Reducing Costs for Meeting Stormwater Regulations for Small to Mid-size Communities in Massachusetts

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An Interactive Qualifying Project Submitted to the Faculty of
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Abstract

Stormwater is a major cause of pollution for waterbodies in Massachusetts. The EPA has drafted new regulations with additional requirements to further reduce stormwater pollution. The implementation of these requirements will increase costs associated with stormwater management. The goal of this project was to assist small to mid-size communities in Massachusetts with fulfilling the EPA's new requirements for stormwater management. To accomplish this goal, we gathered information and conducted case studies to determine resource needs and current stormwater management programs for two Massachusetts towns. We compared these data to the requirements in the new regulations in order to develop a set of recommendations that communities can use as guidelines for reducing costs for implementation.

Acknowledgements

This project would have not been possible without our sponsor, the Massachusetts Department of Environmental Protection (MassDEP). We are especially grateful for the ongoing assistance and guidance we received from Frederick Civian, the Stormwater Coordinator from the MassDEP. We also want to extend our thanks to Steven McCurdy, the Director of Municipal Services from the MassDEP, for answering our questions about stormwater utilities.

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Finally, our goal would have not been achievable without our advisors Seth Tuler, Melissa Belz, and Paul Mathisen. We would like to thank them for their continued advice, support, comments and suggestions throughout the development of our project and report.

Executive Summary

Introduction and Background

Stormwater is one of the major causes of pollution for waterbodies in Massachusetts. Recent studies have shown that stormwater pollution contributes to at least 55% of the contamination of waterbodies in Massachusetts (Tedder, 2014). Stormwater pollution occurs when precipitation from weather events washes over impervious surfaces, such as streets and rooftops, and collects contaminants. Contaminants can come from cars, including wear from tire treads, dust from brake pads, and fuel combustion products (Hvitved-Jacobsen, Nielsen, & Vollertsen, 2010, p. 38), as well as fertilizers and pesticides used at homes, yard wastes, pet waste, and from soils and materials on construction sites (King County, 2016).

Municipal Separate Stormwater Sewer System

The EPA has released new regulations in 2014 for Municipal Separate Stormwater Sewer Systems, or MS4s, to further address stormwater pollution. The new regulations are more detailed and contain more than 100 recording requirements in addition to the current regulations, which were promulgated in 2003. Within both MS4 permits, there are six minimum control measures, which group regulation requirements together by areas that need to be addressed. The six minimum control measures are:

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

EPA's Cost Estimates for Implementation of 2003 and 2014 MS4 Permits

Suburban Community		2003				2014			
Minimum Control Measure		Cost		Hours		Cost		Hours	
		Low	High	Low	High	Low	High	Low	High
Public Education		$3,000	$40,500	30	400	$11,200	$73,800	112	730
Public Participation		$7,000	$14,000	60	120	$9,000	$17,000	80	150
IDDE		$37,500	$65,100	370	619	$86,900	$267,000	806	2510
Construction Site Control		$4,200	$21,600	32	96	$4,200	$21,600	32	96
Post Construction Site Control		$6,000	$12,000	40	80	$21,200	$38,400	182	324
Good Housekeeping	Rented Trucks	$26,000	$383,000	72	**84**	$278,000	$557,000	**602**	1190
	Purchased Trucks	$307,000	$678,000	72	**84**	$390,000	$852,000	**602**	1190
Total[1]	Rented Trucks	**$124,000**	**$602,000**	**996**	**2140**	**$454,000**	**$1,060,000**	**2210**	**5750**
	Purchased Trucks	**$405,000**	**$897,000**	**996**	**2140**	**$556,000**	**$1,350,000**	**2210**	**5750**

Due to the more demanding requirements for the new permit, municipalities will require more labor hours and higher costs to comply. The table of EPA estimates show that it will cost towns approximately $450,000 more to implement the new permit (according to the difference between the highest estimates for each permit).

In order to address the requirements of the current permit and prepare for the new permit, many communities in Massachusetts have joined together to form stormwater coalitions. A stormwater coalition or partnership is comprised of a group of member communities that collaborate to share resources and skills. Stormwater coalitions provide member communities with educational materials, assistance in drafting regulatory documents, toolkits, mapping equipment, grant opportunities, and more. In addition, they share the costs of stormwater management through standardized policies and procedures, regionalized data management systems, and collaborative education and training. The Massachusetts Municipal Statewide Stormwater Coalitions currently include the following coalitions and partnerships ("Massachusetts Statewide Stormwater Coalition", 2016):

1. Central Massachusetts Regional Stormwater Coalition (CMRSWC)
2. Neponset River Watershed Association
3. Southeast Regional Services Group
4. Northern Middlesex Stormwater Collaborative
5. Connecticut River Stormwater Committee
6. Merrimack Valley Stormwater Collaborative

In addition to stormwater coalitions and partnerships, the Massachusetts Department of Environmental Protection (MassDEP) plays a key role in supporting communities with permit compliance by providing technical assistance grants, informational workshop sessions, and videos to educate communities about the MS4 Permit.

Methodology

The goal of this project was to assist small to mid-size communities in Massachusetts with fulfilling the EPA's new requirements for stormwater management. We worked with the Massachusetts Department of Environmental Protection to develop a set of recommendations that towns can use as guidelines to reduce costs for implementation. To achieve our goal, we completed four objectives:

Objective 1: Completed case studies of Grafton and Wellesley to illustrate their current status, motivations, available and required resources, and needs to meet the MS4 requirements.
Objective 2: Identified usage of resources and stormwater management in coalition member communities.
Objective 3: Analyzed and summarized current information and guidelines in relation to resources and needs for towns.

Objective 4: Provided guidelines on measures for permit compliance.

The case studies of Grafton and Wellesley were completed by our team in order to understand their current status, motivations, available and required resources, and needs to meet the MS4 requirements. We interviewed five town officials, gathered cost-based documents and information, and gathered documents and information related to stormwater permit implementation for each town.

After conducting the case studies of the two towns, we also identified how other communities use their resources and manage their stormwater to meet the MS4 requirements through stormwater coalitions and partnerships. Our team identified the usage of resources and stormwater management by coalition member communities by interviewing two representatives of Massachusetts stormwater coalitions, gathering cost-based documents and information from coalitions, and gathering documents and information related to stormwater permit implementation from coalitions.

After gathering all of the data from Grafton, Wellesley, and the coalitions, we analyzed the current information and guidelines from coalitions in relation to resources and needs for the towns. The data we gathered were sorted into categories: cost per hour, total hours, total cost, and minimum control measure. We then compared our data to estimates released by the EPA as well as data available in others communities' annual reports, and used that to develop recommendations to help assist communities with compliance.

Finally, our team provided guidelines to assist communities in minimizing their costs associated with complying with the MS4 regulations. In our guidelines, we provided a summary of the MS4 permit requirements that communities should focus on as they begin planning. We sorted the content of our summary by control measure. In additions, the requirements within the control measures were sorted by implementation date. We used our findings about stormwater management resource usage from our case study towns and the stormwater coalitions, and developed recommendations. We displayed our recommendations as a list that included cost saving measures for implementations as well as which control measures communities should address proactively. Our aim was to allow communities to easily identify what areas of their stormwater management they should focus on for the new permit and to help them to minimize the costs that they would incur in achieving compliance.

Town of Wellesley, MA

Wellesley needs approximately 2,950 more hours of *labor* in comparison with the EPA's estimates for the upper

limit of labor hours for the new MS4 Permit. Therefore, additional staffing would be beneficial because a lot of labor hours are required for stormwater management and implementing the EPA's new stormwater requirements. In addition, we found that the Good Housekeeping control measure will need the most money out of the town's budget. According to their cost estimates for the new MS4 permit, town officials expect that Good Housekeeping will *cost* them about 58% of their stormwater plan expenses. Thus, the town needs to find other ways that they may fund their stormwater program besides the Department of Public Works' budget.

Town of Grafton, MA

Grafton faces a major issue when it comes to *labor* and time requirements for the new MS4 Permit. Currently, consultants complete the communities' outfall mapping for the Illicit Discharge Detection and Elimination (IDDE) control measure. Grafton believes that it could have completed the task itself if it had more staff and time internally. Furthermore, the IDDE control measure is the most difficult for it to achieve compliance due to the time requirements. Additionally, the town is also facing issues with funding for the new permit, which will require, at a minimum, approximately $248,000 more in *costs* than the current permit. Currently,

Grafton is a member of the Central Massachusetts Regional Stormwater Coalition, which supports them in reducing costs, labor, and time needs for its stormwater program since they can share information, ideas, and resources with member communities within the coalition. Beyond the coalition, the Town of Grafton is also considering various options for funding including stormwater utilities, a tax that the people of the town have to pay based on the amount of impervious surface that they have on their property.

Findings

From the project and research of Grafton, Wellesley, and the stormwater coalitions, our team came up with several findings. The first seven findings were generalized observations for the small to mid-size MS4 communities in Massachusetts, which can be divided between *labor* and *cost*, and the eighth finding is specifically for the MassDEP:

Finding 1: Many communities have difficulties with labor and time requirements for stormwater management.
Finding 2: Good Housekeeping is the control measure with the highest expected cost in the new permit.
Finding 3: The cost allocation for Illicit Discharge Detection and Elimination cannot be accurately determined in advance due to the possibility of severe illicit discharges.
Finding 4: Stormwater coalitions are beneficial for aiding communities in meeting regulation requirements.

Finding 5: Towns can use additional sources for funding to implement stormwater requirements.
Finding 6: Communities do not fully understand the new MS4 permit and therefore cannot finalize their budgets.
Finding 7: Member communities within a stormwater coalition normally develop individual educational outreach materials, when these materials are already available.
Finding 8: The MassDEP's Stormwater Handbook is inconsistent with the EPA's new MS4 Permit, causing confusion within communities.

Recommendations

Small to mid-size MS4 communities in Massachusetts and MassDEP can use the following recommendations as guidelines to reduce costs for implementation:

Recommendation 1: Communities should assess internal staffing needs for the increase in new requirements.
Recommendation 2: Communities should allocate enough funding for Good Housekeeping, which can exceed half of the budget for stormwater management.
Recommendation 3: Communities requiring additional assistance with stormwater management should join a coalition or collaborative if not involved in one.
Recommendation 4: Communities that are struggling to finance implementations for the current requirements should consider alternative methods of funding for the new permit, such as stormwater utilities or grants.
Recommendation 5: The MassDEP should update the Stormwater Handbook for the new MS4 Permits to further assist communities with meeting regulations.
Recommendation 6: Stormwater coalitions should compile their educational outreach materials and unify them in order to save resources.

Conclusion

In this project, we developed a set of recommendations that towns in Massachusetts could use as guidelines in order to reduce the costs for implementation of the new permit requirements released by the EPA. Considering the early stage of the new MS4 permit, most towns in Massachusetts do not have a fully developed stormwater program at the time of our report. For this reason, they can use our report to understand which issues they may face when they attempt to meet the new permit requirements. Additionally, stormwater coalitions can use this report to further understand the needs of member towns and prioritize on finding ways to help towns meet these needs first. Lastly, in this report, we have mentioned the town's concerns and have suggested recommendations that the MassDEP and the EPA can take into consideration when developing programs that aim to assist communities according to their needs.

