

February 16, 2018

To: John Robert Smith
Senior Policy Advisor, Smart Growth America

Re: Royal Oak Progress Report #3

Dear Mr. Smith:

Smart Growth America (SGA), in partnership with Clarion Associates, completed a sustainable land use code audit for the City of Royal Oak in July 2016. This audit covered three main topics – stormwater management, green infrastructure, and housing diversity – and was the focus of an all-day workshop in Royal Oak on October 5, 2016.

After receiving feedback from Royal Oak city staff, a final “next steps” memo was released on November 16th, 2016. This memo was circulated to the attendees of the October workshop, in addition to the city commission and multiple boards and task forces, including the Stormwater Task Force and the Environmental Advisory Board.

On January 12, 2017, Royal Oak submitted its first progress report to SGA which summarized two key takeaways that resulted from SGA’s workshop:

1. The Royal Oak City Commission’s request to research a possible tree ordinance;
2. The commission of a target housing assessment study

On July 12, 2017, Royal Oak submitted its second progress report to SGA which summarized the city’s work pertaining to a possible tree ordinance and the commission of a housing assessment study.

As part of its current goals and objectives, the City of Royal Oak has adopted a goal to maintain, replace, and enhance city infrastructure in an environmentally and fiscally sustainable manner. Stormwater management, one of the three topics in the SGA audit for Royal Oak, remains a contentious issue in the city. One of the goals adopted by the Royal Oak City Commission in February 2016 was to review and possibly amend the city’s stormwater detention ordinance (Royal Oak Municipal Code § 644). Concerns raised by members of the business community and condominium associations about the high cost of ordinance compliance; and severe rain events had occurred stretching or exceeding the limits of the current stormwater management system led to the setting of this goal.

Stormwater Task Force Report and Recommendations

In August 2016, Royal Oak City Manager Don Johnson appointed twelve members to the Royal Oak Stormwater Task Force. It has issued a draft report that is being evaluated by city staff. I have attached this draft for SGA’s review as well. The task force has recommended that the city explore creating and implementing a stormwater utility.

A stormwater utility would provide the city with a stable and predictable funding source to fund stormwater system improvements and maintenance, including those areas that are combined sewers, and perform condition assessment and asset management within the stormwater system. User fees would fund a stormwater utility. A user fee would also be an effective tool to implement and encourage better stormwater management, including the use of green infrastructure and compliance with a stormwater detention ordinance on private property. The utility would cover all classifications of property including the Central Business District, churches, and other public entities such as the Royal Oak Schools and Oakland County Community College.

The ability to specifically designate revenue from fees to stormwater management would allow for the reduction of the current sewer fees. Instituting a stormwater utility would allow the city to be able to assess property owners a fee directly correlated to water runoff and the amount of impervious area on their property. A stormwater utility could also provide a method for encouraging compliance with the stormwater detention ordinance, encourage the use of green infrastructure, and would make all property owners responsible for stormwater management regardless of zoning classification. The fees charged by a stormwater utility would be limited to the amount necessary to cover the cost of oversight and management of the utility, fund stormwater charges from the Detroit Water and Sewer Department and Oakland County, and fund programs that improve storm and combined sewer capacity and integrity.

The task force did not make the recommendation to establish a stormwater utility lightly. The task force understands the political, practical and budgetary implications of imposing additional fees on property owners in the city. The task force believes, however, that the implementation of the recommendations summarized in the following section will meet the goal of improving the current stormwater management program by including the entire city in stormwater management, securing a stable and legal funding source, and expanding the use of green infrastructure.

Summary of Task Force Recommendations

1.) Rewrite the Stormwater Detention ordinance

- a. The ordinance should include green infrastructure (GI) as an acceptable method to achieve compliance.
- b. The section of the ordinance that describes the various gray infrastructure detention methods that are available and acceptable should be reviewed and updated if necessary.
- c. The ordinance should require compliance with stormwater management by all new and renovated properties within the city regardless of zoning category, including one- and two-family residential properties.
- d. All appropriate city ordinances should be revised to prohibit one property owner from allowing runoff from its property to flow onto neighboring properties.
- e. The ordinance should be revised to require that properties in the CBD comply as best as possible with the stormwater management program.
- f. The exemption from compliance for projects that are less than 6,100 sq. ft. or 0.14 acres in size should be eliminated.
- g. Clarify the types of renovations or repairs that would trigger the detention requirement.

2.) The City of Royal Oak should develop, adopt and implement a stormwater management plan. The plan should include the following elements:

- a. a more equitable stormwater management ordinance that can be consistently applied
- b. a program to include every property in some manner

- c. the use of green infrastructure, especially when cost effective
- d. a reduction in the overall imperviousness of the city
- e. an increase green space and tree canopy
- f. be consistent with city commission goals, objectives and direction - protect and preserve existing trees
- g. a vigorous program of public education
- h. an effective and reliable source of funding

3.) The City of Royal Oak should investigate the feasibility of creating and implementing a stormwater utility.

- a. The utility should base fees on a properties impervious area or other acceptably recognized and appropriate method
- b. Credits should be given for previous stormwater management activities.
- c. Funding should be used to address current and future operations and maintenance of the stormwater system.

The city is continuing to receive feedback pertaining to the findings in this report and plans to release a final report to the public in Spring 2018.

Sincerely,

Todd E. Fenton
Economic Development Manager



**Report of the Royal Oak
Stormwater Taskforce
2017**



Introduction

One of the goals adopted by the Royal Oak City Commission in February 2016 was to review and possibly amend the city's stormwater detention ordinance (Royal Oak Municipal Code § 644). Concerns raised by members of the business community and condominium associations about the high cost of ordinance compliance; and severe rain events had occurred stretching or exceeding the limits of the current stormwater management system led to the setting of this goal.

In August 2016, Royal Oak City Manager Don Johnson appointed the following to the stormwater task force:

Jennifer Acevedo – Marketing and Promotions Specialist, Michigan Department of Environmental Quality Environmental Matthew J. Callahan, P.E. – City Engineer, City of Royal Oak

Jason Gittinger – President, Greater Royal Oak Chamber of Commerce

Kelly Karll – Engineer, Southeast Michigan Council of Governments Engineer

James Krizan – Assistant to the City Manager, City of Royal Oak

Shawn Lewis-Lakin – Retired Superintendent, School District of the City of Royal Oak

Ilene Orlanski – President, Coventry Park Homes Condominium Association

Patricia Paruch – City Commissioner, City of Royal Oak

Jim Schneider, AIA – President, Schneider Smith Architects

Greg Rassel – Director of Public Services, City of Royal Oak

Devan Rostorfer - Environmental Planner, Southeast Michigan Council of Governments

Anne Varra – Chief Deputy Water Resources Commissioner, Oakland County Water Resources Commission

Jim Wineka, P.E. – Assistant Chief Engineer, Oakland County Water Resources Commission

Executive Summary

The ensuing report will provide the detailed history and background and analysis of the current stormwater management system. The executive summary is designed to give the city commission and members of the Royal Oak community; both residential and business members; an action plan for implementation to improve the management system through three avenues: stormwater detention ordinance amendments; stormwater management planning; and stormwater management funding.

