

ANNUAL TOWN MEETING  
MAY 2021  
ARTICLE 17

The Town of Saugus was required to submit a Notice of Intent Implementation Plan to meet the requirements of the General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts (MS4 Permit).

The Town has hired the engineering firm – Arcadis to perform an evaluation of the cost to meet the compliance requirements of the permit. The estimated cost to comply with the permit is \$1,200,000.00.

This appropriation is for a borrowing authorization in the amount of \$1,200,000.00.

Town of Saugus, Massachusetts  
**MS4 Requirements and Consultant Costs Summary by Year**

<b>YEAR 2 (July 1, 2019 - June 30, 2020)</b>	
Outfalls, Catchment Area investigations, Mapping Updates (work we should have gotten to in Yr 2)	\$ 110,000
<b>TOTAL YEAR 2 STILL NEEDED</b>	<b>\$ 110,000</b>

<b>YEAR 3 (July 1, 2020 - June 30, 2021)</b>	
Public Education Materials Development	\$ 3,000
Public Meeting Support	\$ 2,000
Outfalls, Catchment Area investigations, Mapping Updates	\$ 160,000
BEGIN Reports for Street Design, Green Infrastructure, BMP Retrofits	\$ 30,000
MS4 Treatment Structures inspection (includes inventory research, inspection by Arcadis, plan for future clear	\$ 70,000
Annual Training of staff, SWPPP and SWMP Updates, Annual Report	\$ 21,000
<b>TOTAL YEAR 3</b>	<b>\$ 286,000</b>

<b>YEAR 4 (July 1, 2021 - June 30, 2022)</b>	
Public Education Materials Development	\$ 9,000
Public Meeting Support	\$ 2,000
Catchment Area investigations, Mapping Updates, Wet Weather Sampling	\$ 160,000
Finish Reports for Street Design, Green Infrastructure, BMP Retrofits	\$ 25,000
MS4 Treatment Structures inspection (annual Inspection by Arcadis, some Cleaning By Contractor)	\$ 60,000
Annual Training of staff, SWPPP and SWMP Updates, Annual Report	\$ 21,000
<b>TOTAL YEAR 4</b>	<b>\$ 277,000</b>

<b>YEAR 5 (July 1, 2022 - June 30, 2023)</b>	
Public Education Materials Development	\$ 3,000
Public Meeting Support	\$ 2,000
Catchment Area investigations, Mapping Updates, Wet Weather Sampling	\$ 180,000
BMP Retrofits	\$ 30,000
MS4 Treatment Structures inspection (annual Inspection by Arcadis, some Cleaning By Contractor)	\$ 60,000
Annual Training of staff, SWPPP and SWMP Updates, Annual Report	\$ 21,000
<b>TOTAL YEAR 5</b>	<b>\$ 296,000</b>

<b>YEAR 2 - 5 (July 1, 2019 - June 30, 2023)</b>	
Additional IDDE Investigations	\$ 231,000
<b>TOTAL YEAR 2 - 5</b>	<b>\$ 231,000</b>

<b>GRAND TOTAL YEAR 2 - 5</b>	<b>\$ 1,200,000</b>
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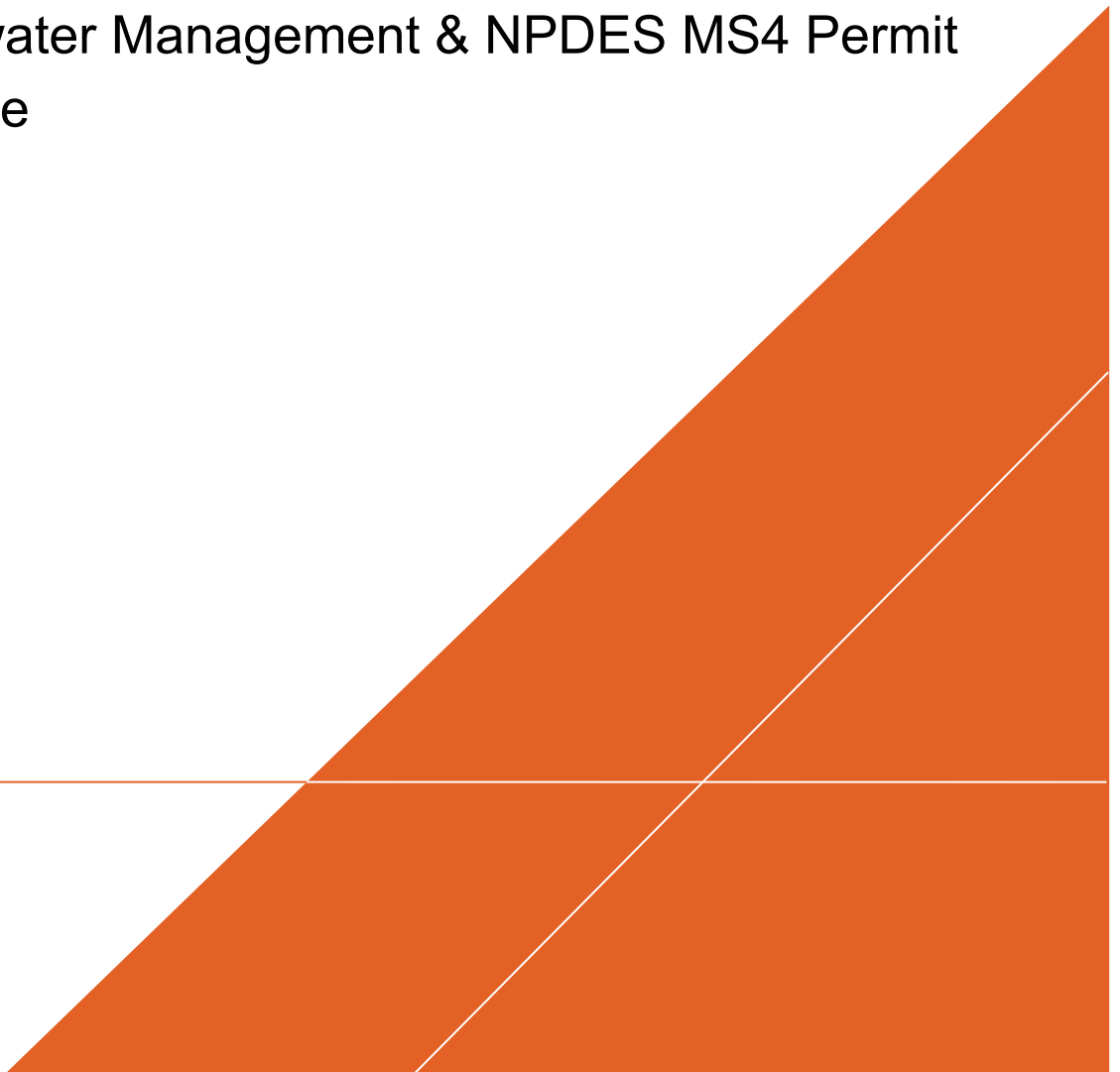


Town of Saugus, Massachusetts  
Department of Public Works

# **NOI IMPLEMENTATION PLAN**

for Stormwater Management & NPDES MS4 Permit  
Compliance

July 11, 2019



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## ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
DMP	Drainage Master Plan (project)
IDDE	Illicit Discharge Detection and Elimination
GIS	Geographic Information System
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
SWPPP	Stormwater Pollution Prevention Plans

## 1 INTRODUCTION

The Town of Saugus recently submitted a Notice of Intent (NOI) to meet the requirements of the General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts (MS4 Permit) issued by the EPA and made effective July 1, 2018. The permit term is 5 years; permit expiration is on June 30, 2022.

The objective of this plan is to present the anticipated costs of MS4 permit compliance over the next 5 years. Permit years coincide with the municipal fiscal year and run from July 1st to June 30<sup>th</sup> each year.

The MS4 Permit categorizes requirements into six Minimum Control Measures (MCM) such as Public Education, Illicit Discharge Detection and Elimination, Construction Site Runoff Control, etc. The Town identified the specific best management practices (BMPs) under each MCM for compliance with the permit. These BMPs are listed in the Town's NOI and include items such as sending out educational brochures or conducting outfall inspections.

Arcadis performed an evaluation of the costs required on an annual basis to meet each of the BMPs listed in the NOI. The costs presented include costs for Town personnel, consultants, and contractors to complete the work.

Arcadis' opinion of anticipated permit compliance cost is made on the basis of our experience and qualifications and represents our judgement as an experienced and qualified professional engineering firm, familiar with the MS4 permits. The current MS4 permit contains new requirements for Massachusetts municipalities and the community's program for permit compliance will be evolving as the Town learns more through the required mapping and field investigations, information provided by the EPA, DEP and stormwater coalitions, and other sources. As such, the costs may need to be updated from time to time to reflect changes in the stormwater compliance program.

Cost tables can be found in Section 2 of this plan. Sections 3 through 8 provide additional explanation of the permit requirements and information taken into consideration during development of the costs for each MCM.

## 2 MS4 PERMIT COMPLIANCE COSTS

Table 1 presents the overall program costs. The table is organized by MCM and BMP ID number and provides descriptions for each BMP. The table also provides the schedule for start and end of each permit requirement, and costs for town employees, consultants, and contractors as well as equipment and materials. Table 1 presents an estimated “Total for Labor Materials and Equipment” which is to be considered the base annual cost for the item. Further to the right in the table are 5 columns which represent the 5 years of the permit term. In these five columns, we have provided an estimate of when the costs would be incurred based on the scheduled duration of the BMP and expected effort for each year that the BMP is scheduled. For example, the residential stormwater pollution prevention brochure (BMP 1-1) was sent out in Permit Year 1 and will be posted on the Town’s website but will not be developed and mailed out in any other years, so the cost only appears under Permit Year 1, whereas updates to GIS mapping (BMP 3-3) are anticipated to be necessary throughout the permit term, and therefore the annual cost is listed under each of the 5 years of the permit term.

Table 2 presents only the recurring costs (annual costs).

Table 1. Overall Stormwater Management Program Costs for MS4 Compliance

MCM	BMP ID	BMP Name	BMP Description	Schedule to Start (Permit Year)	Deadline (Permit Year)	Number of Employees: DPW Director or Senior Staff (web updates)	Number of Employees: DPW Operations	Duration (hours per year per employee)	Total hours per year	Rate (per man-hour)	Equipment and Materials	Consultant/ Contractor	Total Labor Cost	Total Equipment & Materials Cost	Total Consultant/ Contractor Cost	Total for Labor, Materials and Equipment (base annual)	2018 Permit Year 1 7/1/18-6/30/19	2019 Permit Year 2 7/1/19-6/30/20	2020 Permit Year 3 7/1/20-6/30/21	2021 Permit Year 4 7/1/21-6/30/22	2022 Permit Year 5 7/1/22-6/30/23
Public Education	1-1	Residential Stormwater Pollution Prevention Brochure <i>Target Audience: Residents</i>	Develop and distribute Stormwater Pollution Prevention Brochure for target audience: residents. Distribute to all water/sewer account holders. <i>Media: Brochure Mailing</i>	2018 (PY1)	2018 (PY1)	1		4	4	\$ 70.00	\$ 10,000	\$ 13,000	\$ 280	\$ 10,000	\$ 13,000	\$ 23,280	\$ 23,280				
Public Education	1-2	Fact sheet on Stormwater Pollution Prevention for Businesses / Institutions / Commercial Facilities <i>Target Audience: Businesses, Institutions, Commercial Facilities</i>	Develop and publish fact sheet on Stormwater Pollution Prevention for target audience: Businesses / Institutions / Commercial Facilities <i>Media: Website</i>	2019 (PY2)	2019 (PY2)	1		4	4	\$ 70.00	\$ -	\$ 3,000	\$ 280	\$ -	\$ 3,000	\$ 3,280		\$ 3,280			
Public Education	1-3	Stormwater Bylaw, Regulations, and Permitting Fact sheet and checklists for Developers. <i>Target Audience: Developers</i>	Develop and publish fact sheet and checklists to educate developers on how to comply with Town's Stormwater Bylaw, Regulations, and Permitting procedures. Continue to send (by inclusion in the packet) a standard letter for developments which includes language on stormwater compliance in new and redevelopment. <i>Media: Hard copy handouts to project proponents</i>	2018 (PY1)	2018 (PY1) Annual thereafter	1		4	4	\$ 70.00	\$ 5,000	\$ 3,000	\$ 280	\$ 5,000	\$ 3,000	\$ 8,280	\$ 8,280	\$ 8,280	\$ 8,280	\$ 8,280	\$ 8,280
Public Education	1-4	Fact Sheet on Stormwater Pollution Prevention for Industrial Sites <i>Target Audience: Industrial Facilities</i>	Develop and publish a fact sheet on Stormwater pollution prevention for industrial sites. <i>Media: Website</i>	2019 (PY2)	2019 (PY2)	2		4	8	\$ 70.00	\$ -	\$ 3,000	\$ 560	\$ -	\$ 3,000	\$ 3,560		\$ 3,560			
Public Education	1-5	MWRA School Outreach Program <i>Target Audience: Residents</i>	Utilize MWRA School Outreach Program for one classroom presentation on stormwater in each elementary school. <i>Media: School Program</i>	2021 (PY4)	2021 (PY4)	2		6	12	\$ 70.00	\$ -	\$ -	\$ 840	\$ -	\$ -	\$ 840				\$ 840	
Public Education	1-6	Snow Removal and Deicing Brochures/Pamphlets <i>Target Audience: Businesses, Institutions, Commercial Facilities</i>	Develop and distribute a pamphlet on property management and snow removal/deicing best practices to businesses registered with the Chamber of Commerce. <i>Media: Brochure mailing</i>	2021 (PY4)	2021 (PY4)	2		6	12	\$ 70.00	\$ 5,000	\$ 3,000	\$ 840	\$ 5,000	\$ 3,000	\$ 8,840				\$ 8,840	
Public Education	1-7	Low Impact Development Brochures/Pamphlets <i>Target Audience: Developers</i>	Develop and distribute a pamphlet on Low Impact Development to development/redevelopment proponents in Town. <i>Media: Hard copy handouts to project proponents</i>	2020 (PY3)	2020 (PY3)	3		6	18	\$ 70.00	\$ 5,000	\$ 3,000	\$ 1,260	\$ 5,000	\$ 3,000	\$ 9,260			\$ 9,260		
Public Education	1-8	Auto Repair/Maintenance Shops stormwater pollution prevention press release. <i>Target Audience: Industrial Facilities</i>	Develop and distribute press release on stormwater pollution prevention for Auto Repair / Maintenance shops. <i>Media: Newspaper / Website</i>	2021 (PY4)	2021 (PY4)	2		6	12	\$ 70.00	\$ -	\$ 3,000	\$ 840	\$ -	\$ 3,000	\$ 3,840				\$ 3,840	
Public Education	1-9	Pet Waste Brochure distributed annually to dog owners. (Bacteria TMDL) <i>Target Audience: Residents (Dog Owners)</i>	Annually, develop and distribute a pet waste brochure to dog owners at the time of dog license renewal. <i>Media: Hard copy handouts/mailers to dog owners</i>	2019 (PY2)	Annual	3		4	12	\$ 70.00	\$ 5,000	\$ 3,000	\$ 840	\$ 5,000	\$ 3,000	\$ 8,840		\$ 8,840	\$ 8,840	\$ 8,840	\$ 8,840
Public Education	1-10	Septic System Maintenance Brochure distributed to septic system owners. (Bacteria TMDL) <i>Target Audience: Residents (Septic System Owners)</i>	Develop and distribute a septic system maintenance brochure to septic system owners. <i>Media: Brochure mailing or letter</i>	2019 (PY2)	2019 (PY2)	3		4	12	\$ 70.00	\$ 5,000	\$ 3,000	\$ 840	\$ 5,000	\$ 3,000	\$ 8,840		\$ 8,840			
Public Education	1-11	Continue to maintain signs for pet waste cleanup at schools and parks. <i>Target Audience: Residents (Dog Owners)</i>	Continue to maintain signs for pet waste cleanup at schools and parks.	2018 (PY1)	Annual		2	16	32	\$ 50.00	\$ 1,000	\$ -	\$ 1,600	\$ 1,000	\$ -	\$ 2,600	\$ 2,600	\$ 2,600	\$ 2,600	\$ 2,600	\$ 2,600
Public Participation	2-1	SWMP Review / Website	Allow annual review of Stormwater Management Program and posting of stormwater management program on website.	2018 (PY1)	Annual	2		16	32	\$ 70.00	\$ -	\$ 2,000	\$ 2,240	\$ -	\$ 2,000	\$ 4,240	\$ 4,240	\$ 4,240	\$ 4,240	\$ 4,240	\$ 4,240
Public Participation	2-2	Public Meeting - Stormwater	Allow public to comment on Stormwater Management Program annually.	2018 (PY1)	Annual	3		12	36	\$ 70.00	\$ 500	\$ 2,000	\$ 2,520	\$ 500	\$ 2,000	\$ 5,020		\$ 10,040	\$ 5,020	\$ 5,020	\$ 5,020
IDDE	3-1	Legal Authority (Bylaw)	Bylaw to prohibit non-stormwater Discharges must be in place.	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 6,300	\$ 560	\$ -	\$ 6,300	\$ 6,860	\$ 6,860				
IDDE	3-2	Sanitary Sewer Overflows (SSOs) Inventory	Prepare inventory of all identified Sanitary Sewer Overflows (SSOs)	2018 (PY1)	2018 (PY1) Annual updates	2		8	16	\$ 70.00	\$ -	\$ 3,000	\$ 1,120	\$ -	\$ 3,000	\$ 4,120	\$ 4,120	\$ 4,120	\$ 4,120	\$ 4,120	\$ 4,120
IDDE	3-3	Stormwater System Map	Develop/update a map of the entire stormwater system	2018 (PY1)	2019 (PY2) Annual updates	2		8	16	\$ 70.00	\$ -	\$ 20,000	\$ 1,120	\$ -	\$ 20,000	\$ 21,120		\$ 42,240	\$ 21,120	\$ 21,120	\$ 21,120
IDDE	3-4	Written IDDE Program document	Initial document, annual review	2018 (PY1)	2018 (PY1) Annual updates	2		8	16	\$ 70.00	\$ -	\$ 7,000	\$ 1,120	\$ -	\$ 7,000	\$ 8,120	\$ 8,120	\$ 8,120	\$ 8,120	\$ 8,120	\$ 8,120
IDDE	3-4	Outfall and interconnection inventory	Complete an outfall and interconnection inventory of all outfalls each year	2018 (PY1)	2018 (PY1) Annual updates	1		8	8	\$ 70.00	\$ -	\$ 4,000	\$ 560	\$ -	\$ 4,000	\$ 4,560	\$ 4,560	\$ 4,560	\$ 4,560	\$ 4,560	\$ 4,560
IDDE	3-4	Catchment Area Delineation and Ranking.	Delineate the catchment area tributary to each outfall and rank each catchment as "excluded", "problem", "high priority", or "low priority" for its potential to have illicit discharges and SSO's. Assume 300 catchments to delineate and prioritize	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 7,000	\$ 560	\$ -	\$ 7,000	\$ 7,560	\$ 7,560				
IDDE	3-4	Systematic Written Procedure to investigate each catchment area.	Develop a systematic written procedure to investigate each catchment area: Identify maps/plans, include manhole inspection methodology, establish procedure to isolate and confirm sources of illicit discharges. Written procedure due year 1.	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 1,000	\$ 560	\$ -	\$ 1,000	\$ 1,560	\$ 1,560				
IDDE	3-4	Eliminate detected illicit discharges	Eliminate detected illicit discharges as expeditiously as possible. If elimination is not possible within 60 days of detection, develop a schedule for elimination and report the dates of identification and schedule for removal within the Annual Report. Assumes two issues per year, time for DPW Director to complete enforcement actions and time for DPW Operations to remove discharge (if not removed by owner). Assumes blended DPW rate of \$56.00/hour.	2018 (PY1)	Annual	1	2	40	120	\$ 56.00	\$ 5,000	\$ 15,000	\$ 6,720	\$ 5,000	\$ 15,000	\$ 26,720		\$ 53,440	\$ 26,720	\$ 26,720	\$ 26,720
IDDE	3-5	Train employees annually about the IDDE Program	Conduct 1 training annually	2018 (PY1)	2018 (PY1) Annual thereafter	1	19	4.5	90	\$ 56.00	\$ 1,000	\$ 5,000	\$ 252	\$ 1,000	\$ 5,000	\$ 6,252		\$ 12,504	\$ 6,252	\$ 6,252	\$ 6,252



