The Nelson A. Rockefeller Center at Dartmouth College
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Policy Research Shop

Assessing the Feasibility of a Vermont Statewide Stormwater Utility

A Comparative Case Study Approach to Stormwater Utilities

Presented to the Vermont House Committee of Fish, Wildlife, and Water Resources and to the Vermont Agency of Natural Resources

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EXECUTIVE SUMMARY

Given Vermont's pressing need to comply with clean water regulations, the state legislature has expressed interest in the possibility of implementing a statewide stormwater utility. The House Committee of Fish, Wildlife, and Water Resources has commissioned the Rockefeller Center at Dartmouth College to examine existing stormwater utility systems and create a framework from which decisions and comparisons can be made for the state of Vermont. At the most fundamental level, the following questions must be considered when undertaking this endeavor:

1. How feasible is it to create and implement a statewide stormwater utility in Vermont?
2. What models are available from other states that would be useful to analyze when crafting such a utility for Vermont?
3. What are the best practices in developing and implementing stormwater utilities?

To best address these questions, the report assumes the form of a comparative case study. To begin, a nationwide aggregate data of utility systems is briefly explored, creating a holistic understanding of such utilities across the United States. Next, the report focuses upon utility systems located in regions similar to Vermont. Finally, the report concludes with a concise list of best management practices garnered from these case studies. This menu of stormwater management options provides relevant background information to the Vermont state legislature as it identifies the elements they wish to incorporate within a statewide stormwater utility.

1. INTRODUCTION TO STORMWATER UTILITY SYSTEMS

There are a multitude of reasons states and municipalities may choose to implement stormwater utility systems including: pollution control, stormwater runoff management, compliance with environmental regulations, decreased flooding, water quality maintenance, and wildlife environment protection.[1] Specifically of relevance to the state of Vermont is the need to comply with water quality regulations established by the Clean Water Act. Furthermore, given the impact of Tropical Storm Irene on the state of Vermont, the role of a stormwater utility in flood reduction and disaster prevention has become a priority for the legislature. In order to properly confront the stormwater management challenges facing Vermont, increased public awareness and support for stormwater management has become imperative for the success of a stormwater utility. Without a public awareness and education campaign, successful implementation and continued operation of a stormwater utility would prove to be difficult. Therefore, as the report proceeds to analyze various characteristics of stormwater utility systems, it is necessary to recall the justifications for utility implementation and the critical role of public education in ensuring the continued success of a utility. In doing so, one can better assess the state's motivations and determine its stormwater management priorities.

Before presenting the analysis of stormwater utilities, there are a few terms that are critical to the discussion and merit official definitions. At the most basic level, *stormwater* is defined as "precipitation as it falls to the earth, surface runoff and drainage, and paths taken by such water."[2] A *stormwater utility* is "a system established to generate a dedicated source of funding for stormwater pollution and flood prevention, where users pay a fee based on land-use and contribution of runoff to the stormwater system."[3] Finally, *ERU (Equivalent Residential Unit)* is "a measure used to standardize the utility service fees for residential properties, or classes of residential properties, and based on the average size of a residential parcel and an average amount of impervious area."[4]

2. STORMWATER UTILITY SYSTEMS IN THE U.S. – GENERAL OVERVIEW

2.1 National Overview

As of June 2012, there are 1314 documented stormwater utilities within the United States.[5] These utilities vary significantly on nearly every measurable criteria including geographic and population size, payment structure, and authority structure. While no state has yet to implement a comprehensive utility, there are several utilities that serve areas with larger populations than the entire state of Vermont. Although every utility is unique, there are several notable trends that emerge when comparing utility characteristics.

2.1.1 National Distribution

- 81 percent of utilities are found within cities in part due to larger tracts of impervious land within a concentrated area, as well as a large population base for utility fees.[6]
- There is no correlation found between the political preferences and socioeconomic status of a region's population and the emergence of a utility within that region.[7]

2.1.2 Commonalities in Payment and Revenue

- The majority of utilities categorize customers based on property type and charge various fees associated with the different classifications of property.[8]
- 68 percent of utilities delegate fees to the property owner of a piece of property while 23 percent of utilities charge the current resident or user of the property.[9]
- 93 percent of utilities apply one comprehensive fee structure to the customers of the utility while 7 percent employ different fee structures to different regions under the one utility.[10]

- 80 percent of utilities derive at least 90 percent of their revenue directly from user fees, however the fee structure and amount of revenue generated vary greatly between utilities.[11]
- 84 percent of utilities employ some form of pro-rated fee based upon impervious land area measurements on a property. 55 percent of these utilities base their fee exclusively upon impervious land area measurements while the other 29 percent incorporate both the impervious land area and total land area with various development or runoff factors of the property into the fee.[12]
- While 43 percent of surveyed utilities state that their funding is adequate to meet most needs, 47 percent of utilities only receive enough funding to finance their most urgent needs and 10 percent of utilities are unable to finance even these needs.[13]
- Stormwater infrastructure capital investments nationwide are 81 percent cash financed, including 68 percent directly from user fees. The remaining 19 percent comes from various loans and bonds. 90 percent of utilities account for these future capital investments in the structure of the user fees.[14]
- There are a variety of data collection and billing systems utilized across the nation's utilities. 55 percent of utilities use a Geographic Information System (GIS) to collect and organize customer information. 52 percent of utilities use a stormwater utility billing system whereas 41 percent of utilities incorporate stormwater utility into a larger water or sewer utility bill. 15 percent of utilities possess a separate stormwater database.[15]
- The majority of utilities offer some form of credits for runoff reducing measures such as retention ponds, and some utilities offer credits or exemption to federal buildings and tax exempt organizations.[16]

2.1.3 Legal Challenges to Utilities

- 22 percent of utilities have faced some form of legal challenge, yet very rarely are these challenges sustained. Frequently legal challenges are resolved by fees, settlements outside of court, or a rejection of the complaint.[17]

2.1.4 Education Programs

- 94 percent of utilities incorporate some form of public education program.[18]
- 97 percent of utilities surveyed claim education programs are beneficial in establishing a utility, and 70 percent claimed they were essential for the long term success of the project.[19]

- There is no consensus regarding the most effective public awareness and education programs. However, among utilities surveyed, education tools in utility bill inserts, internet media, public hearings and presentations, public school education programs, and event participation and public promotion were among the top 5 listed.[20]

2.2 New England Overview

This report focuses in particular on several case studies within New England. The climate and rainfall throughout the New England region are relatively consistent thereby allowing for a direct comparison between Vermont's stormwater utility needs and those of the other New England states. However, the New England region contains a limited number of stormwater utilities thereby inhibiting the ability of this report to provide a comprehensive list of best stormwater utility management practices by examining exclusively the New England region where factors such as climate, rainfall, and topography remain relatively consistent.

