MAXIMIZING STORMWATER CAPTURE USING GREEN INFRASTRUCTURE IN THE COMBINED SEWER SERVICE AREA

SMITHGROUP
City of Milwaukee
US Army Corps of Engineers.
Shorewood
FRESH COAST GUARDIANS
MMSD
PARTNERS FOR A CLEANER ENVIRONMENT

EXECUTIVE SUMMARY

The Milwaukee Metropolitan Sewerage District (MMSD), US Army Corps of Engineers (USACE), City of Milwaukee, and Village of Shorewood have partnered to strategically identify eight locations within the combined sewer service area to implement large scale green infrastructure projects. This report outlines the need, methodology for site selection, community engagement strategies and provides conceptual plans for each site. The intent of this plan is to present conceptual site designs that can be moved into construction as funding allows.

Over the past several decades, as a result of land use, population changes and climate change, the Milwaukee metropolitan region has transformed its approach to managing stormwater. Increased rain fall frequency and more intense storm events will require a flexible approach to stormwater management. Green infrastructure is one piece of the multi-tiered approach to addressing the Wisconsin Pollutant Discharge Elimination System permit, addressing the risks identified in the Resilience Plan, meeting MMSD's 2035 Vision for zero basement backups, ability to manage changes in precipitation, zero combined sewer overflows, and improved water quality. Widespread green infrastructure implementation plays an important role in achieving this vision by capturing stormwater and allowing it to be held on-site, infiltrate into the ground, or evaporate to reduce stress on gray infrastructure systems. Achieving this level of green infrastructure implementation requires a bold, multifaceted approach.

Green infrastructure complements MMSD's flood management projects, municipal investments (i.e., repair and replacement of gray infrastructure), and private property efforts to reduce inflow into the system. Implementation of green infrastructure supports gray infrastructure, such as sewer pipes, storage tunnels, and reclamation facilities—gray infrastructure has been and will continue to be the backbone for wastewater management. However, strategic identification and implementation of green infrastructure can support gray infrastructure functionality and result in additional co-benefits such as reduced urban heat island effect, improved air quality, and creation of new green space.

This plan outlines a proactive approach to identify priority parcels for green infrastructure implementation based on shared criteria developed by project partners (MMSD, USACE, City of Milwaukee, Village of Shorewood, and Smithgroup). Criteria include projects located in the combined sewer service area, ability to maximize capture from impervious areas, and high levels of feasibility for construction. Eight site plans were developed that will help MMSD and partners meet stormwater management objectives to manage water where it falls. While this plan documents the approach used to select sites, community engagement activities, and funding opportunities, the focus is on **implementation and construction of these plans**. With assistance from the USACE through the Planning Assistance to States (PAS) program, MMSD commissioned this plan with the intention of developing shovel-ready green infrastructure projects that can be designed and constructed as soon as funding is available.

The eight sites were selected through a process of geospatial analysis, site visits, and coordination with City of Milwaukee and Village of Shorewood representatives. Projects were selected based upon their ability to meet multiple priority criteria such as: located on over 0.5 acres of public land, located within 500 feet of areas prone to flooding (based on local drainage and low spots), ability to leverage planned capital improvement projects, and ability to achieve additional co-benefits.

located on over 0.5 acres of public land

located within 500 feet of areas prone to flooding

ability to leverage planned capital improvement projects

ability to achieve additional co-benefits

With conceptual plans being complete, partners will move into the implementation stage as funding is identified and as opportunities to integrate projects into complimentary capital expenditures arise. This plan allows for MMSD to work with partners to meet stormwater management goals in a proactive way.

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INTRODUCTION

The Milwaukee Metropolitan Sewerage District (MMSD) is a regional government agency that is responsible for water reclamation and flood management services for 28 municipalities spanning over 400 square miles. MMSD plans for replacement of equipment, maintenance of the infrastructure system and adjustments to operations, all of which are expected to be impacted by climate change, including changes in precipitation frequency and intensity. MMSD is committed to climate resilience – "the ability to anticipate, prepare for, and respond to hazardous events, trends or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with these risks" (Center for Climate and Energy Solutions).

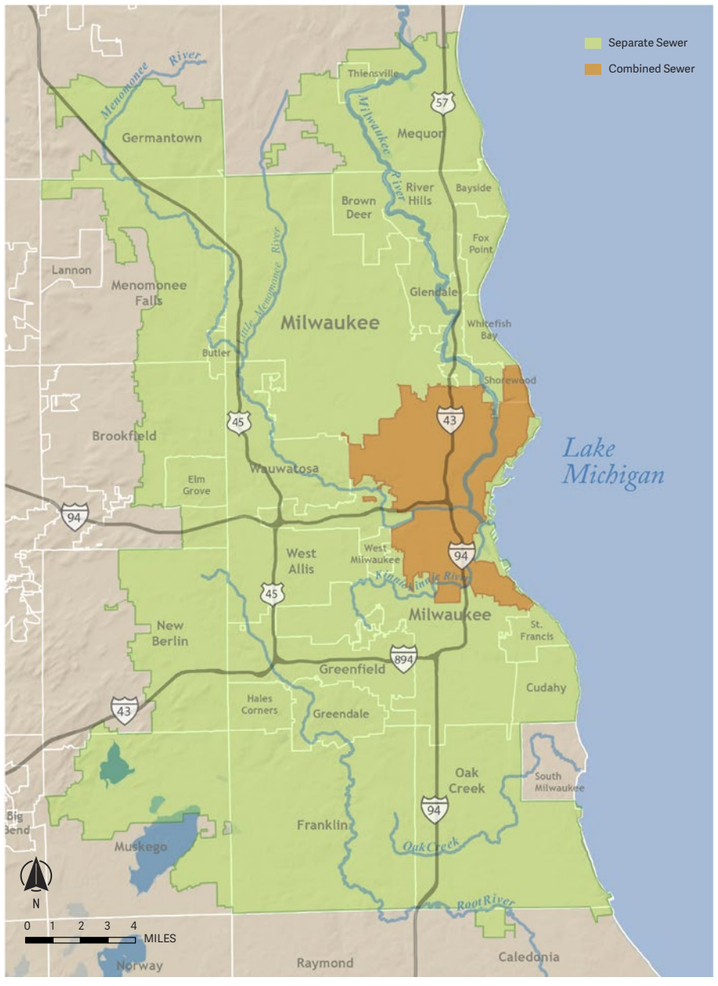
These climatic changes may also affect MMSD's ability to comply with its Wisconsin Pollutant Discharge Elimination System (WPDES) permit. The WPDES permit limits MMSD to either no more than six combined sewer overflows (CSO) per year, or treatment of 85% of the system wide volume of combined sewage collected in the combined sewer system as the result of precipitation events, reported on an annual average basis. The most recent version of the WPDES permit, issued in early 2019, establishes goals that MMSD "shall implement wet weather management programs," with a "green infrastructure retention capacity goal to be achieved during the term of this permit" of 50 million gallons with 20 million gallons of that being collected within MMSD's combined sewer service area. With the combined sewer service area making up less than 6% of the total service area, opportunities for green infrastructure are limited but crucial.

Green infrastructure features are typically thought of as an add-on or afterthought after a capital improvement project is completed or implemented based on when a third party has a green infrastructure project opportunity either based on funding availability, new or renovated development, or in conjunction with another project. Developed through a collaborative, iterative process, this plan flips the status quo and proactively identifies opportunities for partners to invest in large-scale, innovative green infrastructure features to maximize stormwater capture.

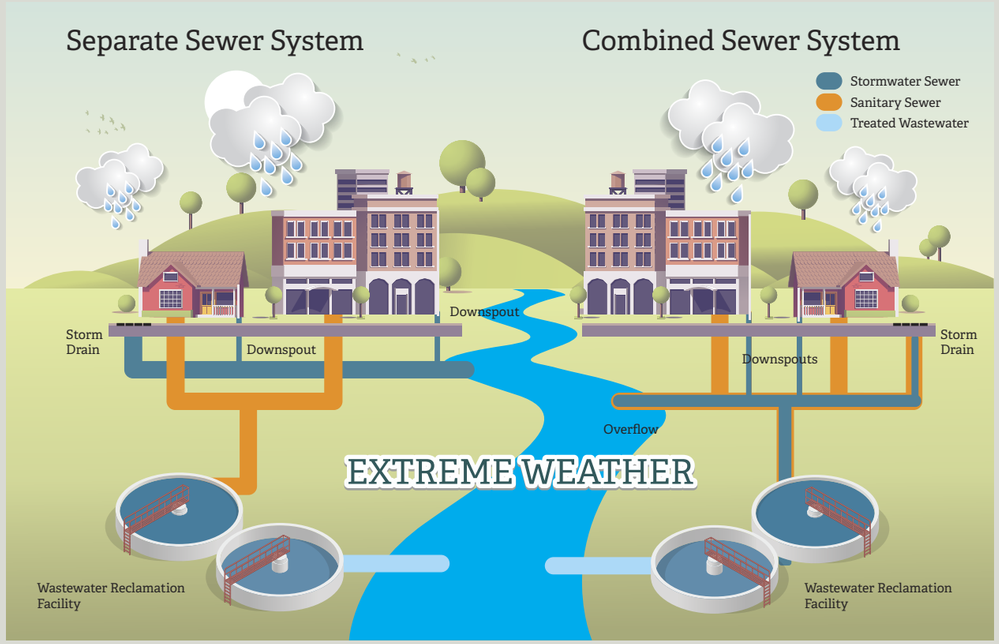
MMSD also recognizes the value of meaningful stakeholder engagement. This report outlines the benefit of community engagement for green infrastructure projects, describes the process for phase one and defines how community engagement should take place in phase two.

This plan is phase one of a two-part strategy. Phase one identifies eight priority sites on public land suitable for large-scale green infrastructure within the combined sewer service area and develops conceptual design recommendations for each site. Phase two of this strategy will be to seek funding for implementation of these projects and take conceptual design through to construction.

CONDITIONS IN THE COMBINED SEWER SERVICE AREA



The majority of MMSD's service area is drained by separate sewer systems, meaning that the stormwater runoff and sanitary sewage are collected in separate pipes and not mixed. In these types of systems, stormwater that is conveyed and released to nearby bodies of water is not mixed with sanitary/sewage water. However, approximately 6% of MMSD's service area, located entirely within the City of Milwaukee and the Village of Shorewood, is serviced by the combined sewer system. **This combined sewer service area is the focus of this Plan**, as reducing stormwater inflow into the combined system will reduce the risk of a combined sewer overflow.



Combined sewers are a water collection system of pipes and tunnels which collect stormwater runoff and domestic and industrial sewage into one shared system. In normal circumstances, all water is conveyed to a wastewater treatment plant for treatment and then released into a natural body or water such as a lake or river. During heavy rainfall or snowmelt periods, the capacity of combined sewers can be exceeded and the untreated stormwater and sewage is discharged directly to nearby bodies of water, to the detriment of water quality. These unplanned discharge events are referred to as "Combined Sewer Overflows" (CSOs) and are a primary water quality concern for the nearly 860 municipalities across the United States which have combined sewers. (https://www.epa.gov/npdes/combined-sewer-overflows-csos)

The Milwaukee region is home to over 1.1 million people. According to the Southeastern Wisconsin Regional Planning Commission projections, the region's population is expected to grow by approximately 16 percent by 2035. A Brookings report found that the four-county Milwaukee metropolitan area has the highest index for black-white segregation (for 2013-2017). The concentration of minority populations aligns with significant disparities in socioeconomic indicators such as unemployment rates, income, poverty rates, and educational attainment between minority populations and non-minority populations. Problems such as flooding, polluted stormwater, and extreme heat tend to impact vulnerable communities more severely, and these impacts are expected to be greater in the region due to climate change. Green infrastructure is a tool in the resiliency toolbox that can be used to mitigate some of these stresses while providing additional community benefits.

WHAT IS GREEN INFRASTRUCTURE

Green infrastructure is a cost-effective, resilient approach to managing wet weather impacts that also provide community benefits. Green infrastructure uses vegetation, soils, and natural processes to manage water and create healthier urban environments. While single-purpose gray stormwater infrastructure—conventional piped drainage and water treatment systems—is designed to move urban stormwater away from the built environment, green infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits. These benefits include enhancing community resilience, reducing flooding, combatting urban heat island effect, and improving water quality.

There are many different types of green infrastructure and strategies for implementation. These strategies vary in terms of cost, target locations, effectiveness, as well as maintenance. It is critical to choose strategies based on site conditions, future use, and ability to maintain. Some types of green infrastructure can be implemented and maintained fairly easily, while some require professional assistance or specific machinery.

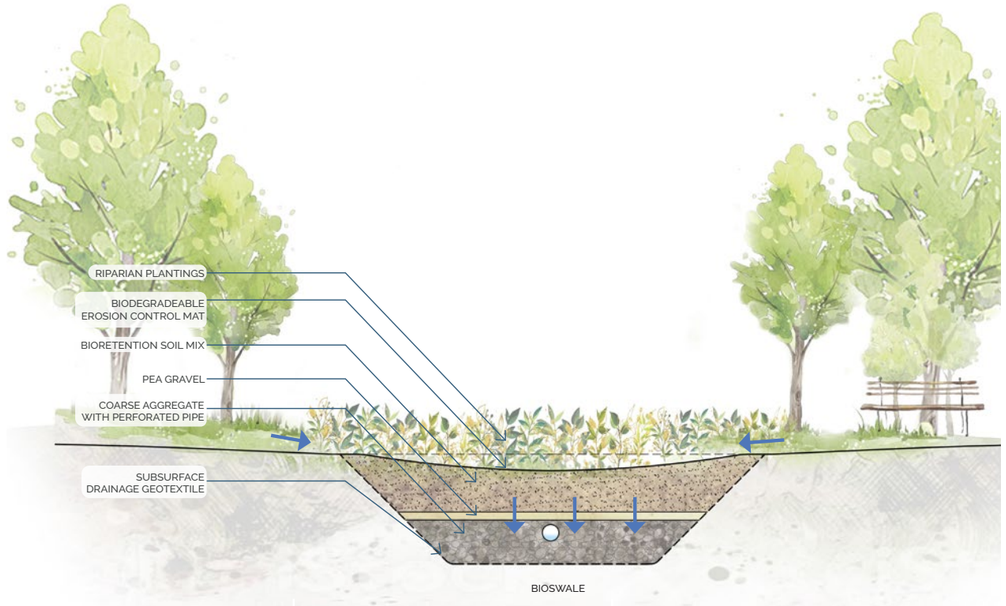
The following is a list and description of the strategies used in the conceptual site plans.

DRY DETENTION BASIN

An excavated basin used for the short-term storage of runoff that allows water to be released slowly.

TRENCH DRAINS AND CURB CUTS

A lined channel used to move water to a green infrastructure feature.



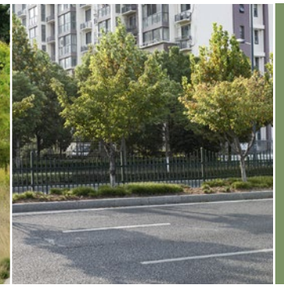
BIOSWALE

BIOSWALES

Landscape features that capture and infiltrate runoff and remove pollutants.

REMOVAL OF PAVEMENT & STRUCTURES

Removal of structures or paving to allow for infiltration.



