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**TOWN OF ESSEX  
STORMWATER MANAGEMENT PLAN**

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## **EXECUTIVE SUMMARY**

A brief description of the “key” elements in the Plan outlined by section is provided below for reference purposes.

### **1.0 INTRODUCTION**

- The December 2012 MS4 NPDES Phase 2 Stormwater Permit issued by the State of Vermont under delegation authority of the U.S. Environmental Protection Agency (EPA) to the Town of Essex identifies the requirements that must be met and actions that must be taken to be in compliance with the permit.
- The actions to be taken encompass the six minimum control measures as well as actions required to improve water quality in the two impaired watersheds – Indian Brook and Sunderland Brook.
- Urban stormwater runoff from impervious surfaces transports increased pollutants which can impair water bodies.
- Recent approaches to stormwater management emphasize on-site stormwater quantity reduction to improve stormwater quality.
- Utilizing “Environmental Indicators” to evaluate program success as a useful tool.
- The Town intends to carry out its stormwater program with attention to the following parameters: fiscal constraint, northern New England climate, realism, and practicality.
- The intent of the Town stormwater program is to reduce the discharge of pollutants to the maximum extent possible, to protect and preserve water quality and to satisfy the appropriate water quality requirements of the Clean Water Act.

### **2.0 WATERSHEDS**

- The Town consists of twelve (12) individual watershed areas. Alder Brook is the largest at approximately 5,416 acres (24% of the total).
- Significant portions of the Town remain primarily rural residential and are sparsely developed. The internal land uses in these areas are typically low impact and are anticipated to remain the same.
- Development will continue in the Indian Brook, Sunderland Brook, and Alder Brook watershed areas. Future land uses are critical in these more urbanized areas to address the increase in impervious area to preserve water quality.
- The majority of the watershed areas located within the Town are not impacted by external land uses from adjacent communities.
- Browns River, Alder Brook, Indian Brook and Sunderland Brook watershed areas are impacted by external land uses and Essex needs to work cooperatively with other communities to preserve water quality.

## Town of Essex Stormwater Management Plan

- The State conducts biomonitoring of rivers and streams to determine the water quality health. Indian Brook and Sunderland Brook have been designated as impaired by stormwater based on the results of the biomonitoring.
- Total Maximum Daily Loads have been formally established for both the impaired watersheds in Essex

### **3.0 STORMWATER SYSTEM INVENTORY AND MAPPING**

- GIS mapping has been performed of the existing public and private stormwater systems and is updated annually.
- The Town conducts a comprehensive inventory of the existing public and some private drainage systems annually and reports the results in the annual NPDES permit update. Locations of approximately 1,660 catch basins, 258 outfalls and 674 culverts have been field verified and plotted.

### **4.0 STORMWATER PERMITS ISSUED BY THE STATE OF VERMONT SEPARATE FROM THE MS4 NPDES PHASE 2 PERMIT AFFECTING ESSEX**

- Coverage is provided by the State under General Permit 3-9010 for permits issued within non-impaired waterways, under General Permit 3-9015 for development and redevelopment discharges to waters that are not principally impaired by collected stormwater runoff, under General Permit 9020 for stormwater discharges associated with construction activities and under Multi-sector General permits for industrial facilities.
- The Town has accepted 3-9010 permit responsibility for 14 discharges, two permits of which have shared responsibilities with homeowner's associations.
- The Town has one no-exposure MSGP for the closed Town landfill.

### **5.0 IDENTIFIED, EXPIRED EXISTING IMPAIRED WATERSHED PERMITS AND NON-PERMITTED OUTFALLS IN THE IMPAIRED WATERSHEDS**

- The Town is impacted by the TMDL's issued for the Indian Brook and Sunderland Brook watershed areas.
- There is a significant variety of discharges within the two impaired watersheds with many different contributors. They range in complexity from direct stream discharges from private property to expired permits which combine both municipal discharges as well as private property discharges.
- The Town has developed a preliminary list of the outfalls and the respective parties contributing to each.
- An unresolved issue is how the State will utilize the Residual Designation Authority, identified in regulation, as a device to encourage or force private property dischargers into compliance on water quality issues.

## Town of Essex Stormwater Management Plan

- The MS4 NPDES Phase 2 permit will require the Town, in cooperation with other MS4 permittees in the impaired watersheds, to prepare a Flow Restoration Plan within 3 years of State approval of the NOI and Stormwater Management Plan.
- The FRP will have to meet the water quality objectives of the TMDL.

### **6.0 PHASE II MUNICIPAL SEPARATE STORM SEWER (MS4)**

- The Town of Essex is designated as a “municipal separate storm sewer system” (MS4) under the Phase II program which is regulated under General Permit #3-9014, dated December 2012.
- The Town is submitting the required Notice of Intent (NOI) prior to June 3, 2013 as a component element of the Town’s Stormwater Management Plan. The NOI describes the approach for addressing the six (6) minimum control measures.
- The six (6) minimum control measures are described in detail: public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction stormwater management, pollution prevention/good housekeeping.

### **7.0 ESSEX COMPLIANCE PROGRAM**

- A narrative summary is provided, with specific reference to sections of the MS4 NPDES Phase 2 Permit, outlining the approach to be taken to effect compliance with the requirements of the permit.
- A description is provided of the management team to be utilized to direct program compliance.
- A schedule of required permit actions dates and activities is identified.
- Past, current and future stormwater funding information has been developed.
- Both stormwater system monitoring for pollutants and stream flow monitoring plans are identified. No acknowledgement has been made by the Vermont Agency of Natural Resources regarding the proposed plan for stream flow monitoring.
- A brief narrative is provided regarding the best management practices noted in the NOI and in the Stormwater Management Plan.

### **8.0 REFERENCES**

- A list of stormwater related documents is provided which were utilized in the preparation of the Plan and are available as resources for additional information.

### **9.0 DEFINITIONS**

A glossary of stormwater related terms is provided for reference purposes.

## **1.0 INTRODUCTION**

### **1.1 BACKGROUND**

The federal Clean Water Act (CWA) was enacted in 1972 and directs the U.S. Environmental Protection Agency (EPA) to develop regulations and programs to improve the water quality of the nation's waterways. The CWA requires states to identify and publish a list of waterways that are "water quality impaired". In Vermont, the "303 (d) list" includes approximately twenty-five (25) waterways that are impaired due to stormwater runoff from existing development. Approximately twelve (12) of these waterways are located in Chittenden County. The CWA also required Vermont to develop a Total Maximum Daily Load (TMDL) study for each waterway on the 303(d) list by 2013. If water quality impairment can be addressed so that the water bodies can be removed from the list, then compliance with the expensive and uncertain requirements of the TMDL program can be avoided. TMDL's were established for the two impaired waterways in Essex – Indian Brook (VT05-09) in September of 2008 and Sunderland Brook (VT08-02) also in September of 2008. Copies are included as Appendices H and I to this Plan.

EPA developed regulations in 1990 under the National Pollutant Discharge Elimination System (NPDES) that address the water quality impacts of stormwater. These regulations apply to land developments and "municipal separate storm sewer systems" (MS4s). EPA imposed these stormwater regulations on large developments and MS4s under Phase I of the program in 1990. In 1999, EPA began expanding these mandates to smaller land developments and MS4s under the Phase II program. MS4s located in U.S. Census defined metropolitan areas of less than 100,000 people comply with the Phase II MS4 program. A current list of Chittenden County municipalities identified as MS4 communities is:

- Burlington
- Colchester
- Essex
- Essex Junction
- Shelburne
- South Burlington
- Williston
- Winooski
- Milton

The State also identified publicly owned nontraditional MS4s to be:

- Burlington International Airport
- University of Vermont
- VT Agency of Transportation (VTRANS)

In addition, the communities of St. Albans, St Albans Town and Rutland were notified in 2012 of their inclusion as MS4 Communities.

The objective of the USEPA Phase II program is for the municipalities to develop effective, site-specific storm water management programs that reduce the discharge of pollutants from the MS4s to the "maximum extent practicable" (MEP). USEPA selected this flexible regulatory approach because the nature of the discharges from MS4s varies from region to region. The

Town of Essex Stormwater Management Plan

Town of Essex, as an operator of a small MS4, incorporates the following elements into the Town's (outside the Village of Essex Junction) storm water management program:

- Government coordination;
- Legal authority and comprehensive planning;
- Funding and staffing;
- Public education and participation; and
- Best management practices (BMP's)

MS4 operators are required to design their storm water management programs to:

- Reduce the discharge of pollutants to the "maximum extent possible" (MEP);
- Protect water quality; and
- Satisfy the water quality requirements of the Clean Water Act.

Implementation of the "maximum extent possible" standard requires the development and implementation of "best management practices" (BMPs) and the achievement of measurable goals to satisfy each of the six (6) "minimum control measures". The Phase II requirements define a MS4 storm water management program as comprising of six (6) elements that, when carried out in concert, will result in reductions of pollutants discharged into receiving water bodies. The six (6) MS4 program elements, termed "minimum control measures", as described by USEPA are:

- (1) Public Education and Outreach
- (2) Public Participation and Involvement
- (3) Illicit Discharge Detection and Elimination
- (4) Construction Site Runoff Control
- (5) Post Construction Runoff Control
- (6) Pollution Prevention/Good Housekeeping

The USEPA and State of Vermont have set into place requirements on the MS4 permittees through a number of legal actions and permits. Under the Phase I and II federal stormwater permit programs, Vermont is an NPDES-delegated state. The State of Vermont Agency of Natural Resources administers the following permit programs for USEPA:

- The NPDES MS4 Phase 2 General Permit 3-9014, as issued in 2003, 2008 and revised again in December of 2012.
- The issued TMDL's for Sunderland and Indian Brook
- Non-impaired waterways permits issued to Essex (3-9010 permits)
- Discharge permits issued for specific projects (3-9015 permits)
- Construction Site Runoff General Permit
- Multi-Sector Industrial General Permits

## **1.2 IMPACTS OF STORMWATER ON WATER QUALITY**

Precipitation is absorbed into the ground or flows across the ground surface. Stormwater runoff flowing across the ground absorbs chemicals and physically carries undissolved particles and other suspended material. Urban stormwater runoff comes from roads, rooftops, and other impervious surfaces associated with developed lands. Increased volumes of runoff tend to transport more absorbed materials containing chemicals and suspended material. Steep slopes and impervious surfaces increase the velocity of the runoff and can cause greater volumes in specific downstream locations. Increased stormwater volumes enable runoff to scour larger particles and transport downstream. Vegetative groundcover, reduced slopes and man-made barriers can slow runoff, diminishing its ability to transport materials.

Stormwater runoff becomes a concern when transported materials include toxic substances and biological pathogens. Non-toxic sediments and nutrients are deposited downstream so that they destroy or unbalance natural habitats. Examples of pollutants that commonly are flushed from developed areas by stormwater include:

- Oil and grease from roadways and parking lots
- Pesticides and fertilizers from lawns
- Sediment from all sources
- Chemicals such as phosphorus
- Pet wastes
- Carelessly discarded litter from pedestrian ways

Urban stormwater runoff can impair water bodies as described below:

- Causes erosion, damages natural settings and private property, and endangers the public, and;
- Can endanger or destroy aquatic wildlife and habitats, cause unhealthy algae blooms, endanger public health via contact recreation sports (public beach closures), and contaminate sources of drinking water supplies.

Land development is not the only cause of water quality impairment but it can adversely affect the stormwater quality as follows:

- The types of activities that occur in developed areas tend to result in increased amounts of pollutants being deposited onto ground surfaces, where they are vulnerable to transport by stormwater into surface water bodies;
- Increased impervious land coverage tends to increase the amount of stormwater runoff, the rate at which it accumulates, and the velocity of discharges; and
- Reduced areas of vegetation and pervious surfaces tend to reduce the opportunities for pollutants to be filtered before stormwater is discharged into water bodies.

## Town of Essex Stormwater Management Plan

Most traditional approaches to storm water management focus on efficiently collecting and conveying storm water off-site. Such an approach may increase downstream property damage and necessitates expensive public works, such as enlarging and reinforcing channels or swales to provide an adequate outfall from the site and/or downstream channel stabilization projects.

More recent approaches to storm water management seek to retain features of drainage systems by providing on-site storm water quantity reduction that also improves storm water quality. This approach views storm water as a resource that can be used to:

- Recharge groundwater from areas of sites that are made impervious;
- Supply fresh water to surface water bodies both directly and as an enhancement to base flow;
- Increase recreational opportunities including hunting, swimming, fishing, and boating; and
- In some cases, augment drinking water supplies.

### **1.3 PROGRAM COMPONENTS**

#### **1.3.1 Governmental Coordination**

Inter- and intra-governmental coordination of Town regional entities and departments involved in storm water related issues are fundamental to the success of managing storm water. To date, the Public Works Department has been the principle department engaged in stormwater programs in Essex supported by the Town Manager's office and the Community Development Department.

The "lead person" is the Public Works Director whose responsibility is to facilitate overall coordination of the various storm water activities. In the Department of Public Works, a Storm water Coordinator/Staff Engineer has a key role in insuring that the Town is in compliance with all permit requirements and reporting. The Public Works Director and Stormwater Coordinator share responsibilities for the NPDES permit, all technical aspects, and the day-to-day public works operations and maintenance functions of this plan's strategies for implementation. Also, the Public Works Director and Storm water Coordinator share the responsibility for collaboration with other municipal and regional entities The Community Development Director oversees the planning functions, bylaw considerations, and permit review aspects. The Town Manager provides the overall coordination between staff and elected officials.

#### **1.3.2 Legal Authority and Comprehensive Planning**

Although required to develop "measurable goals" for each "best management practice", the Town of Essex recognizes that some overarching goals for the Town's entire storm water management program is valuable. Objectives for each of the six (6) minimum control measures helps place each program component into perspective within the framework of the Town's overall program. Essex believes that the use of environmental indicators to evaluate program success at either the minimum control measure or overall program level is useful (e.g. fecal coliform bacteria as an indicator of the presence of human pathogens in drinking water). In identifying its environmental indicators, the Town of Essex considered EPA's established hierarchy of indicators as shown on Figure 1, Environmental Indicators Pyramid.

*Town of Essex Stormwater Management Plan*

The indicators at the base of the pyramid are more general and are most useful for limited statements concerning Essex' specific program areas. Moving up to higher levels on the pyramid results in indicators that reflect improvements in in-stream biota and its linkage to overall program success.

In a similar fashion, the indicators are shown on Figure 2, Hierarchy of Environmental Indicators. These indicators reflect administrative or programmatic measurements while actual indicators of environmental change are contained in the upper boxes. Both figures depict the hierarchy of indicators where administrative and programmatic indicators are relatively easy to determine but are generally not as useful as the environmental indicators.

**Figure 1** Environmental Indicators Pyramid

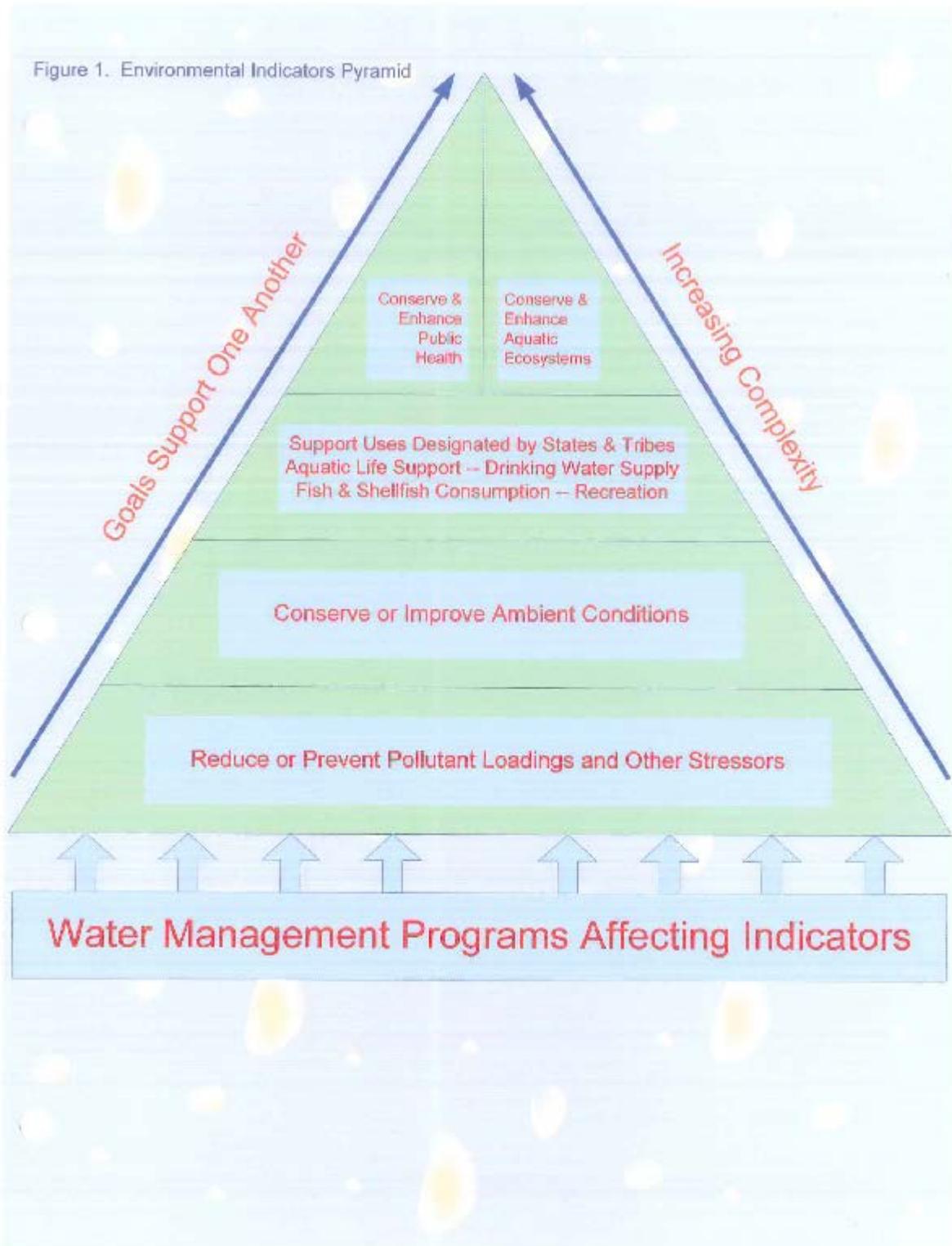
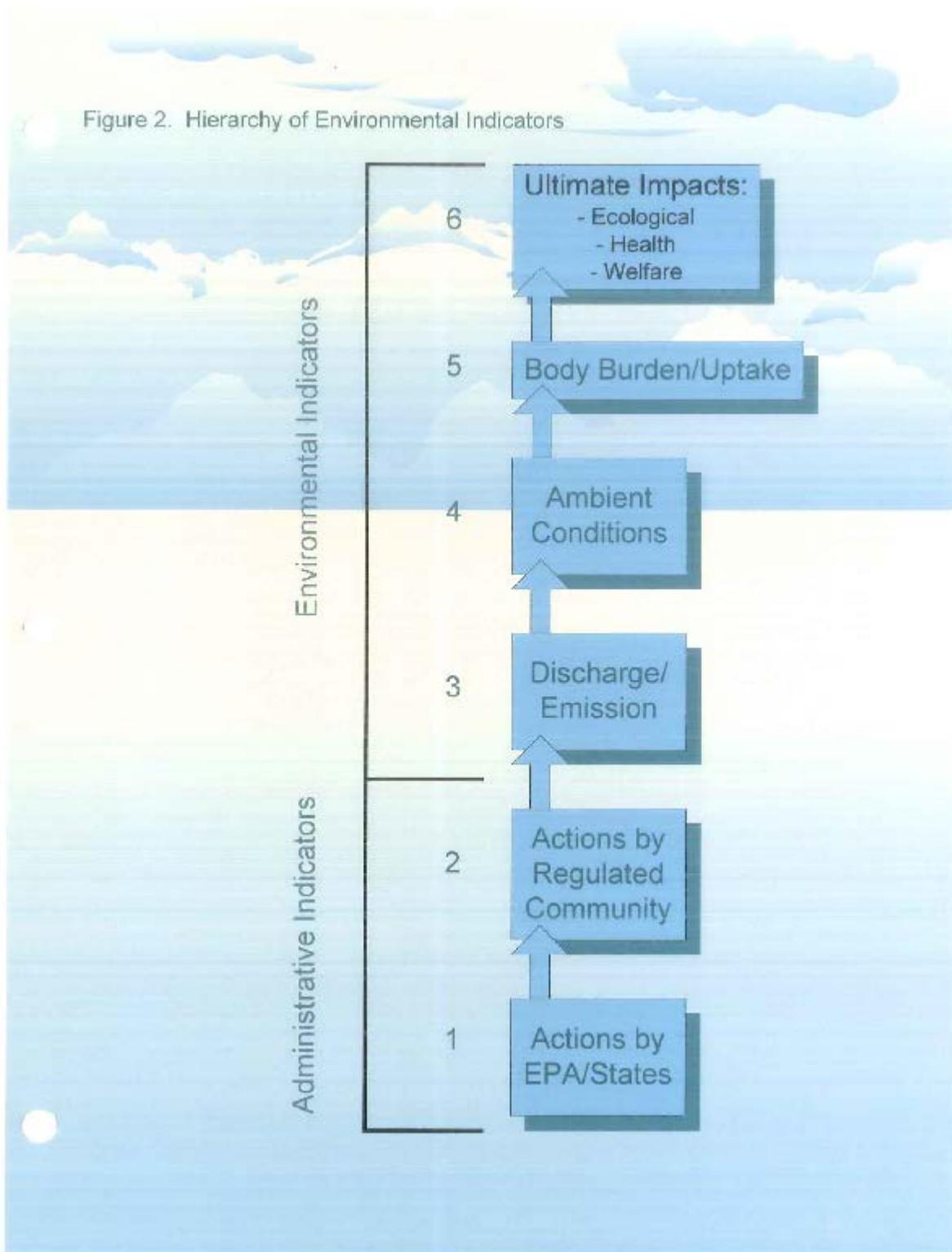


Figure 2. Hierarchy of Environmental Indicators



Town of Essex Stormwater Management Plan

In Table 1, Storm Water Indicators, a list of environmental indicators developed for assessing storm water programs is presented. Indicators #1 through #16 have generally been integrated into the overall Essex storm water management program through the previous and ongoing compliance under the NPDES Phase 2 permit.

**TABLE 1  
STORMWATER INDICATORS**

<b>CATEGORY</b>	<b>#</b>	<b>INDICATOR NAME</b>
Water Quality	1	Water quality pollutant constituent
	2	Toxicity testing
	3	Loadings
	4	Exceeding frequencies of water quality standards
	5	Sediment contamination
	6	Human health criteria
Physical and Hydrological	7	Stream widening/down-cutting
	8	Physical habitat monitoring
	9	Impacted dry weather flows
	10	Increased flooding frequency
	11	Stream temperature monitoring
Biological	12	Fish assemblage
	13	Macro-invertebrate assemblage
	14	Single species indicator
	15	Composite indicator
	16	Other biological indicators
Social	17	Public attitude surveys
	18	Industrial/commercial pollution prevention
	19	Public involvement and monitoring
	20	User perception
Programmatic	21	Number of illicit connections identified/corrected
	22	Number of BMPs installed, inspected, and maintained
	23	Permitting and compliance
	24	Growth and development
Site	25	BMP performance monitoring
	26	Industrial site compliance monitoring

## **1.4 SELF ANALYSIS**

### 1.4.1 Understanding storm water regulations and Essex' storm water responsibilities.

- Essex is located in an urbanized area as Censuses.
- Essex is considered an operator of a “municipal separate storm sewer system” (MS4).
- Essex understands that the town needs to comply with the NPDES Phase II requirements for small municipal separate storm sewer systems, including a program that addresses the six (6) “minimum control measures” and measurable goals. Submittal of the Notice of Intent and SWMP under General Permit 3-9014 dated December 5, 2012 is required by June 3, 2013.