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2.2: Stormwater Regulations	Konstantinos
2.2.1: Phase I Regulations and Phase II Regulations	Konstantinos
2.3: Costs of Adhering to Regulations	Anthony
2.4: Methods to Overcome Challenges to Implementing Regulations	Tasnim
2.4.1: Massachusetts Statewide Municipal Stormwater Coalitions	Tasnim
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Acronyms

Acronym	Meaning
BMP	Best Management Practice
CMRSWC	Central Massachusetts Regional Stormwater Coalition
CRW	Charles River Watershed
CWA	Clean Water Act
DPW	Department of Public Works
EPA	United States Environmental Protection Agency
FWPCA	Federal Water Pollution Control Act
IDDE	Illicit Discharge Detection and Elimination
MA DEP	Massachusetts Department of Environmental Protection
MS4	Municipal Separate Storm Sewer System
MVSC	Merrimack Valley Stormwater Collaborative
NMSC	Northern Middlesex Stormwater Collaborative
PVPC	Pioneer Valley Planning Commission
SOP	Standard Operating Procedures
SWPPP	Stormwater Pollution Prevention Plan

1.0: Introduction Chapter

Stormwater causes up to two thirds of water quality standard violations in Massachusetts (Cooke, 2016). Pollutants and wastes that accumulate on impervious surfaces, such as sidewalks and streets, are transported by stormwater to waterbodies through runoff. Failure to properly manage stormwater can lead to downstream flooding, stream bank erosion, increased water cloudiness, habitat destruction, infrastructure damage, and contaminated streams, rivers and coastal water (EPA, 2016b).

The United States Environmental Protection Agency (EPA) has released a new regulatory permit in 2016 for Municipal Separate Stormwater Sewer Systems, or MS4s, to further reduce the impact that stormwater has on pollution of waterbodies or erosion (EPA, 2016a). According to Tata & Howard, an environmental services consultant that helps communities in Massachusetts meet stormwater regulations, "the permit is expected to increase municipalities' stormwater costs substantially for the duration of the permit term – an increase that simply may not seem affordable to some communities" (Tata & Howard, 2016). This cost increase is estimated to be about $9,000 to $200,000 per year for the permit term (EPA, 2016a).

The Massachusetts Department of Environmental Protection (MassDEP) is tasked with ensuring that communities in Massachusetts are meeting the requirements outlined in the MS4 permits. The MassDEP provides communities with support for implementing the permit with resources such as workshops, training, and grant money. Additionally, some communities in Massachusetts have joined as coalitions to share and develop new stormwater plans, toolkits, templates, and management techniques to reduce costs associated with compliance. Membership in these coalitions can also provide discounts on consulting services and materials from associated vendors.

While communities in Massachusetts have been working together to define actions that will reduce costs for implementing the MS4 permit, it is still unclear which methods are the most effective in reducing the costs. The EPA provides the communities with a range of cost estimates for implementing the new MS4 permit, but these estimates do not divide costs among planning, development, and maintenance of these implementations and the ways that communities and coalitions can cost-effectively use their budget in these different areas. It is important for communities to know the breakdown of costs for implementations because they need to consider not only how much an implementation will cost to plan and develop, but also the cost to maintain it.

The goal of this project was to assist small to mid-size communities in Massachusetts with fulfilling the EPA's new requirements for stormwater management. We developed a set of recommendations that communities can use as guidelines to reduce costs for implementation. In order to identify measures that could save communities money and assist them in complying with the new regulations, we referred to cost documentation and qualitative data gathered from case studies of two towns, and assessed their existing and planned stormwater management programs.

2.0: Background Chapter

Untreated stormwater, or precipitation from weather events, can have serious negative side effects for waterbodies; trash and pollutants carried by stormwater can jeopardize the quality of any waterbodies that stormwater drains into. The pollution of waterbodies can harm the wildlife that are dependent on them. In order to address this problem, new regulations have been released by the EPA to minimize the pollutants associated with stormwater. The new regulations contain over 100 additional requirements compared to current regulations. The new requirements will necessitate additional funds and resources for compliance within Massachusetts communities. Many Massachusetts communities anticipate funding issues with meeting the new stormwater regulations. This chapter explains concepts of stormwater pollution, the roles of the EPA and MassDEP in providing assistance, the roles of stormwater coalitions in Massachusetts, and cost considerations for the communities and local governments.

2.1: Stormwater Pollution

Stormwater has become more polluted as grass and natural ground cover were replaced with impervious surfaces, such as streets and rooftops, and higher quantities of pollutants appeared as byproducts of urbanization. Impervious surfaces substantially reduce the quantity of water that can seep through and replace more pervious surfaces, altering the paths that stormwater follow. As a result, stormwater washes more pollutants into receiving waterbodies instead of filtering pollutants through the soil. According to the National Water Quality Inventory, 13% of polluted rivers and 18% of polluted lakes were affected by polluted stormwater runoff as of 2000 (EPA, 2005a). Figure 1 depicts how different pollutants can be transported by stormwater over impervious surfaces into our waterbodies.

Figure 1- Stormwater Pollutants

Retrieved on 10/3 from http://northgeorgiawater.org/wp-content/uploads/2015/05/ARC-Stormwater-v1-01.jpg

Pollutants in stormwater can take the form of spills, illegal discharges, and chemicals from vehicles and homes. Spills and illegal disposals of contaminants can play a significant role in stormwater pollution, as they typically contain high concentrations of pollutants, and often occur more than once if they are the result of illegal discharge (Hvitved-Jacobsen, Nielsen, & Vollertsen, 2010). Cars and trucks create pollutants resulting from tire treads, dust from brake pads, and fuel combustion products (Hvitved-Jacobsen, Nielsen, & Vollertsen, 2010), and these pollutants are most commonly found on impervious roadways. In addition, deicing salts used on roads result in the interference of permeable surfaces, obstructing stormwater from fully passing through (Kakuturu & Clark,

2015). Pollutants can also come from fertilizers and pesticides used at homes, yard wastes, pet waste, and from soils and materials on construction sites (King County, 2016).

2.2: Stormwater Regulations

The first major US law addressing water pollution was the Federal Water Pollution Control Act (FWPCA) in 1948. This law authorized federal agencies to support water quality research and develop new technology projects. However, this law did not authorize federal agencies to regulate measures to control water pollution. It was over 20 years later, in 1970, that the creation of the United States Environmental Protection Agency (US EPA) followed by the 1972 amendments to the FWPCA led to the commonly known Clean Water Act (CWA).

The CWA established the modern basic structure for regulating the discharge of pollutants into the US surface waters and authorized the US EPA to regulate pollution control programs. The main goal of the CWA was to maintain the "chemical, physical and biological integrity" of US waters by eliminating the release of harmful pollutants into surface waterbodies (EPA, 1977). To achieve this, the National Pollutant Discharge Elimination System (NPDES) was established, a program that regulates the amount of allowable pollutant discharges into US waters. The NPDES requires municipal, industrial, and commercial facilities to obtain permits to discharge pollutants into US waters legally.

2.2.1: Phase I Regulations and Phase II Regulations

In 1987, the EPA issued NPDES permits for five categories of stormwater discharges. These permits targeted medium to large sized Municipal Separate Stormwater Sewer Systems (MS4s). They are generally referred to as Phase I regulations of the stormwater program (EPA, 2014).

Table 1- Categories of stormwater discharges that require NPDES permits

Discharges permitted prior to February 4, 1987
Discharges associated with industrial activity
Discharges from large MS4s (systems serving a population of 250,000 or more)
Discharges from medium MS4s (systems serving a population of 100,000 – 250,000)
Discharges judged by the permitting authority to be significant sources of pollutants which contribute to a violation of a water quality standard

The stormwater program also included Phase II regulations that required permits from small MS4s and facilities owned or operated by small MS4s, which were previously exempted, as an attempt to involve more communities and to improve water quality by reducing pollutants. In addition, the Phase II regulations required measurable goals for **six minimum control measures** and their evaluation (EPA, 2000), as listed in Table 2.

Table 2- Six Minimum Control Measures and Examples

Public Education and Outreach	Implementation of an educational program that distributes educational materials about the impacts of stormwater discharges on local water bodies and the steps that can be taken to reduce stormwater pollution
Public Participation/Involvement	Public meetings that allow citizens to express their viewpoints on stormwater management policies
Illicit Discharge Detection and Elimination (IDDE)	Development of a plan that detects and addresses non-stormwater discharges into the sewer system
Construction Site Runoff Control	Implementation of proper erosion and sediment controls on applicable construction sites[1]
Post-Construction Runoff Control	Long term operation and maintenance
Pollution Prevention/Good Housekeeping for Municipal Operations	Development and implementation of a maintenance program with the goal of minimizing pollutant runoff from municipal operations into storm sewer systems

In addition, as part of the permit program, communities were required to submit annual reports, which could then be reviewed by the EPA and MassDEP to gauge their progress in meeting the regulations.

2.3: Costs of Adhering to Regulations

The new MS4 permit has over 200 recording requirements that are much more extensive than those in the current permit (WaterVision, LLC, 2016). A summary of the new requirements can be found in Appendix A, and the full MS4 permit can be found on the EPA's website. To assist communities in understanding the increase in requirements, the EPA has released estimates that vary for rural, suburban, and urban communities. In order to account for varying levels of existing stormwater management, the estimates are depicted as a range from low to high costs and labor requirements for compliance. The table in Appendix B compares the EPA estimates for expected costs and labor requirements over the first five years for the current permit and for the draft of the new MS4 permit in a suburban community. The table in Appendix B also shows that there is a large increase in labor and monetary requirements between the two permits in every control measure, with the largest increases in IDDE and Good Housekeeping control measures.

For many communities, the large increase in expenses associated with complying to the new permit regulations will take away from other areas of funding within their municipal budget; "Mandates that would be imposed by the federal government in this instance would divert scarce resources away from…police and fire protection, public education, transportation, zoning, investment in environmental infrastructure, and much more" (Beckwith, 2016). While using funds from a municipal budget is one form of paying for the increase in costs for permit

[1] Construction sites with land disturbance of greater or equal to one acre

compliance, there are other options that communities can choose to utilize. These sources include state revolving funds as well as stormwater utilities. A **state revolving fund** is a low interest federal loan that communities can use to develop construction projects, including stormwater projects. These funds can also be utilized in the development of a stormwater utility. A **stormwater utility** is a fee charged to property owners for their stormwater contribution to MS4s, usually based on calculations of impervious surface area. These fees are also applicable to tax exempt properties to get them to pay for their contribution to MS4s (Comprehensive Environmental Inc, 2016). Comprehensive Environmental Inc. has released documentation for MS4 communities that depicts the benefits and challenges associated with the varying sources of funding for compliance, as depicted in Figure 2.

Funding Source	Benefits	Challenges
Municipal Budget	• Uses existing funding system • Can be leveraged to payback bonds or loans • Tax deductible	• Competing municipal needs and priorities may limit funding for stormwater program • Tax exempt properties do not contribute • Based on value of property rather than stormwater contribution from property • May need to raise taxes to fund MS4 program
State Revolving Fund (SRF)	• Low interest loan can be used to fund full implementation of stormwater program • Payback typically over 20 years	• One-time source • May be a competitive process • Time-constrained • Application and reporting requirements
Stormwater Utility (Service Fee)	• More consistent and fair since based on stormwater contribution • Dedicated, stable funding source • Can be leveraged to meet grant and bond requirements • Tax exempt properties pay their share • Can include abatement for good stormwater management practices	• Typically a setup fee to establish requirements and enact regulations • Approval by vote of the legislative body subject to the local charter • Public and political opposition - perceived as a new "rain tax"

Figure 2- Sources of Funding

Retrieved from: http://ceiengineers.com/uploads/files/Services/Stormwater/MS4/3.%20CEI%20NPDES%20MS4%20Basics%20-%20Funding%20Options%20for%20MS4%20-%20Secure.pdf

2.4: Overcoming Challenges of Implementing Regulations

In order to adhere to regulations and meet costs, communities can overcome much of their challenges of implementing regulations by joining a stormwater coalition or partnership, which provides communities cost-saving options that are entailed in the next section. Additionally, communities can look to the MassDEP for support such as technical assistance.