STORMWATER TREES

Absorb rainwater that would normally flow into the sewer system, reduce the urban heat island effect and improve air quality.

MITIGATING THE EFFECTS OF CLIMATE CHANGE WITH GREEN INFRASTRUCTURE

The Earth's climate has always changed. Science tells us that the Earth's climate is now changing much more rapidly than ever before. Climate change affects the Earth's rainfall patterns, temperature, plant and animal populations, and more. In an urban environment, the impact of these changes can be magnified because of dense development and more complex infrastructure. Environmental hazards such as drought, flooding, and heat stress detrimentally impact ecosystems and communities alike and climate change will only continue to amplify these hazards and their effect.

Climate change puts additional stress on our critical infrastructure when it must be maintained, improved, and expanded in an uncertain financial and physical environment. Critical infrastructure includes systems which are socially, economically, or operationally essential to the functioning of a society or community. These systems can include transportation, electricity, water and communication systems. Ensuring that infrastructure is climate resilient will help reduce direct losses and disruption of service.

Based on climate projections, there will be seasonal impacts to the region. Winter months are predicted to be warmer, with more precipitation occurring as rain instead of snow. This may mean an increase in freezing rain storms, which will cause problems for transportation, above-ground power lines, and other infrastructure. The projections indicate that the number of large rainstorms (greater than two inches of rainfall in a day) will increase by around 25% and occur predominantly in the spring and fall. What's more, this trend is already happening. The Milwaukee region storms of 2000, 2002, 2005, 2006, 2008, 2009, 2010, 2012, 2013, 2015, 2016, and 2018 produced significant flooding, basement backups, and sewerage overflows that caused millions of dollars in damage. These large storms demonstrate that the region's existing gray infrastructure, that includes traditional sanitary and storm sewer systems, was not designed for these larger events.

Green infrastructure has the potential to reduce community vulnerability to climate hazards by reducing stormwater runoff and the amount of water entering the combined sewer system. Reducing stormwater runoff can decrease the likelihood that the system will be overwhelmed, which could cause flooding or more frequent CSOs. Green infrastructure can also help to mitigate climate change impacts by enhancing biodiversity and carbon storage capacity. The placement and design of green infrastructure throughout the Milwaukee region should be informed by current regional trends and projected future conditions.

TRENDS

The US Army Corps of Engineers (USACE) has developed concise reports summarizing observed and projected climate and hydrological patterns at large watershed scales. Trends applicable to the Milwaukee area are reported in the Great Lakes Region Report, which was finalized in April 2015. The information cited in this report comes from reputable, peer-reviewed literature and authoritative national and regional reports. Understanding these trends will help determine how to implement creative green infrastructure solutions that have multiple benefits.

Figure 1., taken from USACE's Great Lakes Literature Review, summarizes observed and projected trends for the Great Lakes region, including trends in temperature, precipitation, and streamflow rates. These trends are discussed in further detail in the sections that follow.

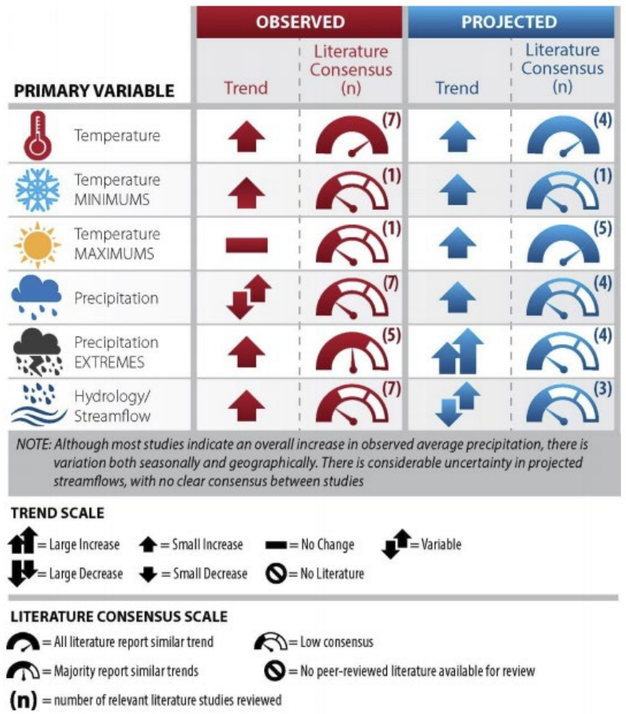


Figure 1: Summary of Observed and Projected Climate Trends for the Great Lakes Region

PRECIPITATION TRENDS

Figure 2. portrays the 3rd National Climate Assessment's (NCA) reported summary of the observed change in very heavy precipitation for the U.S., defined as the amount of precipitation falling during the heaviest 1% of all daily events. The 3rd NCA results indicate that 37% more precipitation is falling in the Great Lakes Region now as compared with the first half of the 20th century, and that the precipitation is concentrated in larger events. These larger events translate to increases in stormwater runoff, flooding, and combined sewer overflows.

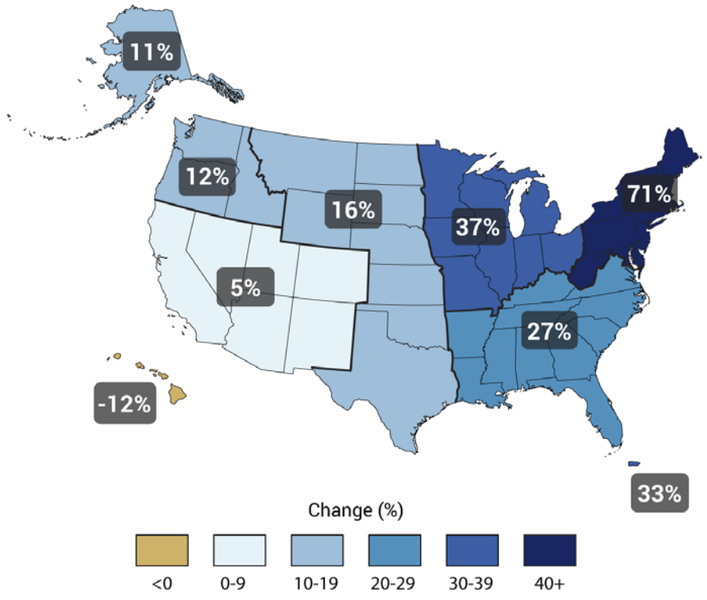


Figure 2: Percent Change in Heavy Precipitation across the US as Compared to the 20th Century

(Walsh et al., 2014)

STREAMFLOW TRENDS

In some parts of the region increases in streamflow have been observed. Future projections of streamflow rates are highly variable. USACE's 2015 literature review states that "Significant uncertainty exists in projected runoff and streamflow, with some models projecting increases and others decreases. Changes in runoff and streamflow may also vary by season. Projections of water levels in the Great Lakes also have considerable uncertainty, but overall lake levels are expected to drop over the next century." In general, future projections suggest stream flows are expected to increase in the winter and spring and decreased flows are expected in the summer (outside of the heavier precipitation events previously described). These changes in flow trends will likely impact urban flooding.

BUILDING ON EXISTING PROGRAMS AND PLANS

MMSD's current approach is to support other entities implementation of green infrastructure within its service area through various programs. While these successful programs support a wide array of stakeholders and scales of green infrastructure, MMSD aims to have a direct role in meeting stormwater objectives by taking a more proactive approach through project collaboration. This helps achieve the 2035 Vision goals of capturing the first ½" of rainfall within its service area in support of the goal of eliminating basement backups and sewer overflows. Implementation of green infrastructure goes beyond meeting stormwater management objectives and mitigates climate change impacts, improves air quality, creates new green spaces, and provides environmental education.

Municipalities also recognize the need and value of green infrastructure. The City of Milwaukee and Village of Shorewood are partners for this planning effort. The City of Milwaukee completed their Green Infrastructure Plan in 2019 which lays out policies and priorities to add 36 million gallons of stormwater storage by 2030. The Village of Shorewood identifies the need to utilize stormwater best management practices in their Sustainability Action Plan.

PROGRAMS

GREEN INFRASTRUCTURE PARTNERSHIP PROGRAM

Every year, MMSD invites both public and private sector organizations who plan to install green infrastructure on their property within eligible municipalities, to submit applications for partnership funding through MMSD's Green Infrastructure Partnership Program. The program originated in 2012 and currently provides approximately $3 million per year in incentive funding. The program is open to public, private, and not-for-profit entities. Since 2017, the program has averaged about 3.4 million gallons of storage funded per year.

GREEN SOLUTIONS PROGRAM

MMSD's Green Solutions program provides financial incentives to municipalities for MMSD Commission-approved types of green infrastructure and combined sewer separation projects. The program is intended for projects in public places, thereby raising awareness of green infrastructure. The budget amount has increased over the past several years, with the 2020 amount being $10 million allocated based on equalized value. In total, from 2013 to 2019, MMSD has provided $3.7 million to municipalities, resulting in 5.2 million gallons of capture in green infrastructure.

Westlawn Garden Project To Install Underground Detention

PLANS

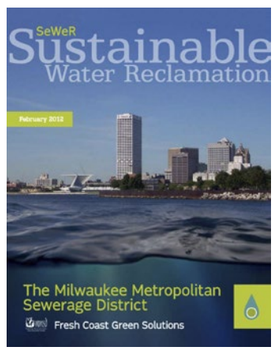
MMSD, City of Milwaukee, and Village of Shorewood have developed various plans related to stormwater best management practices and green infrastructure. This implementation plan aligns with and builds on many of the existing objectives and goals and aims to implement the strategies identified in these existing plans.

For more information about any of the MMSD plans, visit https://www.freshcoastguardians.com/resources/our-plans.

COMPREHENSIVE FACILITY PLAN

(Shorewood 2011)

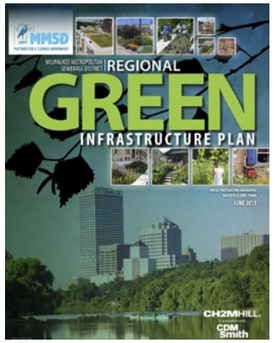
The Village of Shorewood is fully developed and the most densely populated municipality in Wisconsin. The predominant land use is residential, with two principal commercial/business corridors. Creating stormwater management policies are a crucial component to facility planning. The Comprehensive Facility Plan includes direct and indirect stormwater quality and quantity impacts. The Village of Shorewood understands that the protection of private property against basement backups should not be realized at the expense of water quality degradation in the Milwaukee River or Lake Michigan.



SUSTAINABLE WATER RECLAMATION PLAN

(MMSD 2012)

The Sustainable Water Reclamation Plan includes a full chapter examining MMSD's ability to prepare for climate change. It summarizes Wisconsin Initiative on Climate Change Impacts' (WICCI) climate predictions, including increased frequency of severe rainfall events and increased temperatures. In response, the Plan identified a need for MMSD to undertake mitigation activities (to reduce risks and hazards associated with climate change) and adaptation activities (to adjust to likely climatic changes). Several potential mitigation activities are identified such as measuring and reducing MMSD's carbon footprint and increasing green infrastructure installations to slow runoff and serve as carbon sinks. Suggested adaptation activities include capacity enhancements via both gray and green infrastructure projects, inflow and infiltration fixes, and a regional integrated planning process.



REGIONAL GREEN INFRASTRUCTURE PLAN

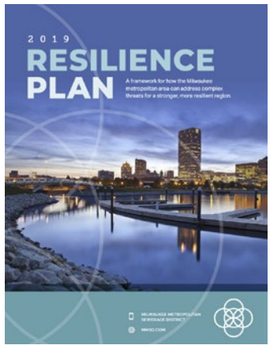
(MMSD 2013)

MMSD recognizes that gray infrastructure is expensive, and it would be extremely difficult to build the amount of gray infrastructure necessary to fully address stormwater management challenges. Green infrastructure complements the region's gray infrastructure by reducing the burden on the system. Both strategies are a necessary component of a comprehensive stormwater management plan. The Regional Green Infrastructure Plan provides recommendations related to specific green infrastructure strategies and quantities for watersheds to capture the equivalent of ½" of rainfall. The Plan outlines triple-bottom-line benefits associated with green infrastructure installation, including economic, social, and environmental benefits and provides a high-level green infrastructure strategy for the region to meet stormwater management goals.

BIODIVERSITY PLAN: USING GREEN INFRASTRUCTURE TO ENHANCE BIODIVERSITY IN THE MMSD PLANNING AREA

(MMSD 2018)

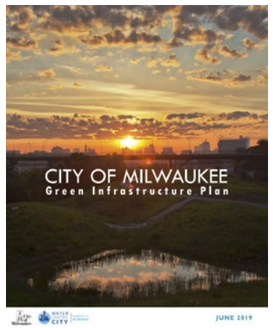
MMSD, with the support of local stakeholders, developed this plan to help protect and restore native biodiversity within MMSD's planning area through the application of green infrastructure. Promoting urban biodiversity is directly linked to MMSD's core mission to cost-effectively protect the region's water resources, and it is important that urban biodiversity be considered and layered into MMSD's projects to ensure a true triple-bottom-line approach to management. The Plan provides a baseline biodiversity inventory for the region and recommendations on how MMSD can play a role in enhancing biodiversity, particularly through the implementation of green infrastructure.



RESILIENCE PLAN

(MMSD 2019)

The 2019 Resilience Plan provides a framework for how the Milwaukee metropolitan area can address complex risks to become a stronger, more resilient region. Climate change is an identified risk that has impacts beyond critical infrastructure systems. The Resilience Plan highlights that environmental and socio-economic issues are "on a collision course over the next several decades." Critical infrastructure systems are becoming increasingly vulnerable to increased precipitation and temperature extremes likely to be experienced in southeastern Wisconsin. Thus, the Resilience Plan recognizes broader ties between climate readiness and economic vitality. While MMSD remains devoted to its primary missions, the Resilience Plan recognizes and describes more holistic goals and strategies that will reduce risks and strengthen the communities in which MMSD operates. The Resilience Plan contains 20 stakeholder-driven actions with two of the actions focused on replacing impervious surfaces with green spaces and increasing green infrastructure in the region.



GREEN INFRASTRUCTURE PLAN

(City of Milwaukee 2019)

By 2030, Milwaukee will add approximately 36 million gallons of stormwater storage by implementing green infrastructure. This is the equivalent of adding 143 acres of green space throughout the City. Green infrastructure will be designed, installed, and maintained by an inclusive workforce that is representative of the City's diversity. The Green Infrastructure Plan will help Milwaukee adapt to climate change while creating a healthier and more resilient city.

METHODOLOGY: MOVING FROM CRITERIA TO SITE SELECTION

The project team participated in an iterative process to define site selection criteria that meet objectives of all stakeholders. The project team was comprised of staff from MMSD, US Army Corps of Engineers, City of Milwaukee, Village of Shorewood, and Smithgroup. The process began with a mini-workshop where all stakeholders listed their individual stormwater management goals (many of which were included during the review of planning documents). The group agreed to use the following screening criteria to initially narrow down sites suitable for large-scale green infrastructure within the combined sewer service area:

- **Parcel is located within the combined sewer service area**
- **Parcel is owned by the City of Milwaukee or Village of Shorewood**
- **Parcel area is greater than or equal to 0.5 acres**
- **Parcel is located within 500 feet of a Bluespot (a MMSD known area of on-street flooding or a depression)**
- **Parcel does not have the presence or potential presence of a hazardous substances, pollutants, or contaminants, also known as a "brownfield sites"**

Public school properties were excluded as potential sites because MMSD has a program that distributes funds to support the design of green infrastructure on Milwaukee Public School grounds. There is another MMSD program for schools to apply to for the construction of the green infrastructure. Similarly, parcels owned by Milwaukee County or the State of Wisconsin were also excluded in this plan because they have their own planning objectives and program strategies and this project was focused on working with local municipal partners.