### 1.4.2 Understanding how Essex currently manages its storm water runoff.

- Inventory of storm water catch basins, pipes, culverts, ditches, and channels.
- Number of outfalls Essex discharges to and their location.
- Other individuals/entities discharging storm water into the Town system.
- Identification of major pollutant sources in Essex (and in other Towns in the same watershed).
- Identification of flood control and water quality practices currently in place in Town.

### 1.4.3 Knowing the condition of the Town's receiving waters.

- Names and locations of waters that receive discharge from the Town's MS4.
- The character and quality of these waters.
- List of impaired waters according to the Vermont 303(d) list.
- List of pollutants impacting these waters.
- Designated use of these waters.

### 1.4.4 Assessing Essex' current programs and practices to determine what needs to change.

- Current practices contributing to water quality problems.
- Current practices that will help meet the NPDES storm water requirements.
  - Existing education program on water quality.

- Erosion control and sediment control program.
- Procedures addressing illegal dumping and spills.
- Current legal authority and legal authority needed to develop.

1.4.5 Identifying stakeholders who can help Essex develop and implement the Town's storm water program.

- Other Phase II communities and non-municipal permittees: All are cooperating with one another to meet the intent of Phase II, in collaboration with the Chittenden County Regional Planning Commission (CCRPC).
- There are no Phase I communities in Vermont that could help Essex deal with storm water issues.
- Other entities that could help Essex include but may not be limited to the CCRPC, Vermont Agency of Natural Resources Water Quality Section, Vermont General Assembly, Champlain Water District, Chittenden Solid Waste District, Lake Champlain Regional Chamber of Commerce, the Greater Burlington Industrial Corporation, and Lake Champlain Committee.

1.4.6 Determining the overall objectives for Essex' storm water program.

*Preamble.* The Town of Essex, while fully understanding the overarching purpose of the USEPA Phase II requirements (and related state efforts), intends to carry out its storm water program with attention to the following parameters:

- Fiscal constraint,
- Northern New England climate,
- Realism, and
- Practicality.

*Policy.* It is the overall intent of the Town of Essex (outside the Village of Essex Junction) to develop, implement, and enforce a storm water management program designed:

- To reduce the discharge of pollutants to the maximum extent practicable,
- To protect and preserve water quality, and
- To satisfy the appropriate water quality requirements of the Clean Water Act.

## 1.5 PLAN DEVELOPMENT

The Town of Essex received a Vermont Municipal Planning Grant to assist the Town with developing a "Stormwater Management Plan" in 2003. In 2012, the revised NPDES Phase 2 Permit required an update to the plan. This document provides that updated version of the 2003 Plan. The following tasks were to be completed by the Town in the preparation of the plan:

- Review of the requirements of the Dec 2012 version of the NPDES Phase 2 Permit
- Confirmation of the defined watershed areas and MS4 boundaries
- Review of the issued TMDL's for both impaired waterways
- Review of the geomorphic stream assessments for both impaired waterways

- Review of existing local storm water regulations and permits
- Review of all existing GIS mapped stormwater information in the Town
- Review of all issued 3-9010 permits of the non-impaired watersheds in Town
- Review and Signing of regional Memorandums of Understanding for Public Education (RSEP) and Public Participation (CCST)
- Review of all BMP practices which the Town has undertaken since the original permit in 2003 and the contents of all stormwater annual reports since then
- Review of literature and experience with BMP's by other communities
- Identification of expired permits in the impaired watersheds
- Continuing Assessment of existing conditions
  - Identification of land uses and zoning
  - Inventory and inspections on existing stormwater facilities
  - Review of State stormwater permits other than the NPDES Phase 2
  - Continuing identification of key locations for water quality testing
- Assessment of future conditions
  - Identify/examine future land uses and development controls
- Development of recommendations for future stormwater improvements
- Report preparation for SWMP and NOI

## 2.0 WATERSHED AREAS

### 2.1 GENERAL DESCRIPTION

#### 2.1.1 Introduction

Mapping and delineation of the watershed areas was performed by the Chittenden County Regional Planning Commission (CCRPC). This GIS mapping was provided to the Town on May 15, 2002. The total area of the Town is approximately 22,392 acres and the Town was divided into twelve (12) individual watershed areas. A map of the watershed areas is provided in Appendix B and a summary is provided in Table 2. Each watershed area is briefly described in the following narratives.

**TABLE 2  
TOWN OF ESSEX  
WATERSHED AREAS**

<b>ID NUMBER</b>	<b>NAME</b>	<b>AREA (acres)</b>	<b>% OF TOTAL</b>
1	Morgan Brook	184	0.8
2	Abbey Brook	1,656	7.4
3	The Creek	88	0.4
4	Browns River	6,127	27.4
5	Skunk Hollow Brook	70	0.3
6	Winooski River East	2,716	12.1
7	Alder Brook	5,416	24.2
8	Indian Brook	4,530	20.2
9	Sunderland Brook	349	1.6
10	Winooski River West	353	1.6
11	Pond Brook	653	2.9
12	Mallets Creek	250	1.1
<b>TOTALS</b>	<b>22,392</b>	<b>100</b>	

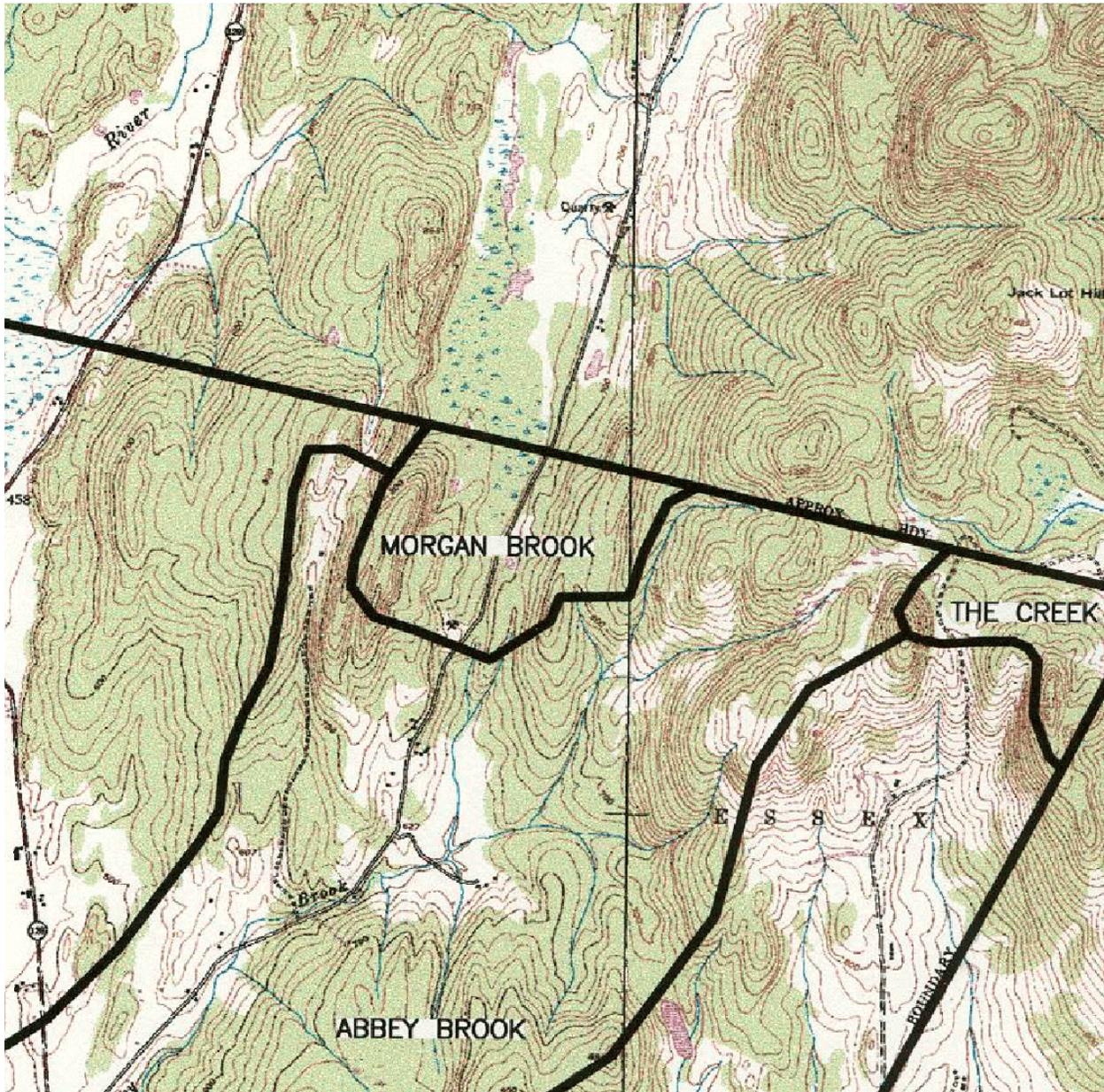
**NOTES:**

1. Watershed areas as defined by CCRPC and indicated on the "Watershed Boundary" map dated May 15, 2002.

### 2.1.2 Morgan Brook

Morgan Brook is located in the northeast corner and the watershed area located within the Town boundaries is approximately 184 acres. This watershed area generally slopes in the northerly direction and extends into Westford. The Abbey Brook watershed surrounds this watershed area along the west, south, and east boundaries.

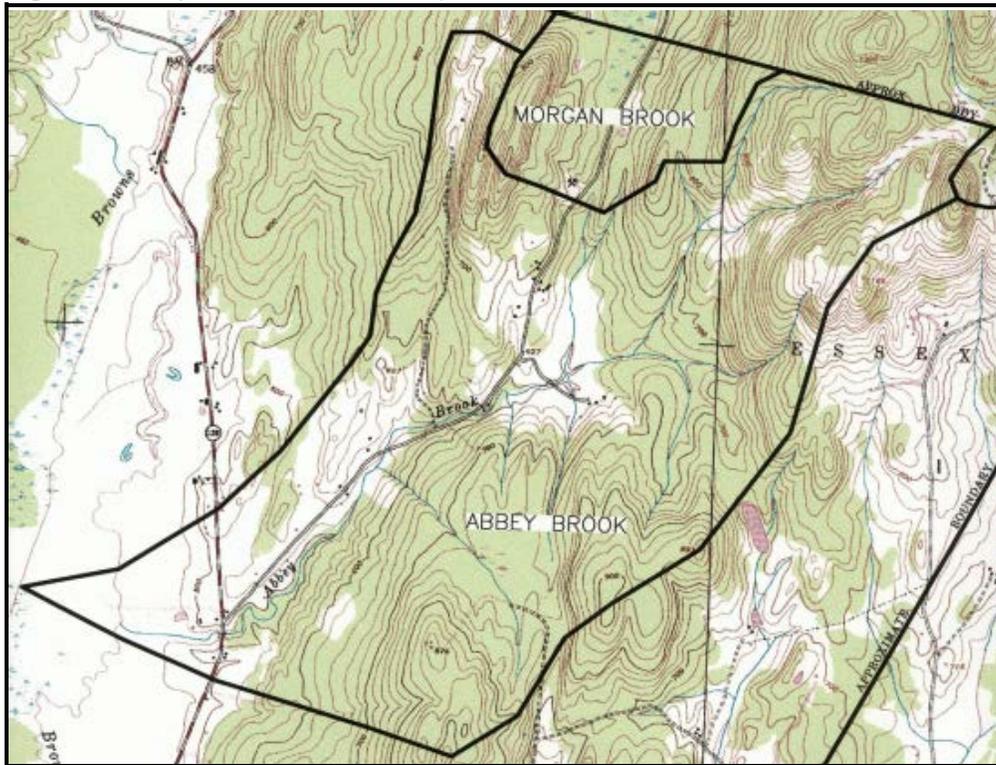
**Figure 2** Morgan Brook Watershed Map



### 2.1.3 Abbey Brook

Abbey Brook is located in the northeastern corner and has a total area of approximately 1,656 acres. This watershed generally slopes in the southerly direction and the entire watershed is located within the Town. Abbey Brook is the largest water body in the watershed and flows south through the center of the watershed to the Browns River. The Browns River watershed surrounds this watershed area along the west, south, and east boundaries.

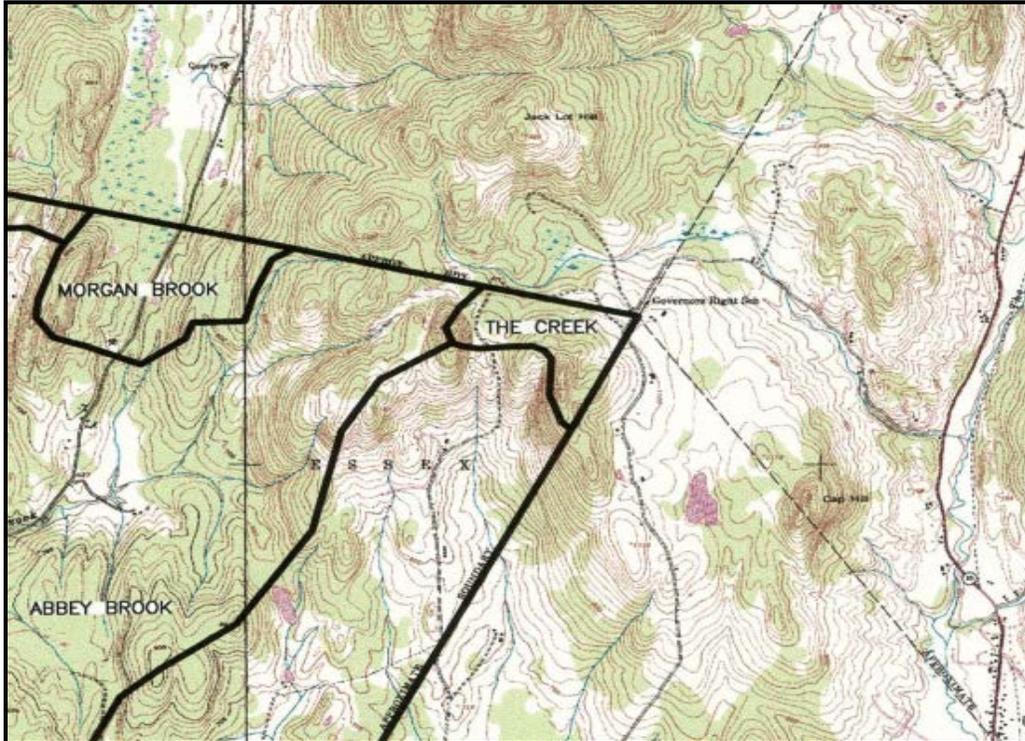
**Figure 4** Abbey Brook Watershed Map



### 2.1.4 The Creek

The Creek is located in the northeast corner and the watershed area located within the Town boundaries is approximately 88 acres. This watershed slopes in the northerly direction and extends into Westford, Underhill, and Jericho. This watershed is bound by the Abbey Brook and Browns River watershed areas to the west and south, respectively.

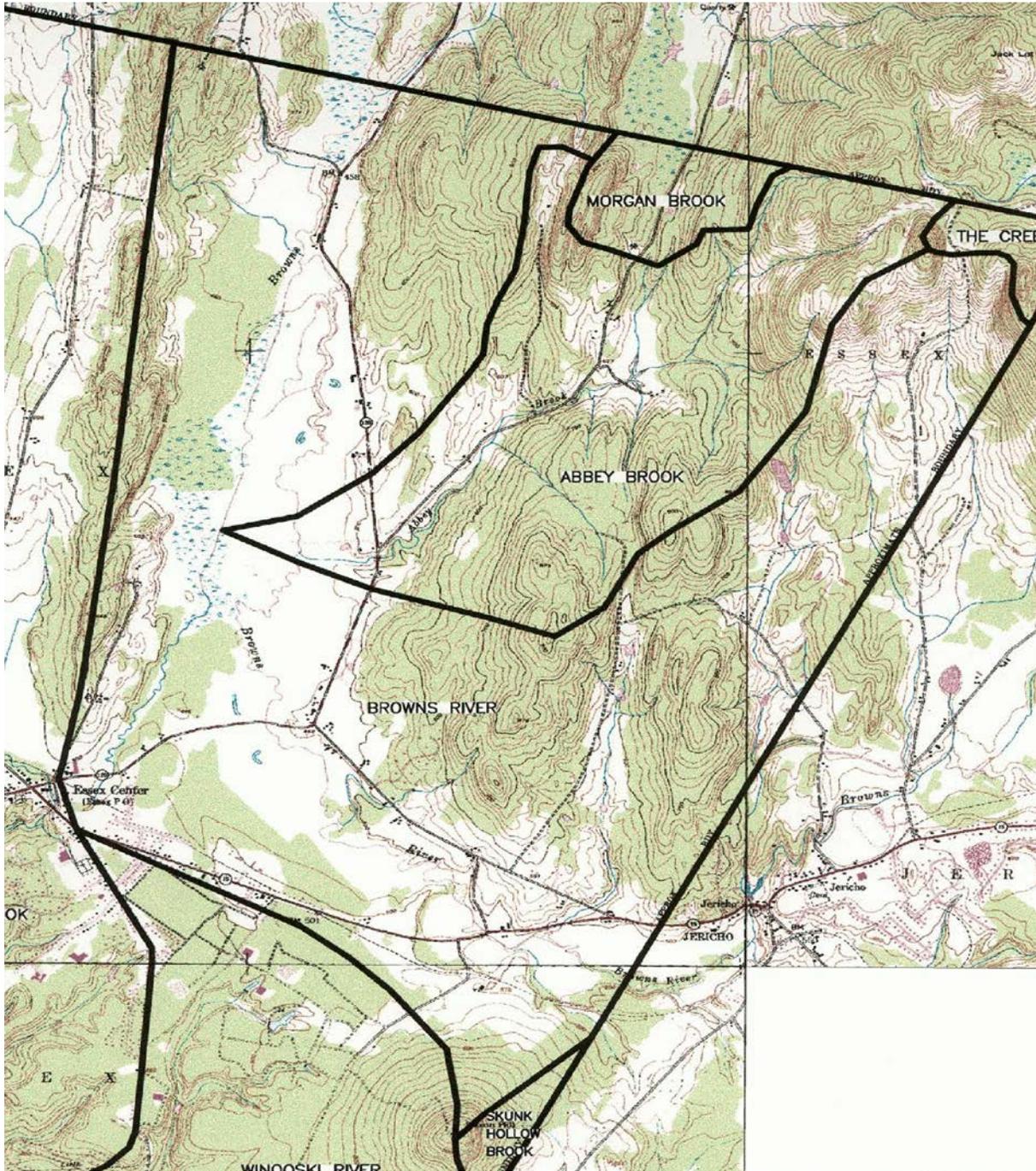
**Figure 5** The Creek Watershed Map



2.1.5 Browns River

Browns River is the largest watershed at approximately 6,127 acres and covers approximately 27.4% of the total area of the Town. The easterly edge of the watershed extends into Jericho and the northerly edge extends into Westford. The Browns River is the largest waterbody in the watershed, and flows west and then north through the watershed area into Westford.

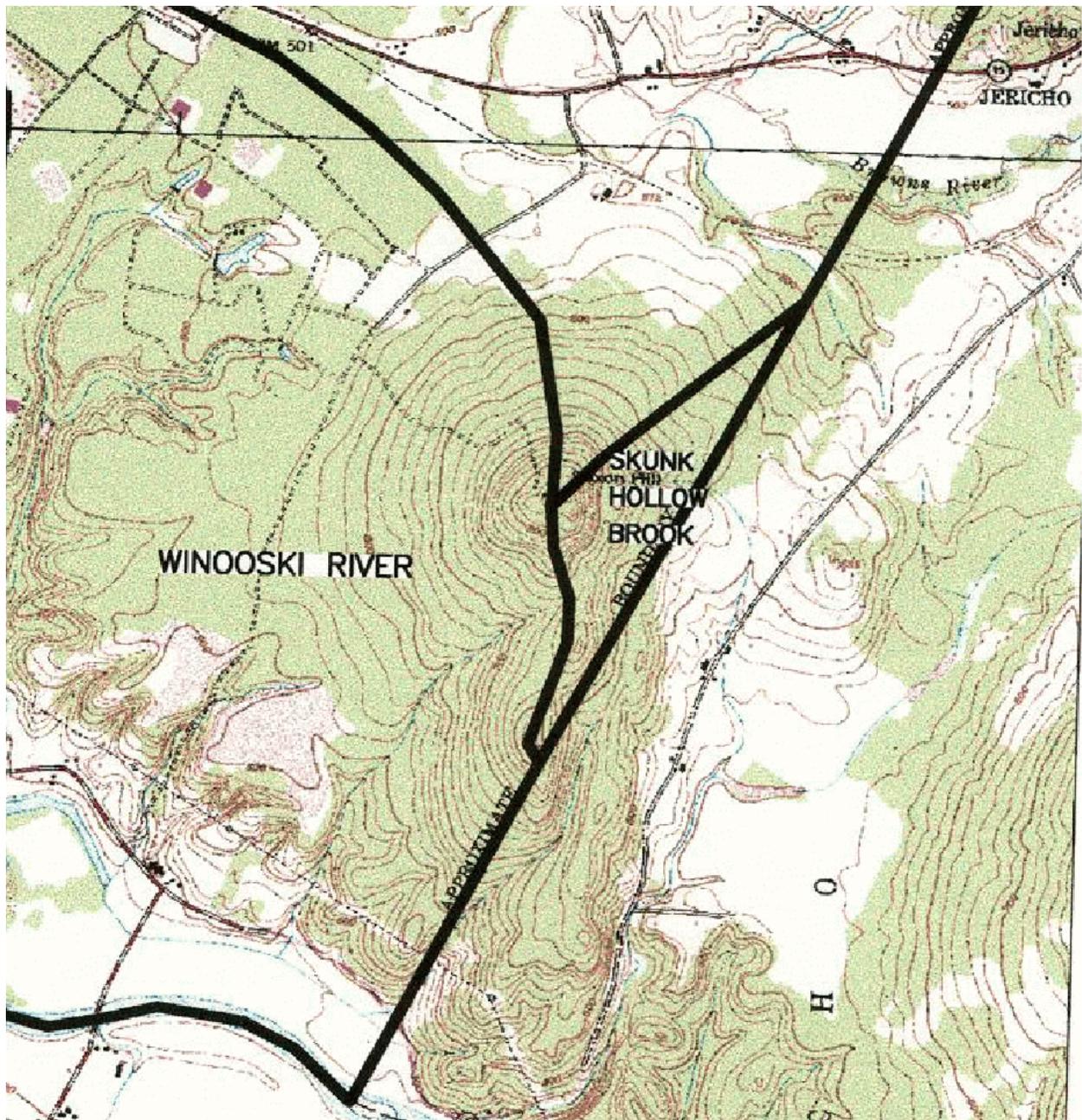
**Figure 6** Browns River Watershed Map



2.1.6 Skunk Hollow Brook

Skunk Hollow Brook is located at the easterly edge along the boundary with Jericho. The watershed area located within the Town boundaries is approximately 70 acres. This watershed area generally slopes in the easterly direction and extends into Jericho.