Currently, there are eight established stormwater utilities in Maine, Massachusetts, and Vermont. In addition, 20 sites in the region are in the process of assessing the feasibility of implementing new stormwater utilities. These 20 cases in New England are at different points in the utility implementation process. The variations in development stages between these 20 cases provide the unique opportunity to analyze each step of the stormwater utility planning and implementation process and enable others to better understand when problems arise and in what ways they can be effectively resolved. Because of the limited number of case studies directly available in New England, the criteria in the following sections contain examples of other stormwater utilities outside of the New England area so as to enrich the data pool with national level surveys and illustrate some of the best management approaches to consider for the Vermont statewide stormwater utility.[21]

2.3 Vermont Overview

Presently, Vermont has two municipal-level stormwater utilities located in Burlington and South Burlington. These two cities attempt to mitigate the effects of stormwater runoff as excessive runoff in the state has led to increased water pollution. Primarily caused by urban stormwater runoff, 17 of Vermont's watersheds are listed as impaired. In 2010, the following urban watersheds were included on the List of Priority Surface Waters.[22]

Table 1. Urban Stormwater Impaired Watersheds

Watershed	Town
Allen Brook	Williston
Bartlett Brook	South Burlington
Centennial Brook	South Burlington
Englesby Brook	Burlington
Indian Brook	Essex - Essex Junction
Moon Brook	Rutland - Mendon
Morehouse	Winooski
Munroe Brook	Shelburne
Potash Brook	South Burlington
Rugg Brook	St. Albans
Stevens Brook	St. Albans
Sunderland Brook	Colchester - Essex

Source: VT DEC, Watershed Management Division

Many of the municipalities and regions that contain the impaired watersheds in Vermont lack comprehensive drainage systems and stormwater utilities to reduce point and nonpoint source pollution runoff from impervious land. This report outlines the case studies and criteria used in assessing the feasibility of implementing a statewide stormwater utility in Vermont in order to ameliorate the state's watersheds and reduce water pollution.

2.4 Introduction to Case Studies

2.4.1 South Burlington

South Burlington contains a population of 18,017 and an area of 16.6 square miles. The city's stormwater infrastructure consists of 5,775 catch basins, 102 miles of pipe, and 250 culverts. Of these structures, 3,000 of the catch basins and 57 miles of pipe are publicly owned. South Burlington acknowledged a need for a stormwater utility to address water quality issues, generate funding for stormwater issues, and remove the burden of stormwater management from the Department of Public Works budget.[23]

The South Burlington utility development timeline began in December 2003 with the stormwater utility feasibility study. For two years, the city conducted public outreach programs while developing its utility. Afterwards, the city sewer ordinance was updated to include additional stormwater water drainage infrastructure and established a new stormwater utility fee. Establishing the South Burlington stormwater utility was a public process, involving all stakeholders in public meetings in conjunction with two consulting firms – Hoyle Tanner Associates, Inc. and AMEC. The stormwater utility feasibility study cost $70,000, and the development and implementation of the stormwater utility amounted to approximately $330,000. The city procured a loan to pay for the immediate costs and created a line item in the stormwater utility budget to repay the loan.[24]

2.4.2 New Hampshire

In 2008, the General Court of New Hampshire identified a need to further evaluate its stormwater infrastructure and established the Stormwater Study Commission to appraise the state's system, to identify its inadequacies, and to construct a recommendation for the state's future stormwater infrastructure. This two year study presented a recommendation for New Hampshire to establish a statewide stormwater utility and includes a proposal outlining the potential characteristics of a New Hampshire statewide utility. While New Hampshire failed to act upon this recommendation, and the state as a whole lacks any local stormwater utilities, the model proposed by the commission provides a guideline for establishing a statewide utility in a state with a similar size and climate to those of Vermont.

2.4.3 Maine

The Maine case study, entitled "*A Model Stormwater Utility for the State of Maine*" was prepared in 2005 by the Horsley Witten Group for the Maine Coastal Program. Funding for the report was provided by the Office of Ocean and Coastal Resource Management in the United States Department of Commerce. The document introduces various options for implementing stormwater utilities at the local level in Maine, provides relevant background information, and offers a model ordinance that could be used to draft the terms of the utility. The report specifically focuses on payment and organization structures as well as identifies recommended management practices. While not specifically focused on implementing a statewide utility, the proposals and background offered in the analysis are especially relevant when assessing the feasibility of implementing a statewide system in Vermont.[25]

2.4.4 Charlotte – Mecklenburg County

In 1985 the city of Charlotte began an investigation on the effectiveness of its drainage programs and infrastructure. The investigation resulted in the joint conceptual approval by elected officials from the city of Charlotte and Mecklenburg County of a stormwater utility. This culminated in 1993 with the creation of the Charlotte – Mecklenburg Storm Water Services, a joint stormwater utility between the city of Charlotte and the surrounding six towns of Mecklenburg County. The utility operates as a unified system in which the County holds responsibility for the major system, watersheds greater in area than one square mile, while the city of Charlotte and other towns are responsible for watersheds of less than one square mile within their jurisdiction. The utility serves a population of 944,373 citizens within the county and provides a variety of services including several public education and volunteer programs.[26]

2.4.5 Chicago Metropolitan Area

On October 13, 2010, the Chicago Metropolitan Agency for Planning (CMAP) adopted the "Go to 2040" regional plan which provides long term goals for the Chicago metropolitan area in terms of land use, transportation, natural resources, housing, and economic development. A primary goal of CMAP is to remove barriers to sustainable cooperation across geographic and political boundaries in the Chicago area. The "Go to 2040" plan provides strategies for the seven counties surrounding Chicago to conserve natural resources and prevent pollution. Among these strategies is the implementation of a stormwater utility. While the Chicago metropolitan area lacks a unified stormwater utility, the "Go to 2040" strategic plan provides recommendations for establishing a stormwater utility and specifically examines several public education practices that may be effective when establishing a utility either at a county, or trans-county level.[27]

