



Stormwater Best Management Practices Maintenance Manual



Photo Credit: Linda Prieskorn | Miller Ave, 2015

City of Ann Arbor, Michigan

Introduction

Background

The City of Ann Arbor has long been a leader in the use of green infrastructure and the installation of structural stormwater Best Management Practices (BMPs) in Michigan. However, enthusiasm for innovation and sustainable design has not been matched by a systematic approach to maintenance. Many older BMPs, in particular, were built in Ann Arbor without specific plans for maintenance.

This manual aims to clarify the maintenance needs of the City of Ann Arbor's existing structural stormwater BMPs, and establish a system for tracking both routine maintenance and unexpected performance issues. The manual also aims to establish a system for determining maintenance jurisdiction over particular assets, standards for maintenance planning, and methods for prioritization, as resources are limited.

- The project team created a comprehensive inventory of existing and planned stormwater BMPs.
- The project team established agreed-upon definitions for each BMP type, in order to reduce confusion across departments.
- The project team created a matrix to facilitate broad agreement on appropriate maintenance methods for each individual BMP/asset.

This is not intended as a design manual, and it is assumed that the reader is familiar with the purpose & importance of stormwater BMPs.

Cost and Uncertainty

Low Impact Design (LID), Green Infrastructure, and Stormwater BMPs are ideas that have been advocated for decades, yet many such practices are still uncommon enough that maintenance

needs are neither well-known nor routine. For some, there is little documentation of how successful installations have been over time in Southeast Michigan (Ahiablame et al. 2012). Long-term monitoring and maintenance studies are few, and tend to cluster geographically near centers of stormwater management study (International Stormwater BMP Database 2017). As a result, many existing manuals provide maintenance recommendations that are based on anecdotal evidence or local experience, rather than on well-documented studies, leaving many communities to rely upon the experience of managers in climatically dissimilar areas (Houle et al. 2013).

While developers are primarily interested in design and construction costs, municipal stormwater managers and planners must consider lifecycle cost per unit of water quality treatment. Unfortunately, few studies examine either lifecycle costs of built practices or quantifiable economic benefits of LID, because to do so requires a highly complex study design (MacMullan and Reich 2007). To highlight the complexity of predicting future costs and benefits, MacMullan and Reich (2007) note:

"...in cases where the LID option costs more to build, it may also control a larger volume of stormwater relative to the conventional option. LID that keeps stormwater out of pipes and treatment facilities help lower operations and maintenance costs, and help extend the useful life of the infrastructure, which can reduce future construction costs."

Accurately predicting this effect, however, requires knowledge of maintenance costs. For example, Buckley et al. of ECONorthwest (2011) attempted to describe the economic value of green infrastructure in Ann Arbor by calculating the avoided cost of treating stormwater by conventional means. The study calculated treatment costs based on utility rates per impervious area and the

expected run-off gallons per area. They then assumed that water treated using green infrastructure would otherwise have been treated at this estimated cost. Since the study did not take into account the long term costs associated with treatment through green infrastructure, it is not entirely accurate. What is important to note though, is that money spent on green infrastructure buys water quality benefits but money spent on traditional sewer construction does not.

Culture of Maintenance

Uncertainty and lack of widespread experience have caused many communities, developers, and engineers to remain hesitant to adopt LID practices. Cost and labor associated with maintenance are often cited as major impediments to the use of structural BMPs, but little reliable information exists on what actions and expenses are actually required in order to keep BMPs functioning properly (Houle et al. 2013). This means that the City of Ann Arbor has an opportunity to be a source of information.

By beginning with plans based on information currently available, keeping detailed records, and adapting management strategies over time, the City of Ann Arbor can produce an increasingly accurate picture of maintenance needs for structural BMPs in Southeast Michigan as well as a model for how to accomplish the meeting of those needs.

Maintenance activities can be categorized as:

- **Reactive-** complaint or emergency driven,
- **Periodic and Predictive-** driven by in an O&M plan, can be calendar-driven, known, schedulable, and
- **Proactive-** adaptive and applied increasingly as familiarity with system develops (Houle et al. 2013; after Erickson et al. 2010)

Houle et al. (2013) note that maintenance

plans are rarely static. Instead, activities tend to start out reactive and trend toward periodic and finally proactive as familiarity with a task or particular BMP increases. In a four-year study, the authors found that initial maintenance effort was higher and diminished as familiarity increased. Planning became easier and maintenance more efficient.