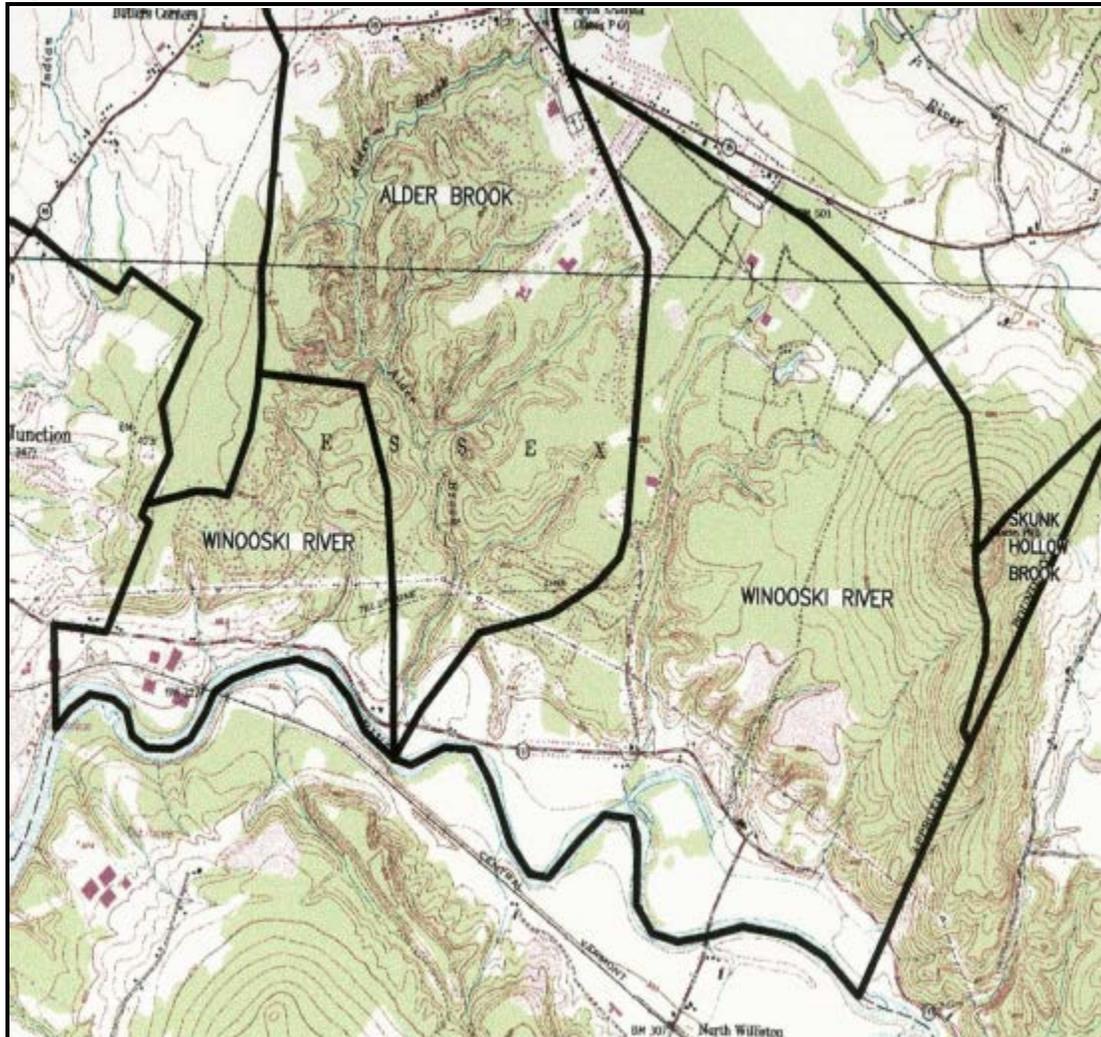
**Figure 7** Skunk Hollow Brook Watershed Map



### 2.1.7 Winooski River East

The Winooski River East is located in the south and southeast corner and the watershed area located within the Town boundaries is approximately 2,716 acres. The watershed generally slopes in the southerly direction towards the Winooski River. The easterly edge of the watershed extends into Jericho and the southerly edge extends to Williston. This watershed is bound by the Alder Brook and Browns River watershed areas to the west and north, respectively.

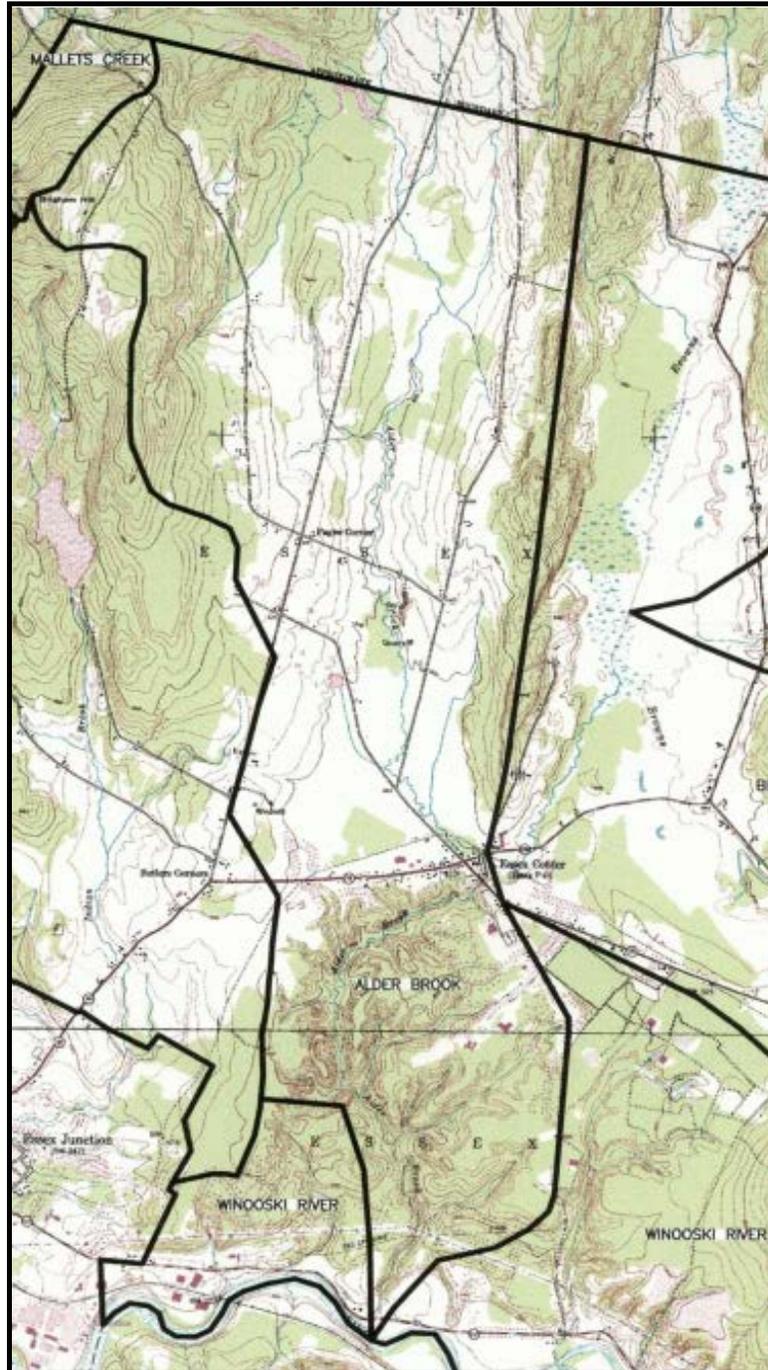
**Figure 8** Winooski River East Watershed Map



2.1.8 Alder Brook

Alder Brook is the second largest watershed at approximately 5,416 acres and covers approximately 24.2% of the total area of the Town. The northerly edge of the watershed extends into Westford. The Alder Brook is the largest waterbody in the watershed and flows south to the Winooski River. This watershed is primarily bound by the Indian Brook and Browns River watersheds to the west and east, respectively.

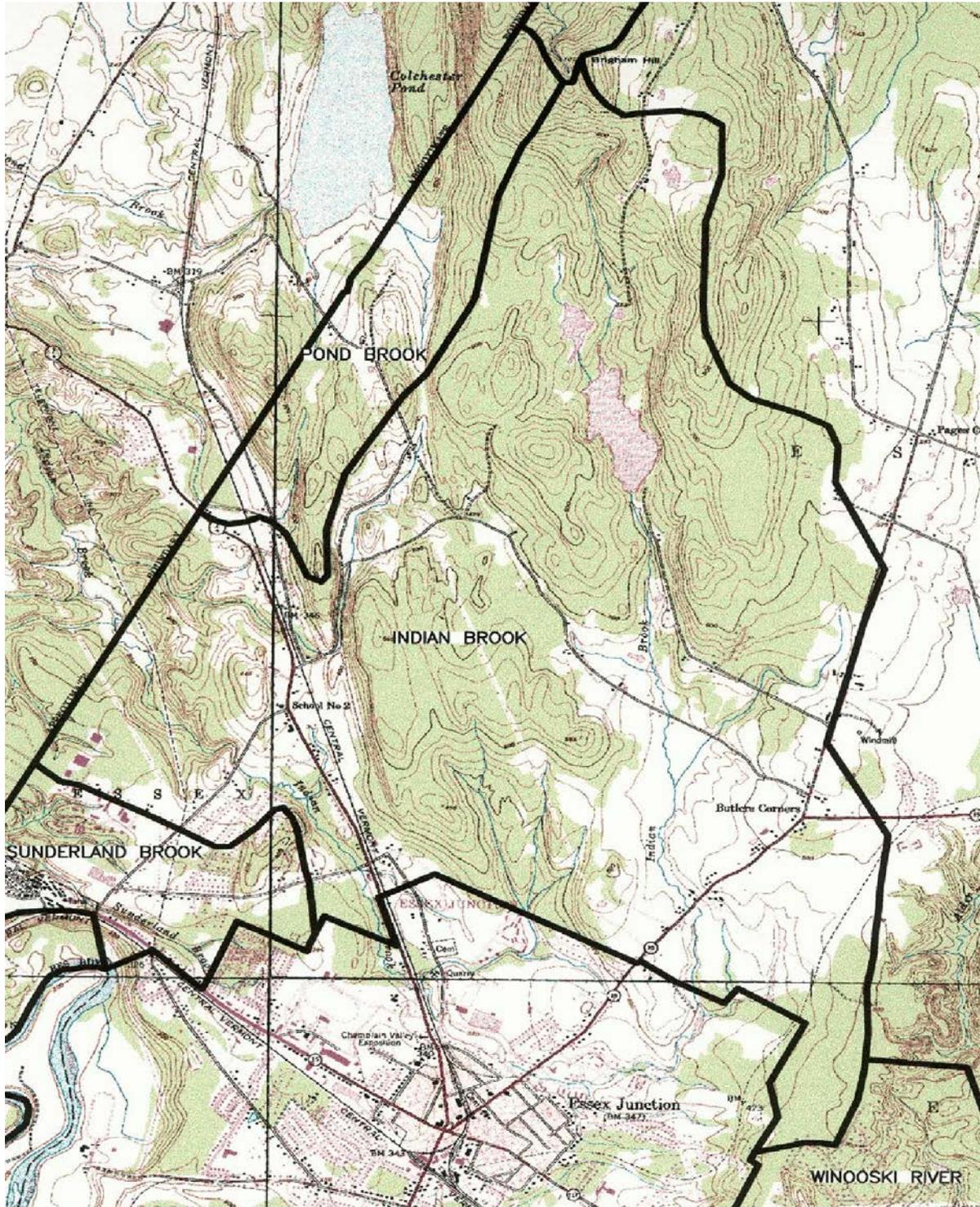
**Figure 9** Alder Brook Watershed Map



2.1.9 Indian Brook

Indian Brook is the third largest watershed at approximately 4,530 acres and covers approximately 20.2% of the total area of the Town. The westerly edge of the watershed extends into Colchester and southerly edge into Essex Junction. Indian Brook Reservoir is the largest waterbody in the watershed. Indian Brook flows south into Essex Junction, west into Essex, and continues west into Colchester. The State has designated this watershed impaired by stormwater.

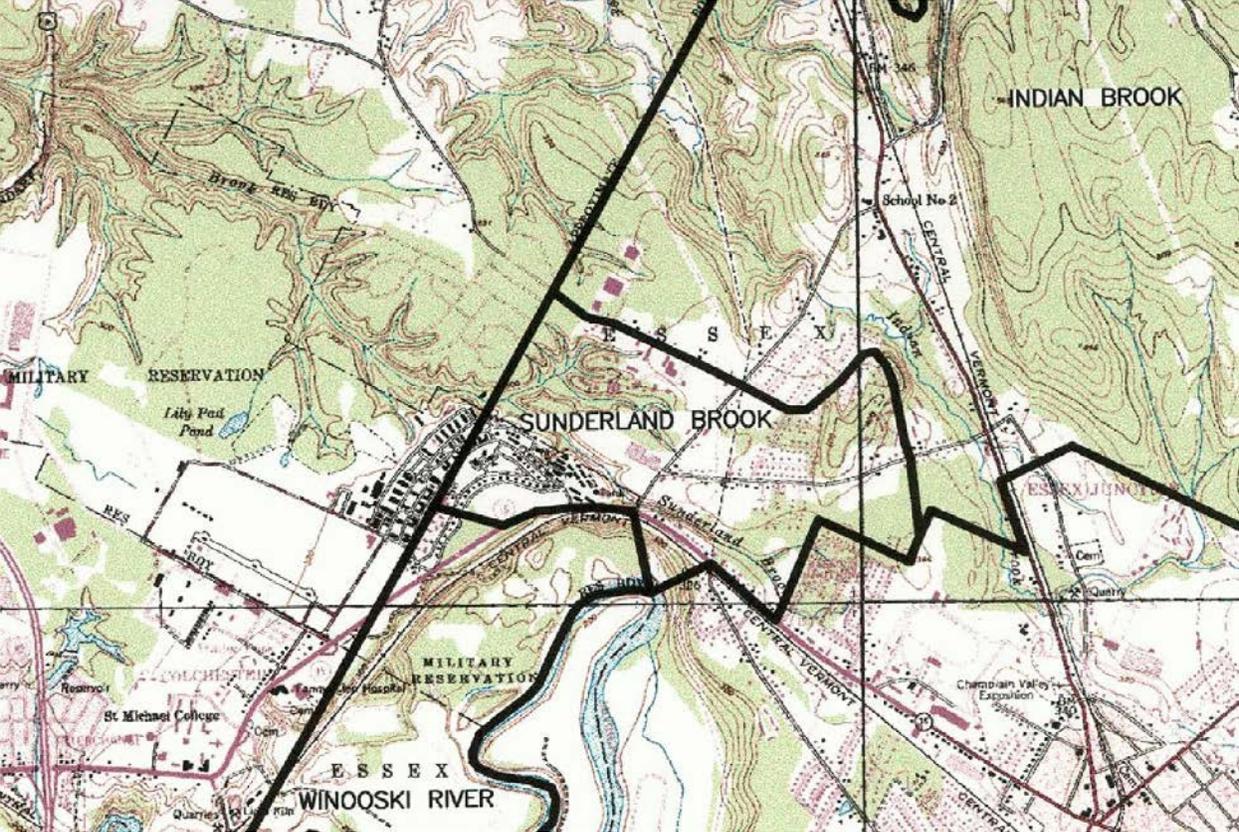
**Figure 10** Indian Brook Watershed Map



2.1.10 Sunderland Brook

Sunderland Brook is located in the southwest corner and the watershed area located within the Town boundaries is approximately 349 acres. The west edge is bounded by Colchester and the southerly edge by Essex Junction. The Sunderland Brook is the largest waterbody in the watershed and flows west into Colchester. The State has designated this watershed impaired by stormwater.

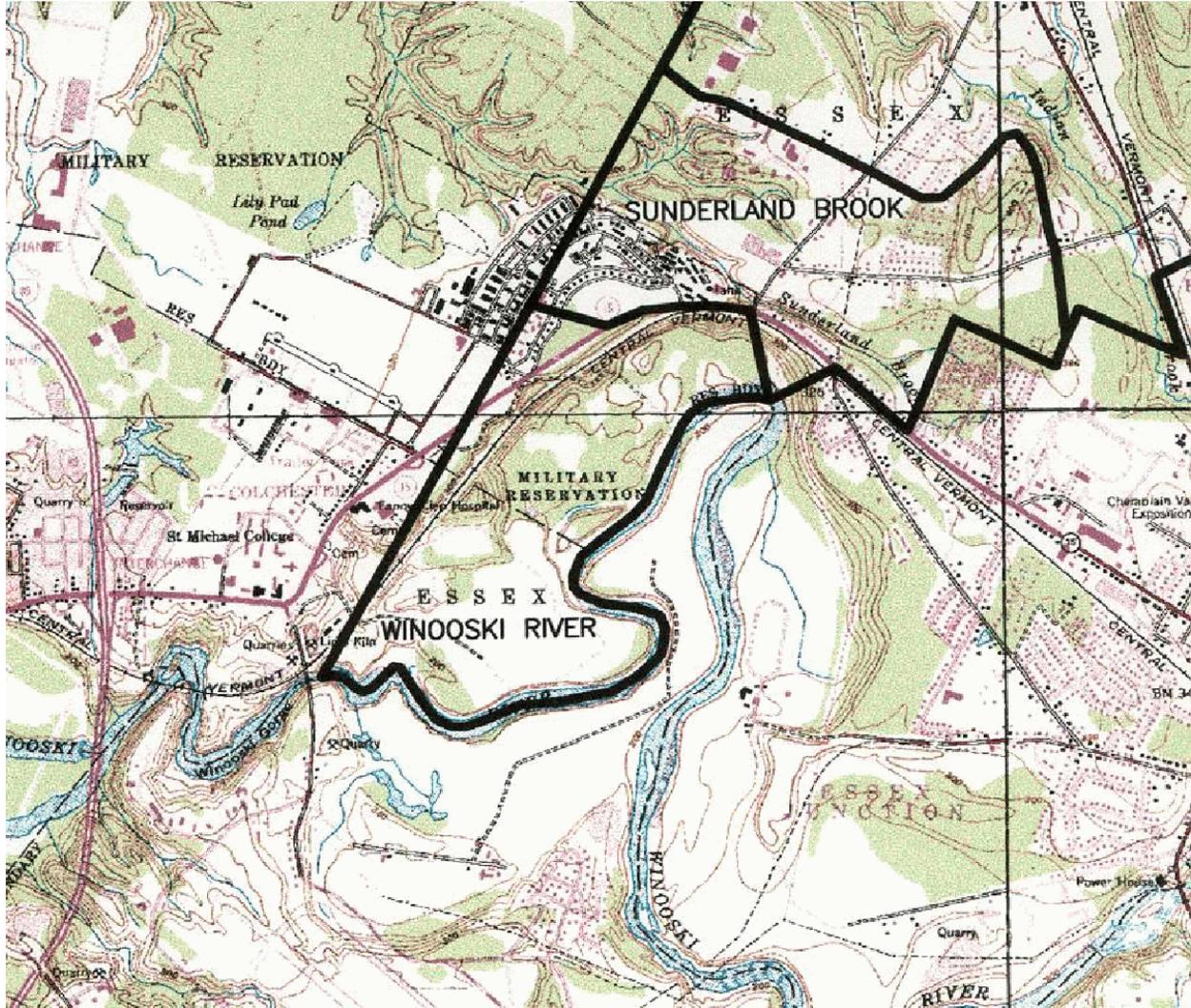
**Figure 11** Sunderland Brook Watershed Map



### 2.1.11 Winooski River West

Winooski River West is located in the southwest corner and the area located within the Town boundaries is approximately 353 acres. The watershed generally slopes in the southerly direction towards the Winooski River. The westerly edge of the watershed extends into Jericho and the easterly edge extends into Essex Junction. This watershed is bound by the Sunderland Brook watershed area to the north.

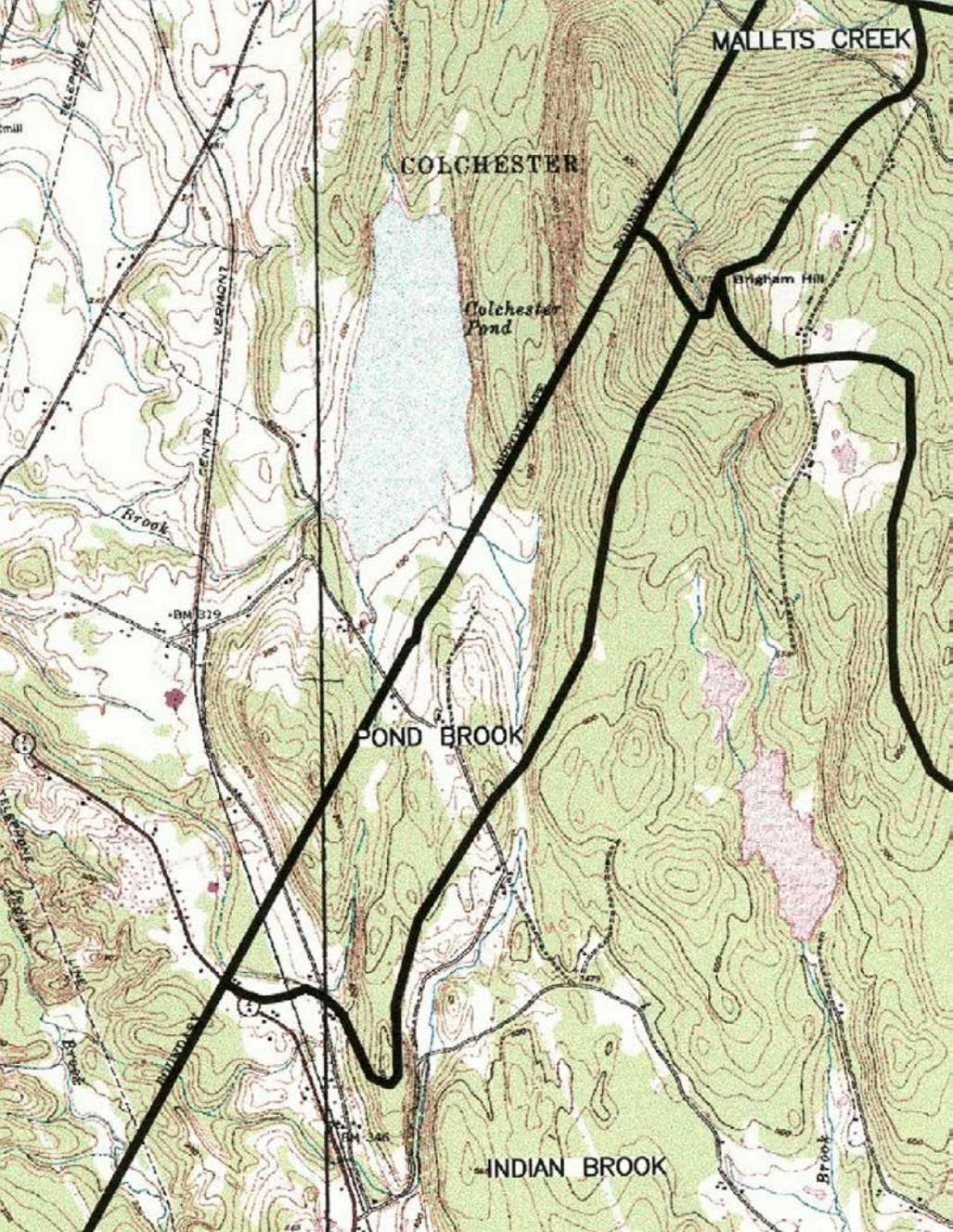
**Figure 12** Winooski River West Watershed Map



2.1.12 Pond Brook

Pond Brook is located along the westerly edge along the boundary with Colchester. The watershed area located within the Town boundaries is approximately 653 acres. This watershed area generally slopes in the westerly direction and extends into Colchester.