2.4.1: Massachusetts Statewide Municipal Stormwater Coalitions

A method that works for communities to efficiently implement the stormwater regulations and manage stormwater is to form coalitions or partner with other communities to share resources and skills amongst each other. The idea of communities forming coalitions began with the Community Innovation Challenge (CIC) Grant program, which was originally formed in

2012. The CIC Grant "supports regionalization and other cost saving initiatives that change the way local governments do business to maintain service delivery and stretch every taxpayer dollar as far as possible" (M. Webber, 2015). The stormwater coalitions, in addition to other community partnerships, share the costs of stormwater management through standardized policies and procedures, regionalized data management systems, and collaborative education and training.

The Massachusetts Statewide Stormwater Coalitions currently include: the Central Massachusetts Regional Stormwater Coalition (CMRSWC), the Neponset River Watershed Association, the Southeast Regional Services Group, the Northern Middlesex Stormwater Collaborative, the Connecticut River Stormwater Committee, and the Merrimack Valley Stormwater Collaborative ("Massachusetts Statewide Stormwater Coalition", 2016). Figure 3 is a map of the location of the coalitions in Massachusetts.

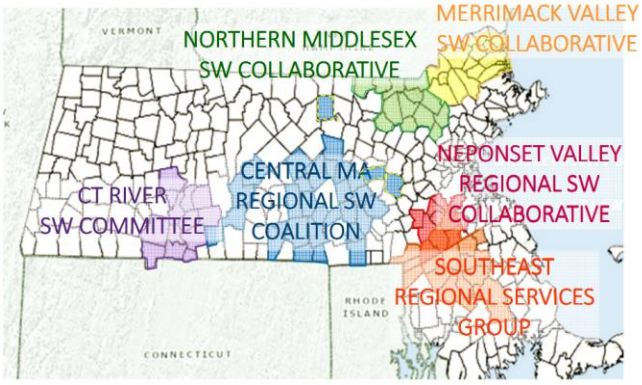

Figure 3- Map of Stormwater Coalitions

Retrieved from http://centralmastormwater.org/pages/CRSC_Documents/Six%20MA%20Stormwater%20Coalitions_graphic.pdf

Stormwater coalitions support their member communities in accomplishing their stormwater management goals by finding approaches that are cost-effective and efficient, protecting the water bodies they have, and meeting the requirements of the MS4 Permit. Coalitions help their member communities reach these goals by providing support to improve water quality and increasing collaboration amongst the communities in order to make the communities a better place through stormwater management and implementation of stormwater regulations. Apart from coalitions, communities can also form their own partnerships with other communities to reach their stormwater management goals. For instance, the Town of Wellesley collaborates with Newton, Needham, Weston, and Watertown through stormwater collaboratives and workshops.

Each community in a coalition or collaborative is driven by specific stormwater problems and has a different capability of managing its stormwater problems. For instance, all communities need to comply with the stormwater regulations, but one community may have a significant flooding problem while another community is worried about providing a clean environment, such as an environment with reduced pollutants in their waterbodies, for their residents. Rather than coming up with a specific solution, the coalitions provide guides and other resources that member communities can apply to their particular issues. The table in Appendix C briefly describes the Massachusetts Statewide Stormwater Coalitions and what guides and other

resources they currently provide. The coalitions differ in the number of member communities that each of them have as well as how advanced they are. However, they all share a common goal to support their member communities with implementing stormwater regulations as well as exceeding them.

The new MS4 Permit requires new or updated practices for stormwater management. In addition, knowledge of the current methods handled by the coalitions and researching the costs to meeting new regulations sets up the baseline to progressing in stormwater management and meeting the new MS4 Permit requirements.

2.4.2: MassDEP's Role in Helping Communities

Beyond stormwater coalitions and partnerships, the MassDEP plays a role in helping communities with permit compliance. The DEP provided $50,000 in a technical assistance grant to the Central Massachusetts Regional Stormwater Coalition (CMRSWC) to support their efforts to help their member communities (CMRSWC, 2016). Furthermore, the MassDEP also provides informational workshops sessions and videos that educate communities about the general MS4 permit and their specific requirements. In addition, stormwater officials from different communities are able to share their knowledge and insight with one another based on what they have learned from the DEP's workshop and what ideas the communities have at the workshop session. The MassDEP plays a huge role in educating communities about the MS4 Permit and bringing communities together so they can improve their stormwater management.

2.5: Background Conclusion

New stormwater regulations are aimed at addressing the problems associated with pollution of receiving waterbodies. Stormwater coalitions and the MassDEP work to assist communities in Massachusetts with compliance with stormwater regulations. While the main purpose of these regulations is to benefit the environment by improving water quality in the communities that they are being placed upon, there are many costs associated with compliance. Many communities are unsure of all of the requirements for the new MS4 permit and the costs associated for compliance with these requirements.

3.0: Methodology Chapter

The goal of this project was to assist small to mid-size in Massachusetts communities with fulfilling the EPA's new requirements for stormwater management. We developed a set of a recommendations that communities can use as guidelines to reduce costs for implementation. In order to achieve our goal, we completed the following:
Objective 1: Completed case studies of Grafton and Wellesley to illustrate their current status, motivations, available and required resources, and needs to meet the MS4 requirements.
Objective 2: Identified usage of resources and stormwater management in coalition member communities.
Objective 3: Analyzed and summarized current information and guidelines in relation to resources and needs for communities.
Objective 4: Provided guidelines on measures for permit compliance.

The following sections outline the approach that was used to complete these objectives. A summary of the objectives, methods, and sources is included in Appendix D.

Objective 1: Completed Case Studies of Grafton and Wellesley to Illustrate their Current Status, Motivations, Available and Required Resources, and Needs to Meet the MS4 requirements

Before we could provide information to Massachusetts communities about possible cost-saving measures for their stormwater management programs, we needed to gain an understanding of how communities managed stormwater. We completed case studies on two towns: Grafton, MA and Wellesley, MA. Wellesley is in Norfolk County in Massachusetts, with a population of just under 28,000 as of 2010 (US Census Bureau, 2010a), while Grafton is in Worcester County in Massachusetts, with a population of approximately 18,000 as of 2010 (US Census Bureau, 2010b). Both are suburban towns and are meeting the requirements of the current MS4 permit. However, Grafton is a member of a stormwater coalition while Wellesley is not. Additionally, both Grafton and Wellesley complete some stormwater management tasks internally and both utilize consultants.

First, our case study with Wellesley included review of their annual reports, stormwater infrastructure, and cost estimates, as well as several semi-structured interviews with the following town officials: Senior Civil Engineer George Saraceno, Town Engineer David Hickey, and Assistant Director of Public Works David Cohen. We conducted several semi-structured interviews with Mr. Saraceno, Mr. Hickey, and Mr. Cohen to discuss Wellesley's compliance with the regulations, stormwater management, departments tasked with compliance, and plans for the new permit. Our interview questions for Wellesley can be located in Appendix E.

For our case study in Grafton, we also reviewed their annual reports, stormwater management plans, and contractor invoices, as well as conducted semi-structured interviews with the following town officials: Town Planner Joseph Laydon, Conservation Agent Maria Mast, Highway Superintendent David Crouse, and Town Engineer Brian Szczurko. Our interview questions for Grafton are located in Appendix F. Grafton is a member of the CMRSWC, so we tailored a number of questions towards the role of the coalition in Grafton's stormwater

management. Furthermore, we acquired invoices from consultants that Grafton has worked with in the past, and assistance Grafton has received from the CMRSWC with their annual membership fee to analyze the costs associated with various management tasks.

Objective 2: Identified Usage of Resources and Stormwater Management in Coalition Member Communities

After examining the towns of Wellesley and Grafton for their current status, motivations, available and required resources, and needs to meet the MS4 requirements, we identified how other communities use their resources and manage their stormwater to meet the MS4 requirements through the stormwater coalitions and other stormwater partnerships. The information we gathered from the coalitions and partnerships helped us to determine what other communities have in common with Wellesley and Grafton, such as assets and complications, for implementation of stormwater regulations. Finally, the coalitions helped us to determine what communities need from the MassDEP and EPA in order to meet the stormwater requirements.

The CMRSWC provides a lot of support to their member communities and therefore, we attended their annual meeting held at the Holden Town Hall in Holden, MA on September 20, 2016. At the meeting, we collected handouts available to all attendees and took detailed minutes of information about the CMRSWC's history and funding history, accomplishments, the MS4 Permit, technical assistance provided by the MassDEP, their contractor (Fuss & O'Neill) and what they provided the coalition, the application they used for the their outfall mapping (PeopleGIS), their coalition budget, and their FY2017 Scope Development. We also attended a Massachusetts Municipal Stormwater Coalitions meeting held at the Worcester MassDEP office on September 27, 2016. All of the Massachusetts coalitions attended the meeting and shared how many member communities they had, what they accomplished in stormwater management, and what complications they are having in stormwater management. In addition, the meeting introduced what support the EPA can provide communities that are subject to the new MS4 Permit.

Finally, our team conducted interviews with Ian Cooke from the Neponset River Watershed Association, and Steven McCurdy from the MassDEP and the financial board of the Town of Milton, MA, which is also a member town of the Neponset River Watershed Association. Our interview questions for Mr. Cooke can be found in Appendix G, and our interview questions for Mr. McCurdy can be found in Appendix H. Our questions for Mr. Cooke were to gather information about funding, assistance, compliance status, and stormwater management plans for the communities in the Neponset River Watershed, as well as any cost estimation data from the communities. We also wanted to know what resources from the MassDEP and EPA would assist communities most. Furthermore, we asked both Mr. Cooke and Mr. McCurdy about stormwater utilities, how communities establish them, their effectiveness, and any political challenges that were faced during implementation.

Using all the stormwater coalition information and data gathered, our team had to analyze and organize the information. In addition, we identified different communities' usage of resources for the new MS4 Permit through the stormwater coalition gave a broad perspective into what many communities need for guidance through the process of MS4 Permit implementation.

Objective 3: Analyzed Current Information and Guidelines from Coalitions in Relation to Resources and Needs for Communities

In order to analyze the data from Grafton and Wellesley that pertain to compliance for the previous MS4 permits as well as estimates on compliance for the new MS4 permit, we sorted the information into different categories; cost per hour, total hours, total cost, minimum control measure, and groups associated. We performed a comparison on information from both towns on specific thematic categories that consisted of issues that the two towns have been facing while meeting the six minimum control measures. This comparison showed whether there were any similarities or differences on how communities handled specific issues on their current stormwater program, which issues they anticipated to face in the new permit, and how they would handle them, such as hiring a consulting company to create a stormwater program for them.

Qualitative information was collected from the Central Massachusetts Regional Stormwater Coalition, the Neponset River Watershed Association, and the Statewide Coalition Meeting. This information provided a broader view of the progress the coalitions had made on assisting communities for the new permit compliance and of the concerns that communities within them had been expressing. The information that we obtained was divided into broader categories consisting of data, such as statistical information, percent increases on expenses, number of communities facing the same issue. With extended discussions with our sponsor, we identified certain aspects that presented a pattern that was applicable to a significant number of communities within both coalitions. Our observations from the coalitions were compared with our observations from Grafton and Wellesley, which showed whether a generalization of the concerns from communities could be performed.