1. Stormwater Detention Ordinance Amendments

- Include green infrastructure (GI) as an acceptable method to achieve compliance. Engineering has already approved systems and recommends an easement requirement be part of the GI to allow monitoring and inspecting to prevent GI removal or alteration.
- GI systems must meet appropriateness of soil conditions and amount of stormwater to be detained.
- The section of the ordinance that describes the various gray infrastructure detention methods that are available and acceptable should be reviewed and updated.
- The ordinance should be reviewed and updated to include current and accurate descriptions of the various detention methods that are acceptable to meet ordinance requirements; including underground storage facilities and surface lot detention areas.
- The ordinance sections that establish the numerical requirements for detention should be reviewed and updated.
- The ordinance should require compliance with stormwater management by all new and renovated properties within the city regardless of zoning category, including one- and two-family residential properties. Remove the current exemptions for single- and two-family residential.
- The ordinance should have a requirement for new residential builds to have stormwater management. When building new homes on parcels where older, smaller homes once stood, the new home would be required to detain the stormwater runoff.
- All relevant city ordinances should be revised to prohibit property owners from conveying their stormwater / runoff onto neighboring properties. To comply with this new provision, builders would have to prepare and submit a site grading plan to be reviewed by the city engineer as a component of site plan approval and/or a request for a building permit.
- The ordinance should be revised to require that properties in the CBD comply with the stormwater management program.
- The exemption from compliance for projects that are less than 6,100 sq. ft. or 0.14 acres in size should be eliminated.
- The ordinance should more clearly describe the types of repairs or renovations allowed before triggering the need for detention.

2. Stormwater Management Planning - develop, adopt and implement a stormwater management plan (SMP) to address and include the following:

- a more equitable stormwater detention ordinance that can be consistently applied
- a program to include every property in some manner
- the use of green infrastructure, especially when cost effective
- a reduction in the overall imperviousness of the city
- an increase green space and tree canopy
- consistent city commission goals, objectives and direction - protect and preserve existing trees
- a vigorous program of public education
- an effective and reliable source of funding
- address the required elements identified in the Michigan Stormwater Utility Act if it is enacted

3. Stormwater Management Funding

- Create and implement a stormwater utility with user fees funding the stormwater utility.
- Stormwater utility would cover all classifications of property including the central business district (CBD), churches, and other public entities like the Royal Oak Schools and Oakland Community College
- Specifically designate revenue from fees to stormwater management would allow for the reduction of the current sewer fees.
- stormwater utility would have opt out and credit provisions for both residential and non-residential property owners
- stormwater utility would allow the city to be able to assess property owners a fee directly correlated to water runoff and the amount of impervious area on their property
- Stormwater utility could also provide a method for encouraging compliance with the stormwater detention ordinance
- Stormwater utility would encourage the use of green infrastructure and make all property owners responsible for stormwater management regardless of zoning classification
- The fees charged by a stormwater utility would be limited to the amount necessary to cover the cost of oversight and management of the utility, fund stormwater charges, fund programs that improve storm and combined sewer capacity and integrity
- Sizable increase in city personnel to staff the utility operation fees generated by the utility would pay for the additional staff costs eventually but the initial establishment of a stormwater utility will be very labor intensive as every property in the city will need to be assessed to determine the impervious and permeable area in order to establish a rate methodology related to either an equivalent residential unit (ERU), intensity of development (ID) or equivalent hydraulic area (EHA).

History and Background

Royal Oak's Current Stormwater Management System

The City of Royal Oak, like many similar communities, has an intricate system for collecting and conveying both waste water and stormwater to treatment facilities prior to discharging into a receiving body of water. Royal Oak's system is considered a combined system with both the storm and waste water collected in the same sewer main. The combined waste and storm waters are treated at facilities in Oakland County and the City of Detroit and then discharged into the Detroit River.

Royal Oak is member of an authority comprised of fourteen Oakland County communities that connect to the George W Kuhn (GWK) combined sewer drain. The GWK drain is owned and operated by the Oakland County Water Resources Commission (OCWRC).



Above: Debris placed to a residential curb after the August 11, 2014 flood

Royal Oak is the last community downstream along the OCWRC system, which is built to capacity. The City of Royal Oak has no ability to regulate the amount of stormwater into this connection. Only the OCWRC can increase the amount and this would be predicated on increasing the capacity of the GWK drain.

1991-1993 Improvements to the Stormwater Management System

In 1991, after two record rain storms on consecutive days, the city began a series of improvements to its stormwater management system.

According to estimates from the city's engineering division, the city has spent over \$10 million on improving, maintaining and increasing capacity in its combined sewer system since 1993. During the early 1990's, Oakland County constructed the region's largest retention and treatment facility in Madison Heights connected to the GWK drain to prevent and regulate combined sewer overflows from the regional system.

The implementation of Royal Oak's storm water detention ordinance in 1991, described in detail below, created over 2.5 million cubic feet of stormwater storage on impervious surfaces such as parking lots and other paved surfaces throughout the city. Once detained during the storm event, stormwater is slowly released into sewers. Hydraulically, freeing up sewer capacity during a storm event.

The street catch basin lid restriction program also provides capacity relief in combined sewers across the city with a goal to maintain a 10-year rainfall storm capacity. Thousands of catch basins have been retrofitted on local streets. Such on-street detention slowly releases storm water to the connected sewers resulting in temporary ponding on local streets, but frees up sewer capacity during the storm event.

Overall, efforts have been successful in handling stormwater from the majority of rain events. The city continues to implement stormwater management efforts to reduce the impact of stormwater runoff from impervious surfaces. However, should storms continue to grow in both frequency and intensity; it is likely there is still not enough capacity within the combined sewer system to handle storms.

OHM Advisors Study and the Major 2014 Stormwater Event

The city contracted with OHM (Orchard, Hiltz and McCliment, Inc.) Advisors in 2014 to study select areas of combined sewers within the city. OHM was asked to determine how the larger

system functions during rain events and if past stormwater detention efforts were effective. The city also wanted to know if the data supported changes to current efforts and codes.

While OHM was conducting the study, a severe rainstorm on August 11, 2014 caused widespread combined sewer overflows and localized flooding across the region. Over the course of just a few hours, approximately four to five inches of rain fell over southeast Michigan. The highest amounts fell mostly in Royal Oak. The storm, which weather experts classified as having a probability of occurring once in 300 to 500 years, completely overwhelmed the sewer systems, open streams and depressed freeways.

County and local sewer systems were defenseless as the rain continued to fall, and with nowhere for the water to go, the combined sewers and upstream sanitary sewers surcharged into the basements of homes, schools and commercial buildings. The amount of water even overwhelmed the large OCWRC detention and treatment facility in Madison Heights, causing back-ups into surrounding properties in unprecedented volumes.

The damage caused by this event was staggering. It resulted in state and federal declarations of emergency. In Royal Oak alone, nearly 6,500 tons of household refuse was discarded and collected due to the event. Total costs for additional refuse collection neared \$650,000. **The Federal Emergency Management Agency (FEMA) estimated the total amount of damage caused by the storm to be [\$ million].**

Although the study from OHM Advisors concluded the city's sewer system functions adequately under normal conditions, a rain event of the August 11 magnitude exposed the deficiencies of the current combined sewer system. It raised awareness about the limitations of the system in severe rain events

In the late 1980s and early 1990s, prior to city requirements for stormwater detention, the city experienced rainfall events too intense for the stormwater system causing back-ups into basements.

At that time, the events demonstrated a need for better regulation of the city's stormwater, just as now, we are seeing evidence of a need to limit the amount of stormwater entering the system. The question now is how can the city regulate stormwater detention. The task force proposes three avenues to explore: stormwater detention ordinance; stormwater management planning; and stormwater management funding.

1. Royal Oak's Stormwater Detention Ordinance

Overview

The City of Royal Oak adopted a stormwater detention ordinance (Chapter 644) in 1991. The stated objective of the ordinance is to “protect the health, safety and welfare” of the community by minimizing stormwater runoff from private property to reduce damaging effects of combined sewer overflows into basements.