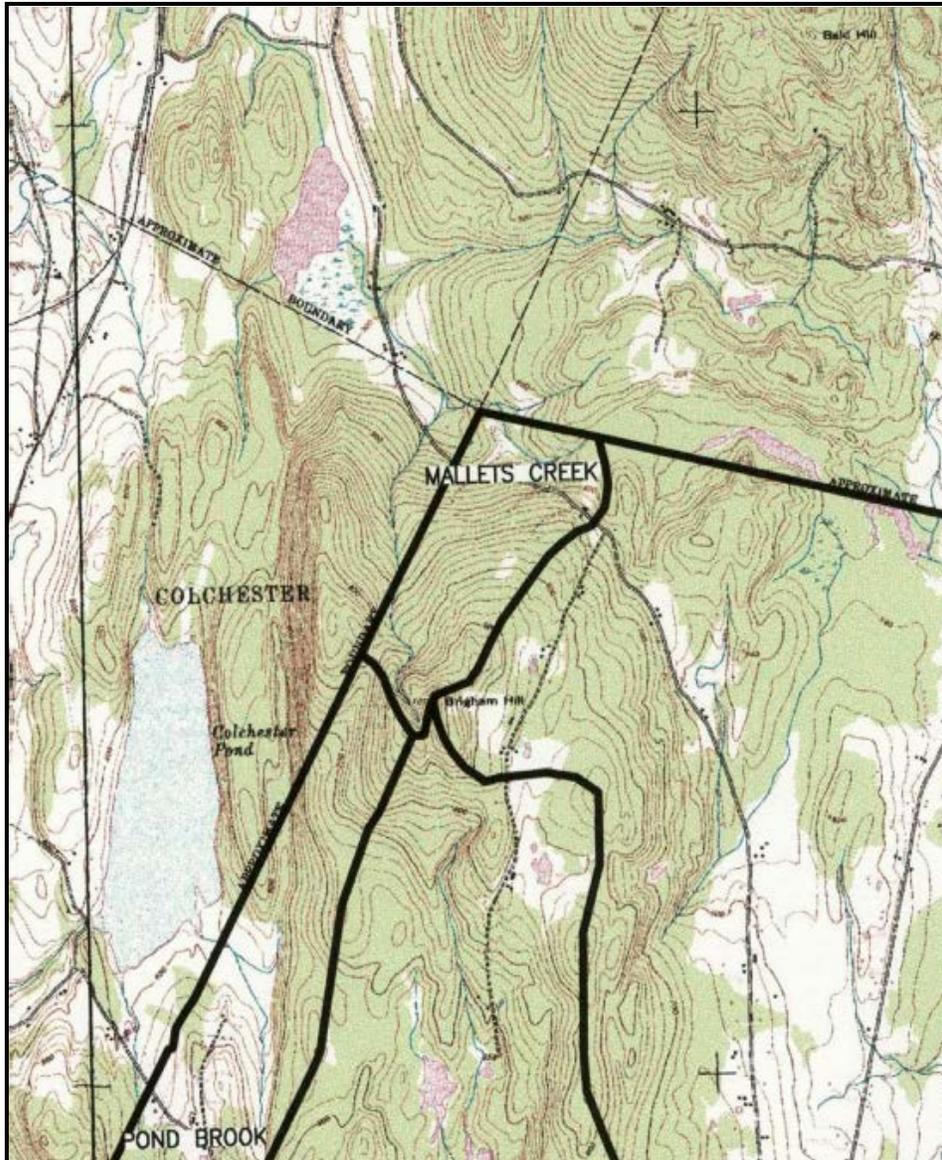
Figure 13 Pond Brook Watershed Map



2.1.13 Mallets Creek

Mallets Creek is located in the northwest corner and the watershed area located within the Town boundaries is approximately 250 acres. This watershed area generally slopes in the northwest direction and extends into Colchester, Milton, and Westford.

**Figure 14** Mallets Creek Watershed Map



## **2.2 DESCRIPTION OF INTERNAL LAND USES**

### 2.2.1 General

The “2011 Town Plan” is the most recent plan and is used to evaluate the existing and future land uses in each watershed area. The map in Appendix BB is the current land use map under the existing Town Plan. The map in Appendix CC is the approved future land use plan within the 2011 approved Town Plan. The Town of Essex watershed map in Appendix B and the Essex areas subject to the MS4 in Appendix C were utilized to develop the following information as well as other sources available to the Town.

### 2.2.2 Morgan Brook

#### *Existing Land Uses*

This watershed is primarily undeveloped. Existing land uses consist of Forest and Wetland areas. Forest is the primary use at approximately 84% of the total watershed area located within the Town boundaries. A significant wetland is partially located in Essex and extends north into Westford. Osgood Hill Road passes through the center of the watershed area to provide access to the rural areas north in Westford.

#### *Future Land Uses*

The future land use is designated as Conservation (C1) at 100% of the total watershed area. The future land use for this area remains unchanged from the existing land use.

### 2.2.3 Abbey Brook

#### *Existing Land Uses*

This watershed is primarily undeveloped with some sparse residential use. Forest is the primary use at approximately 87% of the total watershed area located within the Town boundaries. Osgood Hill Road passes through the center of the watershed and provides access from Route 128 north to Westford.

#### *Future Land Uses*

The primary future land use is Conservation (C1) at 75% of the total watershed area. Agriculture-Residential (AR) use is designated at approximately 22%. The remaining 3% of the total area is designated as floodplain (C2).

### 2.2.4 The Creek

#### *Existing Land Uses*

This watershed is currently rural with Forest the primary use at 100% of the total watershed area.

*Future Land Uses*

The future land use is designated as Conservation (C1) at 100% of the total watershed area. This area remains unchanged from the existing land use.

2.2.5 Browns River

*Existing Land Uses*

This watershed area consists of multiple land uses but remains rural in most areas. The largest single land use is Forest at 77% of the total watershed area and the second largest land use is Wetlands at 7%. Residential, Commercial, and Industrial uses consist of less than 10% of the total watershed area. The majority of the development is located in the southerly portion of the watershed. Route 128 parallels the Browns River through the majority of the watershed and provides access to areas north in Westford.

*Future Land Uses*

The primary future land use is Agriculture-Residential (AR) at 41%, and Low and Medium Density Residential uses are 8% of the total watershed area. Approximately 50% of the total area is designated as Conservation (C1) and Floodplain (C2) uses. The Industrial use consists of 1% of the total area and is a slight increase from the existing designated commercial area.

2.2.6 Skunk Hollow Brook

*Existing Land Uses*

This watershed is currently rural with some sparse residential use. The primary land use is forest at 91% of the total watershed area.

*Future Land Uses*

The future land use is designated as Conservation (C1) at 97% of the total watershed area. This area remains unchanged from the existing land use.

2.2.7 Winooski River East

*Existing Land Uses*

This watershed is a mix of different land uses and consists of significant residential and commercial uses. The primary land use is forest at 56% and the second largest use is Residential at 21%.

*Future Land Uses*

The primary future land use is Medium Residential (R2) at 29%, and the second largest use is the Resource Preservation District Industrial (RPD-1) at 25%. Approximately 22% of the total area is designated as Conservation (C1) and Floodplain (C2) uses. This area consists of a significant Industrial (I1) use in the Saxon Hill area at 18% of the total watershed area.

2.2.8 Alder Brook

*Existing Land Uses*

This watershed is a mix of different land uses and consists of significant residential use. The primary land use is Forest at 42% and the second largest use is Agricultural at 27%. Residential uses are 23% of the total watershed area. Route 15 runs east-west and Old Stage Road runs north providing access to Westford.

*Future Land Uses*

The primary future land use is Agriculture-Residential (AR) at 40%, and Low and Medium Density Residential uses are 8% of the total watershed area. Approximately 50% of the total area is designated as Conservation (C1) and Floodplain (C2) uses.

2.2.9 Indian Brook

*Existing Land Uses*

This watershed is a mix of different land uses. The TMDL indicates that the land breakdown in the watershed is 39% developed lands, 43% forested land or wetlands and 18% agricultural lands. Further, the urban developed areas consist of 1,787 acres that has a 97% influence on runoff and 824 acres of agricultural/open land with a 7% influence on runoff. Almost 15% of the total land use consists of residential, commercial, and industrial uses. The majority of the residential and commercial development is located in the southerly portion of the watershed adjacent to Route 15 and the Circumferential Highway.

*Future Land Uses*

The primary future land use is Agriculture-Residential (AR) at 33%, and Low and Medium Density Residential uses are 20% of the total watershed area. Approximately 20% of the total area is designated as Conservation (C1) and Floodplain (C2) uses. This area consists of a significant Industrial (I1) use at 9% of the total watershed area.

2.2.10 Sunderland Brook

*Existing Land Uses*

This watershed area consists primarily of Residential and Commercial uses which are significant portions of the total watershed area. The southerly section of Susie Wilson Road and Kellogg Road extend through this watershed area. According to the TMDL,

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76% is developed land, 4% agricultural land and 20% forested land. From the TMDL, 1003 acres or 100% of the influence on runoff is from the urban/developed land and 0% from the agricultural/open land.

### *Future Land Uses*

The primary future land use is Medium Density Residential (R2) at 34% of the total watershed area and consists of a significant Industrial (I1) use at 9%. The majority of the watershed at 48% remains designated as Agricultural-Residential (AR) and Conservation (C1).

## 2.2.11 Winooski River West

### *Existing Land Uses*

This watershed is a mix of different land uses with the primary land use being Forest at 34%. Almost 97% of the total watershed area is currently agricultural, open, forest, water, and wetland uses. The existing railroad tracks and Route 15 extend along the north boundary of this watershed area.

### *Future Land Uses*

The primary future land use is designated as Floodplain (C2) at 83% of the total watershed area. This area remains unchanged from the existing land use.

## 2.2.12 Pond Brook

### *Existing Land Uses*

This watershed is currently rural with some minor residential use. The primary land use is Forest at 61% of the total watershed area.

### *Future Land Uses*

The primary future land use is designated as Conservation (C1) at 44% of the total land use. The second largest use consists of Agriculture-Residential (AR) at 34%.

## 2.2.13 Mallets Creek

### *Existing Land Uses*

This watershed is currently rural with some minor residential use. The primary land use is Forest at 77% and the second largest is residential at 23% of the total watershed area.

### *Future Land Uses*

The primary future land use is designated as Conservation (C1) at 98% of the total watershed area.

#### 2.2.14 Conclusions

The internal land uses vary significantly by watershed area. Significant portions of the Town north of Route 15 and 2A remain primarily rural residential and are sparsely developed. The internal land uses in these rural areas are typically low impact and consist of minimal impervious area as compared to the total watershed areas. Based on the Town Plan, future land uses are expected to remain similar to existing conditions in the following watershed areas:

- Morgan Brook
- Abbey Brook
- The Creek
- Pond Brook
- Mallets Creek

Skunk Hollow Brook watershed is located south of Route 15 adjacent to Jericho, but remains a relatively rural area. Based on the Town Plan, future land use for this watershed is expected to remain similar to existing conditions.

The majority of the watershed areas of Browns River, Alder Brook, and Indian Brook are located north of Routes 15 and 2A. The northerly portion of these watershed areas are rural in character and consist of minimal impervious area. Based on the Town Plan, future land uses are expected to remain similar to existing conditions in these areas.

The short-term emphasis on internal future land use planning needs to be on the impaired watershed areas of Indian Brook and Sunderland Brook. Areas in both of these watershed areas have been designated as impaired by the State and have issued TMDLs. Best management practices will be implemented by the Town to comply with the MS4 requirements and these practices will extend across the entire boundary of the Town – both in the impaired and non-impaired watersheds. The focus of the Flow Restoration Plan will be specifically targeted to the two impaired watersheds. Future land use planning needs to ensure the improvement and preservation of water quality throughout the Town but specific, more stringent land use controls will likely be imposed in the impaired watersheds.

For urbanized watersheds, the relationship of impervious area versus water quality is typically applied. The new development and redevelopment in these areas with greater than one (1) acre of impervious area are currently required to comply with State stormwater permits. The Town's permit system states that any activity resulting in creation of new or an expansion of old impervious area greater than ½ acre requires that a Town erosion control permit be obtained and under certain conditions a Town-approved stormwater management plan.

The majority of the future development within the Town is identified to occur along the Route 15 corridor in Essex Center and in the Susie Wilson/Kellogg Road/ 2A corridor. The future development to a great degree will be located within the Municipal Separated Storm Sewer (MS4) designated area. The watershed areas intersected by these major roadways will continue to be the primary areas of future concern regarding the improvement and preservation of water quality. Over the next five (5) years, best management practices for these areas will be implemented by the Town to comply with the MS4 requirements. Also, the flow restoration plan

will specifically address the remediation efforts needed to achieve the water quality levels identified in the TMDL. The time frame for full implementation of the FRP will be determined by the Town and State once the FRP has been developed.

## **2.3 DESCRIPTION OF EXTERNAL LAND USES**

### 2.3.1 General

The existing watershed areas located within the Town of Essex are impacted by several adjacent communities.

- Town of Westford
- Town of Jericho
- Village of Essex Junction
- Town of Colchester

The Town of Essex borders South Burlington and Williston along the Winooski River. The external land uses in each of these communities impact the Winooski River, but not the upstream watershed areas located within the Town of Essex. Both Milton and Underhill also abut the Town of Essex; however the portion of Mallets Creek and The Creek watersheds are not impacted externally since the topography slopes to the outlying communities.

Information was gathered from the CCRPC on the existing and future land uses in the adjacent communities. This information was used to assess the external impacts on the watersheds located in the Town of Essex.

In addition to the influence of adjacent communities, the State Highway system managed by VTRANS impacts on the streams' water quality in many of the watersheds in Essex. The primary concern for the State Highway impacts is to the Indian and Sunderland Brook systems and to a lesser degree the Alder Brook system. The State Highways are VT15, VT289 and VT 2A.

Also, UVM has an impact on the Sunderland Brook system due to buildings and grounds that they own and maintain in the Fort Ethan Allen area.

### 2.3.2 Morgan Brook

#### *Existing Land Uses*

This watershed area extends north into Westford, but the area located within the Town of Essex is located upstream and is therefore not impacted by the existing external land uses to the north.

#### *Future Land Uses*

The future land use within Westford is designated as Agricultural, Forestry, and Residential, but the watershed area located within the Town of Essex is not impacted by the external future land uses to the north.

### 2.3.3 Abbey Brook

#### *Existing Land Uses*

This watershed area begins in the Town of Essex and the northern edge abuts Westford. The downstream portion located within the Town of Essex is not impacted by the existing external land uses to the north.

#### *Future Land Uses*

The future land uses within Westford are designated as Agricultural, Forestry, and Residential, but this watershed area within the Town of Essex is not impacted by the future land uses to the north.

### 2.3.4 The Creek

#### *Existing Land Uses*

This watershed area extends north and east into Westford, Underhill, and Jericho, but the area located within the Town of Essex is located upstream and is therefore not impacted by the existing external land uses to the north and east.

#### *Future Land Uses*

The future land use within Westford is designated as Agricultural, Forestry, and Residential. Within Jericho, the land use is designated as agricultural. However, the watershed area located within the Town of Essex is not impacted by the external future land uses to the north and east.

### 2.3.5 Browns River

#### *Existing Land Uses*

This watershed area extends north into Westford and east into Jericho. The portion located within Westford is located downstream; therefore the external land uses don't impact the area within the Town of Essex. The existing external uses in the upstream portion located in Jericho do impact the area in the Town of Essex. The land uses within Jericho are designated as Agricultural, Village, and Rural Residential.

#### *Future Land Uses*

The future land use within Westford is designated as Agricultural, Forestry and Residential, but the watershed area located within the Town of Essex is not impacted by the external land uses to the north. The watershed area within the Town of Essex is impacted by the future land uses in Jericho designated as Agricultural, Village, and Rural Residential.

### 2.3.6 Skunk Hollow Brook

#### *Existing Land Uses*

This watershed area extends east into Jericho, but the area located within the Town of Essex is located upstream and is not impacted by the existing external land uses to the east. The land use in this adjacent area within Jericho is Agricultural.

#### *Future Land Uses*

This watershed area located within the Town of Essex is not impacted by the external uses in Jericho.

### 2.3.7 Winooski River East

#### *Existing Land Uses*

This watershed area extends east into Jericho, and the westerly edge borders Essex Junction. The southerly edge of this watershed is the Winooski River, which is the common boundary with Williston. The existing land use within Essex Junction is designated as Industrial and Residential over 6 acres, and within Williston is designated as Farm. However, these external land uses do not impact the watershed area within the Town of Essex. The land use in the adjacent area in Jericho is Agricultural and impacts the downstream portion of the watershed area within the Town of Essex.

#### *Future Land Uses*

This watershed area within the Town of Essex is not impacted by the external land uses in Essex Junction and Williston. The future land uses within Essex Junction are designated as Light Industrial and Residential 1 (15,000 sq. ft.), and within Williston are designated as Flood Plain Area. The land use in the adjacent area in Jericho is Agricultural and impacts the downstream portion of the watershed area within the Town of Essex.

### 2.3.8 Alder Brook

#### *Existing Land Uses*

This watershed area extends north into Westford. The portion located within Westford is located upstream, so the external land uses impact the watershed area within the Town of Essex.

#### *Future Land Uses*

The future land use within Westford is designated as Agricultural, Forestry and Residential I and II, and the watershed area within the Town of Essex is impacted by these future land uses.

### 2.3.8 Indian Brook

#### *Existing Land Uses*

This watershed area extends south into Essex Junction and west into Colchester. The majority of the watershed area located within the Town of Essex is located upstream. However, this watershed is unique since it follows the Indian Brook, extends south into Essex Junction and continues west back into the Town of Essex. The existing land uses in the upstream portion located in Essex Junction do impact the westerly portion of the watershed area in the Town of Essex. The existing land uses within Essex Junction are designated as Residential and Commercial. The Colchester watershed area locates downstream and the existing land uses do not impact the portion located within the Town of Essex. Existing land uses in this area are designated as Forest. State Highways Route 15, the Circumferential Highway (VT289) and VT2A impact this watershed.

#### *Future Land Uses*

The future land uses in the upstream portion located in Essex Junction do impact the westerly portion of the watershed area in the Town of Essex. The future land uses within Essex Junction are designated as Residential-Office, Planned Exposition and Residential. The Colchester watershed area is located downstream and the existing land uses do not impact the portion located within the Town of Essex. Future land uses in this area are designated as Rural, Manufacturing/Distribution and Suburban Residential.

### 2.3.9 Sunderland Brook

#### *Existing Land Uses*

This watershed area extends east into Essex Junction and west into Colchester. The portion of this watershed area located within the Town of Essex is located downstream of Essex Junction. The existing land uses in Essex Junction do impact this watershed area in the Town of Essex, and are designated as Residential and Commercial. The Colchester watershed area is located downstream and the existing land uses do not impact the portion located within the Town of Essex. Existing land uses in this area are Residential and Mixed Developed. State Highway VT15 has a minor impact on this watershed as well as UVM facilities in the Fort Ethan Allen area.

#### *Future Land Uses*

The future land uses in the upstream portion located in Essex Junction do impact the portion of the watershed area within the Town of Essex. The future land uses within Essex Junction are designated as Residential 2, Residential-Office, and Heavy Commercial. The Colchester watershed area is located downstream and the existing land uses do not impact the portion located within the Town of Essex. Future land uses in this area are designated as Growth Center.

### 2.3.10 Winooski River West

#### *Existing Land Uses*

This watershed area extends west into Colchester. The southerly edge of this watershed is the Winooski River, which is the common boundary with South Burlington. The existing land use within Colchester is designated as Institutional/Government and Mixed Developed. These external land uses in Colchester, impact the downstream watershed area within the Town of Essex.

#### *Future Land Uses*

This watershed area within the Town of Essex is impacted by the external future land uses in Colchester, but not South Burlington. The future land uses within Colchester are designated as a Growth Center.

### 2.3.11 Pond Brook

#### *Existing Land Uses*

This watershed area extends west into Colchester and the existing land use is designated as Recreation/Park. The area located within the Town of Essex is located upstream and is therefore not impacted by the existing external land uses to the west.

#### *Future Land Uses*

The future land use within Colchester is designated as Rural, but the watershed area located within the Town of Essex is not impacted by the external future land uses to the west.

### 2.3.12 Mallets Creek

#### *Existing Land Uses*

This watershed area extends north and west into Colchester, Milton, and Westford. The existing land use in Colchester is designated as forest. The area located within the Town of Essex is located upstream and is therefore not impacted by the existing external land uses to the north and west.

#### *Future Land Uses*

The future land use within Colchester is designated as Rural and Westford is designated as Agricultural, Forestry, and Residential. However, the watershed area located within the Town of Essex is not impacted by the external future land uses to the north and east.

### 2.3.13 Conclusions

The majority of the watershed areas located within the Town of Essex are not impacted by external existing and future land uses from adjacent communities. For these watershed areas located within the Town boundaries, only the internal land uses impact these areas. It is important that the Town properly manage the internal future land uses within these areas to minimize the impacts to these watershed areas which extend into the adjoining communities.

The watershed areas located within the Town of Essex which are not impacted by external land uses are:

- Morgan Brook
- Abbey Brook
- The Creek
- Skunk Hollow Brook
- Winooski River East
- Winooski River West
- Pond Brook
- Mallets Creek

The Browns River watershed is impacted externally by Jericho. This upstream watershed area in Jericho consists of a developed Village area located within the Browns River drainage area. The Town of Essex needs to work closely with Jericho to minimize the external impacts to this watershed area.

The Alder Brook watershed is impacted externally by Westford. This upstream watershed area in Westford is relatively undeveloped with some rural residential and agricultural uses. This low impact development has minor impacts on the watershed area and no significant changes are expected in the future land uses.

The Indian Brook watershed area begins in the Town of Essex, extends through Essex Junction, reenters the Town of Essex, and continues into Colchester. This watershed area has been designated as impaired by the State and is significantly impacted by the external land uses in Essex Junction and VTRANS. The urbanized area of Essex Junction directly impacts the water quality of this watershed area. It is important for Essex to work cooperatively with Essex Junction and VTRANS to comply with the State requirements of the issued NPDES permit to preserve the water quality of this watershed area.

The Sunderland Brook watershed area begins in Essex Junction, extends through the Town of Essex, and continues into Colchester. This watershed area has been designated as impaired by the State and is impacted by the external land uses in Essex Junction and to a lesser degree by VTRANS and UVM. The urbanized area of Essex Junction directly impacts the water quality of this watershed area. It is important for Essex to work cooperatively with Essex Junction and the other parties to comply with State requirements of the issued NPDES permit to preserve the water quality of this watershed area.

## **2.4 WATER QUALITY DATA**

### 2.4.1 Description

The State performs biomonitoring of rivers and streams to determine the water quality health of rivers and streams. Information was obtained from the Vermont Agency of Natural Resources for the two impaired watersheds in Essex. Appendix G contains the most recent information available as well as results from testing done when the first NPDES permit was issued to the Town (2002-2003).

For the insect community assessment, the nutrient index, clean water species, total number of species and insect densities are used as measurements to estimate the overall stream health. For the fish community assessment, the overall fish community and fish habitat health are evaluated. A stream must pass both the insect and fish community assessments if data is available to meet the Class B water quality standard.

### 2.4.2 Alder Brook

The State estimated in 2002 that approximately 3.5% of this total watershed area was impervious. The majority of the watershed area is located in the Town of Essex, but extends north into Westford. A total of three (3) State monitoring sites were located on Alder Brook. The initial sampling was completed at the upstream monitoring location in 1993 and both the insect and fish community assessments failed. The results of this monitoring were inconclusive based on the review of the State. In 2001, the downstream monitoring station was sampled and the insect community assessment passed. The State has not designated this watershed area as principally impaired by stormwater.

### 2.4.3 Indian Brook

The TMDL in Appendix H on page 5 provides a table listing the river sections and fish/macroinvertebrates testing results from 1988 through 2004. The TMDL further states that the stream is subject to certain stressors to include: stream water volumes, sediment, increased pollutant load from bank erosion, siltation, scour, over-widening of stream channels, washout of biota and loss of habitat due to reductions in stream base flow. The majority of the watershed area is located in the Town of Essex, but extends into the Village of Essex Junction and continues west into Colchester. The fish assessment over time has generally remained constant at fair to very good, depending upon the zone of the river. The macroinvertebrate assessment has been poor to fair in the lower stretches of the river but fair to excellent in the upper stretches. More detailed information can be found in the TMDL.