While uncertainty about its cost and efficacy is a major source of concern over maintenance, it is also hard to predict the difficulty of an unfamiliar task. For example, weeding a bioswale planted with native vegetation might be perceived as complex and time-consuming maintenance, while mowing a grassed swale every two weeks is not considered to be “maintenance” at all, perhaps because mowing is such a familiar task and would be part of caring for a road right-of-way regardless of whether stormwater management is a consideration (Hunt 2014).

By tracking and sharing experiences, the City of Ann Arbor can help to both clarify the expenses associated with stormwater BMPs and change negative perceptions of green infrastructure maintenance.

Maintenance Realities

Erickson et al. (2010) found that of 38 municipalities responding to a survey, 61% perform routine maintenance on stormwater management practices at least once per year, but that frequency varies according to the management strategy being implemented (proactive vs. reactive). The most frequently cited causes of reduced function in BMPs were sediment buildup and litter/debris accumulation, followed by pipe clogging and invasive vegetation (Erickson et al. 2010).

In a study of annual maintenance for several BMP types, Houle et al. (2013) found that in most cases, LID practices had lower annual costs and staff hours per mass of pollutant removal than conventional systems. In a

study conducted at a field facility in New Hampshire, researchers found that sand filters required the highest number of staff hours, followed in decreasing order by wet pond, dry pond, subsurface gravel wetland, bioretention, vegetated swale, and porous asphalt. They also note that reducing the hydraulic loading rate may decrease maintenance burden for a particular facility. For example, porous asphalt had the lowest burden in staff hours and the second lowest annual cost, but it also has the lowest watershed to surface area ratio.

For rain gardens and constructed wetlands, the City of Ann Arbor's Natural Area Preservation department estimated a cost of between \$500 and \$750 per site for prescribed burns, \$600 per site for one volunteer work day, and approximately \$150 per site for tasks such as trash removal and herbicide treatment, based on field experience. This cost was estimated in 2015.

The cost of prescribed burns is highly variable and depends largely upon the amount of time required. This is affected by multiple factors, including weather conditions, how easily the material in the rain garden burns, size of the area to be burned, what items must be protected from burning (boardwalks, bridges, signs, trees, woodchip trails, bird houses, utility poles, cars, etc.), skill and experience of the Burn Boss and crew, proximity to roads and buildings, travel time, and number of smoke warning signs that must be set up along roadways. Approximately an hour is needed to complete even the smallest of burns, when travel, set-up, and clean-up time are considered, meaning that a one hour minimum cost applies to any prescribed burn.

Volunteerism

Over time, costs will shift from paying for infrastructure itself to the cost of long term maintenance.

Many communities rely on volunteer labor, which can be highly effective but is also

notoriously unpredictable. The average volunteer hour was valued at \$20.63 in Michigan in 2013 (Independent Sector 2014), implying significant cost savings over paid labor. Volunteer programs, however, are not without costs. Without significant expenditures on, for example, recruitment, training, and communication, as well as the staff time needed to provide these services, volunteers often become discouraged and work becomes haphazard at best. As green infrastructure increases, effective volunteer programs necessarily become more complex and require more creative and in-depth coordination, and thus require increased funding.

In addition to the costs associated with volunteer coordination, maintenance budgets must consider the inherent unpredictability of the volunteer labor force. While volunteers can contribute a significant dollar value of work, it is impossible to accurately predict how much. To count on a particular volunteer force risks an unexpected labor shortfall. Ensuring that critical maintenance is performed therefore requires an assumption that all work will be performed by paid staff or contractors. Continual failure to budget for adequate paid staff or contract labor risks deferring maintenance indefinitely, which can lead to both infrastructure failures and loss of public trust.

Maintenance Responsibility

In the past, lack of communication between project planners and field operations staff during the design phase has led to a perception that built projects are abandoned by designers, and that maintenance staff are asked to invent proper maintenance protocols for unfamiliar facilities. The City of Ann Arbor and Washtenaw County currently have a policy of requiring maintenance plans as part of designs to improve communication and planning, see the Washtenaw County Water Resources Commissioner's Office Stormwater Rules (revised October 2016).

