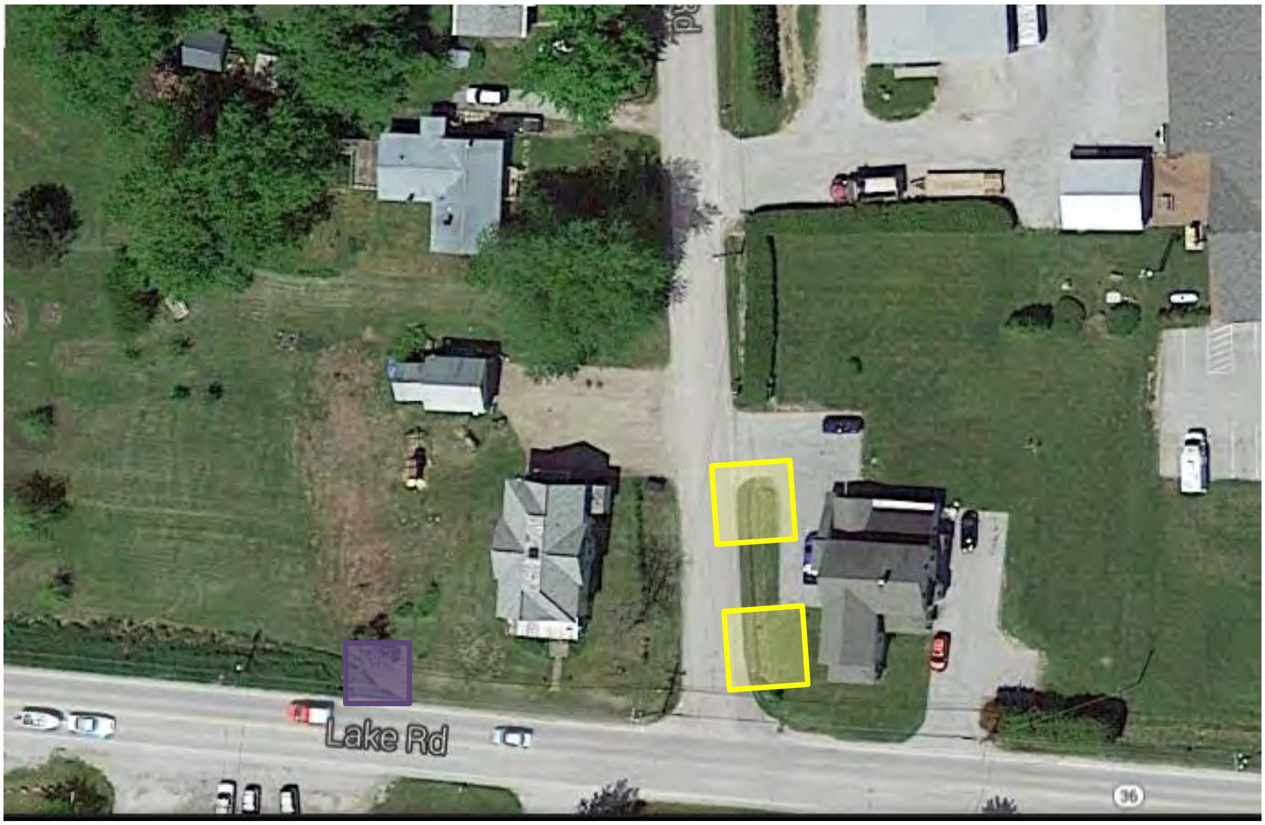

Figure 6. Stormwater Problem Areas near the intersection of Brigham Road and Lake Road.

4.3.7. Lakemont Drive at Fairfield Hill Road (Problem Area ID: DC-02)

Significant and recent sediment deposits were observed where Lakemont Drive joins Fairfield Hill Road (Route 36). It appears that these deposits are largely caused by stormwater runoff flowing along the road shoulder as opposed to in the ditch. It also appears that the road shoulder at the intersection is being undermined by stormwater flows.

The ditches along the section of Lakemont Drive highlighted in Figure 7, below, should be reshaped to ensure that runoff can access the ditch. In addition, the ditch should be stone lined since the road slope is in excess of 5%. It may also be desirable to incorporate check dams to further slow flows. The NRCS soil survey maps for this area indicate that the underlying soils are likely to be poorly drained, suggesting that solutions that encourage infiltration, such as the construction of a bioswale, are unlikely to be viable.

Figure 7. Area of active erosion near the intersection of Lakemont Drive at Fairfield Hill Road.

5. NEXT STEPS

This document represents an extensive effort to identify and evaluate potential stormwater problem areas throughout the Town of St. Albans. Several high priority potential stormwater improvement projects, including conceptual solutions, were identified in Section 4 that the Town could pursue directly, or could work with partners to pursue funding to address.

Beyond addressing the specific problem areas identified in this plan, there are often opportunities to improve management of stormwater runoff that arise as part of routine municipal projects, such as the substantial reconstruction of a road surface or intersection. Grant funds may be available to cover the incremental cost of addressing stormwater runoff as part of such projects, if stormwater management is considered early enough in the design process. It is often significantly more cost-effective and efficient to incorporate stormwater management measures into a planned municipal project as compared to the construction of a “stand alone” stormwater management retrofit.

In addition to exploring opportunities to address current stormwater management needs, St. Albans Town can take steps to prevent future stormwater problems by expanding how stormwater management is addressed in zoning regulations. The Town of St. Albans’ 2009 Zoning Bylaws and Subdivision Regulations contain language specific to stormwater management through the implementation of a minimum setback distance, in the Lakeshore Zoning District, of 75 feet from the mean high water mark of Lake Champlain (95.5 feet) for all structures other than seawalls. The regulations also state that seawalls shall be constructed at an elevation of 98’ or higher, meaning that the base of the wall where entering the ground must be 98’ or higher.

Proposed subdivisions containing more than two lots are required to undergo a review process; submittal requirements include the locations of existing and proposed utilities. Section 221.5 of the Regulations provides specific review standards related to stormwater management, including a requirement that “Drainage Facilities shall be provided sufficient to accommodate the two and ten year return period storm runoff from all roads, lots and upstream drainage areas, whether inside or outside the development. Post-development runoff/drainage (volume & rate) shall not exceed pre-development runoff/drainage (volume & rate).” Section 221.6 sets standards for maintaining existing vegetation, including that “[v]egetated buffers along stream banks are to be maintained or enhanced as required by the Development Review Board for filtration, erosion control and aesthetic purposes.”

In addition to the 75-foot setback for structures from Lake Champlain specified for the Lakeshore Zoning district, Section 403.1 specifies minimum setbacks to be used in locating structures, roadways, and parking in relation to stream banks, classified wetlands, and the shore of Lake Champlain:

Land Use	Named Streams	Water Courses	Class 1 Wetland	Class 2 Wetland
Structure	75 feet	25 feet	50 feet	50 feet
Impervious Roadways/Parking*	60 feet	20 feet	50 feet	50 feet
Permeable Roadways/Parking*	50 feet	15 feet	50 feet	50 feet

* Excluding dwellings

Measurements made from:
Lake Champlain: Mean Water Mark (95.5’)
All streams and water courses: Center of Stream
Wetlands: Edge of Delineation

In addition to these requirements, the Town could articulate a clear preference in the land use and development regulations that low impact development approaches to land development (or re-development) that work with nature to manage stormwater as close to its source as possible, as opposed to more traditional “store and release” stormwater management practices.

Specific examples of how this might be accomplished include:

- Revising Section 221.5 to give preference to green stormwater infrastructure practices such as bioretention areas and disconnection practices that direct stormwater runoff as sheet flow to vegetated buffer areas.
- Revising parking standards (Section 402) to encourage minimal use of impervious surface. For example:
  - Providing a definition of a “parking space” as 9’ by 18’ (162 square feet) in order to prevent the construction of over-sized spaces.
  - Recommending or requiring smaller stalls for compact cars, up to 30% of the total number of parking spaces.
  - Re-evaluating specified parking requirements to prevent the creation of surplus parking. This could involve establishing parking requirements which reflect average parking demand rather than maximum demand, and replacing “parking minimums” in the Regulations with “parking maximums”.
  - Giving the Planning Commission the power to reduce parking requirements conditionally.

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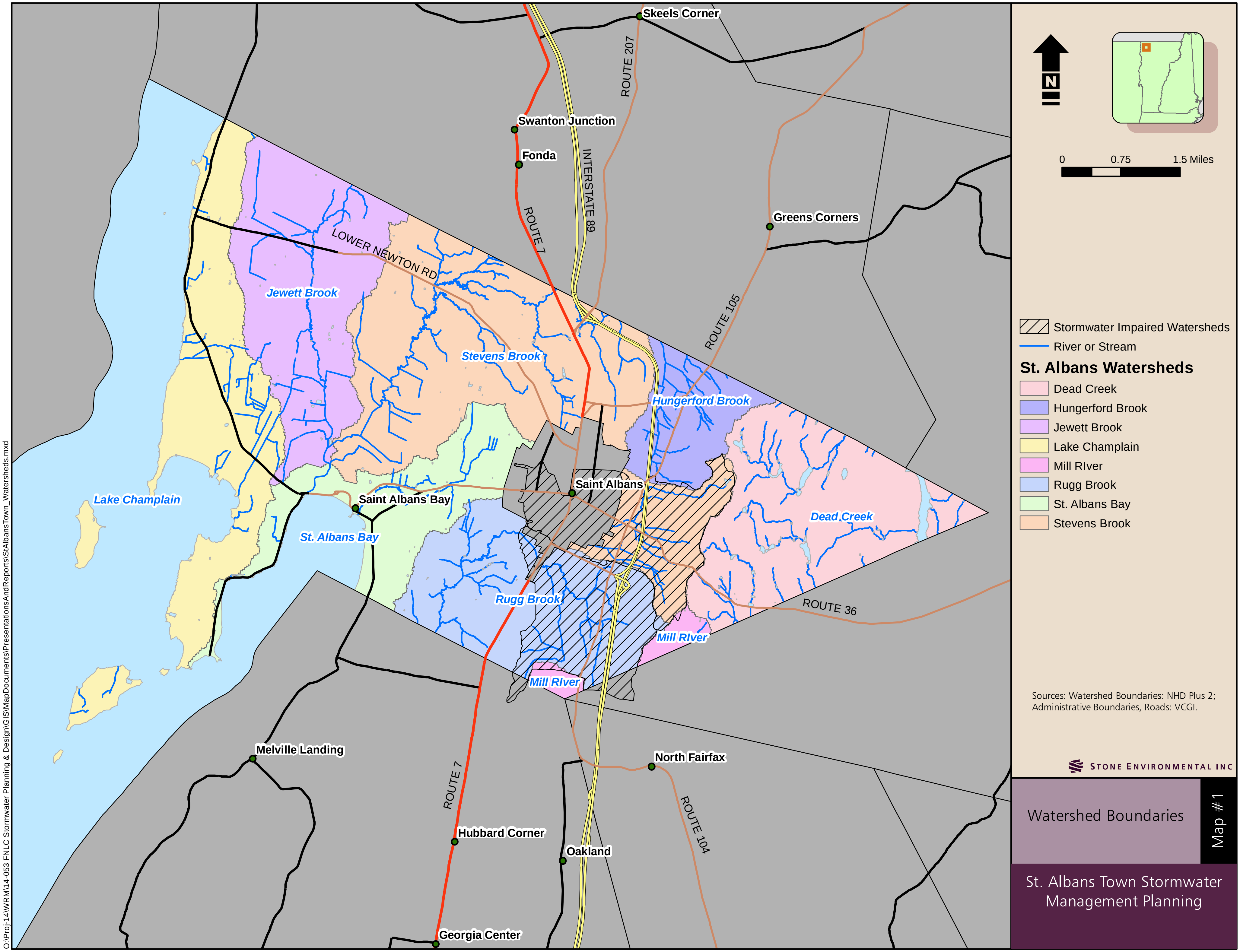
APPENDICES

APPENDIX A : WATERSHED MAP



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APPENDIX B : STORMWATER MANAGEMENT PLANNING LIBRARY

FINAL

STORMWATER MANAGEMENT PLANNING LIBRARY

TOWN OF ST. ALBANS

July 24, 2014

Prepared for:

Friends of Northern Lake Champlain
P.O. Box 58
Swanton, VT 05488
Tel. / 802.933.6677
E-Mail / info2FNLC@gmail.com

Prepared by:

Stone Environmental, Inc.
535 Stone Cutters Way
Montpelier, VT 05602
Tel. / 802.229.4541
E-Mail / info@stone-env.com
Stone Project ID / 14-053

STONE ENVIRONMENTAL INC

Table of Contents

1. BACKGROUND

Water has no political boundaries. As such, evaluations of water quality tend to be undertaken along watershed boundaries and to involve land areas in multiple municipalities, counties, and, in the case of the Lake Champlain, countries. For example, the Missisquoi River watershed area includes part or all of twenty northern Vermont communities in three counties. Although from a strict water quality perspective it would be ideal to manage our water resources along watershed lines, the reality is that many decisions, in particular decisions about land use, are made at the local level. This report is designed to summarize the information currently available from the suite of reports that speak to water quality in the various rivers, lakes, and streams that pass through or are located wholly within the Town of St. Albans, Vermont. Although water quality assessment data dating back to the 1970s is available for St. Albans Bay and for the Missisquoi River watershed, this summary focuses on assessments and reports that have been prepared in the past twenty years. This report will serve as the basis for developing a St. Albans Town-specific list of strategic, prioritized projects that could be undertaken to improve water quality.

2. INTRODUCTION

The Town of St. Albans is located in Franklin County in northwest Vermont. The town has a total area of 60.6 square miles, of which 37.6 square miles (62%) is land and 23.0 square miles (38%) is water[1]. As of the 2010 Census, the population of the town was 5,999[2]. The "water component" of St. Albans Town includes a number of rivers, streams and lakes and ponds, including Lake Champlain, St. Albans Bay, and portions of the Jewett Brook, Stevens Brook, Rugg Brook, and Mill River watersheds, as well as several tributaries to the Missisquoi River (See Figure 1 for a map of watershed boundaries). Development in the area is primarily concentrated near the City of St. Albans and along the shores of St. Albans Bay and Lake Champlain.

The western three-quarters of St. Albans Town drains either to St. Albans Bay (including the portions of town within the Jewett Brook, Stevens Brook, Rugg Brook, and Mill River watersheds) or directly to Lake Champlain. Relatively small areas in the northeast corner of town are in the Missisquoi River watershed (including portions of the Hungerford Brook, Fairfield Pond, and Dead Creek watersheds), and drain to that river and ultimately to Missisquoi Bay.

Numerous and varied groups and individuals have invested considerable effort in evaluating different components of the Town of St. Albans's water resources, and the important interface between water resources and local land use decisions. At times these evaluations have followed watershed boundaries and other times they have followed political boundaries. The following sections identify evaluations that have been done to date and pull out the pieces 1) most relevant to St. Albans Town and 2) most relevant to future efforts to develop a list of strategic, prioritized projects that could be undertaken to improve water quality in and around the town.

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[1] 2012 Town of St. Albans, Franklin County, Vermont Town Plan, http://www.stalbanstown.com/wp-content/uploads/2014/03/Town-Plan-Signed.8.13.2012.pdf

[2] 2010 US Census data, http://www.census.gov/2010census/popmap/

3. WATERSHED-BASED ASSESSMENTS

The ongoing assessments described below are generally led by the State of Vermont's Agency of Natural Resources (ANR). These include:

- Basin planning efforts, whose main purpose is to guide ANR in its own work and in collaborative projects with the public, municipalities, and other state and federal agencies. The basin plans have a five-year scope. The majority of the Town of St. Albans is within the Northern Lake Champlain Direct Drainages basin, which plan was last updated in 2009. The northeastern portion of the Town is within the Missisquoi Basin, which plan was last updated in March of 2013.
- Stream geomorphic assessment work, undertaken to understand the natural tendencies of a particular reach of stream or river, its current condition, and what changes may be anticipated in the future. Stream geomorphic assessments have been completed for the Hungerford, Jewett, Rugg, and Stevens Brooks and for the Mill River in St. Albans Town.
- In-stream or in-lake water quality assessment work, including water chemistry and biological assessments.

The portions of Stevens Brook and Rugg Brook that have been designated as stormwater impaired (Figure 1 and Section 3.10) are subject to specific permitting requirements and, as such, were not evaluated during this project; potential stormwater-related issues within these sub-watersheds are not included in the following section.

3.1. Missisquoi River Watershed Assessments

3.1.1. Missisquoi River Watershed Water Quality Management Plan[3]

Portions of St. Albans Town fall outside the Lake Champlain Direct Drainages basin and thus are not covered by that Water Quality Management Plan. The Missisquoi River Basin Water Quality Management Plan, most recently revised in March of 2013, overviews water resources, and identifies concerns and threats to water quality within the more than 619 square miles of Vermont that drain to the Missisquoi River. Utilizing recommendations from a broad array of stakeholders, the Plan summarizes strategies and specific actions to guide efforts to sustain and improve water quality and aquatic habitat over the next five years.

The Plan's high priority strategies include the following:

- Implement projects to meet the phosphorus reduction targets for Lake Champlain and Lake Carmi, and to meet the bacteria reduction targets for Berry, Godin and Samsonville Brooks.
- Work with towns, VTrans and private landowners to use existing culvert assessments to identify appropriate replacement size and placement to improve fish passage and the geomorphic stability of the stream.

[3] http://www.vtwaterquality.org/mapp/docs/mp_Basin06Plan.pdf

- Use the Critical Source Area study to direct technical and financial agricultural resources to identified critical sources.
- Work with towns to protect river corridors and promote flood resiliency by establishing Fluvial Erosion Hazard zones and buffer zones in local zoning.
- Identify wetlands on agricultural lands for phosphorus retention, and in the river corridor for sediment attenuation, and then prioritize and conserve and/or restore.
- Encourage use of the basin's rivers and lakes to increase people's appreciation of the water resources.
- Assist the towns in addressing specific wastewater treatment infrastructure upgrade needs identified in the Clean Water Fund's forthcoming Water Survey.

The Plan does not identify any specific concerns for waters located in St. Albans Town; it does state that the Missisquoi River (whole length) is considered to be stressed from high sediment loads, turbidity, nutrient enrichment, and increased water temperature, likely from agricultural land uses, loss of riparian vegetation, and stream-bank erosion.

3.1.2. Links Between Geomorphic Condition, Water Quality, and Phosphorus Loading in Hungerford Brook, Vermont (Dani Newcomb)[4]

A 2007 masters thesis developed by a University of Vermont Rubenstein School student examined the links between geomorphic condition, water quality, and phosphorus loading in Hungerford Brook. Specifically, the thesis focuses on:

- The impacts of land use at the watershed and near-stream scales on total suspended solids, total phosphorus, and soluble reactive phosphorus.
- The link between geomorphic condition and phosphorus and sediments in the Hungerford Brook watershed as the spatial scale varies.
- The contribution of soil phosphorus in stream banks to the total phosphorus load in Hungerford Brook.

The results of the study found that in Hungerford Brook:

- Phosphorus and sediment transport happens mainly during storm events and that concentrations greatly exceed the state standards.
- Phosphorus concentrations are significantly lower at the mouth of Hungerford Brook than upstream in the subwatershed, indicating that deposition is occurring in the downstream subwatersheds.
- Agricultural land use is closely associated with stream instability.

[4] http://www.lcbp.org/PDFs/IJC_MBBP/P_loading_Hungerford_Brook.pdf

3.1.3. Missisquoi Areawide Plan[5]

In 2008, the NRCS completed the Missisquoi Areawide Plan, a watershed-based plan designed to reduce the phosphorus load delivered to Missisquoi Bay. The document was structured to inform and help partner agencies and cooperating farmers. The Areawide Plan consists of a series of water quality improvement strategies that target efforts to specific priority areas. The strategies were developed in consultation with local stakeholders and representatives of various state and federal agencies. The Areawide Plan was designed to help move conservation implementation actions away from a "first come, first served basis" in order to target financial and technical resources to the areas of the watershed with the greatest conservation need. The plan includes a considerable amount of geospatial data, including information on farmstead location, annual crop and hay lands, and the adjacency of cropland to areas with steep slopes.