It is a generally accepted best practice to manage stormwater runoff at the location where it falls. Allowing stormwater runoff to flow onto neighboring properties or the city's rights-of-way, only shifts the responsibility and liability for managing the stormwater to others at significant costs.

Most private properties in the city have the land area to store stormwater, either by utilizing the surface area of the property to “pond” the water or by constructing an underground detention facility. If adequate land and soil conditions exist, these properties may also infiltrate stormwater.

Royal Oak designed its ordinance to incorporate the recognized best practices, detaining stormwater where it fell. The city's stormwater detention ordinance requires all new commercial, industrial, or multifamily developments where the area is at least 0.14 acre or 6,100 square-feet in size, detain the stormwater runoff on site. Existing commercial, industrial or multifamily developments renovating that would also meet the 0.14 acre or 6,100 square-foot size, are also required to comply with the ordinance.

Representatives from the chamber of commerce, downtown development authority and school district, collaborated with the city to develop the 1991 stormwater detention ordinance. The parties agreed the ordinance was acceptable with its exemptions and tiered levels of compliance.

Royal Oak is not alone in requiring stormwater detention. Most communities in Oakland and Wayne counties have ordinances that require detention at the source. Most also have exemptions from their ordinance requirements. For instance, just as Royal Oak, the following communities include these in their ordinances: Berkley excludes one and two-family homes; Ferndale excludes for green infrastructure projects; and Birmingham allows renovations at a capped amount to be excluded. As does Royal Oak. Exemptions, no matter how well intended, create disparity and deficiencies.

Stormwater Detention Ordinance Residential Exemptions

In 1991, the drafters of the ordinance cited two reasons to exclude properties zoned as one- and two-family residential. The first was overloaded sewers and basement flooding most negatively impact these types of properties causing damage and financial losses for the owners. Secondly, one- and two-family residential properties often have more surface area that is permeable, unlike commercial properties which are often 90-percent or more impermeable and are a major source of the runoff overloading the sewer system.

Condominium associations are classified as multi-family uses in the city's zoning ordinance and are not entitled to the residential exemption. The cost of complying with the current ordinance can be burdensome for associations with limited funds in their budgets for capital projects. Consequently, associations have to choose to put off or scale back necessary improvements because they would trigger ordinance requirements for additional detention and become cost prohibitive.

The current ordinance includes no requirement for one- and two-family residential properties to manage or detain stormwater, therefore stormwater can discharge onto their neighbor's property. In high volume, the runoff can create flooding to the neighbor's property.

Stormwater Detention Ordinance Central Business District (CBD) Exemptions

Royal Oak's zoning ordinance allows owners of properties in the CBD to build structures right up to the property line. Many of the downtown structures were built decades ago, meaning there is

no surface or underground space available for onsite detention. The stormwater detention ordinance therefore had to exempt properties in the CBD from compliance as a matter of practicality. Difficulty and cost to structurally retrofit a building with stormwater management underneath or on its rooftop would be almost impossible.

Stormwater Detention Ordinance Commercial, Industrial, and Multi-Family Properties Temporary Exemptions

In Royal Oak, most existing commercial and industrial properties are relatively small and any improvements, renovations, or additions to the property fall within the allotted 6,100 square-feet and are exempt. Many of them have 90 percent or more impervious coverage, and direct their runoff offsite.

The property owners that fall below the 6,100 square-foot measure must execute a recordable lien to the city. The lien shall state that when improvement occurs making the accumulated area of the lien and the improvements greater property greater than 6,100 square-feet, the owner will make the required stormwater detention improvements. Stormwater detention almost always is added to the parking lot, either on the surface of or below it.

While the stormwater detention ordinance has been in effect for over 25-years, it has been a source of complaints from the business community, primarily from smaller developments. Property owners will often cite the cost of stormwater detention as an impediment to redevelopment. Claiming the requirement delays or cancels needed improvements due to the cost to make their property compliant. Established businesses have difficulty financing with methods currently available. Financing can require extensive use of capital investment, not readily available to small businesses. This is problematic from both an economic development and stormwater detention management standpoint.

Compliance with the stormwater detention ordinance has resulted in the creation of 2.5 million cubic feet of additional detention area. The city's engineering division calculates nine million cubic feet of stormwater detention area could be realized if the exemption did not exist and every commercial, industrial and multi-family property were compliant with the ordinance.

Stormwater Detention Ordinance and it Relates to City and School District Property

City property is not covered by the ordinance. While the city does not currently have an accurate assessment of the total amount of impervious surface on city rights-of-way, it continues to implement innovative methods of stormwater detention management when feasible. The city is planning a comprehensive green infrastructure feasibility study for city owned or controlled area during the 2017-18 fiscal year.

Under state law, the city cannot mandate the school district to comply with the ordinance for any of its building improvements or renovations. The district has voluntarily included stormwater detention management in its most recent renovation projects. Both the city and the school district hold large amounts of property with considerable impervious areas, however, with limited ability to increase their stormwater detention capacity.

Summary of Stormwater Detention Ordinance Deficiencies

The task force believes the stormwater detention ordinance has strengths and weaknesses. The ordinance provides a very clear and measurable method for calculating stormwater detention requirements for new and renovation projects. But in reality, if the costs are too high for business owners to comply, the city achieves zero net gain of stormwater detention area from these businesses. There are few incentives in the ordinance for increasing stormwater detention to mitigate the expense. The ordinance doesn't prohibit runoff onto neighboring properties, and when stormwater is diverted onto neighboring properties, causing damage, the victimized property owner is left to civil court to remedy the situation. Finally, the ordinance creates a perception of inequality by not requiring all property owners to participate in stormwater detention management.

Recommendations for Royal Oak's Stormwater Detention Ordinance

A primary focus of the stormwater task force has been evaluating the stormwater detention ordinance. The task force wanted to determine the importance of the ordinance as it relates to the overall strategy to of sewerage system. Does the ordinance provide the protection and enhancement the community expects? To answer this, the task force considered what an ideal stormwater detention management program would look like and identified potential amendments to the stormwater detention ordinance.

The task force concluded an ideal stormwater detention management program would have these objectives:

- include all properties in the city regardless of their use or zoning classification.
- utilize green infrastructure as much as is feasible.
- be cost effective in its implementation for both private property owners and public entities such as the city and the school district.

In order to achieve these objectives, the task force recommends the following revisions to the ordinance:

- The ordinance should include green infrastructure (GI) as an acceptable method to achieve compliance.

The ordinance should be rewritten to include the use of green infrastructure (GI) in development projects as an appropriate method for satisfying the ordinance requirements. Green infrastructure, to be effective, must not only be effective but also be reliable. The task force believes that the use of GI cannot be the only solution for stormwater management issues, but when appropriate, GI can be an option. The appropriateness of the use of GI solutions should be based, among other factors, on soil conditions at the property and the amount of stormwater needed to be detained.

Certain areas of the city are more amenable to GI than other areas. Generally, the areas south of 12 Mile Road have predominantly sandy soil. This soil is well suited to GI projects since the water percolates easily through the soil. On the other hand, the areas in the city north of 12 Mile Road have predominantly clay soils which are not well suited for GI projects because of their low permeability capacity.

There have been several proposals for green infrastructure alternatives to part or all of a development requirement for storm detention that the city engineering department has reviewed and approved. In these instances, the approved systems were not necessarily less costly than traditional gray systems and require considerably more monitoring and maintenance.

The city engineering department recommends that when GI is used as an approved method for meeting the ordinance required amount of storm water detention, the property owner must dedicate an easement to the city to allow monitoring and inspection. This is consistent with all other private stormwater management systems in the city. This will prevent its removal or alteration and allows city to inspect the area without trespassing.