2.4.6 Richmond, Virginia

In January, 2009 the Richmond Department of Public Utilities released its Municipal Separate Storm Sewer System Program Plan for its five year permit term lasting from 2008 to 2013. The plan includes a detailed outline for pollution detection and reduction in the forms of illicit chemical discharges and sediment erosion. It specifically targets construction sites as a primary source of stormwater runoff and provides a means for regulating runoff from these sites. The report also provides guidelines for taking a GIS inventory of stormwater drainage systems and a protocol for post-construction stormwater management. It also provides a strategy for educating the public on these protocols.[28]

3. METHODOLOGY

In creating a statewide stormwater utility, many criteria must be considered. For this reason, comparing individual criteria between utilities is more valuable than looking at each utility as an individual entity. By doing so, a plan that is most beneficial to Vermont can be constructed by selecting the best approaches from each category of criteria. Following are the seven criteria that were used to evaluate each case study:

1. Payment structure and revenue
2. Implementation
3. Education and public involvement programs
4. Pollution prevention and reduction
5. Post-construction management
6. Disaster prevention and relief
7. Variable characteristics

The following sections of the report are organized by these criteria. These sections begin with brief descriptions of the criteria and are followed by data from each case study that falls into the respective classification.

4. CRITERIA

4.1 Payment Structure and Revenue

There are multiple strategies a municipality, inter-municipality, region, or state can design to structure payments for a stormwater management utility system. Payment methods vary greatly as utilities can be designed to levy a uniform flat fee, a pro-rated fee based upon one of several factors such as a measurement of the impervious area of land on a property, or a state tax. The design of these structures directly impacts the costs borne by citizens to finance a utility, the revenue generated by a utility, the efficiency of the utility in administering and collecting fees, and the expenditure constraints the utility faces.

4.1.1 South Burlington

For the South Burlington stormwater utility, user fees are determined by a scientific process conducted by the municipality. The amount of impervious area – rooftops, driveways, and walkways – on a property determines the monthly fee per equivalent residential unit (ERU), which calculates the average square feet of impervious surface on a typical single-family home. The stormwater fee is listed on the city sewer and water bills. This method of payment has proven to be effective at reducing property taxes and costs less from an administrative perspective than creating a new and separate method for collecting payments. Single-family homes have a uniform flat fee of $5.94 a month, whereas duplexes and triplexes split the fee into halves and thirds respectively.[29] Moreover, other categories of properties are assessed a fee dependent on the property's actual amount of impervious surface rather than the standard ERU used for homes.

South Burlington depends on the revenue generated by the utility user fee to continue financing its extensive stormwater drainage infrastructure, accruing more than one million dollars annually. With this annual revenue, the stormwater utility provides a stable source of funding to complete required maintenance and manage the stormwater utility and programs.

4.1.2 New Hampshire

According to the NHDES, the capital cost of stormwater management in New Hampshire is estimated to be approximately 182 million dollars.[30] This projected cost, however, is generally considered to substantially underestimate the total cost of stormwater to the state which some consider to approach a billion dollars.[31] While the state of New

Hampshire and its municipalities have failed to institute a stormwater utility, the 2008 Stormwater Study Commission has proposed several methods to generate revenue to alleviate the state's substantial stormwater management costs. In order to implement a payment system, the state of New Hampshire would first need to establish the legal definitions of stormwater and a stormwater utility. The state must also establish property owners as responsible for the stormwater runoff originating from their property in order to legally charge a service fee.[32]

The commission recommended the implementation of a statewide stormwater utility in phases. The initial fee collected by the utility would consist of a flat fee in which all property owners within a particular category - residential, commercial, or industrial - would pay the same amount to the utility.[33] As the statewide system is implemented and data can be collected regarding the amount of stormwater runoff contributed by each property into the system, the flat fee would gradually be replaced by a pro-rated fee in which property owners would pay varying amounts to the utility corresponding to the amount of stormwater they contribute to the system.[34] While no one metric was explicitly recommended to serve as the foundation for this pro-rated system, the commission did propose the use of ERU values as a potential measurement on which to assess the utility fee.[35] The commission also considered the use of a permit, regulatory, and penalty system similar to that utilized by the EPA nationally, however it was determined that such a permit system was more costly, less effective, and generally less popular than a utility fee.[36]

4.1.3 Maine

This report emphasizes the importance of structuring the user payment to the stormwater utility as a service fee and not a tax. The primary justification for this distinction is that a service fee directs 100 percent of the user fee to the utility, whereas a tax directs user payments to the state at large, which then can choose the percentage of this revenue to then allocate back to the utility. Additionally, a service fee is statistically less likely to face legal challenges and is generally considered more popular by the public than a new tax. It is important to note that approximately 70-80 percent of existing stormwater utilities are funded solely by their service fee.[37]

The utility must also determine whether to levy a flat fee, a pro-rated fee, or a hybrid system incorporating both types of fees. The report suggests that a pro-rated fee is preferred to flat-fee because of its equitable nature as citizens under a pro-rated system pay a fee correlated to the amount of stormwater runoff their property contributes to the system. The authors of the Maine report highly recommend the use of an ERU value, which measures the area of impervious land on a property and its resulting stormwater runoff contribution, as the basis for this pro-rated fee. By using such a measurement, individuals pay an amount proportional to their contribution of stormwater runoff. This approach is also favorable because a pro-rated fee results in a more equitable approach that is more likely to withstand legal challenges.[38]

Finally, the report discusses fee collection methods. Most utilities choose to add their fee to another utility bill, such as a water bill. However, approximately 20 percent of utilities include their fee on a municipal tax bill and even fewer issue their own bills. The determination of a method of billing is extremely crucial as it shapes public perception of the program when users are charged for stormwater fees on a utility bill in contrast to a tax bill or even an entirely separate bill. As will be discussed in the public awareness section, the public perception of the utility is critical to its success.[39]

4.2 Implementation

This report examines the distribution of implementation costs as determined by the utilities' authority structure. The section examines the different organizational structures a utility may adopt and how these varying organizational structures affect not only cost distribution between citizens and the government but also the effectiveness of utility implementation and operation. The organizational structure adopted for a utility is conditional upon the scale of the project. The implementation section outlines different organizational strategies and how these design choices may impact other aspects of the utility including pricing strategy, methods for collection, sources of revenue, and allocation of funds.