3.1.4. Identification of Critical Source Areas of Phosphorus in the Vermont Sector of the Missisquoi Bay Basin[6]

Critical Source Areas are areas of the landscape that, absent proper management, are likely to produce disproportionate amount of phosphorus loading to adjacent waterways. Detailed data about the distribution of potential Critical Source Areas (CSAs) of phosphorus to Missisquoi Bay were developed using a Soil and Water Assessment (SWAT) model. The areas identified using this modeling approach were selected primarily by their soils, landscape features, proximity and connectivity to streams, and the land use or farm crop practices that are in place or are likely to be in place. To view this data in an interactive map, visit lcbp.stone-env.com.

From a stormwater management standpoint, phosphorous critical source areas are areas of development (including roads) with a high potential for stormwater runoff. In general, roads with steep grades are particularly vulnerable to runoff and likely to be identified as CSAs. In the Missisquoi Basin portion of St. Albans Town, CSAs identified by the model include:

- VT Route 105 near the Swanton town line
- Fairfield Hill Road (VT Route 36) near the Fairfield town line

3.2. St. Albans Bay Watershed Assessments

3.2.1. Northern Lake Champlain Direct Drainages Water Quality Management Plan[7]

The majority of the land in St. Albans Town drains directly to Lake Champlain and is therefore included in the Northern Lake Champlain Direct Drainages Water Quality Management Plan ("Basin 5 Plan"). The Basin 5 Plan includes areas draining directly to the Lake beginning at the Ferrisburgh/Charlotte town line and ending at the Canadian border, and all Vermont surface waters that drain directly into this section of the Lake, except for three major river watersheds: the Missisquoi (including the Rock and Pike Rivers), the Winooski, and the Lamoille river watersheds. ANR approved the Basin 5 Plan in October 2009.

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[5] http://www.nrcs.usda.gov/wps/portal/nrcs/detail/vt/technical/dma/?cid=stelprdb1176944

[6] http://www.lcbp.org/wp-content/uploads/2013/04/63_Missisquoi_CSA.pdf

[7] http://www.vtwaterquality.org/planning/docs/pl_basin5.Finalplan.pdf

The Basin 5 Plan does not identify strategies specific to any particular waterway but rather outlines a series of broad-based strategies that could be considered. These include recommendations for enhancing efforts to protect stream corridors, improve stormwater management, reduce agricultural pollution, and prevent the spread of aquatic invasive species.

3.2.2. LaRosa Volunteer Data[8] (2004 – 2005)

In 2004-2005, water samples were collected by the St. Albans Bay Association at up to 15 sites in the St. Albans Bay watershed; five of these sites are located in St. Albans Town and are not in stormwater-impaired watersheds. Three of the locations were in the Stevens Brook watershed, and two were in the Jewett Brook watershed. Samples were analyzed by the VT DEC's LaRosa laboratory for total nitrogen, total phosphorus, total suspended solids, and turbidity. All sample results are available online at the source listed below, and are summarized in Table 1. Average total phosphorus and total nitrogen measurements on an annual basis in monitored streams in the St. Albans Town portions of the St. Albans Bay watershed are generally elevated, with annual average total phosphorus levels routinely exceeding 100 ug/L. Unfortunately, it is not possible to determine what portion of the measured pollutant load is attributable to stormwater runoff as compared to other sources (such as agriculture).

3.2.3. Lay Monitoring Lake Water Quality Data[9] (1979-2013)

Since 1979, in-lake water samples have been collected in St. Albans Bay by volunteer monitors. Volunteers collect water samples that are analyzed for total phosphorus, chlorophyll-a, and Secchi transparency. All sample results collected through this program are available online at the source listed below.

3.2.4. Lake Champlain Long-Term Water Quality and Biological Monitoring Program[10]

The Lake Champlain Long-Term Water Quality and Biological Monitoring Program began in 1992 and has continued each year since then. The project is conducted by the Vermont Department of Environmental Conservation (DEC) and the New York State DEC, with funding provided by the Lake Champlain Basin Program and the two states. The program includes 22 monitoring stations spread throughout the basin, including a station in St. Albans Bay (station 40). A summary of total nitrogen, total phosphorus, and total dissolved solids for this station is included as Table 2. Mean annual total phosphorus measurements at Station 40, near the center of St. Albans Bay, has increased from 20-22 ug/L in the early 1990s to 30-35 ug/L in 2010-2013.

3.2.5. St. Albans Bay Watershed Initiative Project Inventory[11]

In partnership with VTDEC, Northwest Regional Planning Commission is, as of July 2014, in the process of identifying water quality improvement nonpoint source projects in the St. Albans Bay watershed using three approaches:

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[8] http://www.vtwaterquality.org/cfm/larosavm/mp_larosavolmon.cfm

[9] https://anrweb.vermont.gov/dec/dec/LayMonitoring.aspx

[10] http://www.lcbp.org/PDFs/MissisquoiPLoadMonitoringPlan.pdf

[11] http://www.watershedmanagement.vt.gov/erp/docs/erp_2013annualreport.pdf

1. Evaluation of previously completed water quality improvement documents.
2. Potential critical source area identification.
3. Identification/inventory of nonpoint source projects. The inventory will identify three categories of projects: unpaved town roads, river and stream corridors, and non-Municipal Separate Storm Sewer System (MS4) implementation. Projects identified under this approach will be ranked by priority with respect to relationship to critical source area analysis.

When complete, this effort will likely identify additional stormwater-related retrofit project opportunities in St. Albans Town.

3.2.6. Landscape Modeling and Spatial Optimization of Management Practices to Restore Water Quality in the St. Albans Bay Watershed[12]

The primary objective of the study was to develop and implement a framework to examine the effectiveness of proposed solutions to diffuse phosphorus pollution, including identifying the relative importance of different sources (spatially and temporally) and transport processes of phosphorus in the watershed. In order to achieve this objective, the author developed a landscape model of the bay watershed.

Key findings of the study include:

- The majority of phosphorus runs off during storm events, rather than during spring runoff as was previously hypothesized.
- Soil test results showed that residential and commercial properties are significantly over-fertilized with phosphorus.

3.2.7. Feasibility Study for the Control of Internal Phosphorus Loading in St. Albans Bay[13]

In response to the lack of improvement in water quality despite efforts to reduce external phosphorus loading, in 2007 the Vermont Agency of Natural Resources contracted ENSR Corporation to conduct a feasibility study of potential techniques for managing internal phosphorus loading within St. Albans Bay. This report outlined a plan of action to reduce internal phosphorus loading as a part of a larger effort to rehabilitate St. Albans Bay by addressing phosphorus pollution in both the Bay and Bay watershed in order to reduce algal blooms to the lowest possible level. In-lake phosphorus management options considered included enhancing circulation, dredging, and internal phosphorus inactivation. The consultants concluded that “in-lake treatments alone will not solve the algal bloom problems of the enriched bay on more than a temporary basis. It is believed that further reductions in watershed nutrient loading must precede any in-lake treatment. An interim nutrient input reduction accomplished by dosing tributaries with aluminum during periods of elevated flow and nutrient concentrations could provide relief until watershed management actions can be fully implemented.” Specific stormwater-related retrofit options in the St. Albans Bay watershed were not identified as part of this work.

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[12] http://www.iemss.org/iemss2006/papers/s2/345_Gaddis_1.pdf

[13] http://www.watershedmanagement.vt.gov/erp/docs/StAlbansBay-FinalReport-Phase1.pdf

3.2.8. Determination of Sediment Phosphorus Concentrations in St. Albans Bay, Lake Champlain: Assessment of Internal Loading and Seasonal Variations of Phosphorus Sediment-water Column Cycling[14]

This study was undertaken by researchers from the University of Vermont Geology Department in 2005 "to determine the current quantity of phosphorus in the sediments of St. Albans Bay" and to "address the role of seasonal variations related to changing redox conditions and mineralization on phosphorus cycling and mobility in those sediments". The results of the study indicated "that there remains a substantial reservoir of phosphorus in the sediments of St. Albans Bay which is mobile within the sediment column due to changing redox front positions and associated changes in iron and manganese mineralization. This sediment reservoir has the potential to contribute phosphorus to the water in the bay for a long period of time into the future; flux of sediment into the overlying water column will be at least partly based on highly reducing events which may vary considerably in space and time."

3.2.9. The Phosphorus Problem in St Albans Bay: A Summary of Research Findings[15]

This paper was prepared by Eric Smeltzer of VTDEC in 2003 at the request of the St. Albans Area Watershed Association. Its purpose was "to provide a concise summary of the major research findings about the phosphorus problem in St. Albans Bay in order to identify what we know, and what we do not know, about the problem". The report concludes:

> *Phosphorus levels in St. Albans Bay remain in excess of the amount allowed by the Vermont Water Quality Standards, and the situation does not seem to be improving as predicted. The wastewater phosphorus loads to the bay are well under control. The St. Albans Treatment Facility is consistently meeting its strict effluent phosphorus limits. However, nonpoint source loads to the bay from agricultural and urban runoff occur at very high rates for such a small watershed. While nonpoint source runoff is minor during the dry summer months when phosphorus levels in the bay are at their peak, it is possible that nonpoint source phosphorus delivered to the bay during the springtime and other wet seasons is being temporarily stored in the sediments and then released back into the water during the summer as internal loading. The continuing excessive nonpoint source phosphorus loads could be adding to the historical phosphorus stored in the sediments, thereby slowing the bay's recovery.*

Three critical areas of action were identified in this report: control nonpoint sources (though no specific projects related to stormwater management are identified), evaluate the feasibility of an alum treatment, and monitor (non-point) phosphorus loads.

[14] http://www.vtwaterquality.org/erp/docs/StAlbansBaySedimentPstudy.pdf

[15] http://www.vtwaterquality.org/lakes/docs/lp_stalbansphosphorus.pdf

3.2.10. Identifying Toxic Constituents of Urban Runoff from Developed Areas within the Champlain Basin[16]

This 1994 report focuses on non-point, urban sources of toxic pollutants. Monitoring activities were conducted in twelve predominantly urban watersheds, ten in Vermont and two in Plattsburgh, New York with the objective of determining: 1) the cumulative effects of urban impacts to the biological communities of these streams; and 2) the potential of the streams to contribute toxic substances to Lake Champlain. One of the locations investigated was Stevens Brook in the Town of St. Albans. Results for samples taken at the mouth of Stevens Brook included:

- Trace levels of polycyclic aromatic hydrocarbons (PAHs) were detected in transplanted mussels
- Zinc was the most commonly detected metal followed by chromium, copper, and nickel. Arsenic and lead were not detected in any sample. Mercury was detected at two sites, including Stevens Brook, at low levels. There appeared to be no correlation between concentrations of metals in sediments and in fish.
- The sediment at Stevens Brook was highly organic and very fine. Low level ecological effect sediment criteria were exceeded for seven of the nine metals in both whole and fine sediments at the Stevens Brook site. Zinc, nickel, and chromium were significantly elevated in Stevens Brook sediments.
- The macroinvertebrate community in Stevens Brook was rated as “fair” and the fish community was rated as “poor”.

3.3. Stream Geomorphic Assessment Final Reports[17]

Stream geomorphic assessments have been completed for Hungerford Brook, Jewett Brook, Stevens Brook, and Rugg Brook. The assessment results are designed to direct future stream corridor restoration and protection measures. The nature of each section of the watershed is characterized and each reach described. Potential restoration projects identified during this work with ties to stormwater management and/or high flows are listed and briefly described below by stream and stream reach.

3.3.1. Phase 2 Stream Geomorphic Assessment[18] and Corridor Plan[19], Hungerford Brook

Potential restoration projects identified during this work with ties to stormwater management and/or high flows are listed and briefly described below by stream and stream reach. See Figure 2 for a stream geomorphic assessment reach map.

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[16] Quackenbush, Alan. 1994. Identifying Toxic Constituents of Urban Runoff From Developed Areas Within The Champlain Basin. Interim report, results of screening activities, 1993-1994, prepared for Lake Champlain Basin Program and U.S. EPA. 65 pp. Not available online.

[17] https://anrnode.anr.state.vt.us/SGA/finalReports.aspx

[18] https://anrnode.anr.state.vt.us/SGA/report.aspx?rpid=28_P2A&option=download

[19] https://anrnode.anr.state.vt.us/SGA/report.aspx?rpid=28_CPA&option=download

For the geomorphic assessment, Hungerford Brook was divided into twelve reaches (Figure 2). The four southernmost, headwaters reaches of the brook (M12 through M08) are completely or partially in St. Albans Town. The goal of this study was to identify stream conditions, including sediment and nutrient inputs, channel constrictions, and other features. Common stressors found in the watershed were:

- Lack of woody buffers
- Accelerated erosion due to increased hydrologic pressure
- Undersized culverts
- Straightened channels
- Drainage of wetlands

Of these reaches, only reach M08 has undergone a Phase 2 geomorphic assessment. This reach was found to be in minor adjustment, but to be very sensitive to additional disruption from a number of stressors.

The Hungerford Brook Corridor Plan, completed in April 2008, "identifies scientifically sound and ecologically beneficial river restoration and conservation projects that will not only improve water quality, but also improve the community's relationship with the river". Projects identified in this report with ties to stormwater management or high flows included:

- Reach M08B: Replace undersized culverts **-** Three private culverts noted as channel/floodplain constriction with structure width/channel width ratios of 30%, 60%, and 30%.
- Reach M09A: Replace undersized Culvert on Route 105 – Current culvert undersized acts as channel/floodplain constriction. May need further Phase III Assessment prior to replacement; current structure only ~35% of channel width.
- Reach M09B: Replace undersized culvert on Private Farm Road **-** Current culvert undersized acts as channel/floodplain constriction. Current structure only ~40% of channel width.

3.3.2. Stevens, Rugg, and Jewett Brook Watersheds, Phases 1 and 2 Stream Geomorphic Assessment (2005)[20]

Potential restoration projects identified during this work with ties to stormwater management and/or high flows are listed and briefly described below by stream and stream reach.

Jewett Brook:

For the Phase 1 geomorphic assessment, Jewett Brook was divided into seven reaches (Figure 3). Part or all of five reaches—M01 through M05—are completely or partially in the Town of St. Albans. All of these reaches were characterized as "slightly entrenched but with access to a floodplain, moderate to high width to depth ratios, and gentle slopes." The report noted that there was very little topographic relief in the watershed (lowest point 97 feet, highest point 206 feet) and that the dominant land cover in all reaches was agricultural – either crop or field.

[20] https://anrnode.anr.state.vt.us/SGA/report.aspx?rpid=7_P2A&option=download

The report concluded that many of the challenges in managing Jewett Brook came from systemic conditions in the watershed. Specifically, the report notes:

- The original forested land cover has been replaced by an agricultural landscape.
- The agricultural lands often have narrow stream buffers
- Infrastructure investments (e.g., road, bridges and culverts) limit the streams' ability to widen.
- Large portions of the stream system have been straightened.

Stevens Brook:

The Phase I assessment divided Stevens Brook into 11 main stem reaches (M01-M11 labeled downstream to upstream), two tributaries with four (T1.01-T1.04) and three (T2.01-T2.03) reaches, and one sub-tributary (T1S1.01) (Figure 4). Reaches M01 through M04 pass through agricultural land in St. Albans Town. Reaches M05 through M10 pass through St. Albans City and continue across I-89. Reach M11 is principally a mountain stream on the east of St. Albans City. The portion of the watershed upstream of river mile 6.8 (Pearl Street in St. Albans City), roughly corresponding to reach M05 and greater, has been designated as stormwater-impaired (see Section 3.11) and cannot be further considered here.

The Phase II assessment found that Reach M01 showed little need for projects to improve water quality, with riparian corridor and wetlands appeared appearing essentially intact. Reach M02 is principally agricultural with a mixture of crop and pasture land; the most downstream section (M02A) was straightened and heavily influenced by high lake levels causing back flow; pastured cattle had access to the water. In reaches M02B and C, extensive erosion is occurring at each meander bend. No substantial needs for projects to improve water quality were noted for reach M03. Reach M04, as the least impacted stream reach in the Stevens Brook system during the Phase I assessment, was not further investigated in the Phase II work.

Rugg Brook:

The Phase I assessment identified eleven reaches along the main stem of Rugg Brook (Figure 5). From downstream to upstream, reaches M01 through M05 drained principally agricultural land, while reach M06 receives drainage from the St. Albans industrial park and Nason Drive. The diversion structure, which shunts water from Stevens Brook to Rugg Brook during high flows, discharges to reach M07, increasing the volume of storm flows for all reaches downstream. Reaches M07 through M09 pass through the most heavily developed portion of the watershed, while reach M10 ran from Quentin Court nearly to Rt. 104 and M11 was located between Rt. 104 and I-89. The portion of the watershed upstream of river mile 3.1, roughly corresponding to reach M06 and greater, has been designated as stormwater-impaired (see Section 3.11) and cannot be further considered here.

Of the non-stormwater-impaired stream reaches of Rugg Brook in St. Albans Town, only reach M05 has undergone Phase II assessment. In this reach, the downstream portion was extensively straightened, and substantial bank erosion and slumping was observed, but specific projects to improve water quality in this reach were not identified.

3.3.3. Fluvial Erosion Hazard Mapping & Phase 2 Assessment Report (Mill River and Rugg Brook) [21]

During the summer of 2006, Phase 2 stream geomorphic assessments (SGA) were completed on approximately 26 miles of stream located throughout Franklin County, Vermont. The purpose of completing the Phase 2 assessments was to provide NRPC with field data to develop Fluvial Erosion Hazard (FEH) maps for participating municipalities. The results of the Phase 2 SGAs and the FEH maps can be used by the municipalities and NRPC to guide management decisions regarding future development and land use within the FEH corridor. The project included additional analysis of the Rugg Brook watershed (as part of the Mill River watershed), but did not provide new information regarding potential water quality improvement projects for the non-stormwater-impaired portion of the watersheds in St. Albans Town. Likewise, no issues or potential projects were identified on the small portions of the Mill River watershed outside of Rugg Book that are located along the southern edge of St. Albans Town.

3.4. Watershed Study Report, Stevens Brook and Rugg Brook[22]

This engineering report, completed by DuBois and King in 2003, presents the results of an investigation of the entire area of both the Stevens Brook and the Rugg Brook watersheds. The investigation addressed longstanding concerns regarding flooding and flood-related damages within the floodplain of these two brooks, as well as impaired water quality. The study concluded:

> *…[T]here are a number of water resource problems in the watershed. These problems are real, well documented, and will continue to grow as development continues.*
>
> *One critical point to make is that the problems are watershed wide, and are not restricted to the floodplain corridor along the brooks. The fact is, land use activities everywhere in the watershed contribute to the problems. It is only the symptoms that are most visible along the brooks.*
>
> *Also critical is the fact that there are growing development pressures in the watershed, particularly in the middle to upper reaches in St. Albans Town. There are a number of large development projects that are expected to be presented to the Town for approval in the near future. It is very important that these projects be located in non-flood prone areas, and that the stormwater systems be designed to mitigate the conversion of undeveloped lands to impervious areas.*
>
> *This study also concludes that there are a number of specific implementation measures that can address the problems. Many of these measures are inexpensive and do not require significant expenditures of funds to implement. Changing land use habits, such as disconnection of roof drains into the drainage systems, or the restriction of most activities in the riparian buffers are several examples. Some of the implementation measures are not simple, and will require long term planning and extensive funding, such as large detention*

[21] https://anrnode.anr.state.vt.us/SGA/report.aspx?rpid=109_P2B&option=download

[22] http://www.nrpcvt.com/Publications/Reports/NaturalResourcesWaterQuality/StevensRuggReport.pdf

basins. However, it is the coordinated implementation of a combination of large and small measures that will result in the long term, sustainable use in this watershed.