Table 1. Overall Stormwater Management Program Costs for MS4 Compliance

MCM	BMP ID	BMP Name	BMP Description	Schedule to Start (Permit Year)	Deadline (Permit Year)	Number of Employees: DPW Director or Senior Staff (web updates)	Number of Employees: DPW Operations	Duration (hours per year per employee)	Total hours per year	Rate (per man-hour)	Equipment and Materials	Consultant/ Contractor	Total Labor Cost	Total Equipment & Materials Cost	Total Consultant / Contractor Cost	Total for Labor, Materials and Equipment (base annual)	2018 Permit Year 1 7/1/18-6/30/19	2019 Permit Year 2 7/1/19-6/30/20	2020 Permit Year 3 7/1/20-6/30/21	2021 Permit Year 4 7/1/21-6/30/22	2022 Permit Year 5 7/1/22-6/30/23
IDDE	3-6	Dry weather screening of outfalls	Perform dry weather screening and sampling (where flowing) of every MS4 outfall and Interconnection (except excluded and problem catchments) within 3 years of the permit effective date. Permittee may rely on screening conducted under the MS4-2003 permit, EPA enforcement action, or by the state or EPA to the extent that it meets the requirements under this permit. Submit all screening data with Annual Report. Assume re-screening of each outfall and interconnections (~300).  Costs here also include the cost of catchment area investigations. Assumes opening and inspection of key junction manholes during dry weather investigations, per permit requirements.	2018 (PY1)	2020 (PY3)	1		8	8	\$ 70.00	\$ -	\$ 58,000	\$ 560	\$ -	\$ 58,000	\$ 58,560	\$ 30,000	\$ 58,560	\$ 58,560	\$ 58,560	\$ 58,560
IDDE	3-6	Follow-up ranking of outfalls and interconnections.	Follow-up ranking of outfalls and interconnections based on findings. Updated ranking due year 3.	2019 (PY2)	2020 (PY3)	1		8	8	\$ 70.00	\$ -	\$ 10,000	\$ 560	\$ -	\$ 10,000	\$ 10,560		\$ 10,560	\$ 20,000		
IDDE	3-7	Ongoing screening of each catchment once every 5 years.	Annually select # of catchments to screen. (Begin screening in Permit Year 6)	2024 (PY6)	Annual	1		8	8	\$ 70.00	\$ -		\$ 560	\$ -	\$ -	\$ 560	\$ 560	\$ 560	\$ 560	\$ 560	\$ 560
IDDE	3-8	Identify System Vulnerability Factors and conduct Wet Weather Screening	Evaluate each catchment area for System Vulnerability Factors and document them. For all catchments with minimum of one SVF identified, inspect and sample under wet weather conditions to the extent necessary to determine whether wet weather-induced high flows in sanitary sewers or high groundwater in septic system areas result in discharges to the MS4. Initial documentation of SVFs and ongoing investigations	2018 (PY1)	1 / Annual	1		8	8	\$ 70.00	\$ -	\$ 12,000	\$ 560	\$ -	\$ 12,000	\$ 12,560		\$ 18,000	\$ 12,560	\$ 12,560	\$ 12,560
Construction Runoff	4-1	Bylaw to require sediment and erosion control must be in place.	Town needed bylaw under 2003 permit. Recently completed.	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 6,300	\$ 560	\$ -	\$ 6,300	\$ 6,860	\$ 6,860				
Construction Runoff	4-2	Site Plan Review Procedures	Written procedures for site plan review. Annually review	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 3,500	\$ 560	\$ -	\$ 3,500	\$ 4,060	\$ 4,060	\$ 3,500	\$ 3,500	\$ 3,500	\$ 3,500
Construction Runoff	4-2	Construction site requirements for erosion and sediment control.	Requirements for construction site operators to implement a sediment and erosion control program on construction site. Annually review	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 8,000	\$ 560	\$ -	\$ 8,000	\$ 8,560	\$ 8,560				
Construction Runoff	4-3	Site inspection and enforcement procedures (erosion control measures).	Written procedures for site inspections and enforcement of erosion control measures. Annually review	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 4,000	\$ 560	\$ -	\$ 4,000	\$ 4,560	\$ 4,560	\$ 4,000	\$ 4,000	\$ 4,000	\$ 4,000
Construction Runoff	4-4	Construction site requirements for control of wastes.	Requirements for construction site operators to control wastes at the site. Annually review	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 4,000	\$ 560	\$ -	\$ 4,000	\$ 4,560	\$ 4,560				
New Development & Redevelopment	5-1	Bylaw to address post-construction runoff in new development and redevelopment must be in place	Town needed bylaw under 2003 permit. Recently completed.	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 4,000	\$ 560	\$ -	\$ 4,000	\$ 4,560	\$ 4,560				
New Development & Redevelopment	5-2	Report assessing current street design and parking lot guidelines.	Prepare a report assessing current street design and parking lot guidelines and whether changes to design standards to support low impact design options are feasible.	2020 (PY3)	2021 (PY4)	1		20	20	\$ 70.00	\$ -	\$ 10,000	\$ 1,400	\$ -	\$ 10,000	\$ 11,400			\$ 11,400	\$ 11,400	
New Development & Redevelopment	5-3	Prepare a report assessing green infrastructure practices.	Prepare a report assessing the feasibility of making the following infrastructure practices allowable: green roofs, infiltration practices and water harvesting devices.	2020 (PY3)	2021 (PY4)	1		20	20	\$ 70.00	\$ -	\$ 10,000	\$ 1,400	\$ -	\$ 10,000	\$ 11,400			\$ 11,400	\$ 11,400	
New Development & Redevelopment	5-4	BMP Retrofit Program for Permittee-owned property	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.  Install retrofit(s) and continue to maintain list of 5 properties until all properties w/ potential modifications have been retrofitted	2019 (PY2)	2021 (PY4)	1		20	20	\$ 70.00	\$ -	\$ 30,000	\$ 1,400	\$ -	\$ 30,000	\$ 31,400		\$ 15,000	\$ 20,000	\$ 25,000	\$ 30,000
New Development & Redevelopment	5-4	BMP Retrofit Program for Permittee-owned property	Annually report on MS4-owned and private property and infrastructure that have been retrofitted with BMPs to mitigate impervious area and directly connected impervious area	2018 (PY1)	Annual	1		8	8	\$ 70.00	\$ -	\$ 5,000	\$ 560	\$ -	\$ 5,000	\$ 5,560	\$ 5,560	\$ 5,560	\$ 5,560	\$ 5,560	\$ 5,560
New Development & Redevelopment	5-5	Long-term O&M and As-Built Plan Submission Requirements	Submission of as-built plans upon completion of construction projects and submission of procedures to ensure long-term O&M of stormwater BMPs	2018 (PY1)	2019 (PY2)	2		8	16	\$ 70.00	\$ -	\$ 6,000	\$ 1,120	\$ -	\$ 6,000	\$ 7,120	\$ 7,120				
New Development & Redevelopment	5-6	Amend bylaw to contain new provisions	New MS4 permit requirements must be written into updated bylaw/regulations. Recently completed.	2018 (PY1)	2019 (PY2)	1		24	24	\$ 70.00	\$ -	\$ 9,300	\$ 1,680	\$ -	\$ 9,300	\$ 10,980	\$ 10,980				
Good Housekeeping	6-1 through 6-3	Written O&M procedures.	Develop written O&M procedures for parks, municipal buildings and facilities, vehicles and equipment, roadway and storm systems. Assume 90 audits of municipal facilities.	2018 (PY1)	2019 (PY2)	2		16	32	\$ 70.00	\$ -	\$ 68,000	\$ 2,240	\$ -	\$ 68,000	\$ 70,240		\$ 70,240			
Good Housekeeping	6-1 through 6-3	Inventory of all municipally-owned facilities, vehicles, and equipment.	Develop an inventory of all municipally-owned parks and open space; buildings and facilities; and vehicles and equipment. Initial list, updates annually	2018 (PY1)	2019 (PY2)	2		8	16	\$ 70.00	\$ -	\$ 5,000	\$ 1,120	\$ -	\$ 5,000	\$ 6,120	\$ 6,120	\$ 6,120			
Good Housekeeping	6-4	MS4 Infrastructure Repair/Rehabilitation Program	Develop and implement a program to repair and rehabilitate MS4 infrastructure to reduce or eliminate the discharge of pollutants. Initial plan / program, ongoing implementation	2018 (PY1)	2019 (PY2)	1	2	60	180	\$ 56.00	\$ 10,000	\$ 50,000	\$ 6,720	\$ 10,000	\$ 50,000	\$ 66,720		\$ 133,440	\$ 66,720	\$ 66,720	\$ 66,720
Good Housekeeping	6-8	MS4 Storm drain and treatment structures inspection and maintenance program.	A program to inspect and maintain the storm drain systems and all stormwater treatment structures, including, but not limited to, water quality swales, retention/detention basins, infiltration structures, and proprietary treatment devices. Initial plan / program, ongoing implementation. All permittee-owned stormwater structures (excluding catch basins) shall be inspected annually.	2018 (PY1)	Annual	1	2	60	180	\$ 56.00	\$ -	\$ 60,000	\$ 6,720	\$ -	\$ 60,000	\$ 66,720		\$ 133,440	\$ 66,720	\$ 66,720	\$ 66,720
Good Housekeeping	6-5	Routine cleaning and maintenance of catch basins	Clean 1/3 total catch basins each year.	2018 (PY1)	Annual/ongoing	1	1	80	160	\$ 56.00	\$ -	\$ 40,000	\$ 4,480	\$ -	\$ 40,000	\$ 44,480	\$ 44,480	\$ 44,480	\$ 44,480	\$ 44,480	\$ 44,480
Good Housekeeping	6-6	Routine sweeping and/or cleaning of streets and municipally-owned parking lots	Streets swept 2x / yr + Business district parking lots swept more frequently. Completed by a contractor.	2018 (PY1)	Annual / ongoing	1	1	80	160	\$ 56.00	\$ -	\$ 85,000	\$ 4,480	\$ -	\$ 85,000	\$ 89,480	\$ 89,480	\$ 89,480	\$ 89,480	\$ 89,480	\$ 89,480

Table 1. Overall Stormwater Management Program Costs for MS4 Compliance

MCM	BMP ID	BMP Name	BMP Description	Schedule to Start (Permit Year)	Deadline (Permit Year)	Number of Employees: DPW Director or Senior Staff (web updates)	Number of Employees: DPW Operations	Duration (hours per year per employee)	Total hours per year	Rate (per man-hour)	Equipment and Materials	Consultant/ Contractor	Total Labor Cost	Total Equipment & Materials Cost	Total Consultant / Contractor Cost	Total for Labor, Materials and Equipment (base annual)	2018 Permit Year 1 7/1/18-6/30/19	2019 Permit Year 2 7/1/19-6/30/20	2020 Permit Year 3 7/1/20-6/30/21	2021 Permit Year 4 7/1/21-6/30/22	2022 Permit Year 5 7/1/22-6/30/23
Good Housekeeping	6-7	Procedures for winter road maintenance, including use and storage of salt and sand	Written procedure and implementation of procedures for pollution prevention. No costs included for plowing of streets or winter road maintenance activities. Time included for DPW to implement/oversee stormwater pollution prevention SOPs related to the winter maintenance program, salt/sand storage, etc.	2018 (PY1)	Annual / ongoing	1	3	40	160	\$ 56.00	\$ -	\$ 2,000	\$ 2,240	\$ -	\$ 2,000	\$ 4,240	\$ 4,240				
Good Housekeeping	6-9	Develop SWPPP for maintenance garages, public works facilities, transfer stations and other waste handling facilities.	Annually review, update SWPPPs. Time included for DPW to markup or adjust any SWPPPs as conditions change and for consultant to formally update the SWPPP documents.	2019 (PY2)	2019 (PY2)	1	3	40	160	\$ 56.00	\$ -	\$ 10,000	\$ 2,240	\$ -	\$ 10,000	\$ 12,240		\$ 12,240	\$ 2,240	\$ 2,240	\$ 2,240
Good Housekeeping	6-10	Recycling Program							0	\$ 70.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -					
Good Housekeeping	6-11	Tree Replacement Program		2018 (PY1)	Annual / ongoing	1	2	40	120	\$ 56.00	\$ 5,000	\$ -	\$ 2,240	\$ 5,000	\$ -	\$ 7,240	\$ 7,240	\$ 7,240	\$ 7,240	\$ 7,240	\$ 7,240
Reporting		Submit NOI	90 days to submit	Immediately	October 1, 2018	1		20	20	\$ 70.00	\$ -	\$ 10,000	\$ 1,400	\$ -	\$ 10,000	\$ 11,400	\$ 11,400				
Reporting		Develop a Stormwater Management Program	Initial plan with updates throughout permit	1	July 1, 2019	1		20	20	\$ 70.00	\$ -	\$ 10,000	\$ 1,400	\$ -	\$ 10,000	\$ 11,400	\$ 11,400	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Reporting		Submit Annual Reports	Annually, submit report to EPA and DEP	1	Annual	1		8	8	\$ 70.00	\$ -	\$ 4,500	\$ 560	\$ -	\$ 4,500	\$ 5,060	\$ 5,060	\$ 5,060	\$ 5,060	\$ 5,060	\$ 5,060
TOTAL									1892				\$ 74,792	\$ 57,500	\$ 633,900	\$ 766,192	\$ 337,980	\$ 797,144	\$ 543,612	\$ 532,872	\$ 501,552

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Town of Saugus, Massachusetts  
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Table 2. Costs for Recurring MS4 Compliance Activities