### 2.4.4 Sunderland Brook

The TMDL in Appendix I on page 5 provides a table listing the river sections and fish/macroinvertebrates testing results from 1995 through 2002. The TMDL further states that the stream is subject to certain stressors to include: stream water volumes,

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sediment, increased pollutant load from bank erosion, siltation, scour, over-widening of stream channels, washout of biota and loss of habitat due to reductions in stream base flow. More current testing has shown an improvement as noted in Appendix G. This watershed starts in the Village of Essex Junction, extends through the Town of Essex, and continues west into Colchester. A total of five (5) State monitoring sites were previously located on Sunderland Brook. The initial sampling was completed at the downstream monitoring location in 1993 and the insect community assessment failed. In 2002, an upstream monitoring station was sampled. The fish community assessment passed, but the results of the insect community assessment were not available. The State has designated this watershed as principally impaired by stormwater since both assessments were not passed.

#### 2.4.5 Browns River

This watershed starts in Jericho, extends through the Town of Essex, and extends west into Colchester. A total of seven (7) State monitoring sites were previously located on Browns River. The initial sampling was completed at the downstream monitoring location in 1992 and the insect community assessment passed. Sampling results from 2000 indicated that the fish community failed. The State has designated this watershed as principally impaired outside the limits of the Town of Essex by agriculture since both assessments were not passed.

### **3.0 STORMWATER SYSTEM INVENTORY AND MAPPING**

#### **3.1 INVENTORY**

Starting in the summer of 2002, the Public Works staff performed a comprehensive inventory of the existing stormwater systems within the Town. The data was input into the Town GIS system and has been updated every year since then. The updates are based on field inspections and GPS identification and confirmation of infrastructure locations. As new development projects come on line or as changes are made by the Town to the storm water systems, the information is provided to the Town GIS coordinator. The maps for both the culverts in Town as well as the system of catch basins, pipes, storm manholes and outfalls is available internally to staff on the Town's "Intranet System." The information is readily available to staff for use in locating systems and for maintenance. The entire system is inspected annually, except for culverts which are done on a 3-year cycle. Both public and private infrastructure has been inventoried and mapped. An inventory of all annual inspections is kept in a excel spreadsheet by year and by structure or outfall. Copies of the inspection sheets used for the inspections are included in Appendix DD.

##### *Catch Basins*

- ID#
- GPS Location
- Watershed
- Date
- Owner
- Street Name
- Location
- Development Plan Reference Sheet
- Year Built
- Structural Data
- Condition
- Maintenance History

##### *Outfalls*

- Inventory Date
- Owner
- Street Name
- Location
- Development Plan Reference Sheet
- Year Built
- Type
- Diameter
- Length
- Material
- Structural Condition

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- Debris Accumulation
- Ditch Condition

### *Culverts*

- ID#
- GPS Location
- Watershed
- Inventory Date
- Owner
- Street Name
- Location
- Development Plan Reference Sheet
- Year Built
- Type
- Diameter
- Length
- Material
- Structural Condition
- Debris Accumulation
- Ditch Condition

## **3.2 RESULTS OF INVENTORY**

There are currently 1660 total catch basins of which 1131 are the total responsibility of the Town. The number of outfalls is 258, with 158 belonging to the Town. The number of culverts exceeds 674. It generally takes anywhere from 6 to 8 weeks of effort by two interns to completely inspect the storm system, exclusive of culvert inspections.

A list of existing outfalls designated by watershed and ownership is provided in Appendix E. Approximately 90 outfalls (public and private) are located within the impaired watershed areas of Indian Brook and Sunderland Brook.

## **3.3 MAPPING**

During the inventory, the original maps were updated by verifying the actual locations of structures, adding any missing structures, and adding pipe sizes. The stormwater system maps are updated annually. The SWMP contains these maps in Appendix E and Appendix F.

## **4.0 STORMWATER PERMITS ISSUED BY THE STATE OF VERMONT SEPARATE FROM THE MS4 NPDES PHASE 2 PERMIT AFFECTING ESSEX**

### **4.1 INTRODUCTION**

The State issues a number of stormwater related permits separate from the MS4 NPDES Phase 2 Permit. These permits are issued to individual residents, developers, other businesses, industries and the Town of Essex for specific stormwater related activities. The general applicability of these permits is covered under the subsections of this chapter of the Plan.

### **4.2 TOWN IMPACTS**

The impacts of these permits on the Town are identified under each type of permit that is listed.

### **4.3 3-9010 PERMITS – PERMITS FOR PREVIOUSLY PERMITTED DISCHARGES TO WATERS THAT ARE NOT PRINCIPALLY IMPAIRED BY COLLECTED STORMWATER RUNOFF**

General Permit 3-9010 is used to renew stormwater discharge permits that were issued for discharges to waters that are not impaired due to stormwater runoff. Coverage under this permit was required if 1) the site previously received coverage under General Permit 3-9015 or 3-9010 and that authorization is due to expire 2) the site has previously received a stormwater discharge permit 3) the site has previously received a temporary pollution permit 4) the permitted discharge is to waters of the State of Vermont that are not principally impaired by regulated stormwater runoff.

The Town currently is the sole permittee for the permits listed in Appendix N, with the exception of permit 3324-9010 and 3574-9010 which are shared with homeowner's associations. All permits were renewed in 2010. A number of the permits have submitted restatement of compliance documents due to their expiration in the late spring of 2013. The list will be updated as these recertifications are acknowledged by the State.

This general permit does not cover the following discharges:

- Non-stormwater discharges
- Stormwater discharges to Class B waters
- Stormwater discharges from new development, expansion, or redevelopment.
- Stormwater runoff from farms.
- Stormwater discharges that will be managed by an alternative STP design.
- Stormwater discharges that are currently covered by an individual permit.

The Town has maintained these permits, inspects each of the systems annually and files a separate report each year to the State for the component infrastructure associated with the permits.

The permits for which the Town determined partial or full responsibility, additional costs are being incurred. Cleaning of catch basins and correction of existing deficiencies are performed to comply with the permit requirements. In addition, the original permit fee and annual renewal fees are required.

#### **4.4 3-9015 PERMITS – PERMITS FOR DEVELOPMENT AND REDEVELOPMENT DISCHARGES TO WATERS THAT ARE NOT PRINCIPALLY IMPAIRED BY COLLECTED STORMWATER RUNOFF**

The permit requirements for this permit were modified as of March 30, 2013. Coverage under this general permit is required for discharges of regulated stormwater runoff from the construction, expansion and redevelopment of impervious surfaces. The requirement to obtain a stormwater discharge permit for discharges from regulated impervious surfaces is contained in the State Stormwater Management Rule; the following excerpt from the Rule outlines the requirements for permit coverage:

- A discharge from new development equal to or greater than one (1) acre;
- A discharge from the expansion of an existing impervious surface, such that the total resulting impervious surface is equal to or greater than one (1) acre, with the exception that a permit is not required for an expansion that meets the exemption in subsection 18-304(a)(4) of the Stormwater Management Rule;
- A discharge from the redevelopment of an existing impervious surface if the redevelopment portion of the existing impervious surface is equal or greater than one (1) acre;
- A discharge from a combination of expansion and redevelopment of an existing impervious surface, such that the total resulting impervious surface is equal to or greater than one (1) acre, except that a permit is not required if the exemptions in subsections 18-304 (a)(4) and (5) of the Stormwater Management Rule are met;
- A discharge from any size of impervious surface if the Secretary determines that treatment is necessary to reduce the adverse impacts of the discharge due to the size of the impervious surface, drainage pattern, hydraulic connectivity, installation or modification of drainage or conveyance structures, location of the discharge, existing stormwater treatment, or other factors identified by the Secretary; and
- A discharge from an existing impervious surface of equal to or greater than one (1) acre if the Secretary has previously issued an individual stormwater discharge permit or individual temporary pollution permit for the discharge or has previously granted coverage for the discharge under a stormwater discharge general permit.

This permit is integrated into the Town's development review process and the Town's Stormwater Ordinance. On projects less than the one (1) acre threshold, the Town's Stormwater Ordinance contains the standards for Town stormwater compliance. On projects equal to or over the one (1) acre threshold, the Town-issued development permits by the Planning Commission or Zoning Board reference the requirement for obtaining a 3-9015 permit from the State as a condition of local approval.

The plans and supporting documentation provided to the State for the 3-9015 permits are also provided to the Town staff. The issued 3-9015 permits are also provided by the State to the

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Town. The Town Public Works Department inspects all new development as part of a Highway Agreement and Letter of Credit process and therefore local inspection of the 3-9015 permit and stormwater facilities is routinely conducted. The Town also files with its annual MS4 NPDES Phase 2 permit report, a listing of all development projects that have received local approval and a separate listing of those exceeding the one (1) acre threshold.

### **4.5 3-9020 PERMITS – PERMITS FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES**

Construction General Permit 3-9020 authorizes permittees to discharge stormwater runoff from construction activities provided the project is in compliance with the requirements of the permit. The permitting requirements for projects authorized under this general permit depend upon the risk of having a discharge of stormwater from the construction site. There are two risk categories authorized by the general permit: Low Risk and Moderate Risk. Projects that pose a higher risk are ineligible to use the general permit, and must file an application for an individual Permit.

To determine the appropriate risk category for a construction project, applicants must complete a risk evaluation document identified as Appendix A to the permit. Projects that qualify as a Low-Risk do so because of favorable site conditions and must employ the measures identified in the State's Low Risk Site Handbook of Erosion and Sediment Control. Moderate Risk projects must develop a site specific Erosion and Sediment Control (EPSC) Plan that meets the requirements of the general permit and conforms to the Vermont Standards and Specifications for Erosion Prevention and Sediment Control (2006).

The Town receives copies of 3-9020 permits issued by the State and the Town Public Works Department uses these notifications to perform field checks on the adequacy of compliance by the permittees. In addition, some Town projects require the issuance of these permits, such as the proposed new Police Station which is undergoing development permit review at this time. The Town requires minor corrections onsite if the required erosion control facilities are not in-place or if they are not working properly. Major deficiencies are reported to the State.

### **4.6 MULTI-SECTOR GENERAL PERMITS**

The Multi-Sector General Permit is a federally-mandated NPDES permit that covers new and existing discharges of stormwater from industrial facilities. Industrial facilities conduct activities and use materials that have the potential to impact the quality of Vermont's waters. The permit requires facilities to examine potential sources of pollution, implement measures to reduce the risk of stormwater contamination and test stormwater discharges for sources of pollution. In Vermont, the Agency of Environmental Conservation is the permitting authority and administers the MSGP. The most recent version of the MSGP is dated August 4, 2011.

The Town is not directly involved with any of issued MSGP's with the exception of one permit. The closed Town landfill is covered by a No-Exposure Certification Number 4453-9003.R. This no-exposure certification was issued on December 8, 2011. A copy of the certificate and conditions of approval are contained in Appendix EE.

## **5.0 IDENTIFIED, EXPIRED EXISTING IMPAIRED WATERSHED PERMITS and NON-PERMITTED OUTFALLS IN THE IMPAIRED WATERSHEDS**

### **5.1 General**

The MS4 NPDES Phase 2 permit in Section IV, C, 1, e, (3) requires that the Town address the issue of expired stormwater permits in the impaired watersheds. Historically, there are a number of expired permits that were issued to developers or subsequently turned over to homeowner's associations that have been allowed to lapse by the State over time. In addition, there are a number of discharges in the impaired waterways that were never permitted or at least have no record of ever being permitted. These discharges fall into a number of categories covering a wide range of responsible parties. The Town will need to determine the responsible parties to take action on the expired permits and unassigned discharges within the first six months of the approved NOI and SWP.

The various types of discharges can be categorized as follows:

- Private discharge to private land or stream (same owner) -- no existing permit
- 100% Public system discharging to stream or private land adjacent to stream (i.e., no easements) -- no existing permit
- Combined private lands Catch Basin (CB) and public road CB discharging together to private land or stream (no easements) -- no existing permits
- Combined private lands CB and public road CB discharging together to private land or stream (with easements) and stormwater treatment -- not listed on permit list -- Kellogg Road stormwater project
- Combined private lands CB and public road CB discharging together to private land or stream (with easements) -- existing expired permit
- Private discharge to private land or stream (same owner) -- existing expired permit
- Private to storm pond + public to storm pond; storm pond outflow to public storm lines combined with private CB to outfall (with easements) -- existing expired permit
- 100% Public system discharging to stream or private land adjacent to stream (i.e., no easements) -- existing expired permit
- Combined public and private CB to storm pond with private outfall to stream -- existing permit
- State CB discharging to State lands
- State + Town discharging to State lands

It will be a time consuming and difficult task to sort out and determine the responsible parties. The impact of this determination will set the stage for later discussions on potential costs to bring the systems both up to the standards identified in the original permits and also future cost-sharing on potential stormwater system upgrades.

Compounding the issue is the lack of clear direction from the State on the use of their Residual Designation Authority (RDA). Under the RDA, Essex could request that specific expired permit holders be issued an RDA, which then requires direct State involvement in the issuance of a revised permit to that party. The action removes the permit holder from coverage under the municipal MS4 NPDES Phase 2 permit. However, many of the permits are noted as having stormwater that is co-mingled between the Town and private entities or homeowner's associations. The general intent would be to only use the RDA for stormwater contributors not willing to participate in joint resolution of stormwater issues or purely private discharges not com-mingled with any municipal stormwater.

## **5.2 INDIAN BROOK**

A list of expired stormwater permits previously issued within each impaired waterway was provided by the State Agency of Natural Resources to the Town. The Public Works Department reviewed the list of existing permits issued within the Town as well as discharges without any known permit. The list is preliminary in nature. It is found in Appendix Z along with a map depicting the expired permits provided by the State.

## **5.3 SUNDERLAND BROOK**

A list of expired stormwater permits previously issued within each impaired waterway was provided by the State Agency of Natural Resources to the Town. The Public Works Department reviewed the list of existing permits issued within the Town as well as discharges without any known permit. The list is preliminary in nature. It is found in Appendix Y along with a map depicting the expired permits provided by the State.

## **6.0 PHASE II MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)**

### **6.1 INTRODUCTION**

For the Small Municipal Separate Storm Sewer Systems (MS4), a General Permit 3-9014 was issued by the Vermont Agency of Natural Resources (ANR). This program is a requirement of the United State Environmental Protection Agency (USEPA) under the National Pollutant Discharge Elimination System (NPDES) for discharges from MS4s to certain waters of the State. Owners of small MS4s that discharge storm water submitted a Notice of Intent (NOI) to be covered by the general permit and will receive written approval for permit coverage and authorization to discharge. These requirements apply to areas served by each MS4 located within either the U.S. Census Bureau designated urban area and so classified by the State ANR. The Town of Essex is a designated municipal separate storm sewer system (MS4) and a map indicating the areas is provided in Appendix F.

As an MS4, the Town of Essex has submitted an NOI on June 3, 2013, showing how they intend to apply for coverage under this MS4 General Permit. A copy of the NOI is provided in Appendix D. This MS4 General Permit is an NPDES permit and has a five (5) year term.

Under the MS4 General Permit, the Town shall comply with the following six (6) minimum control measures:

- 1) Public Education and Outreach
- 2) Public Participation/Involvement
- 3) Illicit Discharge Detection and Elimination
- 4) Construction Site Runoff Control
- 5) Post-Construction Runoff Control
- 6) Pollution Prevention/Good Housekeeping

### **6.2 USEPA STORMWATER MANAGEMENT PROGRAM**

#### **6.2.1 General**

The Phase II Municipal Separate Storm System (MS4) program was followed as an outline to address the NPDES stormwater requirements. The minimum control measures are listed below and each measure includes a description, USEPA guidelines, and menu of Best Management Practices (BMP's). Detailed information on each BMP is provided at [www.cfpub.epa.gov/npdes/stormwater/menuofbmps](http://www.cfpub.epa.gov/npdes/stormwater/menuofbmps).

#### **6.2.2 (1) Public Education and Outreach**

##### *6.2.2.1 Description*

An informed and knowledgeable community is crucial to the success of a storm water management program since it helps to ensure the following:

- Greater support for the program as the public gains a greater understanding of the reasons why it is necessary and important. Public support is particularly beneficial when operators of small systems attempt to institute new funding initiatives for the program or seek volunteers to help implement the program; and
- Greater compliance with the program as the public becomes aware of the personal responsibilities expected of them and others in the community, including the individual actions they can take to protect or improve the quality of area waters.

#### 6.2.2.2 USEPA Guidelines

The main action areas which are important for successful implementation of a public education and outreach program are:

*Forming Partnerships;* Form partnerships with governmental, environmental, civic and industrial organizations.

*Using Educational Materials and Strategies;* Use educational materials and strategies, such as: brochures or fact sheets, recreational guides, web sites, event participation, storm drain stenciling, economic incentives, telephone hotlines and educational programs for school children.

*Reaching Diverse Audiences;* Reach diverse audiences through a mix of appropriate local strategies to address the viewpoints of a variety of audiences and communities.

#### 6.2.2.3 Menu of BMP's

Some examples of BMP's that can be used to satisfy the requirements of this minimum control measure are:

*Lawn and garden activities*

- Water conservation practices for homeowners
- Proper disposal of household hazardous wastes
- Pet waste management
- Trash management

*Targeting public outreach/education*

- Education/outreach for commercial activities
- Tailoring outreach programs to minority and disadvantaged communities and children
- Classroom education on storm water
- Storm water educational material

*Public outreach programs for new development*

- Low impact development

*Public prevention programs for existing development*

- Educational displays, pamphlets, booklets, and utility stuffers
- Using the media
- Promotional giveaways
- Pollution prevention for businesses

6.2.3 (2) Public Participation/Involvement

*6.2.3.1 Description*

The public can provide valuable input and assistance to a municipal storm water management program and, therefore, suggests that the public be given opportunities to plan an active role in the development and implementation of the program. An active and involved community is crucial to the success of a storm water management program because it allows for:

- Broader public support since citizens who participate in the development and decision making process are partially responsible for the program and, therefore, may be less likely to raise legal challenges to the program and more likely to take an active role in its implementation;
- Shorter implementation schedules due to fewer obstacles in the form of public and legal challenges and increased sources in the form of citizen volunteers;
- A broader base of expertise and economic benefits since the community can be valuable, and free, intellectual resource; and
- Conduits to other programs as citizens involved in the storm water program development process provide important cross-connections and relationships with other community and government programs. This benefit is particularly valuable when trying to implement a storm water program on a watershed basis.

*6.2.3.2 USEPA Guidelines*

The public shall be included in the development, implementation, and review of the stormwater management programs. The public participation process should make every effort to reach out and engage all groups.

*Implementation Challenges;* Traditional methods of soliciting public input are not always successful in generating interest, and subsequent involvement, in all sectors of the community. Alternative advertising methods should be used whenever possible, including radio or television spots, postings at bus stops, announcements in neighborhood newsletters, announcements at civic organization meetings, distribution of flyers, mass mailings, door-to-door visits, and telephone notifications. In addition, advertising and soliciting for help should be targeted at specific population sectors. The goal is to involve a diverse cross-section of people who can offer a multitude of concerns, ideas, and connections during the program development process.

*Possible Practices (BMP's):* There are a variety of practices that could be incorporated into a public participation and involvement program, such as:

- Public meetings/citizen panels
- Volunteer water quality monitoring
- Volunteer educators/speakers
- Storm drain stenciling
- Community clean-ups
- Citizen watch groups

#### 6.2.3.3 Menu of BMP's

Some examples of BMP's that can be used to satisfy the requirements of this minimum control measure are:

##### *Activities/public participation*

- Storm drain stenciling
- Stream cleanup and monitoring
- Volunteer monitoring
- Reforestation programs
- Wetland plantings
- Adopt-A-Stream programs

##### *Involvement/public opinion*

- Watershed organization
- Stakeholder meetings
- Attitude surveys
- Community hotline

#### 6.2.4 (3) Illicit Discharge Detection and Elimination

##### 6.2.4.1 Description

Discharges from municipal storm sewer systems typically include wastes and wastewater from non-storm water sources. Illicit discharges enter the system through either direct connections or indirect connections. Common sources of illicit discharges are:

- Sanitary wastewater
- Effluent from septic tanks
- Car wash washwaters
- Improper oil disposal
- Radiator flushing disposal
- Laundry wastewaters
- Spills from roadway accidents
- Improper disposal of auto and household toxics (e.g., paint)

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The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies. Pollutant levels from these illicit discharges have been shown to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health.

### *6.2.4.2 USEPA Guidelines*

The objective of the illicit discharge detection and elimination is to have the operators gain a thorough awareness of their systems. This awareness allows them to determine the types and sources of illicit discharges entering their system; and establish the legal, technical, and educational means needed to eliminate these discharges.

*The Map:* The storm sewer map demonstrates a basic awareness of the intake and discharge areas of the system. Collection of all existing information on outfall locations and then conducting field surveys to verify locations is recommended.

*Legal Prohibition and Enforcement:* Some municipalities may have limited authority to establish and enforce an ordinance or other regulatory mechanism prohibiting illicit discharges. Therefore, the municipality is encouraged to obtain the necessary authority.

*The Plan:* The plan to detect and address the illicit discharges is dependent on several factors: available resources, size of staff, and degree and character of its illicit discharges. The major steps of a recommended plan include:

- Locate problem areas,
- Finding the source,
- Remove/correct illicit connections and
- Document actions taken.

*Educational Outreach;* Outreach to public employees, businesses, property owners, the general community, and elected officials regarding ways to detect and eliminate illicit discharges will gain support for the storm water program. Suggested educational outreach efforts include:

- Developing informative brochures and guidelines for specific audiences and school curricula, designing a program to publicize and facilitate public reporting of illicit discharges,
- Coordinating volunteers for locating, and visually inspecting outfalls or stenciling storm drains,
- Initiating recycling programs for commonly dumped wastes such as: motor oil, antifreeze, paint, and pesticides.

### *6.2.4.3 Menu of BMP's*

Some examples of BMP's that can be used to satisfy the requirements of this minimum control measure are:

- Failing septic systems
- Industrial/business connections
- Recreational sewage

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- Sanitary sewer overflows
- Identifying illicit connections
- Wastewater connections to the storm drain system
- Illegal dumping

### 6.2.5 (4) Construction Site Runoff Control

#### *6.2.5.1 Description*

Polluted storm water runoff from construction sites often flows to municipal storm sewer systems and ultimately is discharged into local rivers and streams. Pollutants commonly discharged from construction sites include:

- Sediment
- Solid and sanitary wastes
- Phosphorus (fertilizer)
- Nitrogen (fertilizer)
- Pesticides
- Oil and grease
- Concrete truck washout
- Construction chemicals and debris

Sediment runoff rates from construction sites are typically 10 to 20 times greater than those of agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction sites can contribute more sediment to streams than can be deposited naturally over a significant period of time.

#### *6.3.5.2 USEPA Guidelines*

*Regulatory Mechanism:* The Town must establish a construction program that controls polluted runoff from construction sites with a land disturbance of greater than or equal to one acre.

*Site Plan Review:* The Town must include in its construction program requirements for the implementation of appropriate BMP's on construction sites to control erosion and sediment and other waste at the site. Site plan review aids in compliance and enforcement efforts and provides a method to track new construction activities.

*Inspections and Penalties:* Once construction commences, BMP's should be in place and the monitoring activities should begin. Procedures should be developed for site inspection and enforcement of control measures to deter infractions. Procedures should identify priority sites for inspection based on the nature and extent of construction activity, topography, and the characteristics of the receiving water.

*Information Submitted by the Public:* Develop procedures for the receipt and consideration of public inquiries, concerns, and information submitted regarding local construction activities. The Town is required to only consider the information submitted, and may not need to follow-up and respond to every complaint or concern. However,

the Town is required to demonstrate acknowledgment and consideration of the information submitted.