3.5. Impaired Surface Waters[23]

Every two years, under section 303(d) of the Clean Water Act (CWA), states are required to list impaired waters in need of total maximum daily loads (TMDL). Impaired waters are those that continually fail to meet quantitative water quality criteria (Vermont Water Quality Standards (VWQS) in the case of Vermont waters). TMDLs are load allocations for point and nonpoint sources of pollution appropriate for a particular body of water for it to meet water quality standards. The following are water bodies within St. Albans Town listed under section 303(d) as impaired surface waters in need of TMDL.

- Rugg Brook, from its mouth to approximately 3.1 miles upstream, fails to meet VWQS because of E. coli, nutrients, and sediment pollution due to agricultural runoff. This segment of Rugg Brook has a high TMDL priority, suggesting completion of TMDL within 1-3 years
- Jewett Brook (3.5 miles of main stem) fails to meet VWQS because of E. coli, nutrients, and sediment pollution due to agricultural runoff. Jewett Brook has a high TMDL priority, suggesting completion of TMDL within 1-3 years.
- Stevens Brook, from its mouth upstream 6.8 miles, fails to meet VWQS because of E. coli, nutrients, and sediment pollution due to agricultural runoff and morphological instability. This segment of Stevens Brook has a high TMDL priority, suggesting completion of TMDL within 1-3 years.
- Stevens Brook, from its mouth upstream 6.8 miles, fails to meet VWQS because of E. coli, nutrients, and sediment pollution due to agricultural runoff and morphological instability. This segment of Stevens Brook has a high TMDL priority, suggesting completion of TMDL within 1-3 years.
- Stevens Brook, from approximately 1 mile below the Central Vermont Rail Yard upstream to that yard, fails to meet VWQS because of sediment, oil, grease, and hydrocarbons due to sediment, soil & water contamination from fuel spills and management. This segment of Stevens Brook has a low TMDL priority, suggesting that eight or more years may pass before a TMDL is developed.

Portions of the Stevens Brook[24] and Rugg Brook[25] watersheds in St. Albans Town (Figure 1) have been designated as impaired by stormwater runoff, and TMDLs for both watersheds were developed and approved by the U.S. EPA in February 2009. Flow restoration planning efforts are now underway for both watersheds.

[23] http://www.vtwaterquality.org/mapp/docs/mp_2012_303d_Final.pdf

[24] http://www.vtwaterquality.org/stormwater/docs/sw_ste_tmdl_finalapproved.pdf

[25] http://www.vtwaterquality.org/stormwater/docs/sw_rug_tmdl_finalapproved.pdf

4. MUNICIPALITY-SPECIFIC ASSESSMENTS

In addition to the watershed-based assessments, a number of pieces of data are developed on a municipality-by-municipality basis. These are important to fold into any effort to develop a list of strategic, prioritized projects that could be undertaken to improve water quality in and around the Town of St. Albans. These include direct feedback from the Town, work by the Vermont Agency of Transportation, as well as past and current planning initiatives.

4.1. Town Feedback

In meetings with Stone Environmental, St. Albans Town officials indicated that many of their current areas of highest priority and concern were located within the stormwater-impaired watersheds of Stevens and Rugg Brooks. Once Stone's preliminary problem area identification field efforts are completed, staff will meet again with Town officials to discuss findings and learn more about the Town's concerns.

4.2. City and Town of St. Albans Illicit Discharge Detection and Elimination (IDDE) Study Final Report[26]

A comprehensive Illicit Discharge and Detection and Elimination Study was conducted in the City and Town of St. Albans, Vermont through an Ecosystem Restoration Grant (#2012 ERP-1-01) funded by the Vermont Department of Environmental Conservation (DEC). The study involved a comprehensive assessment of the City and Town's existing stormwater drainage system in order to identify and eliminate non-stormwater discharges to Stevens and Rugg Brooks. Most of the investigated drainage systems were located within stormwater-impaired portions of these watersheds. Several possible illicit discharges were located in the un-impaired portion of the Stevens Brook watershed, three of which were further investigated during this project. One of the systems evaluated (Outfall T123 at the Highgate Shopping Center) included an outfall constructed or 18" corrugated metal pipe that appeared to be in disrepair and could be a candidate for retrofit.

4.3. Town of St. Albans Erosion Study: Final Summary Report[27]

Watershed Consulting Associates, LLC (WCA) was retained by the Town in 2010 using Better Backroads funding (Section 4.6.3) to:

1) perform a Town-wide windshield survey to map erosion areas,

2) evaluate each mapped erosion area to determine if the Town road crew could repair the problem with limited design information, or if the problem area repair required a full engineering assessment,

3) prioritize each erosion area for risk to water quality and infrastructure,

4) prepare limited design plans and construction details for a subset of the mapped areas, sufficient enough for the Town road crew to repair the problem area, and

[26] http://www.watershedmanagement.vt.gov/erp/docs/erp_StAlbansIDDE_FinalReport_12-13_12.pdf

[27] Watershed Consulting Associates, LLC. 2010. Town of St. Albans Erosion Study: Final Summary Report. Prepared for the Town of St. Albans, November 15, 2010. 10pp. Not available online.

5) produce a GIS database to include all mapped erosion areas.

A total of 33 areas of erosion were mapped, primarily along Maquam Shore Road, within St. Albans Bay, in the urbanized areas to the north and south of St. Albans City, and along steeper roads east of the City. The French Hill area was not included, as areas of erosion were evaluated there in 2008. Twenty-six of these areas were assigned as priority areas due to the potential impacts to water quality and/or infrastructure resulting from the erosion. For seven of the priority erosion areas, a complete engineering design was recommended to determine the appropriate solution for repairing the problem. For the remaining 19 priority areas not needing a full engineering design solution, a list of five typical construction details were developed and specifically recommended for the erosion problems observed.

The majority of the priority erosion areas identified in this work were located in the stormwater-impaired portion of Rugg Brook; the remaining seven priority areas are marked on Figure 7 and summarized on Table 4.

4.4. St. Albans Green Streets Flow Monitoring Project[28]

This project, located in the stormwater-impaired portion of Rugg Brook, monitored stormwater flow for two residential neighborhoods in St Albans City. One neighborhood was retrofitted with three rain gardens constructed in the median between the sidewalk and the street. The project documented flow reductions provided by those rain gardens compared to a nearby control watershed. Storms tended to produce significantly lower total event discharges after the rain gardens were installed, and the difference increased with increasing storm size. Within the range of storm magnitudes monitored, either the rain gardens were more efficient at detaining runoff at higher flows, possibly due to hydraulic factors at the curb cuts or, during smaller storms, relatively less runoff is generated on the upper, flatter portion of Rugg Street where the rain garden curb cuts are located when compared the more steeply sloped portion of the street downslope of the rain garden curb cuts.

4.5. St. Albans Area Stormwater Program Feasibility Study[29]

The Northwest Regional Planning Commission (NRPC) commissioned this Stormwater Program Feasibility Study to evaluate the potential options for a fee-based stormwater program to help meet the ongoing and anticipated future needs of both the City and Town of St. Albans for funding, management, and implementation of activities related to municipal stormwater management and regulatory compliance. Key findings of the report included:

- There are viable, realistic options for developing permanent, fee-based stormwater programs in each community independently, or through an inter-municipal program. It does appear that an inter-municipal program would result in several efficiencies, including staffing, use of equipment, greater ease of raising revenue, and a reduced impact on budgets from potentially non-paying landowners.

[28] http://www.watershedmanagement.vt.gov/erp/docs/erp_2013annualreport.pdf

[29] VHB Pioneer and Forcier Aldrich & Associates. 2009. St. Albans Area Stormwater Program Feasibility Study. Prepared for the Northwest Regional Planning Commission, June 2009. 135 pp. Not available online.

- There needs to be further, detailed discussion of appropriate staffing levels and structures, and the best division of management responsibilities for activities such as operations and maintenance, grant writing and management, finances and billing, and appeals and credits issues.
- Further discussion of the geographic extent of stormwater services that should be provided is very important to determine the appropriate level of municipal stormwater services for more rural areas of the Town, and the accompanying amount and structure of fees to support these services.

4.6. Vermont Agency of Transportation-Sponsored Programs

4.6.1. Vermont Online Bridge and Culvert Inventory Data[30]

Vermont has 2,699 long structures (bridges and culverts) greater than 20 feet on interstate, state, and town routes and another 1,276 short structures between 6 and 20 feet on the state system that the state Agency of Transportation (VTrans) inspects. Inspections are conducted every 24 months on long structures and every 60 months on short structures unless conditions warrant more frequent inspections. Data collected as part of these inspections can help identify not only bridges and culverts with structural deficiencies but also structures that may be adversely impacting water quality. The system contains basic information for nine bridges and 319 culverts in St. Albans Town. Of the culverts, 235 are located outside of the stormwater-impaired portions of the Stevens Brook and Rugg Brook watersheds; 132 (or about 55%) of these culverts are listed in the VTrans inventory as being in "fair" or worse overall condition. Eleven of these culverts were listed as being in "urgent" or "critical" condition (Figure 7 and Table 4).

4.6.2. Stream Geomorphic Assessment, Bridge and Culvert Data[31]

Failure Modes- Problems and Causes

This document records the failure modes of a select group of bridges and culverts in the Missisquoi River watershed in St. Albans Town. The tables provide a structure number and a road name for the structure. Typical problems with structures are scouring of the bank, other erosion issues, and poor structure placement. Although the database indicates that reports are currently available for structures and crossings on French Hill Road, no report results are currently returned.

Structure Failure Modes

This document is similar to the Failure Modes Problems and Causes, but includes issues such as sediment deposits, obstructed structures, floodplain problems, and beaver dams. No report data are currently available for culverts located in St. Albans Town.

[30] http://apps.vtrans.vermont.gov/BridgeAndCulvert/Login.aspx?ReturnUrl=%2fBridgeAndCulvert%2fDefault.aspx

[31] https://anrnode.anr.state.vt.us/SGA/datasets/selectReport.aspx?sortType=Town&bid=06&bnm=Missisquoi

4.6.3. Better Backroads Program[32]

St. Albans Town has been successful in obtaining multiple grants from the Agency of Natural Resources and the Better Backroads Program to address several pressing erosion issues that threatened public roads and bridges.

The Better Backroads Program helps fund work on gravel roads to alleviate erosion issues and improve water quality, using grants to municipalities, under the leadership of VTrans and VANR. In 2013, in response to federal funding requirements and program needs, VTrans and VANR made a variety of changes to this program, including use of state (rather than federal) funding, and movement of administrative and technical assistance from the Northern Vermont Resource Conservation and Development Council to VTrans.

The Vermont Local Roads Program[33], sponsored by the Vermont Agency of Transportation (VTrans) and the Federal Highway Administration (FHWA) and currently operated from St. Michael's College, provides information, training and technical assistance to cities, towns and villages in Vermont. This is done through seminars and workshops, distribution of materials and technical assistance to fulfill service requests. The administration and technical assistance offered through this program will also be transitioning from St. Michael's College to VTrans in 2015[34]

4.6.4. Ecosystem Restoration Program Projects[35]

St. Albans Town has 14 listed Ecosystem Restoration Program (ERP) projects, many of which are for work in the stormwater-impaired portions of Stevens and Rugg Brooks. Below is a brief description of each project and its status:

Project	ERP Program	Description	Start Year	Status
Rugg Brook Project Implementation	River Management	Reconstruction of flood plain for severely incised reach of Rugg Brook.	2006	Complete
St. Albans Bay Sediment Phosphorus Core Study	Monitoring	Study to determine long-term sediment phosphorus trends in St. Albans Bay	2004	Complete
Subwatershed Mapping of Stormwater Impaired Streams	Stormwater Management	Identify discharge points within the Rugg Brook stormwater-impaired watersheds and delineate the associated watersheds for those discharge points.	2005	Complete
Subwatershed Mapping of Stormwater Impaired Streams	Stormwater Management	Identify discharge points within the Stevens Brook stormwater-impaired watersheds and delineate the associated watersheds for those discharge points.	2005	Complete
St. Albans Bay water quality forum	Basin Planning	The St. Albans Area Watershed Assoc, with assistance from the Water Quality Division, organized a meeting attended by 33 people to discuss water quality problems in the Bay	2003	Complete

[32] http://www.vtwaterquality.org/erp/htm/backroads.htm

[33] http://www.vermontlocalroads.org/index.html

[34] http://www.leg.state.vt.us/docs/2014/bills/Passed/H-872.pdf

[35] http://www.vtwaterquality.org/erp/projects/

		with the community.		
Water quality monitoring in St. Albans Bay tributaries	Basin Planning	Water quality monitoring study to identify land uses that contribute phosphorus to the Bay via Stevens and Rugg Brooks.	2004	Complete
A spatial model of hydrology and nutrient transport	Basin Planning	UVM graduate students developed a spatially explicit/dynamic model of hydrology and nutrient transport with community input and technical advice from the Water Quality Division.	2004	Complete
Nason Street buffer planting	Basin Planning	The St. Albans Area Watershed Association coordinated the planting of a riparian buffer. The buffer averaged 35' wide along a 1250' stretch of Rugg Brook previously maintained as lawn.	2005	Complete
Feasibility Study for the Control of Internal Phosphorus Loading in St. Albans Bay	Monitoring	The Agency of Natural Resources initiated a feasibility study in 2006 to examine alternative methods for controlling this internal phosphorus loading.	2006	Complete
Stevens, Rugg, and Jewett Brook River Project Identification	River Management	This project will do a complete phase 1 stream geomorphic assessment on Stevens, Rugg, and Jewett Brooks located in St. Albans.	2005	Complete
Evaluation of Effectiveness of SolarBee (TM) Water Circulation Devices	Monitoring	Three SolarBee (TM) water circulator devices were operated in St. Albans Bay during May-August 2007 with the goal of reducing algae levels and improving water clarity over a total area of approximately 100 acres at the northern end of the bay.	2007	Complete
Road Inventory and Planning for French Hil	Better Backroads Program	Comprehensive road inventory and plan to address the stormwater drainage issues and related stream erosion on French Hill.	2008	Complete
St. Albans comprehensive review of road system	Better Backroads Program	Inventory and assessment of road drainage system and identification of water quality improvement opportunities.	2009	Complete
French Hill Road	Better Backroads Program	Drainage work to include a new culvert to reduce erosion on French Hill Road	2009	In progress

Vermont DEC staff working under the ERP also completed a Stormwater Mapping Project[36] in March 2009 which identifies specific areas in the City and Town of St. Albans for stormwater retrofits. In St. Albans Town, these areas are located in the Stevens Brook watershed, primarily along the VT Route 7 corridor between the northern border of the City of St. Albans and the Exit 20 interchange for I-89. A map showing the locations of top-priority retrofit opportunities was produced and is included as Figure 6; a table summarizing the high-priority retrofits is included as Table 3.

[36] http://www.watershedmanagement.vt.gov/erp/news/StAlbansStormmapping%20projectfinal.pdf

4.7. Vermont DEC Stormwater Permitting Program

4.7.1. State Stormwater Permits[37]

Currently, Vermont DEC requires that a stormwater permit be obtained when any construction, new development, or redevelopment results in impervious or disturbed area equal to or greater than one acre, with stricter requirements in watersheds that are classified as stormwater impaired. The State has developed a suite of technical standards for stormwater-related mitigation that are outlined in the Vermont Storm Water Management Manual, Volumes I and II. For example, the goal of a stormwater management program during construction is to mitigate sediment loss during storm events—while during and after construction, the objective is to maintain as much of the pre-developed hydrology as possible.

4.7.2. Environmental Research Tool[38]

ANR's Environmental Research Tool allows the user to look up the location of stormwater permits that have been issued by ANR, as well as the locations of hazardous waste sites, brownfields, and spills. There are approximately 120 documented stormwater permits (individual, 9010, 9003, or 9015) that have been issued to 82 sites in St. Albans Town. Roughly a third of these permits were issued for 31 sites located outside of the stormwater-impaired portions of the Stevens and Rugg Brook watersheds. None of the permits are currently expired, but the permit records database indicates that routine maintenance and reporting may not be consistently performed. Of the 31 sites, about a third (12 sites) are overdue for submittal of an annual inspection report, a designer's restatement of compliance, or both. The table below summarizes sites where the state stormwater permits database indicates that there may be maintenance needs. Depending on the age, style, size, and upkeep of an existing facility, these may be excellent candidates for improvement to enhance stormwater management capabilities.

Site ID	Permit Number	Project Name	Permittee Business	Status
3154	3154-9010.1, 3154-9015.1	Franklin Business Park East	GMS Derby, LLC	needs inspection, restatement
3655	3655-9010	St. Albans Wal-Mart	JLD Properties of St. Albans, LLC	needs inspection
3759	3759-9015	Phase II - Franklin Park West		needs inspection
3830	3830-9015	TC's RV's	TC's RV's	needs inspection, restatement
4149	4149-9015	Brigham Road Subdivision		needs restatement
4219	4219-9010.R	Franklin Park West Lot 19 Fine Lines Equipment	Franklin Park West Assoc.	needs inspection
4260	4260-9015	Newton's Forest Site Development	Newton's Forest Development, LLC	needs inspection, restatement
5222	5222-9010	Brigham Road Storage, LLC		needs inspection, restatement
5897	5897-9015	Route 7 South PUD	Route 7 South Condominium Homeowners Association	needs inspection, restatement
6212	6212-9010	Meadow Crossing	Meadow Crossing HOA, Town of St. Albans	needs inspection
6597	6597-9015	McDonalds Restaurant	McDonalds USA, LLC	needs inspection
6765	6765-INDS	US7 & VT207 intersection improvements	VT Agency of Transportation	needs inspection

[37] http://www.vtwaterquality.org/stormwater.htm

[38] http://www.anr.state.vt.us/WMID/StormWater.aspx

4.8. Town of St. Albans, Franklin County, Vermont, Town Plan[39]

Three sections of St. Albans Town's 2012 Town Plan relate to stormwater management: Land Use (Chapter 3), Transportation (Chapter 4); Historic, Scenic and Natural Resources (Chapter 5); and Facilities, Utilities and Services (Chapter 7).

The Land Use section contains "general development standards" that apply to all proposed development in the town of St. Albans. These standards include minimum environmental considerations for all development proposals, including that projects must adhere to the Town's Storm water Management Plan standards; Erosion Control Plan standards, especially for access permits and construction sites; landscape screening; and stream and wetland set-backs and standards. This section also includes limited information about the minimum National Flood Hazard Insurance Program (NFIP) standards, along with a statement restricting Flood Hazard Overlay regulations to meet and not exceed the minimum National Flood Insurance Program requirements, so that property owners may obtain flood insurance.

The Transportation section includes information about the Town of St. Albans' road network. Two policies and goals in this chapter relate directly to stormwater management:

- Policy 7. The Town shall explore mandated storm water regulations and determine the impact and implementation.
- Suggested Action 13. Explore and analyze storm water regulations, maps and tools to assure the regulations will not be overbearing for the Town to implement.

The Historic, Scenic, and Natural Resources section includes a summary of surface water resources (including Jewett, Stevens, and Rugg Brooks, St. Albans Bay, and Lake Champlain). The Lake Champlain phosphorus TMDL is described, and its (then-current) status as being under review by US EPA is noted. The history of water quality issues in St. Albans Bay is described, as well as the Town's efforts to improve the Bay's overall health. Storm water runoff is noted as "a consistent issue that the Town of St. Albans is and will continue to address", and the plan notes that the Town of St. Albans "should take a careful and logical approach to storm water management. Any storm water project should be accompanied with a feasibility study to ensure the cost/benefit analysis has been thoroughly considered and that taxpayers monies are efficiently being utilized." Stormwater management needs in portions of the Stevens and Rugg Brook watersheds, and the then forthcoming MS4 stormwater permit for the Town of St. Albans, are also described. Several policies and suggested actions in this section related directly to stormwater management:

- Policy 5. The Town shall explore programs and methods to protect streams and brooks.
- Policy 8. The Town shall explore programs and methods to protect all water sources.
- Policy 10. The Town shall explore storm water and water quality issues and regulations.
- Suggested Action 9. Review and update regulations, as necessary, related to storm water in response to regulatory changes.
- Suggested Action 10. Review and coordinate information with other municipalities, agencies and organizations in implementing MS-4 and other storm water/water quality permits.