Since rain gardens have been built by various City and County departments and are located in multiple department's physical jurisdiction, assigning responsibility for maintenance has been difficult. Rain gardens in Ann Arbor are located on Natural Area Preservation land, park property, road right of ways and Washtenaw County Water Resources Commissioner's property. Rain gardens in Ann Arbor have been built by the City's Parks department, the Systems Planning department, the Natural Area Preservation department, the Huron River Watershed Council and the County's Water Resources Commissioner's Office. Maintenance responsibilities for each rain garden must be divided amongst these parties.

Within the City of Ann Arbor, funds can be dedicated to green infrastructure maintenance from the stormwater fund if the green infrastructure asset receives stormwater runoff from a road. The general fund can dedicate resources if the asset is located within a City park. The Water Resources Commissioner's Office can fund maintenance on assets that they own, which are typically on county drains.

By coordinating within the limits of each department, maintenance of public rain gardens can be achieved through volunteer labor, contract labor, and by the efforts of staff.

Context and Public Perception

The performance of a BMP can be measured both in terms of water quality and in terms of public opinion. The degree to which a project "succeeds" is a function of how its design and maintenance respond to context, including both physical design constraints such as soil type, and perceptual ones such as appearance of care and visual fit with surroundings.

Some BMPs are more highly visible than others, meaning they are physically seen by

a larger number of people, they contrast more sharply with their surroundings, they were more highly publicized at the time they were built, or some combination of factors. Visible failures can take multiple forms. Failures that result in continued standing water, draw public notice and can sour opinions on new infrastructure systems that are almost invisible under normal conditions. Conversely, highly visible projects that succeed in terms of water quality can still be regarded as failures by the public if they fail to meet aesthetic expectations (Nassauer, 2004). For example, on Easy Street in Ann Arbor, the inclusion of 8-inch underdrains means the rain gardens are likely continuing to filter stormwater without excessive ponding, despite being visually unattractive in their current condition.



Easy Street Rain Gardens, August 2017

Public opinion is a notorious sticking point in the use of rain gardens and other BMPs. Differences of opinion are common in garden design, and research has shown that aesthetic opinions vary not just among individuals, but also for individuals across site contexts, and with the appearance of near neighbors' landscapes (Nassauer 1995; Nassauer et al. 2009). Ecological function can be difficult to perceive even when it is known to exist (Gobster et al. 2007). In the case of rain gardens, ecological function is largely independent

of aesthetic choices, allowing designers to adapt the aesthetic style of gardens to site context without reducing their effectiveness. This means that both designers and managers can tread a line between making rain gardens look the way the public wants them to, and teaching the public to appreciate a new type of landscape.

Finding the balance requires understanding how people think about “natural” landscapes. When the context is a designated natural area, such as a national park or wildlife preserve, visitors tend to prefer landscapes that look free of human intervention (Gobster et al. 2007), but in an urban or agricultural setting, landscapes that are “wild” tend to be considered “abandoned”. “Abandoned” landscapes carry associations with danger for many people (Nassauer et al. 2009). Mismatch between design aesthetic and the perceived wildness/tameness of surrounding land use or landscaping creates a dissonance that can be tempered by “cues to care” (Nassauer 1995), but in such situations avoiding unnecessary negative visual cues may be particularly important.

Visual cues often associated with neglect include things that are common in rain gardens: tall and highly mixed plants, trash accumulation, puddles, and bare spots. Tall native vegetation is likely to be present by design, but can be difficult to distinguish from noxious weeds without practice. Planting designs that mass perennials, rather than mixing them, can be easier to maintain for visual appeal as well as ecological health, because weeds are easier to spot and potentially physically easier to reach.

Trash accumulation is often considered a problem, but can be regarded as a part of a rain garden's job. Frequent inspection and litter removal can be treated as helping a hard-working landscape to succeed, rather than fixing a problem with the landscape. Puddles are also inherent in rain gardens, but ponding that lasts more than 48 hours

is a sign of reduced infiltration capacity or blocked outlets, and thus a genuine signal of neglect. Bare spots can be caused by excessive ponding, salt damage, or sedimentation, all of which indicate a need for increased attention to maintenance.