4.2.1 South Burlington

The municipal Stormwater Services Division administers the utility, and Tom DiPetrio serves as the superintendent of the South Burlington stormwater facility. The municipality expends revenue generated from user fees to finance system maintenance, capital project construction, fee enforcement, and customer outreach and assistance.[40]

4.2.2 New Hampshire

The 2008 Stormwater Study Commission of New Hampshire conferred a recommendation to the state to institute a statewide stormwater utility system. While the EPA estimated the state's stormwater utility needs to be approximately 64.6 million dollars, it is widely believed that this figure underestimates the state's true stormwater needs.[41] The commission recognizes that the state lacks an accurate estimate for the short-term implementation costs of a statewide utility, yet also suggests that stormwater reduction efforts can lead to both foreseen and unforeseen cost savings in the long run. The commission supports the implementation of a statewide stormwater utility for a multitude of reasons. It endorses the need for state uniformity in stormwater and water quality regulation, and the need to construct efficient drainage systems across municipal boundaries.[42] The state also needs to force municipalities, which have been unwilling or unable to construct utilities due to financial or political issues, to adopt stormwater utilities as no New Hampshire municipality has yet succeeded in creating a utility in spite of the fact that New Hampshire municipalities have the legal opportunity to do so.[43]

Under the statewide system, municipalities would be encouraged to create their own utility or form an inter-municipal utility between neighboring municipalities. Those municipalities that did not form their own utilities under the larger umbrella of the state system would be placed into state run utilities organized by watershed boundaries.[44] Implementation of the system would take place over several years in phases beginning in areas with the greatest need for drainage system improvement. Municipalities would be given a period of 12 months to approve their own utility or be integrated into the state system.[45] Those municipalities that construct their own utility, however, would be allowed to retain all user fee revenue at a local level whereas revenue from state operated utilities would be partially directed to the state government and partially retained at the local level.[46]

4.2.3 Maine

Although Maine's report does not extensively focus on the costs of implementation, it does offer many insights into methods for the organization of a utility. Among these recommendations are two that discuss management structures for the utility. The first of these structures is implemented within the existing district. With this method, the utility would be a division within the district with its own source of funding. With such an approach, implementation is easy, and existing administration can remain intact. However, a negative consequence of this strategy is that a mismatch may result if the desired area of the stormwater utility does not correspond with the boundaries of the district. The second option is to make the utility a separate department in the city. In fact, 124 utilities in Florida have chosen such an approach and the utilities share the same Director of Public Works. With such an approach, multiple services can be coordinated together, and revenues and costs can be maintained efficiently. However, this method grants the utility less authority than if it were its own entity, which could inhibit its ability to operate efficiently at a local level. [47]

All properties in a given service area are beneficiaries of the stormwater management system and therefore all property owners should be required to pay a user fee. Under this system, no property owners within the area of a utility would be able to avoid payment as the utility functions as a positive externality that benefits the entire community. The utility cannot selectively manage and protect public water resources for only particular individuals. [48]

An interesting concept suggested by the report is the creation of a state association of stormwater utilities. Such an organization would be able to advocate on behalf of the statewide utility at the local and national levels. This would have financial benefits and aid in coordination of statewide efforts. Lastly, for Maine, an individual stormwater utility's implementation timeline would span a period from 14 to 24 months.[49]

4.3 Education and Public Involvement Programs

In order for a stormwater utility to have long-term success, it requires the support of the community members who finance its operation through user fees. Educational and public awareness programs are integral to fostering public support for, awareness of, and involvement in a stormwater utility and must be considered when establishing a utility. The spread of knowledge regarding stormwater does not only increase public receptivity to a utility, but leads community members to adopt stormwater runoff reduction practices at a community and individual level. This section examines the education and public involvement strategies employed by the respective superintendents of stormwater facilities and state governments supporting each utility.

4.3.1 South Burlington

South Burlington is a member of a consortium of neighboring towns and cities that participate in the Chittenden County Regional Stormwater Education Program (RSEP) website: http://www.smartwaterways.org/about/member-towns/. The RSEP uses television, radio, print, and the above website to distribute messages and information pertaining to specific stormwater problems, which includes but is not limited to proper pet waste disposal, environmentally safe car washing, and over fertilization of lawns and gardens. Chittenden County also raises awareness and encourages green behavior by residents through its educational events.[50] Moreover, South Burlington maintains its own website with annual reports of its stormwater management plan.

The stormwater superintendent gives tours of stormwater treatment facilities. The stormwater utility staff maintains an informational display in the City Office building, which outlines the practices homeowners can take to reduce stormwater pollution on their property. The South Burlington DPW twitter feed (@SBPubWorks) also provides information related to stormwater.

To increase public involvement related to stormwater problems, South Burlington hosted a Green Up Day to remove trash around neighborhoods and near streams. In 2011, volunteers removed 6.1 tons of trash – much of the work focused in the Bartlett Brook watershed. The city of South Burlington also participates in and provides funding for the Chittenden County Stream Team, a project to engage community members across an eight-town area to execute projects to reduce non-point source pollution and stormwater volume at the local level. South Burlington's inclusion in the Chittenden County RSEP allows for a larger scale approach to public awareness and involvement programs.[51]

4.3.2 Maine

Just as in the other reports, the Maine case study emphasizes how critical public awareness and education programs are for the long-term success of a statewide stormwater utility. In fact, it is cited as the "single most important factor" in creating and

maintaining such a utility. The reasoning for such an emphasis is because public engagement in the process leads to political and financial support. With such support, funding can be ensured for the future and legal problems are less likely. Some of the examples for building this community ownership entail including citizens in water quality monitoring and general progress evaluations. Finally, the report stated that this component be deliberate and formally included in the plan of the utility.[52]