BMP ID	BMP Name	BMP Description	Schedule to Start (Permit Year)	Deadline (Permit Year)	Number of Employees: DPW Director or Senior Staff (web updates)	Number of Employees: DPW Operations	Duration (hours per year per employee)	Total hours per year	Rate (per man-hour)	Equipment and Materials	Consultant/ Contractor	Total Labor Cost	Total Equipment & Materials Cost	Total Consultant / Contractor Cost	Total for Labor, Materials and Equipment (base annual)	2018 Permit Year 1 7/1/18-6/30/19	2019 Permit Year 2 7/1/19-6/30/20	2020 Permit Year 3 7/1/20-6/30/21	2021 Permit Year 4 7/1/21-6/30/22	2022 Permit Year 5 7/1/22-6/30/23
1-3	Stormwater Bylaw, Regulations, and Permitting Fact sheet and checklists for Developers. <i>Target Audience: Developers</i>	Develop and publish fact sheet and checklists to educate developers on how to comply with Town's Stormwater Bylaw, Regulations, and Permitting procedures. Continue to send (by inclusion in the packet) a standard letter for developments which includes language on stormwater compliance in new and redevelopment. <i>Media: Hard copy handouts to project proponents</i>	2018 (PY1)	2018 (PY1) Annual thereafter	1		4	4	\$ 70.00	\$ 5,000	\$ 3,000	\$ 280	\$ 5,000	\$ 3,000	\$ 8,280	\$ 8,280	\$ 8,280	\$ 8,280	\$ 8,280	\$ 8,280
1-9	Pet Waste Brochure distributed annually to dog owners. (Bacteria TMDL) <i>Target Audience: Residents (Dog Owners)</i>	Annually, develop and distribute a pet waste brochure to dog owners at the time of dog license renewal. <i>Media: Hard copy handouts/mailers to dog owners</i>	2019 (PY2)	Annual	3		12	36	\$ 70.00	\$ 5,000	\$ 3,000	\$ 2,520	\$ 5,000	\$ 3,000	\$ 10,520		\$ 10,520	\$ 10,520	\$ 10,520	\$ 10,520
1-11	Continue to maintain signs for pet waste cleanup at schools and parks. <i>Target Audience: Residents (Dog Owners)</i>	Continue to maintain signs for pet waste cleanup at schools and parks.	2018 (PY1)	Annual		2	16	32	\$ 50.00	\$ 1,000	\$ -	\$ 1,600	\$ 1,000	\$ -	\$ 2,600	\$ 2,600	\$ 2,600	\$ 2,600	\$ 2,600	\$ 2,600
2-1	SWMP Review / Website	Allow annual review of Stormwater Management Program and posting of stormwater management program on website.	2018 (PY1)	Annual	2		16	32	\$ 70.00	\$ -	\$ 2,000	\$ 2,240	\$ -	\$ 2,000	\$ 4,240	\$ 4,240	\$ 4,240	\$ 4,240	\$ 4,240	\$ 4,240
2-2	Public Meeting - Stormwater	Allow public to comment on Stormwater Management Program annually.	2018 (PY1)	Annual	3		12	36	\$ 70.00	\$ 500	\$ 2,000	\$ 2,520	\$ 500	\$ 2,000	\$ 5,020		\$ 10,040	\$ 5,020	\$ 5,020	\$ 5,020
3-2	Sanitary Sewer Overflows (SSOs) Inventory	Prepare inventory of all identified Sanitary Sewer Overflows (SSOs)	2018 (PY1)	2018 (PY1) Annual updates	2		8	16	\$ 70.00	\$ -	\$ 3,000	\$ 1,120	\$ -	\$ 3,000	\$ 4,120	\$ 4,120	\$ 4,120	\$ 4,120	\$ 4,120	\$ 4,120
3-3	Stormwater System Map	Develop/update a map of the entire stormwater system	2018 (PY1)	2019 (PY2) Annual updates	2		8	16	\$ 70.00	\$ -	\$ 20,000	\$ 1,120	\$ -	\$ 20,000	\$ 21,120		\$ 42,240	\$ 21,120	\$ 21,120	\$ 21,120
3-4	Written IDDE Program document	Initial document, annual review	2018 (PY1)	2018 (PY1) Annual updates	2		8	16	\$ 70.00	\$ -	\$ 7,000	\$ 1,120	\$ -	\$ 7,000	\$ 8,120	\$ 8,120	\$ 8,120	\$ 8,120	\$ 8,120	\$ 8,120
3-4	Outfall and interconnection inventory	Complete an outfall and interconnection inventory of all outfalls each year	2018 (PY1)	2018 (PY1) Annual updates	1		8	8	\$ 70.00	\$ -	\$ 4,000	\$ 560	\$ -	\$ 4,000	\$ 4,560	\$ 4,560	\$ 4,560	\$ 4,560	\$ 4,560	\$ 4,560
3-4	Eliminate detected illicit discharges	Eliminate detected illicit discharges as expeditiously as possible. If elimination is not possible within 60 days of detection, develop a schedule for elimination and report the dates of identification and schedule for removal within the Annual Report. Assumes two issues per year, time for DPW Director to complete enforcement actions and time for DPW Operations to remove discharge (if not removed by owner). Assumes blended DPW rate of \$56.00/hour.	2018 (PY1)	Annual	1	2	40	120	\$ 56.00	\$ 5,000	\$ 15,000	\$ 6,720	\$ 5,000	\$ 15,000	\$ 26,720		\$ 53,440	\$ 26,720	\$ 26,720	\$ 26,720
3-5	Train employees annually about the IDDE Program	Conduct 1 training annually	2018 (PY1)	2018 (PY1) Annual thereafter	1	19	4.5	90	\$ 56.00	\$ 1,000	\$ 5,000	\$ 252	\$ 1,000	\$ 5,000	\$ 6,252		\$ 12,504	\$ 6,252	\$ 6,252	\$ 6,252
3-6	Dry weather screening of outfalls	Perform dry weather screening and sampling (where flowing) of every MS4 outfall and Interconnection (except excluded and problem catchments) within 3 years of the permit effective date. Permittee may rely on screening conducted under the MS4-2003 permit, EPA enforcement action, or by the state or EPA to the extent that it meets the requirements under this permit. Submit all screening data with Annual Report. Assume re-screening of each outfall and interconnections (~300).  Costs here also include the cost of catchment area investigations. Assumes opening and inspection of key junction manholes during dry weather investigations, per permit requirements.	2018 (PY1)	2020 (PY3)	1		8	8	\$ 70.00	\$ -	\$ 58,000	\$ 560	\$ -	\$ 58,000	\$ 58,560	\$ 30,000	\$ 58,560	\$ 58,560	\$ 58,560	\$ 58,560
3-7	Ongoing screening of each catchment once every 5 years.	Annually select # of catchments to screen. (Begin screening in Permit Year 6)	2024 (PY6)	Annual	1		8	8	\$ 70.00	\$ -		\$ 560	\$ -	\$ -	\$ 560	\$ 560	\$ 560	\$ 560	\$ 560	\$ 560
3-8	Identify System Vulnerability Factors and conduct Wet Weather Screening	Evaluate each catchment area for System Vulnerability Factors and document them. For all catchments with minimum of one SVF identified, inspect and sample under wet weather conditions to the extent necessary to determine whether wet weather-induced high flows in sanitary sewers or high groundwater in septic system areas result in discharges to the MS4. Initial documentation of SVFs and ongoing investigations	2018 (PY1)	1 / Annual	1		8	8	\$ 70.00	\$ -	\$ 12,000	\$ 560	\$ -	\$ 12,000	\$ 12,560		\$ 18,000	\$ 12,560	\$ 12,560	\$ 12,560
4-2	Site Plan Review Procedures	Written procedures for site plan review. Annually review	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 3,500	\$ 560	\$ -	\$ 3,500	\$ 4,060	\$ 4,060	\$ 3,500	\$ 3,500	\$ 3,500	\$ 3,500
4-3	Site inspection and enforcement procedures (erosion control measures).	Written procedures for site inspections and enforcement of erosion control measures. Annually review	2018 (PY1)	2018 (PY1)	1		8	8	\$ 70.00	\$ -	\$ 4,000	\$ 560	\$ -	\$ 4,000	\$ 4,560	\$ 4,560	\$ 4,000	\$ 4,000	\$ 4,000	\$ 4,000
5-4	BMP Retrofit Program for Permittee-owned property	Annually report on MS4-owned and private property and infrastructure that have been retrofitted with BMPs to mitigate impervious area and directly connected impervious area	2018 (PY1)	Annual	1		8	8	\$ 70.00	\$ -	\$ 5,000	\$ 560	\$ -	\$ 5,000	\$ 5,560	\$ 5,560	\$ 5,560	\$ 5,560	\$ 5,560	\$ 5,560
6-4	MS4 Infrastructure Repair/Rehabilitation Program	Develop and implement a program to repair and rehabilitate MS4 infrastructure to reduce or eliminate the discharge of pollutants. Initial plan / program, ongoing implementation	2018 (PY1)	2019 (PY2)	1	2	60	180	\$ 56.00	\$ 10,000	\$ 50,000	\$ 6,720	\$ 10,000	\$ 50,000	\$ 66,720		\$ 133,440	\$ 66,720	\$ 66,720	\$ 66,720
6-8	MS4 Storm drain and treatment structures inspection and maintenance program.	A program to inspect and maintain the storm drain systems and all stormwater treatment structures, including, but not limited to, water quality swales, retention/detention basins, infiltration structures, and proprietary treatment devices. Initial plan / program, ongoing implementation. All permittee-owned stormwater structures (excluding catch basins) shall be inspected annually.	2018 (PY1)	Annual	1	2	60	180	\$ 50.00	\$ -	\$ 60,000	\$ 6,000	\$ -	\$ 60,000	\$ 66,000		\$ 132,000	\$ 66,000	\$ 66,000	\$ 66,000
6-5	Routine cleaning and maintenance of catch basins	Clean 1/3 total catch basins each year.	2018 (PY1)	Annual/ongoing	1	1	80	160	\$ 56.00	\$ -	\$ 40,000	\$ 4,480	\$ -	\$ 40,000	\$ 44,480	\$ 44,480	\$ 44,480	\$ 44,480	\$ 44,480	\$ 44,480

Town of Saugus, Massachusetts  
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Table 2. Costs for Recurring MS4 Compliance Activities

BMP ID	BMP Name	BMP Description	Schedule to Start (Permit Year)	Deadline (Permit Year)	Number of Employees: DPW Director or Senior Staff (web updates)	Number of Employees: DPW Operations	Duration (hours per year per employee)	Total hours per year	Rate (per man-hour)	Equipment and Materials	Consultant/ Contractor	Total Labor Cost	Total Equipment & Materials Cost	Total Consultant / Contractor Cost	Total for Labor, Materials and Equipment (base annual)	2018 Permit Year 1 7/1/18-6/30/19	2019 Permit Year 2 7/1/19-6/30/20	2020 Permit Year 3 7/1/20-6/30/21	2021 Permit Year 4 7/1/21-6/30/22	2022 Permit Year 5 7/1/22-6/30/23
6-6	Routine sweeping and/or cleaning of streets and municipally-owned parking lots	Streets swept 2x / yr + Business district parking lots swept more frequently. Completed by a contractor.	2018 (PY1)	Annual / ongoing	1	1	80	160	\$ 56.00	\$ -	\$ 85,000	\$ 4,480	\$ -	\$ 85,000	\$ 89,480	\$ 89,480	\$ 89,480	\$ 89,480	\$ 89,480	\$ 89,480
6-9	Develop SWPPP for maintenance garages, public works facilities, transfer stations and other waste handling facilities.	Annually review, update SWPPPs. Time included for DPW to markup or adjust any SWPPPs as conditions change and for consultant to formally update the SWPPP documents.	2019 (PY2)	2019 (PY2)	1	3	40	160	\$ 56.00	\$ -	\$ 10,000	\$ 2,240	\$ -	\$ 10,000	\$ 12,240		\$ 12,240	\$ 2,240	\$ 2,240	\$ 2,240
6-10	Recycling Program						0	\$ 70.00				\$ -	\$ -	\$ -	\$ -					
6-11	Tree Replacement Program		2018 (PY1)	Annual/ongoing	1	2	40	120	\$ 56.00	\$ 5,000	\$ -	\$ 2,240	\$ 5,000	\$ -	\$ 7,240	\$ 7,240	\$ 7,240	\$ 7,240	\$ 7,240	\$ 7,240
	Develop a Stormwater Management Program	Initial plan with updates throughout permit	1	July 1, 2018	1		20	20	\$ 70.00	\$ -	\$ 10,000	\$ 1,400	\$ -	\$ 10,000	\$ 11,400	\$ 11,400	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
	Submit Annual Reports	Annually, submit report to EPA and DEP	1	Annual	1		8	8	\$ 70.00	\$ -	\$ 4,500	\$ 560	\$ -	\$ 4,500	\$ 5,060	\$ 5,060	\$ 5,060	\$ 5,060	\$ 5,060	\$ 5,060
								1442				\$ 51,532	\$ 32,500	\$ 406,000	\$ 490,032	\$ 234,320	\$ 679,784	\$ 472,512	\$ 472,512	\$ 472,512

### 3 MCM 1: PUBLIC EDUCATION AND OUTREACH

The Public Education and Outreach Minimum Control Measure requires the Town to develop and distribute two target messages to each of four audiences throughout the permit term. Audiences include:

- Residents
- Businesses, Institutions, and Commercial Facilities
- Developers
- Industrial Facilities

In addition, due to the approved pathogen Total Maximum Daily Load (TMDL) for the North Coastal Watershed (includes Saugus River, Bennett's Pond Brook, Pines River, Hawke's Brook, Shute Brook), Saugus must provide supplemental public education messages on pet waste and septic system maintenance.

The Notice of Intent lays out the schedule for sending the targeted public education messages through differing forms of media (print, website, educational programs, etc.). A summary of Public Education messages and the schedule to distribute them is presented in Table 3.

The EPA, MassDEP and ThinkBlue Massachusetts have developed and published templates for many of the public education messages planned for the permit term. As such, costs for a consultant related to developing the messages include filling out the templates, coordination, and distribution materials/costs. Costs also include time for DPW review of the materials before publication. It is anticipated that items that are distributed via mailing or hard copy handout will also be placed on the Town's website for future access by targeted audiences. We have included time for the Town's website coordinator (listed in the DPW Director/Senior Staff hours column) to assist with uploading documents to the website.

The only anticipated annual messages include the Pet Waste Brochure (given out at time of dog license application / renewal) and maintenance of Pet Waste cleanup signs. The pet waste cleanup sign maintenance is an existing DPW duty under the previous permit.

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**Table 3. Summary of Public Education Messages Requirements and Deadlines**

BMP ID	Public Education Message	Target Audience	Media / Distribution Method	Scheduled Due Date
1-1	Residential Stormwater Pollution Prevention Brochure	Residents	Brochure / Mailing	Permit Year 1 Completed in Dec. 2018
1-2	Commercial Stormwater Pollution Prevention Fact Sheet	Businesses / Institutions/ Commercial	Website	Permit Year 2
1-3	Stormwater Bylaw Regulations and Permit Fact Sheet/Checklists	Developers	Hard copy handouts to permittees	Permit Year 1 Materials complete, need to track distribution.
1-4	Industrial Stormwater Pollution Prevention Fact Sheet	Industrial Facilities	Website	Permit Year 2
1-5	MWRA School Outreach Program	Residents	School Program	Permit Year 4
1-6	Snow Removal and Deicing Brochure	Businesses / Institutions/ Commercial	Brochure / Mailing	Permit Year 4
1-7	Low Impact Development Brochure	Developers	Hard copy handouts to permittees	Permit Year 3
1-8	Auto Repair/Maintenance Shops Pollution Prevention Press Release	Industrial Facilities	Newspaper / Website	Permit Year 4
1-9	Pet Waste Brochure (Pathogen TMDL)	Residents	Hard copy handouts / mailing to dog license applicants	Permit Year 2 / Annual
1-10	Septic System Maintenance Brochure (Pathogen TMDL)	Residents	Brochure / Mailing	Permit Year 2
1-11	Continue to Maintain Signs for Pet Waste Cleanup	Residents	Signs	Permit Year 1 / Annual

## 4 MCM 2: PUBLIC PARTICIPATION

The permit requires that the Town provide opportunities to engage the public to participate in the review and implementation of the permittee's Stormwater Management Program (SWMP). The requirements include:

- BMP 2-1 Allow annual review of the SWMP and posting of SWMP on the Town's website.
- BMP 2-2 Allow public to comment on the SWMP at a public meeting, annually.

Costs associated with these items include updates to the SWMP by a consultant, review by the DPW, and posting to the website by Town staff. There is also time included for one public meeting annually (2 DPW / senior staff members) and consultant time to prepare for and attend the meeting.



## 5 MCM 3: ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

The IDDE minimum control measure includes requirements for updated stormwater system mapping, written program documentation, outfall screening and other field investigations to identify any illicit discharges to the stormwater system. The Town has begun some of the IDDE measures through previous contracts and is continuing to address most of the first year IDDE requirements through the Drainage Master Plan contract. The basic requirements and status of spending are outlined in Table 4.

The EPA has created a timeline visual of the overall IDDE requirements which is included as Figure 1 and may be used for reference while reading this Section 5.

**Table 4. Summary of IDDE Requirements**

BMP ID	Description	Deadline	Status of Spending
3-1	Legal Authority (Bylaw)	Permit Year 1	Complete
3-2	Sanitary Sewer Overflows Inventory	Permit Year 1	Drainage Master Plan (DMP) contract
3-3	Stormwater System Map	Permit Year 2 & Permit Year 10	DMP Contract (partial map updates) Additional work to complete.
3-4	Written IDDE Program document Outfall and interconnection inventory Catchment Area Delineation & Ranking (TMDL Requirements for this item) Systematic Written Procedure to Investigate catchment areas Elimination of detected illicit discharges	Permit Year 1 Annual Updates	DMP Contract (Initial written plans/inventories, catchment area delineations for up to 200 OFs) Additional work to complete
3-5	Train employees annually	Permit Year 1 Annual	Additional work to complete
3-6	Dry Weather Screening of Outfalls Follow-up ranking of outfalls and interconnections	Permit Year 3	DMP Contract (partially) Additional Work to Complete
3-7	Ongoing screening of each catchment once every 5 years	Begin in Year 6	This ongoing screening begins after the first 5-year permit term
3-8	Wet Weather Screening	Permit Year 1 / Annual	Identify system vulnerability factors in Year 1, Wet Weather Screening thereafter.

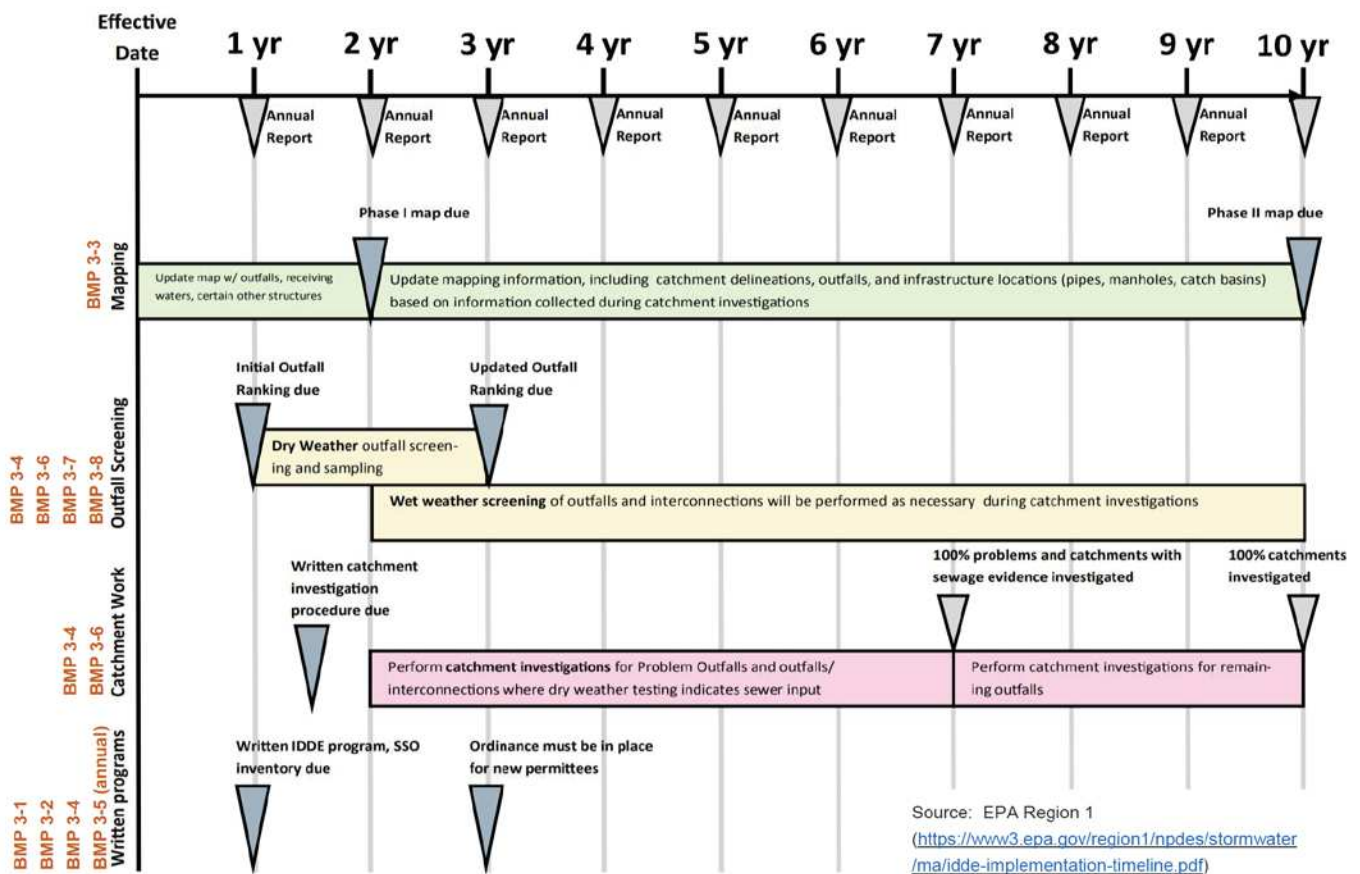


Figure 1. Illicit Discharge Detection and Elimination Timeline

## 5.1 GIS Mapping

The Town's previous mapping and screening program for outfalls fulfilled the requirements (map all outfalls and receiving waters) for the 2003 permit. The Town has continued to improve their GIS mapping of the stormwater system over the years to include manholes, catch basins, pipes, etc.