Positive visual cues can serve to normalize stormwater facilities and create a perception of them as both familiar and valuable (Nassauer 1995). Literal signage has been used at several sites as a way of explaining BMPs to the public, and of signaling deliberate design. Highly recognizable design elements or signature plant palettes repeated across sites might be another way of normalizing projects, making it clear at a glance that, for example, rain gardens of varying aesthetic are still rain gardens.



Burns Park Rain Garden, June 2016

In general, rain gardens that are located within highly formal contexts are more likely to be accepted and appreciated if they are highly formal themselves, and therefore it is ideal to choose plants that naturally have tidy-looking habits, plant them in groups instead of using a seed mix, be very definite about the garden's edges, possibly include decorative elements such as boulders, and then maintain the site as a formal garden. This requires frequent weeding, pruning of shrubs and trees, and constant attention to litter removal.

For example, the ideal maintenance of a large formal rain garden at Nichols Arboretum requires between ten and twenty person-hours per week during the growing season (Adrienne O'Brien, pers. communication). In contrast, bioretention facilities that are in or near natural areas can be allowed to be wild looking because that fits visitors' expectations.

Level of Service

For this project, a simple rating system was developed ("High/Medium/Low") for the level of neatness required in vegetated BMPs. Because each site is unique, group consensus was used to attach a rating to each, rather than attempting to create a rigid classification system for aesthetic needs.

Low level sites are rarely seen by the public or blend in with their natural surroundings. Medium level sites are seen by the public but only on occasion. High level sites are frequently seen and located in areas where they should look well kept.

The following describes what plants would need to be removed for each rating level.

Low Rating:

Highly invasive plants such as buckthorn, bull thistle, burdock, canada thistle, crown vetch, curly dock, dames rocket, field bindweed, garlic mustard, honeysuckle, japanese hedge parsley, oriental bittersweet, phragmites, purple loosestrife, sow thistle, teasel, reed canary grass, spotted knapweed, tree of heaven, white sweet clover and yellow sweet clover

Medium Rating:

All plants listed above as well as narrow-leaved cattail, ragweed, sweet pea and mullein

High Rating:

All plants listed above as well as chicory, dandelion, plantain and queen anne's lace.

Rain gardens should be monitored regularly to ensure that they are functioning at the appropriate ecological and aesthetic level. Monitoring can be achieved through photo monitoring and visual assessments. Time lapse cameras can also be used to measure infiltration rates during large storm events.

Standardizing Maintenance Planning System

- Create recurring work orders
- Track past maintenance and compare to performance
- Assess success and adjust maintenance plans as needed

Maintenance

I. Detention & Retention Basins and Constructed Wetlands

Definitions

Retention Basin

Above-ground basin engineered to collect and hold stormwater, having no outlet with the exception of emergency spillways.

Wet Detention Basin

Above-ground basin with engineered outlet structure(s), designed to collect and hold stormwater, and then release it slowly over a period of 12 to 48 hours with the goal of reducing sedimentation and “flashiness” of downstream flows. Designed to maintain a permanent pool of water, with capacity to hold and detain additional water above permanent pool level during rain events (permanent pool is not included in detention volume).

Dry Detention Basin

Above-ground basin with engineered outlet structure(s), designed to collect and hold stormwater, and release it slowly over a period of 12-48 hours with the goal of reducing sedimentation and “flashiness” of downstream flows. Does not include a permanent pool of standing water; intent is for all water to be released so that the basin is dry a majority of the time.

Constructed Wetland

Above-ground engineered basin with multiple vegetative zones and at least one area with extended saturated conditions. The depth is generally shallow and varied while the surface area is large. Design intent is to mimic a natural wetland, producing ecosystem services beyond stormwater retention or infiltration.

Description

Detention basins were among the first stormwater BMPs to be implemented, and have been popular since the 1970s. Unfortunately, their effectiveness in improving water quality has proven to be limited. While wet detention basins are capable of significant water quality treatment, dry basins have a negligible effect on pollutant levels. Both wet and dry basins can have unintended negative effects on regional hydrology when considered cumulatively. As early as 1974, McCuen (as cited in Goff and Gentry 2006) demonstrated that when multiple detention basins are located near the outlet of a watershed, the timing of peak flow from those basins coincides with peak flow reaching the outlet from further upstream, effectively increasing peak flow rate at the watershed outlet instead of decreasing it as intended. Much subsequent research has led to widespread agreement that detention basin efficacy should be considered at the scale of the watershed, rather than of a single development project (Goff and Gentry 2006). Retention basins with no outlet may be a more effective means of controlling both peak flow and contaminants.