- The section of the ordinance that describes the various gray infrastructure detention methods that are available and acceptable should be reviewed and updated if necessary.

The current code establishes the numerical requirements for compliance and gives standards for certain types of detention methods. The ordinance should be reviewed and updated if necessary to include current and accurate descriptions of the various detention methods that are acceptable to meet ordinance requirements. This includes such detention methods such as underground storage facilities and surface lot detention

areas. The ordinance sections that establish the numerical requirements for detention should be reviewed and updated if necessary.

- The ordinance should require compliance with stormwater management by all new and renovated properties within the city regardless of zoning category, including one- and two-family residential properties.

The task force identified the need to include all Royal Oak properties in the management of stormwater. One step toward accomplishing this goal would be to remove the current exemption for single- and two-family residential. The ordinance should have a requirement that new residential builds have an aspect of stormwater management. When building new homes on parcels where older, smaller homes once stood, the new home would be required to detain the stormwater runoff. – to be discussed at the next meeting

- All appropriate city ordinances should be revised to prohibit one property owner from allowing runoff from its property to flow onto neighboring properties.

All relevant city ordinances should also be revised to prohibit property owners from conveying their stormwater onto neighboring properties. To comply with this new provision, builders would have to prepare and submit a site grading plan to be reviewed by the city engineer as a component of site plan approval and/or a request for a building permit.

- The ordinance should be revised to require that properties in the CBD comply as best as possible with the stormwater management program.

Small commercial properties and properties in the CBD will require more creative solutions as these sites are often entirely impervious. Green roofs and permeable surfaces in parking lots and adjacent alleyways are two common actions that small and currently fully impervious sites could use. The Detroit Zoo, the City of Southfield and Ford Motor Company are some local examples of these types of innovative methods for managing stormwater. The Detroit Zoo and the City of Southfield have both recently developed parking lots using permeable pavements and bio-swales while, over a decade ago, Ford Motor Company installed North America's largest green roof at the Ford Rouge Center.



Green Roof on Ford Rouge Center
Image courtesy of Ford Motor Company

- The exemption from compliance for projects that are less than 6,100 square feet or 0.14 acres in size should be eliminated.

The task force is recommending that the revisions **eliminate the 6,100 square feet exemption**. This would require that any redevelopment that installs new pavement, or creates other new impervious areas, would require some level of detention. This might be able to be accomplished in a manner similar to Ann Arbor where there is a sliding scale on how much must be detained based on the amount of impervious area increased.

This would expand upon what the current code allows on sites that are less than 1.5 acres (65,340 square feet) – Also to be discussed at the next meeting.

- Clarify the types of renovations or repairs that would trigger the detention requirement.

The ordinance should more clearly describe the types of repairs or renovations allowed before triggering the need for detention. For example, the current code allows property owners to resurface existing parking areas indefinitely which consist of capping existing paved areas with asphalt or concrete which does not trigger the detention requirement. In reviewing and permitting these improvements, the city does review the site grading to correct any deficiency that directs runoff towards neighboring properties.

2. Stormwater Management Planning

The task force recognizes that not all problems with the current Royal Oak stormwater management program will be solved by rewriting the ordinance alone. Because the ordinance only applies to private developments and does not address any type of public right-of-way facilities or school or community college properties, the task force reviewed other communities with successful stormwater management programs.

The task force reviewed the highly regarded stormwater management programs in the cities of Seattle, WA and Ann Arbor, MI. Both communities are required by the provisions of the federal and Michigan clean water acts to apply for and receive a National Pollutant Discharge Elimination System (NPDES) Permit to discharge stormwater into waters of the United States. (For more information on these two communities, see Appendix B – Case Studies). As a component of their applications for the NPDES permit, federal and state rules require each community to develop a “stormwater management plan” (SMP). Detailed requirements for an SMP are set forth in federal rules. U.S. Environmental Protection Agency (EPA) (www.epa.gov) and the Michigan Department of Environmental Quality (MDEQ) (www.mich.gov.deq) both have detailed information about SMP requirements on their websites.

Additionally, both the state and federal clean water acts require that other urbanized institutions and public entities such as cities, counties, hospitals and school districts which discharge stormwater directly into waters of the state or the U.S. without commingling the stormwater with waste water and without passing through a treatment facility obtain a NPDES permit to discharge as a “municipal separated storm sewer system” (MS4). In our area, the Rochester Community Schools is classified as an MS4. The school system has 24 buildings or facilities which discharge stormwater directly into drains which then discharge into the Clinton River and/or its tributaries. The school district is an active participant in the Clinton River Watershed Council and is required to prepare an SMP as a component of its NPDES/MS4 permit application. A copy of the 2016-2020 SMP for the school district can be found on its website (www.rochester.k12.mi.us/pages/5160/rochester.schools.stormwater.management.plan).

As previously described, the City of Royal Oak is part of a larger network of combined sewer systems which convey the combined storm and waste water to the DWSW facility, which discharges into the Detroit River. DWSW is the NPDES permit holder for this system. Because Royal Oak is not required to obtain its own NPDES permit and because it is not classified as a municipal separated storm sewer system (MS4) community for permitting purposes, Royal Oak is not required by law to develop, approve and implement an official stormwater management plan.

But while non-MS4/NPDES communities are not required to utilize stormwater management planning, a stormwater management plan is useful in helping a community organize efforts to handle stormwater issues. Non-MS4 communities can also utilize the format and structure of plans that permit-holding communities must follow.

SMPs developed with EPA rules all have required elements:

- Public Participation/Involvement
- Public Education
- Illicit Discharge Elimination
- Construction Stormwater Runoff control
- Post-Construction Stormwater Runoff
- Pollution Prevention
- Total Maximum Daily Load Implementation

Since Royal Oak is not a permit-holding community, a stormwater management plan that it developed would not be required to follow the exact format as prescribed by MDEQ and EPA. These requirements, however, would be useful to provide guidance in formulating a plan to meet Royal Oak's specific objectives.

Royal Oak would need to contract with an outside consulting firm to assist in the development of a stormwater management plan. Such an undertaking would require funding from some source. Funding for a stormwater management plan and other related stormwater management activities could possibly be funded through the creation of a stormwater utility, which is discussed in a following section.

In January, 2017, HB 4100 was introduced in the Michigan House of representatives. If enacted, HB 4100 would require (among other things) that any community creating a stormwater utility develop a stormwater management plan using the plan elements required by the EPA rules. HB 4100 has been sent to a committee for review and hasn't begun to move through the Legislature, but this legislation may become a factor if Royal Oak were to consider developing its own SMP with or without creating a stormwater utility.

Recommendations for Stormwater Management Planning

The task force recommends that the city consider developing, adopting and implementing an SMP. Coordination of all stormwater management activities through an official SMP would improve the city's efforts to meet the objectives identified earlier in this report.

The SMP should cover a multitude of aspects and best management practices. One of the most important aspects to the plan will be a component for public education. Efforts to educate the public on the impacts of stormwater runoff will be essential to help residents, businesses and other property owners understand how they can help reduce risks of flooding and backups in the future.

Initially, Royal Oak's plan should address and include the following:

- a more equitable stormwater management ordinance that can be consistently applied
- a program to include every property in some manner
- the use of green infrastructure, especially when cost effective
- a reduction in the overall imperviousness of the city
- an increase green space and tree canopy
- be consistent with city commission goals, objectives and direction - protect and preserve existing trees
- a vigorous program of public education
- an effective and reliable source of funding

The plan should also address the required elements identified in the Michigan Stormwater Utility Act if it is enacted to ensure that the city will be able to maintain possible future funding options as described in the next section of this report.