Finally, we expressed the cost estimates from the Town of Wellesley in percentages of their entire stormwater plan and included them in a pie chart. We also considered the EPA's percent cost estimates and presented them in a pie chart. The two charts were compared for similarities and differences between the cost estimations for the respective control measures. The EPA's cost estimates were generalized for most communities in Massachusetts and a similarity between them and the Wellesley's estimations would prove that a generalization on certain permit compliance costs could be valid. The results from the comparison between the EPA's and Wellesley's cost estimates reflected the concerns that were raised from Grafton, Wellesley, and communities included in the coalitions on specific permit requirements. This evidence was used for our findings.

Objective 4: Provided Guidelines on Measures for Permit Compliance

In order to assist communities in gaining a better understanding of the new MS4 permit and costs associated with complying to the regulations, we developed a set of guidelines on approaches towards meeting compliance and created a list of recommendations that communities could utilize when planning for the new permit. Our recommendations were portrayed as a list that included cost saving measures for implementations as well as which control measures communities should address preemptively. Our aim was to allow communities to easily identify what areas of their stormwater management they should focus on for the new permit and to help them to minimize the costs that they would incur in achieving compliance.

In addition to our recommendations, we provided a summary of the MS4 permit requirements that communities should focus on as they begin planning. Our summary was divided by control measure as well as by implementation date for requirements within that control measure. Additionally, we included a table for easier interpretation by communities looking for a direct comparison of requirements and their implementation schedule. Below each table are the EPA's estimates for that control measure for communities to assess how much the implementations will cost them as well as the amount of labor hours necessitated.

To reach our target audience of small to mid-size MS4 regulated communities, we contacted Massachusetts stormwater coalitions for help distributing our guidelines to member communities. We published our guidelines on the WPI Boston Project Center website and distributed them to our two case study communities, Grafton and Wellesley. Recommendations that are included in our guidelines can be found in our recommendations section of our report.

4.0: Findings

In this chapter, we identified findings that may be applicable to communities in Massachusetts as part of the new permit requirements. The findings are based on concerns that communities have expressed and issues that communities in Massachusetts may face while addressing the new permit requirements. From our study of Wellesley's and Grafton's current stormwater management, we found that the resource usage and complications from implementation of the new permit fall into the categories of labor, costs, and department coordination. We organized our observations and findings under these categories and listed our findings in Table 3, which is included at the end of this chapter. In the following sections, we share the results from Wellesley, Grafton, and the stormwater coalitions.

4.1: Case Study of the Town of Wellesley

Wellesley is currently meeting the requirements of the 2003 MS4 permit and has begun estimating costs for compliance with the new MS4 permit. Wellesley is not a member of a stormwater coalition, but it collaborates with the Charles River Stormwater Collaborative of Newton, MA and the Stormwater Workshop from Needham, MA. Wellesley also works with the town of Weston and Watertown (Town of Wellesley, 2016).

4.1.1: Labor

For the Town of Wellesley, stormwater management requires a large amount of labor. According to the town's estimates of labor required for compliance with the six minimum control measures for the new permit, as shown in Figure 4, they will need approximately 8,700 hours of labor. The Town of Wellesley needs about 2,950 hours more in comparison with the EPA's estimates (Figure 4) for the upper limit of labor hours for the new MS4 permit. Currently, Wellesley handles the majority of their stormwater management in-house. Senior Civil Engineer George Saraceno, Town Engineer David Hickey, and Assistant Director of Public Works David Cohen are actively involved in the implementations of stormwater regulations in Wellesley. Furthermore, there are only eight town engineers total that work to manage stormwater from the Town Engineering Department and the Highway Division. Wellesley outsources some tasks to interns and co-ops, such as outfall mapping, and other tasks to consultants, like catch basin cleaning. Additionally, they work with the Boy Scouts of America to offer projects for Eagle Scouts in assisting with stormwater tasks. Mr. Saraceno noted that, although Wellesley is in good standing with regards to the staffing they have to manage stormwater, additional staffing would be beneficial because **a lot of labor hours are required for stormwater management and implementing the EPA's new stormwater requirements** (Finding 1). For instance, the new permit has new requirements regarding sediment and erosion control. Therefore, it is best that the town gets the Building Commission of Wellesley to be involved, which requires more labor hours. Figure 4 depicts the expected difference in labor hours required to adhere to the six minimum control measure requirements in the current and new MS4 permit. This figure is based on Wellesley's estimates for the new permit and the upper limit of EPA's estimates (Figure 5) for a suburban community for the current permit. Figure 4 portrays how the Town of Wellesley requires a lot more labor hours than expected by the EPA, especially for the Good Housekeeping control measure.

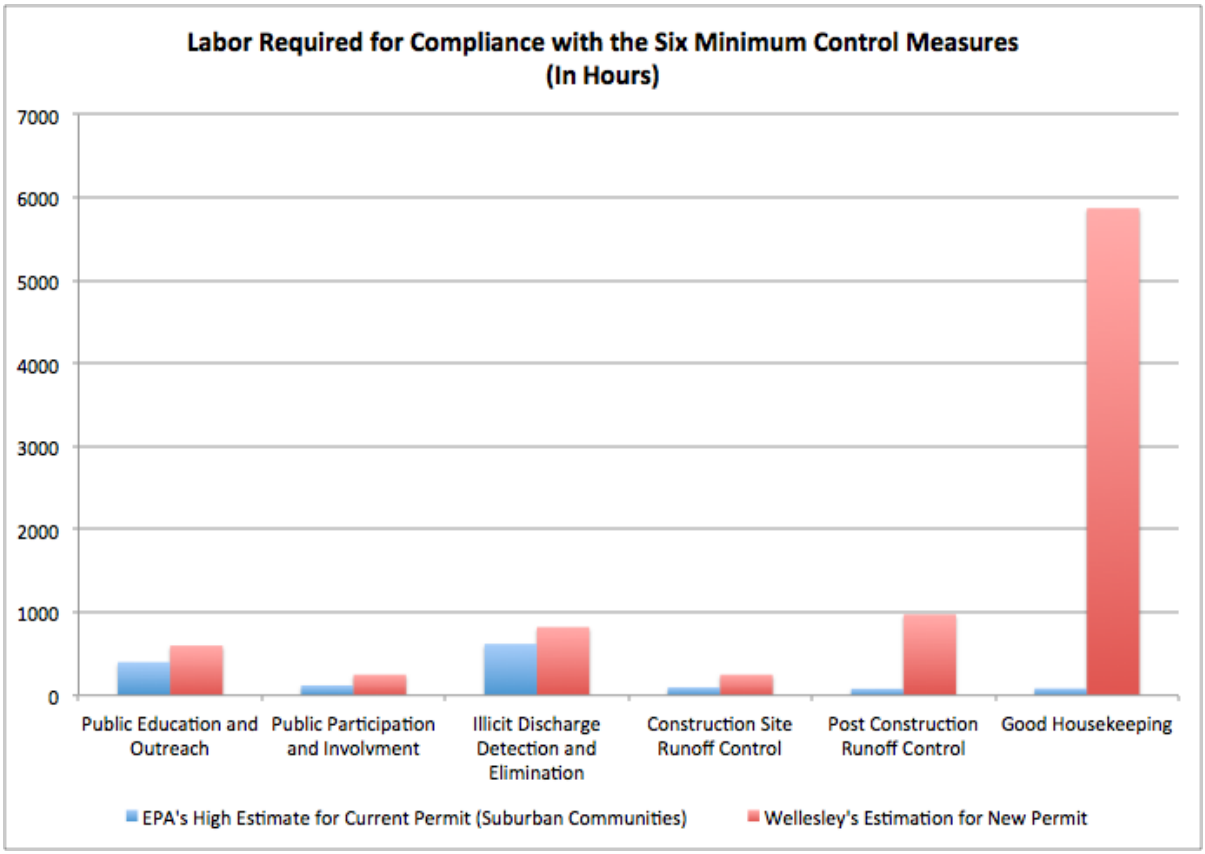

Figure 4- Labor Requirement Comparison Between MS4 Permits

Source- https://www3.epa.gov/region1/npdes/stormwater/ma/ma-stormwater-program-cost-evaluation.pd

4.1.2: Cost

To obtain cost information for stormwater management for the Town of Wellesley, we reviewed documents, annual reports, and conducted interviews. We created a chart that displays the breakdown of Wellesley's Cost Estimates for the New MS4 Permit by Control Measure in Figure 5. According to their Cost Estimates for the New MS4 Permit, town officials expect that the Good Housekeeping control measure will cost them about 58% of their stormwater plan expenses, which is about $225,000 before material costs (i.e. road salt). Figure 5 presents a pie chart that breaks down Wellesley's cost estimates for the new MS4 permit by each control measure. The Town of Wellesley has found that the **Good Housekeeping control measure will need the most money out of its budget** (Finding 2). Furthermore, although the IDDE control measure will be the most labor demanding control measure to achieve compliance for, it is also found that the **cost allocation for IDDE cannot be accurately determined due to the possibility of severe illicit discharges** in the future (Finding 3). An example of a severe illicit discharge is an oil spill or significant algae growth within a waterbody. This possibility is not considered in the cost estimates, but is a concern of the Town of Wellesley.