#### 6.2.5.3 Menu of BMP's

Some examples of BMP's that can be used to satisfy the requirements of this minimum control measure are:

##### **Runoff Control**

###### *Minimize clearing*

- Land grading
- Permanent diversions
- Preserving natural vegetation
- Construction entrances

###### *Stabilize drainage ways*

- Check dams
- Filter berms
- Grass-lined channels
- Riprap

##### **Sediment Control**

###### *Install perimeter controls*

- Temporary diversion dikes
- Wind fences and sand fences
- Brush barrier
- Silt fence

###### *Install sediment trapping devices*

- Sediment basins and rock dams
- Sediment filters and sediment chambers
- Sediment trap

###### *Inlet protection*

- Storm drain inlet protection

##### **Erosion Control**

###### *Stabilize exposed soils*

- Chemical stabilization
- Mulching
- Permanent seeding
- Sodding
- Soil roughening

###### *Protect steep slopes*

- Geotextiles

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- Gradient terraces
- Soil retention
- Temporary slope drain

### *Protect waterways*

- Temporary stream crossings
- Vegetated buffer

### *Phase construction*

- Construction sequencing
- Dust control

### **Good Housekeeping**

#### *Other wastes*

- General construction site management
- Spill prevention and control plan
- Vehicle maintenance and washing areas

#### *Education and awareness*

- Contractor certification and inspector training
- Construction reviewer
- BMP inspection and maintenance
- Model ordinances

## 6.3.6 (5) Post-Construction Stormwater Management

### *6.3.6.1 Description*

Post construction stormwater management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly effect receiving water bodies. Many studies indicate that prior planning and design for the minimization of pollutants in post-construction storm water discharges is the most cost-effective approach to storm water quality management.

There are generally two forms of substantial impacts of post-construction runoff. The first is caused by an increase in the type and quantity of pollutants in storm water runoff. As runoff flows over areas altered by development, harmful sediment and chemicals are collected. These pollutants often become suspended in runoff and are carried to receiving waters. The second kind of post-construction runoff impact occurs by increasing the quantity of water delivered to the waterbody during storms. Water is collected from surfaces such as asphalt and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving water. The effects of this process include streambank scouring and downstream flooding.

### 6.3.6.2 Menu of BMP's

Some examples of BMP's that can be used to satisfy the requirements of this minimum control measure are:

#### **Structural BMPs**

##### *Ponds*

- Dry extended detention ponds
- Wet ponds

##### *Infiltration practices*

- Infiltration basins
- Infiltration trenches
- Porous pavement

##### *Filtration practices*

- Bioretention
- Sand and organic filters

##### *Vegetative practices*

- Storm water wetland
- Grassed swales
- Grassed filter strip

##### *Runoff pretreatment practices*

- Catch basins/catch basin inserts
- In-line storage
- Manufactured products for storm water inlets

#### **Nonstructural BMPs**

##### *Experimental practices*

- Alum injection

##### *On-lot treatment*

- On-lot treatment

##### *Better site design*

- Buffer zones
- Open space design
- Urban forestry
- Conservation easements
- Infrastructure planning
- Narrower residential streets
- Eliminating curbs and gutters
- Green parking

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- Alternative turnarounds
- Alternative pavers
- BMP inspection and maintenance
- Ordinances for post-construction runoff
- Zoning

#### 6.3.6.3 *Expired Stormwater Permits*

In the fall of 2014, the Town's Selectboard passed an amendment to the Town's Stormwater Ordinance that provided guidance on how to handle the expired stormwater permits within the Town. A copy of the Expired Stormwater Permit is in Appendix FF.

The expired permits were sorted into one of the four following categories:

- Type 1 Stormwater System: Consists of a system of stormwater infrastructure that is entirely on public land and owned by the town.
- Type 2 Stormwater System: Consists of a system of stormwater infrastructure that is entirely contained on private property.
- Type 3 Stormwater System: Consists of a shared stormwater system that combines stormwater flow from both public and non-public stormwater infrastructure.
- Type 4 Stormwater System: Any other type of stormwater system not covered under Types 1 through 3.

The Town is working with expired permit holders to finalize agreements that will allow the Town to accept MS4 permit responsibility. A list of expired permits is included in Appendix GG.

The Town will conduct inspections and report on an annual basis all Stormwater Treatment Practices (STPs) for which it has assumed responsibility.

#### 6.3.7 (6) Pollution Prevention/Good Housekeeping

##### *6.3.7.1 Description*

This measure requires the Town to examine and subsequently alter their own actions to help ensure a reduction in the amount and type of pollution that:

- Collects on streets, parking lots, open spaces, and storage and vehicle maintenance areas and is discharged into local waterways; and
- Results from actions such as environmentally damaging land development and flood management practices and poor maintenance of storm sewer systems.

##### *6.3.7.2 USEPA Guidelines*

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This control measure is to ensure that existing municipal, State and Federal operations are performed in ways that will minimize contamination of storm water discharges. The following components should be considered when developing their program for this measure:

- Maintenance activities, maintenance schedules, and long-term inspection procedures for structural and non-structural controls to reduce floatables and other pollutants discharged from separate storm sewer;
- Controls for reducing or eliminating the discharge of pollutants from areas such as roads and parking lots, maintenance of storage yards (including salt/sand storage and snow disposal areas), and waste transfer stations. These controls include programs that promote recycling, minimize pesticide use, and ensure the proper disposal of animal waste;
- Procedures for the proper disposal of waste removed from separate storm sewer systems and areas listed above, including dredge spoil, accumulated sediments, floatables, and other debris; and
- Ways to ensure that new flood management projects assess the impacts on water quality and examine existing projects for incorporation of additional water quality protection devices or practices.

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The effective performance of this control measure hinges on the proper maintenance of BMP's.

### 6.3.7.2 Menu of BMP's

Some examples of BMP's that can be used to satisfy the requirements of this minimum control measure are:

#### *Source controls*

- Pet waste collection
- Automobile maintenance
- Vehicle washing
- Illegal dumping control
- Landscaping and lawn care
- Pest control
- Parking lot and street cleaning
- Roadway and bridge maintenance
- Septic system controls
- Storm drain system cleaning
- Alternative discharge options for chlorinated water

#### *Materials management*

- Alternative products
- Hazardous materials storage
- Road salt application and storage
- Spill response and prevention
- Used oil recycling
- Materials management

## **6.3 STATE (VT ANR) REQUIREMENTS**

### 6.3.1 Introduction

The Town is required to develop a stormwater management program addressing the minimum control measures over the five (5) year duration of the permit. In the plan, information is required to address each control measure, and include the decision process and measurable goals for each measure. Monitoring and record keeping is required throughout the permit duration, and submittal of an annual report is required for each year of the permit term.

The minimum requirements are described in the following narratives based on the General Permit.

#### 6.3.1.1 (1) Public Education and Outreach on Storm Water Impacts

- Participate in the regional stormwater education and outreach strategy described in the March 10, 2008 memorandum of agreement between designated small MS4s, the Chittenden County Regional Planning Commission and the Vermont Agency of Natural Resources, or

Town of Essex Stormwater Management Plan

- Submit a plan based on the following EPA guidance documents: Fact Sheet 2.3, Stormwater Phase II Final Rule, Public Education and Outreach Minimum Control Measure, National Menu of Best Management Practices for NPDES Stormwater Phase II, and Measurable Goals Guidance for Phase II Small MS4's, or
- Undertake the following activities:
  - Develop or acquire informational brochures relevant to local stormwater concerns.
  - Town-wide distribution of stormwater related brochures at least twice in the first year and once in subsequent years.
  - Seek the cooperation of the local news media to run two or more stormwater-related news or feature stories per year.
  - Develop elementary, middle school, and high school education curricula regarding local stormwater concerns based on new or existing material; conduct teacher training in at least 4 schools and in each subsequent year maintain program information and hold at least one refresher teacher training course.
  - Develop and maintain a web site with locally relevant stormwater management information and promote its existence and use.

6.3.1.2 (2) Public Involvement/Participation

- The Town shall comply with State and local public notice requirements, and
- Implement a program which includes at least three (3) of the following:
  - Form a citizen stormwater advisory panel.
  - Establish a water quality monitoring program involving citizen volunteers.
  - Institute an on-going public workshop series on stormwater awareness.
  - Institute a continuing storm drain stenciling project.
  - Sponsor a periodic community stream corridor clean-up days.
  - Establish and support a citizen “stormwater watch” group.
  - Create and “adopt-a-stream” program.
- Participate in the regional stormwater public involvement and participation program described in the May 1, 2011 memorandum of understanding between the designated small MS4s and the Chittenden County Regional Planning Commission.

6.3.1.3 (3) Illicit Discharge Detection and Elimination

- Develop, implement, and enforce a program to detect and eliminate illicit discharges.

Town of Essex Stormwater Management Plan

- Develop a storm sewer geographic information systems map of the MS4, showing the location of all outfalls and the names and the location of all waters of the United States that receive discharges from these outfalls.
- Through an ordinance or other regulatory mechanism, effectively prohibit non-storm water discharges into the storm sewer system and implement appropriate enforcement procedures and actions.
- Develop and implement a plan to detect and address non-storm water discharges, including illegal dumping, to the system.
- Inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste.
- Address the non-stormwater discharges or flows only if identified as significant contributors of pollutants to the MS4.
- By April 1, 2018, provide a summary of monitoring activities conducted and corrective actions taken.

6.3.1.4 (4) Construction Site Storm Water Runoff Control

The Town must develop a program to regulate stormwater runoff from construction activities and may qualify for coverage under the general permits for stormwater runoff from large and small construction sites by developing and implementing a program to assist the State in the regulation of such discharges. This program must include the development and implementation of the following as a minimum;

- Procedures to identify construction activities meeting the one-acre and five-acre regulatory thresholds and to report such activities to the State to assure that all such projects are properly permitted.
- Procedures to assist the State in inspecting permitted construction sites for compliance with the conditions of their permits.
- Procedures to assure that construction activities undertaken by the Town are properly permitted and implemented in accordance with the terms of the permit.
- Review existing policies; planning, zoning and subdivision regulations; and ordinances to determine their effectiveness in managing construction related erosion and sediment and controlling waste. The policies, regulations, and ordinances must also be reviewed for their consistency with the requirements of State general permits for stormwater runoff from large and small construction sites.
- Adopt an erosion control ordinance, planning, zoning and subdivision regulation at a minimum for development activities not subject to State erosion control requirements.

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### 6.3.1.5 (5) Post-Construction Storm Water Management in New Development and Redevelopment

- Review existing policies; planning, zoning and subdivision regulations; and ordinances to determine their effectiveness in managing stormwater runoff that discharges into the MS4 from new development and redevelopment projects to prevent adverse impacts to water quality. The policies, regulations, and ordinances must also be reviewed for their consistency with the requirements of State general permits regulating stormwater runoff from new development and redevelopment projects that have one or more acres of impervious surface.
- Develop procedures to identify new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, and to report to the State such activities that have one or more acres of impervious surface.
- For stormwater runoff that discharges into the MS4 from new development and redevelopment projects that disturb greater than or equal to one acre and that have less than one acre of impervious surface, adopt an ordinance, planning, zoning or other regulatory mechanism.
- For stormwater runoff that discharges into the MS4 from new development and redevelopment projects that disturb greater than or equal to one acre and that have more than one acre of impervious surfaces, the following shall be implemented:
  - Develop and implement procedures to assist the State in inspecting permitted development and redevelopment projects for compliance with the conditions of their permits.
  - Develop and implement procedures to assure that development and redevelopment activities undertaken by the Town are properly permitted, constructed, and maintained in accordance with the terms of the permit.

### 6.3.1.6 (6) Pollution Prevention/Good Housekeeping for Municipal Operations

- Describe your operation and maintenance program for preventing or reducing pollutant runoff from municipal operations, including, at a minimum: new construction and land disturbance and maintenance of fleet and buildings, park, open space, construction and maintenance practices for gravel backroads, snow disposal, and stormwater systems.

## 6.3.2 Monitoring

The program compliance, the appropriateness of identified best management practices, and progress toward achieving identified measurable goals will be evaluated. If monitoring of illicit discharges is conducted, the information shall be reported on Discharge Monitoring Reports (DMR) and shall include the following:

- The date, exact place, and time of sampling or measurements;
- The name(s) of the individual (s) who performed the sampling or measurements;

- The date and name(s) of the individuals who performed the analyses;
- The analytical techniques or methods used; and
- The results of such analyses.

### 6.3.3 Record Keeping

Records must be retained of all monitoring information, copies of all reports required by this permit, copies of Discharge Monitoring Reports (DMR's), a copy of the NPDES permit, and records of all data used to complete the application for the term of the permit.

### 6.3.4 Reporting

The Town takes strong exception to the 30-day time frame following the end of the permittee's fiscal year for submitting its Annual Report. This is an unrealistic and difficult requirement that cannot be met by the Town.

First, the annual report should be based on a calendar year. Almost every storm water activity under the permit occurs during the non-winter months. Stormwater actions generally take place between March/April and October/November of a given year. Infrastructure inspections take place in the spring/early summer and then actions such as cleaning, repair, reconstruction occur the same year before snowfall. The current calendar year basis enables all the seasonal storm water activities to be reported in a single year's report.

Additionally, the annual reports take significant time to prepare. Cost reporting for any month does not download to Departments from Finance until at least 30 days following the end of the previous month. A 30-day reporting time line would be akin to requiring filing of income taxes 30 days after the end of the calendar year.

The schedule for reporting was developed during previous permit cycles after much discussion and agreement between the permit parties and the State.

The Town will continue to submit its annual reports as of close of business on the 31<sup>st</sup> of December with the report due on the 1<sup>st</sup> of April.

Annual reports to be submitted will include:

- The status of compliance with permit conditions, an assessment of the appropriateness of the identified best management practices, progress towards achieving the goal of reducing the discharge of pollutants to the MEP, and the measurable goals for each of the minimum control measures;
- Results of information collected and analyzed during the reporting period;
- A summary of the storm water activities which will be undertaken during the next reporting cycle;
- Proposed changes to the stormwater management program;
- Notice that the Town is relying on another governmental entity to satisfy some of the permit requirements.

## **6.4 TOWN STORMWATER MANAGEMENT PLAN**

### 6.4.1 Introduction

The Town developed a stormwater management program addressing the minimum control measures as submitted with the Notice of Intent (NOI). The best management practices selected by the Town meet and exceed the minimum requirements and are described in the following narratives. In the plan, information is provided to address each control measure, and includes the decision process and measurable goals for each measure. This document with the minimum control measures is referenced in Appendix D.

#### 6.4.1.1 (1) Public Education and Outreach on Storm Water Impacts

- Participate in the regional stormwater education and outreach strategy described in the March 10, 2008 memorandum of agreement between designated small MS4s, the Chittenden County Regional Planning Commission and the Vermont Agency of Natural Resources, or
- Provide pet bags and waste receptacles at designated locations.
- Provide periodic update will be provided to the Selectboard on stormwater issues.
- Create and maintain a section of the Town's web site for stormwater information.

#### 6.4.1.2 (2) Public Involvement/Participation

- Comply with State and local public notice requirements.
- Develop a Town-wide Stormwater Management Plan.
- Implement a storm drain stenciling project.
- Conduct an annual community clean-up.
- Assign the Town Conservation Committee to serve as the citizen stormwater advisory panel.
- Participate in the regional stormwater public involvement and participation program described in the May 1, 2011 memorandum of understanding between the designated small MS4s and the Chittenden County Regional Planning Commission.

#### 6.4.1.3 (3) Illicit Discharge Detection and Elimination

- Develop a GIS based map of all known discharge points (outfalls).
- Conduct field verification of the discharge points with the impaired watersheds.

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- Develop and implement a monitoring plan which prioritizes municipal storm drain outfalls and addresses detection of non-stormwater discharges.
- Ensure compliance with the ordinance on illicit discharge/connections and non-stormwater discharges.
- Establish database to document monitoring actions taken. Develop and implement a plan to detect and address non-storm water discharges, including illegal dumping, to the system.

#### 6.4.1.4 (4) Construction Site Storm Water Runoff Control

- Inspect new development projects approved as part of Town approval process.
- Develop procedures to identify construction activities which are regulated by the State and report such activities to the State.
- Review existing Town policies to determine effectiveness of controls in managing construction related erosion and sediment and controlling waste.
- Ensure Town construction activities will comply with the State requirements for stormwater from small and large construction sites.
- Ensure compliance with the Town erosion control ordinance, or general zoning regulations for development activities not subject to State erosion control requirements.

#### 6.4.1.5 (5) Post-Construction Storm Water Management in New Development and Redevelopment

- Review existing Town policies to determine their effectiveness in managing stormwater runoff that discharges into the MS4 from new development and redevelopment projects that have less than one acre of impervious surface.
- Develop procedures to identify new development and redevelopment projects that disturb greater than or equal to one acre, and report such activities to the State.
- Ensure Town development and redevelopment activities comply with State regulations.
- Develop and adopt an ordinance from new development and redevelopment projects that disturb greater than or equal to one acre and that have less than one acre of impervious surface.

#### 6.4.1.6 (6) Pollution Prevention/Good Housekeeping for Municipal Operations

- Train employees annually on good municipal stormwater practices

## Town of Essex Stormwater Management Plan

- Maintain spill prevention kit at highway garage.
- Recycle petroleum wastes from internal municipal wastes.
- Participate in Green-Up Day to assist in removing debris from parks and selected roads.
- Inspect all catch basins within the MS4 area, at least annually, and the catch basins within the impaired areas, twice per year. Catch basins with more than 50% of the sump filled will be cleaned; pipes will be cleaned as necessary.
- Sweep streets at least once per year in the spring within the MS4 area and sweep streets in the impaired waterways at least twice per year.
- Provide pet waste control bags at designated locations.
- Schedule correction of defective pipe systems, erosion problems, and outfall problems consistent with the extent of the problem, the potential impact on water quality and the availability of funds.

## **7.0 ESSEX COMPLIANCE PROGRAM**

### **7.1 SUMMARY OF COMPLIANCE APPROACH WITH RESPECT TO SPECIFIC REQUIREMENTS OF THE MS4 NPDES PHASE 2 PERMIT:**

- Page 1, General Comments:

*“Regulated small MS4’s must develop, implement and enforce a SWMP designed to reduce the discharge of pollutants from the small MS4 to the maximum extent practicable (MEP), to protect water quality and to satisfy the appropriate water quality requirements of the Clean Water Act.”*

**RESPONSE:** The Town has an existing Storm Water Management Program (Plan) dated 2003. This document titled **Updated Storm Water Management Program Version 2012** updates that plan but does not replace the content of that plan except where applicable. The 2012 version of the NPDES 3-9014 permit is an update of two earlier versions of the permit and the majority of requirements have not changed as the permit has been revised. It should also be noted that the Town uses the term “Storm Water Management Plan” and “Storm Water Management Program” as synonyms with respect to the permit.

- Page 7, II, A: *“If an applicant has been previously regulated as an operator of a small MS4 and obtained coverage under the 2003 small MS4 permit, then it shall submit a **revised** NOI and a SWMP....”*

**RESPONSE:** The Town of Essex submitted a Storm Water Management Plan (Program) in 2003 per the requirements of the NPDES Phase 2 Permit and has been operating under that plan since then. This document revises that plan, titled as **Updated Storm Water Management Program Version 2012**. It provides updated information as appropriate to meet the water quality objectives from December 2012 and will remain as the Essex SWMP until such time as a new permit is issued or the current permit amended.

- Page 8, II, E: “A permittee may partner with other small MS4s to develop and implement its SWMP.”

**RESPONSE:** The Town of Essex currently partners with other communities with respect to Public Education (Regional Storm water Education Program) and Public Participation (Chittenden County Stream Team) through signed inter-municipal agreements (signed MOUs are included as Appendices L and M). It is also intended that the Town will sign a future agreement with the Agency of Environmental Conservation or their designated representative to perform stream water quality testing to meet the permit requirements of Section C, 1, e), (7), (a). In addition, the Town will be exploring opportunities with the Village of Essex Junction regarding some form of future collaborative effort on storm water permit compliance.

- Page 8, III: “The permittee must develop a written storm water management program (SWMP). The SWMP must be signed in accordance with Section VI.H of this permit. The SWMP shall provide measureable goals for the development and implementation of the six minimum measures described in Subparts IV.F and G and additional measures necessary to protect water quality described in Part IV. A permittee’s approved Flow Restoration Plan developed in accordance with Subpart IV.C.1 shall be considered a part of the permittee’s SWMP.”

**RESPONSE:**

a: This document is the SWMP as revised from the 2003 SWMP submitted under earlier permits.

b: The document is signed in accordance with Section IV.H of the permit.

c: The submitted NOI (Appendix D) provides a listing of the six minimum measures to be undertaken either as a continuation of existing programs or as new initiatives. Appendix O to this document provides a list of the measurable goals for the six minimum measures as well as additional measureable goals associated with assessment of the Town’s program to protect water quality.

d: The FRP will be included as a future Appendix (AA) to the Storm water Management Program after it has been developed and approved.

- Page 9, IV, B, 2: “Except for discharges addressed by Part IV.C.1, if at any time the permittee becomes aware, or the Secretary determines, that a discharge

*causes or contributes to an exceedance of water quality standards, the permittee shall within 60 days of becoming aware of the situation, eliminate the conditions causing or contributing to the exceedance of water quality standards. If elimination within 60 days is infeasible, the permittee shall document in the SWMP measures and anticipated timeframes to eliminate the conditions causing or contributing to the exceedances. The 60 day period does not constitute a grace period for enforcement of water quality standards or this permit. Within 30 days of eliminating the condition, the permittee shall document the measure used to correct the condition in the SWMP.”*

**RESPONSE:** The Town agrees to eliminate identified and documented water quality exceedances within the 60 day period, or if infeasible, modify the SWMP by identifying measures and time frames to eliminate the conditions causing the exceedances and document the measures within 30 days of identification of the exceedances.

- Page 10, IV, C, 1, a): *“The permittee shall control discharges consistent with the assumptions and requirements of any wasteload allocation (WLA) applicable to the permittee in the TMDL. The permittee shall describe in the SWMP all measures that are being used to address this requirement.”*

**RESPONSE:** The TMDL for Indian Brook and for Sunderland Brook are included as Appendix H and Appendix I to this document. Appendices D (NOI) and O (Measurable Goals), describe the measures that will be used to address the requirements of the TMDL.

- Page 10, IV, C, 1, c): *“The permittee shall include in the annual reports and the SWMP the rationale supporting the permittees assessment that such controls are adequate to meet the applicable TMDL requirements.”*

**RESPONSE:** Appendix X to the SWMP is a document from the James River Basin in Virginia wherein the effectiveness of urban BMP’s was evaluated. In general, the findings from this report support the findings in Essex since the first NPDES Phase 2 Permit was issued to the community. In previous NOI’s, the Town documented why certain BMP’s were selected and why others were not. The list of BMP’s available to the community has essentially not changed over the life of the NPDES Phase 2 permits. This fact coupled with the James River Basin study negates the need to provide further documentation on why other BMP’s were not selected as part of the permit compliance.

- Page 11 and 12, IV, C, 1, e (1) through (2): *“ The permittee shall develop and submit a comprehensive Flow Restoration Plan for the portion of each storm water impaired watershed within the permittee’s boundaries....Upon approval by the Secretary, the Flow Restoration Plan shall be a part of the permittee’s SWMP. Any failure of the permittee to comply with the SWMP, including but not limited to*

*the design and construction schedule in the approved FRP, shall constitute a violation of this permit.”*

**RESPONSE:** The Town of Essex will develop and submit comprehensive Flow Restoration Plans for the impaired watershed areas of Indian Brook and Sunderland Brook, which will include a cooperative effort with other MS4 permittees within these impaired watersheds. On Indian Brook, the other MS4 parties are the Village of Essex Junction and VTRANS. In the Sunderland Brook watershed, the MS4 parties are the Village of Essex Junction, VTRANS, the Town of Colchester and UVM (for areas in Fort Ethan Allen). Once approved by all parties, the FRP will become Appendix AA to the Essex SWMP. Implementation of constructed projects under an approved FRP will be dependent on the voters' approval of financing for identified projects. Although the designated representatives are responsible for permit compliance, the authorized representatives cannot guarantee voter financial support.