In addition to the screening criteria above, criteria that stakeholders thought were important to consider for this project are listed in the 'Conceptual Green Infrastructure Designs' section. The additional criteria were divided into three categories to represent the three aspects of sustainability: Environmental, social, and economic. Some of the criteria addressed multiple categories.

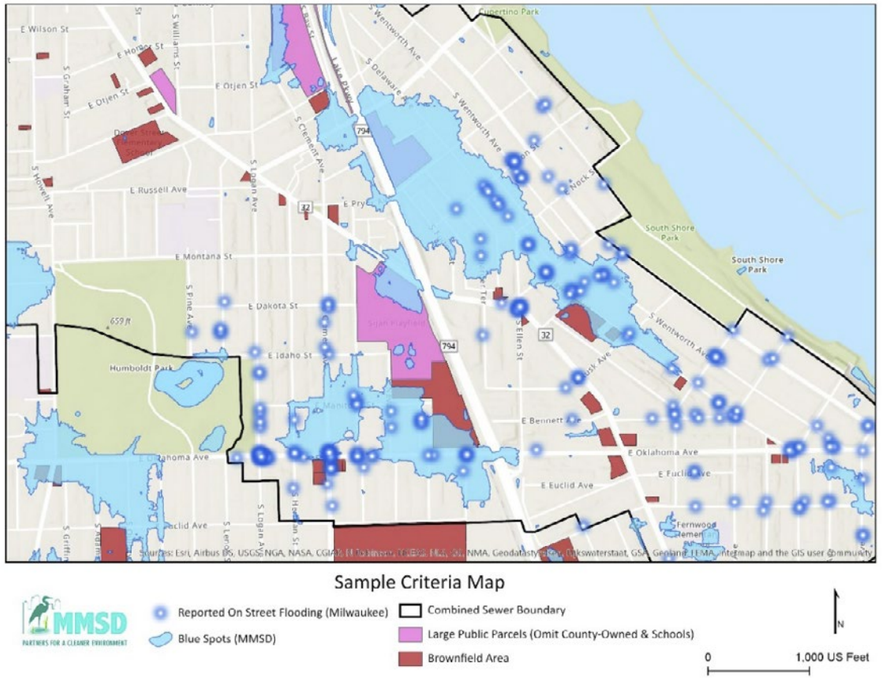


Figure 3: Sample Map With Green Infrastructure Site Criteria

MMSD identified 141 potentially feasible parcels during the initial site selection analysis. Upon desktop evaluation of each of the parcels, 104 sites were determined to not be good candidates for large-scale green infrastructure installations for various site-specific reasons such as challenging topography, existing uses, or parcel information being incorrectly flagged. 37 sites were identified as potentially viable and warranted further investigation.

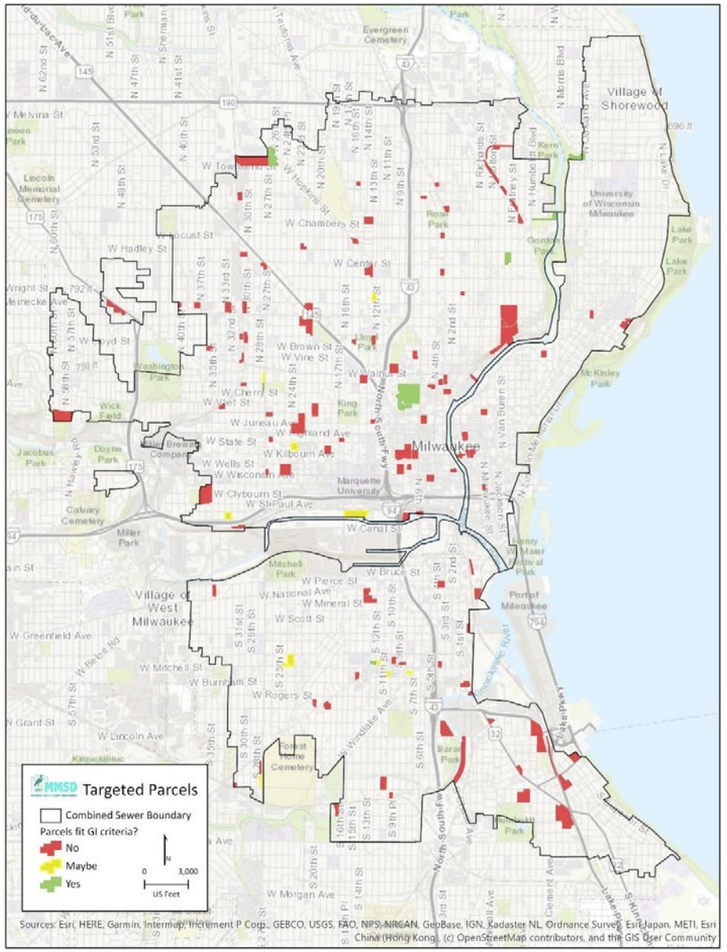


Figure4: Initial Map Of Properties Meeting Screening Criteria

MMSD worked collaboratively with the City of Milwaukee and Village of Shorewood to decide which of the 37 potentially viable sites should be further investigated with site visits. It was important for MMSD to have support from the municipal partners to ensure that the sites selected for green infrastructure implementation through this planning process would meet their needs and objectives. Sites that were not selected for site visits included those that would potentially be developed in the future, change of ownership, minimal green infrastructure opportunities (pervious to impervious ratio, could not take runoff from adjacent roadway, building drains internally, etc.). Of the 37 sites, 17 were selected for site visits: 16 in Milwaukee and 1 in Shorewood.

The site visits were completed in the fall of 2019 by SmithGroup and Oneida Total Integrated Enterprises. The site visit team documented information about each site. Information included location, existing use and conditions, vegetation type, potential to capture runoff from the street or adjacent

sites, and the evidence of factors that would limit the potential for and/or success of green infrastructure practices. A site visit template was filled out for each site allowing space for the teams to make comments and observations. In addition, the teams marked up base maps and took photographs of each site.

The project team understood the opportunity to leverage investments in infrastructure projects, in order to have an even greater impact on the community. The additional selection criteria will help the team maximize the green space investment using a community lens during phase 2 (engineering and construction).

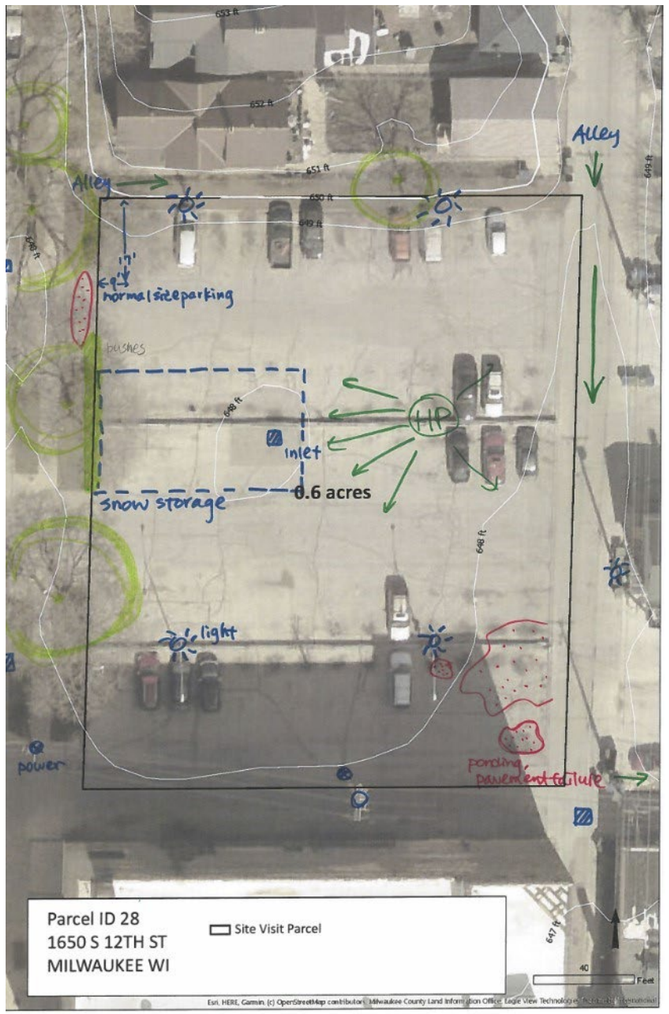


Figure 5: Example Of A Site Visit Template And Base Map Markup

Planning for Optimal Green Infrastructure in the Combined Sewer Service Area

DRAFT Site Visit Template 10/8/19

1. Site Name: 28
2. Location (address or nearest intersection): 1650 S. 12th St.
3. Team Member(s): Cassie Goodwin & Peggy Huang
4. Date & time: 10/30 10:50 5. Weather conditions: Chilly, overcast

Observations:

6. Existing site use(s): City parking lot
7. Predominant impervious cover & condition: asphalt, poor condition with spalling and cracking
8. Vegetation types & conditions (circle all that apply): (1) lawn (2) woods (3) prairie (4) old field/scrub/invasives (5) gardens or landscape beds (6) potential/undocumented wetlands (7) primarily not vegetated (paved)
   Describe: Some shrubs in island along 12th St, trees
9. Tree sizes (approx. DBH), conditions, species: 3 trees. approx. 12-18" along S. 12th St.
10. Is the site publicly accessible? (Y) / N Please describe if the public currently uses the site and how: parking lot for adjacent businesses, may be some residential permit parking
11. Is there potential to capture runoff from the street right-of-way? Y (N) Please describe:
    · limited due to elevation of street being lower and sloping away.
12. Is there drainage infrastructure on site? Please describe: yes.
    inlet in middle of lot, inlet in SE corner (alley)
13. Is there evidence of any existing or prior uses that would limit the potential for GI practices? Please describe:
    existing parking use makes GI options limited
14. Is there potential to create new green/open space or depave? Please describe:
    limited without losing parking
15. Are there observable areas of erosion, ponding or poor drainage on site? Please describe:
    Some ponding in bird baths; drainage is pretty flat
16. Other observations: parking lot is a bit more spacious than 77, no curb between south alley and lot. Some large OH power lines. May be able to get swales in islands.
17. Overall, is this site a good candidate for green infrastructure (see criteria below)? Yes / No (Maybe)
    Opportunity to repave and provide porous pavement in parking stalls or remove some stalls to add bioswales. Limited potential to capture off-site runoff.

Figure 6: Example Of A Site Visit Template And Base Map Markup

For the City of Milwaukee sites, 16 sites were visited and 8 were eliminated after the site visits and after additional review with the City of Milwaukee. The reasons these sites were eliminated included limited space or challenging topography, brownfield status that hadn't been identified in the earlier round, and the potential or change in ownership or future development. The SmithGroup team then worked with the USACE to perform an initial hydrologic analysis on the remaining sites to determine the stormwater volume capture potential. The stormwater runoff was determined for each of the potential sites by use of the Natural Resources Conservation Service's Urban Hydrology for Small Watersheds. This method, known as the TR-55 method, uses ground topography, sewer system drainage, landuse type, soil type, and precipitation to estimate stormwater runoff.

After the site assessments and hydraulic analysis, 8 sites were determined to be good candidates for large-scale green infrastructure practices with a high likelihood of constructability and reduced flood impacts. 7 of the sites are located within the City of Milwaukee, and 1 site is located in the Village of Shorewood. The sites range in size and use from grassy rights-of-way to paved parking lots. A pattern of municipally-owned parking lots began to appear as a real opportunity to transform under-utilized and unattractive spaces and capture public parcels which produce a lot of runoff and yet are relatively easy to transform in a dense urban environment such as the combined sewer service area, which is almost entirely built out. Detailed site plans are included in the 'Conceptual Green Infrastructure Design' section of this report.

MEANINGFULLY ENGAGING THE COMMUNITY

THE IMPORTANCE OF COMMUNITY ENGAGEMENT IN INFRASTRUCTURE INVESTMENTS

MMSD recognizes that engaging stakeholders in collaborative decision making improves the connections between land, water, and people. The Resilience Plan specifically identifies community decision making as an action that can reduce the impacts of climate change and address the risk of social (in)equity. Meaningful community engagement is based on the belief that those affected by a decision have a right to be involved in the decision-making process. According to the US EPA, public participation "results in better outcomes and better governance." Well-developed strategies for community engagement build trust, promote accountability, and strengthen commitment of all stakeholders toward an improved project. By engaging residents, they value the investment being made in their neighborhoods and develop a sense of ownership.

Furthermore, when done in a meaningful way, community engagement leads to sustainable decisions that reflect the interests and values of the community. An investment in infrastructure is an opportunity to leverage additional investments and improvements to further meet the needs of the community. These may include new access to green space, increased litter pickups, or a formation of a block watch. By identifying and meeting additional community interests, it encourages residents to be more engaged in the decision-making processes. Public infrastructure investments also provide an opportunity to develop community capacity for managing difficult social problems. Through engagement, residents better understand the need for continued investments in a critical infrastructure system they depend on, but is largely unseen. Engagement also creates a framework for neighbors to learn meaningful and collaborative ways to approach each other, manage difficult decisions, and resolve problems.

MMSD'S APPROACH

Ideally, community engagement begins at the very early stage of the project. This leads to the formation of lasting relationships with community members and ensures the project will be a neighborhood asset. Early community engagement also identifies additional neighborhood needs and opportunities that can be integrated into the project. These often times could include working with the local police to get a neighborhood watch started, providing information about grants to improve business facades, contacting elected officials to discuss needs such as painted crosswalks and speed bumps or providing access to existing community resources (MMSD's Resilience Plan Action 7). Information should be shared with residents that goes beyond the project goals; the average resident is likely less interested in green infrastructure and more interested in a neighborhood watch, who to call about potholes in the street, or needing help to find a job.

Community engagement includes the promise that the public's contribution will influence the decision. It is important to define the amount and type of decisions the community can influence. If not done correctly, it will raise expectations and likely direct input to areas where no influence is possible, resulting in a loss of trust in the process. Decisions that are informed by public participation processes are perceived as more legitimate and are less subject to challenge.

Meaningful public engagement provides the community with the information they need to participate in a significant way. There are three crucial components for community engagement in green infrastructure and climate change resilience projects:

1. Since green infrastructure is often new to residents, initial engagement should include information focused on what green infrastructure is, what co-benefits could be achieved, and how these investments will affect the neighborhood.

2. Green infrastructure is typically a larger investment undertaken by a municipality or organization. But individual community members can support these large investments through behavioral change. These behavioral change strategies develop a sense of ownership over the space and water resources at large. The behavioral change centers on an educational component. This needs to resonate and align with a tangible component of someone's life. Once this connection is made, the educational component provides clear ways for very small behavior changes that support water resource management such as installing a rain barrel, disconnecting a downspout, picking up litter, and using less water when it rains. Providing ways that an individual can support a much larger investment also helps establish that the 'solution' requires everyone to play a role-not just government building more 'things'.