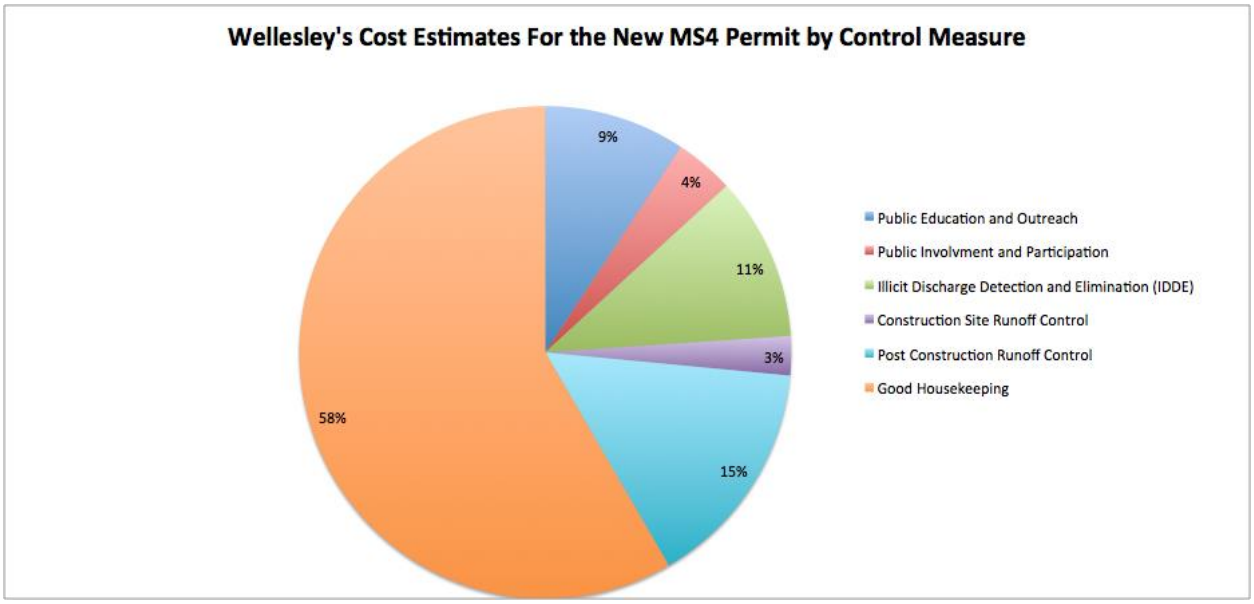

Figure 5- Wellesley's Cost Estimates for the New MS4 Permit

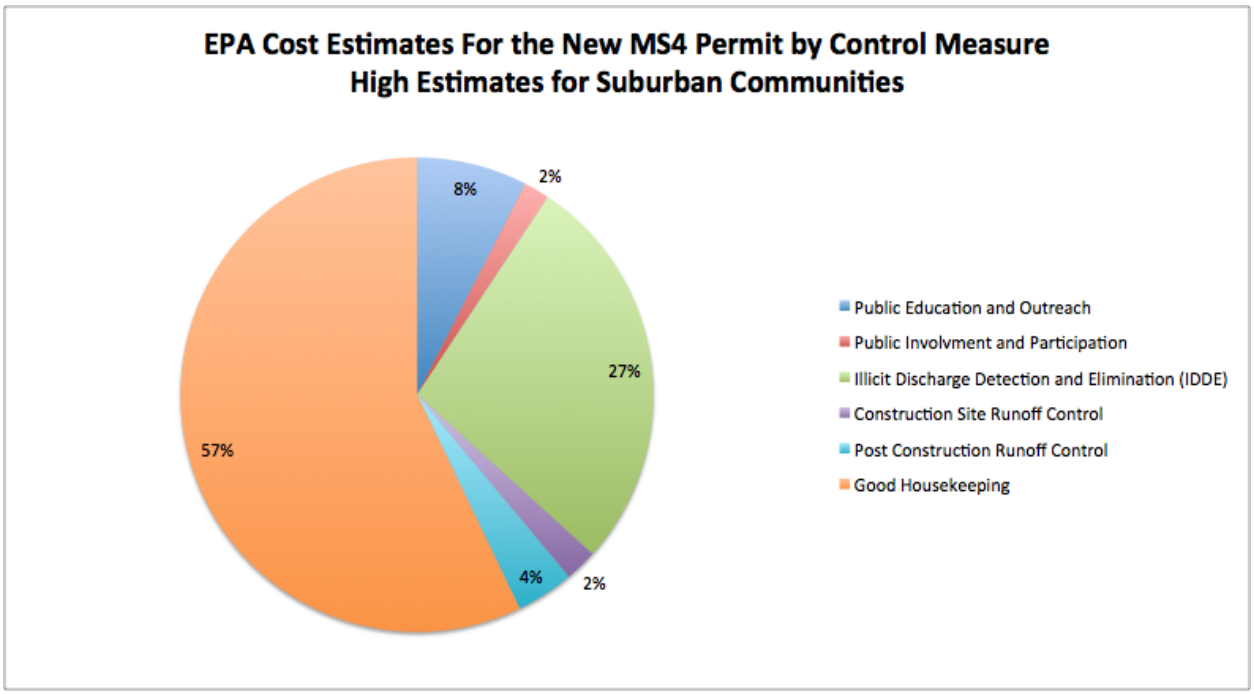

Figure 6- EPA Cost Estimates for the New MS4 Permit by Control Measure; High Estimates for Suburban Communities

Source- https://www3.epa.gov/region1/npdes/stormwater/ma/ma-stormwater-program-cost-evaluation.pd

The cost estimate distribution provided by Wellesley (Figure 5) was similar to the distribution of the cost estimates provided by the EPA for the new MS4 permit (Figure 6). Wellesley's range of costs for the new permit, which was between $600,000 and $700,000, falls in the range of the EPA's cost estimates for the new permit, which is between $454,000 and $1,350,000. However, Wellesley's cost estimates for IDDE were lower than the EPA's, likely due to the progress Wellesley has made within the control measure. Wellesley started conducting dry-weather sampling of outfalls, a part of the IDDE control measure, while the new permit was still a draft because they expressed concerns about fulfilling this requirement if they started once the permit was released. Mr. Saraceno also stated that Wellesley could benefit from a stormwater utility in order to fund their stormwater management program for the new MS4 permit.

4.1.3: Department Coordination

Several different departments within Wellesley's local government handle stormwater management. The Town Engineering Division, Planning Department, Zoning Department, Wetlands Protection Committee and other DPW Divisions are responsible for ensuring that Wellesley is taking the necessary steps for compliance with the permit requirements. In addition the Highway Division is responsible with erosion and sediment control issues. Mr. Saraceno noted that there are difficulties with meeting the sediment and erosion requirement, as Wellesley can only manage this reactively due to the majority of violations on private property. He recommended further collaboration with the Building Commission of Wellesley will be needed to perform checks for this requirement while conducting site inspections.

4.2: Case Study of the Town of Grafton

Grafton is a town in Worcester County, which is smaller in population, larger in land area, and more residential than Wellesley. The characteristics of Grafton have led to a different stormwater management program from that of Wellesley regarding aspects such as hiring consultants, coordination of departments, or funding of the program. Although there are differences between the two towns and their stormwater management programs, we have identified that in certain aspects such as labor requirements, both towns have expressed the same concerns but for different reasons. Grafton is a member of the Central Massachusetts Regional Stormwater Coalition (CMRSWC) and has mentioned that **being a member has been a great asset because of the tools and information it receives** (Finding 4). The town is currently meeting the requirements of the 2003 MS4 permit and has exceeded some of the requirements such as GIS mapping of outfalls, stormwater infrastructure, and erosion control inspections for construction sites. Furthermore, Grafton's staff has attended informational meetings to start its preparation for the new permit. For Grafton, we needed to obtain most of the data through personal interviews and meetings with the town officials rather than through documentation.

4.2.1: Labor

The Town of Grafton expressed that labor and time requirements are a major issue for their stormwater management program. In order to address this issue, Grafton currently works with consultants to complete some time-consuming permit requirements. Town Planner Joseph Laydon, Conservation Agent Maria Mast, Highway Superintendent David Crouse, and Town Engineer Brian Szczurko are tasked with ensuring that Grafton is complying with stormwater regulations. Grafton completes much of the Good Housekeeping internally, specifically for catch

basin cleaning and street sweeping. In addition, its Public Outreach and Education Control measure is handled internally also. However, the Illicit Discharge Detection and Elimination Control measure is done through consultants, specifically for outfall mapping and screening. Ms. Mast mentioned that she would have been able to complete the outfall mapping herself, but **lack of time was an issue** (Finding 1). The town even came up with the idea to train staff to handle some permit requirements, such as outfall mapping. However, this was not something they were able to do for the current permit, but are considering for the new permit. In addition, Grafton believes that IDDE will be the most difficult control measure for which to achieve compliance, primarily due to the **time requirements in the control measure** (Finding 1). Furthermore, Grafton expressed that the reason why they do not have mostly internal staffing, although it is preferable, was because providing salary with benefits to employees would cost the town a lot of money.

4.2.2: Cost

In an effort to reduce costs, Grafton has received many benefits such as educational materials, planning for the requirements, and suggestions for implementations through the CMRSWC for a member fee of about $4,000. The usefulness of working with other communities within the CMRSWC is shown from the information, ideas and resources that are mutually shared in order to identify and work towards solving issues that have been observed (Finding 4). Furthermore, Grafton received benefits of grant money through the CMRSWC.

However, even with the benefits Grafton receives as being a part of the stormwater coalition, they have expressed concern about the amount of money that they plan to allocate to stormwater management for the new permit. According to the 2016 NPDES PII Small MS4 General Permit Annual Report, the Town of Grafton spent approximately $206,000 total for implementing the current permit since it was released in 2003. The new permit is estimated to cost them $454,000 at a minimum according to the EPA, as depicted in Appendix B. As an attempt to address the increase in costs for permit compliance, **Grafton has been considering various options for funding** (Finding 5). A stormwater utility is a possibility that has been discussed but the town is hesitant due to the political implications that will be presented. These political implications include citizens that would likely not support a program that would require additional taxes and industries that have the funds to lobby against the stormwater utility. In addition, Grafton is approximately 90% residential, which reduces the funding that can be generated by a stormwater utility. Attracting more businesses could lead for higher tax rates that could benefit the stormwater program in the long run.

4.2.3: Department Coordination

Several departments in the local government of Grafton are responsible for compliance with stormwater regulations. The Town Engineers and DPW work with each other to ensure compliance with regulations, while the Highway Department is tasked with doing maintenance on facilities, such as cleaning catch basins, street sweeping, and the illicit discharge program. The Board of Selectmen handle enforcement of Grafton's stormwater bylaw, and the Conservation Commission conducts construction site inspections and manages review of the erosion control plan. Ms. Mast stated that meeting the public education and involvement control measures would involve cooperation of the DPW, Conservation Commission, Board of Selectmen, Board of Health, School Department, Parks and Cemetery Department, and others.

4.3: Stormwater Coalitions

The Massachusetts Municipal Stormwater Coalitions consist of a total of ninety-four participating communities that are part of the: Central Massachusetts Regional Stormwater Coalition (CMRSWC), Neponset River Watershed Association, Southeast Regional Services Group, Northern Middlesex Stormwater Collaborative, Connecticut River Stormwater Committee, or Merrimack Valley Stormwater Collaborative. These partnerships and coalitions helped our team understand how stormwater management programs in other communities are similar and different to those of Grafton and Wellesley. Conducting interviews with representatives of stormwater coalitions and attending two coalition meetings, the CMRSWC's Annual Meeting and a Massachusetts Municipal Stormwater Coalitions Meeting, supported our findings so that we can apply them to other small to mid-size MS4 communities.

4.3.1: Labor

The stormwater coalitions reported that their **communities were experiencing issues with staffing.** However, the coalitions still differ in what difficulties they face in terms of labor requirements for stormwater management (Finding 1). For instance, the Neponset River Watershed Association had issues with lack of staffing among their communities within the stormwater management program, which each typically only have a Department of Public Works director, a town engineer, and a junior civil engineer. The Connecticut River Stormwater Committee expressed that their communities want additional work in education, Illicit Discharge Detection and Elimination (IDDE), and pre-construction for stormwater management. The Merrimack Valley Stormwater Collaborative voiced a concern about one of their communities that has a shrinking Department of Public Works from eighty members down to seventeen members. Finally, at the CMRSWC's Annual Meeting, the coalition said that they had increasing issues with maintaining staff.

In order to resolve these issues of labor needs for the member communities, stormwater coalitions and collaborations found ways to support their member communities. At the Massachusetts Municipal Statewide Coalitions meeting, our team learned that **regional stormwater coalitions collaborate by sharing cost information, technical products, field procedures, public education tools, documentation, training opportunities, and other resources** (Finding 4) which in turn reduces staffing needs that communities would need if they completed these items individually. Additionally, communities and coalitions outsource labor through consultants and colleges for their stormwater management programs. The Neponset River Watershed Association support their communities in planning for the stormwater permit implementation and is considering group procurement of consultants for their communities, especially the ones lacking labor requirements. The Northern Middlesex Stormwater Coalition provides training for the stormwater staff in their communities for Good Housekeeping, Best Management Practices (BMPs), and IDDE. They also assisted communities with mapping catchment areas and resources and opportunities for educational purposes, such as the water festival and school events. The Connecticut River Stormwater Committee has issued a request for proposal for a consultant that will perform data collection and mapping for the communities. In addition, they began working with local colleges, like the Merrimack College, for stormwater projects. The CMRSWC also outsources stormwater projects to students from Worcester Polytechnic Institute and hired Fuss & O'Neill as a consultant for creating workshops, videos, templates, and tools for their stormwater management program.

4.3.2: Cost

The Lieutenant Governor of Massachusetts, Karyn Polito, who attended the Massachusetts Municipal Stormwater Coalitions meeting indicated that **funding for regionalization creates more efficiency when managing stormwater** (Finding 4). Creating coalitions eliminated redundant tasks for optimum financial efficiency since communities receive resources, equipment, and management practices as being part of a regional group, which they do not have to develop themselves or pay for. Furthermore, we found that **communities do not fully understand the new MS4 permit and therefore cannot finalize their budgets or allocate money** (Finding 6). In order to address this issue, the Neponset River Watershed Association is creating a short summary of the new permit for their member communities as well as a model Notice of Intent and template for a five-year workplan. Additionally, the watershed is providing support to communities with cost estimation for the new permit. The CMRSWC also provides their member communities with informational videos about the MS4 permit through a consultant.