4.3.3 Charlotte – Mecklenburg County

The Charlotte-Mecklenburg County case study demonstrates the benefits of a multi-faceted public education campaign prior to the actual implementation of a utility. In 1991, two years prior to the eventual implementation of the stormwater utility, the city of Charlotte conducted a telephone survey of residents to gauge public opinion regarding water quality and potential support for a stormwater utility. The survey found that 96 percent of residents claimed water quality to be a high priority, 80 percent agreed that current drainage problems resulted in hazardous driving conditions, and 18 percent stated they had drainage problems on their own property. Additionally, roughly half of those questioned stated they would be willing to pay $3.00 per month to address stormwater issues. The results of this survey are significant as they demonstrate the public's perceived need to better address stormwater drainage. In this case, a substantial proportion stated they would be willing to pay for such services even prior to the activation of the public awareness campaign. These numbers also can be useful for accumulating political or public support for a utility at a later time.[53]

After conducting the aforementioned survey, the Charlotte city council and Mecklenburg County Commission proceeded with their multi-faceted public awareness campaign. This campaign involved a speaker's bureau, workshops for the public and news media, brochures, fliers, and a monthly newsletter. The intent of the media campaign was to "explain the need for the utility, create awareness of stormwater problems, describe solutions to those problems, and educate people about the stormwater fee." The success of the public awareness campaign latter became evident as few citizens raised concerns regarding the utility or its fee during the approval process. In May 1992, only ten people spoke at an official public hearing on stormwater fees held by the Charlotte city council. Additionally, only a handful of citizens raised questions or concerns during a Mecklenburg County Commission public hearing held in 1993 prior to the approval of stormwater fees. From the time of the survey in 1991 to the final implementation of the stormwater utility in 1993, the public education campaign continued to provide citizens with information regarding stormwater issues and the need for a utility. While only half of residents surveyed in 1991 stated they would willingly pay a fee to address stormwater drainage needs, the implementation of the utility in 1993 and the assessment of utility fees were met with minimal resistance and no legal challenges. Nearly all of the of citizens who did not support a utility fee in the 1991 survey acquiesced to the utility fee

in 1991 following the multi-faceted public awareness campaign resulting the relatively smooth implementation of the utility fees in 1993.[54]

4.3.4 Chicago Metropolitan Area

The Chicago stormwater management strategy paper cites two smaller case studies in the Midwest as examples of successful utility implementations. Specifically, it identifies public education as a necessary factor for the adoption of a utility. In the first of these cases, the Chicago Metropolitan Agency for planning draws a link between the success of the Bloomington, Illinois utility in terms of effective stormwater drainage and public reception, and their allocation of fees collected to public education. The report also references the Fishers, Indiana utility which originally was met with great resistance prior to implementation. The utility's management, however, improved public opinion of the utility by distribting a letter explaining why the utility fees were necessary and detailing how the money generated from fees would be allocated prior to the first billing cycle. Following the distribution of this letter, resistance to the utility fee diminished and the utility has operated successfully since its implementation.[55]

The stormwater management strategy paper also describes the potentially significant role of private conservation organizations in public education and outreach opportunities. In particular, the report states that these private organizations may supplement public agencies who lack the funding or resources for substantial public education programs. The paper specifically mentions the Upper Des Plains River Ecosystem Partnership which consists of local organizations, political leaders, scientists, and outdoor enthusiasts. The organizations publish a newsletter entitled "River Talk" which promotes watershed friendly practices and programs and supports public awareness events such as the "It's Our River Day," a statewide event that recruits volunteers to clean local rivers and expand public awareness of watershed issues including stormwater drainage.[56]

4.4 Pollution Prevention and Reduction

Much of the impervious land found on private and public property increases the amount of stormwater runoff, which carries pollutants and releases them into nearby watersheds. Moreover, with improper maintenance, the pipes in the stormwater network system can release chemicals into water sources. There are, however, strategies intended to reduce non-point source pollution and to create incentives for green infrastructure.

4.4.1 South Burlington

With pollution prevention and reduction driven by community members to preserve the watershed, the city of South Burlington has created programs to reduce non-point source pollution. In addition to voluntary community member involvement, the city has:

1. Calibrated salt spreading systems on plow trucks using a computerized system,
2. A street sweeping program that from 2008 to 2011 has removed 1,200 cubic yards of material, which includes catch basin cleaning
3. Proper disposal procedures for waste removed from cleanup programs.[57]

Moreover, the Stormwater Superintendent participated in the State of Vermont Department of Environmental Conservation's green infrastructure round table, which helped him acquire information regarding the South Burlington stormwater utility.[58]

4.4.2 New Hampshire

According to the NHDES, stormwater is one of the leading causes of water pollution and contributes to 83 percent of surface water quality impairment in the state.[59] The 2008 Stormwater Study Commission asserted the negative correlation between impervious land cover and water quality and argued that the new development regulations, which were commonplace, failed to address the majority of faulty land use from previously unregulated development projects.[60] The commission also recognized the failure of conventional drainage systems to protect water quality and distinguished the importance of vegetative surfaces not only in absorbing stormwater but in cleaning the water itself.[61] The committee also highlighted EPA regulations of Municipal Separate Storm Sewer Systems (MS4) and expressed the need to improve stormwater drainage in order to comply with water quality regulation and avoid penalties.[62]

4.4.3 Richmond, Virginia

The Richmond stormwater utility program plan contains several components to prevent the illicit discharge of substances harmful to a watershed and to reduce sediment erosion from construction sites. The city began by developing a Geographic Information Systems (GIS) inventory of storm sewer outfalls identifying and mapping these outfalls by GPS. This storm sewer system map allows the managers of the stormwater utility to establish baselines for stormwater runoff and to identify potential areas of infrastructure failure where better drainage may be needed. After mapping the stormwater sewer system, the city will issue permits to organizations requesting to discharge chemicals or other substances into the watershed. In permit year one, the city will collect baseline chemical and biological information for all stormwater sewer outfalls, including the volume of stormwater flow. In permit year two, the city will adopt an illicit discharge

ordinance to better define regulation after establishing the baselines for chemical discharges and stormwater runoff levels. In permit year three the city of Richmond will implement a training program complete with a manual for stormwater pollution prevention guidance, and field GPS training to train additional stormwater utility inspectors. In permit year four, the Richmond stormwater utility will evaluate the adequacy of illicit discharge investigations and will determine if all cases have been successfully resolved. It will also determine if further public education is required depending on the quantity of illicit discharges found. Richmond will also provide stormwater pollution prevention training to all municipal workers whose occupation has been deemed to have a potential detrimental impact on a watershed. The city will continue to monitor discharges through permit year five, eliminating illicit discharges when discovered.[63]