3. Typically, a large portion of infrastructure projects are supported via taxes. Community members have a right to influence how their tax dollars are spent. Including neighbors early-on in the decision-making process helps to create trust and often leads to better projects. Early-on engagement also develops an understanding of the need to fund infrastructure projects, which can translate to political support.

GREEN INFRASTRUCTURE CAN LEAD TO INCREASED PROPERTY VALUES, JOB CREATION, DECREASED AIR POLLUTION, REDUCED OPERATION AND MAINTENANCE COSTS, AND, FOR VEGETATED ALTERNATIVES, A REDUCED URBAN HEAT ISLAND EFFECT.

PHASE 1 COMMUNITY ENGAGEMENT

To begin identifying the target audience, an analysis was completed to discover other planned community activities or projects that might lead to a mutually beneficial partnership. For example, one of the project sites is adjacent to a city park that is undergoing a master planning process. The City of Milwaukee and MMSD partnered to engage the local community in tandem. In another instance, MMSD is completing a sewer project, which was also identified as a green infrastructure site, leading to combined engagement for both projects.

The traditional approach includes engaging community partners with existing, trusted networks and hosting in-person opportunities for participation. Traditional approaches can include in-person meetings, workshops, site visits, informational mailers, social media, and attendance at community events. Unfortunately, just as activities towards community engagement were advancing, COVID-19 stay at home orders began and forced a change in strategy (spring 2020).

The alternative strategy to inform residents about the project began with informational mailers sent to residents within a half mile radius around each project location. Mailers included information on the general project, the importance of green infrastructure in protecting neighborhoods, co-benefits, and an introduction to various green infrastructure practices proposed at the site (see appendix for example). Following the educational information mailers, residents were asked for their feedback. In order to be responsive to community access and familiarity to technology, the mailers incorporated various methods for residents to return their feedback including a tear-off pre-stamped postcard, website directions, email, or a phone call. Mailers were sent in English and Spanish.

In project areas where established community groups were using digital tools, community partners were asked to send out surveys and information for the project to their networks. For example, a business improvement district in the area emailed out the survey to surrounding businesses to gather input.

PHASE 2 COMMUNITY ENGAGEMENT

As projects transition to final design and construction, a traditional in-person or virtual meeting approach will occur and be supplemented with continued updates through mailers and digital tools. In realizing the full potential of projects, partnerships will be continued or built with local community groups that have a trusted networks and relationships, and can help reach the target audience. These groups may include neighborhood associations surrounding the projects, business improvement districts that use the parking lots, and recreational groups that use the park areas.

The engagement will move beyond what green infrastructure is and will explore opportunities achieving multiple economic, social, and environmental benefits, often referred to as the triple bottom line (TBL). Well-planned green infrastructure development can lead to increased property values, job creation, decreased air pollution, reduced operation and maintenance costs, and, for vegetated alternatives, a reduced urban heat island effect. It is important for the breadth of TBL benefits to be a part of the discussion. Incorporating local feedback on projects can help create stewardship for these spaces and reduce the long-term operations and maintenance costs.

During this next phase, education and engagement techniques may include:

- Before and after field trips to project sites
- Field trips to nearby sites that have similar green infrastructure elements
- Collaborative meetings to review prior feedback and solicit more input
- Workshops to identify individual behavior changes residents can implement
- Litter pickups and “adoptions” by neighborhood groups of new green spaces
- Educational signage adjacent to the green infrastructure site

These engagement techniques can be used alone or in combination depending on the project, timeframe, and objectives. Community engagement ensures that multiple benefits can be considered as part of a single investment and integrates stakeholder perspectives that can result in the project improving the quality of life for neighbors in the project area.

CONCEPTUAL GREEN INFRASTRUCTURE DESIGNS

The SmithGroup team started the conceptual design process by evaluating the potential drainage areas for each site to maximize the amount of runoff that could be diverted to the green infrastructure features from the parcel or adjacent streets based on topography. Through an iterative process, the team proposed ideas for green infrastructure and solicited feedback from MMSD, USACE, and the local municipality (Milwaukee or Shorewood). The team then finalized the conceptual plans and created illustrative diagrams. They also ran hydrologic models to evaluate the green infrastructure storage volume for a typical 10% Annual Exceedance Probability (10-year) storm event as well as the peak flow reduction from the existing condition to the proposed condition. In two cases, the sites were close enough to the Milwaukee River that the entire project drainage basin was able to be diverted to the river and separated from the combined sewer.

Each of these plans has been created to function as a standalone document. These plans should be considered when there is a funding opportunity or a capital investment near the site. Integrating the green infrastructure plan into a larger project will likely result in cost savings as compared to a retrofit. General maintenance specifications are listed in the appendix. Plant lists for naturalized and ornamental plants have been developed using MMSD's Plant Selection Tool. HydroCAD documents and plant lists are available upon request.

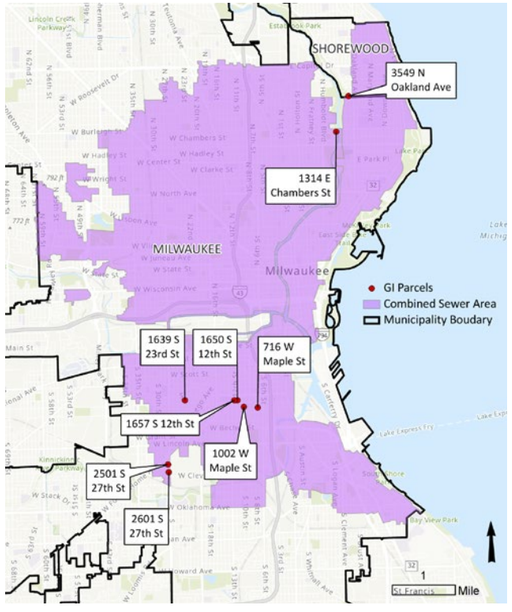


Figure 7: Locations Of Conceptual Designs

	1314 E CHAMBERS ST	2501/2601 S 27TH ST	1657 S 12TH ST	1650 S 12TH ST	1002 W MAPLE ST	716 W MAPLE ST	1640 S 24TH ST	RIVER PARK, SHOREWOOD
ECONOMIC/ENVIRONMENTAL								
Target priority dropshaft tributaries to reduce CSOs	•		•					•
Alleviate localized flooding concerns (locate near known blue spots)	•							•
Coordinate with municipally-adopted plan recommendations (e.g. Shorewood Facilities Plan, Milwaukee GI Plan)	•	•	•	•	•	•	•	•
ECONOMIC								
Minimize maintenance costs (target $4 per gallon captured)	•		•	•				•
Minimize capital costs								•
Employ strategies which attract multiple grant sources				•			•	
Leverage planned capital improvement projects								•
ECONOMIC/SOCIAL								
Leverage activity/funding/ownership within BIDs, NIDs, and TINs			•	•	•	•		
SOCIAL								
Provide social benefits, especially in areas with high social vulnerability		•	•	•			•	
Create additional open space (especially where it is lacking)		•		•				
Increase educational awareness around GI (and MMSD exposure/brand)		•	•	•	•	•	•	•
ENVIRONMENTAL								
Follow recommendations of MMSD's Biodiversity Plan	•	•	•	•	•	•	•	•

Figure 8: Additional Ranking Criteria

1314 E CHAMBERS ST

A dry detention basin will be constructed on an MMSD-owned parcel near the Milwaukee River at the base of a steep street. A new storm sewer will be extended up the hill on the block of 1300 E Chambers to pick up runoff from the street, the adjacent park, and residential areas and divert the flow from the combined sewer. The dry detention basin will discharge directly to the Milwaukee River, effectively removing approximately 10.0 acres of tributary area from the combined sewer service area.

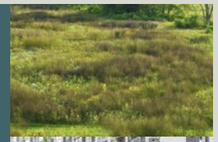
DRAINAGE AREA
10.0
acres of land

ESTIMATED COST
$308,000
dollars

$1.12
per gallon

PEAK FLOW REDUCTION
94%

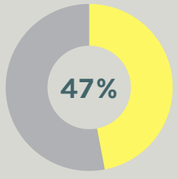
DRY DETENTION BASIN & STORMWATER TREES



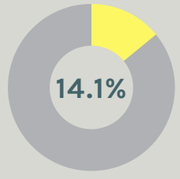
8,300
square feet

GALLONS CAPTURED
275,740
gallons

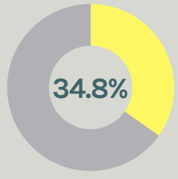
IMPERVIOUS



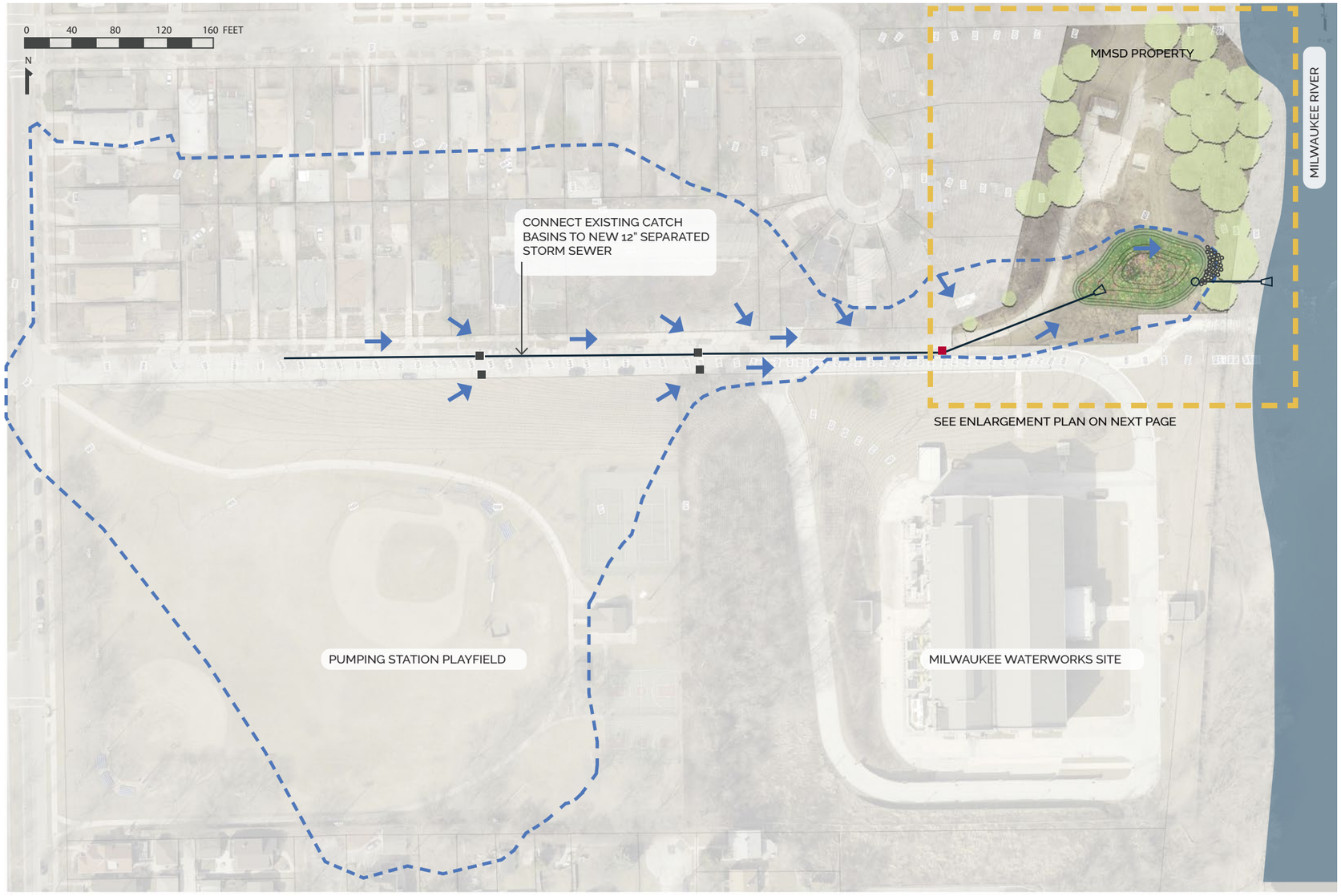
POVERTY



MINORITY



percentages above are based on census tract



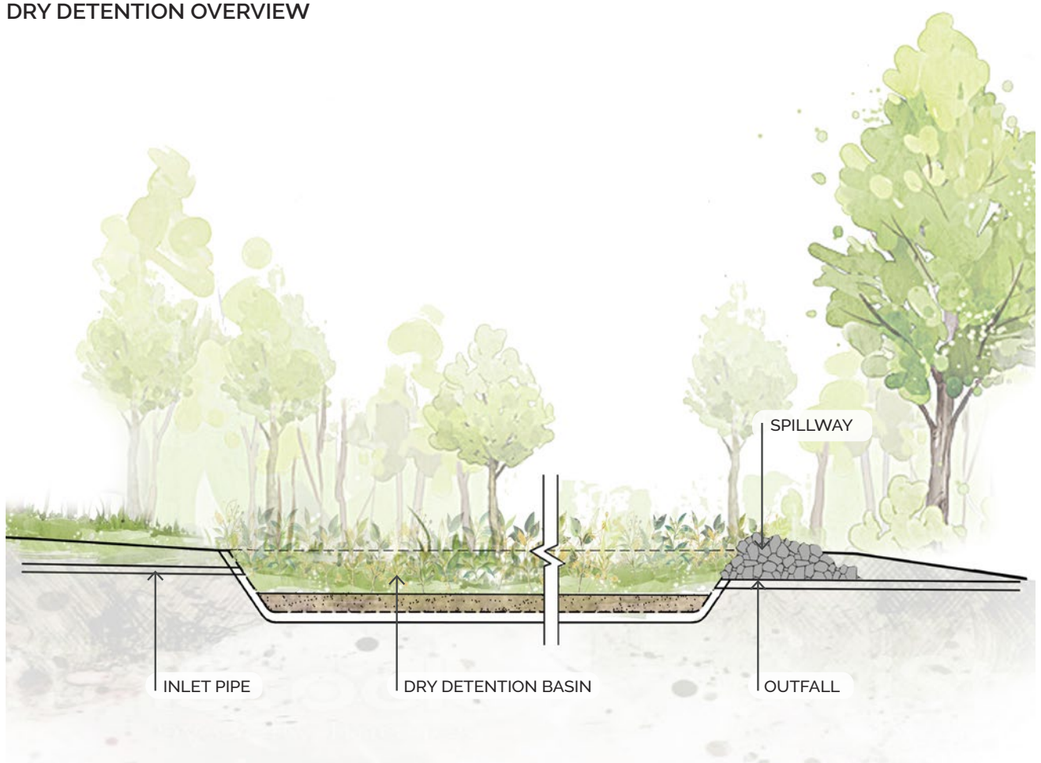
EXISTING CONDITIONS

DRAINAGE AREA
DRAINAGE FLOW DIRECTION
EXISTING CATCH BASIN
PROPOSED CATCH BASIN
PROPOSED DRY DETENTION BASIN
EXISTING TREE

1314 E CHAMBERS ST (CONT'D)

DETENTION SECTION ENLARGEMENT

DRY DETENTION OVERVIEW



DRAINAGE AREA

DRAINAGE FLOW DIRECTION

EXISTING CATCH BASIN

PROPOSED CATCH BASIN

PROPOSED DRY DETENTION BASIN

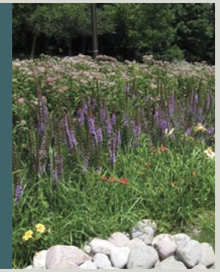
EXISTING TREE

+ 2501/2601 S 27th St

Two skinny parcels of public right-of-way along the west side of S. 27th Street across from the Forest Home Cemetery used to have homes on them but are now open spaces with lawn and trees. This provides an opportunity to add bioswales, curb cuts and trench drains to capture water from the street and the adjacent alley to provide stormwater detention (reducing the amount of water going to the sewers and slowing down the rate) and promote infiltration and evapotranspiration.