Lieutenant Governor Polito also noted that **more funding also can help the communities to expand their' stormwater programs** (Finding 5). Currently, the MassDEP offers the 604B Grant of $50,000 towards watersheds and water quality which coalitions use for compiling tools and identification of new tools for stormwater management. This grant was given to the CMRSWC as technical assistance and they used it towards the consultant, Fuss & O'Neill, for creation of workshops for IDDE, the Stormwater Pollution Prevention Program, Best Management Practices (BMPs), and Low Impact Developments (LIDs are plans to manage stormwater runoff). In addition, the contractor performed outfall inspections and water quality sampling for the coalition communities, created informational videos on the MS4 requirements, and public awareness tools. This consultant expanded the CMRSWC and its member communities' stormwater programs in a significant way. Furthermore, the Town of Milton, MA, which is a part of the Neponset River Watershed Association, adopted a stormwater utility, which is a method of funding stormwater management programs while other communities within the watershed and other coalitions are considering the option.

Through the ambiguity of the MS4 permit and what sources of funding towns' can utilize, communities can also reduce costs. **Member communities within a stormwater coalition normally develop individual Education Outreach materials when these materials are readily available** (Finding 7). However, communities can save resources, such as time and money. Communities are required to provide educational materials to residents, businesses, institutions (churches, hospitals), and commercial facilities, developers (construction), and industrial facilities and then determine how effective the education program is for each of the places in order to include it in their annual stormwater report. However, with different metrics of effectiveness, it is difficult to determine whether communities are actually implementing effective Education Outreach programs, or if it is only effective for the town. The Town of Grafton expressed issues with measuring the effectiveness of educating their community to use less fertilizer. It could be measured through the amount in the soil perhaps, or through the amount in the waterbodies. Furthermore, most towns are unsure about the metrics for it as well, causing discrepancies of effectively implementing this educational program among communities. Therefore, communities are spending time and money to measure an item that cannot even be appropriately compared with that of another community.

4.4: EPA and MassDEP

Many Massachusetts communities under the MS4 permit have expressed a concern about the **inconsistency between the MassDEP's Stormwater Handbook and the EPA's new MS4 Permit**, which is creating confusion for within communities (Finding 8). Communities want a standardized Stormwater Handbook from the MassDEP. An example of a concern that communities have expressed is the requirement for water on a post-construction site, which is listed as 0.8 inches of rainfall in the regulations, but one inch in the handbook. A summary of all of the findings is included in Table 3. These findings provided a basis for the recommendations that are included in Chapter 5.

Table 3- Findings Table

Number	Finding	Relevant Communities
1	Many communities have difficulties with labor and time requirements for stormwater management.	All communities under the MS4 permit
2	Good Housekeeping is the control measure with the highest expected cost in the new permit	All communities under the MS4 permit
3	The cost allocation for Illicit Discharge Detection and Elimination cannot be accurately determined in advance due to the possibility of severe illicit discharges	Wellesley and other communities under the MS4 permit
4	Stormwater coalitions are beneficial for aiding communities in meeting regulation requirements	Communities under the MS4 permit who are not involved in a coalition
5	Communities can use additional sources for funding to implement stormwater requirements	Communities involved in stormwater coalitions and communities where utilities can be passed
6	Communities do not fully understand the new MS4 permit and therefore cannot finalize their budgets	All communities under the MS4 permit, MassDEP, and EPA
7	Member communities within a stormwater coalition normally develop individual Educational Outreach materials when these materials are already available	Communities involved in stormwater coalitions and communities under the MS4 permit
8	The MassDEP's Stormwater Handbook is inconsistent with the EPA's new MS4 Permit, causing confusion within communities	MassDEP and EPA

5.0: Recommendations

The observations and findings our team obtained from the two case-study towns of Grafton and Wellesley and from the stormwater coalitions gave us insight into what MS4 communities need to consider when implementing the new MS4 permit. In this chapter, we provide our recommendations for small to mid-size communities in Massachusetts to reduce their costs of compliance for the new permit. We also have recommendations for the MassDEP relating to assistance for communities. Note that all the findings referred to within this section are found in Table 3.

Recommendation 1: Massachusetts communities should assess internal staffing needs for the increase in new requirements

We have found that many communities in Massachusetts were understaffed during the current permit, which could cause potential problems for meeting the new MS4 permit requirements (Finding 1). We propose that communities evaluate their current stormwater management program and the new MS4 permit to determine which areas they will need the most resources to address and determine the increase in resources that will be required. The new permit requires additional collaboration between different departments within local government. Staffing in these additional departments should be considered when reviewing the new permit requirements. Communities should assess the quantity of tasks outsourced to consultants as well as the corresponding fees, because it may cost less to hire additional internal staff to complete these tasks. Additionally, communities should consider the technical level required for certain tasks. For example, some communities could cut costs by hiring interns to map outfalls or conduct dry-weather sampling, whereas phosphorus reduction measures may need to be handled by an engineer or consultant. These measures will help communities ensure they are properly staffed to comply with the new requirements, as well as reduce overall labor costs.

Recommendation 2: Communities should allocate enough funding for Good Housekeeping, which can cost over half of the budget for stormwater management

According to the EPA's cost estimates for communities, they anticipate that the Good Housekeeping control measure will account for almost 60% of stormwater funding annually (Figure 6). The Good Housekeeping control measure specifically requires materials costs (i.e. salt, sand, and trucks), street sweeping, building maintenance, and more. Our second finding showed that Good Housekeeping is the control measure with the highest expected cost in the new permit. Therefore, communities need to consider referring to the cost estimates from the EPA when preparing their budget for implementation of the new MS4 Permit. Communities may consider cost saving options, such as switching from sand to salt-sand mixtures during the winter, an approach that helped Grafton reduce costs associated with catch basin cleaning.

Recommendation 3: Communities requiring additional assistance with stormwater management should join a coalition or collaborative if they are not involved in one

We advise that communities consider joining a stormwater coalition. Before doing so, communities should evaluate their current stormwater management program and consider what other assistance a coalition can offer to help. Member communities of stormwater coalitions and other partnerships share cost information, technical products, public education tools, field procedures, documentation, training opportunities, and more. When member communities collaborate in a coalition, redundancy is reduced because the communities no longer need to develop or pay for resources that the coalitions already provide. In Finding 4, we determined that stormwater coalitions are beneficial for aiding communities in meeting regulation requirements. Thus, communities MAY save time in the process of implementing the MS4 permit and managing stormwater while being a part of a coalition. Joining a coalition can especially be helpful for communities without much of a stormwater management program since they can take advantage of the templates and toolkits provided by coalition. Communities that are further developed can add their resources and intelligence (i.e. stormwater management practices) to the coalition for the benefit of the collaboration as a whole. In return, the community can be recognized for their extensive work and will be able to gain access to resources they may not have.

Recommendation 4: Communities that are struggling to finance implementations for the current requirements should consider additional methods of funding for the new permit, such as stormwater utilities and grants

Communities in Massachusetts were struggling with funding the implementation of the MS4 permit and are worried about funding the new permit as well. Finding 5, communities can use additional sources of funding to implement stormwater requirements, gave us knowledge of three important sources for funding, grants, stormwater utilities, and stormwater coalitions that may have funding already (through grants or saved funding). Grants are a good opportunity to improve infrastructure and management for stormwater. Grants also motivate communities to work towards implementation of stormwater regulations as they normally have a deadline that has to be met. Grants are normally applied for by a stormwater coalition that can support their communities effectively with this money in addition to saved funding they may have. Also, grants geared towards stormwater management also support regionalization (of coalitions). The MassDEP provides technical assistance with the 604B Grant for watersheds and water quality in Massachusetts. They have recently awarded the Central Massachusetts Regional Stormwater Coalition with the 604b Grant. Apart from the MassDEP, the Lieutenant Governor of Massachusetts suggested that coalitions in need of extra support should apply for grants under the Community Compact Program, offered by the Massachusetts' government, which currently has five million dollars in grants. Aside from grants, communities can also implement stormwater utilities. Stormwater utilities work well because they free up the municipal budget so

that it can be used for other matters. However, communities should be aware that establishing a stormwater utility can result in political issues. It is difficult to persuade residents and businesses to agree with paying a stormwater utility, especially if large industries lobby against it. In conclusion to this recommendation, note that finding 6, communities do not fully understand the new MS4 permit and therefore cannot finalize their budgets, and finding 6, the cost allocation for IDDE cannot be accurately determined due to the possibility of severe illicit discharges. These findings provide the reasons for why it is vital for communities to secure the funding they need because many communities are not completely sure of how much money they will require and if unforeseen scenarios (i.e. severe illicit discharges) will arise and cost them much more.

Recommendation 5: The MassDEP should update the Stormwater Handbook for the new MS4 Permits to further assist communities with meeting regulations

MS4 communities and coalitions would like to have a standardization of the MS4 permit and the DEP Stormwater Handbook. Finding 8, the MassDEP's Stormwater Handbook is inconsistent with the EPA's new MS4 Permit causing confusion within communities, entailed the reason to why this is an issue and what the communities thought needed to be standardized, which is the quantity of water required on a post-development site. This concern was expressed at the Massachusetts Municipal Statewide Stormwater Coalitions meeting on September, 27th and in a discussion with one of our case study communities. The MassDEP can assist the communities by updating the Stormwater Handbook so that it is consistent with the new MS4 permit. There are inconsistencies for the quantity of required water on a post-development site. Currently the regulations require up to 0.8 inches of rainfall while the handbook requires 1 inch of rainfall. The MassDEP needs clarify which one is the requirement for communities.

Recommendation 6: Stormwater coalitions should compile their Educational Outreach materials and unify them in order to save resources

Many of the stormwater coalitions as well as the communities within them have developed their own sets of educational outreach materials. As indicated in Finding 7, while these materials are useful in educating the public on the negative side effects associated with stormwater pollution and actions that they can take to mitigate these effects, creating these materials is a process that requires a lot of time and money that could be used elsewhere. The EPA estimated that the Public Education and Outreach control measure can cost up to $73,800 for the new permit and take up to 730 hours for suburban communities. By compiling the educational outreach materials it will be easier for communities to find materials that target the audience that they are aiming to address. The new permit requires that communities provide material to four target audiences: residents, businesses, institutions (churches, hospitals), and commercial facilities, developers (construction), and industrial facilities. The communities must then document and assess the effectiveness of the educational programs. It is up to the regulated communities to create their own metric for effectiveness. This creates a wide range as to what

communities would be including in their annual reports. If coalitions are able to distribute a more uniform way of assessing effectiveness then it would save member communities time and allow them to compare their effectiveness in reaching their audiences with other communities.

5.1: Conclusion

In this project, we developed a set of recommendations that communities in Massachusetts could use as guidelines in order to reduce the costs for implementation of the new permit requirements released by the EPA. Considering the early stage of the new MS4 permit, most communities in Massachusetts do not have a fully developed stormwater program at the time of this report. For this reason, they can use this report to understand which issues they may face when they attempt to meet the new permit requirements. They can also utilize the set of recommendations that we provided in this report to identify ways that they can reduce costs and obtain useful resources from working with other communities that will assist them in permit compliance. Additionally, stormwater coalitions can use this report to further understand the needs of their communities and prioritize on finding ways to help communities on these needs first. In this report, we have also mentioned most of the communities' concerns and have suggested recommendations that the MassDEP and the EPA can take into consideration when developing programs that aim to assist communities according to their needs.