3. Funding Stormwater Improvements

Current Funding System

Between 1993 and 2015, the City of Royal Oak completed approximately \$10 million worth of projects to maintain, improve or increase the capacity of the combined sewer system in the city. The city identified these projects based upon code requirements, engineering studies, or best practices within the industry.

Currently, projects relating to stormwater activities are funded through the fees paid by rate payers into the city's water/sewer fund and through various state and federal (?) grants. The water/sewer fund is the primary funding source not only for these capital improvement projects but also for the fees charged by Oakland County for handling waste and storm water through its combined system including the GWK drain. Oakland County bases its sewer fees on the city's water usage. Thus, the rates set by Oakland County are a component of the rates charged by the city. Other activities funded by these rates and fees include the city's sanitary sewer operation and maintenance.

The total amount of funding available for stormwater management activities is, unfortunately, very limited. The limited available funding makes the current funding model difficult to rely upon to maintain and improve or expand the current stormwater system. A more reliable funding mechanism will be necessary to improve the city's ability to evaluate and address stormwater needs.

Legal Limitations on Increasing or Imposing Additional Stormwater Fees

The current funding model also presents exposure to potential legal challenges. In 1998, a landmark Michigan Supreme Court decision (*Bolt v. City of Lansing*) held that the City of Lansing's fee schedule within its stormwater utility constituted a tax, not a fee, in violation of the state's Headlee amendment which requires voter approval of any new tax.

The court determined that in order for a fee to be valid it must meet three criteria. The fee must serve a regulatory purpose, not just a revenue raising purpose (such as regulating the amount of stormwater entering the system). The fee must be proportional to the necessary operational and capital costs of providing the service. Finally, the fees must be voluntary. For a fee to be voluntary, a user must have the ability to limit or opt out of the service.

In 2011, the City of Jackson's stormwater utility fee scheme faced a similar challenge. The court ultimately ruled that Jackson's fee schedule was also a tax which had not been approved by the voters because it failed to satisfy the three criteria set forth in the *Bolt* decision.

The most recent challenge came in *Schroeder v. City of Royal Oak*. In this case, the plaintiff challenged the city's water and sewer rates on the basis that the stormwater components violated the Headlee amendment. The stormwater components are made up of the debt service charges to the OCWRC for the GWK drainage district and the commodity 'pass through' charge to DWSD.

The plaintiff claimed that these charges were imposed to raise revenue raising rather than for a regulatory purpose. The city ultimately settled the lawsuit for \$2 million payable into a fund to reimburse rate payers. The agreement also mandates that, by July 1, 2018, the city develop a new method by which to fund debt service for the GWK drainage district. The city will need to find a method that provides adequate funding and is able to withstand a potential legal challenge.

Stormwater Utility

A handful of other municipalities in Michigan created a "stormwater utility" to fund their stormwater management activities, including Marquette, New Baltimore, and Ann Arbor. Ann Arbor's is the oldest, dating to 1984.

While a stormwater utility does impose an additional cost on property owners, the size of the cost is relatively modest. Table 3, below, shows some examples of local costs for a single family residence. This table uses an example of a single-family home with a lot that is 6,100 square feet with 3,000 square feet of impervious surface.

	Service Fee	Commodity Fee	Annual Total
Ann Arbor	6.77	\$29.75	\$146.08
Detroit	\$0	\$750 per Impervious Acre	\$206.61
Birmingham - Evergreen Farmington District (EF)	\$0	\$45.75	\$183.00
Birmingham - South Oakland District (SO)	\$0	\$59.50	\$238.00

Table 2: Sample Stormwater Fees in Michigan

Ann Arbor has a tiered fee system for residential properties based upon the impervious surface square footage of the property. For all other properties, Ann Arbor charges a flat fee per acre. Residents can opt out of the fees by installing rain barrels for roof runoff, by installing a rain garden, a cistern, or a dry well, or by participating in the Washtenaw County Riversafe Home program. Commercial property owners can opt out if they participate in the Community Partners for Clean Streams program, install a stormwater management system that reduces their discharge rate by at least 29.5%, or by instituting best stormwater management practices by installing retention ponds, green roofing, or a new wetland.

Recommendations for Funding Stormwater Improvements

The task force recommends the city explore creating and implementing a stormwater utility. A stormwater utility would provide the city with a stable and predictable funding source to fund stormwater system improvements and maintenance, including those areas that are combined sewers, and perform condition assessment and asset management within the stormwater system. User fees would fund a stormwater utility. A user fee would also be an effective tool to implement and encourage better stormwater management, including the use of green infrastructure and compliance with a stormwater detention ordinance on private property. The utility would cover all classifications of property including the CBD, churches, and other public entities such as the Royal Oak Schools and OCC.

The ability to specifically designate revenue from fees to stormwater management would allow for the reduction of the current sewer fees. Currently, sewer fees are used to fund stormwater operations, projects and charges from DWSD and OCWRC. These charges would become a component of the Oakland County stormwater fee thus reducing the city's current sewer charge. This process would also allow for a much more transparent rate setting process.

In order to comply with the mandate from *Bolt*, the stormwater utility would have to be designed with opt out and credit provisions for both residential and non-residential property owners similar to those in the Ann Arbor stormwater utility. (For examples of possible credits, see the Ann Arbor case study – Appendix B).

Instituting a stormwater utility would allow the city to be able to assess property owners a fee directly correlated to water runoff and the amount of impervious area on their property. A stormwater utility could also provide a method for encouraging compliance with the stormwater detention ordinance, encourage the use of green infrastructure, and would make all property owners responsible for stormwater management regardless of zoning classification.

The fees charged by a stormwater utility would be limited to the amount necessary to cover the cost of oversight and management of the utility, fund stormwater charges from DWSD and Oakland County, and fund programs that improve storm and combined sewer capacity and integrity.

Implementation of a stormwater utility will require a sizable increase in city personnel to staff the utility operation. Additional staff would oversee and manage the operations of the utility. Staff in this department would be responsible for identifying and programming improvements, implementing a stormwater management plan (including public education components), as well as processing and assessing requests for credits.

Eventually, the fees generated by the utility would pay for the additional staff costs. But the initial establishment of a stormwater utility will be very labor intensive and could be quite costly. Every property in the city will need to be assessed to determine the impervious and permeable area in order to establish a rate methodology that is related to either an equivalent residential unit (ERU), intensity of development (ID) or equivalent hydraulic area (EHA). Once a methodology is established, a rate structure based on the actual costs to operate the utility and the costs for future improvements, based upon a capital improvement plan will need to be established and regularly updated. Only then will the utility be an effective method to finance improvements, maintenance and operations of the stormwater system.

Conclusion

The task force did not make these recommendations to establish a stormwater utility lightly. The task force understands the political, practical and budgetary implications of imposing additional fees on property owners in the city. The task force believes, however, that the implementation of the recommendations summarized in the following section will meet the goal of improving the current stormwater management program by including the entire city in stormwater management, securing a stable and legal funding source, and expanding the use of green infrastructure.

Summary of Recommendations

The previous sections provided background information and recommendations that the task force believes will improve the city's ability to address and improve stormwater needs.

Below is a listing of all the recommended actions:

1.) Rewrite the Stormwater Detention ordinance

- a. The ordinance should include green infrastructure (GI) as an acceptable method to achieve compliance.
- b. The section of the ordinance that describes the various gray infrastructure detention methods that are available and acceptable should be reviewed and updated if necessary.

- c. The ordinance should require compliance with stormwater management by all new and renovated properties within the city regardless of zoning category, including one- and two-family residential properties.
- d. All appropriate city ordinances should be revised to prohibit one property owner from allowing runoff from its property to flow onto neighboring properties.
- e. The ordinance should be revised to require that properties in the CBD comply as best as possible with the stormwater management program.
- f. The exemption from compliance for projects that are less than 6,100 sq. ft. or 0.14 acres in size should be eliminated.
- g. Clarify the types of renovations or repairs that would trigger the detention requirement.