DRAINAGE AREA
4.53
acres of land

BIORETENTION AREAS (BIOSWALES)
16,700
square feet



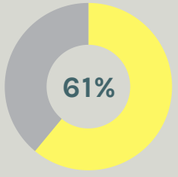
ESTIMATED COST
$849,000
dollars

$9.97
per gallon

PEAK FLOW REDUCTION
79%

GALLONS CAPTURED
85,170
gallons

IMPERVIOUS



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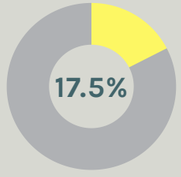

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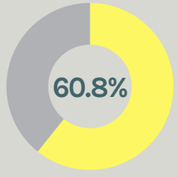
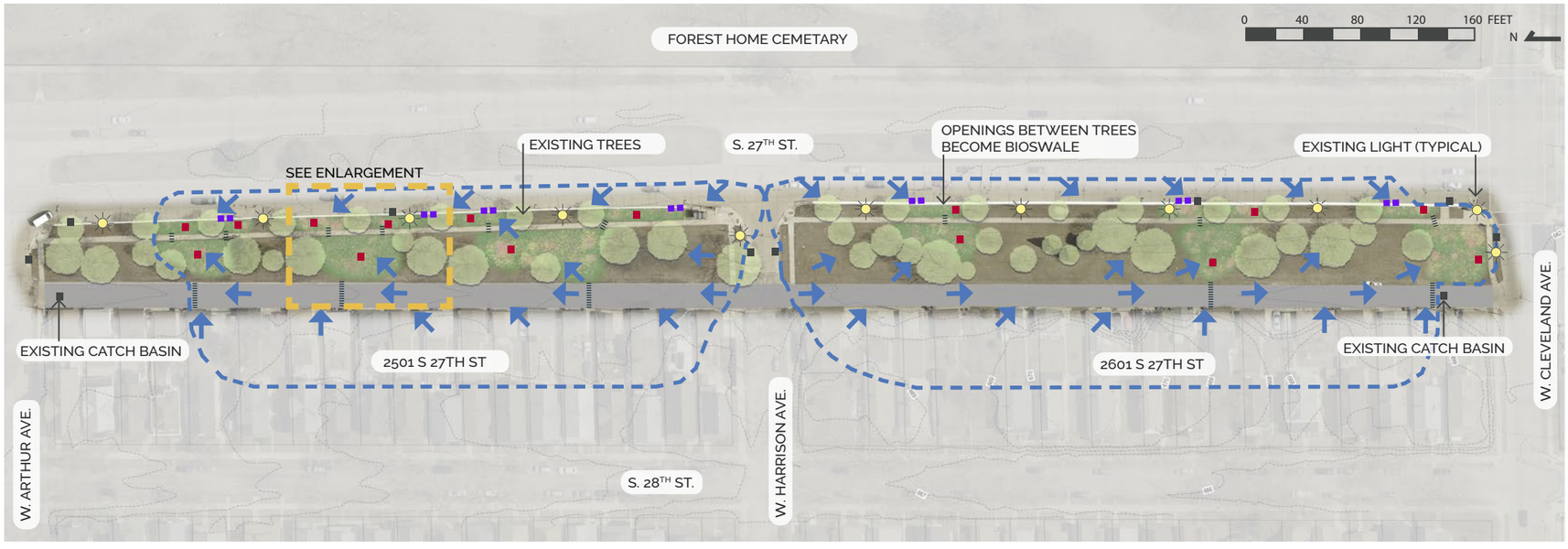


percentages above are based on census tract

EXISTING CONDITIONS



DRAINAGE AREA
DRAINAGE FLOW DIRECTION
EXISTING CATCH BASIN
PROPOSED CATCH BASIN
PROPOSED BIOSWALE

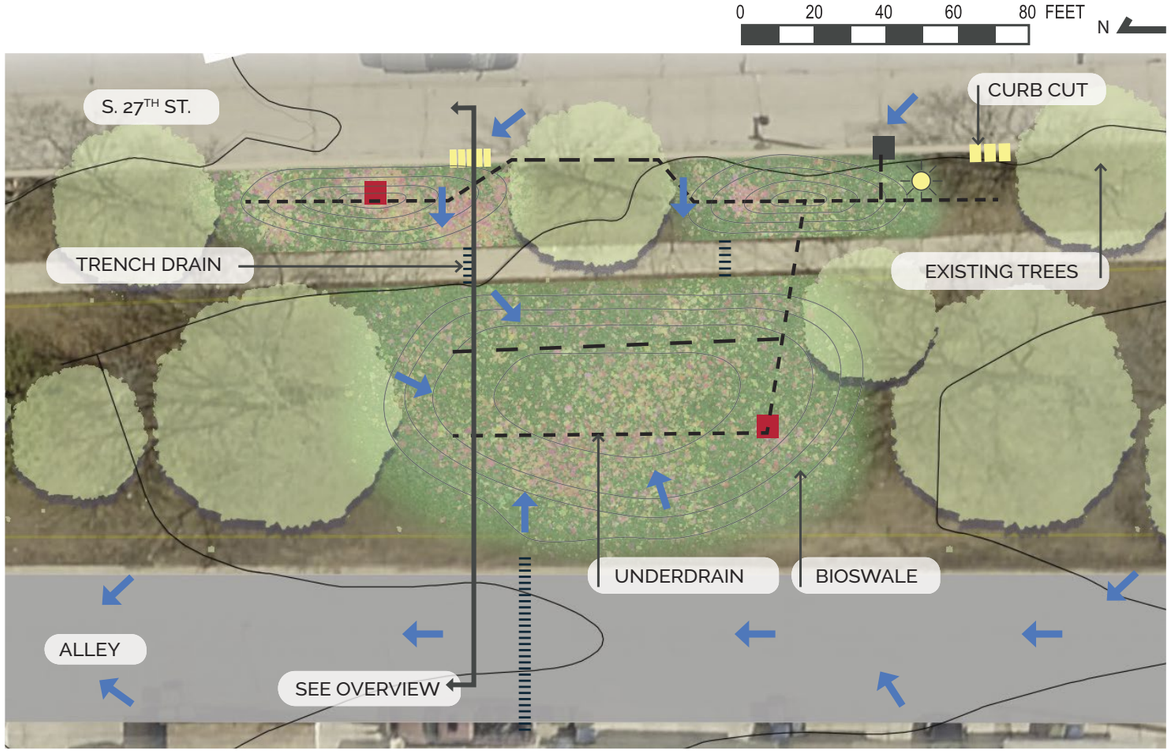
EXISTING TREE
EXISTING LIGHT POLE
PROPOSED CURB CUT
PROPOSED TRENCH DRAIN
UNDERDRAIN

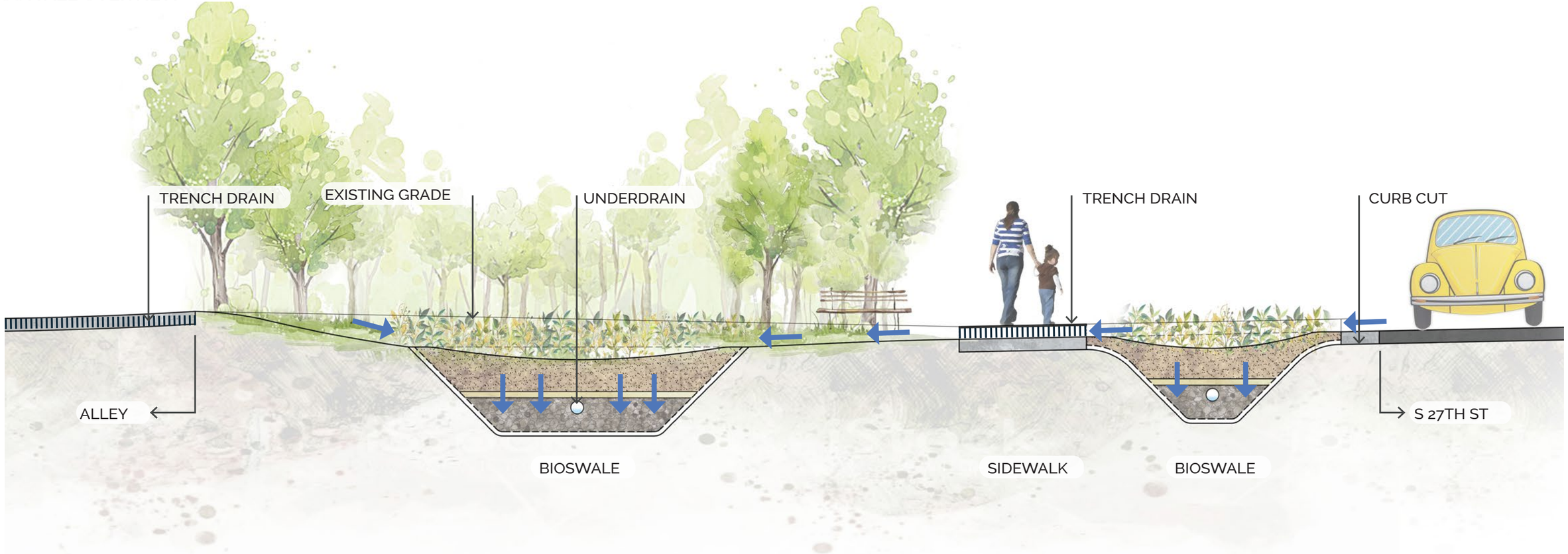
2501/2601 S 27th St (CONT'D)

BIOSWALE ENLARGEMENT

EXISTING CONDITIONS

BIOSWALE OVERVIEW





1657 S 12th St

This existing surface parking lot will be reconstructed to make way for green infrastructure islands capturing runoff from the parking lot, adjacent alley and street. New tree islands will also add shade, improve the parking lot aesthetics, and provide additional rainwater capture. Costs for this project do not include the removal of the entire parking lot or re-pavement.

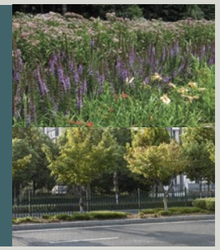
DRAINAGE AREA
1.03
acres of land

ESTIMATED COST
$259,100
dollars

$7.39
per gallon

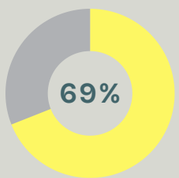
PEAK FLOW REDUCTION
25%

BIOSWALES AND STORMWATER TREES
2,000
square feet



GALLONS CAPTURED
35,070
gallons

IMPERVIOUS



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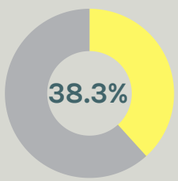

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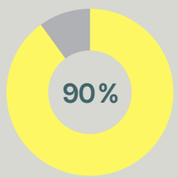
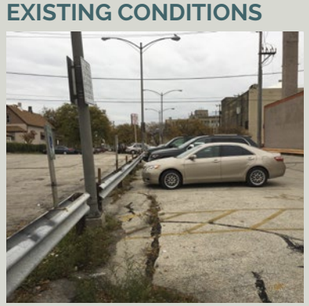
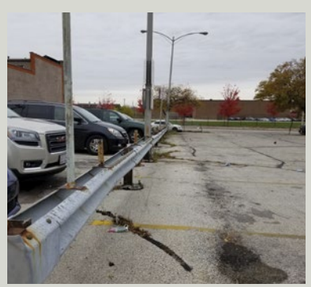
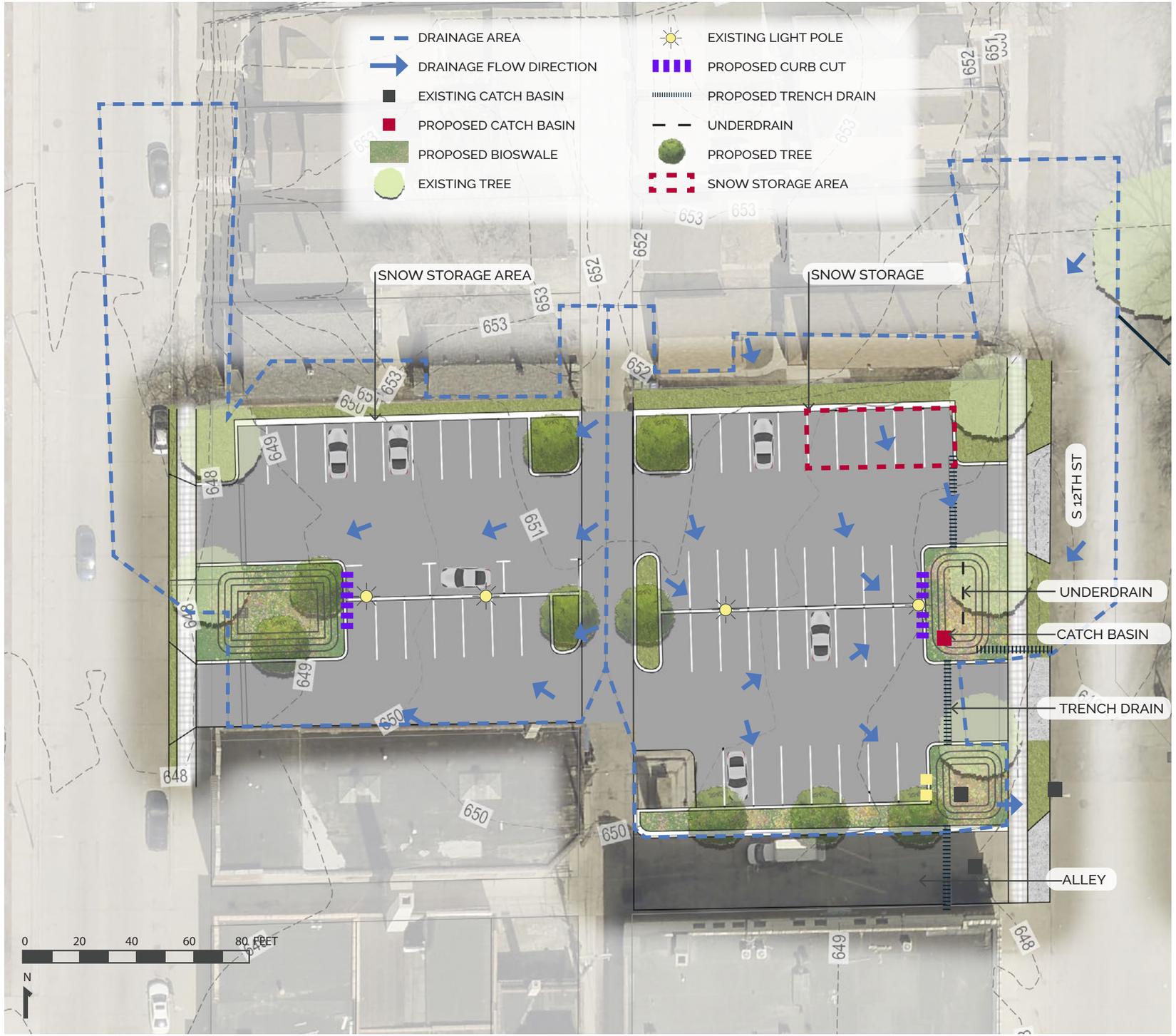


percentages above are based on census tract

EXISTING CONDITIONS







1650 S 12th St

This existing surface parking lot will be demolished to make way for a new public pocket park with green infrastructure capturing runoff from the adjacent alley and street. Depaving of the parking lot will significantly reduce the volume and rate of runoff from the site and provide community benefit, making way for green space, trees, walking paths, play equipment, and a permeable paver plaza for community gatherings. The estimated cost for this project only includes the removal of the parking lot and green infrastructure components. It does not include costs associated with park amenities such as the shade structure.