Because the money and effort spent on detention in the last three decades has not resulted in the hoped-for degree of water quality improvement, the Office of the Washtenaw County Water Resources Commissioner adopted site plan requirements for new development in 2016. Most notably, the first inch of runoff must now be infiltrated unless soils can be proven unsuitable across the entire property to be developed.

Maintenance

Basic inspection points are similar for detention basins and constructed wetlands. For most detention basins, inspection is the most routine of the activities needed. Often, the most frequent tasks require the least expertise (EPA 2009). In many cases normal maintenance will consist mainly of cleaning outlet structures. Activities such as large-scale sediment removal or embankment repairs will be needed at relatively long intervals. Close inspection of pipes, embankments, and other structures require the expertise of a civil engineer, but only need to occur every 1-5 years (EPA 2009). Particularly in constructed wetlands, the desire for diverse vegetation means that significant attention must be paid to plant community health. Aggressive non-native species should be removed at least annually, to prevent them from establishing such large colonies that removal becomes too expensive and time consuming to be practical.

Inlet and Outlet Structures and Pipes

Inlets, risers, low-flow drains, and other outlet structures, including pipes, can become clogged no matter how well-designed. All structures should be checked for clogging and signs of erosion monthly to quarterly, or after rainfall events greater than 1" (EPA 2009; SEMCOG 2008). Improper water level, either too high or too low, can indicate problems with clogging or leaking outlets or pipes (EPA 2009). Difficult-to-access pipes should be inspected via remote television every 5-25 years (EPA 2009).

Sediment Forebays

Both sediment forebays and main basins should be inspected annually for excessive sediment accumulation. Sediment should be removed from forebays approximately every 5 years, or when 60% of storage volume has been lost, depending upon design (EPA 2009). Main pond cells should be dredged when 50% of pond volume has been lost, often on as long as a 20-year cycle, depending upon the design and location of the pond (EPA 2009). Sediment

removal jobs may be significant enough in some cases to require heavy equipment, particularly in the case of ponds that go 20 to 50 years between dredging (EPA 2009). In the case of small or frequently cleaned sediment traps, hand tools may be the best solution.

Plant Communities

Assessing the health of plant communities is an important part of maintaining both detention/retention basins and constructed wetlands, but is particularly important when habitat value is a goal in addition to stormwater management. While detailed Floristic Quality Assessment is time consuming and would be difficult to repeat frequently, rapid assessment tools such as the Michigan Rapid Assessment Method for Wetlands (MiRAM) may be simple enough to be performed annually, and would provide a record of plant status as well as an opportunity to catch infestations of aggressive non-native species while they are still relatively manageable (MDEQ 2010).

Many basins and constructed wetlands are large enough to make hand weeding impractical except in cases of localized or minor weed invasions. Prescribed burning is a more efficient and more natural means of controlling unwanted woody vegetation, and has the benefit of encouraging fire-adapted native species. Burning on a variable 1-5 year rotation and varying the season of the burn can promote plant diversity more effectively than annual burning at one time of year (Knapp et al. 2009). Many constructed wetlands are designed to resemble emergent marshes and can burn quite well (Kost et al. 2007). A patchy burn can actually be a positive outcome, because it leaves micro-refuges for slow-moving invertebrates (Knapp et al. 2009).

Periodic mowing can approximate some of the effects of burning, and can be used as a substitute in situations that prohibit burning.

Mowing in spring may promote forb diversity more effectively than spring burning, especially if cut plants are removed via haying (Tix et al. 2005), but can be impossible in wetlands depending upon soils and slopes. Mowing the edges of a constructed wetland is critical for establishing visible care and thus maintaining a positive public opinion (Nassauer 1995). Reseeding with native species after a burn can help with establishment and maintenance of the plant community, provided that the site is one in which seeds are unlikely to be washed away before they can establish.

II. Rain Gardens, Bioswales and Naturalized Wet Areas

Definitions

Rain Garden

Above-ground infiltration depression engineered (hand-digging is considered engineering) to collect stormwater and designed to use deep-rooted native and/or ornamental (may be non-native as long as they are non-invasive) plants to facilitate infiltration. Does not include a permanent pool of standing water; all water intended to infiltrate completely within about 48 hours. May include berms and emergency outlets, but not usually large enough to require complex embankments and outlet structures. Water pools at 6 inches or less.