- *Page 12 and 13, IV, C, 1, e (3): “Schedule of Compliance”*

**RESPONSE:** The schedule of compliance references a number of required sub elements, some of which pertain directly to the FRP and some of which are indirectly related. Comments follow:

a: A plan for performing the stream flow monitoring requirement must be submitted within 3 months of the Vermont Agency of Natural Resources (VANR) approval of the NOI and SWMP. Work has already begun to effect this monitoring. A request has been made to the VANR, in concert with other permittees, to have VANR contract for this service and charge each community a proportionate share of the Chittenden County impaired waterways stream flow testing. A request is before the Vermont Legislature to make this possible. In the event that this approach cannot be implemented due to inaction or disapproval by the VT Legislature, the Town will request that a testing program be established by the Chittenden County Regional Planning Commission to perform this service on behalf of the affected MS4 permittees.

b. A plan for addressing expired stormwater permits discharging to the Town's MS4 system must be submitted within 6 months of the Vermont Agency of Natural Resources (VANR) approval of the NOI and SWMP. Essex has requested that the VANR provide clear direction on the legal authority vested under the Residual Designation Authority (RDA). No response has yet been received. Compliance with the 6 month permit requirement will be dependent on the VANR ability to provide clear direction to the permittee on use of the RDA. It should be noted that Appendix Y and Z contain information on the expired permits and non-permitted outfalls in the two impaired streams.

c. Other compliance dates will be met subject to clarification and resolution of the RDA issue in a timely manner by the VANR.

- *Page 14, IV, C, 1, e (4): “Commencing two years after the issuance of an authorization or designation as a regulated small MS4, the permittee shall develop a program to identify opportunities for and provide technical assistance to landowners in the implementation by landowners of low impact BMP’s such as maximizing disconnection, maximizing infiltration of stormwater runoff, preventing and eliminating soil erosion and preventing and eliminating the delivery of pollutants to stormwater conveyances.”*

RESPONSE: The Town will develop a program to meet this requirement at the appropriate time.

- *Page 14, IV,C,1,e, (5): “Commencing two years after the issuance of an authorization or designation as a regulated small MS4, the permittee shall prepare and submit to the Agency a report on legal authorities or strategies that the permittee has adopted to protect and regulate the development in the stream corridors of storm water-impaired waters.”*

RESPONSE: The Town reviewed and developed changes to the Town’s Subdivision and Zoning Regulations and developed a comprehensive Storm water Ordinance during the previous round of the NPDES Phase 2 permit. In our opinion, those documents contained in Appendices P, Q, R, S, T, U, and V address the new NPDES Phase 2 permit requirement from a legal standpoint of compliance. However, both the Town of Essex and Village of Essex Junction requested that the Chittenden County Regional Planning Commission review the two communities’ documents pertaining to this permit requirement as a work item under their annual work plan (UPWP). It is included in the UPWP that is currently warned for approval (see Appendix W). Funds will be available after 1 October 2013 for this review. It is anticipated that the review will be completed by the spring/summer of 2014. At that time, any changes to the documents would have to go through the local planning bodies and be adopted by the Selectboard and/or Trustees. Until the VANR approves the SWMP and NOI for both communities, it cannot be determined if the 2 year schedule for adoption can be met. If it cannot, a request will be made to revise the SWMP and NOI to reflect an appropriate adoption date for any changes. The adoption date for any changes should not impact on the permit’s legal deadline since the documents currently in place, in our opinion, already meet this requirement.

- *Page 14, Page 14, IV,C,1,e, (6): “Commencing two years after the issuance of an authorization or designation as a regulated small MS4, the permittee shall prepare and submit a plan for outlining options for enhanced protection of stream corridors of stormwater impaired waters. The plan should include a map of stream corridors depicting areas that have not been converted to impervious surface and areas that have been converted to impervious surface.”*

**RESPONSE:** The report to be prepared for the Town by the CCRPC as part of their UPWP will address the issue of ideas/concepts for enhanced protection of the impaired stream corridors as well as the unimpaired steam corridors. The Town of Essex GIS coordinator has mapped the entire Town for impervious and pervious areas. The Town will review the CCRPC study results, the Town's current riparian buffer regulatory controls and the riparian buffer and stream fluvial geomorphological information (contained in Appendices J and K) to determine whether or not changes are needed to the current Town programs.

- *Page 14, IV,C,1,e, (6) (a): "For those areas of stream corridors that have not been developed or otherwise converted to impervious surface, the permittee's plan should identify options for ensuring enhanced protection, which may include 1) minimum widths of stream channel buffers requiring protections, (2) minimum setback requirements and 3) proposed planning and zoning regulations, municipal ordinances or codes, policies or other requirements to enhance protection of undeveloped stream corridors."*

**RESPONSE:** The information noted under item 11 applies also to this specific requirement. In addition, it is the intent of the Town to utilize summer interns during the summer of 2013 to physically walk the top of slope along both sides of the impaired watersheds in Essex with GPS instruments to better establish an accurate top of slope of all banks. This information will then be mapped onto the GIS maps for better delineation of needed setbacks. Also, the Town Public Works Specs are being rewritten in 2013 to provide for better defined requirements for all infrastructure, including storm water and bank setbacks.

- *Page 14, IV,C,1,e, (6) (b): "For those areas of stream corridors that have been developed or otherwise converted to impervious surfaces, the permittee's plan should identify options for stream corridor restoration which may include 1) restoring stream buffers and 2) relocation of development outside stream corridors for development projects."*

**RESPONSE:** The Town of Essex will comply with this requirement subject to limitations with regard to infringement on private landowners' rights on previously developed land. The two situations where the Town will support this requirement are 1) under conditions of approval on new development applications consistent with Town established regulations or ordinances or with State and Federal law or regulations and 2) under conditions of voluntary compliance by landowners.

- *Page 15, IV,C,1,e, (7): "The permittee shall implement or otherwise fund, a flow and precipitation monitoring program, subject to approval by the Secretary, in its respective storm water impaired watersheds."*

**RESPONSE:** Refer to response under Page 11 and 12, IV, C, 1, e (1) through (2).

- *Page 15, IV,C,1,g: “The assessment of whether a SWMP is consistent with the assumptions and requirements of a storm water TMDL will be based on the implementation and maintenance of best management practices identified in the FRP and on flow monitoring, not on measurements of pollution loading.”*

**RESPONSE:** The Town’s NOI and SWMP are based on implementation and maintenance of best management practices and not on measurements of pollution loading.

- *Page 17, IV, G, 1: A permittee shall develop, implement and enforce a Storm water Management program (SWMP) designed to reduce the discharge of pollutants from the small MS4 to the extent practicable (MEP), to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act. For purposes of this permit, narrative effluent limitations requiring implementation of best management practices (BMPs) are the most appropriate form of effluent limitations when designed to satisfy technological requirements (including reductions of pollutants to the maximum extent practicable) and to protect water quality. Implementation of best management practices for purposes of the six minimum measures consistent with the provisions of the SWMP constitutes compliance with the standard of reducing pollutants to the “maximum extent practicable”.*

**RESPONSE:** The SWMP has been developed by the Town for review by the Vermont Agency of Natural Resources. It is anticipated that the VANR may make recommendations for change to the document. Once all reviews and changes have been made to meet the regulatory threshold of acceptance, the SWMP will be formally adopted by the Town Selectboard. Following Selectboard approval of the SWMP, the plan will be implemented and enforced.

- *Page 18, IV, G, 2: “A permittee must develop and fully implement its SWMP for the six minimum measures in accordance with this permit by the expiration date of this permit.” The SWMP must include the following information for each of the six minimum control measures described in Subpart IV. G of this permit.*

*a) The person or persons responsible for implementing or coordinating the BMP’s for the SWMP.*

*b) The best management practices (BMPs) that the permittee or another entity will implement for each of the storm water six minimum measures.*

*c) The measureable goals for each of the BMP’s including, as appropriate, the months and years in which the required actions will be undertaken, including interim milestones and the frequency of the action.”*

**RESPONSE:**

a). The person responsible for implementing the BMP's for the SWMP is the individual signing the NOI and SWMP as per Section IV, H of the NPDES Phase 2 Permit.

b) and c) This information is documented in the NOI and the NOI is a component of the SMWP.

- *Page 18, IV, G, 3: In addition to the requirements listed above, a permittee must provide a rationale for how and why it selected each of the BMP's and measureable goals for the SWMP. The rationale should describe 1) the stormwater problems to be addressed by the BMP 2) the major alternative BMP's to the ones selected and why they were not adopted, the behavioral and institutional changes necessary to implement the BMP and 4) expected water quality outcomes.*

**RESPONSE:**

Under Minimum Measure #1, Public Education and Outreach on Stormwater Impacts, the Town has selected permit item H,1, a) (1) and (2) plus additional BMPs as outlined in the Town NOI. No additional information is required to satisfy Section IV, G, 3.

Under Minimum Measure #2, Public Involvement/Participation, the Town has selected permit item H, 2, a), (9) plus additional BMP's as outlined in the Town's NOI. No additional information is required to satisfy Section IV, G, 3.

Under Minimum Measure #3, Illicit Detection and Elimination, the Town will meet the requirements of all 7 of the required BMP actions, noted under H, 3, a), (1) through (7) as it has done on previous permits. Under paragraph b), the following comments apply:

- (1) The Town GIS maps in Appendices E and F contain updated information on all catch basins, storm lines, manholes, outfalls and culverts. The information is updated annually by the Town's dedicated GIS coordinator following field inspections by summer engineering interns. The maps are based on aerial photography, field investigations with GPS instruments and annual physical inspections.
- (2) A local Storm water ordinance was adopted under the prior NPDES permit (Appendix P). A locally adopted ordinance provides the control and enforcement provisions necessary to effect compliance.
- (3) The Stormwater Ordinance adopted by the Town contains a significant section on illegal discharges. Any changes to the Ordinance would occur as a result of the CCRPC review of Town documents for compliance with the new NPDES permit.

- (4) The Town utilizes engineering interns to randomly test the individual storm water systems, using a combination of optical brightener and chemical tests. This system of testing has been ongoing since 2003, with sufficient data to establish validity for selecting points for testing into the future. In general, the most downstream catch basins or the outfall is tested as well as any key “junctions” upstream in a piped system. If any illicit discharges are detected, the testing follows the “tree” of piping until the problem area is isolated. In the case of Essex, voluntary compliance has occurred due to the threat of fines that can be levied through the Ordinance. Every year, the testing program is evaluated based upon a review of data from previous years. The Town inspects every outfall every year as well as over 90% of the municipal catch basins and some private systems per prior agreement with the landowners. In most years, it is a 100% inspection throughout the entire system.
- (5) Whenever an illicit discharge is detected, the responsible party is provided written notice of the violation, generally with 24-hours of the occurrence. Immediate correction is required. The Town also uses RSEP to develop educational programs aimed at preventing illicit discharges. Because of the small size of the work force, the same individuals are responsible for public education and pollution prevention so there are no issues with coordination of the two programs.
  - (6) Reference Section IV, H for the responsible party.
  - (7) Reference the NOI and SWMP goals.

Under Minimum Measure #4, Construction Site Storm water Runoff Control, the Town will continue to work within the selected BMP's as identified under earlier permits. The controls are vested in the Town's Stormwater Ordinance and Planning/Zoning regulations adopted by the Town. The Town adopted controls are more stringent than the State requirements (see Appendix R as a Guide). The Town has an adopted Storm water Ordinance with a section devoted to erosion control.

Further, the Town under the new permit and will review its current ordinances and regulations in cooperation with the CCRPC to determine what if any changes should be made.

In addition to the written regulatory controls, all new development projects undergo a thorough technical review by the Public Works staff. Larger projects operate under a letter of credit with a 3-year warranty program.

Public Works employees periodically perform site visits to all new development and proper erosion control is a significant element of the inspections.

Under Minimum Measure #5, Post – Construction Stormwater Management for new development and re-development, The Town already has adopted and enforced a program aimed at post-construction storm water runoff from new development and redevelopment. A more stringent program has been developed than the State's requirements as noted in the Town's adopted Stormwater Ordinance and as reflected in the flow chart in Appendix R.

An element of the CCRPC UPWP study will be to develop a design resource guide for low impact designs and to determine how best to integrate LID into the development review process.

The Public Works Specifications are currently under extensive re-write and the standards will be evaluated for potential changes supporting LID design. Recommended changes will also be incorporated over time into the appropriate development review and control regulations and ordinances.

Maintenance of BMP's is also a component element of all new development approvals. Expanded codification of the maintenance responsibilities will be investigated as part of the CCRPC related study work during this permit cycle.

Under Minimum Measure #6, Pollution Prevention/Good Housekeeping for Municipal Operations, the Town already has a comprehensive program in place that was adopted under previous NPDES Phase 2 permits. Key elements include employee training, street sweeping, winter salt reduction, catch basin inspections and cleaning, outfall inspections and repair, highway garage site compliance with stormwater controls and a number of other elements reported in earlier NPDES Phase 2 permit annual reports.

- *Page 33, IV, J, 1. SWMP Review: The permittee must perform an annual review of its SWMP in conjunction with preparation of the annual report under Subpart V.C.*

**RESPONSE:** The Town will continue its annual update of the major elements of the SWMP in conjunction with the annual report as has been done since the first NPDES Phase 2 permit that was issued to the Town.

- *Page 33, IV, J, 2. SWMP Update: A permittee may change its SWMP during the life of the permit in accordance with the procedures noted in a) through c).*

**RESPONSE:** The Town is aware of the ability to update the SWMP.

- *Page 33, IV, J, 3, SWMP Updates required by the Secretary as noted in a) through d).*

**RESPONSE:** The Town is aware of this potential requirement.

- *Page 34, IV, J, 4. Transfer of Ownership, Operational Authority or responsibility for SWMP Implementation noted in a) and b).*

**RESPONSE:** The Town is aware of this provision of the permit.

- *Page 34 and 35, V., A, Monitoring and B, Record Keeping:*

**RESPONSE:** The Town is aware of these requirements.

- *Page 35, V, C. Reporting:*

**RESPONSE:** The Town takes strong exception to the 30-day time frame following the end of the permittee's fiscal year for submitting its Annual Report. This is an unrealistic and difficult requirement that cannot be met by the Town.

First, the annual report should be based on a calendar year. Almost every storm water activity under the permit occurs during the non-winter months. Stormwater actions generally take place between March/April and October/November of a given year. Infrastructure inspections take place in the spring/early summer and then actions such as cleaning, repair, reconstruction occur the same year before snowfall. The current calendar year basis enables all the seasonal storm water activities to be reported in a single year's report.

Additionally, the annual reports take significant time to prepare. Cost reporting for any month does not download to Departments from Finance until at least 30 days following the end of the previous month. A 30-day reporting time line would be akin to requiring filing of income taxes 30 days after the end of the calendar year.

The schedule for reporting was developed during previous permit cycles after much discussion and agreement between the permit parties and the State.

The Town will continue to submit its annual reports as of close of business on the 31<sup>st</sup> of December with the report due on the 1<sup>st</sup> of April.

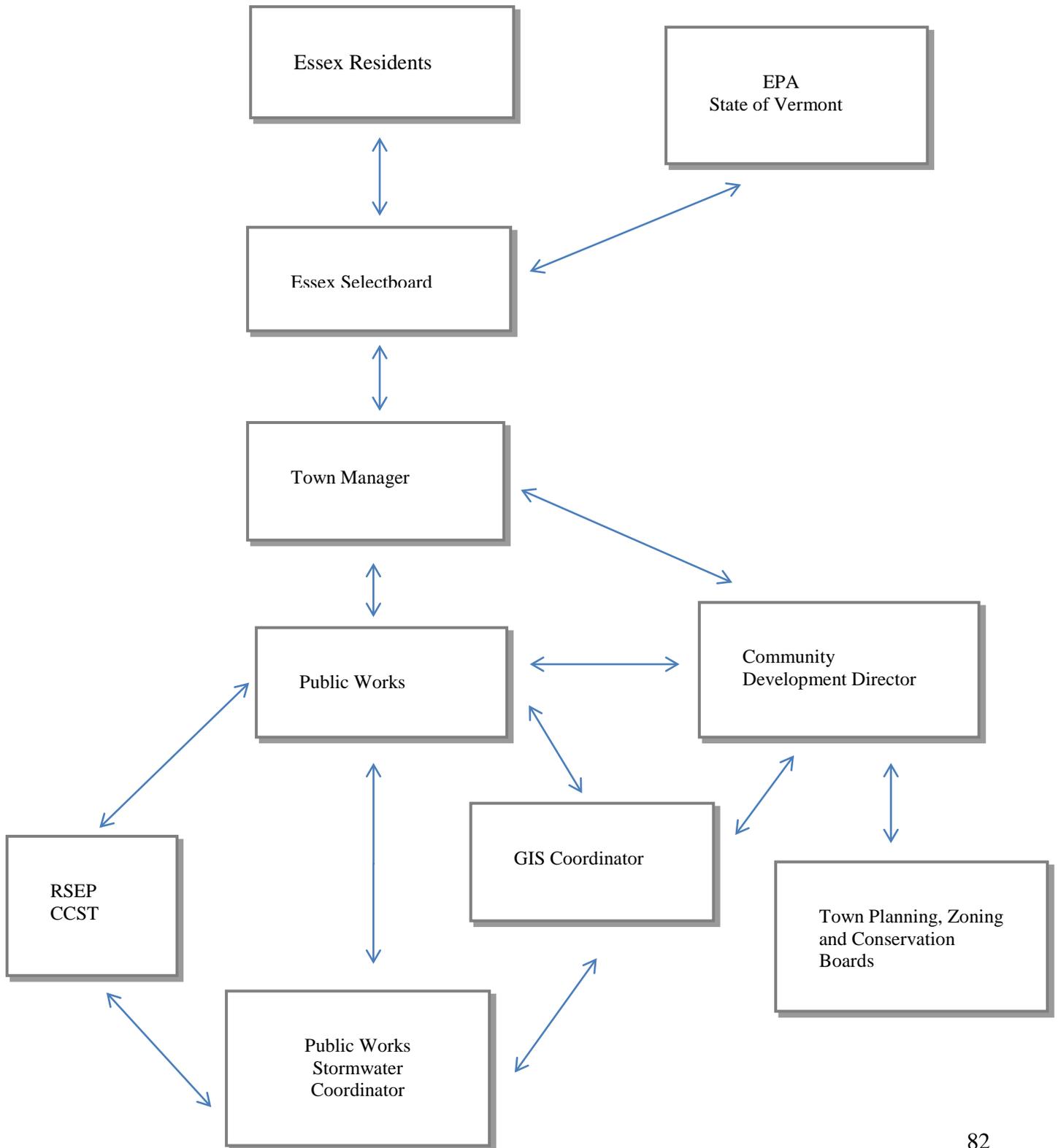
## **7.2 STORMWATER MANAGEMENT TEAM**

The organizational chart is shown on Figure 15. Overall, the Selectboard is the responsible municipal authority, with management and charter authority to act on behalf of the Selectboard vested in the Town Manager. The lead staff department on stormwater issues is the Public

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Works Department directed by the Public Works Director and assisted by the Town Stormwater Coordinator. The Community Development acting under the Community Development Director assists the Town Manager and Public Works Department on issues relating to stormwater planning, bylaws and permitting. The Town GIS coordinator provides the technical update of data into the stormwater infrastructure mapping. Other Town Boards and Commission such as the Planning Commission, Zoning Board and the Conservation Committee provide input and develop planning policies relating to stormwater. The Town also receives assistance from the two regional stormwater entities of which it is a part – the regional Stormwater Education Program (for Minimum Measure #1) and the Chittenden County Stream Team (for Minimum Measure #2).

**Figure 15** Essex Storm Water Organizational Chart



### 7.3 IMPLEMENTATION SCHEDULE

The implementation schedule is developed to comply with the multiple State and Federal stormwater regulatory requirements. The required activities are listed by activity under the MS4 NPDES Permit requirements. Other permit schedules such as for the 3-9010 permits are not listed since these are ongoing actions. The permit schedules for compliance with the six (6) minimum measures are indicated in the NOI.

**Table 2. Key dates for Stormwater NPDES Phase 4 MS4 Permit Issued 5 Dec 2012:**

Item	Permit Reference	Time frame for Compliance	Calendar Due Date
NOI Submittal	II, A, 1 Pg 7	180 days from date of permit issuance	3 June 2013 (Firm)
Storm water Management Plan Submittal	II, A, 1 Pg 7	180 days from date of permit issuance	3 June 2013 (Firm)
Annual NPDES Permit Report	V, C Pg 35	Permit requires 30 days following end of permittee's fiscal year; Town NOI reflects 90 days following end of calendar year as per previous NPDES Permit	1 April 2014 as per Town NOI
State Issuance of Authorization to Discharge	Implied under IV, C, 1, e	Depends upon review time and appeals – estimate 3 months	1 Sept. 2013 (estimated)
Submit Flow Monitoring Plan to State	IV, C, (3) Pg 13	3 months from Authorization to Discharge	1 Dec 2013 (estimated)
Submit Plan for addressing expired stormwater permits	IV, C, (3) Pg 13	6 months from Authorization to Discharge	1 March 2014 (estimated)
Submit semi-annual report on Flow restoration plan progress (FRP)	IV, C, (3) Pg 13	12 months from Authorization to Discharge	1 Sept 2014 (estimated)
Technical assistance to homeowners	IV, C, (4) Pg 14	Commence 24 months after Authorization to Discharge	5 Dec 2014 (estimated)
Regulate and protect development in stream corridors	IV, C, (4) Pg 14	Commence 24 months after Authorization to Discharge	5 Dec 2014 (estimated)

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Plan for enhanced protection of stream corridors	IV, C, (4) Pg 14	Commence 24 months after Authorization to Discharge	5 Dec 2014 (estimated)
Submit semi-annual report on Flow restoration plan progress (FRP)	IV, C, 3 Pg 14	18 months from Authorization to Discharge	1 March 2015 (estimated)
Annual NPDES Permit Report	V, C Pg 35	Permit requires 30 days following end of permittee's fiscal year; Town NOI reflects 90 days following end of calendar year as per previous NPDES Permit	1 April 2015
Submit report that all existing permits are in compliance, or RDA requested and maintenance completed	IV, C, 3 Pg 14	24 months from Authorization to Discharge	1 Sept 2015 (estimated)
Submit semi-annual report on Flow restoration plan progress (FRP)	IV, C, 3 Pg 14	30 months from Authorization to Discharge	1 March 2016 (estimated)
Annual NPDES Permit Report	V, C Pg 35	Permit requires 30 days following end of permittee's fiscal year; Town NOI reflects 90 days following end of calendar year as per previous NPDES Permit	1 April 2016
Submit complete report on Flow restoration plan progress (FRP)	IV, C, 3 Pg 14	36 months from Authorization to Discharge	1 June 2016 (estimated)
Submit semi-annual report on Flow restoration plan progress (FRP)	IV, C, 3 Pg 14	42 months from Authorization to Discharge	1 Dec 2016 (estimated)
Annual NPDES Permit Report	V, C Pg 35	Permit requires 30 days following end of permittee's fiscal year; Town NOI reflects 90 days following end of	1 April 2017

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		calendar year as per previous NPDES Permit	
Submit semi-annual report on Flow restoration plan progress (FRP)	IV, C, 3  Pg 14	Every 6 months	1 June 2017 (estimated)
Submit semi-annual report on Flow restoration plan progress (FRP)	IV, C, 3  Pg 14	Every 6 months	1 December 2017 (estimated)
Annual NPDES Permit Report	V, C  Pg 35	Permit requires 30 days following end of permittee's fiscal year; Town NOI reflects 90 days following end of calendar year as per previous NPDES Permit	1 April 2018

## 7.4 FUNDING

### 7.4.1 Historical Budget Information:

The Town completed the following actions associated with permit compliance at the noted costs over a nine-year period:

- a. Field checked and GIS-mapped all stormwater infrastructure to include annual inspections of 1132 catch basins, 262 pipe outfalls and 7+ treatment systems using 2 to 4 summer interns every year.....estimated cost **\$175,000**
- b. Purchased a street sweeper (\$139,000) and swept 2 to 4 times per year at an annual cost of \$25,000.....estimated cost **\$364,000**
- c. Annually cleaned catch basins using contractors ( \$8,800 yearly) and Town forces (\$6,000 yearly).....estimated cost **\$133,000**
- d. Annually repaired/replaced deficient stormwater infrastructure, minor projects \$20,300/year; major projects (some with grants, local share only \$275,000) .....estimated cost **\$477,000**
- e. Hired a full-time stormwater program coordinator in 2011 at an annual cost of \$32,000 plus \$15,000 in benefits.....estimated cost **\$94,000**
- f. Developed with other MS4 permittees a Regional Stormwater Education Program (RSEP) at \$5,000/year since 2002 and a Regional Public Participation Program at \$1,800/year since 2011 .....estimated cost **\$48,600**
- g. Assumed non-impaired stormwater permits for the community.....**\$30,600**

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- h. Constructed new stormwater treatment systems with and without state and federal grants (with some long-term debt).....estimated cost **\$500,000**
  - i. Installed oil-water separators, stormwater pond, new gas island, addition to salt shed for stormwater improvements at the highway garage.....**\$155,000**
  - j. Assisted with funding and construction of rain gardens, mitigation of stream erosion and similar projects ..... estimated cost **\$25,000**
  - k. Other employee costs not already identified at \$95,724 in 2014 budget; over nine year period with program changes.....estimated cost **\$554,000**
  - l. Other stormwater budget line items not previously identified at \$15,000 per year.....estimated cost **\$135,000**
  - m. Capital funds for future stormwater construction required by NPDES Phase 2 permit (including FYE2014)..... cost **\$240,000**
- Total estimated cost.....\$2,931,000**

• **Other actions taken by the Town without specific identification of costs:**

- n. Revised Subdivision and Zoning Regulations to increase development setbacks from streams and establish stricter controls over stormwater for new developments.
- o. Prepared and obtained Selectboard approval over a comprehensive Stormwater Ordinance with guidelines for new developments that fall below the regulatory threshold of State stormwater permitting. The documents also establish policies and procedures for erosion control during construction.
- p. Obtained assistance on future Town stormwater projects utilizing UVM Senior Class Students as part of their Capstone Projects.
- q. Identified illicit discharges into the Town’s stormwater system and obtained corrective action without fines or litigation.
- r. Worked with the Vermont Youth Conservation Corps over a number of years to reduce erosion in the Fern Hollow area.
- s. Reduced Town road salt use through introduction of new equipment, revision to operational procedures, better employee training and use of alternative products
- t. Responded to citizens’ complaints on stormwater or handled staff observed violations such as :
  - (1) A contractor pouring white paint into a storm drain
  - (2) Builders failing to utilize any form of erosion control with sediment going directly to streams
  - (3) A resident discharging their laundry water to a Town catch basin
  - (4) Residential discharge of wastewater to the storm system through contractor error

### 7.4.2 Current Budget Information:

Stormwater costs are budgeted for FY14 (starting 1 July 2013) in a number of locations within the Town budget.