[39] http://www.stalbanstown.com/wp-content/uploads/2014/03/Town-Plan-Signed.8.13.2012.pdf

- Suggested Action 11. Explore and analyze other communities who have implemented MS-4 permit requirements and other storm water strategies.
- Suggested Action 12. Proactively engage with the State and other agencies for the MS-4 permit.
- Suggested Action 13. Explore, review and update community BMP's for storm water control during construction.
- Suggested Action 14. Review and update regulations for proposed developments to include a BMP plan and storm water plan.
- Suggested Action 15. Explore and analyze funding options in anticipation of the MS-4 permit and other storm water/water quality permits/programs.
- Suggested Action 19. Explore and analyze the surrounding communities impacts to the streams and brooks within the Town.
- Suggested Action 20. Explore opportunities to coordinate storm water strategies with the surrounding communities.
- Suggested Action 21. Review and update regulations to ensure storm water compliance and permits with the State.

The Facilities, Utilities and Services section outlines current and expected future infrastructure-related services and needs. It notes that the Town Highway Department is responsible for road maintenance and repair of Town highways and drainage systems, including the maintenance of culverts and ditches annually in accord with the Town's Capital Improvement Plan. Several suggested actions in this section directly related to stormwater management:

- Suggested Action 11. Review and update the inventory of the location, condition and size of current infrastructure in the Town including water and sewer lines, culverts, ditches, etc.
- Suggested Action 15. Review and update regulations, as necessary, related to storm water in response to regulatory changes.
- Suggested Action 16. Review and coordinate information with other municipalities, agencies and organizations in implementing MS-4 and other storm water/water quality permits.

The Town of St. Albans' 2009 Zoning Bylaws and Subdivision Regulations[40] also contain language specific to stormwater management through the implementation of a minimum setback distance, in the Lakeshore Zoning District, of 75 feet from the mean high water mark of Lake Champlain (95.5 feet) for all structures other than seawalls. Seawalls shall be constructed at an elevation of 98' or higher, meaning that the base of the wall where entering the ground must be 98' or higher.

Proposed subdivisions containing more than two lots are required to undergo a review process; submittal requirements include the locations of existing and proposed utilities. Section 221.5 of the Regulations provides specific review standards related to stormwater management, including a requirement that "Drainage Facilities shall be provided sufficient to accommodate the two and ten year return period storm runoff from all roads,

[40] http://www.stalbanstown.com/wp-content/uploads/2014/03/Bylaws-Subdivision-Regulations-2009.pdf

lots and upstream drainage areas, whether inside or outside the development. Post-development runoff/drainage (volume & rate) shall not exceed Pre-development runoff/drainage (volume & rate).” Section 221.6 sets standards for maintaining existing vegetation, including that “[v]egetated buffers along stream banks are to be maintained or enhanced as required by the Development Review Board for filtration, erosion control and aesthetic purposes.”

In addition to the 75-foot setback for structures from Lake Champlain specified for the Lakeshore Zoning district, Section 403.1 specifies minimum setbacks to be used in locating structures, roadways, and parking in relation to stream banks, classified wetlands, and the shore of Lake Champlain:

Land Use	Named Streams	Water Courses	Class 1 Wetland	Class 2 Wetland
Structure	75 feet	25 feet	50 feet	50 feet
Impervious Roadways/Parking*	60 feet	20 feet	50 feet	50 feet
Permeable Roadways/Parking*	50 feet	15 feet	50 feet	50 feet

* Excluding dwellings

Measurements made from:
Lake Champlain: Mean Water Mark (95.5’)
All streams and water courses: Center of Stream
Wetlands: Edge of Delineation

5. OTHER RELATED INFORMATION

There are a significant number of farm operations in St. Albans Town. Farmsteads (barn areas) often contain a large amount of impervious surface and may be an important source of stormwater pollution.

5.1. NRCS Conservation Practice #558—Roof Runoff Structure[41]

NRCS Standard #558 addresses the management of stormwater from farm structures; specifically, where roof runoff from precipitation needs to be:

- diverted away from structures or contaminated areas;
- collected, controlled, and transported to a stable outlet; or
- collected and used for other purposes such as irrigation or animal watering facility.

The total barn roof area on a farm can be substantial, often in excess of one acre (the threshold for state stormwater regulation in the developed landscape) and therefore roof runoff from farm barns can be an important source of unmanaged stormwater.

[41] http://efotg.sc.egov.usda.gov//references/public/VT/VT558-0311.pdf

6. CONCLUSIONS

This report is part of a larger project, funded by Vermont DEC, which will ultimately lead to a set of community-specific, prioritized projects to address stormwater runoff. Rather than starting from scratch in identifying stormwater management needs, the project (and this report) is drawing from the extensive library of water quality assessments and information that already exists, and augmenting them with interviews with local officials.

As this report demonstrates, there are numerous agencies and entities whose activities touch on various aspects of water quality in the St. Albans Bay, Lake Champlain, and Missisquoi River watersheds in general, and in the Town of St. Albans more specifically. This work is dynamic and ongoing, and so, while this summary is believed to be comprehensive, it will be important to periodically review and update the content to ensure the most current information can be incorporated. A comprehensive inventory of existing water quality assessments serves as a basis for connecting land use, stormwater management, floodplain management, river management activities; and public infrastructure needs to more effectively address all of the issues which contribute to degradation of a watershed.

FIGURES & TABLES

Figure 1. St. Albans Town watershed boundaries.

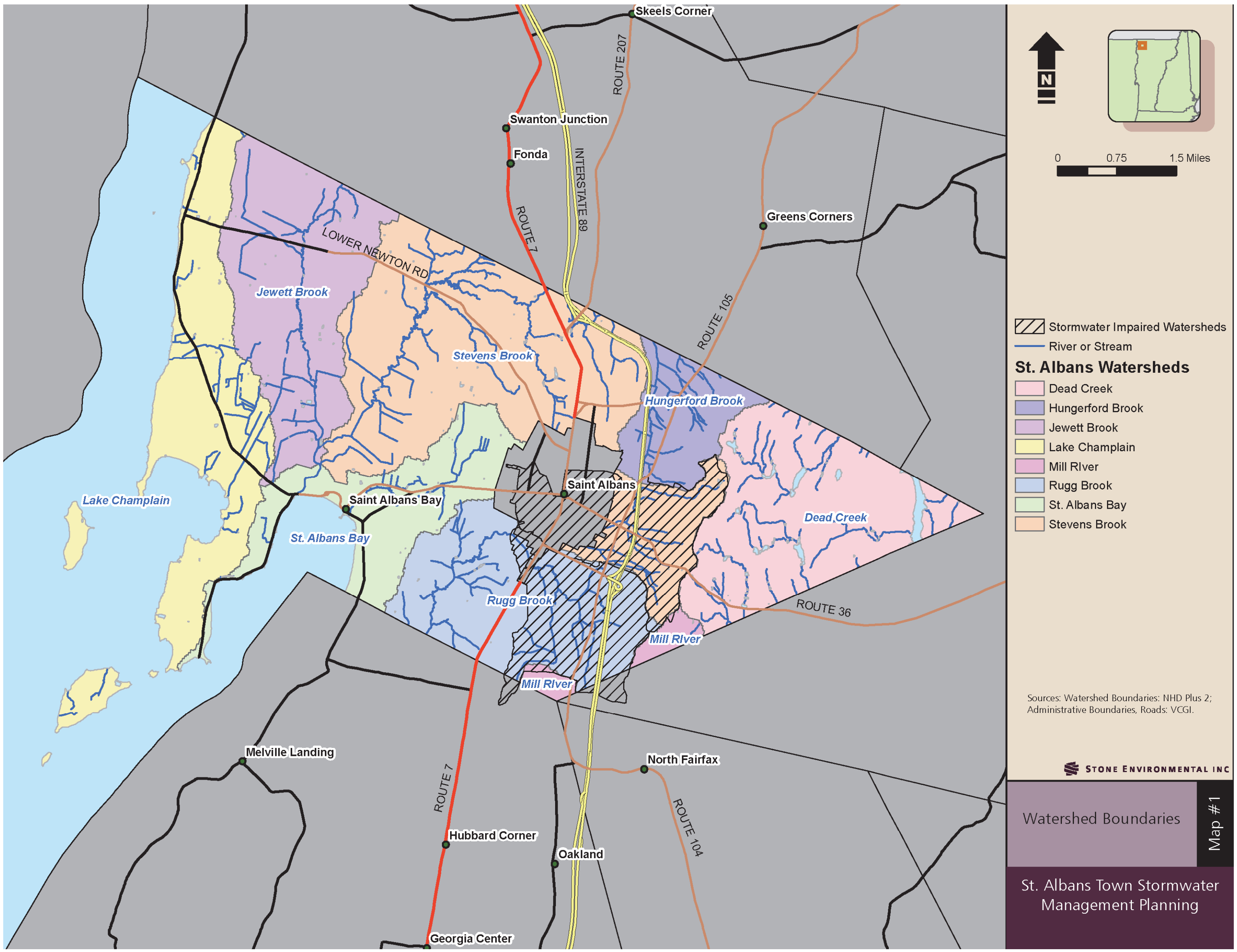


Figure 2. Hungerford Brook Reach Map

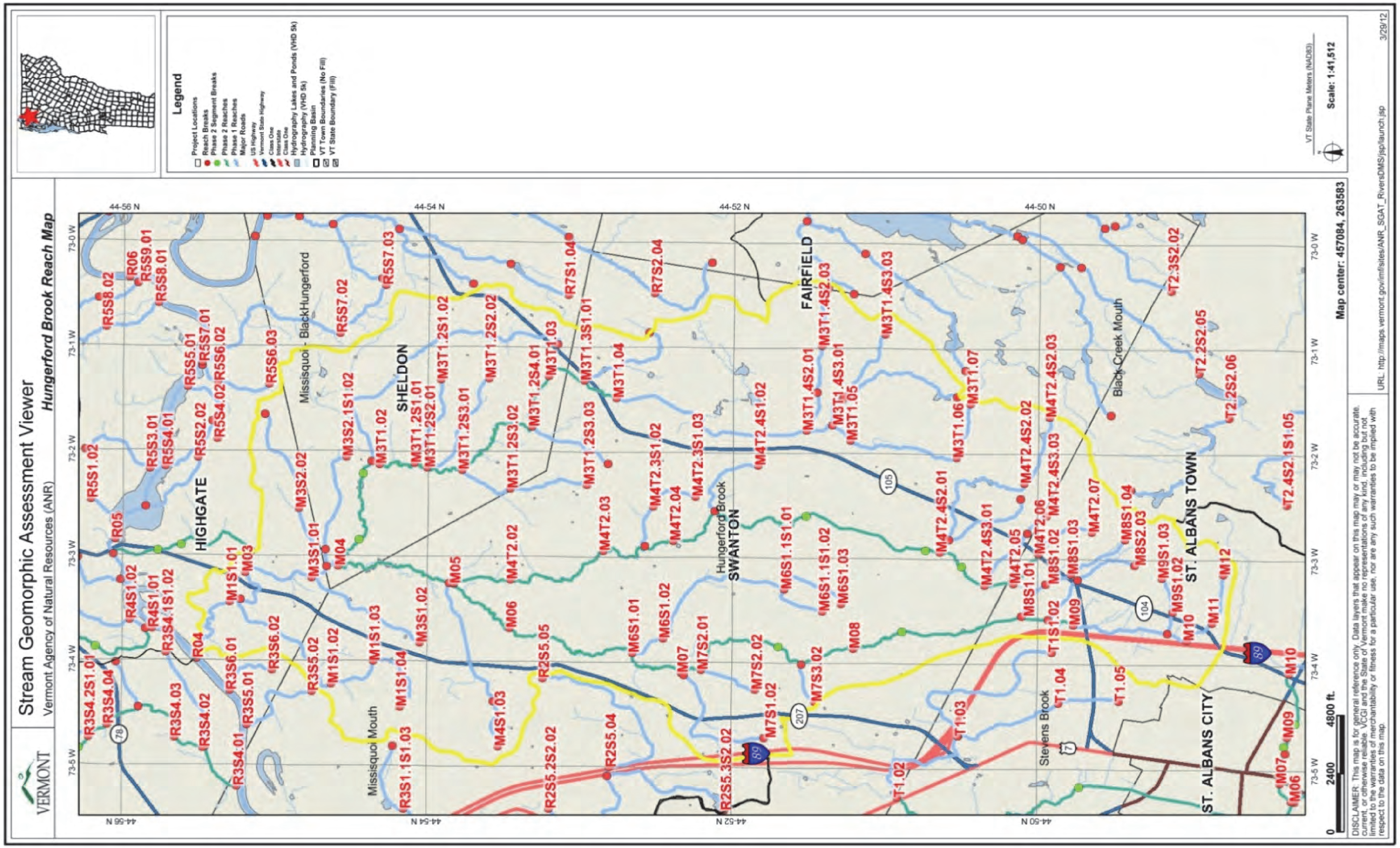
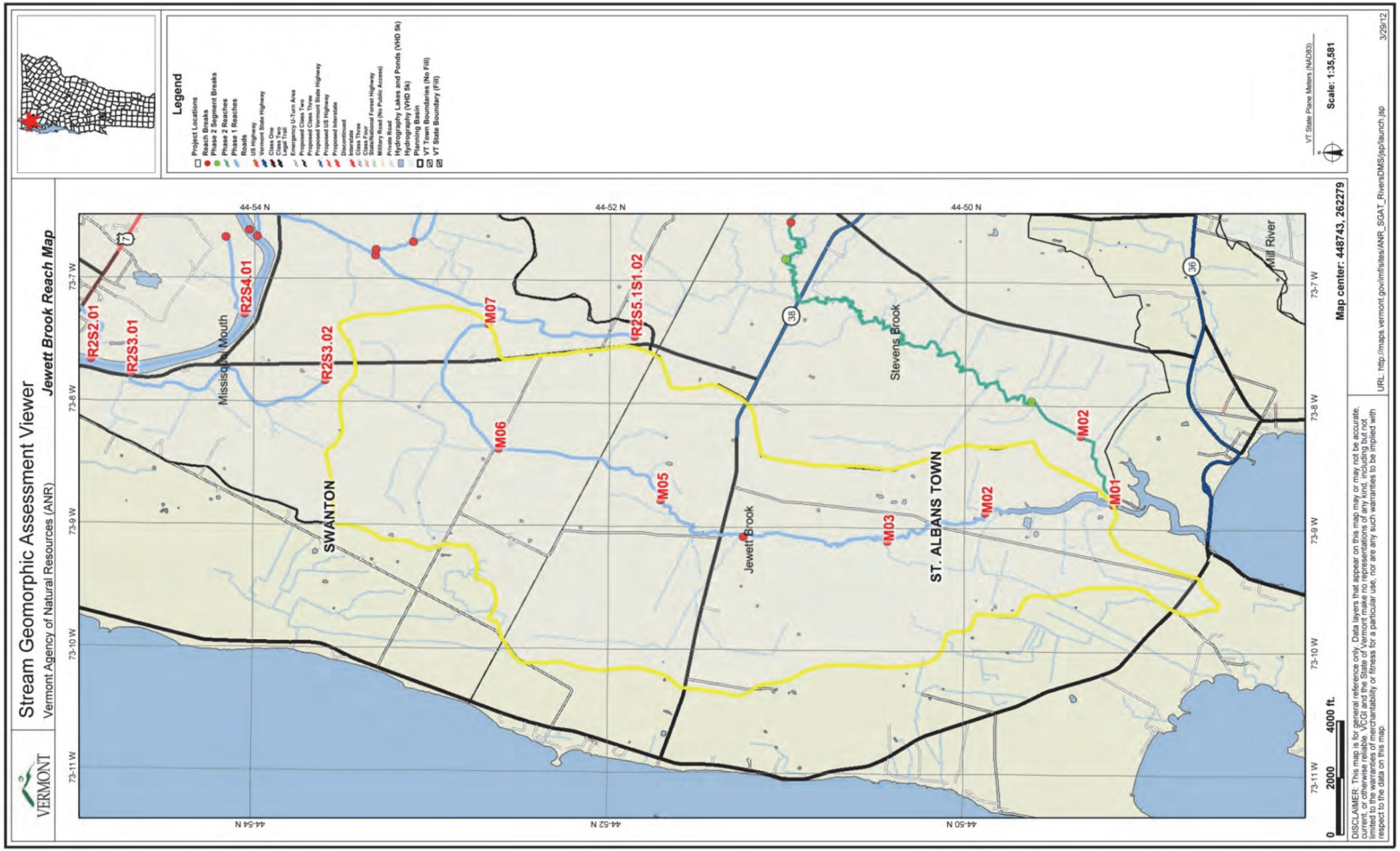


Figure 3. Jewett Brook Reach Map



STONE ENVIRONMENTAL INC

Figure 4. Stevens Brook reach map.

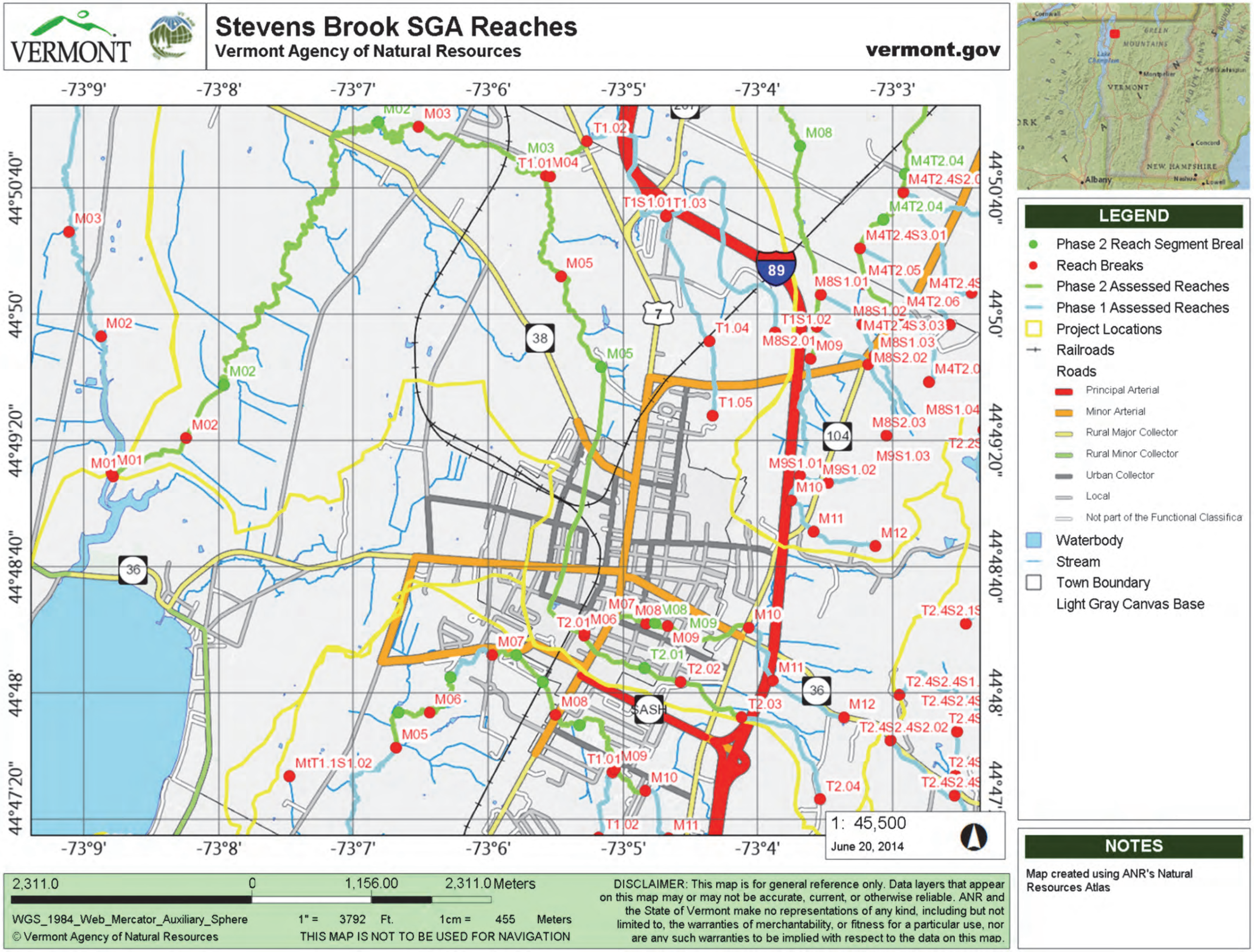


Figure 5. Rugg Brook reach map.