The 2018 MS4 Permit Mapping Requirements are broken into two phases:

- Phase 1 (Due in Permit Year 2): Update map with outfalls, receiving waters, and certain other structures
- Phase 2 (Due in Permit Year 10): Update mapping information, including catchment delineations, outfalls, and infrastructure locations (pipes, manholes, catch basins) based on information collected during catchment investigations.

To understand the level of mapping updates required for Saugus to meet the 2018 MS4 Permit a GIS Gap Analysis was completed. The gap analysis included the review and analysis of the Town's existing

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GIS mapping to identify mapping discontinuities, misinformation, or other questions regarding the connectivity or attributes of the stormwater system. The detailed results of the gap analysis are included in Appendix A.

A summary of findings includes:

- The initial review of the stormwater GIS indicates that the attribute data (material, diameter, etc.) are substantially complete with minimal percentage of missing information for known stormwater features (catch basins, outfalls, manholes).
- The largest gap in information is in the install year data (pipes), which is not required by the MS4 permit and is not able to be acquired by field inspection.
- Stormwater features (manholes, outfalls, catch basins, pipes) currently do not appear to have unique identifiers which can become a problem as the GIS is utilized for asset management and investigation purposes.
- The stormwater system map does not specifically identify open channels, conveyances, swales, etc.
- The stormwater system GIS does not specifically identify municipally-owned treatment structures (Stormceptor, other best management practices).

We have also utilized the GIS gap analysis data to determine if all outfalls previously identified in Town meet the definition in the 2018 MS4 permit for outfall:

“An outfall means a point source as defined by 40 CFR § 122.2 as the point where the municipal separate storm sewer discharges to waters of the United States. An outfall does not include open conveyances connecting two municipal separate storm sewers or pipes, tunnels or other conveyances that connect segments of the same stream or other waters of the United States and that are used to convey waters of the United States. (40 CFR § 122.26(b)(9)). However, it is strongly recommended that a permittee inspect all accessible portions of the system as part of this process. Culverts longer than a simple road crossing shall be included in the inventory unless the permittee can confirm that they are free of any connections and simply convey waters of the United States.”

There are 341 outfall features included in the existing GIS database. At this time, we anticipate approximately 275 outfalls will qualify as true MS4 outfalls, however field investigations will be necessary to confirm some of the outfall analysis. The following methodology was utilized to determine outfalls during our desktop analysis.

1. Outfalls within 100-200 feet of a waterbody or wetland were considered MS4 outfalls.
2. Outfalls which were greater than 100-200 feet from a waterbody or wetland were reviewed and either
  - (a) incorporated into the final number of outfalls,
  - (b) flagged as requiring additional investigations, or
  - (c) excluded from requiring screening as defined by the Small MS4 general permit.

Outfalls added to the final number requiring screening include those that discharge to areas that may convey stormwater flow to a waterbody by overland flow.

Outfalls requiring additional investigations include those that may discharge to a detention/retention basin or pervious land that may flow to an intake feature connected to a downstream catchment area and ultimately to a waterbody.

Outfalls excluded from requiring screening are those that are isolated away from the municipal or private sewer features; or are shown as the outlet of culverts where no additional stormwater features are shown connecting to the culvert.

Catchment areas draining to each Town-owned outfall in GIS (up to 200 outfalls) using the GIS topography information provided by Saugus will be completed by Arcadis under the DMP Contract. This process can be semi-automated through newer GIS tools, but manual review work is required.

Catchment areas are then prioritized based on certain attributes or factors, as identified in the permit, such as proximity to impaired waterbodies, the sanitary sewer system, known SSOs, etc.

Costs for the mapping program include both 1) work to be completed under the DMP project to fulfill some of the first-year requirements, and 2) costs anticipated to fill data gaps and meet all mapping requirements within the permit. For example, the scope of work under the DMP does not include additional updates to mapping such as adding Town-owned open channel conveyances (swales, ditches, etc.) or 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).

We have also included DPW time for review of the mapping.

## 5.2 IDDE Program

The IDDE program and procedures for investigation, confirmation of illicit discharges and their removal, must be documented in a Written IDDE Program document under the new MS4 permit. The written IDDE program and inventories are due in Permit Year 1, and the first drafts for use in Permit Year 1 will be provided under the DMP project contract. Future updates may be required and are accounted for in the costs presented.

Catchment areas are ranked by the end of Permit Year 1 and dry weather outfall inspections follow. All outfalls must be inspected (and sampled as necessary) during dry weather within 3 years of the effective permit date. The DMP contract includes a total of 100 dry weather outfall inspections.

In permit Year 2, catchment areas investigations begin for problem outfalls and outfalls where dry weather testing indicates potential sewer discharges. Catchment area investigations include opening of key junction manholes and sampling where flow is observed during dry weather. Wet weather screening also begins in Year 2, as necessary based evaluation of system vulnerability factors and in accordance with the MS4 permit requirements.

By the end of Permit Year 3, dry weather outfall screening should be complete and both catchment area investigations and wet weather screening will have yielded enough results to create updated catchment area rankings. All catchment areas must be investigated by the end of Permit Year 10.

Outfall monitoring (rescreening) must occur once every 5 years, and is anticipated to begin in Permit Year 6 .

## 6 MCM 4: CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

The Construction Site Stormwater Runoff Control measure requires the Town to have a bylaw and written procedures in place for sediment and erosion control, procedures for site inspection and enforcement, and requirements for control of waste at construction sites. These items have largely been completed during the development of the Stormwater Bylaw and Rules and Regulations. As the Town begins to work with their new Stormwater Management Permit and the project proponents, it may be necessary to make adjustments to the internal Town processes (e.g. development of inspection SOPs or minor policy updates in the regulations). The need for updates will be captured during the annual review process, and costs have been included for a consultant to facilitate this review and capture any changes annually.

Table 5. Summary of Construction Site Runoff Control Requirements

BMP ID	Description	Status of Spending
4-1	Bylaw to require sediment and erosion control must be in place.	Complete. Review Annually.
4-2	Written procedures for site plan review. Requirements for construction site operators to implement a sediment and erosion control program on construction site.	Complete. Review Annually.
4-3	Written procedures for site inspections and enforcement of erosion control measures.	Complete. Review Annually.
4-4	Requirements for construction site operators to control wastes at the site.	Complete. Review Annually.

## 7 MCM 5: STORMWATER MANAGEMENT IN NEW DEVELOPMENT AND REDEVELOPMENT

The requirements for Stormwater Management in New Development and Redevelopment include development and updates to bylaws and regulations which have been completed as part of the recent stormwater bylaw and regulations development work in Saugus. There are two assessment reports required under this minimum control measure which will need to be completed. Additionally, the identification of potential retrofit sites and implementation of a retrofit program are included in this MCM.

**Table 6. Summary of Requirements for Stormwater Management in New Development and Redevelopment**

BMP ID	Description	Status of Spending
5-1	Bylaw to address post-construction runoff in new development and redevelopment must be in place	Complete. Review Annually.
5-2	Prepare a report assessing current street design and parking lot guidelines and whether changes to design standards to support low impact design options are feasible.	Additional work. Must be completed by Permit year 4.
5-3	Prepare a report assessing the feasibility of making the following infrastructure practices allowable: green roofs, infiltration practices and water harvesting devices.	Additional work, must be completed by Permit Year 4.
5-4	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.  Annually report on MS4-owned and private property and infrastructure that have been retrofitted with BMPs to mitigate impervious area and directly connected impervious area	Additional work, must be completed by Permit Year 4.  Must install retrofits and continue to maintain a list of potential sites.  Annual reporting.
5-5	Submission of as-built plans upon completion of construction projects and submission of procedures to ensure long-term O&M of stormwater BMPs	Complete. Review Annually
5-6	Amend bylaw to contain new provisions	Complete. Review Annually

## 8 MCM 6: GOOD HOUSEKEEPING AND POLLUTION PREVENTION

The good housekeeping and pollution prevention MCM includes development of an inventory of municipal facilities/activities and written O&M procedures for parks, municipal buildings and facilities, vehicles and equipment, and other municipal activities. It also includes development of a program to inspect and maintain the stormwater system as well as program to repair and rehabilitate MS4 infrastructure. Stormwater Pollution Prevention Plans (SWPPPs) are also required for all maintenance garages, public works facilities, transfer stations and other waste handling facilities.

To facilitate cost development, we have created a preliminary list of municipally-owned facilities in Saugus. It can be found in Appendix B. There are 90 municipally-owned parcels/facilities on the preliminary list with 22 parcels that potentially require SWPPPs (DPW or waste handling facilities). O&M Plan and SWPPP templates are anticipated to be released by EPA and other sources, and our costs take use of such templates into consideration.

Typically, a site audit and interview at each identified municipal facility would be conducted to determine what materials are stored there and what activities take place. Audits typically involve interviews with facility managers, site visit, and may include review and update of the stormwater system mapping at the property (catch basins, manholes, pipes, connectivity). The audit facilitates development of the O&M Plans and SWPPPs for the municipal facilities. It is currently assumed that 90 audits would be required.

Ongoing operation and maintenance costs for catch basin cleaning and street sweeping are included in the costs for the stormwater program, as provided by the Saugus DPW. There are specific frequencies and documentation requirements for these two programs.

Written procedures for winter road maintenance are also a requirement. Costs are included for Permit Year 1 for this item. Costs (including labor, equipment, and materials) for plowing and maintaining the roads, sidewalks, and parking areas during snow events are not included here, as they are included in the DPW Highway budget.

# APPENDIX A

## GIS Gap Analysis Report







# TOWN OF SAUGUS, MA

## GIS GAP ANALYSIS

March 2019

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## APPENDICES

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## 1 OVERVIEW

The Town of Saugus, MA provided multiple personal and file-geodatabases for review as part of the Drainage Master Plan. One geodatabase best represents the Town's stormwater infrastructure. The other geodatabases represent the other systems of the utility and include background information.

The geodatabases provided include:

- Drain\_Final.mdb (PGDB)
- SaugusWater\_MASTER\_11302018.gdb (FGDB)
- Sewer\_Rehabilitation.gdb (FGDB)
- townssurvey.gdb (FGDB)

Appendix A contains a detailed data profile of the storm GIS database. The following sections utilize the data profile results and other analysis tools to identify strengths and weaknesses in the GIS. The specific data that has been evaluated is related to the Storm collection.

## 2 GIS

The projection used in the personal geodatabase (PGDB) is NAD 1983 State Plane Massachusetts Mainland US Feet.

The PGDB received by Arcadis only contains 3 feature classes

For this Stormwater NOI Implementation Plan data assessment, only the feature classes within the Drain\_Final geodatabase will be evaluated.

The two types of data review were performed include:

- Attribute gaps and inconsistencies within the GIS
- Geometric network connectivity within the GIS

Attribute gaps are identified where records contain empty values or if a field does not exist to store data that is typically useful for asset management. Data inconsistency is identified where two or more attributes do not agree with each other. An example might be a pipe installation date of 01/15/2000 and a lining date of 07/01/1990, where the rehabilitation of the pipe could not take place before it was installed.

An effective geometric network helps enforce proper connectivity of pipes as well as defining individual pipe assets of reasonable length to support asset management. Generally, pipes should only be segmented when there is change in one or more physical attributes, such as size, material, age, or where there is a split in flow.

## 3 GENERAL CONSIDERATIONS

### 3.1 Geometric Network

The received Saugus Storm GIS did not have a geometric network, however, for the purposes of this analysis a network was created. An ArcGIS geometric network requires all edge features to have a junction feature at both ends. ArcGIS automatically creates any missing junctions at the ends of edge features using an orphaned junction feature class. The existence of orphaned junctions represents the lack of specific asset documentation and may also indicate invalid geometry. A complex edge is a special type of line that allows other edges or junctions to be attached along its length. This can be useful for connecting service laterals to a storm pipe without breaking that edge into multiple segments. Within a feature dataset the Junction, Complex Edge or Edge feature class types are part of a defined geometric network.. The Stand-alone Point, Polyline and Polygon feature class types do not participate in a geometric network and are not governed by connectivity rules.

### 3.2 Local Government and Water Utility Models

The ArcGIS Local Government and Stormwater Utilities Data Models provide the foundation for a complete GIS solution geared to the needs of Stormwater utility end users. The Stormwater Data Model is a collection of objects, feature classes and attributes defined for stormwater collection networks. The model can be tailored to meet project requirements for data management and integration with other utility systems.

Additionally, the model comes with add-on applications like Attribute Assistant and Water Utility Network Tools which provides a series of predefined methods to automatically populate attributes and edit network features.

### 3.3 Asset IDs

Every GIS feature that represents a physical asset must have a unique and persistent ID that does not change over the lifetime of the asset. This ID is then used as a reference by other computer systems and paper records to track information and activities related to each asset.

ArcGIS defines and maintains an ObjectID and in some cases a GlobalID field for each feature class. Although the ObjectID and GlobalID are unique, they are maintained by the ArcGIS system which can reassign the value when certain processes are run. Therefore, the ObjectID and GlobalID cannot be used as a persistent identifier over the entire asset life.

The ArcGIS Local Government and Stormwater Utilities Data Model defines a FACILITYID that is intended to be used as a unique identifier that is managed by the utility. This is the most logical field to store a unique and persistent asset identifier for all features. Attribute Assistant is an excellent add-on application to help manage FACILITYIDs. That said, if the tool is not configured properly or is not running, duplicates or null asset identifiers can be introduced into a dataset.

### 3.4 Abandoned Assets

Assets that are abandoned in place should be disconnected from the geometric network and attributed as abandoned. An example is an old stormwater main that remains in the ground but is no longer in use. The GIS should represent this abandoned main as an edge with a Cap Fitting on both ends such that these assets appear to be floating on their own and not connected to the rest of the system. These pipe and cap assets should also have their lifecycle status attribute set to 'Abandoned'.

## 4 STORMWATER COLLECTION SYSTEM

### 4.1 Attributes Assessment

The Stormwater Collection System feature dataset contains the following feature classes (including a geometric network):

Table 4-1: Feature Classes within the Drain\_Final.mdb

TableName	Record Count	Length Miles
pipe	3,835	54.63
structure	3,929	-
Issue_Points	120	-
Drainage_System_Net_Junctions	455	-

In a typical GIS, there are many more types of feature classes such as Manholes, Catch Basins, Outfalls, etc. This additional segregation of the data allows for better understanding of the collection system. Splitting up the structures feature class will also help identify gaps or missing features within the system.

**Recommendation – Add additional feature classes (catch basin, manhole, outfall, etc.) to help better represent point assets within the system. Build geometric network rules to enforce connection integrity.**

#### 4.1.1 Pipe – 3,835 records

The primary collection assets of the stormwater collection system are the pipes defined in the pipe feature class. The table below lists all attributes within the pipe feature class. The most critical attributes have been **bolded** and column names with an asterisk (\*) are populated with unique values. Critical attributes are elaborated upon in subsequent sections.



Table 4-2: Fields within the Pipes Feature Class

Column Name	Data Type	Percent Populated
BARRELCNT	Int16	76.22%
COMMENT	String	45.01%
CONDITION	String	73.30%
DATESTAMP	String	49.39%
<b>DEPTH</b>	<b>String</b>	<b>76.32%</b>
<b>DEPTH1</b>	<b>Single</b>	<b>62.76%</b>
<b>DEPTH2</b>	<b>Single</b>	<b>62.97%</b>
<b>DIAMETER</b>	<b>Int16</b>	<b>100.00%</b>
Enabled	Int16	100.00%
<b>FEATUREID</b>	<b>String</b>	<b>76.51%</b>
<b>HEIGHT</b>	<b>Int16</b>	<b>76.79%</b>
<b>ID</b>	<b>Int32</b>	<b>99.90%</b>
<b>INST_DATE</b>	<b>DateTime</b>	<b>16.95%</b>
<b>MATERIAL</b>	<b>String</b>	<b>93.17%</b>
OBJECTID*	Int32	100.00%
Owner	String	100.00%
<b>P_TYPE</b>	<b>String</b>	<b>100.00%</b>
PIPE_SHAPE	String	78.57%
PLAN_NO	String	34.16%
Shape	Byte[]	99.79%
Shape_Length	Double	99.79%
SOURCE	String	95.31%
STATUS	String	76.56%
STREETNAME	String	95.93%
TEAM	String	77.78%
<b>WIDTH</b>	<b>Int16</b>	<b>76.79%</b>
YEAR_	Int16	0.00%

#### 4.1.1.1 Asset Identifier

The ID field is not completely unique. There are 4 pipes with a missing ID and the ID appears to be a straight copy of the ObjectID to a new field. The lack of a clearly defined Asset ID will make it more difficult to manage GIS and support required programs. A second ID field named FEATUREID is not well populated and has many duplicate values within the field. **Recommendation – Choose or create an ID field to be the definitive identification of record. Populate the ID's with unique values using a string type format as opposed to a number format and include letters and padded zeros with a uniform length for all IDs.**

#### 4.1.1.2 Diameter

The Diameter field is highly populated, with around 95% of the system known. The Height and Width fields are much less populated with around 10% of the values known. Additionally, there are 1.96 Mi of storm pipe with a diameter less than 8 in. **Recommendation – There are too many fields to manage that describe the size of a pipe. The Diameter and Height fields should be combined into one Height field. Width should then only be populated when the pipe shape is not a circle. Additionally, all small diameter storm pipes values are questionable and should be investigated to ensure data accuracy.**

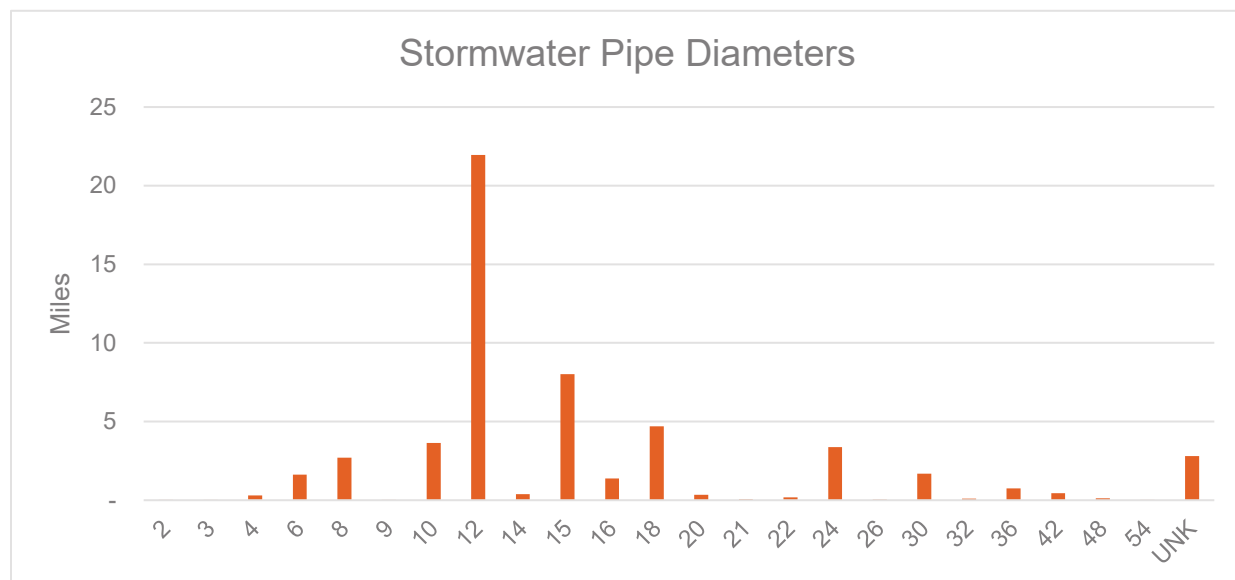


Figure 4-1: Diameter Values within the Pipe feature class

#### 4.1.1.3 Installation Date

Installation date is Null for roughly 82% of the collection system. **Recommendation – Update the missing INST\_DATE values.**