The city of Richmond has also identified construction sites as high-risk areas for stormwater runoff pollutants. Consequently, it has established regulatory controls for erosion and sediment from construction sites and sanctions to ensure compliance with these standards. These standards demand that construction site operators utilize best management practices and encourage site owners to use structural and nonstructural techniques to minimize sediment erosion from stormwater runoff. This program provides for the inspection of construction sites greater than 2,500 square feet and has established a procedure for citizens to report potential illicit discharges or a failure to comply with erosion standards.[64]

4.5 Post-Construction Stormwater Management

Once a stormwater utility has been constructed and implemented, it is important to consider the strategies necessary to maintain and sustain an efficient, clean stormwater utility system.

4.5.1 South Burlington

In addition to South Burlington's conveyance system – catch basins, gutters, curbs, ditches, man-made channels, and stormwater drainage pipes – the stormwater utility maintains thirty stormwater treatment practices throughout the city. The city also conducts inspections around its utility and treatment plants to sustain the efficiency and effectiveness of the system[65].

4.5.2 Maine

There are three main components that the Maine case study emphasized for the long-term success of a statewide utility. The first of these elements is public awareness and support. As mentioned previously, without such support, long-term maintenance and expansion of the utility are unlikely. Next, there must be a method to enforce payments to the utility. Two common methods suggested by the report are the filing of property tax liens or the

shutting off an individual's utility service, such as their water service. Lastly, in order for continued funding of the utility, it is important to increase the utility's revenue beyond the simple user or service fee. Some options discussed include municipal bonds, state and federal grants, as well as other fees. These three components were highlighted as important because the utility's continued success is dependent upon the maintenance of public support and a constant source of incoming revenue.[66]

4.5.3 Richmond, Virginia

The city of Richmond has developed a GIS inventory of storm sewer outfalls by identifying areas of stormwater runoff by GPS. It will then evaluate this mapping of stormwater runoff for areas in need of structural or non-structural improvement, and will analyze the map to identify the best management practices that have resulted in favorable stormwater conditions. The city will then develop a stormwater management ordinance that will provide technical criteria, procedural information for construction inspection, and will encourage the use of low impact development techniques to reduce stormwater peak flows of runoff for both new development and redevelopment. The ordinance allows for the future revision of best management practices to incorporate new stormwater drainage techniques and technology. The combination of the GIS storm sewer outfall inventory to identify areas in need of improved stormwater management, persistent inspections of watersheds, and the availability of a database of best management practices for post-construction stormwater maintenance provides stormwater utility managers the tools necessary to effectively contend with stormwater drainage infrastructure needs even after the initial implementation of the utility and to use the funds generated from utility fees efficiently and effectively.[67]

4.6 Disaster Prevention and Relief

While Vermont does not regularly face disaster phenomena, its stormwater drainage infrastructure must be capable of handling the large volume of runoff that these infrequent, yet costly storms cause. In order to avoid stormwater related damages resulting from flooding such as that sustained in the aftermath of Tropical Storm Irene, this section provides an overview of action plans and policies from other systems that face disaster conditions with similar regularity.

4.6.1 New Hampshire

The proposal of a statewide utility in New Hampshire sought to create a greater source of funding for stormwater based disaster relief and flooding by pooling together fees from the entire state rather than a single municipality. The committee in particular stressed the problems associated with increased development and additional impervious land in recent years which has led to increased flooding during the five year period leading up to the study, 2003-2008.[68]

4.6.2 Maine

The Maine report, along with most of the case studies, does not specifically focus on disaster prevention. However, like the other reports, it cites the benefit of flood reduction from the implementation of a stormwater utility. Therefore, there is an implicit value in stormwater utilities to mitigate damage from natural disasters. Through implementation of stormwater utilities, states and municipalities are much better equipped to handle heavy storms and respond in times of disaster. This implicit value is especially relevant and timely to the state of Vermont, as the damage caused by Tropical Storm Irene remains in recent memory.[69]

4.7 Variable Utility Characteristics

As previously mentioned, there is a wide range of stormwater utilities throughout the United States. In order to determine the best management practices specific to the state of Vermont, this section looks into cases that have similar characteristics to Vermont. These features include but are not limited to climate, total population, population density, topography, and land area.

4.7.1 South Burlington

Although the city of South Burlington's population is small compared to the scale of the statewide utility that the Vermont state legislature is currently considering to implement, South Burlington provides a foundation to evaluate the feasibility in expanding the scale of the existing stormwater utility system.

4.7.2 New Hampshire

The area of the state of New Hampshire, 9,304 square miles, is comparable to that of Vermont, 9,217 square miles. Both states have similar climates and topographies due to their proximity. One major distinction between New Hampshire and Vermont is that the population of New Hampshire is roughly double that of Vermont which may lead to differences in the scale of programs, funding available for infrastructure investment, and revenue generated through property fees.[70]

4.7.3 Maine

The population of Maine is 1,328,188 and Vermont's is 626,431. Despite Maine's larger population, it has a population density of 43.04 inhabitants per square mile, while Vermont has 67.73 inhabitants per square mile. Furthermore, the land area in Maine is 30,841 square miles and Vermont's land area is 9,217 square miles. Despite some of these differences, there is significant value to the Maine case study due to the similar climate of both states and the fact that the Maine report explores the implementation of a statewide utility.[71]

4.7.4 Charlotte – Mecklenburg County

Mecklenberg county possesses a population of 944,373 individuals which is comparable to population of Vermont at 626,431. The size of Mecklenberg county is 546 square miles compared to the size of the state of Vermont at 9,620 square miles. While differences in the size of the two areas and the challenges in physical infrastructure and infrastructure needs from population density vary between the two, the similar population sizes mean that the state of Vermont will face similar challenges in terms of public education and awareness campaigns.[72]