For future projects, we would recommend that a detailed investigation of the benefits of stormwater utilities, any overhead in the creation of the utility, as well as any political or social implications that communities may face is conducted. Additionally, a study of various approaches to gauge the effectiveness of outreach materials that communities will use to meet the educational requirement of the new permit would be beneficial to communities and coalitions. Finally, we strongly recommend that future projects conduct cost comparisons between hiring a consulting company or hiring internal employees, considering short term and long term expenses according to the needs of communities, since the new permit requirements will lead to greater costs from consulting companies.

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Appendix A: Summary of Permit Requirements by Control Measure

Minimum Control Measure 1: Public Education and Outreach

New Permit Requirements:
The permittee shall continue to implement the public education program required by the MS4- 2003 permit by distributing educational material to the MS4 community.

1. Additionally, the educational program shall include education and outreach efforts for the following four audiences:
    a. Residents
    b. Businesses institutions (churches, hospitals), and commercial facilities
    c. Developers (construction)
    d. Industrial facilities
2. The permittee shall identify methods that it will use to evaluate the effectiveness of the educational messages and the overall education program. Any methods used to evaluate the effectiveness of the program shall be tied to the defined goals of the program and the overall objective of changes in behavior and knowledge.

Implementation Schedule:

1. The permittee must include (2) educational messages over the permit term to each audience identified above. The distribution of materials to each audience shall be spaced at least a year apart.
2. The permittee must include the evaluation of effectiveness in the annual report.

Minimum Control Measure 2: Public Involvement and Participation

New Permit Requirements:

1. The permittee shall annually provide the public an opportunity to participate in the review and implementation of the SWMP. The permittee shall report on the activities undertaken to provide public participation opportunities. Public participation opportunities may include, but are not limited to: websites, hotlines, clean-up teams, monitoring teams, or an advisory committee.

Implementation Schedule:

1. Annually, beginning year 2.

Minimum Control Measure 3: Illicit Discharge Detection and Elimination

New Permit Requirements:
The permittee shall implement an IDDE program to systematically find and eliminate sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges.

1. The permittee shall identify all known locations where Sanitary Sewer Overflows (SSO)s have discharged to the MS4 within the previous five (5) years. This shall include SSOs resulting, during dry or wet weather, from inadequate conveyance capacities, or where interconnectivity of the storm and sanitary sewer infrastructure allows for communication of flow between the systems.
2. The system map shall be updated within two (2) years of the permit effective date to include the following information:
    a. Outfalls and receiving waters (required by MS4-2003 permit)
    b. Open channel conveyances (swales, ditches, etc.)
    c. Interconnections with other MS4s and other storm sewer systems
    d. Municipally-owned stormwater treatment structures (e.g., detention and retention basins, infiltration systems, bioretention areas, water quality swales, gross particle separators, oil/water separators, or other proprietary systems)
    e. Waterbodies identified by name and indication of all use impairments as identified on the most recent EPA approved Massachusetts Integrated List of waters report
    f. Initial catchment delineations
3. The system map shall be updated annually as the following information becomes available during implementation of catchment investigation procedures. This information must be included in the map for all outfalls within ten (10) years of the permit effective date:
    a. Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
    b. Pipes
    c. Manholes
    d. Catch basins
    e. Refined catchment delineations. Catchment delineations shall be updated to reflect information collected during catchment investigations
    f. Municipal sanitary sewer system (if available)
    g. Municipal combined sewer system (if applicable).
4. The IDDE program shall be recorded in a written (hardcopy or electronic) document. At a minimum this shall include the written procedures for dry weather outfall screening and sampling and for catchment investigations. The permittee shall implement the IDDE program in accordance with the goals and milestones contained in this part.
5. The permittee shall assess and priority rank the outfalls in terms of their potential to have illicit discharges and SSOs and the related public health significance. This ranking will determine the priority order for MA MS4 General Permit 34 screening of outfalls and interconnections.
6. All outfalls/interconnections (excluding Problem and excluded Outfalls) shall be inspected for the presence of dry weather flow
7. The permittee shall, at a minimum, annually provide training to employees involved in IDDE program about the program, including how to recognize illicit discharges and SSOs. The permittee shall report on the frequency and type of employee training in the annual report.

Implementation Schedule:

1. Within one (1) year of the effective date of the permit, the permittee shall develop an inventory of all identified SSOs.
2. The system map shall be updated within two (2) years of the permit date with initial required information.
3. The system map shall be updated within ten (10) years for additional requirements, and annually as information becomes available
4. The written (hardcopy or electronic) IDDE program shall be completed within one (1) year of the effective date of the permit and updated in accordance with the milestones of this part.
5. An initial outfall and interconnection inventory and priority ranking to assess illicit discharge potential based on existing information shall be completed within one (1) year from the effective date of the permit; an updated inventory and ranking will be provided in each annual report thereafter.
6. All outfalls/interconnections (excluding Problem and excluded Outfalls) shall be inspected for the presence of dry weather flow within three (3) years of the permit effective date.
7. Training shall take place at a minimum annually.

Minimum Control Measure 4: Construction Site Stormwater Runoff Control

New Permit Requirements:

1. The permittee shall develop and implement a construction site runoff control program that includes the following elements:
    a. An ordinance or regulatory mechanism that requires the use of sediment and erosion control practices at construction sites. In addition to addressing sediment and erosion control, the ordinance must include controls for other wastes on constructions sites such as demolition debris, litter and sanitary wastes.
    b. Written (hardcopy or electronic) procedures for site inspections and enforcement of sediment and erosion control measures.
    c. Requirements for construction site operators performing land disturbance activities within the MS4 jurisdiction that result in stormwater discharges to the MS4 to implement a sediment and erosion control program that includes BMPs appropriate for the conditions at the construction site
    d. Requirements for construction site operators within the MS4 jurisdiction to control wastes, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes. These wastes may not be discharged to the MS4.
    e. Written procedures for site plan review and inspection and enforcement.

Implementation Schedule:

1. Varying Dates for Implementation
    a. Development of an ordinance or other regulatory mechanism was a requirement of the MS4-2003 permit.The ordinance or other regulatory mechanism required by the MS4-2003 permit shall have been effective by May 1, 2008.
    b. If not already existing, these procedures shall be completed within one (1) year from the effective date of the permit.
    c. Ongoing
    d. Ongoing
    e. If not already existing, the procedures for site plan review and inspection and enforcement shall be completed within one (1) year from the effective date of the permit.

Minimum Control Measure 5: New Permit Requirements: Post Construction Stormwater Management

New Permit Requirements:

Permittees shall develop, implement, and enforce a program to address post-construction stormwater runoff from all new development and redevelopment sites that disturb one or more acres and discharge into the permittees MS4 at a minimum. Permittees authorized under the MS4-2003 permit shall continue to implement and enforce their program and modify as necessary to meet the requirements of this part.

1. The permittee's new development/ redevelopment program shall include sites less than one acre if the site is part of a larger common plan of development or redevelopment which disturbs one or more acre.
2. The permittee shall develop or modify, as appropriate, an ordinance or other regulatory mechanism to contain provisions that are as least as stringent as those outlined in 2.3.6.a.ii.4 of the MS4 Permit
3. The permittee shall require, at a minimum, the submission of as-built drawings. The as-built drawings must depict all on site controls, both structural and non-structural, designed to manage the stormwater associated with the completed site (post construction stormwater management).
4. The permittee shall develop a report assessing current street design and parking lot guidelines and other local requirements that affect the creation of impervious cover.
5. The permittee shall develop a report assessing existing local regulations to determine the feasibility of making, at a minimum, the following practices allowable when appropriate site conditions exist:
    a. Green Roofs
    b. Infiltration Practices
    c. Water Harvesting devices
6. The permittee shall identify a minimum of 5 permittee-owned properties that could potentially be modified or retrofitted with BMPs designed to reduce the frequency, volume, and pollutant loads of stormwater discharges to and from its MS4 through the reduction of impervious area.

Implementation Schedule:

1. Ongoing
2. The permittee's development or modification of regulatory mechanism must occur within two (2) years of the effective date of the permit
3. The as-built drawing must be submitted no later than two (2) years after completion of construction projects.
4. The assessment of current street design and parking lots must occur within four (4) years of the effective date of this permit.
5. The report assessing existing local regulations to determine the feasibility of implementing the BMPS stated above shall be implemented within four (4) years from the effective date
6. The identification of 5 properties appropriate for BMP retrofits must be submitted within four (4) years from the effective date of this permit.

Minimum Control Measure 6: Good Housekeeping and Pollution Prevention for Permittee Owned Operations (Excluding Stormwater Pollution Prevention Plan)

New Permit Requirements:

The permittee shall implement an operations and maintenance program for permittee-owned operations that has a goal of preventing or reducing pollutant runoff and protecting water quality from all permittee-owned operations.

1. The permittee shall develop, if not already developed, written (hardcopy or electronic) operations and maintenance procedures for the municipal activities listed below. These written procedures shall be included as part of the SWMP.
2. The permittee shall develop an inventory of all permittee owned facilities within the categories listed below. The permittee shall review this inventory annually and update as necessary.
    a. Parks and Open Space
    b. Buildings and facilities where pollutants are exposed to stormwater runoff
    c. Vehicles and Equipment
3. The permittee shall establish a written (hardcopy or electronic) program detailing the activities and procedures the permittee will implement so that the MS4 infrastructure is maintained in a timely manner to reduce the discharge of pollutants from the MS4.
4. The permittee shall optimize routine inspections, cleaning and maintenance of catch basins such that the following conditions are met:
    a. Prioritize inspection and maintenance for catch basins located near construction activities (roadway construction, residential, commercial, or industrial development or redevelopment). Clean catch basins in such areas more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings.
    b. Establish a schedule with a goal that the frequency of routine cleaning will ensure that no catch basin at anytime will be more than 50 percent full.
    c. If a catch basin sump is more than 50 percent full during two consecutive routine inspections/cleaning events, the permittee shall document that finding, investigate the contributing drainage area for sources of excessive sediment loading, and to the extent

practicable, abate contributing sources. The permittee shall describe any actions taken in its annual report.

d. For the purposes of this part, an excessive sediment or debris loading is a catch basin sump more than 50 percent full. A catch basin sump is more than 50 percent full if the contents within the sump exceed one half the distance between the bottom interior of the catch basin to the invert of the deepest outlet of the catch basin.
e. The permittee shall document in the SWMP and in the first annual report its plan for optimizing catch basin cleaning, inspection plans, or its schedule for gathering information to develop the optimization plan. Documentation shall include metrics and other information used to reach the determination that the established plan for cleaning and maintenance is optimal for the MS4. The permittee shall keep a log of catch basins cleaned or inspected.
f. The permittee shall report in each annual report the total number of catch basins, number inspected, number cleaned, and the total volume or mass of material removed from all catch basins.

5. The permittee shall establish and implement procedures for sweeping and/or cleaning streets, and permittee-owned parking lots. All streets with the exception of rural uncurbed roads with no catch basins or high speed limited access highways shall be swept and/or cleaned a minimum of once per year in the spring (following winter activities such as sanding).
6. The permittee shall ensure proper storage of catch basin cleanings and street sweepings prior to disposal or reuse such that they do not discharge to receiving MA MS4 General Permit 50 waters.
7. The permittee shall establish and implement procedures for winter road maintenance including the use and storage of salt and sand; minimize the use of sodium chloride and other salts, and evaluate opportunities for use of alternative materials; and ensure that snow disposal activities do not result in disposal of snow into waters of the United States. For purposes of this MS4 Permit, salt shall mean any chloride-containing material used to treat paved surfaces for deicing, including sodium chloride, calcium chloride, magnesium chloride, and brine solutions.
8. The permittee shall establish and implement inspection and maintenance frequencies and procedures for all stormwater treatment structures such as water quality swales, retention/detention basins, infiltration structures, proprietary treatment devices or other similar structures. All permittee-owned stormwater treatment structures (excluding catch basins) shall be inspected annually at a minimum.