2.) The City of Royal Oak should develop, adopt and implement a stormwater management plan. The plan should include the following elements:

- a. a more equitable stormwater management ordinance that can be consistently applied
- b. a program to include every property in some manner
- c. the use of green infrastructure, especially when cost effective
- d. a reduction in the overall imperviousness of the city
- e. an increase green space and tree canopy
- f. be consistent with city commission goals, objectives and direction - protect and preserve existing trees
- g. a vigorous program of public education
- h. an effective and reliable source of funding

3.) The City of Royal Oak should investigate the feasibility of creating and implementing a stormwater utility.

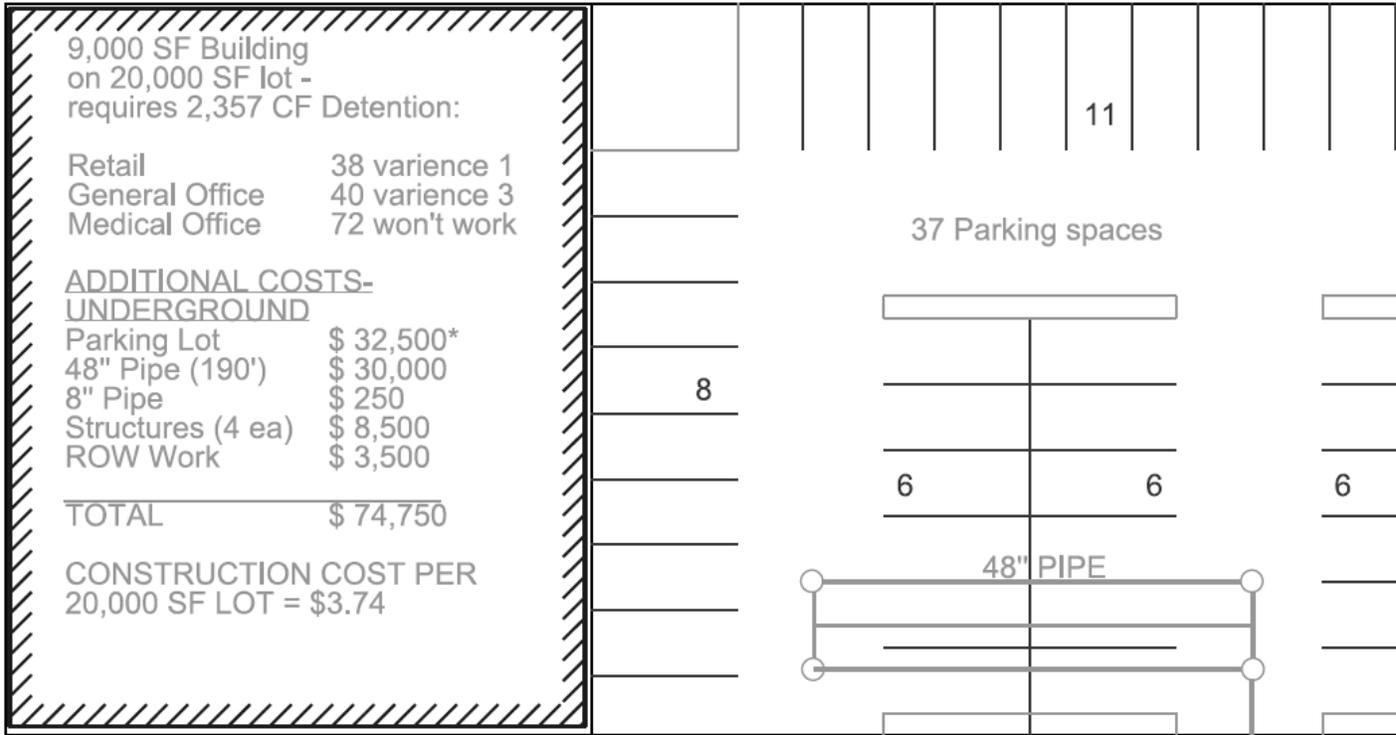
- a. The utility should base fees on a properties impervious area or other acceptably recognized and appropriate method
- b. Credits should be given for previous stormwater management activities.
- c. Funding should be used to address current and future operations and maintenance of the stormwater system.

Appendix A

– Detention Lot Designs and Costs

Underground Detention Design and Estimated Cost

200'

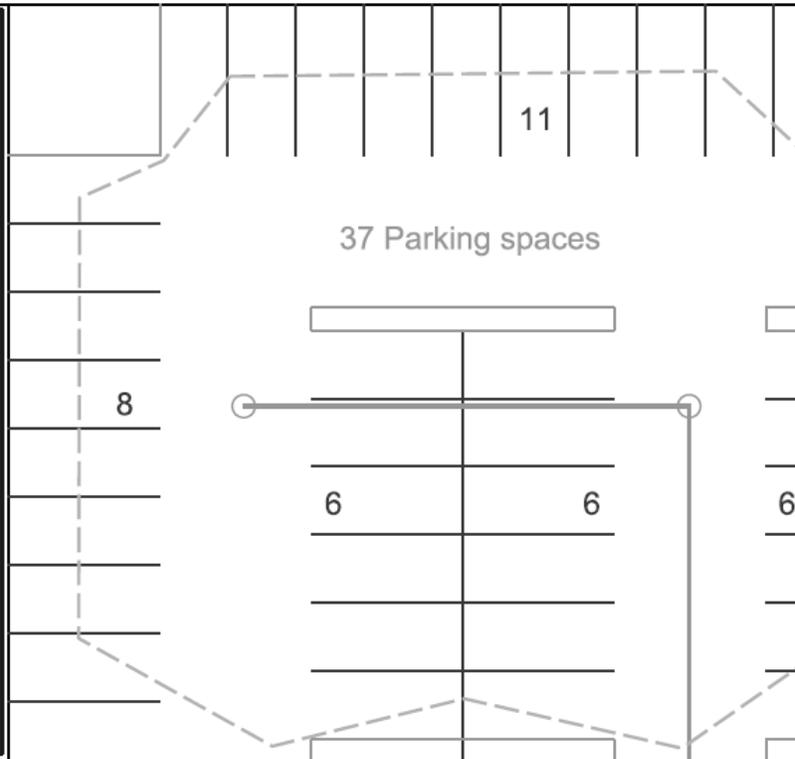


* ASSUMES NEW HMA AND NEW STONE BASE IN
LOCATION OF UNDERGROUND PIPE

Surface Detention Design and Estimated Cost

200'

9,000 SF Building on 20,000 SF lot - requires 2,357 CF Detention:	
Retail	38 variance 1
General Office	40 variance 3
Medical Office	72 won't work
ADDITIONAL COSTS-SURFACE	
Parking Lot	\$ 50,000*
8" Pipe (150')	\$ 7,500
Structures (2 ea)	\$ 4,200
ROW Work	\$ 3,500
TOTAL	\$ 65,200
CONSTRUCTION COST PER 20,000 SF LOT = \$3.26	



* ASSUMES NEW HMA AND ALL NEW STONE BASE AND
RESHAPE ENTIRE LOT

Appendix B

-Case Studies

A Brief Overview of The City of Ann Arbor's Stormwater Program

The City of Ann Arbor is located approximately 45 miles west of Detroit and is part of the Middle Huron River Watershed. The city makes up approximately 27.8 square miles and has a population nearing 114,000 people. Ann Arbor has a municipal separated storm sewer system (MS4) that is made up of over 23,000 inlets and catch basins and 540 miles of storm sewer pipes that discharge untreated stormwater into the Huron River.