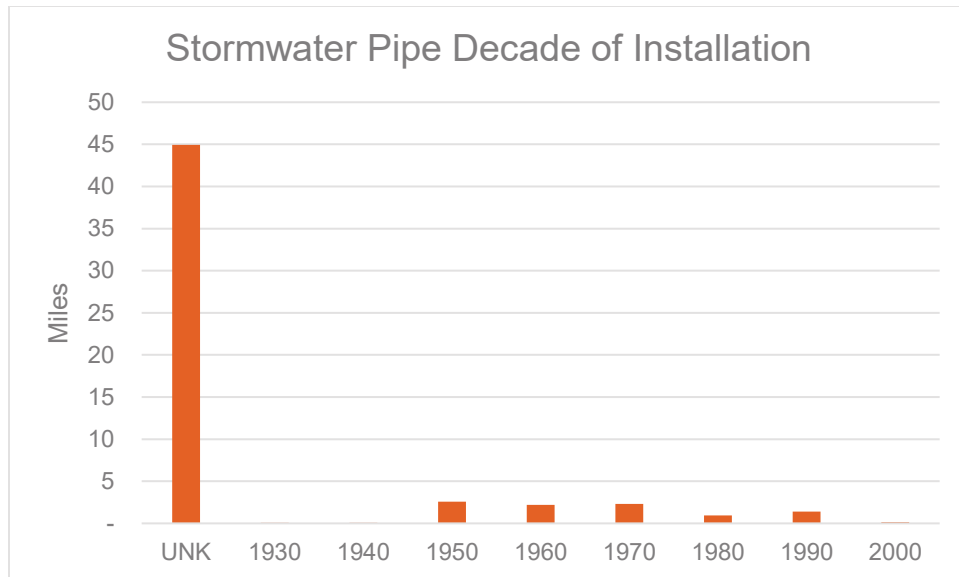


Figure 4-2: Decade of Installation within the Pipe feature class

#### 4.1.1.4 Material

There are 3.36 Mi of Unknown Material. There are 41 unique materials within the pipes layer and many of the materials appear to overlap. (PVC/VC, VC/PVC, CMP/RCP, RCP,CMP). **Recommendation – Consolidate all the overlapping pipe materials. Populate all the Unknowns. Create a domain list of all the valid Material types to ensure invalid materials are not introduced to the pipes Layer.**

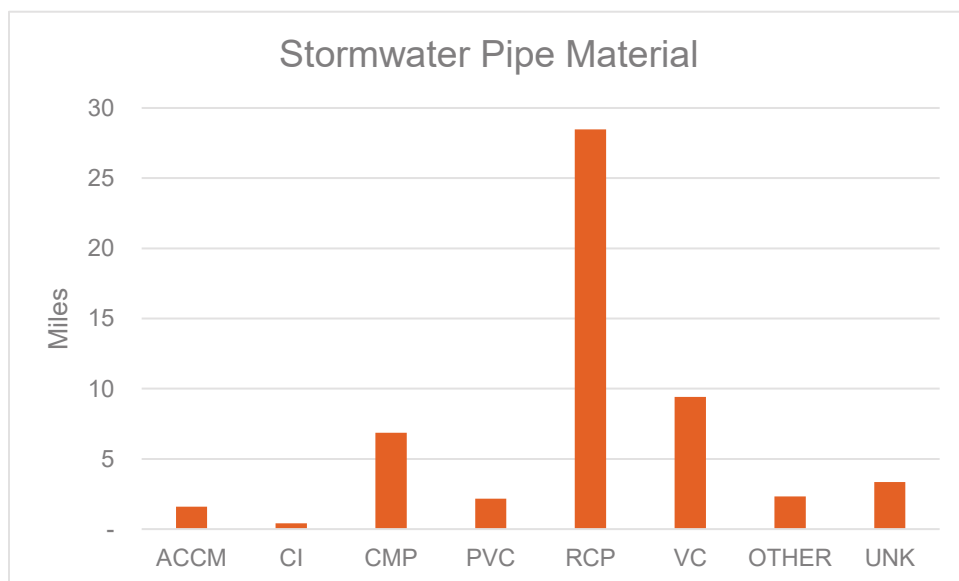


Figure 4 3: Material within the Pipe feature class

Table 4-3: All Materials found within the Pipe feature class

MATERIAL	Count	LengthMi	Percent
RCP	1,948	28.47	52.11%
VC	586	9.42	17.25%
CMP	491	6.87	12.58%
PVC	198	2.17	3.98%
ACCM	97	1.59	2.92%
CI	26	0.41	0.76%
RCP/CMP	16	0.37	0.68%
STEEL	30	0.23	0.43%
PVC/VC	8	0.19	0.35%
SLOTTED PVC	19	0.16	0.29%
CMP/RCP	6	0.15	0.27%
VC/RCP	5	0.13	0.24%
VC/CMP	9	0.13	0.24%
AC	2	0.12	0.21%
RCP/VC	8	0.10	0.19%
VC/PVC	7	0.09	0.17%
RCP/PVC	6	0.07	0.12%
RCP/STEEL	3	0.06	0.12%
PVC/CMP	5	0.06	0.11%
CMP/VC	6	0.05	0.09%
STEEL/RCP	4	0.04	0.07%
AMCO	2	0.04	0.07%
DI	2	0.03	0.06%
PVC/RCP	3	0.03	0.06%
ACCM OR RCP	1	0.03	0.06%
CI/VC	2	0.03	0.06%
STEEL/VC	1	0.03	0.05%
PERF. PVC	2	0.02	0.04%
STEEL/PVC	3	0.02	0.04%

## GIS Gap Analysis

ACCOMP	1	0.02	0.04%
CI/CMP	2	0.02	0.04%
CORR PLASTIC	2	0.02	0.03%
STEEL/CMP	1	0.02	0.03%
BITUMINOUS CMP	2	0.01	0.02%
HDPE	1	0.01	0.02%
CI/RCP	1	0.01	0.01%
PVC/STEEL	1	0.01	0.01%
STONE AND CMP	1	0.01	0.01%
METAL	1	0.01	0.01%
RCP/CI	1	0.00	0.01%
BRICK	3	0.00	0.01%
UNK	322	3.36	6.15%

#### 4.1.1.5 To/From Depth

Depth1 and Depth2 fields are poorly populated having roughly 75% of the records with a valid depth. Additionally, some of the Depth2 values are less than Depth1 signalling upstream flow.

**Recommendation – Depth information should be converted to invert elevation to clarify flow direction. Null and unknown values should be investigated and filled in.**

### 4.1.2 Structure – 3,929 records

The structure feature class is the only point layer that contains valid structure assets within the Saugus stormwater collection system. Typically, within a collection system the point layers are organized by type in their own discrete feature class. Not all point assets will require the same information. Outfalls will contain information about the elevation, the size, whether there is a grate, etc. Manholes contain information about the access type, the wall material, invert elevation, etc. **Recommendation – Split up the Structure feature class into five new feature classes; Inlet, Manhole, Outfall, Structure, and Tap. Fully populate the essential fields and ensure the ID fields are populated with unique values.**

Table 4-4: Types of assets within the Structures feature class

FTYPE	Count	Proposed Feature Class
BASIN	1	INLET
CB	1,738	INLET
CURB	219	INLET
CURB DGRATE	12	INLET
DBLCB	46	INLET
DBLCURB	1	INLET
DGRATE	72	INLET
DGRATE CURB	2	INLET
DIRECT INLET	2	INLET
FRENCH DRAIN	1	INLET
GUTTER INLET	2	INLET
INTAKE	152	INLET
DMH	1,119	MANHOLE
OUTFALL	341	OUTFALL
DETENTION BASIN	10	STRUCTURE
DRYWELL	39	STRUCTURE
SEPERATOR	2	STRUCTURE
STORMCEPTOR	14	STRUCTURE
UNK	13	STRUCTURE
DIRECT TAP	143	TAP

Table 4-5: Attribute fields within the Structures feature class

Column Name	Data Type	Percent Populated
<b>ACCESSTYPE</b>	<b>String</b>	<b>73.58%</b>
COMMENT	String	42.73%
CONDITION	String	69.05%
CONTAM	String	69.03%
DATESTAMP	String	98.42%
Enabled	Int16	100.00%
<b>FEATUREID</b>	<b>Int32</b>	<b>72.56%</b>
<b>FLR_DEPTH</b>	<b>Double</b>	<b>71.47%</b>
<b>FLR_ELEV</b>	<b>Double</b>	<b>3.87%</b>
<b>FTYPE</b>	<b>String</b>	<b>99.69%</b>
HOODED	Int16	1.20%
<b>ID</b>	<b>Int32</b>	<b>99.97%</b>
<b>INST_DATE</b>	<b>DateTime</b>	<b>18.20%</b>
OBJECTID	Int32	100.00%
Owner	String	100.00%
PLAN_NO	String	34.49%
REINSPECT	String	68.77%
<b>RIM_ELEV</b>	<b>Double</b>	<b>4.28%</b>
<b>RIMTOSED</b>	<b>Double</b>	<b>68.52%</b>
SEALMETHOD	String	69.15%
SED_DEPTH	Double	0.00%
SEPARATOR	Int16	0.03%
Shape	Byte[]	100.00%
SOURCE	String	92.70%
SUMP	String	0.00%
SUMP_DEPTH	Double	0.00%
TEAM	String	74.04%
<b>WALL_MAT</b>	<b>String</b>	<b>72.41%</b>



## GIS Gap Analysis

X_COORD	Double	60.93%
Y_COORD	Double	60.93%
YEAR_	Int16	0.00%
Z_COORD	Double	60.93%

## 5 SPATIAL ASSESSMENT

### 5.1 Missing Features

Many of the spatial issues within the GIS are documented within the 120 features of the Issue\_Points feature class. Over 78% of the comments within the Issue\_Points feature class detail a “Missing Connection.” These documented missing connections are highly correlated with the Net\_Junctions that were generated when the geometric network was created. In total, there are 455 Net\_Junctions or in other words missing assets within the stormwater collection system. The figure below shows a detail of the Issue\_Points (yellow points with question marks) and the Net\_Junctions (red points with an X).

**Recommendation – Conduct field investigations to assess Net\_Junction locations and Issue\_Points and correct with a valid asset or update connectivity to have a complete, accurate stormwater inventory.**

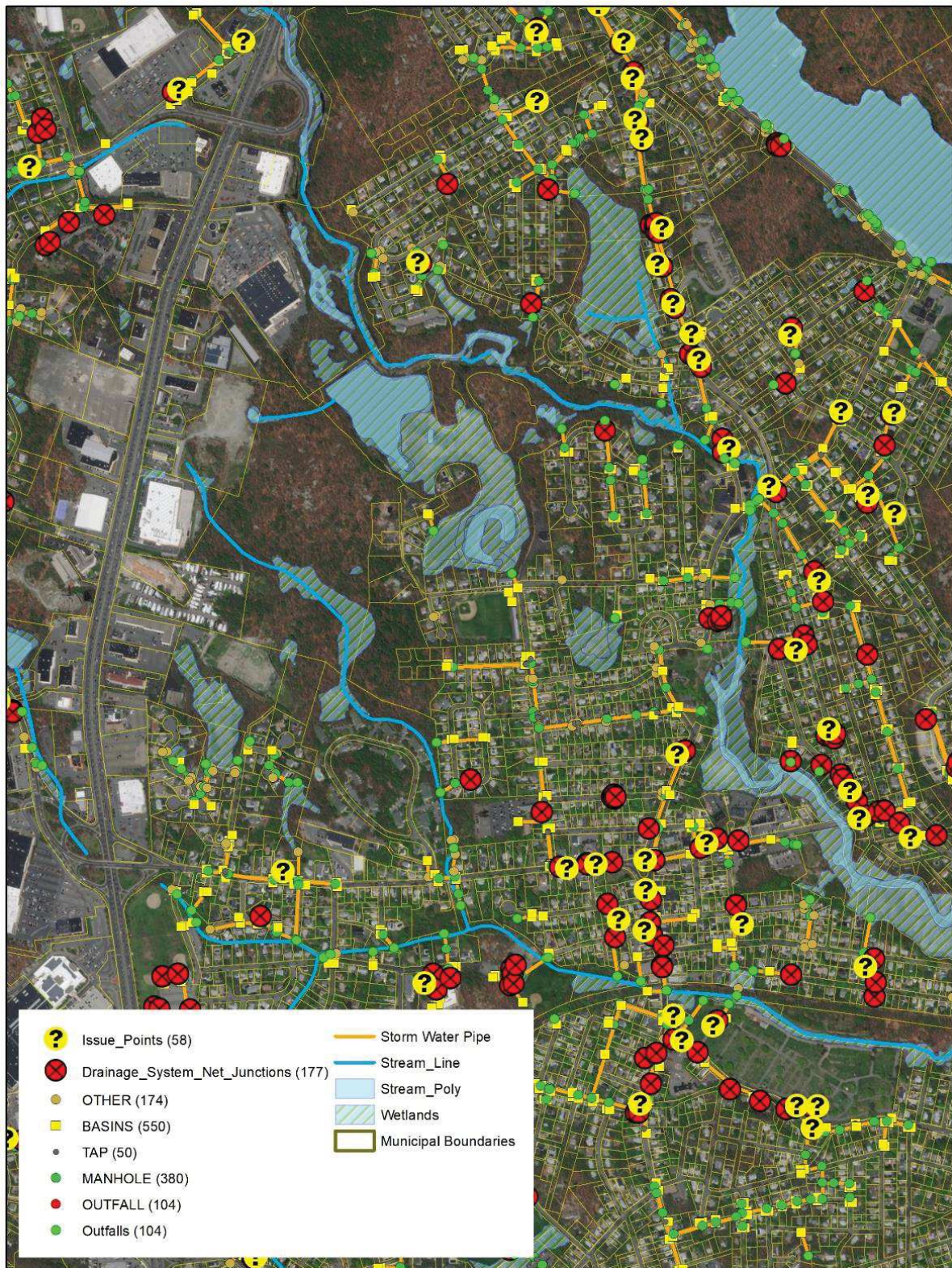


Figure 5-1: Missing Features



## 5.2 Outfall Prioritization

A desktop spatial analysis has revealed there are many outfall-like features that are outside of what constitutes an outfall as defined by the Environmental Protection Agency (EPA) in the Small Municipal Separate Storm Sewer Systems (MS4) permit. The GIS database for stormwater Structures indicates 341 “Outfalls” as part of the municipal stormwater collection system. A spatial analysis was conducted using a hydrology database acquired from the Massachusetts Bureau of Geographic Information to identify Outfalls within 200ft of waterbody features and Outfalls within 200ft of wetlands. 207 outfalls were identified within 200ft of waterbody features and 224 outfalls were within 200 feet of a wetlands and contained a significant overlap. Combining these results yielded 246 Outfalls within 200 ft of a waterbody or wetland. This leaves 95 Outfalls that are located beyond 200 ft of a stream or wetland. These results were furthered reviewed visually to determine if discharges of stormwater from any of the 95 Outfalls were likely to reach a waterbody or wetland. Additionally, the 224 Outfalls were reviewed to determine those which may be excluded from investigations in accordance with the EPA’s MS4 permit. The permit allows the exclusion of outfalls that are of a significant distance from municipal and private sanitary sewer utilities and open conveyances that connect two or more MS4’s or pipes, and tunnels or culverts that connect segments of the same stream or waterbody and do not include additional connections from an MS4. This resulted in an assumed 275 outfalls requiring investigations under the MS4 general permit, with some outfalls flagged as “requiring additional investigations” to determine if the structures should remain under the “Outfall” classification.

The figure below shows outfalls within 200 ft of a waterbody in yellow and outfalls beyond 200 ft of a waterbody in red. **Recommendation – Investigate outfalls that have been flagged as “requiring additional investigations” and those that may discharge flows to open conveyances connecting two or more MS4’s to determine if they classify as “Outfalls” and recategorize structures accordingly.**



Figure 5-2: Outfall Prioritization



## 6 RECOMMENDATION SUMMARY

On conclusion of this GIS gap analysis, a summary of recommendations for updating the stormwater collection system mapping includes:

1. Add additional feature classes to help better represent point assets within the system.
2. Build geometric network rules to enforce asset connection integrity.
3. Institute an ID field to be the definitive identification of record unique ID's including values using a string type format as opposed to a number format that includes letters and padded zeros with a uniform length for all IDs within the stormwater collection system.
4. Reduce the number of fields used to identify pipe cross sectional sizes to a field for pipe Height and a field for pipe Width used when non-circular pipes are encountered. Additionally, all small diameter storm pipes values should be investigated to ensure data accuracy.
5. Review available records and update missing Install Date values.
6. Consolidate all the overlapping materials and populate all the Unknowns and create a domain list of all valid Material types to ensure invalid materials are not introduced to the pipes Layer.
7. Depth information should be converted to invert elevation to clarify flow direction. Null and unknown values should be investigated and filled in.
8. Split up the Structure feature class into five new feature classes; Inlet, Manhole, Outfall, Structure, and Tap. Fully populate the essential fields and ensure the ID fields are populated with unique values.
9. Conduct field investigations to assess Net\_Junction locations and Issue\_Points and correct with valid assets and update connectivity to produce a complete, accurate spatially connected stormwater inventory.
10. Investigate outfalls that have been flagged as "requiring additional investigations" and those that may discharge flows to open conveyances connecting two or more MS4's to determine if they classify as "Outfalls" and recategorized structures accordingly.

# APPENDIX A

## Detailed Stormwater GIS Data Profile



**Data Profile**

The following list contains the profiled database table names and their record count. The table name and record count are highlighted red if there are no records in a table. An asterisk (\*) is placed in front of any table without a Primary Key and it is highlighted yellow.