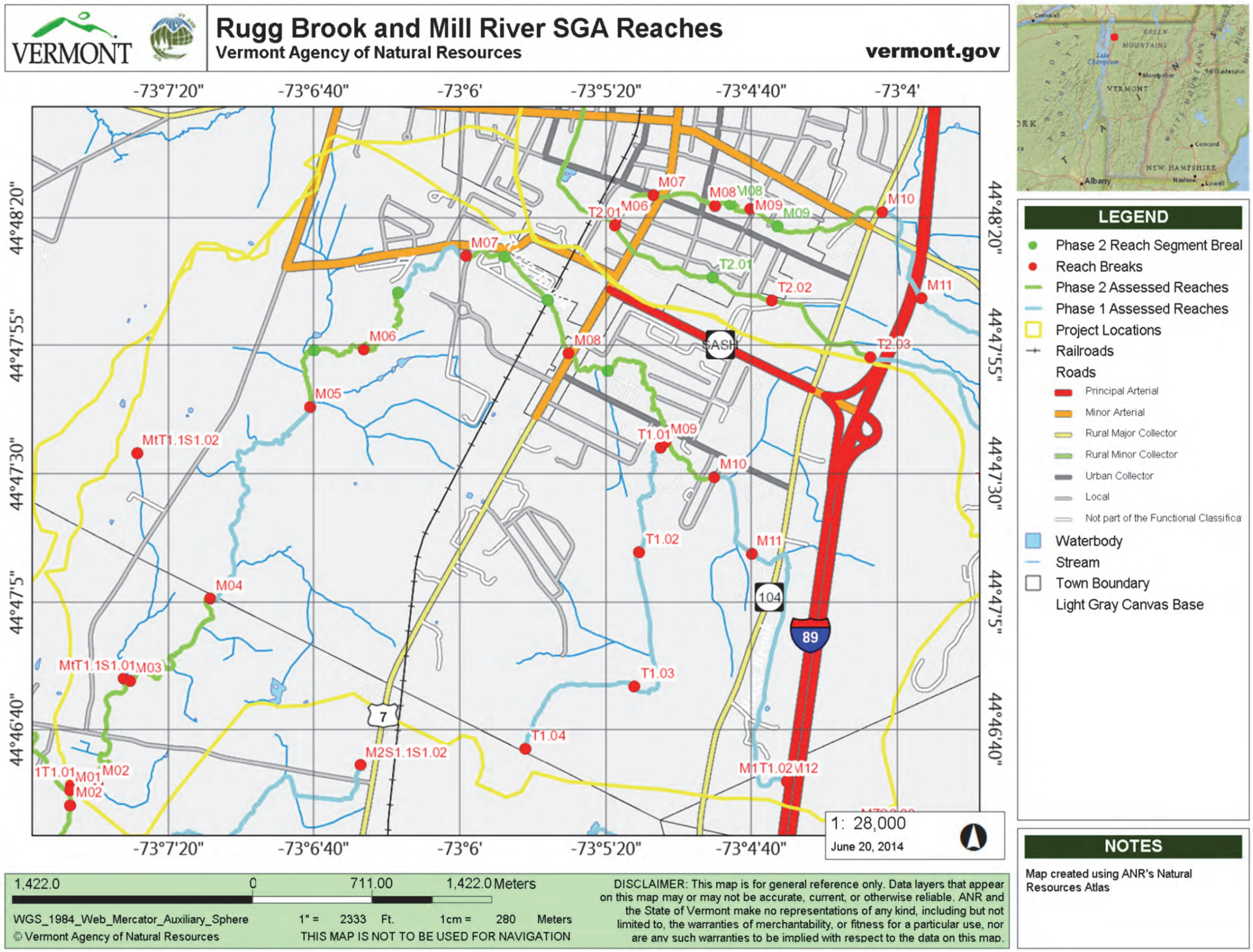


Table 1. Tabulated summaries of pollutant concentrations for LaRosa Volunteer Data monitoring sites in selected St. Albans Bay tributaries.

Location	Average Total Phosphorus (ug/L)		Average Total Nitrogen (mg/l)		Average Total Suspended Solids (mg/l)		Average Turbidity (NTU)	
	2004	2005	2004	2005	2004	2005	2004	2005
Jewett Brook at Newton Rd and Middle Rd (500878)	443	531	2.6	4.7	39	54	12.7	26.2
Jewett Brook at Dunsmore Rd (500879)	501	--	2.3	--	18	--	11.4	--
Stevens Brook, Unnamed Tributary 7 at Route 7 (North of Warner's) (500880)	155	272	2.2	2.1	5	72	2.0	4.5
Stevens Brook at Mitch Montagne's Farm (500877)	131	285	1.7	2.5	18	62	10.5	13.0
Stevens Brook at Kellogg Rd Bridge (500876)	91	126	1.2	1.5	4	28	1.9	2.1

Table 2. Tabulated summaries of pollutant concentrations for the DEC Long Term Lake Champlain Monitoring Program in St. Albans Bay.

Year	Station 40 (St. Albans Bay)		
	Total Nitrogen (mg/L)	Total Phosphorus (ug/L)	Total Suspended Solids (mg/L)
1992	0.4	22.6	1.5
1993	0.4	25.4	1.9
1994	0.5	23.9	2.0
1995	0.4	21.7	1.5
1996	0.4	27.6	2.2
1997	0.4	21.6	1.8
1998	0.4	28.2	2.4
1999	0.5	27.3	2.6
2000	0.4	30.2	3.5
2001	0.4	26.2	2.6
2002	0.6	43.0	3.8
2003	0.5	31.2	2.7
2004	0.4	27.7	2.4
2005	0.4	29.5	2.5
2006	0.4	29.3	--
2007	0.4	28.9	--
2008	0.4	28.1	--
2009	0.3	25.4	--
2010	0.3	26.8	--
2011	0.4	31.0	--
2012	0.3	34.3	--
2013	0.4	31.8	--

Figure 6. Map of St. Albans Town subwatersheds and potential retrofit opportunities (DEC ERP, 2009)

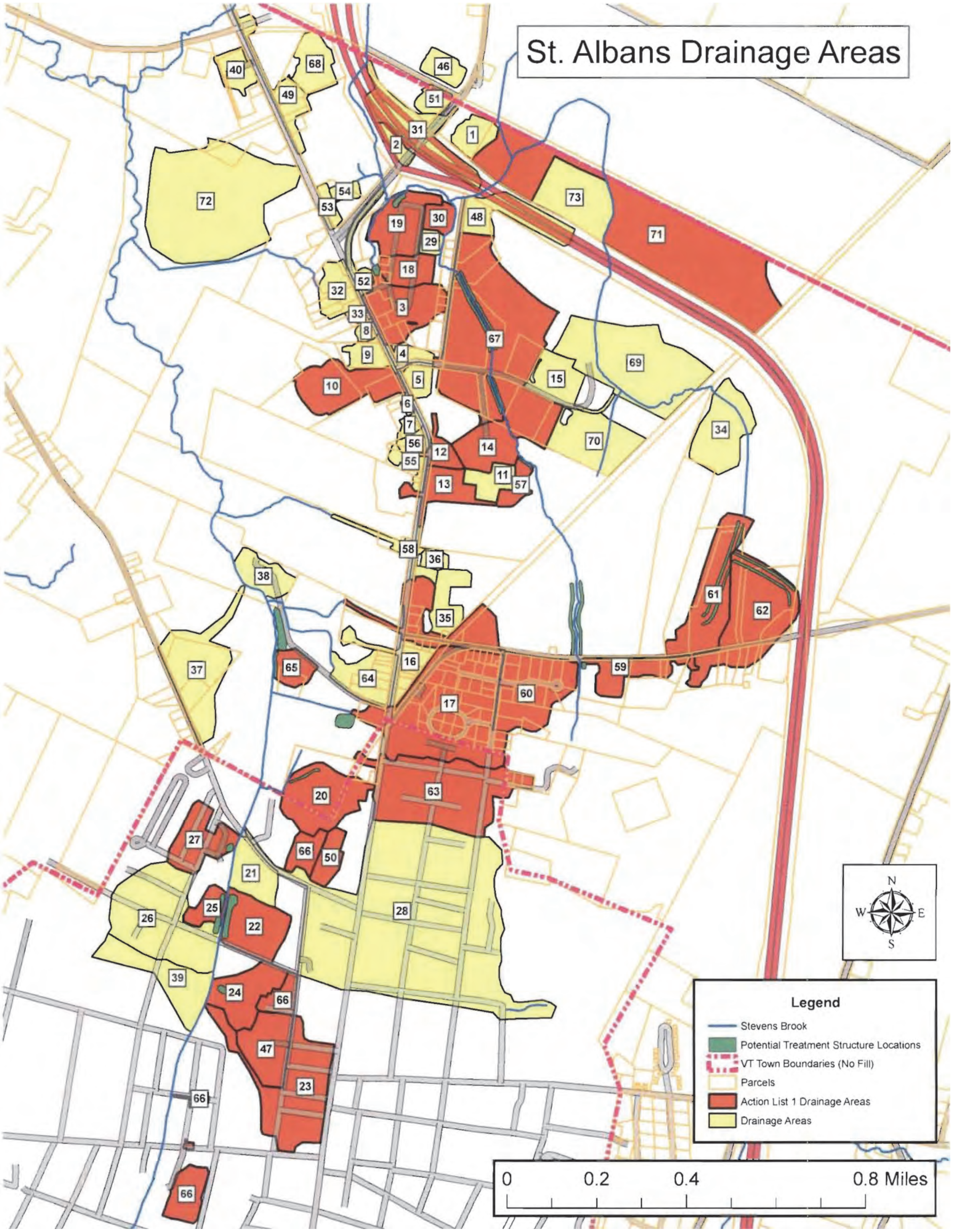


Table 3. St. Albans - Subwatershed Prioritization and Recommendations, Top Priority Actions (DEC ERP, 2009)

Watershed Number	Action List	Proposed or Existing Stormwater Treatment Practice	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Assistance Program
10	**1**	Existing Ext Det. Basin, upgrade to 2002	12.37	64.3	**41**	0.39	0.84		$25,000	ANR-CWSRF, C&C, 319
12	**1**	Convert Asphalt Swale to Grass Swale	3.03	15.0	**6**	0.02	0.05		$500	VYCC
13	**1**	Convert Asphalt Swale to Grass Swale	6.49	23.9	**12**	0.08	0.16		$500	VYCC
11	**1**	Existing Infiltration basin	4.18	96.5	**93**	0.28	0.42		$15,000	ANR-CWSRF, C&C, 319
14	**1**	Combine with 11	7.63	50.8	**36**	0.22	0.41	included in above		
18	**1**	Wet Pond	5.15	94.2	**94**	0.35	0.51	$186,311		ANR-CWSRF, C&C, 319
3	**1/1**	Upgrade Permitted Basin to Ext Det. Micro Pool & Combine Outfall with 18*	11.74	66.8	**62**	0.53	0.82		$15,000	ANR-CWSRF, C&C, 319
19	**1**	Ext Det. Micro Pool	9.70	65.4	**60**	0.43	0.67	$239,044		ANR-CWSRF, C&C, 319
57	**1**	Filter strip	2.66	53.8	**39**	0.08	0.15		$500	Partnerships in Wildlife/VYCC
60	**1**	Correct Erosion Near 1328 Swanton Rd	27.76	22.1	**10**	0.30	0.65		$250	Better Backroads/VYCC
61	**1**	Stream Buffer in Corn Field	16.11	6.7	**2**	0.08	0.11		$500	CREP-DAFM/Partnerships in Wildlife/VYCC
62	**1**	Stream Buffer in Corn Field	21.76	13.0	**5**	0.15	0.30		$500	CREP-DAFM/Partnerships in Wildlife/VYCC
17	**1/1**	Ext Det. Micro Pool & Correct Erosion Near 34 Sheldon Rd	36.99	30.9	**17**	0.57	1.20	$731,666	$500	ANR-CWSRF, C&C, 319 / VTrans-Enhancement
63	**1**	Combine with 17	28.64	32.6	**26**	0.61	0.98	included in above		
66	**1**	Wetland or Ext Det. Micro Pool at WWTP site	12.93	72.5	**73**	0.68	0.98	$2,806,016		ANR-CWSRF, C&C, 319 / VTrans- Enhancement, Insufficient room for 33% of basin
23	**1**	Combine with 66	21.12	80.6	**78**	1.18	1.79	included in above		
47	**1**	Combine with 23	9.45	62.5	**49**	0.35	0.62	included in above		
28		Combine with 66 or Ext Det. Micro Pool	99.18	33.3	**27**	2.17	3.47	included in above		
50	**1**	Combine with 28	3.76	89.7	**88**	0.24	0.35	included in above		

Watershed Number	Action List	Proposed or Existing Stormwater Treatment Practice	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Assistance Program
21	**2**	Combine With 66 & Clean-up Site	6.85	86.5	**84**	0.42	0.62	included in above		Anti-litter Ordinance
71	**1**	Permit Has Title 3 for Old 10 yr Design Pond; Motivate to Upgrade, Site Not Yet Built	50.53	2.3	**0**	0.19	0.12			
20	**1/1**	Wet Swale & Remove Old Culvert In Lower Swale	13.73	47.1	**32**	0.35	0.68		$1,000	C&C, 319
65	**1/1**	Filter Strip/No Dumping	3.96	55.6	**41**	0.13	0.23		$500	Partnerships in Wildlife/Anti-litter Ordinance
24	**2/1**	Ext Det. Micro Pool in RR Cloverleaf & Stabilize Eroded Outfall Into Stream	9.53	60.6	**55**	0.39	0.61		$500	VYCC
67	**2/1**	Permit Has Title 3 for Old 2 yr Design; Motivate to Upgrade & Break Old Ag Tile Drains In Field/Remove Old Ag Road Culvert/Plant Stream Buffer-No Mow Zone	51.52	28.3	**12**	0.60	1.53		$1,000	Partnerships in Wildlife/VYCC

Figure 7. Areas of concern and priority projects identified by town officials and in other reports.

Table 4. Areas of concern and priority projects identified by town officials, and in other reports and data sources.

ID	Watershed	Problem Type	Description	ID Source
SB-03	Stevens Brook	Erosion	Stream crossing in good condition, but incising noted in nearby ditches	Geomorphic Assessment; Town of St. Albans Erosion Study
SB-04	Stevens Brook	Infrastructure; Erosion	Large scour pool at outlet; outlet is perched.	Geomorphic Assessment
SB-05	Stevens Brook	Encroachment	Straightened section of stream in developed area near water treatment facility. Banks appear stable, but existing vegetation may not resist erosion during flood conditions.	Geomorphic Assessment
SB-10	Stevens Brook	Infrastructure; Erosion	Inlet is mostly buried and clogged with debris. The bank above the outlet is steep (1:2). The culvert outlet is perched	Geomorphic Assessment
HB-01	Hungerford Brook	Infrastructure; Erosion	Culvert is undersized. Upstream banks are unstable and may meander away from culvert inlet.	Geomorphic Assessment
HB-02	Hungerford Brook	Infrastructure; Erosion	Small scour pool at culvert outlet. Water ponds at inlet. Area identified as having high potential for stormwater runoff and as a potential critical source of phosphorus.	Geomorphic Assessment; Critical Source Areas Study
HB-03	Hungerford Brook	Infrastructure	Replace undersized culverts - Three private culverts noted as channel/floodplain constriction with structure width/channel width ratios of 30%, 60%, and 30%.	Geomorphic Assessment
HB-04	Hungerford Brook	Infrastructure	Private culverts noted as channel/floodplain constriction.	Geomorphic Assessment
DC-01	Dead Creek	Erosion	Three culverts identified as being in critical condition; center of the three culverts is perched and downstream banks are eroding.	Culvert Inventory
DC-02	Dead Creek	Erosion	Area identified as having high potential for stormwater runoff and as a potential critical source of phosphorus.	Critical Source Areas Study
LC-01	Lake Champlain	Infrastructure	Four culverts along Samson Road were identified in the culvert inventory as “critical.”	Culvert Inventory
LC-02	Lake Champlain	Erosion	Culvert condition identified in the culvert inventory as “critical”. The ditch upstream from the culvert is narrow and V-shaped and is beginning to incise	Culvert Inventory
LC-03	Lake Champlain	Infrastructure	Culvert is undersized and the bank above the outlet is too steep.	Culvert Inventory; Town of St. Albans Erosion Study
LC-04	Lake Champlain	Infrastructure	Culvert is undersized and too short. The bank above the inlet is too steep.	Culvert Inventory
LC-05	Lake Champlain	Infrastructure	Three culverts in this area identified as in “critical” condition	Culvert Inventory
LC-06	Lake Champlain	Infrastructure	Culvert identified as in “critical” condition	Culvert Inventory; Town of St. Albans Erosion Study
SAB-01	St. Albans Bay	Infrastructure	Culvert condition identified in the culvert inventory as “critical”.	Culvert Inventory; Town of St. Albans Erosion Study
SAB-02	St. Albans Bay	Infrastructure	Culvert condition identified in the culvert inventory as “critical”.	Culvert Inventory; Town of St. Albans Erosion Study
SAB-03	St. Albans Bay	Infrastructure	Culvert condition identified in the culvert inventory as “critical”.	Culvert Inventory; Town of St. Albans Erosion Study
SAB-07	St. Albans Bay	Infrastructure	Culvert condition identified in the culvert inventory as “urgent”.	Culvert Inventory; Town of St. Albans Erosion Study

APPENDIX C : PROBLEM AREA DATA SHEETS

Problem Area Data Sheet

Problem Area ID: SB-03	Latitude: 44.848675°	Longitude: -73.104322°

Watershed: Stevens Brook

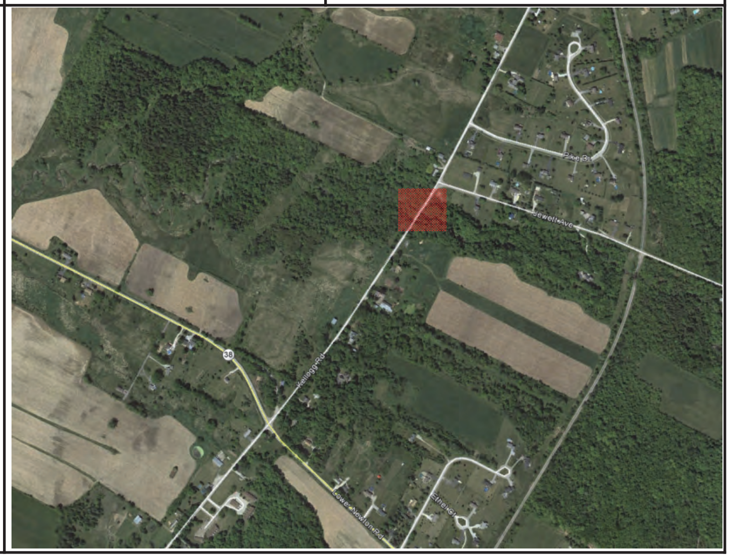
Location: Kellogg Rd, South of Jewett Ave

Problem Type: Erosion

Identification Source: SGA

Ownership: Public

Classification: 2



Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

The crossing is in good condition. Some incising was observed in nearby ditches. The Town indicated an intention to apply for Better Backroads funding in 2015 to improve the ditch.