Implementation Schedule:

1. The written operations and maintenance procedures for municipal activities must be developed within two (2) year of the effective date of this permit.
2. The inventory of all permittee owned facilities must be developed within two (2) year of the effective date of this permit.
3. The written operations and maintenance procedures for MS4 infrastructure must be developed within two (2) year of the effective date of this permit.
4. Annually
5. Annually

6. Annually
7. Not Provided
8. Ongoing

Appendix B: Table of EPA Cost Estimates

Suburban Community		2003				2014			
Minimum Control Measure		Cost		Hours		Cost		Hours	
		Low	High	Low	High	Low	High	Low	High
Public Education		$3,000	$40,500	30	400	$11,200	$73,800	112	730
Public Participation		$7,000	$14,000	60	120	$9,000	$17,000	80	150
IDDE		$37,500	$65,100	370	619	$86,900	$267,000	806	2510
Construction Site Control		$4,200	$21,600	32	96	$4,200	$21,600	32	96
Post Construction Site Control		$6,000	$12,000	40	80	$21,200	$38,400	182	324
Good Housekeeping	Rented Trucks	$26,000	$383,000	72	84	$278,000	$557,000	602	1190
	Purchased Trucks	$307,000	$678,000	72	84	$390,000	$852,000	602	1190
Total[2]	Rented Trucks	**$124,000**	**$602,000**	**996**	**2140**	**$454,000**	**$1,060,000**	**2210**	**5750**
	Purchased Trucks	**$405,000**	**$897,000**	**996**	**2140**	**$556,000**	**$1,350,000**	**2210**	**5750**

Source: https://www3.epa.gov/region1/npdes/stormwater/ma/ma-stormwater-program-cost-evaluation.pdf

[2] Total includes cost for additional material submitted with annual report as well as cost to draft the report

Appendix C: Summary of Coalitions

Coalition	Current Program
Central Massachusetts Regional Stormwater Coalition	The Central Massachusetts Regional Stormwater Coalition currently has thirty-one member communities. They provide their communities with Stormwater Pollution Prevention Plan templates, Outreach Materials, Best Management Practices Toolkits, water quality sampling kits, workshops and trainings, and more. In addition, they are helping their communities save money in different ways such as introducing consistency in inspections and partnering with DEP and the EPA.
Northern Middlesex Stormwater Collaborative	The Northern Middlesex Stormwater Collaborative currently has thirteen communities. They provide training to staff for good housekeeping, Best Management Practices, and illicit discharge detection and elimination. In addition, they are assisting with mapping catchment areas and have a good focus on education and outreach.
Merrimack Valley Stormwater Collaborative	The Merrimack Valley Stormwater Collaborative currently has fifteen communities and are working with the New England Environmental Finance Center to discuss Best Management Practices as well as financing for implementing stormwater regulations among member communities.
Neponset Valley Regional Stormwater Collaborative	The Neponset Valley Regional Stormwater Collaborative currently have nine member communities along with the Metropolitan Area Planning Council and Neponset River Watershed Association. They are drafting a two to three page summary of the permit as requested by communities. They are providing members with a model Notice of Intent and a template for a five-year plan for stormwater regulation implementation.They are also helping with cost-estimation for the new MS4 permit to communities..
Southeast Regional Services Group	The Southeast Regional Services Group currently has twenty member communities and some communities are in the Neponset Valley Regional Stormwater Collaborative as well. They are going to bid for Department of Public Works Services and will hatch catch basin cleaning specifications. They have over $5 million in grants for community compact program.
Connecticut River Stormwater Committee	The Connecticut River Stormwater Committee currently has thirteen member communities, but will have sixteen soon. They work primarily on education and outreach for stormwater management. Their communities want additional work on education, illicit discharge detection and elimination, and pre-construction.

Table 4: Description of Current Program for Each Massachusetts Stormwater Coalition (Massachusetts Statewide Municipal Stormwater Coalition, 2016).

Appendix D: Table of Methodology Summary

Objectives	**Methods**	**Sources**
Completed examination of Grafton and Wellesley to illustrate their current status, motivations, available and required resources, and needs to meet the MS4 requirements.	● Interviewed Wellesley and Grafton town officials ● Gathered cost-based documents and information from Wellesley and Grafton ● Gathered documents and information related to stormwater permit implementation from Wellesley and Grafton	● Department of Public Works (DPW) officials ● Town officials ● Annual Reports ● Receipts from consultants
Identified usage of resources and stormwater management in coalition member communities.	● Interviewed representatives of stormwater coalitions ● Gathered cost-based documents and information from coalitions ● Gathered documents and information related to stormwater permit implementation from coalitions	● Department of Public Works (DPW) officials ● Town officials ● Coalition members ● Coalition meetings ● Annual reports
Analyzed and summarize current information and guidelines in relation to resources and needs for communities	● Analyzed cost-based documents ● Analyzed documents related to stormwater permit implementation ● Compiled findings on stormwater management	● Annual reports and public documents ● Department of Public Works (DPW) officials
Provided guidelines on measures for permit compliance.	● Displayed trends in findings on stormwater management ● Created recommendations based off of our findings ● Generalized our recommendations for use in other towns	● Contacts within coalitions ● Analysis of resource usage and stormwater management

Appendix E: Interview Questions for the Town of Wellesley

- What's the history behind stormwater management in Wellesley?
- Have you had any complications meeting the regulations?
    - If so, how were they overcome?
    - Were any organizations or government associations created/developed as a result?
- Are there any local motivators for your community? Such as preservation of historic locations, wildlife protection, business dependencies, etc.
- What measures have been taken for community outreach?
    - Did certain measures prove to be more effective than others?
- How do you enforce the minimum control measures (IDDE, Construction/Post Construction)?
- What roles do the different departments in the local government play in stormwater management?
- Is your community involved with any of the Massachusetts stormwater coalitions or collaboratives?
    - If so, how has this interaction made an impact on stormwater management for you?
- Did your community make any preparations in anticipation of the new MS4 regulations before they were released?
    - If so, what preparations? Did you target a specific control measure or action item?
    - If not, why?
- Did your community exceed the prior regulations?
    - If so, in what area(s)?
    - What was the motivation for exceeding?
- Is your community already working on the NOI in anticipation of the new regulations?
    - If so, what has been completed?
- What methods did your town use in order to meet the IDDE control measure for the current permit?
    - Did your town exceed the requirements for this control measure?
- What aspects of the current MS4 Permit were difficult/challenging for your town to meet?
- We see in your estimates that Good Housekeeping makes up about 60 percent of your estimated budget. Are there any ways that you would be able to lower these costs?
- Ask for GIS information to gauge size of stormwater systems (from Wellesley)
- The 2014 Annual Report states that your town was experiencing sediment control problems. Has your town established a plan to overcome these problems currently or perhaps for the new permit?
- How effective is your stormwater hotline? How do you know?
- How successful has the Morse Pond Maintenance and Beach Restoration Project been? Were there any complications your town faced with this project?

Appendix F: Interview Questions for the Town of Grafton

- What's the history behind stormwater management in Grafton?
- Have you had any complications meeting the regulations?
    - If so, how were they overcome?
    - Were any organizations or government associations created/developed as a result?
- What has your inspiration been for excelling in stormwater management?
- Are there any local motivators for your community? Such as preservation of historic locations, wildlife protection, business dependencies, etc.
- What measures have been taken for community outreach?
    - Did certain measures prove to be more effective than others?
- What is your approach on completing administrative requirements (i.e. drafting the annual reports) for the permit?
- Which of the six minimum control measures do you need help with the most?
- How do you enforce the minimum control measures (IDDE, Construction/Post Construction)?
- What roles do the different departments in the local government play in stormwater management?
- How involved is your community with the Central Massachusetts Stormwater Coalition? Has this interaction made an impact on stormwater management for you?
- Did your community make any preparations in anticipation of the new MS4 regulations before they were released?
    - If so, what preparations? Did you target a specific control measure or action item?
    - If not, why?
- Did your community exceed the prior regulations?
    - If so, in what area(s)?
    - What was the motivation for exceeding?
- Is your community already working on the NOI in anticipation of the new regulations?
    - If so, what has been completed?
- What methods did your town use in order to meet the IDDE control measure for the current permit?
    - Did your town exceed the requirements for his control measure?
- What aspects of the current MS4 Permit were difficult/challenging for your town to meet?
- Does Grafton face any complications when it comes to catch basin cleaning?
- Does your town plan on reaching out to the Sudbury Assabet Concord Community Council's Water Quality/Water Quantity Sub-committee for the new permit?
    - If so, for what services?
- Does your town require any more GIS mapping for the new MS4 Permit?
    - The 2014 annual report says that your town exceeds mapping requirements. What did you do to exceed?

- How successful were your previous public events (Bookmarks, clean-up event, Arbor Day tree planting)?
    - Did these events help increase public awareness significantly?
    - Do you think the awareness has made a difference in your community?
- We noticed in your 2006 annual report the number of methods you took for public outreach, from flyers at voting polls to contests in school district- what was the motivation to go above and beyond?
    - Also in 2006 permit was mentions of construction complaints/concerns from public- what was typically received?
- How effective has stormwater management been for Flint Pond?

Appendix G: Interview Questions for Neponset Stormwater Collaborative

- What benefits does your coalition provide member communities? (Ex: BMP documentation, cost estimation documents, guidelines for different control measures, education/outreach materials, etc.)
- Overall, how are your member communities doing with complying to the current MS4 permits?
    - Is there any specific control measure they were struggling with?
- Have you found communities that have been successful in meeting/surpassing the prior permit requirements?
    - Which communities?
    - Are you aware of any motivations that the communities may have had?
- Do you have any guidelines in the works that will be released to communities on the changes in IDDE/Good housekeeping?
    - Any examples of how they can manage these control measures?
- Are you thinking about providing assistance for the new annual permit which will be more extensive?
- Do some of your communities have an estimate as to how much compliance will cost for the new MS4 permit?
    - If so, which communities?
- What type of assistance from the EPA/DEP do you think that member communities would benefit the most from?
- You wrote an article that Milton recently got a stormwater utility- can you tell us much about this process?
    - Any political challenges they faced getting approval?
- Was your coalition an influence on Milton pursuing a stormwater utility?
- Are there any hidden or overhead costs with implementing the utility that some communities might not be expecting?

Appendix H: Stormwater Utilities Questions for Steven McCurdy, Director of Municipal Services at the MassDEP

- What are the opinions of residents of towns towards stormwater utilities? How about businesses, industries, companies, etc.?
    - How much do they know about the importance of meeting stormwater regulations and does that correlate with willingness to pay stormwater utilities?
- Which towns in Massachusetts currently have stormwater utilities?
    - How successful has it been?
    - Does it help with implementing stormwater regulations significantly?
    - Are there any overhead costs with implementing the utility that some communities might not be expecting?
- It seems like many other states have a higher adoption rate for stormwater utilities, is there any reason why Massachusetts might be different?
- Ian Cooke of the Neponset River Watershed Association mentioned the process of the creation of Milton's stormwater utility was rather uncommon, can you give any further insight to any political/economical challenges that were faced?
    - What were the overhead and labor costs for creating a utility?
    - Does it work well enough in a mostly-residential area?
    - Were there any major businesses in Milton?
        - Did they have any pushback?
    - Would the utility be more effective in a more commercial area?
        - Would any political concerns apply?
    - Did Curry College have/cause any influence in the creation of the utility?