**Summary Records per Table**

*Drainage_System_Net_Junctions	455	*Issue_Points	120	*pipe	3,835
*SelectedObjects	2,394	*structure	3,929		

The following pages detail each table having one or more records.

Each table field is listed with the percent of populated, zero and negative values. An empty field has a Null value, zero length string or all spaces. Zero or negative values may occur in a numeric field. Although empty, zero and negative values are not necessarily invalid, they may indicate a problem. Fields containing all empty, zero or negative values are highlighted red. Fields containing 50-100% empty or zero values or any negative values are highlighted yellow.

An asterisk (\*) is placed in front of any field containing all unique values, they are highlighted blue and \*\*UNIQUE\*\* is shown next to the field name.

Text fields may have the top 10 most occurring value lengths listed. If listed, the quantity of zero length strings will be highlighted red.

The top 10 most occurring values (greater than 1% and occurring more than once) will be listed. Empty or zero values will be highlighted red.





Primary Key: NONE

Percent Populated / Zero / Negative Values per Field

Enabled 100% / 0% / 0% \*OBJECTID 100% / 0% / 0% SHAPE 100% / 0% / 0%

Enabled (int16, 1 to 1, Avg=1.0, StDev=0.0) Unique:1 Null/Zero/Neg:0 / 0 / 0

Most Occuring Values		Count	%
1		455	100%

OBJECTID \*UNIQUE\* (int32, 1 to 455, Avg=228.0, StDev=131.49) Unique:455 Null/Zero/Neg:0 / 0 / 0

Most Occurring Lengths	Count	%
3 Characters:	356	78%
2 Characters:	90	20%
1 Characters:	9	2%

SHAPE (byte[]) Unique:0 Null/Zero/Neg:0 / 0 / 0

## Issue\_Points Table - 120 records



**Primary Key:** NONE

**Percent Populated / Zero / Negative Values per Field**

COMMENTS	100%/ /	FIXCODE	32%/ /	*ID	100%/ 0% / 0%
*OBJECTID	100%/ 0% / 0%	PROBLEMID	53%/ 0% / 0%	REVIEW	53%/ 0% / 0%
Shape	100%/ 0% / 0%	TEAM	55%/ /		

**COMMENTS** (string254)

Unique: **83**

Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
18 Characters:	22	18%	MISSING CONNECTION	22	18%
19 Characters:	17	14%	MISSING CONNECTIONS	17	14%
43 Characters:	6	5%			
45 Characters:	4	3%			
57 Characters:	3	3%			
124 Characters:	2	2%			
96 Characters:	2	2%			
84 Characters:	2	2%			
74 Characters:	2	2%			
70 Characters:	2	2%			

**FIXCODE** (string16)

Unique: **5**

Null/Zero/Neg: **82 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
5 Characters:	27	23%		57	48%
1 Characters:	25	21%	FIELD	27	23%
6 Characters:	10	8%		25	21%
			OFFICE	7	6%
			DETAIL	3	3%

**ID \*UNIQUE\*** (int32, 1 to 377, Avg=213.49, StDev=109.42)

Unique: **120**

Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Lengths	Count	%
3 Characters:	99	83%
2 Characters:	19	16%
1 Characters:	2	2%

**OBJECTID \*UNIQUE\*** (int32, 1 to 246, Avg=125.97, StDev=72.92)

Unique: **120**

Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Lengths	Count	%
3 Characters:	76	63%
2 Characters:	40	33%
1 Characters:	4	3%

**PROBLEMID** (double, 1.0 to 791.0, Avg=517.25, StDev=233.84)

Unique: **61**

Null/Zero/Neg: **57 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
3 Characters:	61	51%	597	2	2%
			775	2	2%

**REVIEW** (double, 1.0 to 3.0, Avg=1.63, StDev=0.55)

Unique: **3**

Null/Zero/Neg: **57 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
1 Characters:	63	53%	2	36	30%
			1	25	21%
			3	2	2%

**Shape** (byte[])

Unique: **0**

Null/Zero/Neg: **0 / 0 / 0**

**TEAM** (string25)

Unique: **4**

Null/Zero/Neg: **54 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
1 Characters:	63	53%	2	37	31%
6 Characters:	3	3%	1	26	22%
			OFFICE	2	2%

**Primary Key:** NONE**Percent Populated / Zero / Negative Values per Field**

BARRELCNT	77%/ 0% / 0%	COMMENT	45%/ /	CONDITION	73%/ /
DATESTAMP	49%/ /	DEPTH	76%/ /	DEPTH1	81%/ 19% / 0%
DEPTH2	82%/ 19% / 0%	DIAMETER	100%/ 0% / 0%	Enabled	100%/ 0% / 0%
FEATUREID	77%/ /	HEIGHT	77%/ 0% / 0%	ID	100%/ 0% / 0%
INST_DATE	17%/ 0% / 0%	MATERIAL	93%/ /	*OBJECTID	100%/ 0% / 0%
Owner	100%/ /	P_TYPE	100%/ /	PIPE_SHAPE	79%/ /
PLAN_NO	34%/ /	Shape	100%/ 0% / 0%	Shape_Length	100%/ 0% / 0%
SOURCE	95%/ /	STATUS	77%/ /	STREETNAME	96%/ /
TEAM	78%/ /	WIDTH	77%/ 0% / 0%	YEAR_	47%/ 47% / 0%

**BARRELCNT** (int16, 0/1 to 999, Avg=7.47/7.51, StDev=80.03/80.22)

Unique:5

Null/Zero/Neg:898 / 14 / 0

Most Occurring Lengths	Count	%
1 Characters:	2,917	76%
3 Characters:	19	0%

Most Occurring Values	% Length	Count	%
1	75%	2,896	76%

**COMMENT** (string254)

Unique:719

Null/Zero/Neg:2,109 / 0 / 0

Most Occurring Lengths	Count	%
1 Characters:	1,893	49%
70 Characters:	233	6%
18 Characters:	171	4%
25 Characters:	64	2%
63 Characters:	48	1%
69 Characters:	42	1%
7 Characters:	41	1%
79 Characters:	39	1%
27 Characters:	39	1%
72 Characters:	37	1%

Most Occurring Values	% Length	Count	%
FROM PLANS, LOCATION BASED ON PLAN AND BASEMAP DATA	48%	1,895	49%
	6%	216	6%
	7%	214	6%
MISSING CONNECTION	2%	140	4%
PRIVATE	0%	41	1%

**CONDITION** (string10)

Unique:13

Null/Zero/Neg:1,024 / 0 / 0

Most Occurring Lengths	Count	%
4 Characters:	2,706	71%
1 Characters:	154	4%
7 Characters:	56	1%
3 Characters:	40	1%
8 Characters:	5	0%
10 Characters:	2	0%

Most Occurring Values	% Length	Count	%
GOOD	72%	2,705	71%
	24%	870	23%
	2%	154	4%
UNK	1%	40	1%
BLOCKED	1%	39	1%

**DATESTAMP** (string50)

Unique:867

Null/Zero/Neg:1,941 / 0 / 0

Most Occurring Lengths	Count	%
1 Characters:	1,910	50%
7 Characters:	861	22%
17 Characters:	487	13%
18 Characters:	408	11%
16 Characters:	75	2%
19 Characters:	54	1%
8 Characters:	9	0%

Most Occurring Values	% Length	Count	%
	49%	1,910	50%
6-29-04	3%	119	3%
6-23-04	3%	101	3%
6-15-04	2%	79	2%
6-08-04	2%	77	2%
6-18-04	2%	63	2%
6-14-04	1%	45	1%
6-07-04	1%	43	1%
6-03-04	1%	41	1%
6-25-04	1%	40	1%

**DEPTH** (string16)

Unique:1,396

Null/Zero/Neg:908 / 0 / 0

Most Occurring Lengths	Count	%
5 Characters:	1,512	39%
2 Characters:	682	18%
6 Characters:	415	11%
7 Characters:	227	6%
3 Characters:	74	2%
4 Characters:	10	0%
1 Characters:	6	0%
8 Characters:	2	0%

Most Occurring Values	% Length	Count	%
	25%	904	24%
999:999	3%	177	5%
999	1%	49	1%

# pipe Table - 3,835 records



**DEPTH1** (single, 0.0/1.0 to 999.0, Avg=145.04/188.0, StDev=306.28/336.94)

Unique: **161**

Null/Zero/Neg: **715 / 713 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
2 Characters:	1,949	51%	0	16%	713	19%
1 Characters:	719	19%	999	7%	353	9%
3 Characters:	414	11%	36	1%	63	2%
5 Characters:	24	1%	33	1%	52	1%
4 Characters:	13	0%	38	1%	52	1%
			34	1%	51	1%
			40	1%	51	1%
			37	1%	50	1%
			39	1%	50	1%
			41	1%	50	1%

**DEPTH2** (single, 0.0/1.0 to 999.0, Avg=184.63/239.06, StDev=345.34/376.06)

Unique: **149**

Null/Zero/Neg: **708 / 712 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
2 Characters:	1,849	48%	0	16%	712	19%
1 Characters:	722	19%	999	11%	474	12%
3 Characters:	519	14%	50	1%	53	1%
5 Characters:	25	1%	52	2%	53	1%
4 Characters:	12	0%	42	1%	50	1%
			40	1%	46	1%
			46	1%	45	1%
			54	1%	45	1%
			41	1%	42	1%
			47	1%	41	1%

**DIAMETER** (int16, 2 to 999, Avg=87.17, StDev=259.92)

Unique: **24**

Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
2 Characters:	3,031	79%	12	40%	1,739	45%
1 Characters:	516	13%	10	7%	402	10%
3 Characters:	288	8%	8	5%	340	9%
			15	15%	317	8%
			999	5%	288	8%
			18	9%	199	5%
			24	6%	134	3%
			6	3%	117	3%
			30	3%	69	2%
			16	3%	57	1%

**Enabled** (int16, 1 to 1, Avg=1.0, StDev=0.0)

Unique: **1**

Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Values	% Length	Count	%
1	100%	3,835	100%

**FEATUREID** (string16)

Unique: **2,737**

Null/Zero/Neg: **901 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
9 Characters:	1,390	36%	25%		900	23%
4 Characters:	634	17%				
7 Characters:	631	16%				
3 Characters:	109	3%				
8 Characters:	103	3%				
5 Characters:	38	1%				
2 Characters:	19	0%				
14 Characters:	5	0%				
6 Characters:	3	0%				

**HEIGHT** (int16, 2 to 999, Avg=868.55, StDev=333.96)

Unique: **21**

Null/Zero/Neg: **890 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
3 Characters:	2,557	67%	999	66%	2,555	67%
2 Characters:	322	8%	12	5%	207	5%
1 Characters:	66	2%				

**ID** (int32, 1 to 3879, Avg=1936.59, StDev=1116.52)

Unique: **3,831**

Null/Zero/Neg: **4 / 0 / 0**

Most Occurring Lengths	Count	%
4 Characters:	2,848	74%
3 Characters:	884	23%
2 Characters:	90	2%
1 Characters:	9	0%

# pipe Table - 3,835 records



**INST\_DATE** (datetime, 1932 to 2004, Avg=1970.46, StDev=15.23)

Unique: **67**

Null/Zero/Neg: **3,185 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
9 Characters:	267	7%	10/10/1955 12:00:00 AM	2%	63	2%
8 Characters:	261	7%	5/1/1964 12:00:00 AM	2%	58	2%
10 Characters:	122	3%	12/5/1997 12:00:00 AM	1%	46	1%

**MATERIAL** (string16)

Unique: **43**

Null/Zero/Neg: **262 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
3 Characters:	2,694	70%	RCP	52%	1,948	51%
2 Characters:	616	16%	VC	17%	586	15%
4 Characters:	100	3%	CMP	13%	491	13%
6 Characters:	50	1%	PVC	4%	198	5%
5 Characters:	37	1%	ACCM	3%	97	3%
7 Characters:	36	1%	UNK	1%	57	1%
11 Characters:	20	1%				
9 Characters:	14	0%				
14 Characters:	2	0%				
12 Characters:	2	0%				

**OBJECTID** \*UNIQUE\* (int32, 1 to 3883, Avg=1938.62, StDev=1117.71)

Unique: **3,835**

Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Lengths	Count	%
4 Characters:	2,852	74%
3 Characters:	884	23%
2 Characters:	90	2%
1 Characters:	9	0%

**Owner** (string50)

Unique: **5**

Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
8 Characters:	2,929	76%	Laptop 1	46%	1,822	48%
6 Characters:	899	23%	Laptop 2	29%	1,107	29%
10 Characters:	7	0%	OFFICE	23%	853	22%
			ANDREW	1%	46	1%

**P\_TYPE** (string25)

Unique: **2**

Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
5 Characters:	3,761	98%	DRAIN	99%	3,761	98%
7 Characters:	74	2%	CULVERT	1%	74	2%

**PIPE\_SHAPE** (string10)

Unique: **7**

Null/Zero/Neg: **822 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
4 Characters:	2,964	77%	CIRC	76%	2,959	77%
3 Characters:	48	1%				

**PLAN\_NO** (string16)

Unique: **177**

Null/Zero/Neg: **2,525 / 0 / 0**

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
1 Characters:	2,330	61%		60%	2,314	60%
5 Characters:	830	22%		5%	211	6%
2 Characters:	141	4%	8-458	1%	46	1%
7 Characters:	124	3%	L3.1	1%	46	1%
12 Characters:	71	2%				
4 Characters:	46	1%				
14 Characters:	25	1%				
6 Characters:	23	1%				
9 Characters:	13	0%				
13 Characters:	11	0%				

**Shape** (byte[])

Unique: **0**

Null/Zero/Neg: **8 / 0 / 0**

**Shape\_Length** (double, 0.0/0.94 to 868.47, Avg=75.21/75.37, StDev=82.2/82.22)

Unique: **3,821**

Null/Zero/Neg: **0 / 8 / 0**

Most Occurring Lengths	Count	%
16 Characters:	3,390	88%
15 Characters:	392	10%
14 Characters:	36	1%
1 Characters:	8	0%
13 Characters:	3	0%
2 Characters:	3	0%
4 Characters:	2	0%

# pipe Table - 3,835 records



## SOURCE (string8)

Unique: 5

Null/Zero/Neg: 180 / 0 / 0

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
5 Characters:	2,760	72%	Field	73%	2,760	72%
2 Characters:	629	16%	AB	18%	630	16%
8 Characters:	246	6%	Document	3%	186	5%
4 Characters:	19	0%	INFERRED	1%	60	2%

## STATUS (string4)

Unique: 1

Null/Zero/Neg: 899 / 0 / 0

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
1 Characters:	2,936	77%	I	75%	2,936	77%

## STREETNAME (string100)

Unique: 390

Null/Zero/Neg: 156 / 0 / 0

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
13 Characters:	938	24%	CROSS-COUNTRY	17%	537	14%
10 Characters:	608	16%	Walnut St	3%	166	4%
11 Characters:	486	13%	Central St	5%	165	4%
9 Characters:	471	12%	Lincoln Ave	4%	142	4%
12 Characters:	243	6%	Main St	3%	122	3%
14 Characters:	223	6%	CROSS COUNTRY	3%	82	2%
8 Characters:	205	5%	Juniper Dr	2%	59	2%
7 Characters:	204	5%	Water St	1%	53	1%
15 Characters:	98	3%	Ballard St	2%	49	1%
16 Characters:	70	2%	HAMMERSMITH DR	1%	48	1%

## TEAM (string25)

Unique: 7

Null/Zero/Neg: 852 / 0 / 0

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
6 Characters:	2,977	78%	Team 1	47%	1,856	48%
1 Characters:	6	0%	Team 2	28%	1,075	28%
20 Characters:	4	0%		23%	847	22%
			OFFICE	1%	46	1%

## WIDTH (int16, 2 to 999, Avg=868.74, StDev=333.53)

Unique: 22

Null/Zero/Neg: 890 / 0 / 0

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
3 Characters:	2,557	67%	999	66%	2,555	67%
2 Characters:	324	8%	12	5%	207	5%
1 Characters:	64	2%				

## YEAR\_ (int16, 0/0 to 0, Avg=0.0/0.0, StDev=0.0/0.0)

Unique: 1

Null/Zero/Neg: 2,014 / 1,821 / 0

Most Occurring Lengths	Count	%	Most Occurring Values	% Length	Count	%
1 Characters:	1,821	47%	0	46%	1,821	47%

## SelectedObjects Table - 2,394 records



**Primary Key:** NONE

### Percent Populated / Zero / Negative Values per Field

*ObjectID	100% / 0% / 0%	SelectionID	100% / 0% / 0%
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**ObjectID** \*UNIQUE\* (int32, 1 to 3963, Avg=1911.77, StDev=1098.35) Unique: **2,394** Null/Zero/Neg: **0 / 0 / 0**

Most Occurring Lengths	Count	%
4 Characters:	1,802	75%
3 Characters:	505	21%
2 Characters:	78	3%
1 Characters:	9	0%

**SelectionID** (int32, 99 to 99, Avg=99.0, StDev=0.0) Unique: **1** Null/Zero/Neg: **0 / 0 / 0**

Most Occuring Values	Count	%
99	2,394	100%

**Primary Key:** NONE**Percent Populated / Zero / Negative Values per Field**

ACCESSTYPE	74%/ /	COMMENT	43%/ /	CONDITION	69%/ /
CONTAM	69%/ /	DATESTAMP	98%/ /	Enabled	100%/ 0% / 0%
FEATUREID	73%/ 0% / 0%	FLR_DEPTH	76%/ 4% / 0%	FLR_ELEV	47%/ 43% / 0%
FTYPE	100%/ /	HOODED	73%/ 71% / 0%	ID	100%/ 0% / 0%
INST_DATE	18%/ 0% / 0%	*OBJECTID	100%/ 0% / 0%	Owner	100%/ /
PLAN_NO	34%/ /	REINSPECT	69%/ /	RIM_ELEV	47%/ 43% / 0%
RIMTOSD	73%/ 4% / 0%	SEALMETHOD	69%/ /	SED_DEPTH	73%/ 73% / 0%
SEPARATOR	73%/ 73% / 0%	Shape	100%/ 0% / 0%	SOURCE	93%/ /
SUMP	0%/ /	SUMP_DEPTH	73%/ 73% / 0%	TEAM	74%/ /
WALL_MAT	72%/ /	X_COORD	85%/ 24% / 0%	Y_COORD	85%/ 24% / 0%
YEAR_	47%/ 47% / 0%	Z_COORD	85%/ 24% / 0%		

**ACCESSTYPE (string8)**

Unique:33

Null/Zero/Neg:1,038 / 0 / 0

Most Occurring Lengths	Count	%
5 Characters:	1,678	43%
3 Characters:	798	20%
8 Characters:	231	6%
4 Characters:	176	4%
7 Characters:	7	0%
1 Characters:	4	0%