Field Photos

Photo 1. Incised ditch bottom

Photo 2. Ditch path to Stevens Brook

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-04	Latitude: 44.846998°	Longitude: -73.090683°

Watershed: Stevens Brook

Location: Jewett Ave., west of St. Albans Rd.

Problem Type: Infrastructure/Erosion

Identification Source: SGA

Ownership: Public

Classification: 1

Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

A large scour pool has formed at the outlet. The outlet is perched. The Town spent ~$20,000 to install a "concrete bottom" in this culvert recently and was advised that, as a result, they could expect the structure to last an additional 20-25 years.

Field Photos

Photo 1. Perched outlet

Photo 2. Scour pool at outlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SB-05	Latitude: 44.828406°	Longitude: -73.086049°

Watershed: Stevens Brook

Location: Rewes Drive

Problem Type: Encroachment

Identification Source: SGA

Ownership: Public

Classification: 2

Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

Straightened section of stream in developed area near wastewater treatment facility. Banks appear stable, but existing vegetation may not be sufficient to resist erosion during flood conditions.

Field Photos

Photo 1. Straightened section of stream

Photo 2. Straightened section of stream

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	1	1	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-06	Latitude: 44.848997°	Longitude: -73.119179°

Watershed: Stevens Brook

Location: Lower Newton Rd., west of Kellogg Rd.

Problem Type: Erosion

Identification Source: SWMP Assessment

Ownership: State

Classification: 1 (crossing) / 3 (roadside ditch)

Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

Crossing is undersized, resulting in scour pool at the outlet. Stream banks directly upstream of the crossing are extremely unstable. The stream is meandering away from the crossing. Nearby ditches are eroding and incising.

Field Photos

Photo 1. Scour pool at outlet

Photo 2. Ditch erosion along Lower Newton Rd.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
3	3	3	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SB-07	Latitude: 44.843822°	Longitude: -73.109160°

Watershed: Stevens Brook

Location: Kellogg Rd. south of Lower Newton Rd.

Problem Type: Erosion

Identification Source: SWMP Assessment

Ownership: Public

Classification: 2

Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

A tile drain has day lighted and is eroding a deep, narrow channel. The Town applied for, and received, funding from the Better Backroads program to reshape and stabilize this problem area. Worked is planned for summer 2015.

Field Photos

Photo 1. Day lighted pipe

Photo 2. Erosion along Kellogg Rd

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	3	3	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-08	Latitude: 44.844296°	Longitude: -73.110639°

Watershed: Stevens Brook

Location: Kellogg Rd. south of Lower Newton Rd.

Problem Type: Erosion

Identification Source: SWMP Assessment

Ownership: Public

Classification: 1

Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

Erosion at culvert outfall resulting in scour pool. A 10ft tall bank approximately 50 feet downstream of the culvert has sloughed into the stream. The culvert inlet is in good condition. The Town applied for, and received, funding from the Better Backroads program to address this problem area. Worked is planned for summer 2015.

Field Photos

Photo 1. Scour pool at outlet

Photo 2. Bank slough

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
3	3	3	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SB-09	Latitude: 44.824575°	Longitude: -73.125064°

Watershed: Stevens Brook

Location: Kellogg Rd., 0.9 miles north of Lake rd.

Problem Type: Infrastructure

Identification Source: SWMP Assessment

Ownership: Public

Classification: 1

Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

Culvert outlet is perched over 2 feet, and downstream banks are experiencing significant erosion. The Town applied for, and received, funding from the Better Backroads program to install a splash pad under the culvert outlet. Work is planned for summer 2015.

Field Photos

Photo 1. Perched outlet

Photo 2. Culvert inlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	3	2	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SB-10	Latitude: 44.847393°	Longitude: -73.088467°

Watershed: Stevens Brook

Location: Jewett Ave.,
west of St. Albans Rd.

Problem Type: Infrastructure/Erosion

Identification Source: SGA

Ownership: Public

Classification: 2

Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

Inlet is mostly buried and clogged with debris. The bank above the outlet is steep (1:2). The culvert outlet is perched. The Town applied for, and received, funding from the Better Backroads program to address this problem area. Work is planned for summer 2015.

Field Photos

Photo 1. Culvert inlet.

Photo 2. Steep bank above outlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-12	Latitude: 44.863559°	Longitude: -73.114536°

Watershed: Stevens Brook

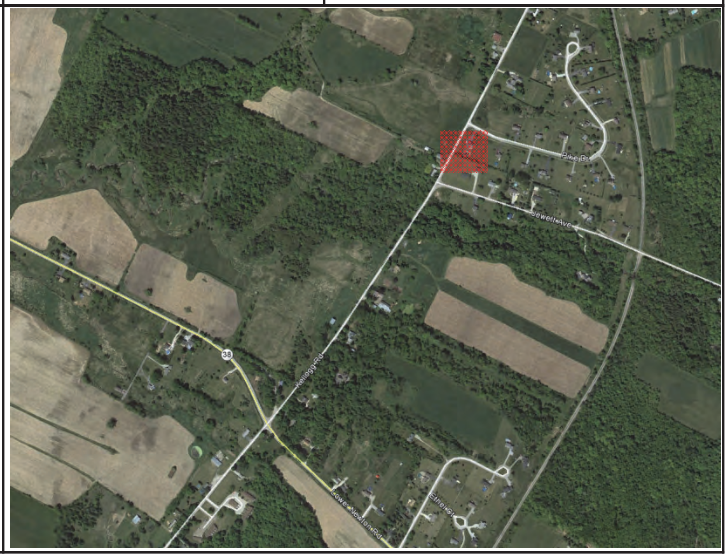
Location: Kellogg Rd., just south of Pike Dr.

Problem Type: Infrastructure/Erosion

Identification Source: SWMP Assessment

Ownership: Public

Classification: 3



Date of Field Data Collection: 05-02-14

Description of Observed Conditions:

Culvert appears to have been recently replaced. The culvert is undersized and not appropriately aligned. Future erosion is likely.

Field Photos

Photo 1. Culvert outlet

Photo 2. Culvert inlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SB-13	Latitude: 44.824165°	Longitude: -73.076077°

Watershed: Stevens Brook

Location: La Cresta Dr., at High St

Problem Type: Erosion

Identification Source: SWMP Assessment

Ownership: Private

Classification: 3

Date of Field Data Collection: 06-18-2014

Description of Observed Conditions:

Ditch carrying stormwater runoff from private road is actively eroding, and the culvert under La Cresta Dr. is completely plugged with sediment. The Town indicated that the area of active erosion extends further to the west, between Howard Estates and Ashton Drive.

Field Photos

Photo 1. Actively eroding ditch.

Photo 2. Plugged culvert

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	3	2	Y	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-14	Latitude: 44.844907°	Longitude: -73.077288°

Watershed: Stevens Brook

Location: Paquette Dr., at Route 207

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 2

Date of Field Data Collection: 06-18-2014

Description of Observed Conditions:

Grassed swale in front of Handy Chevrolet receives stormwater runoff from parts of the I-89 off-ramp, Route 207 and Paquette Dr.

Field Photos

Photo 1. Looking south along Route 207 toward I-89.

Photo 2. Intersection of Route 207 and I-89 off ramp

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
1	2	2	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-15A	Latitude: 44.838144°	Longitude: -73.080886°

Watershed: Stevens Brook

Location: Highgate Commons Plaza

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 3

Date of Field Data Collection: 06-20-2014

Description of Observed Conditions:

Green space between Key Bank and McDonald's appears well-suited for stormwater retrofit, including existing curb cuts.

Field Photos

Photo 1. Existing green space between McDonald's and Key Bank.

Photo 2. Existing curb-cut along back edge of Key Bank parking lot.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-15B	Latitude: 44.838144°	Longitude: -73.080886°

Watershed: Stevens Brook

Location: Highgate Commons Plaza

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 2

Date of Field Data Collection: 06-20-2014

Description of Observed Conditions:

Numerous elevated vegetated islands within Highgate Commons parking lot could be retrofitted to become stormwater management depressions.

Field Photos

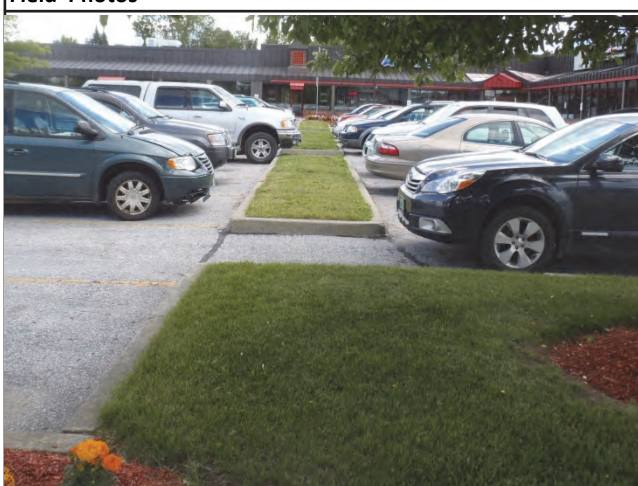


Photo 1. Islands at the south end of the parking lot.

Photo 2. Example of island used to separate parking areas from travel lanes.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-15C	Latitude: 44.838144°	Longitude: -73.080886°

Watershed: Stevens Brook

Location: Highgate Commons Plaza

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 3

Date of Field Data Collection: 06-20-2014

Description of Observed Conditions:

Much of the parking lot drains toward the north and west to a grassed, and eventually a tributary to Stevens Brook. There is ample space for a retrofit in the existing green space.

Field Photos

Photo 1. Evidence of stormwater draining off wet edge of parking area

Photo 2. Evidence of sediment transport from parking lot to green space and some localized erosion .

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SB-15D	Latitude: 44.838144°	Longitude: -73.080886°

Watershed: Stevens Brook

Location: Highgate Commons Plaza

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 3

Date of Field Data Collection: 06-20-2014

Description of Observed Conditions:

Opportunity to improve (e.g., stop mowing) buffer between north-end of shopping plaza and unnamed tributary to Stevens Brook and potentially provide treatment for stormwater being discharged directly to the tributary.

Field Photos

Photo 1. Buffer area is mowed to “top of bank”

Photo 2. Evidence of bank slumping and direct stormwater discharges.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-15E	Latitude: 44.838144°	Longitude: -73.080886°

Watershed: Stevens Brook

Location: Highgate Commons Plaza

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 2

Date of Field Data Collection: 06-20-2014

Description of Observed Conditions:

Significant area of underutilized impervious (paved) surface behind Peebles that could potentially be “depaved”.

Field Photos

Photo 1. Underutilized impervious area behind Peebles.

Photo 2. Underutilized impervious area.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-16A	Latitude: 44.838144°	Longitude: -73.080886°

Watershed: Stevens Brook

Location: Franklin Park West

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 2

Date of Field Data Collection: 06-20-2014

Description of Observed Conditions:

There are numerous opportunities to improve stormwater management in Franklin Park West. Unnamed tributary to Stevens Brook passes through the park and there is little woody vegetation in the buffer, where a buffer is provided. The area has wide grass roadside swales that could be retrofitted to further slow and treat stormwater runoff. The Town cleaned ~1.5 feet of sediment from this culvert in 2012.

Field Photos

Photo 1. Unnamed tributary to Stevens Brook flowing through Franklin Park West

Photo 2. Example of wide grass swales present throughout Franklin Park West.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-16B	Latitude: 44.838144°	Longitude: -73.080886°

Watershed: Stevens Brook

Location: Franklin Park West

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 2

Date of Field Data Collection: 06-20-2014

Description of Observed Conditions:

There are numerous opportunities to improve stormwater management in Franklin Park West. In general, the area has wide grass roadside swales, with some areas of erosion (see Photo 2, below). In addition, roof runoff within the Park appears largely unmanaged. Friends of Northern Lake Champlain applied for funding to improve stormwater management at Champlain Valley Equipment in late 2014.

Field Photos

Photo 1. Downspout at Champlain Valley Equipment discharging directly onto parking lot

Photo 2. Eroding swale near F.W. Webb

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SB-17	Latitude: 44.839456°	Longitude: -73.114170°

Watershed: Stevens Brook

Location: Kellogg Rd., just south of Christina Dr.

Problem Type: Erosion

Identification Source: SWMP Assessment

Ownership: Public/Private

Classification: 2

Date of Field Data Collection: 06-20-2014

Description of Observed Conditions:

Cross-culvert under Kellogg Rd outlets into a steep ditch with significant bank erosion. Water flowing thru cross-culvert appears to come from surface drainage along Christina Dr. as well as runoff from a significant length of Kellogg Rd. The Town applied for, and received, funding from the Better Backroads program to address this problem area. Work is planned for summer 2015.

Field Photos

Photo 1. Active erosion at outlet to cross-culvert

Photo 2. Area draining to cross-culvert

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: JB-01	Latitude: 44.856208°	Longitude: -73.151057°

Watershed: Jewett Brook

Location: Lower Newton Rd. at Middle Rd.

Problem Type: Infrastructure/Erosion

Identification Source: SWMP Assessment

Ownership: Public

Classification: 1

Date of Field Data Collection: 5-2-14

Description of Observed Conditions:

There is a large scour pool at the outlet and banks appear unstable downstream. A USGS Station is monitors the flow as it enters this culvert.

Field Photos

Photo 1. Scour pool at culvert outlet

Photo 2. Flooded area and USGS station at inlet.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: HB-01	Latitude: 44.828084°	Longitude: -73.060566°

Watershed: Hungerford Brook

Location: Rt. 105, East of I-89

Problem Type: Encroachment

Identification Source: SGA

Ownership: Public/private

Classification: 3

Date of Field Data Collection: 5-2-14

Description of Observed Conditions:
Upstream banks are unstable and may meander away from culvert inlet.

Field Photos

Photo 1.Upstream from culvert

Photo 2. Culvert outlet.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: HB-02	Latitude: 44.829324°	Longitude: -73.053620°

Watershed: Hungerford Brook

Location: Rt. 104,
Just north of Rt. 105

Problem Type: Infrastructure

Identification Source: SGA

Ownership: Public

Classification: 1

Date of Field Data Collection: 5-2-14

Description of Observed Conditions:
Small scour pool at culvert outlet. Water ponds at inlet.

Field Photos

Photo 1. Scour pool at outlet

Photo 2. Water ponding at inlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
1	2	1	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: RB-01	Latitude: 44.800302°	Longitude: -73.099209°

Watershed: Rugg Brook

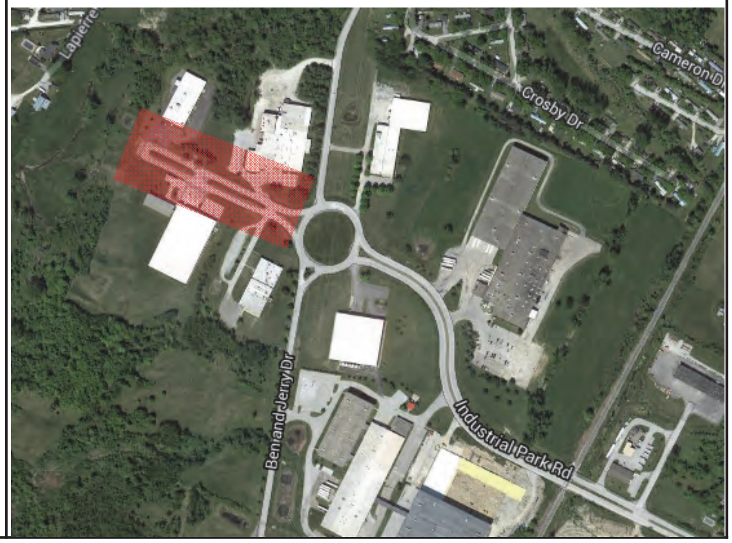
Location: Industrial Park Rd

Problem Type: Erosion/Retrofit Opportunity

Identification Source: 2010 Erosion Study/ SWMP Assessment

Ownership: Public/Private

Classification: 3



Date of Field Data Collection: 06/18/2014

Description of Observed Conditions:

The swale running down the middle of Industrial Park Rd. could be retrofitted to improve stormwater management. Check dams have been installed but are not functioning well. Some evidence of on-going erosion within existing swales.

Field Photos

Photo 1. Swale, with some evidence of erosion

Photo 2. Existing check dam

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: RB-02	Latitude: 44.801770°	Longitude: -73.102729°

Watershed: Rugg Brook

Location: Industrial Park Rd.

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Private

Classification: 2

Date of Field Data Collection: 06/18/2014

Description of Observed Conditions:
Green space and unpaved area within *Catamount Research and Development* parking lot present retrofit opportunities.

Field Photos

Photo 1. Possible green space for stormwater management

Photo 2. Unpaved area within parking lot.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	1	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: RB-03	Latitude: 44.789803°	Longitude: -73.097988°

Watershed: Rugg Brook

Location: Prospect Hill Rd., just off Georgia Rd (Route 7)

Problem Type: Erosion

Identification Source: SWMP Assessment

Ownership: Public/Private

Classification: 2

Date of Field Data Collection: 06/18/2014

Description of Observed Conditions:

A series of eroding roadside ditches are carrying runoff along Prospect Hill Rd., before turning northwest toward Harborview Estates.

Field Photos

Photo 1. Ditch along Prospect Hill Dr.

Photo 2. Runoff, having crossed under Prospect Hill, heading off-site toward Harborview Estates

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: RB-04	Latitude: 44.783151°	Longitude: -73.101744°

Watershed: Rugg Brook

Location: Cedar Hill Rd.

Problem Type: Erosion

Identification Source: SWMP Assessment

Ownership: Public/Private

Classification: 3

Date of Field Data Collection: 06/18/2014

Description of Observed Conditions:

Active erosion in the ditch along Cedar Hill Rd., from Charbonneau Dr. down to Route 7. Culvert headers poorly installed and actively being eroded around.

Field Photos

Photo 1. Erosion around culvert header.

Photo 2. Erosion upstream of culvert header.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	3	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: DC-01	Latitude: 44.812944°	Longitude: -73.040234°

Watershed: Dead Creek

Location: French Hill Road

Problem Type: Infrastructure

Identification Source: Culvert inventory

Ownership: Town

Classification: 1

Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Culvert is perched and downstream banks are eroding.

Field Photos

Photo 1. Perched culvert outlet

Photo 2. Bank erosion downstream from culvert

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	1	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: DC-02	Latitude: 44.794885°	Longitude: -73.048592°

Watershed: Dead Creek

Location: Lakemont Dr. at Fairfield Hill Rd (Route 36)

Problem Type: Erosion

Identification Source: Culvert inventory

Ownership: Public

Classification: 3

Date of Field Data Collection: 06-18-2014

Description of Observed Conditions:

Culvert is perched and downstream banks are eroding.

Field Photos

Photo 1. Evidence of sediment from Lakemont Drive being deposited in ditch along Route 36

Photo 2. Road shoulder crumbling at corner of Lakemont Dr. and Route 36

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	3	y	Y	N	N

Problem Area Data Sheet

Problem Area ID: LC-01	Latitude: 44.82298825	Longitude: -73.1893853

Watershed: Lake Champlain

Location: Samson Rd.

Problem Type: Infrastructure

Identification Source: Culvert inventory

Ownership: Town

Classification: 3

Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Four culverts along Samson Road were identified in the culvert inventory as “critical.” It appears that the culverts have been replaced recently with catch basins that outlet to the lake. Some erosion was observed around the catch basin located 120 ft north of Waters Edge Dr. Some bank erosion was observed around the outlet located 720 feet north of Waters Edge Dr. The remaining two catch basins and outlets appear to be in good condition.

Field Photos

Photo 1. Erosion near catch basin

Photo 2. Erosion around outlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	3	2	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: LC-02	Latitude: 44.859291°	Longitude: -73.170685°

Watershed: Lake Champlain

Location: Rt.38 and Perry Rd. Intersection

Problem Type: Infrastructure

Identification Source: Culvert inventory

Ownership: Town

Classification: 2

Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

The culvert under Perry Road appears to have recently been replaced. The ditch upstream from the culvert is narrow and V-shaped and is beginning to incise.