- Stormwater Salaries and benefits include 20% of the Public Works Director's and Public Works Secretary's salaries and benefits, 80% of the Stormwater/Staff engineer salary and benefits, 67% of one Highway Department Equipment Operator's salary and benefits and the costs for hiring 2 summer interns, the total of which is.....\$154,832
- Professional services.....\$ 15,000
- System repairs and maintenance.....\$ 20,000
- Construction of facilities.....\$ 7,000
- Advertising.....\$ 7,800
- Other purchased services.....\$ 10,200
- Travel.....\$ 1,300
- Taxes, licenses and registration.....\$ 5,800
- Vehicles.....\$ 9,700
- Subtotal.....\$231,632

In addition, there are some added funds under the Highway Budget for stormwater repairs and storm drainage materials purchase of .....\$52,240

Also, there is a Capital Fund line item for future stormwater construction. This account had a fund balance of \$99,675 as of June 30, 2012. Another \$80,000 will be placed into this fund in FYE 2014.

### 7.4.3 Future Budgets:

The current budget will be adequate through 30 June 2014 to meet the requirements of the MS4 NPDES Phase 2 permit. However, as stream monitoring is initiated and engineering costs are needed to prepare elements of the Flow Restoration Plan, the current budget will be inadequate to meet the requirements.

In addition, future construction of FRP required improvements will likely drive costs to a level where some form of long term financing will be needed. Compounding the issue in Essex is the reality that the FRP will involve both the Village of Essex Junction and the Town of Essex, since both are included in the water shed boundaries for the two impaired waterways. Essex Junction residents are also Town residents and any long term financing will likely require some form of cooperative financial effort between the two communities or a separate Town-outside the-Village stormwater utility will need to be formed to achieve financial equity. Alternatively, both communities could agree to jointly fund stormwater improvements in the Village and the Town under one-umbrella cost proposal. Both options will be explored as an element of developing the Flow Restoration Plan.

#### **7.4.4 Stormwater Utilities**

Stormwater utilities have been formed in Burlington and South Burlington. The Town of Williston is investigating this approach. In general, the more extensive the need for stream-clean-up, the more there appears to be a need to develop this type of management system.

Most of the stormwater utilities have a funding approach based on identification of impervious versus non-impervious areas and residents pay on the basis of their impervious area. Credits are offered to users who have helped reduce their impervious areas or treat their runoff. In principle, the practice is equitable. However, it carries with it a significant system management and administration cost which drives up the costs for stormwater clean-up. Also, utility fees are not tax deductible for those who itemize their tax deductions; property taxes are deductible with generally a 20 to 30 % reduction for every property tax dollar spent.

At this time, it does not appear that a utility may be the best solution for managing the stream clean-up. However, this alternative will be investigated in more depth as part of the FRP financial studies. Public input is a critical element throughout the entire process involving the selection of a stormwater financing option.

#### **7.4.5 State/Federal Grants and Loans**

It is not anticipated that there will be funds available from these two historic sources for implementing stormwater solutions. Unless commercial interest loans increase their interest costs significantly, it is not worth pursuing State loans with the cumbersome and archaic administrative requirements that accompany those loans.

### **7.5 MONITORING PROGRAM**

#### **7.5.1 Illicit Discharges**

Under the MS4 requirements, implementation of a monitoring program is required to detect non-storm water discharges under the illicit discharge detection and elimination plan. The Town has been implementing such a program since 2002 and has maintained records of the monitoring.

The methods used by the Town include:

- Visual monitoring of outfalls
- Optical brightener testing throughout the system
- Site specific testing for water quality parameters

For monitoring purposes, priority areas have been identified over time using the following very general criteria:

- Commercial/industrial areas
- Older areas of the system
- Areas of repeated complaints
- Locations identified from water quality sampling data

The Town has proposed utilizing the Optical Brightener test under the MS4 “Stormwater Management Program”. This is a simple and inexpensive method to determine the presence of a non stormwater discharge. An untreated cotton pad is placed at the storm drain outlet, manhole, or catch basin for a period of time. A blue color indicates the presence of detergents, signifying illegal dumping, a direct illicit connection, a leaking sewer, or contamination from a failed septic system. If the test is positive for detergents, further tests need to be performed to determine the source.

Depending on the type of suspected contamination, additional water quality testing can be performed. Water quality testing at these locations can be performed for the parameters listed in Table 2. Typically, the most common illicit discharge is bacteria, so the discharge should initially be sampled for E. coli.

**TABLE 2  
WATER QUALITY TEST PARAMETERS**

<b>Water Quality Test</b>	<b>Application</b>
Conductivity	Indicator of dissolved solids
Ammonia	Indicator of presence of sanitary sewer
Surfactants	Indicates presence of detergents
pH	Extreme values may indicate commercial or industrial flows
Temperature	High temperature indicates presence of sanitary sewer
Total Chlorine or Fluoride	Indicator of potable water source
E. Coli	Indicator of presence of sanitary sewer
Turbidity	Indicator of solids and water clarity
Total Phosphorous (P) Orthophosphate	Potential TMDL pollutant due to impact on Lake Champlain
Suspended Solids (TSS)	TMDL pollutant indicator for impaired streams

## 7.5.2 Water Quality Testing

- **Biomonitoring**

The State has conducted biomonitoring for the major watershed areas within the Town of Essex in Sunderland Brook, Indian Brook, Alder Brook, and Browns River. Monitoring stations have been established by the State at specific locations within each watershed area. Copies of the water quality testing performed on the two impaired watersheds are included in Appendix G.

The chemical monitoring of the streams makes it difficult to gather reliable data on the health of a stream. This type of testing is useful to check for a specific water quality parameter; however it can be highly variable due to changes in stream flows, time of year, and difficulty in collecting composite versus a grab sample. We concur that performing chemical monitoring should be limited to checking of discharges, and not expanded for monitoring of the health of streams.

- **Stream-flow Monitoring**

Section IV, C, 1, e, (3) of the MS4 NPDES Phase 2 permit requires the permittee to perform stream flow monitoring. Although the Town strongly disagrees with this permit requirement, the option of complying may be far less expensive than other options, such as periodic testing of each stormwater outfall. The issue is that there is a long standing and established principle in Vermont law that the waters of the State fall entirely within the jurisdiction and control of the State. Flow monitoring of the “stream” itself and not a discharge into the stream should fall entirely under the State and no other permittees who discharge into the waterway.

The Town has agreed to reimburse the State for the required stream flow testing. The Agency of Natural Resources requested funding from the Legislature for this purpose and with ultimate reimbursement to the State from the permittee. At this time there is no indication that the legislature has taken action on this issue. The Town’s plan, should this approach not materialize, will be to seek testing services through management by a local agency such as the Chittenden County Planning Commission.

## **7.6 STORMWATER BEST MANAGEMENT PRACTICES**

### 7.6.1 General

A stormwater best management practice (BMP) is a technique, measure or structural control that is used for a given set of conditions to manage the quantity and improve the quality of stormwater runoff in the most cost-effective manner. BMP’s can be either engineered and constructed systems called “structural” BMP’s or pollution prevention practices called “nonstructural” BMP’s. The goals of BMP’s intend to address urban development in areas undergoing new development or redevelopment. The most effective method of controlling impacts is to limit the amount of rainfall converted to runoff. Good development practices can effectively limit the impacts of stormwater to reduce the amount of impervious surfaces, thereby reducing the amount of stormwater converted to runoff.

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Design of storm water systems strive to balance flood protection with ecological concerns. In urbanized and densely populated areas, large impervious surfaces often produce large quantities of runoff. In these areas, the most appropriate BMP's are those that limit the generation of pollutants or remove pollutants from the urban landscape. BMP's that control runoff at the point of generation are more effective, instead of managing runoff at the point of discharge to the receiving stream. Rainfall needs to be managed as a resource instead of a waste stream requiring treatment. If managed at the site level by promoting concepts of conservation design, the need for traditional storm sewer conveyance and treatment systems can be reduced.

### 7.6.2 Best Management Practices in the NOI

The NOI identifies the BMP's to be utilized to meet the objectives of the six minimum measures.

### 7.6.3 Other Best Management Practices

The Cost-Effectiveness Study of Urban Stormwater BMP's in the James River Basin found in Appendix X provides an excellent overview of which BMP's are the most effective and at the lowest costs. Specifically, the following measures rate high in achieving cost effective results:

- For average pollutants:
  - Urban growth reduction
  - Vegetated open channels
  - Infiltration practices
- For phosphorus reduction:
  - Forest buffers
  - Urban growth reduction
  - Infiltration practices
- For total suspended solids:
  - Vegetated open channels
  - Infiltration practices
  - Retrofit of existing dry ponds to wet ponds or wetlands

These are specific practices that the Town will evaluate more closely as the Flow Restoration Plans are developed and for implementation throughout the Town under its stormwater program.

For post construction storm water management in new development and redevelopment, the non-structural BMP's should be evaluated and incorporated into future projects as appropriate. Long-term impacts of development and increase of impervious areas on individual watershed areas should be closely monitored. Within the Town, proper management of the following watersheds is critical to improve and/or preserve the water quality of existing streams.

- Indian Brook
- Sunderland Brook
- Alder Brook
- Winooski River
- Browns River

Some examples of non-structural BMP's are described below. The Town should consider use of the following BMP's where appropriate.

#### 7.6.3.1 On-lot treatment

This term refers to a series of practices designed to treat runoff from individual lots in areas with well draining soils. Specific areas of the Town have suitable soil conditions which can utilize this practice. The most common practice is to direct runoff to pervious lawn areas or direct runoff to a dry well and/or infiltration trenches.

#### 7.6.3.2 Better Site Design

*Buffer zones;* An aquatic buffer is an area along a wetland or stream where development is restricted or prohibited. A buffer zone physically protects and separates a stream or wetland from future disturbance. The buffers can be applied to new development and can remove pollutants contained in stormwater.

*Open space design;* The open space design or cluster development concentrates dwelling units in a compact area in exchange for providing open space or protecting natural areas elsewhere on the site. This approach is consistent with the Planned Unit Developments (PUD) permitted in designated districts under the current Zoning Regulations. Open space designs as compared to conventional residential subdivisions can reduce impervious cover, stormwater pollutants, and loss of natural areas. Less land is cleared during construction, buffer zones can be protected, and 25 to 50 percent of the area can be protected in green space.

*Urban forestry;* Trees absorb water and help to provide some of the stormwater management by breaking up the landscape of impervious cover. Preservation of existing trees and reestablishing areas in newly developed areas are critical to maintaining the urban forestry. The current Zoning Regulations outline specific requirements for landscaping objectives for new development projects.

*Conservation easements;* Easements are agreements that allow set aside of private property to limit the type or amount of development and preserve open space. Conservation easements can protect water quality in an indirect approach and the location of the easement determines the water quality benefits. Property along stream corridors which can act as vegetated buffer is desirable. Prior to consideration, the typical criteria need to be evaluated to determine the feasibility of entering into the conservation easement agreement.

*Infrastructure planning;* This practice requires changes in the regional growth planning process to contain sprawl development. Infrastructure planning encourages the direction of new growth into previously developed areas, discouraging low-density development. Sprawl development contributes to the increase in impervious cover outside the designated growth areas. Techniques used to manage the growth are: define the urban growth boundaries and encourage the infill/community redevelopment.

*Grass Roadway Swales;* This street design promotes the use of grass swales as an alternative to curbs and gutters. Curbs and gutters quickly convey runoff from the street to the storm drains, and provide little or no removal of pollutants. In the Public Works Standards, the typical roadway standard requires curbs and gutters for the densely developed residential and commercial areas. Site factors must be evaluated to determine if grass swales are appropriate for a particular site. The use of grass swales are appropriate if the slope is less than 5%, the

### Town of Essex Stormwater Management Plan

underlying soils are permeable, the seasonal high water table is below the bottom of the swale, and development densities are low to medium.

*Green parking;* This approach is applied to reduce the contribution of parking lots to the total impervious area. These techniques include setting maximums for the parking lots created, minimizing the dimensions of parking spaces, utilizing alternative pavers, encouraging shared parking, and providing incentives for structured parking.

*Alternative turnarounds;* Alternative turnarounds can be used for end-of-street vehicle turnarounds to reduce the impervious cover. These alternative approaches include reducing the radius, creating hammerheads, loop roads, and pervious islands in the center.

*Alternative pavers;* Alternative pavers are permeable surfaces which replace asphalt and concrete driveways, parking lots, and walkways to reduce the impervious cover. Alternative pavers consist of using paving blocks and other driveway materials. Limitations for these materials are areas with high traffic volumes, and where snow removal is required.

*BMP inspection and maintenance;* To maintain effectiveness of the post-construction stormwater BMP's, regular inspection of control measures is essential. The inspection and maintenance typically involves expected routine maintenance and non-routine (repair) maintenance. Routine maintenance consists of checks performed on a regular basis to keep the BMP in good working order and aesthetically pleasing. Documentation should be kept regarding the dates of inspection, findings, and maintenance and repairs.

*Increased surveillance for post-construction runoff;* Management of stormwater runoff from newly developed sites is critical to controlling the impacts on urban water quality. Increase in impervious surfaces due to land development can have a negative effect on aquatic systems. Runoff from these areas can contain pollutants including: sediment, nutrients, road salts, metals, bacteria, and hydrocarbons.

## **8.0 REFERENCES**

Note that many of the references can be found on the Vermont State Stormwater Section, Watershed Management Division web site or the EPA website.

- *MS4 NPDES Phase 2 General Permit* (3-9014 dated December 2012); see Appendix A
- *Town of Essex 2011 Town Plan* adopted March 1, 2011; see Appendix Q
- *Town of Essex Outside the Village of Essex Junction Official Zoning Regulations*, amended May 23, 2011; see Appendix Q
- *Town of Essex Outside the Village of Essex Junction Official Subdivision Regulations* amended May 23, 2011; see Appendix Q
- *Stormwater Management Rule for Impaired Waters*, Environmental Protection Rules, Chapter 22
- *Stormwater Management Rule for Unimpaired Waters*, Environmental Protection Rules, Chapter 18
- *The Vermont Stormwater Manual, Volume 1, 2002*
- *The Vermont Stormwater Manual, Volume 2, 2002*
- *Advance Stormwater Standards Compilation Final Report* (Stone 2012 report)
- *Report of the Orphan Stormwater Grant Program*, VANR 2008 Report
- *Stormwater Practices Research Project Final Report*, VTRANS and CRI, 2012
- *Urban Stormwater Management in Vermont*, VANR, 2002 report
- *Vermont Low-Impact Development Guide for Residential and Small Sites*, VANR 2010
- *Cost-Effectiveness Study of Urban Stormwater BMP's in the James River Basin*, Center for Watershed Protection, 201; see Appendix X
- *EPA Stormwater Management Best Practices*, EPA website current version
- *EPA National Menu of Stormwater Best Management Practices*, EPA website current version
- *Illicit Discharge Detection and Elimination Manual*, A Handbook for Municipalities by New England Interstate Water Pollution Control Commission, dated January 2003.
- *Impacts of Impervious Cover on Aquatic Systems*, Center for Watershed Protection, March 2003.
- *Site Planning for Urban Stream Protection*, Center for Watershed Protection, March 2003.
- State of Vermont Agency of Natural Resources *General Permit 3-9003 Multi-Sector General Permit for Stormwater Discharges associated with Industrial Activity* (2011).
- *Approved TMDL for Indian Brook*, VT Department of Environmental Conservation and EPA, September 2008; see Appendix H
- *Approved TMDL for Sunderland Brook*, VT Department of Environmental Conservation and EPA, September 2008; see Appendix I
- State of Vermont Agency of Natural Resources NPDES *General Permit 3-9020* VANR

## **9.0 DEFINITIONS**

**Best Management Practices (BMP's);** Activities, prohibitions of practices, maintenance procedures, and other management practices to reduce the quantity and improve the quality of storm water runoff. BMPs also include treatment requirements, operating procedures, and practices to control runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

**Clean Water Act (CWA);** Formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972. Public law 92-500; 33 U.S.C. 1251 et seq.; legislation which provides statutory authority for the NPDES program.

**Conveyance;** The process of water moving from one place to another.

**Development;** The construction of impervious surfaces on a tract or tracts of land.

**Erosion;** When land is diminished or worn away due to wind, water, or glacial ice. Often the eroded debris (silt or sediment) becomes a pollutant via storm water runoff. Erosion occurs naturally but can be intensified by land clearing activities such as farming, development, road-building, and timber harvesting.

**Existing Development;** A development which was built prior to the effective date of the general permit, or from which the discharge of stormwater runoff was authorized.

**General Permit;** A permit issued under the NPDES program to cover a certain class or category of storm water discharges. These permits reduce the administrative burden of permitting storm water discharges.

**Illicit Connection;** Any discharge to a municipal separate storm sewer that is not entirely composed of storm water, except discharges authorized under an NPDES permit and discharges resulting from fire fighting activities.

**Impervious Surface;** Man made surfaces, including, but not limited to, paved and unpaved roads, parking areas, roofs, driveways and walkways, from which precipitation runs off rather than infiltrates.

**Industrial Activity;** Any activity which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant.

**Maximum Extent Practicable (MEP);** The requirement set forth in the federal Clean Water Act that permits discharges from municipal storm sewers to include controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the State determines appropriate for the control of such pollutants.

**Minimum Control Measures;** Any BMP or other method used to prevent or reduce the discharge of pollutants to water of the United States.

**Municipal Separate Storm Sewer System (MS4);** A conveyance or system of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches,

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man-made channels, or storm drains. The conveyance system shall be owned or operated by a State, city, town, or other public body having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes designed or used for collecting and conveying storm water which is not a combined sewer and which is not part of a public owned treatment works.

**Multi-Sector General Permit (MSGP);** An NPDES permit that regulates storm water discharges from eleven categories of industrial activities.

**National Pollutant Discharge Elimination System (NPDES);** The name of the surface water quality program authorized by Congress as part of the 1987 Clean Water Act. This is EPA's program to control the discharge of pollutants to waters of the United States.

**New Development;** The construction of new impervious surfaces on a tract or tracts of land occurring after the effective date of the general permit.

**Non-point Source (NPS) Pollutants;** Pollutants from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

**Nonstructural Stormwater Treatment Practice (STP);** Methods or activities used to mitigate the adverse impacts of stormwater runoff, including but not limited to disconnection of rooftop runoff, disconnection of non-rooftop runoff, sheetflow runoff to stream buffers and use of open vegetated swales.

**Notice of Intent (NOI);** The mechanism used to register for coverage under a general permit and exempts a facility from having to submit an individual or group application.

**Offsite;** The land within the development's drainage area that is not owned or controlled by the permit applicant.

**Outfall;** The point where drainage discharges from a pipe, ditch, or other conveyance to a receiving body of water.

**Permittee;** A person who has received authorization to discharge pursuant to a general permit from the State.

**Point Source Pollutant;** Pollutants from a single, identifiable source such as a factory or refinery.

**Runoff;** Drainage or flood discharge that leaves an area as surface flow or as pipeline flow which has reached a channel or pipeline by either surface or sub-surface routes.

**Sediment;** Soil, sand, and minerals washed from land into water, usually after rain. Sediment can destroy fish-nesting areas, clog animal habitats, and cloud water so that sunlight does not reach aquatic plants.

**Selected Contributor;** A person who owns or controls a stormwater discharge that has been designated a selected discharge.

**Selected Discharge;** A stormwater discharge designated by the State as ranked by impervious surface area and other factors including; drainage patterns, hydraulic connectivity, and existing stormwater treatment.

**Sheet Flow;** The portion of precipitation that moves initially as overland flow in very shallow depths before eventually reaching a stream channel.

**Standard Industrial Classification;** A four digit number which is used to identify various types of industries.

**Stormwater;** Precipitation of snowmelt that accumulates in natural and/or constructed storage and storm water systems during and immediately following a storm event.

**Stormwater Management Program (SWMP);** A comprehensive program to manage the quality of storm water discharged from the municipal separate storm sewer system.

**Stormwater Treatment Practice (STP);** A specific device or technique designed to provide stormwater quality treatment and/or quantity control.

**Structural Stormwater Treatment Practice (STP);** Devices that are constructed to provide temporary storage and treatment of stormwater runoff.

**Substantially Deteriorated;** The condition of a stormwater treatment practice that would necessitate repair or reconstruction beyond that which would be considered typical, periodic maintenance for a system of similar design.

**Total Maximum Daily Load (TMDL);** The maximum amount of pollutants, which can be released into a water body without adversely affecting the water quality.

**Urbanized Area;** A Bureau of the Census determination of a central place or places and the adjacent densely settled surrounding territory that together have a minimum residential population of 50,000 people and a minimum average density of 1,000 people/square mile.

**Urban Runoff;** Storm water from urban areas, which tends to contain heavy concentrations of pollutants from urban activities.

**Watershed;** That geographical area which drains to a specified point on a water course, usually a confluence of streams of rivers.