4.7.5 Chicago Metropolitan Area

The Chicago metropolitan area under the jurisdiction of the Chicago Metropolitan Agency for Planning (CMAP) contains seven counties, Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will. This area holds a population of over 8 million individuals and an area of 4,071 square miles. While its population is significantly greater than that of the state of Vermont, its size is approximately half of that of Vermont. In spite of these differences however, the public education practices discussed in the CMAP "Go to 2040" as well as the strategies for constructing a trans-county stormwater utility covering a large population and land area is directly applicable to a Vermont stormwater utility strategy.[73]

4.7.6 Richmond, Virginia

The Richmond Department of Public Utilities and its stormwater utility serves over 500,000 customers, a similar figure to the population size of the state of Vermont. Given this similar cliental base, many of the educational services provided by Richmond regarding its stormwater utility may be directly replicable by Vermont. The Richmond stormwater utility serves a land area of approximately 1,200 square miles which is only fraction of the size of Vermont. Nevertheless, many of the pollution prevention and post-construction management policies, and specifically the GIS stormwater drainage inventory, employed by the Richmond utility may serve as models for a statewide utility in Vermont.[74]

5. CONCLUSION

As Vermont continues to construct its stormwater management plan, it should develop a list of goals and benchmarks that the state wishes to pursue, and evaluate which potential stormwater management practices will be most beneficial to achieving these goals. The development of a statewide stormwater utility is a potential option to meet the state's stormwater management needs, however, there are also other options that could address

these issues. The case studies discussed within this report demonstrate the wide variety of structures a stormwater utility may adopt. However, there are certain practices that appear to be incorporated into utilities nationwide and are generally considered to be successful. Some of these best management practices include: public education programs, the use of a service fee as opposed to a tax, defining the service area to include all beneficiaries of the utility, and implementing supplementary pollution reduction measures. If Vermont chooses to pursue a statewide stormwater utility, it should take into account these best management practices among others as identified by the seven criteria outlined within this study and attempt to incorporate them within the stormwater utility model the state would choose to adopt.

APPENDICES

APPENDIX A. NATIONAL OVERVIEW FIGURES

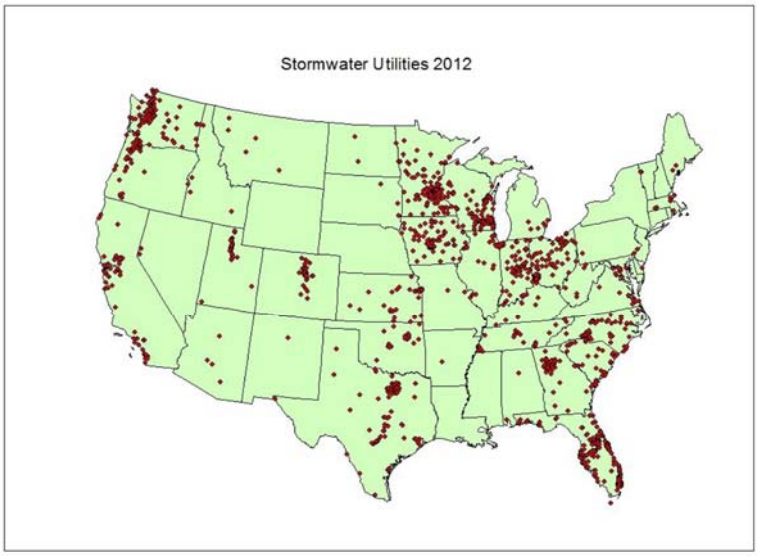

Figure 1: Map of National Distribution of Stormwater Utilities
Source: Western Kentucky University Stormwater Survey 2012

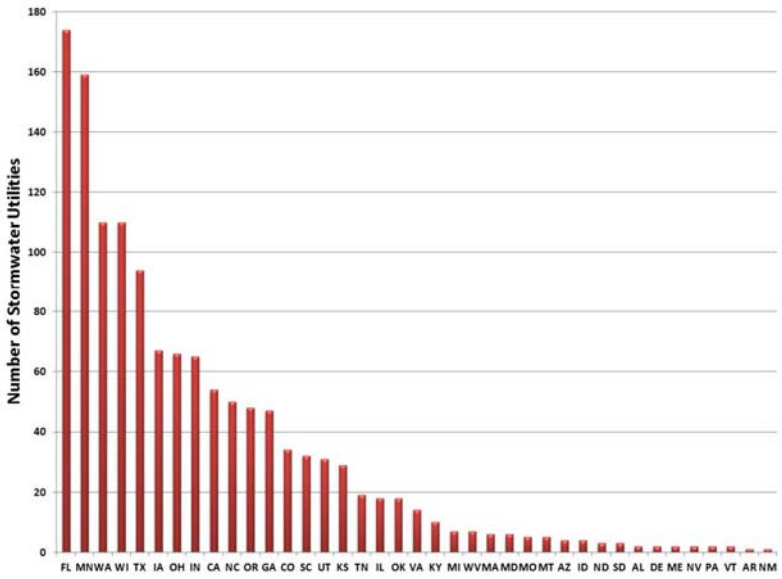

Figure 2: Number of Stormwater Utilities by State
Source: Western Kentucky University Stormwater Survey 2012