The city conveys stormwater runoff to help prevent localized flooding, but it also works to improve the quality and quantity of the stormwater that it ultimately discharges into the Huron River. It does this in a number of different ways.

Stormwater Code

The first is by regulating the amount of stormwater runoff that occurs from properties within the city. This is accomplished through the enforcement of their storm water code. The stormwater code regulates what properties require which types of stormwater management systems.

Whenever a residential property (one and two-family homes) increases impervious surface by 200 square feet they are required to do storm water management. In order to determine how much and what kind of management system to use, the city created a worksheet for residents providing all of the options (Appendix A).

Properties that have (or plan to have) more than 5,000 square feet of impervious surface require differing levels of stormwater management systems. Table 1 below shows the differing requirements for these properties. As you can see in the table, all properties require the infiltration or retention of the first flush (the initial runoff during a rainstorm) and as the size of the impervious area increases, so too does the size of the rain event that must be detained.

Amount of Impervious Surface (by square feet)	Required Retention/Infiltration of First Flush	Require Detention of Bankfull (1-2 Year) Storm Events	Require Detention of 100-Year Storm Event
5,000 to 9,999	Yes	No	No
10,000 to 14,999	Yes	Yes	No
15,000 and above	Yes	Yes	Yes

For properties that already have existing impervious surface and sites within the Downtown Development authority,

the code allows properties that provide stormwater detention to the maximum amount feasible to not meet the same criteria as illustrated in Table 1. In these circumstances, an impact fee of \$2.00

Table 1: Infiltration and Retention Requirements by Impervious Area

per square foot for residential properties and \$2.50 per square foot of commercial properties is required. These fees are used to improve stormwater management systems within the watershed. (Note: another option is the donation of land, with city council approval, instead of the impact fee).

Green Infrastructure

Another method that the City of Ann Arbor uses to help control the quality and quantity of stormwater discharged into the Huron River is through the use of green infrastructure. One example of the city's use of green infrastructure is the installation of a green roof. Simply put, a green roof is created by planting vegetation on a building's roof to allow for the infiltration of stormwater. Green roofs also create recreational opportunities (i.e. aesthetically pleasing natural areas for employees to enjoy lunches or breaks) where none existed prior.

Other green infrastructure initiatives that the City of Ann Arbor has used have been the installation of bio-swales and rain gardens during road improvement projects. Rain gardens are depressed areas with natural landscaping that allow for a greater infiltration of stormwater. As the water is infiltrated, it is filtered and eventually helps recharge the ground water table. In February of 2014 the city codified these efforts and created a Green Streets Policy. This policy requires the city to implement green infrastructure during all street construction and reconstruction projects.

Stormwater Management Program

As an MS4 community with over 100,000 residents, the City of Ann Arbor is required to have a National Pollution Discharge Elimination System Permit that requires the city have a Stormwater Management Program (SWMP). As the City of Royal Oak is not an MS4 community, but rather a combined sewer system community, there is no requirement to have an NPDES Permit or a SWMP. However, a SWMP could help guide any improvements in the Royal Oak system.

Ann Arbor's NPDES Permit outlines the specific topics that must be covered by the Program. The SWMP must include sections on public education, public involvement/participation, illicit discharge elimination program, post-construction stormwater management, construction stormwater runoff control and pollution prevention/good housekeeping for municipal operations. The Ann Arbor SWMP describes their pollution prevention compliance activities that they currently do as well as proposed activities, their operations and maintenance activities, and their public education activities.

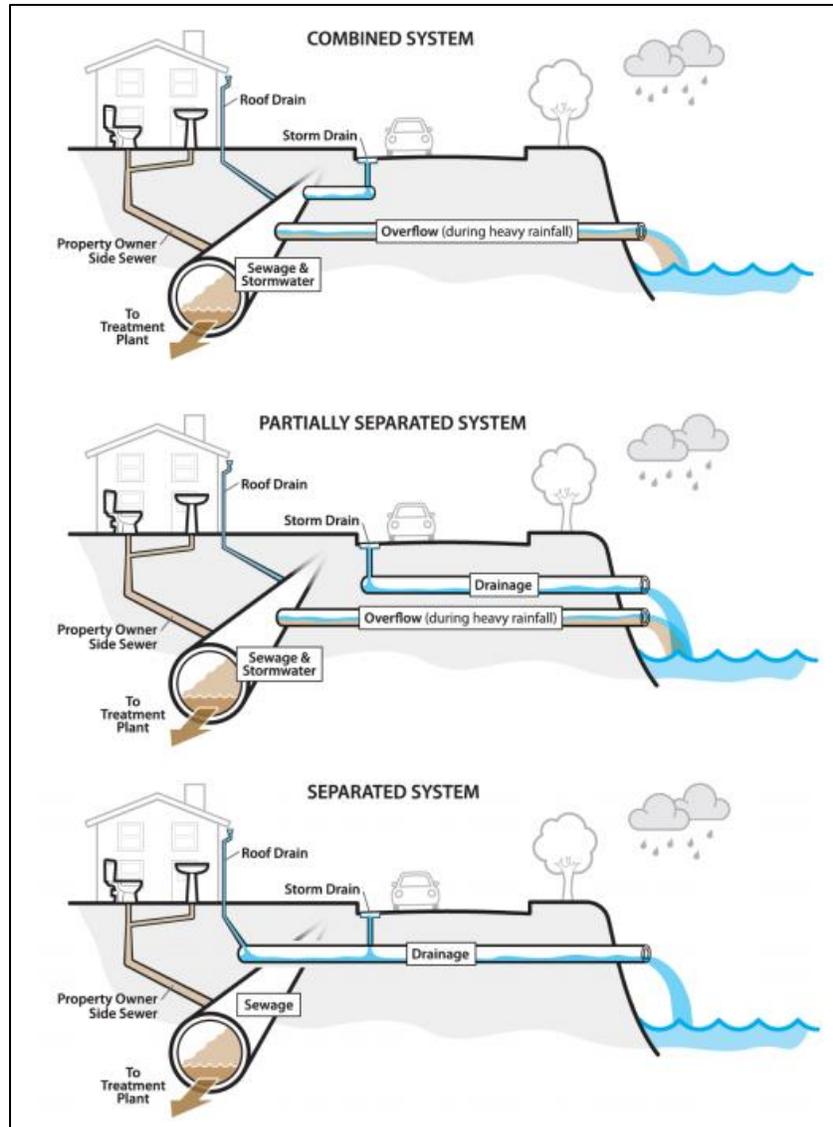
Ann Arbor Stormwater Utility

In 1980, the city of Ann Arbor established a stormwater utility for the purposes of generating funds to improve, expand and maintain their stormwater system. Currently, the stormwater utility operates with an annual budget of roughly \$6 million. Of this between \$3.5 million and \$4 million is spent on capital improvements.

The rate structure for the utility incorporates a customer fee that all customers pay and a fee based on the total amount of impervious area on a property. Customers are able to apply for credits when they create stormwater facilities or other actions that result in a quantifiable cost savings to the city. There are different credits for different types of properties.

One or two-family residential credits include the use of rain barrels, cisterns or dry wells, one or more rain gardens resulting in at least 130 square feet and three to six inches deep and the participation in the River Safe Home Program. For nonresidential properties, credits are given for facilities that are constructed in accordance to the stormwater code, for participants in the Community Partners for Clean Streams Participants and for facilities that do not fully meet the code but do capture 50 percent of impervious area, capture the half inch of rain and release the captured volume to the city system in less than 24 hours.