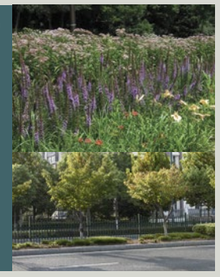
DRAINAGE AREA
1.22
acres of land

ESTIMATED COST
$335,000
dollars

$6.79
per gallon

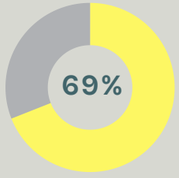
PEAK FLOW REDUCTION
90%

BIOSWALES AND STORMWATER TREES
6,217
square feet



GALLONS CAPTURED
49,330
gallons

IMPERVIOUS



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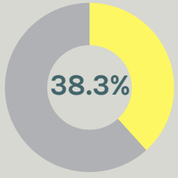

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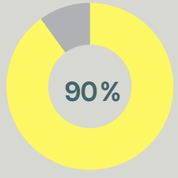
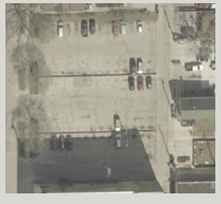
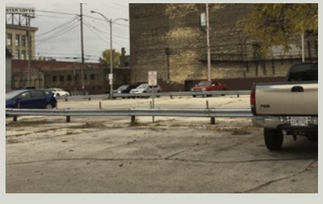


percentages above are based on census tract

EXISTING CONDITIONS



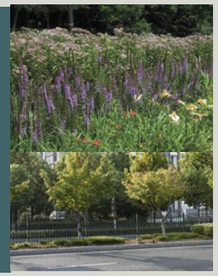


1002 W Maple St

This existing surface parking lot will be reconstructed to make way for green infrastructure islands capturing runoff from the parking lot, adjacent alley and street. A portion of the parking lot will be removed to create a new green space with a large bioswale, walking paths and trees. New tree islands will also add shade, improve the parking lot aesthetics, and provide additional rainwater capture.

DRAINAGE AREA
1.26
acres of land

BIOSWALES AND STORMWATER TREES
2,500
square feet



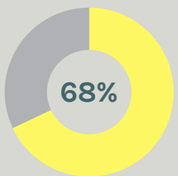
ESTIMATED COST
$192,000
dollars

$3.59
per gallon

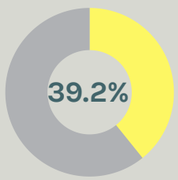
PEAK FLOW REDUCTION
76%

GALLONS CAPTURED
53,500
gallons

IMPERVIOUS



POVERTY



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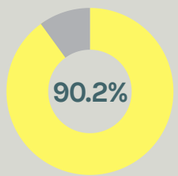
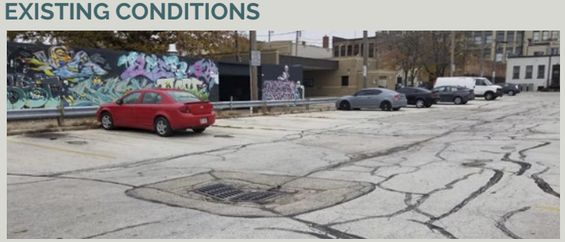
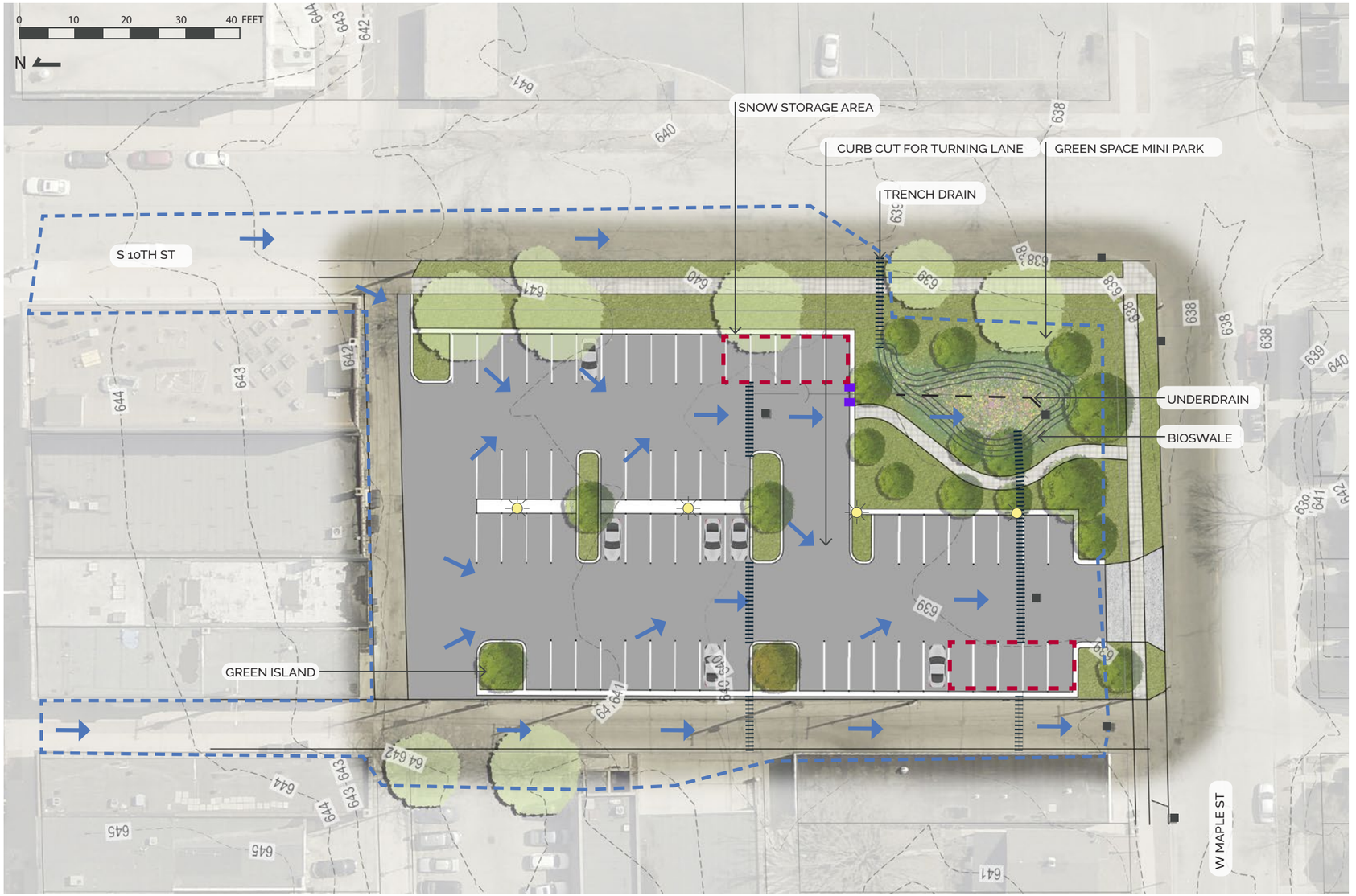


percentages above are based on census tract

EXISTING CONDITIONS





EXISTING CONDITIONS

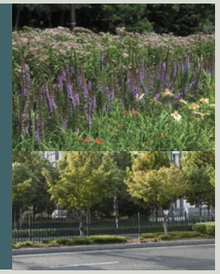
- DRAINAGE AREA
- DRAINAGE FLOW DIRECTION
- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- PROPOSED BIOSWALE
- EXISTING TREE
- EXISTING LIGHT POLE
- PROPOSED CURB CUT
- PROPOSED TRENCH DRAIN
- UNDERDRAIN
- PROPOSED TREE
- SNOW STORAGE AREA

716 W Maple St

This existing surface parking lot will be reconstructed to make way for green infrastructure islands capturing runoff from the parking lot, adjacent alley and street. New tree islands will also add shade, improve the parking lot aesthetics, and provide additional rainwater capture. Costs for this project do not include the removal of the entire parking lot or re-pavement.

DRAINAGE AREA
1.29
acres of land

BIOSWALES AND STORMWATER TREES
2,200
square feet



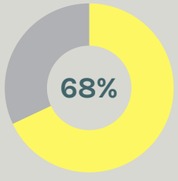
ESTIMATED COST
$286,000
dollars

$7.28
per gallon

PEAK FLOW REDUCTION
27%

GALLONS CAPTURED
39,290
gallons

IMPERVIOUS



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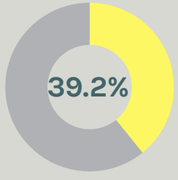

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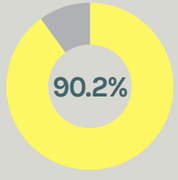
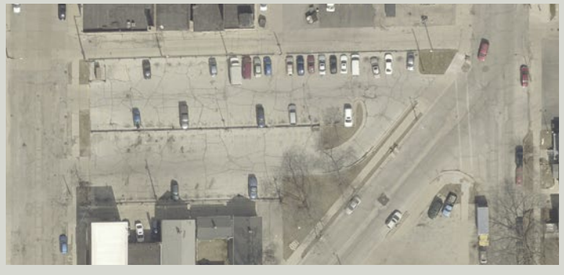
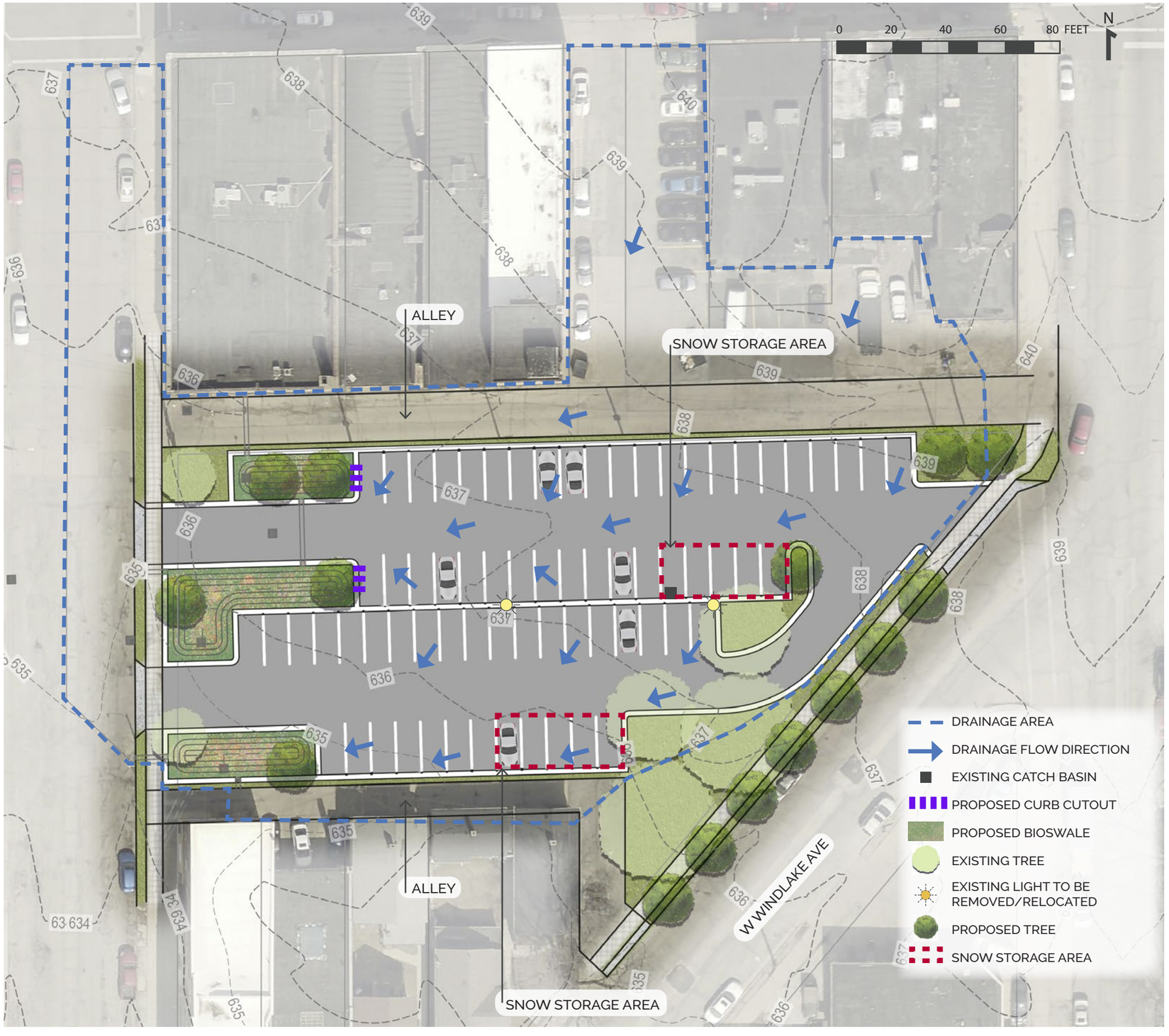


percentages above are based on census tract

EXISTING CONDITIONS



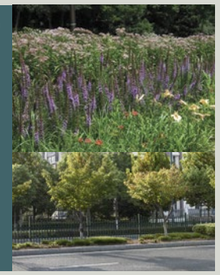


1640 S 24th St

The parking lot of the Southside Health Center is oversized and produces a lot of runoff. This project reduces the pavement area and adds three bioswales to pick up the runoff from the remaining parking lot surfaces to provide stormwater detention (reducing the amount of water going to the sewers and slowing down the rate) and promote infiltration and evapotranspiration. It will also improve the appearance of the parking lot for patients and visitors of the center and the nearby Reiske Park. With the smaller parking lot there is more space for community gardens, walking paths, or other community amenities. Costs for this project do not include the removal of the entire parking lot or re-pavement.