Most Occuring Values	Count	%
GRATE	1,675	43%
	1,034	26%
DMH	665	17%
PIPE	159	4%
BLANK CO	132	3%
UNK	101	3%
None Sel	53	1%

**COMMENT (string254)**

Unique:852

Null/Zero/Neg:2,250 / 0 / 0

Most Occurring Lengths	Count	%
1 Characters:	2,054	52%
62 Characters:	180	5%
63 Characters:	111	3%
17 Characters:	84	2%
16 Characters:	51	1%
56 Characters:	45	1%
22 Characters:	40	1%
71 Characters:	39	1%
21 Characters:	38	1%
12 Characters:	34	1%

Most Occuring Values	Count	%
	2,054	52%
	196	5%
ROM PLANS, LOCATION BASED ON PLAN AND BASEMAP DATA	168	4%
ROM PLANS, LOCATION BASED ON PLAN AND BASEMAP DATA	109	3%
PIPE PVC SCREENED	51	1%

**CONDITION (string8)**

Unique:11

Null/Zero/Neg:1,216 / 0 / 0

Most Occurring Lengths	Count	%
4 Characters:	2,535	65%
3 Characters:	172	4%
1 Characters:	161	4%
6 Characters:	3	0%
7 Characters:	2	0%

Most Occuring Values	Count	%
GOOD	2,479	63%
	1,055	27%
UNK	170	4%
	161	4%

**CONTAM (string8)**

Unique:22

Null/Zero/Neg:1,217 / 0 / 0

Most Occurring Lengths	Count	%
2 Characters:	2,328	59%
3 Characters:	196	5%
1 Characters:	162	4%
6 Characters:	73	2%
4 Characters:	59	2%
8 Characters:	44	1%
7 Characters:	7	0%
5 Characters:	5	0%

Most Occuring Values	Count	%
NO	2,328	59%
	1,055	27%
UNK	165	4%
	162	4%
GREASE	73	2%
ODOR	58	1%

**DATESTAMP (string50)**

Unique:2,660

Null/Zero/Neg:62 / 0 / 0

Most Occurring Lengths	Count	%
17 Characters:	1,465	37%
7 Characters:	1,006	26%
18 Characters:	882	22%
16 Characters:	409	10%
19 Characters:	92	2%
8 Characters:	12	0%
1 Characters:	4	0%

Most Occuring Values	Count	%
6-29-04	136	3%
6-23-04	123	3%
6-15-04	74	2%
6-08-04	64	2%
6-18-04	63	2%
	58	1%
6-14-04	51	1%
6-03-04	50	1%
6-04-04	49	1%
6-07-04	47	1%



# structure Table - 3,929 records



Enabled (int16, 1 to 1, Avg=1.0, StDev=0.0)

Unique:1

Null/Zero/Neg:0 / 0 / 0

Most Occuring Values		Count	%
1		3,929	100%

FEATUREID (int32, 0/5 to 6183, Avg=2649.33/2650.26, StDev=2238.92/2238.76)

Unique:2,847

Null/Zero/Neg:1,077 / 1 / 0

Most Occurring Lengths	Count	%
4 Characters:	1,974	50%
3 Characters:	801	20%
2 Characters:	73	2%
1 Characters:	4	0%

FLR\_DEPTH (double, 0.0/11.0 to 999.0, Avg=202.94/214.79, StDev=327.95/333.6)

Unique:134

Null/Zero/Neg:957 / 164 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
2 Characters:	2,203	56%	999	429	11%
3 Characters:	603	15%	0	164	4%
1 Characters:	164	4%	73	74	2%
4 Characters:	2	0%	70	71	2%
			60	70	2%
			75	70	2%
			68	65	2%
			80	62	2%
			77	60	2%
			76	59	2%

FLR\_ELEV (double, 0.0/99.0 to 999.0, Avg=81.9/993.08, StDev=274.05/73.0)

Unique:3

Null/Zero/Neg:2,086 / 1,691 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
1 Characters:	1,691	43%	0	1,691	43%
3 Characters:	151	4%	999	151	4%

FTYPE (string25)

Unique:20

Null/Zero/Neg:12 / 0 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
2 Characters:	1,738	44%	CB	1,738	44%
3 Characters:	1,120	29%	DMH	1,119	28%
7 Characters:	381	10%	OUTFALL	341	9%
6 Characters:	224	6%	CURB	219	6%
4 Characters:	219	6%	INTAKE	152	4%
10 Characters:	143	4%	DIRECT TAP	143	4%
5 Characters:	47	1%	DGRATE	72	2%
11 Characters:	28	1%	DBLCB	46	1%
15 Characters:	10	0%			
12 Characters:	5	0%			

HOODED (int16, 0/1 to 1, Avg=0.02/1.0, StDev=0.13/0.0)

Unique:2

Null/Zero/Neg:1,074 / 2,808 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
1 Characters:	2,855	73%	0	2,808	71%
			1	47	1%

ID (int32, 1 to 3967, Avg=1970.82, StDev=1140.16)

Unique:3,928

Null/Zero/Neg:1 / 0 / 0

Most Occurring Lengths	Count	%
4 Characters:	2,931	75%
3 Characters:	899	23%
2 Characters:	89	2%
1 Characters:	9	0%

INST\_DATE (datetime, 1932 to 2004, Avg=1970.32, StDev=15.3)

Unique:71

Null/Zero/Neg:3,214 / 0 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
8 Characters:	313	8%	5/1/1964 12:00:00 AM	65	2%
9 Characters:	284	7%	10/10/1955 12:00:00 AM	60	2%
10 Characters:	118	3%	12/5/1997 12:00:00 AM	50	1%

OBJECTID \*UNIQUE\* (int32, 1 to 3968, Avg=1971.33, StDev=1140.46)

Unique:3,929

Null/Zero/Neg:0 / 0 / 0

Most Occurring Lengths	Count	%
4 Characters:	2,932	75%
3 Characters:	899	23%
2 Characters:	89	2%
1 Characters:	9	0%

# structure Table - 3,929 records



## Owner (string50)

Unique:5

Null/Zero/Neg:0 / 0 / 0

Most Occurring Lengths	Count	%
8 Characters:	2,842	72%
6 Characters:	1,077	27%
10 Characters:	10	0%

Most Occuring Values	Count	%
Laptop 1	1,843	47%
OFFICE	1,026	26%
Laptop 2	999	25%
ANDREW	51	1%

## PLAN\_NO (string16)

Unique:173

Null/Zero/Neg:2,574 / 0 / 0

Most Occurring Lengths	Count	%
1 Characters:	2,260	58%
5 Characters:	881	22%
7 Characters:	149	4%
2 Characters:	136	3%
12 Characters:	59	2%
4 Characters:	42	1%
6 Characters:	30	1%
14 Characters:	25	1%
13 Characters:	9	0%
9 Characters:	9	0%

Most Occuring Values	Count	%
	2,252	57%
	322	8%
8-458	51	1%
8-430	42	1%
L3.1	42	1%

## REINSPECT (string20)

Unique:20

Null/Zero/Neg:1,227 / 0 / 0

Most Occurring Lengths	Count	%
2 Characters:	2,564	65%
1 Characters:	158	4%
9 Characters:	44	1%
15 Characters:	27	1%
20 Characters:	23	1%
10 Characters:	18	0%
6 Characters:	8	0%
3 Characters:	6	0%
7 Characters:	5	0%
19 Characters:	2	0%

Most Occuring Values	Count	%
NO	2,564	65%
	1,069	27%
	158	4%

## RIM\_ELEV (double, 0.0/15.55 to 999.0, Avg=81.9/906.25, StDev=273.75/286.73)

Unique:15

Null/Zero/Neg:2,070 / 1,691 / 0

Most Occurring Lengths	Count	%
1 Characters:	1,691	43%
3 Characters:	152	4%
5 Characters:	15	0%

Most Occuring Values	Count	%
0	1,691	43%
999	152	4%

## RIMTOSED (double, 0.0/11.0 to 999.0, Avg=191.77/203.17, StDev=326.53/332.63)

Unique:136

Null/Zero/Neg:1,077 / 160 / 0

Most Occurring Lengths	Count	%
2 Characters:	2,180	55%
3 Characters:	508	13%
1 Characters:	160	4%
4 Characters:	4	0%

Most Occuring Values	Count	%
999	399	10%
0	160	4%
60	83	2%
58	71	2%
62	60	2%
55	59	2%
70	56	1%
68	55	1%
50	52	1%
59	51	1%

## SEALMETHOD (string8)

Unique:7

Null/Zero/Neg:1,212 / 0 / 0

Most Occurring Lengths	Count	%
4 Characters:	2,560	65%
1 Characters:	160	4%
3 Characters:	150	4%
8 Characters:	4	0%
6 Characters:	3	0%

Most Occuring Values	Count	%
NONE	2,560	65%
	1,052	27%
	160	4%
UNK	150	4%

## SED\_DEPTH (double, 0.0/0.0 to 0.0, Avg=0.0/0.0, StDev=0.0/0.0)

Unique:1

Null/Zero/Neg:1,077 / 2,852 / 0

Most Occurring Lengths	Count	%
1 Characters:	2,852	73%

Most Occuring Values	Count	%
0	2,852	73%

## SEPARATOR (int16, 0/1 to 1, Avg=0.0/1.0, StDev=0.02/0.0)

Unique:2

Null/Zero/Neg:1,077 / 2,851 / 0

Most Occurring Lengths	Count	%
1 Characters:	2,852	73%

Most Occuring Values	Count	%
0	2,851	73%

## Shape (byte[])

Unique:0

Null/Zero/Neg:0 / 0 / 0

# structure Table - 3,929 records



## SOURCE (string8)

Unique:9

Null/Zero/Neg:287 / 0 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
5 Characters:	2,689	68%	Field	2,689	68%
2 Characters:	638	16%	AB	638	16%
8 Characters:	291	7%		286	7%
4 Characters:	18	0%	Document	170	4%
6 Characters:	4	0%	INFERRED	121	3%
1 Characters:	2	0%			

## SUMP (string8)

Unique:1

Null/Zero/Neg:3,929 / 0 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
1 Characters:	2,852	73%		2,852	73%
				1,077	27%

## SUMP\_DEPTH (double, 0.0/0.0 to 0.0, Avg=0.0/0.0, StDev=0.0/0.0)

Unique:1

Null/Zero/Neg:1,077 / 2,852 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
1 Characters:	2,852	73%	0	2,852	73%

## TEAM (string25)

Unique:6

Null/Zero/Neg:1,020 / 0 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
6 Characters:	2,898	74%	Team 1	1,850	47%
20 Characters:	10	0%		1,015	26%
1 Characters:	5	0%	Team 2	997	25%
			OFFICE	51	1%

## WALL\_MAT (string8)

Unique:25

Null/Zero/Neg:1,084 / 0 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
5 Characters:	1,677	43%	CCBLK	1,152	29%
2 Characters:	735	19%		925	24%
3 Characters:	174	4%	CC	735	19%
1 Characters:	159	4%	BRICK	466	12%
4 Characters:	109	3%	UNK	172	4%
8 Characters:	99	3%		159	4%
7 Characters:	45	1%	NONE	109	3%
6 Characters:	6	0%	CONC BLK	65	2%
			STONE	54	1%

## X\_COORD (double, 0.0/776828.9 to 795976.2, Avg=562083.46/787949.92, StDev=

Unique:2,362

Null/Zero/Neg:573 / 962 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
8 Characters:	2,172	55%	0	962	24%
1 Characters:	962	24%			
6 Characters:	222	6%			

## Y\_COORD (double, 0.0/2986912.2 to 3008206.3, Avg=2136653.83/2995242.38,

Unique:2,365

Null/Zero/Neg:573 / 962 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
9 Characters:	2,151	55%	0	962	24%
1 Characters:	962	24%			
7 Characters:	243	6%			

## YEAR\_ (int16, 0/0 to 0, Avg=0.0/0.0, StDev=0.0/0.0)

Unique:1

Null/Zero/Neg:2,086 / 1,843 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
1 Characters:	1,843	47%	0	1,843	47%

## Z\_COORD (double, 0.0/3.7 to 227.4, Avg=39.53/55.42, StDev=38.86/35.17)

Unique:981

Null/Zero/Neg:573 / 962 / 0

Most Occurring Lengths	Count	%	Most Occuring Values	Count	%
4 Characters:	1,753	45%	0	962	24%
1 Characters:	980	25%			
5 Characters:	229	6%			
3 Characters:	200	5%			
2 Characters:	194	5%			

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A decorative graphic consisting of three thin orange lines. One line is horizontal, starting from the left edge and extending across the page. Two other lines are diagonal, starting from the bottom left and extending towards the top right, intersecting the horizontal line.

# APPENDIX B

## Preliminary Municipal Facilities List



Town of Saugus, Massachusetts  
Preliminary Municipal Facilities List

ADDRESS	SITE NAME	BUILDING TYPE
100 BALLARD ST	HARBORMASTER	LODGE
180 WALNUT ST	CATALDO AMBULANCE SERVICE	GARAGE
27 HAMILTON ST	PUBLIC SAFETY BUILDING	GOVERNMENT BUILDING
515 MAIN ST	DPW OFFICES	OFFICE WAREHOUSE GARAGE
466 CENTRAL ST	SENIOR CENTER	CITY-CLUB
295 CENTRAL ST	PUBLIC LIBRARY	LIBRARY
7084 SUMMER ST	STACKPOLE FIELD	CLUB-HOUSE
400 LINCOLN AVE	SAUGUS HOUSING AUTHORITY	APARTMENT GROUNDS
443 WALNUT ST	LYNNHURST SCHOOL	SCHOOL
REAR HOBSON ST	COMCAST OF MA INC	INDUSTRIAL
2 RICE ST	SAUGUS HOUSING AUTHORITY	MULTIPLE GROUND
25 DOW ST	BELMONT JR. HIGH	SCHOOL
25 TALBOT ST	WAYBRIGHT SCHOOL	SCHOOL ASSISTED LIVING
50 HURD AVE	VETRANS MEMORIAL SCHOOL	SCHOOL
PEARCE MEMORIAL DR	SAUGUS HIGH SCHOOL	SCHOOL
270 MAIN ST	SINGLE FAMILY HOUSE	SPLIT ENTRY
20 EAST DENVER ST	EVANS SCHOOL	SCHOOL
400 CENTRAL ST	SENIOR CENTER	LODGE
164 WINTER ST	CEMETERY	OFFICE
266 MAIN ST	OAKLANDVALE SCHOOL	SCHOOL
515R MAIN ST	HIGHWAY DEPARTMENT	VET CLINIC
24 LINCOLN AVE	PUBLIC WORKS	WAREHOUSE
5458 ESSEX ST	CLIFTONDALE SCHOOL	SCHOOL
2228 RICHARD ST	BALLARD SCHOOL	SCHOOL
216 ESSEX ST	SAUGUS HOUSING AUTHORITY	APARTMENT GROUNDS
298 CENTRAL ST	TOWN HALL & FIRE STATION	GOVERNMENT BUILDING / FIRE STATION
ALDWORTH AVE	PARKS & PLAYGROUND	
34 HOUSTON AVE	SAUGUS HOUSING AUTHORITY	
50 SPENCER AVE	SAUGUS HOUSING AUTHORITY	
21-25 MAIN ST	SCHOOL ADMINISTRATION	SCHOOL / GOVERNMENT BUILDING
APPLETON ST	PARKS & PLAYGROUND	
BALLARD ST	PARKS & PLAYGROUND	
10 BENNETT AVE	PARKS & PLAYGROUND	
23 BRISTOW ST	PARKS & PLAYGROUND	
R CENTRAL ST	PARKS & PLAYGROUND	
CENTRAL ST	PARKS & PLAYGROUND (1 of 2)	
CENTRAL ST	PARKS & PLAYGROUND (2 of 2)	
REAR CHEEVER AVE	PARKS & PLAYGROUND	
57-71 CHEEVER AVE	PARKS & PLAYGROUND	
70 CHEEVER AVE	PARKS & PLAYGROUND	
EMERALD RD	PARKS & PLAYGROUND	
GLEN PARK AVE	PARKS & PLAYGROUND	
42 GOLDEN HILLS RD	PARKS & PLAYGROUND	
42 HOUSTON AVE	PARKS & PLAYGROUND	
PIEDMONT AVE	PARKS & PLAYGROUND	
ROSE ST	PARKS & PLAYGROUND (1 of 2)	

Town of Saugus, Massachusetts  
Preliminary Municipal Facilities List

ADDRESS	SITE NAME	BUILDING TYPE
ROSE ST	PARKS & PLAYGROUND (2 of 2)	
STOCKER ST	PARKS & PLAYGROUND	
22 STOCKER ST	PARKS & PLAYGROUND	
WHITTIER AVE	PARKS & PLAYGROUND	
WINTER ST	PARKS & PLAYGROUND	
BAILEY AVE	PUBLIC WORKS	
JASPER ST	PUBLIC WORKS	
JOHNSON ST	PUBLIC WORKS	
28 LAUREL ST	PUBLIC WORKS	
LINCOLN AVE	PUBLIC WORKS	
9 MORRIS PL	PUBLIC WORKS	
RIVERWAY	PUBLIC WORKS	
BAKER ST	WATER DEPARTMENT	
HAMILTON ST	WATER DEPARTMENT	
SUMMIT AVE	WATER DEPARTMENT (1 of 2)	
SUMMIT AVE	WATER DEPARTMENT (2 of 2)	
BALLARD ST	PUBLIC LANDING	
1 JONES DR	PUBLIC LANDING	
3 JONES DR	PUBLIC LANDING	
PRANKERS POND	PUBLIC LANDING	
BELMONT ST	CEMETERY	
MAIN ST	CEMETERY	
MARSHLAND	CEMETERY	
BIRCH ST	SENIOR CENTER (1 of 2)	
BIRCH ST	SENIOR CENTER (2 of 2)	
4 CASTLE ROCK RD	SPRING POND	
CLIFTON AVE	HIGHWAY DEPARTMENT	
DEWEY ST	HIGHWAY DEPARTMENT	
FARRINGTON AVE	HIGHWAY DEPARTMENT	
JOHNSON ST	HIGHWAY DEPARTMENT	
LEWIS ST	HIGHWAY DEPARTMENT	
LINCOLN AVE	HIGHWAY DEPARTMENT	
WALNUT ST	HIGHWAY DEPARTMENT (1 of 2)	
WALNUT ST	HIGHWAY DEPARTMENT (2 of 2)	
124 ESSES ST	FIRE STATION/LIBRARY	FIRE STATION
HURD AVE	SCHOOL DEPARTMENT	SCHOOL
IRON WORKS WAY	OPEN SPACE	
SHORE RD	GRISWOLD POND	
SWEETWATER ST	GRISWOLD LOWER POND	
28 TAYLOR ST	LIBRARY PARKING LOT	
VINEGAR HILL DR	OPEN SPACE (1 of 2)	
VINEGAR HILL DR	OPEN SPACE (2 of 2)	
WINTER ST	STOCKER PARK	
WINTER ST	RIGHT OF WAY / USED IN COMMON	

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1. Property owners within 100 yards of the Saugus River, from Bridge Street, downstream to the Saugus Municipal Boundary, shall receive written notice and warning from the Town of Saugus within 48 hours.
2. Signs must be conspicuously placed within 12 hours at Vitale Park and the Penney Landing on Ballard Street for a period of time to be determined by the Board of Health.
3. Notice shall be sent to the Saugus and Lynn cable TV stations within 12 hours of the beginning of any period of sewage discharge. Said notice shall read: "The Town of Saugus has issued a warning about potential health risks in the Saugus River from bacterial pollution with recent sewage overflows."