Bioswale

Above-ground linear depression (open channel) engineered to collect and convey stormwater from one location to another, while using vegetation to slow and infiltrate water. Does not include a permanent pool of standing water, or a permanent stream; water is intended to either infiltrate or flow out of the swale.

Naturalized Wet Area

A small/localized area with frequently saturated soil that tends to be wet without being deliberately engineered to collect stormwater, in which turf is infrequently mowed or replaced with suitable vegetation to form a wet garden. The reason it is wet is that water is NOT infiltrating well, and the intent is a better way to handle the wet spot, rather than to collect and infiltrate more stormwater.

Maintenance

Deep-rooted plants are critical to the infiltration and water quality function of a rain garden. Unsuccessful plantings therefore reduce performance. Dead or sparse plants are also an aesthetic concern, and sparse plantings are more vulnerable to weed invasion than are dense, healthy plantings. In addition to the loss of performance, the monetary cost of replacing failed plantings is potentially high.

Mulch

A mulch layer discourages weeds and helps to keep soil moist, which reduces the need for watering during plant establishment and aids infiltration. Un-dyed shredded hardwood bark mulch is recommended, because it resists flotation and washout better than most other materials, including pine bark. Mulched rain gardens should not be burned because the fire will smolder in the mulch for a long period of time.

Weeding

Weeding is a critical part of rain garden maintenance for both ecological and cultural reasons. While any vegetation can reduce erosion by binding soil and slowing water, rain gardens are typically designed with a focus on native species because they are thought to be better ecological performers. Species are also chosen for their ornamental value, because rain gardens are intended to function as both environmental and visual amenities.

There are few studies demonstrating the infiltration performance of native vs. non-native plant species. However, the conventional wisdom that native species are more efficient because they form deeper root systems appears to be true when prairie plants are compared with turf grass (Selbig and Balster 2010). Some aggressive non-native plants that commonly

invade constructed wetlands, such as narrowleaf cattail, are highly efficient at nutrient uptake, but do not appear to tolerate the relatively dry conditions in a well-functioning rain garden. More commonly, rain gardens are invaded by opportunistic upland garden or “barnyard” weeds, and woody plants such as common and glossy buckthorn. Regardless of their performance in terms of infiltration and nutrient uptake, aggressive weeds are problematic in rain gardens because they displace desirable plants and often contribute to an unkempt look. In addition, weedy gardens can serve as seed sources for invasion of neighboring properties. This is of particular concern for gardens that are located near natural areas.

An additional argument for the use of native plant species and the removal of non-native weeds is the idea that rain gardens can provide habitat benefits for urban wildlife. Native insects, an important food source for song birds, have been shown to prefer native plant species.

Weeding can often be accomplished through the use of prescribed fire. This is especially practical when the desired aesthetic for a rain garden is naturalistic or “wild,” and the rain garden area is large. Many of the plants most commonly used in rain gardens are fire adapted and actually benefit from burning, while many non-native plants are less tolerant of fire and are less able to compete with native plants when regularly burned. While it is often possible to burn a formal garden, it is not always practical. For example, some planting designs may not produce enough fuel to carry a fire through the garden, while others might include fire intolerant species that must be protected during a burn. In some locations, such as those in close proximity to homes, burning is not an option due to concerns for safety and nuisance smoke.

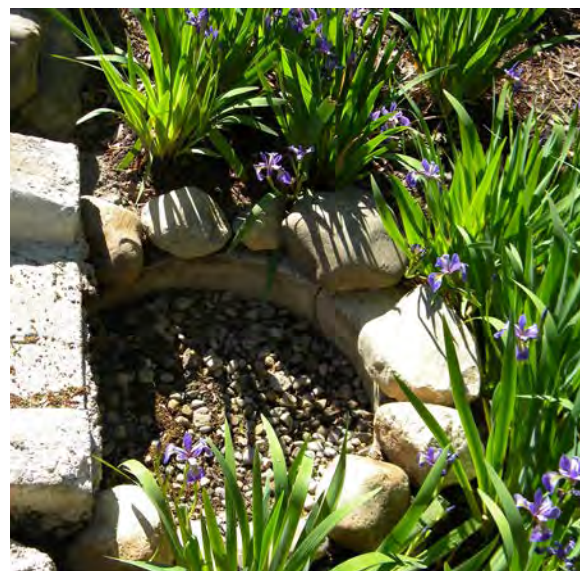
Dividing, Pruning and Deadheading Plants