DRAINAGE AREA
0.95
acres of land

BIOSWALES AND STORMWATER TREES
5,340
square feet



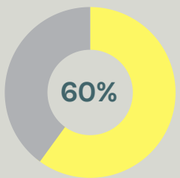
ESTIMATED COST
$300,000
dollars

$34.63
per gallon

PEAK FLOW REDUCTION
79%

GALLONS CAPTURED
8,662
gallons

IMPERVIOUS



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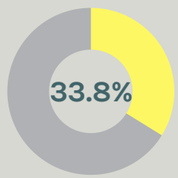

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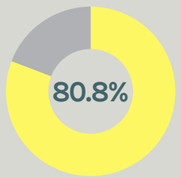
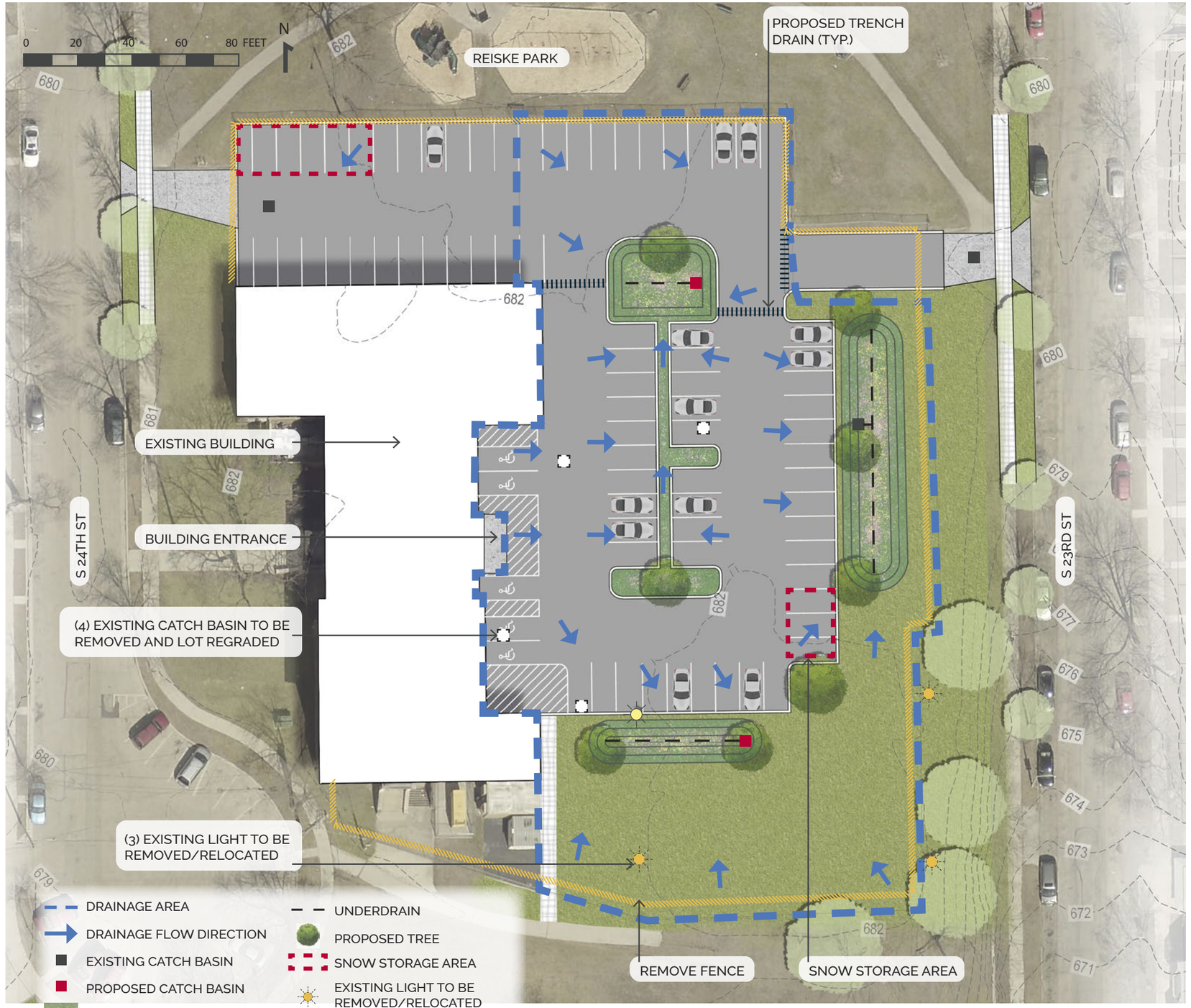


percentages above are based on census tract

EXISTING CONDITIONS



SHOREWOOD RIVER PARK: MOVING FROM CONCEPT TO CONSTRUCTION

The combination of site selection criteria and the density of the Village of Shorewood provided limited options for optimal sites. As the project team moved through the process of combining selection criteria and available parcels, the Shorewood River Park site was the ideal fit. MMSD and the Village of Shorewood were already working on a large project to increase the capacity of the combined sewer system. Although green infrastructure was evaluated as part of that larger project, there were limited opportunities within the project boundaries. However, an adjacent parking lot to the project in Shorewood River Park was slated to be the staging area for construction and was also identified as an optimal site for green infrastructure.

Because of this overlap, the Shorewood River Park site moved from conceptual identification to full integration into the planned construction of the combined sewer system improvements. All construction is anticipated to be completed by late 2022, including the green infrastructure.

DRAINAGE AREA
1.83
acres of land

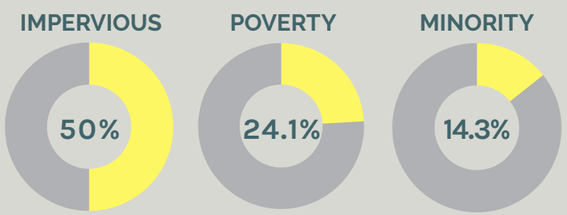
ESTIMATED COST
$58,000
dollars

$4.74
per gallon

PEAK FLOW REDUCTION
11%

VEGETATED BIOSWALE
7,240
square feet

GALLONS CAPTURED
12,237
gallons



percentages above are based on census tract

+ River Park, Shorewood

As part of MMSD's Near Surface Collector (NSC) project near Edgewood and Oakland. A portion of the parking lot in River Park will be reconstructed. New trench drains will be added to capture runoff from the parking lot and divert it to a vegetated swale that will improve water quality of the runoff and promote evapotranspiration prior to discharging to a swale near the Oak Leaf Trail that drains to the Milwaukee River. This will effectively remove 1.83 acres of tributary area from the combined sewer service area.

RECOMMENDED PROJECTS FOR IMPLEMENTATION

The process used to identify the eight potential sites was robust, based on quantitative and qualitative data, and was thoroughly vetted by the stakeholders. As the team looks to the next stage of project implementation, it is recommended that the projects listed below be prioritized based on cost per gallon and their potential to address additional economic, environmental, and social criteria. This prioritization is not suggesting that the remaining projects should not move forward, but rather emphasizes the potential for return on investment, which is significantly higher with the projects listed below.

1314 E. Chambers Street

1650 S. 12th Street

1002 W. Maple Street

716 W. Maple Street

716 W. Maple Street

This project leverages investments in green infrastructure and address risks identified in the Resilience Plan such as climate change, financial constraints, social equity and vulnerability of critical infrastructure. Surface level infrastructure can be implemented, adjusted and maintained easier then gray infrastructure. It is likely that full build out of projects would cost approximately $4 million dollars. When implemented in full, this project would capture 525,000 gallons of stormwater in a single storm event and provide a platform to continue to build community and political support for investments in infrastructure.

Mitchell Street Library Parking Lot With Green Infrastructure.

FUNDING OPPORTUNITIES

This planning document is the first phase and includes identifying sites that meet partner criteria and creation of conceptual plans. The next phase is to transition the projects into final design and engineering, and secure funding for construction. Funding may be sought by MMSD and partners for both final design and construction activities.

Funding opportunities are broken out by funding source, and individual funding priorities are listed. Many of the funding opportunities for green infrastructure projects have both environmental and social goals. Some opportunities are only available for nonprofit organizations and would require close coordination with MMSD during construction and on-going maintenance. An array of funding programs have been listed because MMSD will likely take a creative, multi-pronged approach to implement green infrastructure at all of the identified sites.

FEDERAL

NATIONAL FISH AND WILDLIFE FOUNDATION (NFWF)
Resilient Communities Program

Mechanism: Grants (1:1 match requirement)

Description: Through preparedness and by taking advantage of natural and nature-based features like wetlands, resilient shorelines, urban tree canopies, natural forests and healthy upstream watersheds, communities can accrue quality of life benefits today. Projects are funded under three categories:

- Adaptation through conservation projects
- Community capacity building and demonstration projects
- Adaptation focused on affordable housing and small businesses

The program will emphasize community inclusion and assistance to traditionally underserved populations in vulnerable areas.

Eligible Entities: Non-profit organizations, local governments, state government agencies and Tribes

Link: https://www.nfwf.org/programs/resilient-communities-program

NATIONAL FISH AND WILDLIFE FOUNDATION (NFWF)
Sustain Our Great Lakes Program

Mechanism: Grants (1:1 match not required but will be more competitive)

Description: Sustain Our Great Lakes funding priorities include:

- Aquatic connectivity
- Riparian and stream habitat
- Wetlands
- Green stormwater infrastructure

In fiscal year 2020, a specific program priority was green infrastructure projects within the MMSD green infrastructure service area. An additional priority was given to green infrastructure projects in shoreline cities that add more than 100,000 gallons of stormwater storage capacity per year and directly benefit Great Lakes water quality.

Eligible Entities: Non-profit organizations, state government agencies, local governments, municipal governments, Tribes, and educational institutions

Link: https://www.nfwf.org/programs/sustain-our-great-lakes-program

US DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)
Community Development Block Grant (CDBG) Programs

Mechanism: Grants

Description: HUD awards grants to carry out a wide range of community development activities directed toward revitalizing neighborhoods, economic development, and providing improved community facilities and services. Each activity must meet one of the following national objectives for the program:

- Benefit low- and moderate-income persons
- Prevention or elimination of slums or blight
- Address community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community

Eligible Entities: Principal cities of Metropolitan Statistical Areas (MSAs), other metropolitan cities with populations of at least 50,000, qualified urban counties with populations of at least 200,000 (excluding the population of entitled cities)

Link: https://www.hudexchange.info/programs/cdbg/

US ENVIRONMENTAL PROTECTION AGENCY (EPA)
Environmental Justice Small Grants Program

Mechanism: Grants

Description: The Environmental Justice Small Grants (EJSG) program awards grants that support community-driven projects designed to engage, educate, and empower communities to better understand local environmental and public health issues and develop strategies for addressing those issues, building consensus in the community, and setting community priorities. Given projected increases in extreme weather events and the vulnerability of underserved populations, this opportunity will emphasize projects that address emergency preparedness and increase resiliency.

A project must consist of activities that fall under clean air, healthy waters, land revitalization, and/or environmental health. Demonstration projects are eligible but must involve new or experimental approaches where the results of the project will be shared so that others can benefit from the knowledge gained.

Eligible Entities: Non-profit organizations, Tribal governments or organizations

NOTE: Governmental entities are not eligible, but are strongly encouraged to partner with eligible entities

Link: https://www.epa.gov/environmentaljustice/environmental-justice-small-grants-program

US ENVIRONMENTAL PROTECTION AGENCY (EPA)
Urban Waters Small Grants Program

Mechanism: Grants

Description: Improving urban waters requires various levels of government and local stakeholders (e.g., community residents, local businesses, etc.) to work together in developing effective and long-term solutions with multiple benefits. EPA supports and empowers communities, especially in under-served areas, who are working on solutions to address multiple community needs and fostering successful collaborative partnerships. In general, projects should meet the following four program objectives:

- Address local water quality issues related to urban runoff pollution
- Provide additional community benefits
- Actively engage underserved communities
- Foster partnership

Eligible Entities: States, local governments, Tribes, public and private universities and colleges, public or private nonprofit institutions/organizations, intertribal consortia, and interstate agencies

Link: https://www.epa.gov/urbanwaters/urban-waters-small-grants

US FOREST SERVICE (USFS)

USDA Forest Service 2020 Great Lakes Restoration Initiative (GLRI) Request for Applications (RFA)

Mechanism: Grants (20% non-federal match requirement)

Description: The U.S. Department of Agriculture, Forest Service anticipates that up to $4.2 million in new funds will be available for tree planting and forest health improvement in the Great Lakes Basin through the GLRI. The minimum and maximum Federal funding requests vary depending on Program Area, with an overall range of $50,000 to $300,000.

Funds will be distributed across four program areas:

- Forest Insect and Disease Mitigation
- Reduce Runoff from Degraded Sites through Green Infrastructure
- Protect and Restore Coastal Wetlands through Healthy Tree Cover
- Restore Resilient Riparian and Shoreline Forests

Link: GLRI RFA website

STATE AND LOCAL

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Urban Nonpoint Source & Storm Water Management Grant Program

Mechanism: Grants

Description: The Urban Nonpoint Source & Storm Water (UNPS&SW) Management Grant Program offers competitive grants to local governments for the control of pollution from diffuse urban sources that is carried by storm water runoff. Grants from the UNPS&SW Program reimburse costs of planning or construction projects controlling urban nonpoint source and storm water runoff pollution. Eligible construction activities include:

- Construction of structural urban best management practices including detention, wet, infiltration, or wetland basins, or infiltration trenches
- Engineering design and construction services for BMPs installation
- Land acquisition and easement purchase, including appraisal cost
- Storm sewer rerouting and removal of structures
- Streambank and shoreline stabilization

For Construction grants, the total state reimbursement amount cannot exceed $150,000 for construction and engineering, plus an additional $50,000 for land acquisition.

Eligible Entities: Municipalities, counties, regional planning commissions, Tribal governments and special purpose lake, sewerage and sanitary districts

Link: https://dnr.wi.gov/Aid/UrbanNonpoint.html

WISCONSIN DEPARTMENT OF ADMINISTRATION

Coastal Grants Program

Mechanism: Grants (50%-60% match requirement)

Description: The Wisconsin Department of Administration (DOA) administers Wisconsin Coastal Mangement Program Grants in collaboration with the Wisconsin Coastal Management Council (WCMC) and the Office for Coastal Management (OCM), U.S. Department of Commerce, through funding provided under the Coastal Zone Management Act of 1972. Grants are available for:

- Coastal wetland protection and habitat restoration
- Nonpoint source pollution control
- Coastal resource and community planning
- Great Lakes education
- Public access and historic preservation projects

Eligible Entities: Local units of governments, state agencies, colleges and universities, school districts, regional planning commissions serving coastal areas, Tribal units of government and private, nonprofit organizations

Link: https://doa.wi.gov/Pages/LocalGovtsGrants/CoastalGrants.aspx

PHILANTHROPIC

FUND FOR LAKE MICHIGAN

Mechanism: Grants

Description: The Fund for Lake Michigan gives priority to on-the-ground projects that have near-term, direct and quantifiable impacts on water quality in the Lake Michigan watershed. These projects include protecting critical natural habitats, reducing polluted runoff and generally making water resources more swimmable, fishable and drinkable. Special consideration is given to projects that leverage significant public and private investments from other Lake Michigan and Great Lakes donors.

Eligible Entities: Non-profit organizations, local units of government, government agencies, Tribes, universities and other educational institutions

Link: https://fundforlakemichigan.org/current-opportunities/

GREAT LAKES PROTECTION FUND

Mechanism: Grants

Description: The Great Lakes Protection Fund does not have specific funding programs or formal deadlines. After an entity submits a pre-proposal, and staff will review. If the project is invited to submit a full proposal, feedback on the pre-proposal will be provided along with guidance for developing the full proposal.

Link: http://glpf.org/get-funding/

NEXT STEPS

Reducing combined sewer overflows, improving water resources, and addressing climate change will require a collaborative approach; this plan provides that framework. This plan lays a groundwork to demonstrate the need and impact of projects as listed in the steps below.