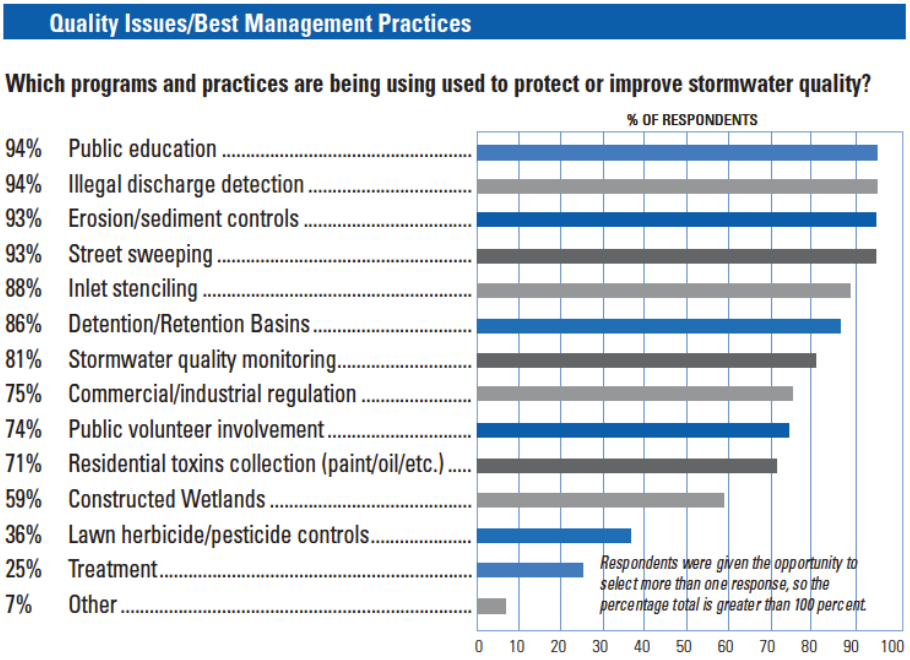

Figure 4: 2010 Stormwater Utility Survey Best Management Practices
Source: Black & Veatch 2010 Stormwater Utility Survey

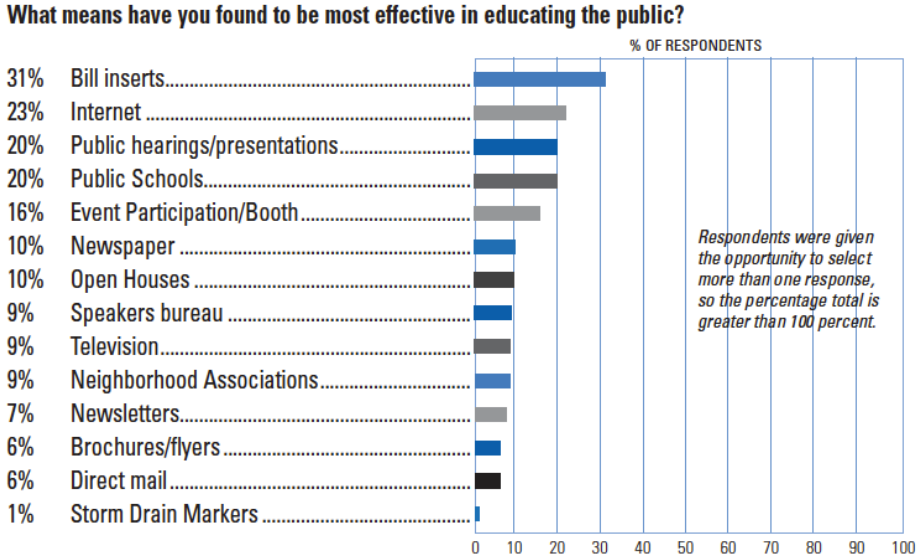

Figure 3: 2010 Stormwater Utility Survey Best Education Programs
Source: Black & Veatch 2010 Stormwater Utility Survey

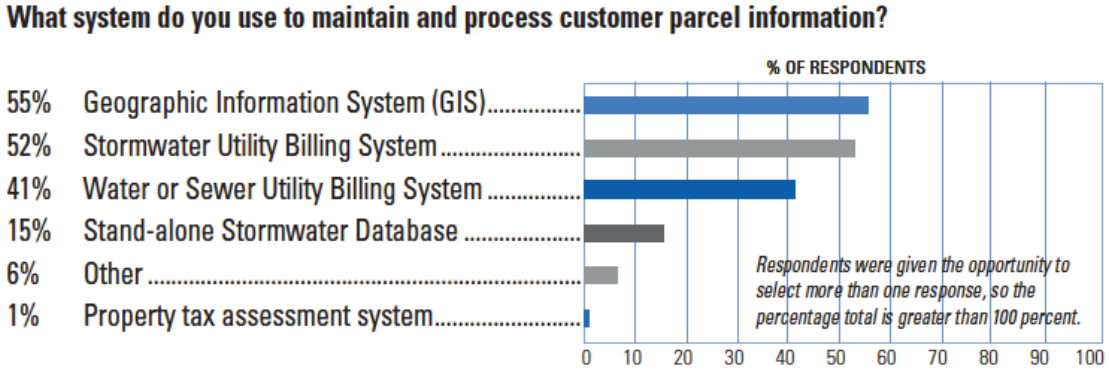

Figure 5: 2010 Stormwater Utility Survey Customer Data Collection Systems
Source: Black & Veatch 2010 Stormwater Utility Survey

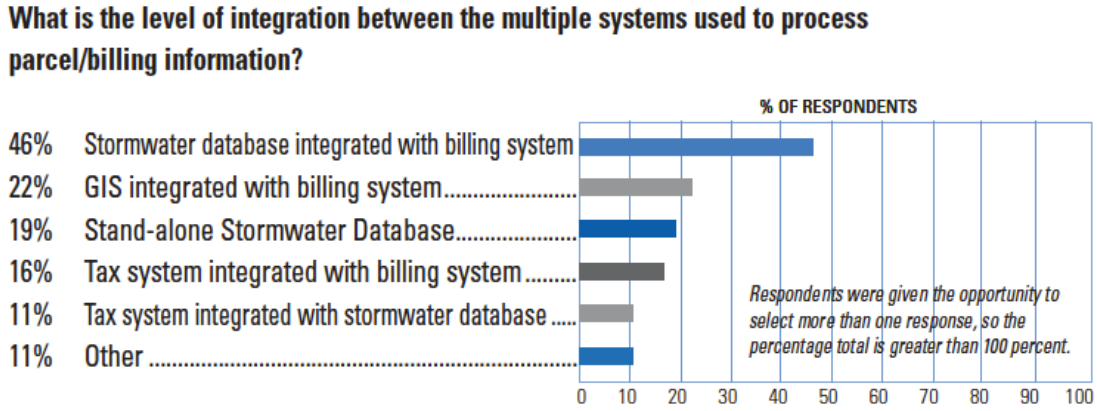

Figure 6: 2010 Stormwater Utility Survey Billing Systems
Source: Black & Veatch 2010 Stormwater Utility Survey

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