Field Photos

Photo 1. Narrow ditch upstream from culvert

Photo 2. Culvert inlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: LC-03	Latitude: 44.847735°	Longitude: -73.183927°

Watershed: Lake Champlain

Location: Maquam Rd.,1250 ft south of Pike Farm Estates

Problem Type: Infrastructure

Identification Source: Culvert inventory

Ownership: Town

Classification: 3

Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Culvert is undersized and the bank above the outlet is too steep. There is significant erosion at the outlet. The adjacent field is cultivated to the edge of the roadside ditch. Runoff from the field discharges directly to Lake Champlain, less than 50 feet away.

Field Photos

Photo 1. Erosion at culvert outlet

Photo 2. Narrow buffer is visible in background of inlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
3	3	2	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: LC-04	Latitude: 44.846471°	Longitude: -73.183843°

Watershed: Lake Champlain

Location: Maquam Rd.,1600 ft south of Pike Farm Estates

Problem Type: Infrastructure

Identification Source: Culvert inventory

Ownership: Town

Classification: 2

Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Culvert is undersized and too short. The bank above the inlet is too steep. The culvert discharges to an open structure on the west side of Maquam Rd., which contains debris. The adjacent field is cultivated to the edge of the roadside ditch. Runoff from the field discharges directly to Lake Champlain, less than 50 feet away.

Field Photos

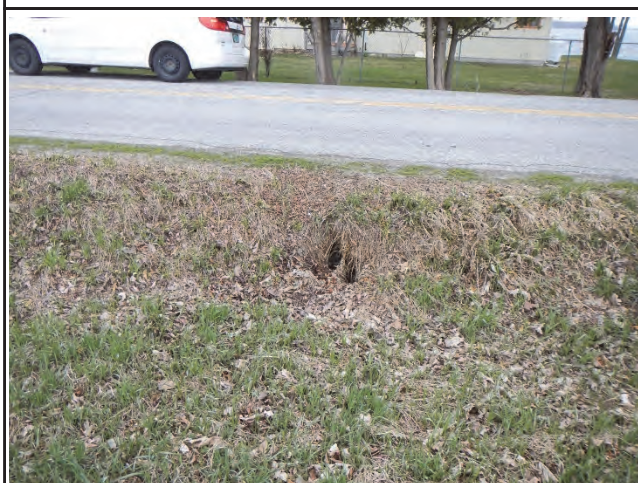


Photo 1. Culvert inlet

Photo 2. Culvert outlet

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
1	2	2	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SAB-01	Latitude: 44.805582°	Longitude: -73.134757°

Watershed: St. Albans Bay

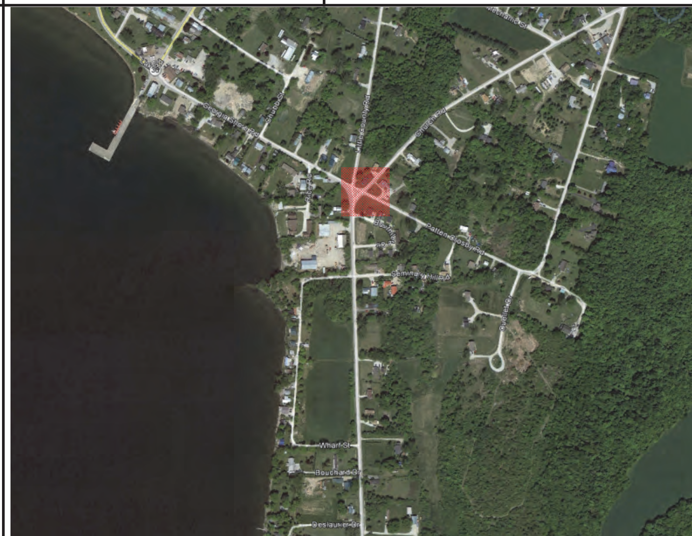
Location: Patten Crosby Rd.

Problem Type: Infrastructure

Identification Source: Culvert inventory

Ownership: Town

Classification: 2



Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

The culvert beneath Patten Crosby Rd. appears to have recently been replaced. A discontinuous culvert section from Church St. is misaligned and may cause future erosion problems due to the confined nature of the area and nearby utilities.

Field Photos

Photo 1. Culvert outlet from Church St. is buried, but visible

Photo 2. Erosion will be an issue with nearby utilities

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
3	2	2	2	Y	Y	Y	Y

Problem Area Data Sheet

Problem Area ID: SAB-03	Latitude: 44.810947°	Longitude: -73.133882°

Watershed: St. Albans Bay

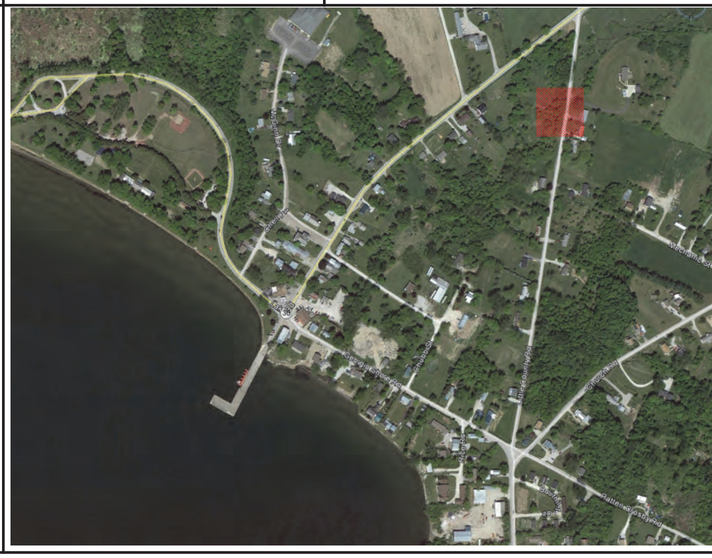
Location: Little County Rd.

Problem Type: Infrastructure

Identification Source: Culvert inventory

Ownership: Town

Classification: 1



Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Stream banks upstream from culvert are unstable for several hundred feet. As a result, the culvert is misaligned with the stream. The bank above the culvert inlet and outlet is steep. The culvert outlet is perched, but a concrete splash pad has limited erosion.

Field Photos

Photo 1. Upstream banks are unstable and meandering

Photo 2. Culvert outlet and scour pool

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
3	2	2	1	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SAB-04	Latitude: 44.812159°	Longitude: -73.107130°

Watershed: St. Albans Bay

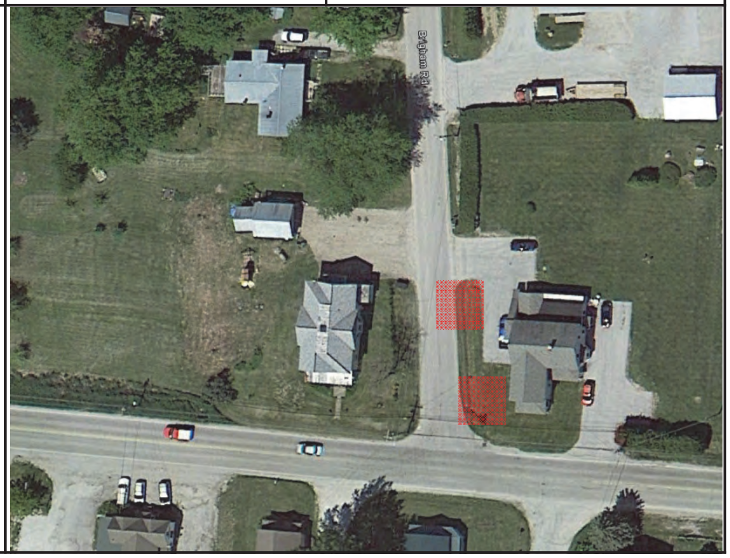
Location: Brigham Rd. at the intersection with Lake Rd.

Problem Type: Infrastructure

Identification Source: SWMP Assessment

Ownership: Public

Classification: 3



Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Two locations where culvert sections are discontinuous, resulting in scour holes approximately 4 ft. deep. The area around this location is largely impervious.

Field Photos

Photo 1. Discontinuous culvert sections and scour hole

Photo 2. Discontinuous culvert sections and scour hole

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	3	3	2	N	Y	N	Y

Problem Area Data Sheet

Problem Area ID: SAB-05	Latitude: 44.812159°	Longitude: -73.107130°

Watershed: St. Albans Bay

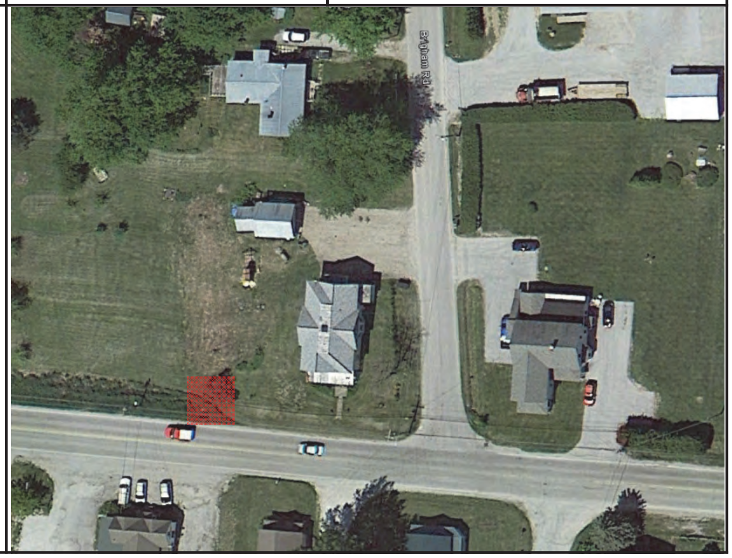
Location: Lake Rd. just west of intersection with Brigham Rd.

Problem Type: Infrastructure

Identification Source: SWMP Assessment

Ownership: Public

Classification: 3



Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Erosion at the outlet of a culvert. Outlet is only 2 feet from the edge of pavement (Lake Rd.), and pavement is beginning to fail.

Field Photos

Photo 1. Pavement erosion at culvert outlet

Photo 2. Pavement erosion

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	3	3	2	Y	Y	Y	Y

Problem Area Data Sheet

Problem Area ID: SAB-06	Latitude: 44.810003°	Longitude: -73.124885°

Watershed: St. Albans Bay

Location: Church Rd.

Problem Type: Infrastructure

Identification Source: SWMP Assessment

Ownership: Town

Classification: 2

Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Banks near inlet are eroding where stream turns 90-degrees to enter the culvert. There is a large scour pool at the outlet. Nearby utilities may be at risk as banks continue to erode.

Field Photos

Photo 1. Bank erosion near the culvert inlet

Photo 2. Large scour pool at culvert outlet.

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	3	2	2	Y	Y	Y	N

Problem Area Data Sheet

Problem Area ID: SAB-07	Latitude: 44.805582°	Longitude: -73.134757°

Watershed: St. Albans Bay

Location: Church Rd.

Problem Type: Infrastructure

Identification Source: Culvert Inventory

Ownership: Town

Classification: 3

Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

A large catchment drains to this undersized culvert. The culvert outlet is perched and the banks nearby are eroding.

Field Photos

Photo 1. Culvert outlet from Church St. is buried, but visible

Photo 2. Erosion will be an issue with nearby utilities

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

Problem Area Data Sheet

Problem Area ID: SAB-08	Latitude: 44.808490°	Longitude: -73.138976°

Watershed: St. Albans Bay

Location: Lake Rd.

Problem Type: Retrofit Opportunity

Identification Source: SWMP Assessment

Ownership: Public

Classification: 2

Date of Field Data Collection: 5/2/2014

Description of Observed Conditions:

Stormwater runoff from Town Hall currently flows out to Lake Rd., and across the edge of the gravel parking lot before dropping into a nearby catch basin. It appears that the front lawn of Town Hall could be retrofitted to improve stormwater management.

Field Photos

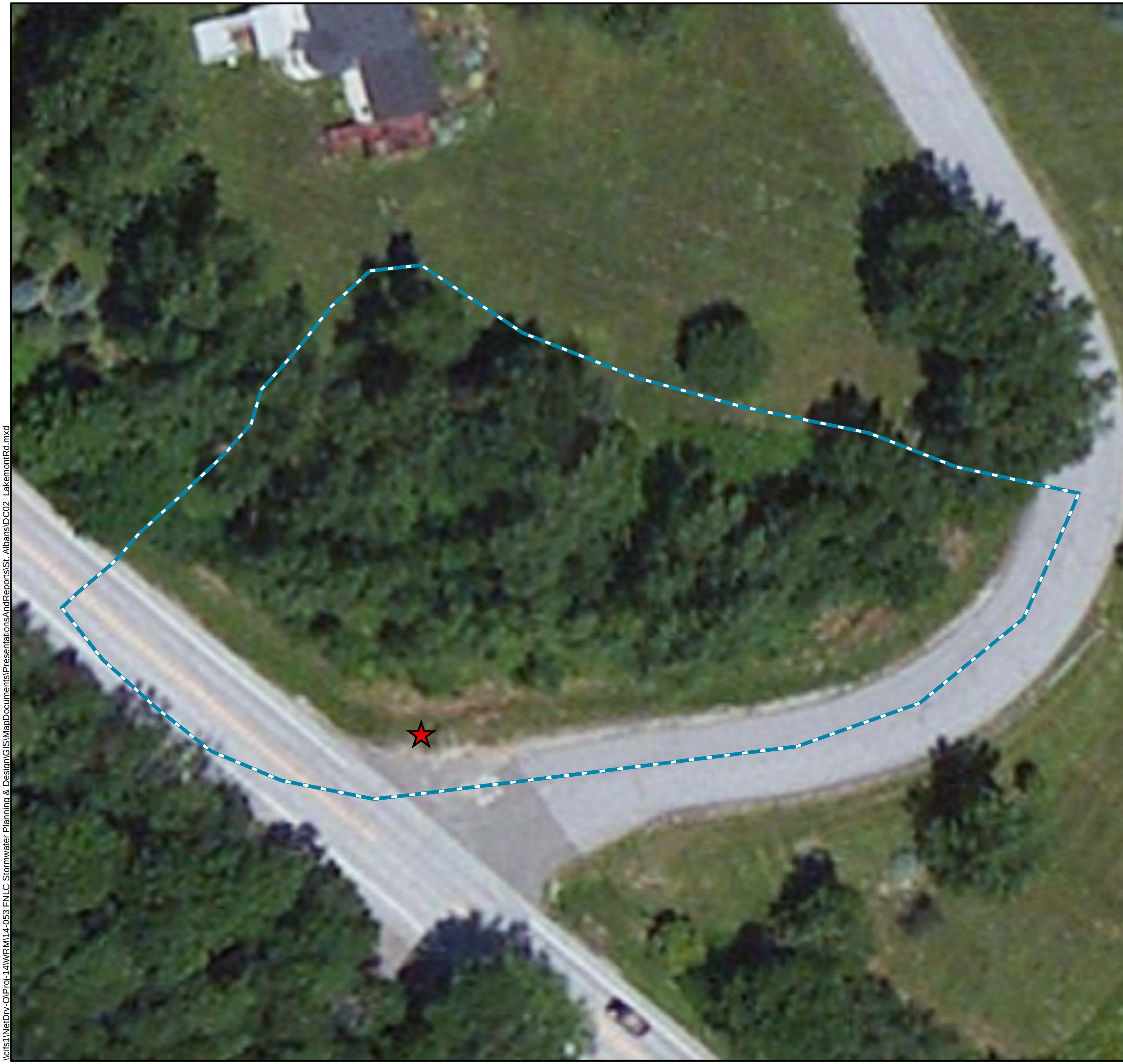
Photo 1. St Albans Town Hall, and lawn

Photo 2. Catch basin that receives runoff from Town Hall

Prioritization Ranking Factors

Relative Impact	Frequency	Current Condition	Urgency	Impact to public infrastructure?	Realistic to fix?	Impacts beyond water resources?	Part of a larger or systemic problem?
2	2	2	2	N	Y	N	N

APPENDIX D : DRAINAGE AREA MAPS FOR PRIORITY STORMWATER PROBLEM AREAS



0 12.5 25 50 Feet

SW Treatment Opportunity

River or Stream

Highly Erodible Soils

Drainage Area (0.7 Acres)

Treatment Opportunity: Promote stabilization of culvert inlet and outlet; reshape ditch along northeast slope of Route 36

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Lakemont Rd

DC-02

St. Albans Stormwater Management Planning

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0 250 500 1,000
Feet

SW Treatment Opportunity
River or Stream
Drainage Area (542.0 Acres)
Highly Erodible Soils

Treatment Opportunity: Evaluate need for animal exclusion above culvert inlet; identify opportunities to establish more robust riparian buffer

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Rt. 105

HB-01

St. Albans Stormwater Management Planning

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N

0 40 80 160
Feet

SW Treatment Opportunity
River or Stream
Highly Erodible Soils
Drainage Area

Treatment Opportunity: Evaluate installing bioswale along eastern edge of Samson Road to allow water to infiltrate; stabilize culvert outlet

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Samson Rd

LC-01

St. Albans Stormwater Management Planning

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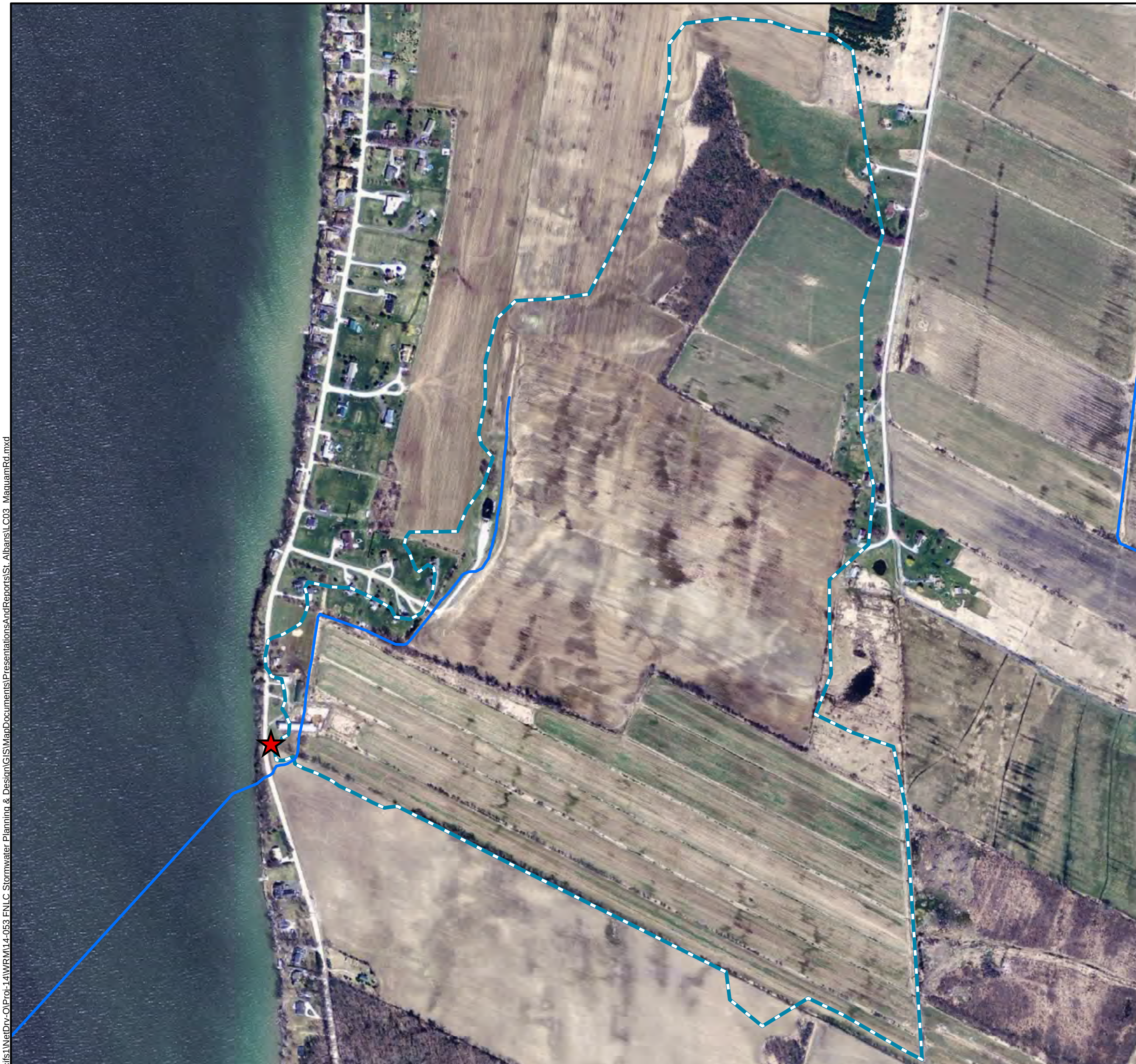