1. Create an agreed upon set of criteria for which projects should be included/excluded
2. Use geospatial data, review of aerial footage, and interviews with municipalities to narrow down sites
3. Complete site visits for on the ground verification that the site meets criteria
4. Choose final eight sites
5. Complete hydroCAD modeling and design on chosen sites
6. Provide information to neighbors near the eight sights and engage them in decision making
7. Develop site plans

As green infrastructure projects move forward (both as part of this project and in general) MMSD will continue to strongly encourage community engagement. Community engagement at the most basic level is a way to begin communicating about complicated but crucial subjects. Water resource management requires support from behavior change at the individual level to financial and technical support at the federal level.

MMSD is committed to supporting the implementation of these projects through grant applications and working with partners to integrate projects into planned capital investments. Projects can also move forward as a stand-alone investment as funds become available.

Thank you to the municipal partners for participating in this process with flexibility and vision for how green infrastructure can continue to positively impact water resources and communities. Thank you to the US Army Corps of Engineers for participation and the financial contribution through the Planning Assistance to States Program.

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APPENDIX: PUBLIC OUTREACH MAILER EXAMPLE

APPENDIX: LANDSCAPE MAINTENANCE SPECIFICATIONS

1) LOCATION

   a) Address:

2) TERM OF SPECIFICATION

   a) The term for basic maintenance services shall be one (1) full year. Owner will negotiate extensions of term with selected contractor(s).

3) GENERAL SCOPE OF WORK

   a) The site includes naturalized and ornamental landscapes. Basic maintenance services shall include the management of the following landscape types:

      i) Naturalized Landscapes

      ii) Ornamental Landscapes including:

         (1) Turfgrass, and

         (2) Tree, Shrub & Ornamental Perennial Beds

      iii) Tree and Large Shrub Care

      iv) Bioretention / Bioswales

   b) Basic maintenance services do not include the maintenance of parking lot/driveway surfaces, irrigation systems, lighting, or snow removal.

   c) The Owner reserves the right to award portions of these services to multiple contractors and/or to award services for multiple portions of the site. Service providers shall coordinate their activities with other contractors and other consultants as needed and desired by Owner and as beneficial to the overall maintenance of the site.

   d) Contractors should provide separate line item costs for all work identified as an "allowance." The cost for these items shall be separate from the lump sum cost for basic maintenance services. Contractor will be reimbursed for the quantity of service provided. Contractor shall not exceed the amount indicated for each allowance item without prior authorization from Owner's Authorized Agent.

   e) Refer to the provided plan set for the layout of areas requiring maintenance.

   f) Service providers should be familiar with and confirm existing conditions.

4) NATURALIZED LANDSCAPES

a) The primary goal will be to speed the establishment of robust naturalized vegetation throughout the site.

b) Exotic/Invasive Species Control.

i) Crew visits should be made every other week on average during the growing season (April 1 – October 31) to police the grounds and control exotic and aggressive weeds throughout the naturalized landscapes.

(1) Trash and manmade debris should be collected and removed from the site for recycling/disposal during each visit.

(2) Weed control methods should include selective mowing, hand cutting, pulling, and herbicide applications as appropriate.

(3) An effort should be made to remove weed plants before they set seed. If weeds have already set seed, they should be removed carefully so that seeds are not dispersed.

c) Enhancement and Repair.

i) Poorly performing areas of the naturalized landscape, and/or areas of weed removal should be overseeded with a mix of grasses and forbs as needed throughout the season and as specified in the original seed schedule. Seed should be installed using a hand broadcast method to achieve optimal soil contact.

(1) ALLOWANCE: Basic maintenance services shall include the installation of 1,000 square feet of seed at the rate of 2 lbs./1,000 SF. Installation shall include soil preparation, seeding, fertilizing, mulching, watering and weeding as necessary to ensure the establishment of plant material. Seed shall be installed between May 1st and June 30th. Locations for seeding and the species installed shall be reviewed with the Owner's authorized agent prior to performing the work.

5) ORNAMENTAL LANDSCAPES

a) Basic maintenance services shall include the maintenance of turfgrass areas, and beds of trees, shrubs and ornamental forbs. The schedule for maintenance activities should be designed to promote the healthy growth and enhance the natural beauty of these areas and will include mowing, weed control, pest management, mulching, edging, pruning, and fertilization.

b) Basic maintenance services do not include work to repair damage from unforeseen and unpredictable events such as storm damage, pest epidemics, or extremes of climate, except as described herein.

c) Management activities will be provided during each contract year between April 1st and November 30th. Regular weekly services shall be provided from May 1st through October 31st (26 weeks). A spring cleanup shall occur in April and a fall cleanup shall occur in November.

i) The spring cleanup shall be performed to remove accumulated winter debris from turf areas, plant beds, and pavement areas. Clean up will include edging to turf and pavement within maintained areas. It shall also include cutting back ornamental grasses and flower stalks from herbaceous plants from the previous season's growth. Clean up shall be completed by April 30 each year.

ii) Spring cleanup will include minor renovation and overseeding of all turf areas which were damaged during winter snow removal activities. It shall also include the removal of winter protection devices such as tree wrapping and burlap snow fence.

iii) One general fall cleanup shall be performed in November to remove leaves, branches and spent plant material, from turf, plant bed, and pavement areas. Winter protection measures as required herein shall also be installed.

d) All landscape debris resulting from scheduled landscape operations shall be removed from the work site as work is completed and disposed of according to local and state regulations.

e) Turfgrass Maintenance

i) Most turf areas shall be maintained at a height of 3 inches. Areas that are planted solely with fine fescues should be allowed to grow to 8-10 inches before mowing to a height of 5 inches.

ii) Contractor's mowing equipment shall be maintained in fit condition to prevent tearing/damage to turfgrass leaf blades. Mowing patterns will be alternated to avoid rutting and mulching blades will be used to recycle grass clippings on site. If excess clippings are produced, the clumps will be removed from the lawn areas. Walks and paved areas will be left in a clean and neat condition. Mowing will be done with care and attention to prevent damage to plants and structures.

iii) Turf adjacent to curbs and walkways shall be edged and cleaned as needed through the growing season.

iv) Turf fertilizer and pest control shall be applied as needed throughout the growing season. The scheduling of applications shall be determined by: 1) turf species composition, 2) turf growing conditions, and 3) turf vigor. The agreement shall provide for up to 3 separate fertilizer applications throughout the season. One application (including a crabgrass preventer and broadleaf herbicide) will be made in spring, and another (including a broadleaf herbicide) will be made in late summer/fall. A third application (including insecticides) may be made in summer, if turf conditions dictate, however a general conservation ethic of low chemical inputs shall be employed. Fertilizer applications will be made using methods and equipment to limit drift and overspray into non-turf areas. Applications shall be performed by a licensed pesticide applicator.

v) ALLOWANCE: Basic maintenance services shall include the replacement of 100 square feet of turfgrass sod. This includes stripping of dead or damaged turf and replacement with live sod rolls. It also includes watering, weeding, and fertilizing as necessary to ensure establishment of sod. This work shall be performed between May 1st and June 30th each year. Locations for installing the sod shall be reviewed with the Owner's authorized representative prior to completing the work.

f) Tree, Shrub and Ornamental Perennial Beds

i) Plant beds shall be weeded to maintain a neat appearance through the growing season.

ii) Groundcover beds shall be pruned or sheared to maintain their health and appearance. Runners from trailing vines shall be trimmed back from the edges of plant beds

iii) Small deciduous and evergreen shrubs shall be pruned as determined by the plant species and its growing conditions. Narrow leaf evergreen shrubs shall be pruned primarily in spring and broadleaf evergreens shall be pruned after flowering in spring.

iv) Non-hardy woody shrubs that incur frequent die-back of stems over the winter shall be pruned back to within 6 to 12 inches from the ground each year in late winter (Mid-February to late March). This includes plants in the following genus's: Rosa, Spirea, and Diervilla.

v) Shrubs, groundcover, and perennials in plant beds shall be fertilized in spring. Fertilizer shall be of a 1:1:1 ratio, shall consist of at least 50% slow release nitrogen, shall be acidic in soil reaction, and shall be applied at a rate of three pounds of nitrogen per 1000 sq. ft.

vi) Integrated Pest Management (IPM) procedures should be followed to control insects and diseases within shrub and ornamental perennial plant beds. IPM methods shall include establishing action thresholds for certain diseases/pests, monitoring disease/pest levels, developing prevention strategies, and identifying control strategies. Control methods may include mechanical removal (trapping), or highly targeted chemical treatments, such as pheromone applications. Broadcast spraying of non-selective pesticides should be avoided and used only as a last resort.

vii) Perennials shall be deadheaded after blooming and spent foliage shall be removed (except as noted below).

viii) All ornamental grasses and certain late-flowering ornamental forbs with decorative seed heads, such as Aster, Echinacea, Rudbeckia, and Sedum, shall be allowed to keep their spent foliage and flower heads through the winter. Any remaining vegetation from these plants shall be pruned to the ground in March, or early April and removed.

ix) Tree rings around the base of lawn trees shall be edged and weeded to maintain a neat appearance through the growing season.

x) ALLOWANCE: Basic maintenance services shall include the installation and replacement of 10 ornamental grasses, sedges, rushes or forbs, 1 gallon size, each year. Installation shall include removal of existing vegetation, watering, weeding, and fertilizing as necessary to ensure the establishment of the plant material. This work will be performed between May 1st and June 30th each year. Locations for planting and the species installed shall be reviewed with the Owner's authorized agent prior to performing the work.

xi) ALLOWANCE: Basic maintenance services shall include the installation of 50 lineal feet of burlap snow and salt protection fence for evergreens. The fencing shall be installed around the perimeter of plantings to protect these evergreens from drifting snow and salt. It should be installed with the fall cleanup in November and removed with the Spring Cleanup in April each year.

xii) ALLOWANCE: Basic maintenance services shall include the replenishment of 10 cubic yards of premium, double-shredded, hardwood bark mulch in woody plant beds and tree rings throughout the site. The locations of plant beds receiving mulch should be alternated each year so that mulch is replenished in each bed approximately every 3 years. Mulch should be placed to a depth of 2 inches in previously mulched beds and 3 inches in beds with only topsoil.

xiii) ALLOWANCE: Basic maintenance services shall include the replenishment of 6 cubic yards of partially decomposed leaf mulch in herbaceous plant beds throughout the site. The locations of plant beds receiving mulch should be alternated each year so that mulch is replenished in each bed approximately every 3 years. Mulch should be placed to a depth of 2 inches in previously mulched beds and 3 inches in beds with only topsoil.

6) TREE AND LARGE SHRUB CARE

a) Basic maintenance services for trees and large shrubs shall include pruning, staking, pest management, and winter protection and repair measures.

b) Pruning.

i) Pruning shall be performed to remove diseased, or damaged wood and to maintain general form and habit. It shall include the following:

(1) Removal of diseased, or damaged wood.

(2) Removal of sucker growths at the base of trees.

(3) Removal of watersprouts from dormant or adventitious buds on the trunks or main branches of trees.

(4) Removal of forked or competing leaders on smaller trees.

(5) Shaping of larger shrubs to control size of plant head.

ii) Exclusions.

(1) This scope of work does not include renovation pruning of trees and large shrubs which can be described as the removal of more than 1/3 of the plant's head, or canopy. It also does not include removal of diseased, or declining trees and large shrubs.

iii) Pruning shall be primarily performed during the winter season between December 1st and March 1st when plants are dormant. Pruning of damaged, or diseased wood should be performed as soon as it is observed.

iv) Any pruning equipment used to remove diseased wood should be cleaned with a bleach solution before using it on other plants, or non-diseased wood from the same plant.

v) All debris from pruning activities shall be removed and disposed of off-site. The contractor shall take care to sweep walks and drives after activities are completed.

c) Staking.

i) Temporary staking shall be provided to young trees that are vulnerable to wind damage.

ii) Staking methods shall include the use of adjustable, flexible tree loops made of plastic, or rubber. Rope and wire can be used as tie-downs but should not be in contact with the tree.

iii) Staking shall be installed and inspected during the spring and fall cleanups.

iv) Once trees are established the staking shall be removed.

d) Pest Management.

i) Integrated Pest Management (IPM) procedures should be followed to control insects and diseases on trees and large shrubs. IPM methods shall include establishing action thresholds for certain diseases/pests, monitoring disease/pest levels, developing prevention strategies, and identifying control strategies. Control methods may include mechanical removal (trapping), or highly targeted chemical treatments, such as pheromone applications. Broadcast spraying of non-selective pesticides should be avoided and used only as a last resort.

e) Winter Protection and Repair Methods.

i) Commercial-grade tree wraps shall be installed on all young trees (under 6" caliper) that are susceptible to sun scald in the winter. This includes plants of the following genuses: Prunus, Malus, Gleditsia, Tilia, Acer, and Platanus.

ii) Tree wraps shall be installed during the fall cleanup in November and removed during the spring cleanup in April.

iii) Any sun scald damage occurring to the outer bark of young trees should be removed with a sharp clean knife.

7) BIORETENTION / BIOSWALES

a) Refer to Part 4 or Part 5 for maintenance of plant material in Bioretention / Bioswale areas. In addition to these services, the following shall be performed:

b) Routine Structure Inspections

i) Drainage structures and flow restrictors shall be inspected and cleaned twice per year and after significant rain events exceeding 1.5 inches in 24 hours.

c) Routine Soil maintenance

i) Shall be performed twice per year

ii) Inspect bioretention / bioswale areas to identify accumulation of sediment and matted organic debris that could seal the surface as well as extend the duration of ponding (ponding for more than 48 hours after cessation of rain). Inspections should be conducted semi-annually and after rainfall events exceeding 1.5".

iii) Remove, as needed, matted organic debris such as large leaves and other layered matter that prevents transmission of water into the bioretention / bioswale soil.

iv) Rake accumulated sediment from the bioretention / bioswale surface, taking care to protect plants. Minor accumulations may be raked into the bioretention soil.

d) Clogging remediation (if water is observed to pond longer than 48 hours)

i) Identify the source of ponding when extended periods of ponding occur within the bioretention / bioswale area.

ii) Inspect cleanouts to determine if the underdrain or downstream storm line are clogged as evidenced by standing water in the cleanouts to the elevation of the surface ponding in the bioretention area.

iii) If no water is standing in the cleanouts, the bioretention surface is clogged. The clogged soil should be remediated by removing the top one to two inches of bioretention soil until the area drains. Removed soil should be replaced with new bioretention soil meeting project specifications.

8) GENERAL CONTRACT CONDITIONS

a) Landscape operations shall be performed in a professional manner in accordance with the standards of the Associated Landscape Contractors of America.

b) All work shall be performed by uniformed and trained personnel, to maintain professional standards and conduct. Crews will be under supervision by experienced, English speaking foremen.

c) Equipment and materials will be handled in a safe and efficient manner. Machinery and materials will not be left unattended.

d) Personnel on work or lunch breaks will conduct themselves in a considerate manner, in the vicinity of company vehicles.

e) All pesticides applied will be registered with the E.P.A., will be used according to the manufacturer's directions and will be applied by licensed personnel.

f) Weekly services will be performed on the same day each week as weather and holiday schedules permit. When necessary, work will be rescheduled for the day after or day prior to the regularly scheduled day.

g) Adequate personnel and equipment will be employed to ensure timely completion of landscape management operations.