The City of Ann Arbor has an extensive stormwater management program and system funded through their stormwater utility. This steady funding source allows the city to utilize a combination of both green and grey infrastructure to continue to meet the needs of their residents as well as the requirements of their NPDES Permit.



The City of Seattle, WA

Background

The City of Seattle, WA is often regarded as having one of the most robust stormwater management programs in the country. This is in large part due to their need to comply with the 2013 National Pollution Discharge Elimination System (NPDES) Phase I Municipal Stormwater Permit which establishes minimum performance requirements for the discharge of pollutants from their separate storm sewers. While this differs from the City of Royal Oak's combined sewer system which is treated, many of the quality objectives set by Seattle are addressed through

quantity reduction methods which could be applicable in our case. These requirements must be reconciled with Seattle’s primary purpose for its drainage infrastructure, to convey stormwater runoff in a manner that protects people and property.

Stormwater Management Requirements

Stormwater Code

The City of Seattle’s stormwater code is applies to all grading and drainage and erosion control, all land disturbing activities, all discharges directly or indirectly to a public drainage system or a public combined sewer, all discharges directly or indirectly into receiving waters within or contiguous to the city limits, all new and existing land uses, and all real property. The code applies regardless of whether a project requires a permit, and does extend to municipal properties. There are some exceptions to activities such as agriculture and forestry which are subject to other state requirements. Additional exceptions may be granted by the department director responsible for conducting a specific action.

All projects are required to maintain natural drainage patterns to the extent possible and to minimize changes to the pattern of flooding on and runoff to neighboring sites. The following table outlines minimum requirements for various project types.

The City of Seattle has three types of drainage systems. Requirements of the stormwater management program apply only to the separated system.

Single-Family Residential		Trails & Sidewalks	
Requirements/Applications	BMPs	Requirements/Application s	BMPs
Applies to: Lots created or adjusted after January 1, 2016 where:	<ul style="list-style-type: none"> • Full Dispersion • Infiltration Trenches • Dry Wells • Rain Gardens • Infiltrating Bioretention 	Must retain and protect any undisturbed top soil and must amend all new, replaced, or disturbed topsoil.	<ul style="list-style-type: none"> • Full Dispersion • Rain Gardens • Permeable Pavement Facilities

<ul style="list-style-type: none"> • Total new or replaced hard surface is 750 square feet or more, • 7,000 square feet or more of land is disturbed, and <p>For lots that were drawn before January 1, 2016:</p> <ul style="list-style-type: none"> • Any project that creates new or replaces 1500 square feet of hard surface, or • Disturbs 7,000 square feet of land or more 	<ul style="list-style-type: none"> • Rainwater Harvesting • Permeable Pavement Facilities • Permeable Pavement Surfaces • Sheet Flow Dispersion • Concentrated Flow Dispersion • Splashblock Downspout Dispersion • Trench Downspout Dispersion • Non-infiltrating Bioretention • Vegetated Roofs • Cisterns • Perforated Stub-out Connections • Newly Planted Trees 	<p>Must manage stormwater onsite for:</p> <ul style="list-style-type: none"> • All sidewalk and trail projects with 2,000 square feet or more of replaced or new hard surface, or • That disturb 7,000 square feet or more of land 	<ul style="list-style-type: none"> • Permeable Pavement Surfaces • Sheet Flow Dispersion • Concentrated Flow Dispersion
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Parcel-Based Projects

Requirements/Applications	BMPs
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<p>Lots created or adjusted after January 1, 2016 where:</p> <ul style="list-style-type: none"> • Total new or replaced hard surface is 750 square feet or more, • 7,000 square feet or more of land is disturbed, and <p>For lots that were drawn before January 1, 2016:</p> <ul style="list-style-type: none"> • Any project that creates new or replaces 1500 square feet of hard surface, or • Disturbs 7,000 square feet of land or more <p>If water discharges into wetlands:</p>	<ul style="list-style-type: none"> • Full Dispersion • Infiltration Trenches • Dry Wells • Rain Gardens • Infiltrating Bioretention • Rainwater Harvesting • Permeable Pavement Facilities • Permeable Pavement Surfaces • Sheet Flow Dispersion • Concentrated Flow Dispersion • Splashblock Downspout Dispersion • Trench Downspout Dispersion • Non-infiltrating Bioretention • Vegetated Roofs • Cisterns • Perforated Stub-out Connections • Newly Planted Trees
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<ul style="list-style-type: none"> • Total new plus replaced hard surface is greater than 5,000 square feet • Project converts more than ¼ acre of vegetation to lawn or landscaping, or • 2.5 or more acres is being converted to pasture <p>There are additional basin specific requirements for discharges into high risk waterways.</p> <p>For discharges into combined sewer systems requirements are triggered when new plus replaced hard surface equals 10,000 square feet or more.</p>		
Roadway Projects		On-Site Stormwater Management
Requirements/Applications	BMPs	Requirements
<p>Must retain and protect any undisturbed top soil and must amend all new, replaced, or disturbed topsoil.</p> <p>Must manage stormwater onsite for:</p> <ul style="list-style-type: none"> • All roadway projects with 2,000 square feet or more of replaced or new hard surface, or • That disturb 7,000 square feet or more of land <p>There are additional basin specific requirements for discharges into high risk waterways.</p> <p>For discharges into combined sewer systems requirements are triggered when new plus replaced</p>	<ul style="list-style-type: none"> • Full Dispersion • Rain Gardens • Infiltrating Bioretention • Permeable Pavement Facilities • Permeable Pavement Surfaces • Sheet Flow Dispersion • Concentrated Flow Dispersion 	<p>If hard surface coverage is less than 35 percent:</p> <ul style="list-style-type: none"> • Post-development discharge durations should match forested pre-development discharge rates between 8-50 percent of a 2-year storm. <p>For all other projects:</p> <p>Post-development discharge duration shall meet the pasture pre-developed discharge rates between 1-10 percent of a 10-year storm</p>

hard surface equals 10,000 square feet or more.		
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Other Plan Elements

The City of Seattle is undergoing an extensive mapping process of its entire stormwater infrastructure, including that which is installed on private property. All projects are required to map stormwater infrastructure on their property which is turned into the city and incorporated in its GIS mapping system.

Additionally, the City of Seattle maintains extensive public engagement in its stormwater management including budget public hearings for the allocation of monies related to NPDES stormwater management, the creation of several citizen advisory groups, and an education and outreach component. Education initiatives can target school aged children/general public, businesses, or engineers/contractors/developers/planners. A list of topics may be found in the table to the right.

Seattle reLeaf

The Seattle Releaf is a program designed to educate the public on the value of urban canopy and to encourage them to help build a well-maintained urban forest. Each year program staff and resident volunteers plant 1,000 trees.

RainWise

The RainWise program provides education to the general public and landscapers on low impact development techniques including the installation of rain retention, permeable paving, and rain gardens. The primary goal of this program is to slow the flow of runoff and increase infiltration. Program materials include a rain gardens website, guidebook, and plant list. Staff for the program led at least two public workshops each year and several rain garden demonstrations throughout the city.

<p style="text-align: center;">Education and Outreach Topics</p> <ul style="list-style-type: none"> • General impacts of stormwater on surface waters • Impacts from impervious surfaces • Impacts of illicit discharges and reporting them • Low Impact Development BMPs • Stewardship activity opportunities • Technical standards for site control and erosion plans • Stormwater treatment facilities • Use and storage of auto chemicals • Equipment maintenance • Prevention of illicit discharges • Yard care for water quality • Use and storage of yard and household chemicals • Vehicle, equipment, and home/building maintenance • Pet waste management • Stormwater facility maintenance • Dumpster maintenance