(Article 26 of the 2005 Annual Town Meeting held on May 23, 2005)

## 705.00 Stormwater

### 705.01 - General

#### SECTION 1 - Authority

This By-Law is adopted by the Town under its home rule powers, its police powers to protect public health and welfare, and its specific authorization under M.G.L. c. 40A, Sections 21 and 21D, c. 83, Sections 1, 10, and 16, and pursuant to the regulations of the Federal Clean Water Act (40 CFR 122.34).

#### SECTION 2 - Purpose, Objectives and Intent

Regulation of discharges to the municipal storm drainage system is necessary for the protection of the Town's waterbodies and groundwater, and to safeguard public health, safety, welfare, and environment. The purpose of this By-law is to improve and protect water quality, reduce erosion and sedimentation, promote environmentally sensitive site design practices, and ensure long term maintenance of stormwater controls. This By-law is required to meet all applicable federal and state requirements of the Town's National Pollutant Discharge Elimination System Small Municipal Separate Storm Sewer Systems Permit, commonly known as the "NPDES MS4 permit".

The purposes, objectives, and intent of this By-law are as follows:

- A. To prevent pollutants from entering the Town's Municipal Storm Drainage System and Waters of the Commonwealth of Massachusetts;
- B. To establish an Authorized Enforcement Agency to promulgate, adopt, implement, enforce and amend stormwater regulations;
- C. To prohibit non-stormwater and unauthorized discharges, connections and obstructions to the municipal storm drainage system;
- D. To require the removal of all such illicit discharges, connections and/or obstructions;
- E. To comply with state and federal statutes and regulations relating to stormwater discharges;
- F. To establish procedures to regulate construction and post-construction stormwater runoff management from new development and redevelopment; and

G. To establish legal authority to ensure compliance with the provisions of this By-law through inspection, monitoring, and enforcement.

SECTION 3 - Definitions.

AUTHORIZED ENFORCEMENT AGENCY - The Director of the Department of Public Works, its employees, officers, or agents are designated to enforce this By-law.

BY-LAW - Refers to Section 705.00, Stormwater By-law of the "Town of Saugus By-laws".

CLEAN WATER ACT - The Federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.) as hereafter amended.

DISCHARGE OF POLLUTANTS - The addition from any source of any pollutant or combination of pollutants into the municipal storm drainage system or into the waters of the United States or Commonwealth of Massachusetts from any source.

GROUNDWATER - Water beneath the surface of the ground.

ILLICIT CONNECTION - A surface or subsurface drain or conveyance, which allows an illicit discharge into the municipal storm drainage system, including without limitation sewage, process wastewater, or wash water and any connections from indoor drains, sinks, or toilets, regardless of whether said connection was previously allowed, permitted, or approved before the effective date of this By-law.

ILLICIT DISCHARGE - Direct or indirect discharge to the municipal storm drainage system that is not composed entirely of stormwater, except as exempted in 705.02, Section 2 of this By-law. The term does not include a discharge in compliance with a NPDES Stormwater Discharge Permit or a Surface Water Discharge Permit, or resulting from firefighting activities exempted pursuant to 705.02, Section 2 of this By-law.

IMPERVIOUS SURFACE - Any material or structure on or above the ground that prevents water infiltrating the underlying soil. Impervious surface includes without limitation roads, paved parking lots, sidewalks, and rooftops.

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) or MUNICIPAL STORM DRAINAGE SYSTEM - The system of conveyances designed or used for collecting or conveying stormwater, including any road with a drainage system, street, gutter, curb, inlet, piped storm drain, pumping facility, retention or detention basin, natural or man-made or altered drainage channel, reservoir, and other drainage structure that together comprise the storm drainage system owned or operated by the Town.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORMWATER DISCHARGE PERMIT - A permit issued by United States Environmental Protection Agency or jointly with the State that authorizes the discharge of pollutants to waters of the United States.

NON-STORMWATER DISCHARGE - Discharge to the municipal storm drainage system not composed entirely of stormwater.

OWNER - A person with a legal or equitable interest in property.

PERSON - An individual, partnership, association, firm, company, trust, corporation, agency, authority, department or political subdivision of the Commonwealth of Massachusetts or the federal government, to the extent permitted by law, and any officer, employee, or agent of such person.

POLLUTANT - Any element or property of sewage, agricultural, industrial or commercial waste, runoff, leachate, heated effluent, or other matter whether originating at a point or nonpoint source, that is or may be introduced into any sewage treatment works or waters of the Commonwealth of Massachusetts. Pollutants shall include without limitation:

- A. Paints, varnishes, and solvents;
- B. Oil and other automotive fluids;
- C. Non-hazardous liquid and solid wastes and yard wastes;
- D. Refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordnances, accumulations and floatables;
- E. Pesticides, herbicides, and fertilizers;
- F. Hazardous materials and wastes;
- G. Sewage, fecal coliform and pathogens;
- H. Dissolved and particulate metals;
- I. Animal wastes;
- J. Rock. sand. salt. soils;
- K. Construction wastes and residues; and
- L. Noxious or offensive matter of any kind.

PROCESS WASTEWATER - Water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any material, intermediate product, finished product, or waste product.

STORMWATER - Any water resulting from rainfall or other precipitation that runs off surfaces during or after a storm, including stormwater runoff, snowmelt runoff, and surface water runoff and drainage.

SURFACE WATER DISCHARGE PERMIT - A permit issued by the Department of Environmental Protection (DEP) pursuant to 314 CMR 3.00 that authorizes the discharge of pollutants to waters of the Commonwealth of Massachusetts.

TOXIC OR HAZARDOUS MATERIAL OR WASTE - Any material, which because of its quantity, concentration, chemical, corrosive, flammable, reactive, toxic, infectious or radioactive characteristics, either separately or in combination with any substance or substances, constitutes a present or potential threat to human health, safety, welfare, or to the environment. Toxic or hazardous materials include any synthetic organic chemical, petroleum product, heavy metal, radioactive or infectious waste, acid and alkali, and any substance defined as Toxic or Hazardous under G.L. Ch.21C and Ch.21E, and the regulations at 310 CMR 30.000 and 310 CMR 40.0000.

WASTEWATER - Any sanitary waste, sludge, or septic tank or cesspool overflow, and water that during manufacturing, cleaning or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct or waste product.

WATERCOURSE - A natural or man-made channel through which water flows or a stream of water, including a river, brook or underground stream.

WATERS OF THE COMMONWEALTH OF MASSACHUSETTS - All waters within the jurisdiction of the Commonwealth of Massachusetts, including, without limitation, rivers, streams, lakes, ponds, springs, impoundments, estuaries, wetlands, coastal waters, and groundwater.

WETLANDS - Coastal and freshwater wetlands, including wet meadows, marshes, swamps, and bogs, as defined and determined pursuant to G.L. c. 131, § 40 and 310 CMR 10.00 et seq.

#### SECTION 4 - Applicability.

A. Municipal Storm Drainage System and Waters of the Commonwealth of Massachusetts.

1. This By-law shall apply to flows entering the Town's Municipal Storm Drainage System and Waters of the Commonwealth of Massachusetts.

B. Construction and Post-Construction Activities

1. Any construction activity, including clearing, grading, and excavation that will disturb equal to or greater than one acre of land or will disturb less than one acre of land but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than one acre of land draining to the Town municipal separate drain system without a Stormwater Management Permit from the Enforcement Agency. After the initial common plan construction activity is completed for a particular parcel, any subsequent development or redevelopment of that parcel would be regarded as a new plan of development. For example, after a house is built and occupied, any future construction on that lot (e.g., reconstructing after fire, adding a pool or parking area, etc.), would stand alone as a new common plan for purposes of calculating acreage disturbed to determine if a Stormwater Management Permit is required. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or the original purpose of the site.

2. Exemptions.

a) Construction activities waived from permit coverage under the NPDES General Permit for Stormwater Discharges from Construction Activities.

b) Normal maintenance and improvement of land in agricultural use as defined by the Wetlands Protection Act regulation 310 CMR 10.04;

c) Maintenance of existing landscaping, gardens or lawn areas associated with a single family dwelling;

d) The construction of fencing that will not substantially alter existing terrain or drainage patterns;

e) Construction of utilities other than drainage (gas, water, electric, telephone, etc.) which will not alter terrain or drainage patterns;

f) Emergency work to protect life, limb, or property.

## SECTION 5 - Responsibility for Administration.

The Authorized Enforcement Agency shall administer, implement and enforce this By-Law, and any rules and regulations adopted thereunder. Any powers granted to or duties imposed upon the Authorized Enforcement Agency may be delegated in writing by the Authorized Enforcement Agency to employees or agents of the Authorized Enforcement Agency.

## SECTION 6 - Regulations.

The Authorized Enforcement Agency may adopt and periodically amend rules and regulations, not inconsistent, herewith, to effectuate the purposes of this By-law. Said regulations may include but shall not be limited to provisions regarding: administration; application requirements and fees; permitting procedures and requirements; design standards; surety requirements; inspection and site supervision requirements; waivers and exemptions; and enforcement procedures. Failure by the Authorized Enforcement Agency to promulgate such rules and regulations shall not have the effect of suspending or invalidating this By-law.

## SECTION 7 - Enforcement

The Authorized Enforcement Agency or appointed designee shall enforce this By-law and any regulations, orders, violation notices, enforcement orders, and permit conditions on behalf of the Town, and may pursue all civil and criminal remedies for such violations pursuant thereto.

A. Civil Relief. If a person violates the provisions of this By-law, regulations, permit, notice, or order issued there under, the Authorized Enforcement Agency may seek injunctive relief in a court of competent jurisdiction restraining the person from activities which would create further violations or compelling the person to perform abatement or remediation of the violation.

## B. Orders.

1. The Authorized Enforcement Agency or an authorized agent of the Authorized Enforcement Agency may issue a written order to enforce the provisions of this By-law or the regulations there under, which may include:

- a) Elimination of illicit connections or discharges to the municipal storm drainage system;
- b) Performance of monitoring, analyses, and reporting;
- c) That unlawful discharges, practices, or operations shall cease and desist; and
- d) Remediation of contamination in connection therewith.

2. If the Authorized Enforcement Agency determines that abatement or remediation of contamination is required, the order shall set forth a deadline by which such abatement or remediation must be completed. Said order shall further advise that, should the violator or property owner fail to abate or perform remediation within the specified deadline, the Town may, at its option, undertake such work.

C. Criminal Penalty. Any person who violates any provision of this By-law, regulation, order or permit issued there under, shall be punished by a fine of not more than \$300 for each violation. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

D. Non-criminal Disposition. As an alternative to criminal prosecution or civil action, the Town may elect to utilize the noncriminal disposition procedure. The penalty for the 1st violation shall be \$100. The penalty for the 2nd violation shall be \$200. The penalty for the 3rd and subsequent violations shall be \$300. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

E. Entry to Perform Duties Under this By-law. To the extent permitted by state law, or if authorized by the owner or other party in control of the property, the Authorized Enforcement Agency or Inspectional Services Department, its agents, officers, and employees may enter upon privately owned property for the purpose of performing their duties under this By-law and regulations and may make or cause to be made such examinations, surveys or sampling as the Authorized Enforcement Agency deems reasonably necessary.

F. Appeals. The decisions or orders of the Authorized Enforcement Agency shall be final. Further relief shall be to a court of competent jurisdiction.

G. Remedies Not Exclusive. The remedies listed in this By-law are not exclusive of any other remedies available under any applicable federal, state or local law.

#### SECTION 8 - Severability.

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

#### SECTION 9 - Transitional provisions.

Residential property owners shall have 90 days from the effective date of this By-law to comply with its provisions provided good cause is shown for the failure to comply with this By-law during that period.

#### 705.02 - Non-Stormwater Discharges, Connections and Obstructions

##### SECTION 1 - Prohibited Activities.

A. Illicit Discharges. No person shall dump, discharge, cause or allow to be discharged any pollutant or non-stormwater discharge into the municipal storm drainage system, into a watercourse, or into the waters of the Commonwealth of Massachusetts.

B. Illicit Connections. No person shall construct, use, allow, maintain or continue any illicit connection to the municipal storm drainage system, regardless of whether the connection was permissible under applicable law, regulation or custom at the time of connection.

C. Obstruction of Municipal Storm Drainage System. No person shall obstruct or interfere with the normal flow of stormwater into or out of the municipal storm drainage system without prior written approval from the Authorized Enforcement Agency.

SECTION 2 - Exemptions.

The following exemptions are applicable to 705.02, Section 1.

A. Discharge or flow resulting from firefighting activities.

B. The following non-stormwater discharges or flows are exempt from the prohibition of non-stormwaters provided that the source is not a significant contributor of a pollutant to the municipal storm drainage system:

1. Waterline flushing;
2. Flow from potable water sources;
3. Springs;
4. Natural flow from riparian habitats and wetlands;
5. Diverted stream flow;
6. Rising groundwater;
7. Uncontaminated groundwater infiltration as defined in 40 CFR 35.2005(20), or uncontaminated pumped groundwater;
8. Water from exterior foundation drains, footing drains (not including active groundwater dewatering systems), crawl space pumps, or air conditioning condensation;
9. Discharge from landscape irrigation or lawn watering;
10. Water from individual residential car washing;
11. Discharge from dechlorinated swimming pool water (less than one ppm chlorine) with written authorization to discharge received from the Authorized Enforcement Agency, provided the water is allowed to stand for one week prior to draining and the pool is drained in such a way as not to cause a nuisance;
12. Street wash water by methods approved by Town;
13. Dye testing, provided verbal notification is given to the Authorized Enforcement Agency prior to the time of the test;
14. Non-stormwater discharge permitted under a NPDES permit or a Surface Water Discharge Permit, waiver, or waste discharge order administered under the authority of the United States Environmental Protection Agency or the Department of Environmental Protection, provided that the discharge is in full compliance with the requirements of the permit, waiver, or order and applicable laws and regulations; and
15. Discharge for which advanced written approval is received from the Authorized Enforcement Agency as necessary to protect public health, safety, welfare or the environment.

SECTION 3 - Emergency Suspension of Municipal Storm Drainage System Access.

The Authorized Enforcement Agency may suspend municipal storm drainage system access to any person or property without prior written notice when such suspension is necessary to stop an actual or threatened discharge of pollutants that presents imminent risk of harm to the public health, safety, welfare or the environment. In the event any person fails to comply with an emergency

suspension order, the Authorized Enforcement Agency may take all reasonable steps to prevent or minimize harm to the public health, safety, welfare or the environment.

#### SECTION 4 - Notification of spills.

Notwithstanding other requirements of local, state or federal law, as soon as a person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of or suspects a release of materials at that facility or operation resulting in or which may result in discharge of pollutants to the municipal drainage system or waters of the Commonwealth of Massachusetts, the person shall take all necessary steps to ensure containment, and cleanup of the release. In the event of a release of oil or hazardous materials, the person shall immediately notify the Fire and Police Departments, Board of Health, and the Department of Public Works. In the event of a release of non-hazardous material, the reporting person shall notify the Authorized Enforcement Agency no later than the next business day. The reporting person shall provide to the Authorized Enforcement Agency written confirmation of all telephone, e-mail, facsimile or in-person notifications within three business days thereafter. If the discharge of prohibited materials is from a commercial or industrial facility, the facility owner or operator of the facility shall retain on-site a written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

#### 705.03 - Construction and Post Construction Stormwater Management of New Developments and Redevelopments.

##### SECTION 1 - Permit Required

A. No person may undertake a construction activity, including clearing, grading, and excavation that results in a land disturbance that will disturb equal to or greater than one acre of land or will disturb less than one acre of land but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than one acre of land in the Town of Saugus without a Stormwater Management Permit from the Enforcement Agency pursuant to this By-law and regulations promulgated hereunder.

##### B. Exemptions.

1. Construction activities waived from permit coverage under the NPDES General Permit for Stormwater Discharges from Construction Activities.
2. Normal maintenance and improvement of land in agricultural use as defined by the Wetlands Protection Act regulation 310 CMR 10.04;
3. Maintenance of existing landscaping, gardens or lawn areas associated with a single family dwelling;
4. The construction of fencing that will not substantially alter existing terrain or drainage patterns;



5. Construction of utilities other than drainage (gas, water, electric, telephone, etc.) which will not alter terrain or drainage patterns;

6. Emergency work to protect life, limb, or property.

#### SECTION 2 - Permits and procedures.

Permits and Procedures shall be defined and included as part of any rules and regulations promulgated under this By-law.

#### SECTION 3 - Fee structure.

Town Meeting shall establish and may periodically amend a schedule of fees under this Bylaw. Town Meeting shall obtain with each submission an Application and Review Fee and an Inspection Fee fixed by Town Meeting to cover expenses connected with the application review of the Stormwater Management Permit and to cover DPW costs in ensuring adherence to the applicant's permit conditions. Authority for Town Meeting is granted pursuant to MGL c.40, § 22F. The Applicant must hire a Registered Professional Engineer (P.E.) in the Commonwealth of Massachusetts to certify that the plans are in accordance with the Town's standards. Town Meeting is authorized to retain professional consultation at the applicant's expense from applicable Town Departments or a third party professional consultant for expert engineering or other services to advise the Enforcement Agency on any or all aspects of the applicant's permit.

#### SECTION 4 - Waivers.

A. The Enforcement Agency may waive strict compliance with any requirement of this By-law or the rules and regulations promulgated hereunder, where:

1. Such action is allowed by federal, state and local statutes and/or regulations,
2. Is in the public interest, and
3. Is not inconsistent with the purpose and intent of this By-law.

B. Any applicant may submit a written request to be granted such a waiver. Such a request shall be accompanied by an explanation or documentation supporting the waiver request and demonstrating that strict application of this By-law does not further the purposes or objectives of this By-law.

C. All waiver requests shall be reviewed by the Enforcement Agency and if necessary, discussed with other Town departments.

D. If in the Enforcement Agency's opinion, additional time or information is required for review of a waiver request, the Enforcement Agency may continue a hearing to a date certain announced at the meeting. In the event the applicant objects to a continuance, or fails to provide requested information, the waiver request shall be denied.

***(Article 15 of the 2018 Annual Town Meeting held on May 7, 2018)***