0 175 350 700 Feet

SW Treatment Opportunity
River or Stream
Highly Erodible Soils
Drainage Area (217.6)

Treatment Opportunity: Stabilize culvert outlet and receiving ditch; identify opportunities to establish more robust buffer upstream of culvert

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Maquam Rd

LC-03

St. Albans Stormwater Management Planning

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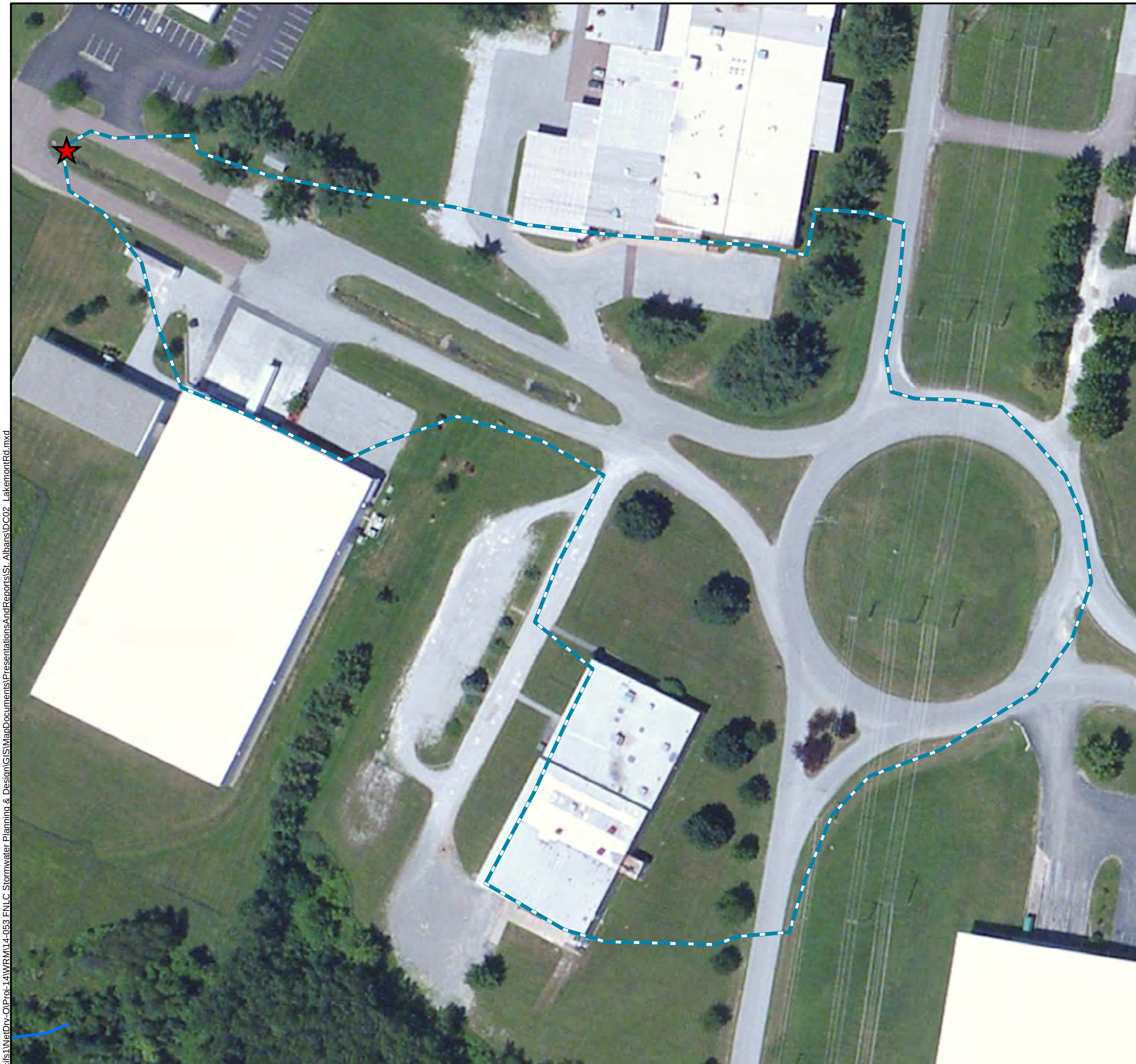

N

0 37.5 75 150 Feet

SW Treatment Opportunity

River or Stream

Highly Erodible Soils

Drainage Area (7.0 Acres)

Treatment Opportunity: Retrofit existing swale with check dams or other measures to slow stormwater

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Industrial Park Rd

RB-01

St. Albans Stormwater Management Planning

N

0 45 90 180 Feet

SW Treatment Opportunity

River or Stream

Drainage Area (3.6 Acres)

Highly Erodible Soils

Treatment Opportunity: retrofit existing swale along Cedar Hill with check dams or other measures to slow stormwater and reduce erosion

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Cedar Hill Rd

RB-04

St. Albans Stormwater Management Planning

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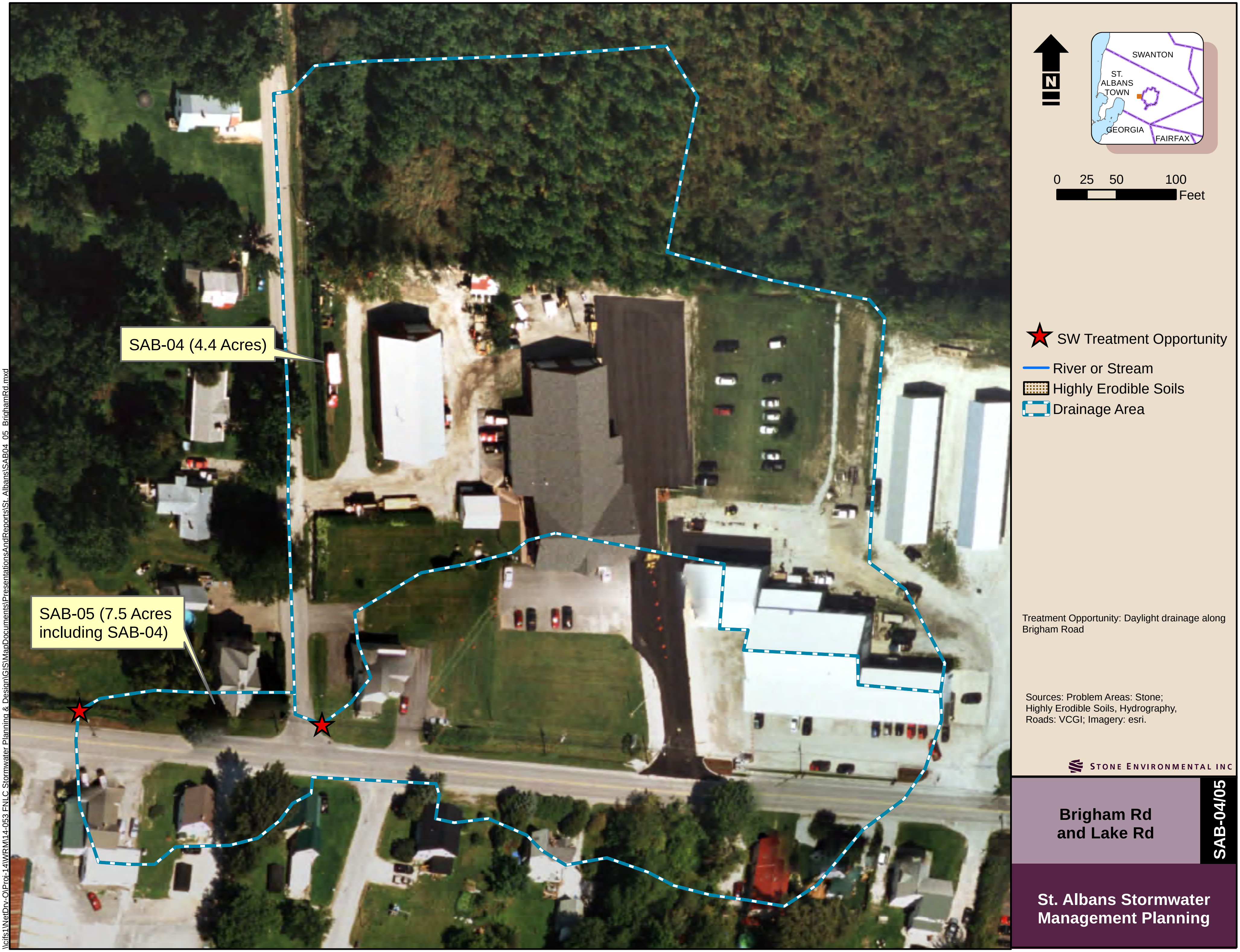
SAB-04 (4.4 Acres)
SAB-05 (7.5 Acres including SAB-04)
SWANTON
ST. ALBANS TOWN
GEORGIA
FAIRFAX
N
0 25 50 100
Feet
SW Treatment Opportunity
River or Stream
Highly Erodible Soils
Drainage Area
Treatment Opportunity: Daylight drainage along Brigham Road
Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.
STONE ENVIRONMENTAL INC
Brigham Rd and Lake Rd
SAB-04/05
St. Albans Stormwater Management Planning
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N

0 175 350 700 Feet

SW Treatment Opportunity

River or Stream

Highly Erodible Soils

Drainage Area (107.3 Acres)

Treatment Opportunity: Stabilize culvert inlet and outlet; identify opportunities to establish more robust riparian buffer

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Church Rd

SAB-07

St. Albans Stormwater Management Planning

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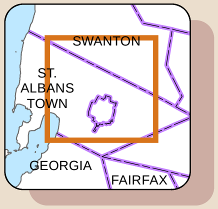

N

0 0.25 0.5 1 Miles

SW Treatment Opportunity

River or Stream

Highly Erodible Soils

Drainage Area (6198 Acres)

Treatment Opportunity: Reshape and stabilize ditch along northside of Lower Newton Rd.

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Lower Newton Rd

SB-06

St. Albans Stormwater Management Planning

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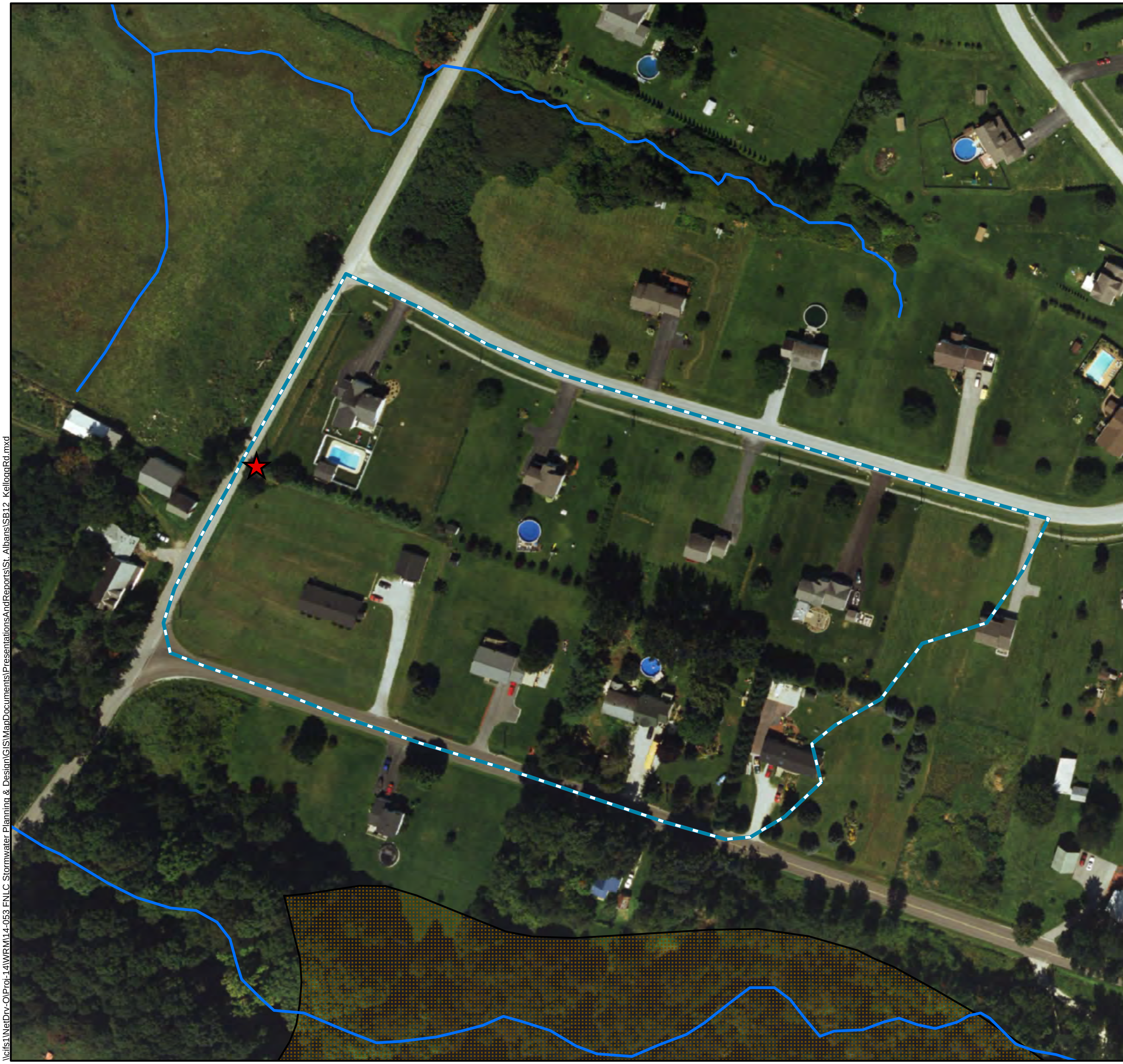

N

0 50 100 200 Feet

SW Treatment Opportunity
River or Stream
Highly Erodible Soils
Drainage Area (9.3 Acres)

Treatment Opportunity: Headwalls should be installed at culvert inlet and outlet to prevent erosion

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Kellogg Rd.

SB-12

St. Albans Stormwater Management Planning

N

0 37.5 75 150
Feet

SW Treatment Opportunity
River or Stream
Drainage Area (2.2 Acres)
Highly Erodible Soils

Treatment Opportunity: Drainage ditch along La Cresta Dr. should be reshaped and rock-lined with possible addition of check dams

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

La Cresta Dr

SB-13

St. Albans Stormwater Management Planning

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N

0 25 50 100 Feet

SW Treatment Opportunity

River or Stream

Drainage Area (2.9 Acres)

Highly Erodible Soils

Treatment Opportunity: Reshape newly created green space to maximize stormwater detention and/or infiltration

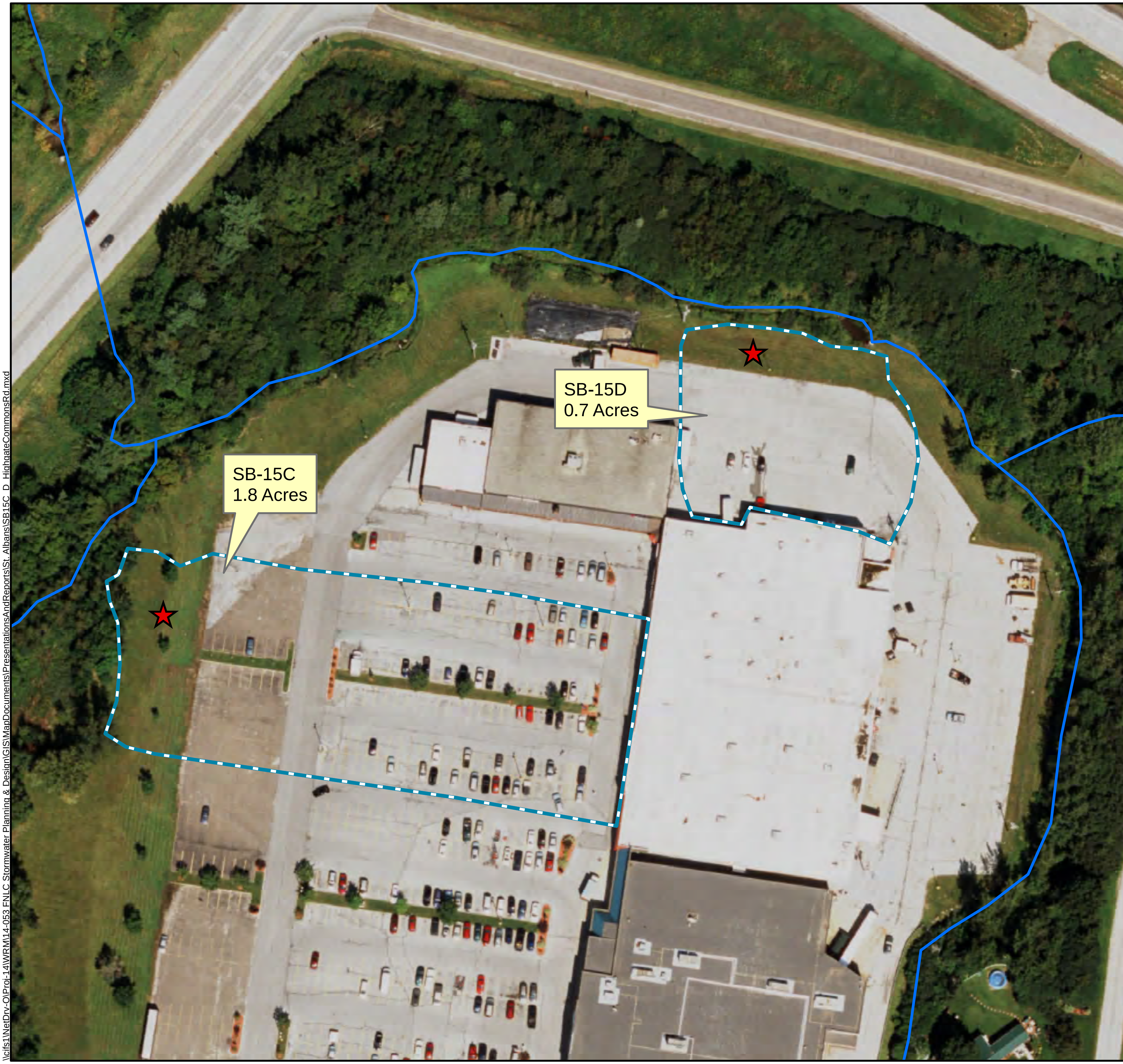
Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Highgate Commons Plaza

SB-15A

St. Albans Stormwater Management Planning



N

0 37.5 75 150
Feet

SW Treatment Opportunity
River or Stream
Highly Erodible Soils
Drainage Area

Treatment Opportunity: Construct stormwater retrofit in green space and establish more robust riparian buffer

Sources: Problem Areas: Stone; Highly Erodible Soils, Hydrography, Roads: VCGI; Imagery: esri.

STONE ENVIRONMENTAL INC

Highgates Commons Plaza

SB-15C/D

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