Appropriate periodic care of established plants includes pruning of trees and shrubs,

and deadheading and dividing perennials. Pruning is important for removing dead wood and for controlling the size of plants, which may be necessary to prevent them from becoming safety hazards by obstructing views. Deadheading, or removing spent blossoms, improves aesthetic appearance of the garden, encourages plants to bloom again, and helps prevent shading of new growth. Dividing perennials both helps to rejuvenate older plants and can serve as a source of new planting material for other sites.

Erosion and Sediment

Depending upon their location and design, rain gardens can accumulate significant amounts of sediment. This tendency is part of a rain garden's job, but excessive sediment build-up will interfere with the garden's ability to store and infiltrate water, and can impact plant health. Designs that include a sediment trap or forebay can make it easier to remove built-up material without disturbing plants.



Miller Ave Rain Garden, August 2016

Each garden will behave slightly differently, and periodic monitoring can give caretakers an indication of how frequently sediment may need to be removed from a particular site. Gardens that collect runoff from roads will be particularly prone to sedimentation, and should be monitored carefully. In cases where sedimentation is a significant

problem, frequent minor maintenance may prevent the eventual need for completely dredging and replanting the garden. Sediment should be removed from a garden when the trap or inlet is full. All sediment should be disposed of in the decant. It can't be composted or recycled since there are often trace amounts of hazardous materials in the sediment.

Erosion can become a problem if a rain garden is undersized or if inputs change after the garden is built. Like sedimentation, erosion will alter a garden's performance. Checking for gully formation or shifting of soil out of the garden should be part of routine inspection.

Other important tasks include trash removal, cleaning of drain structures, and mowing of edges. Of these, trash removal is both the easiest and the most critical to the appearance of the garden. Sites should be inspected for trash on at least a monthly basis; the actual work of collection may take only a few minutes. Drain structures should be inspected, and cleaned if necessary, at least annually, or if drainage problems are observed.

Inspection Points

- Inspect plants for stress, disease, or salt damage
- Check for evidence of erosion or excessive sediment buildup
- Check for adequate mulch layer in new gardens
- Check for weeds
- Observe in wet weather to check drainage, return to check drawdown time
- Note dividable plants

III. Green Roofs

Definition

Green Roof

Roof system that incorporates a planting medium and supports permanent vegetation.

Description

While vegetated roofs are an ancient idea and have been used for centuries, the modern “green roof” concept was developed in mid-20th century Germany when research showed that many species of Sedum can survive in the very thin, fast draining growing mediums ideal for rooftops (GSA 2011). Green roofs can address not only stormwater runoff but also energy use, air pollution, and lack of green space. These benefits come with increased maintenance needs when compared with a traditional “black” roof. The intensity of maintenance depends upon the nature of the roof design. “Extensive” roofs, which use thin growing medium and simple plantings across a large surface area, typically require less maintenance than “intensive” roofs, which often include complex landscaping intended to have high aesthetic quality. The City of Ann Arbor used a hybrid system produced by LiveRoof for the green roof at City Hall.

Green roofs have an estimated life expectancy of 40 years—much higher than the average of 17 years for a traditional roof (GSA 2011). Because the planted medium protects roof membranes from UV damage and reduces temperature fluctuations that stress materials, a properly installed and maintained green roof may go several decades before the membrane begins to fail due to age (GSA 2011). In reality, estimating life expectancy is difficult, because some green roofs fail early and some exceed expectations.

Vegetated roofs on some federal buildings, including the Robert F. Kennedy (DOJ)

building and the Federal Trade Commission building, have not needed replacement since they were installed in the 1930s, meaning they have had an 80-year service life so far (GSA 2011).

Maintenance

The most common maintenance issue for green roofs is invasion by weeds. Leaks are often caused by poor workmanship rather than poor maintenance, but can be caused by root damage to the waterproofing layer, particularly from tree seedlings (GSA 2011). Leaks are often difficult to locate and expensive to repair, making prevention extremely valuable (GSA 2011).

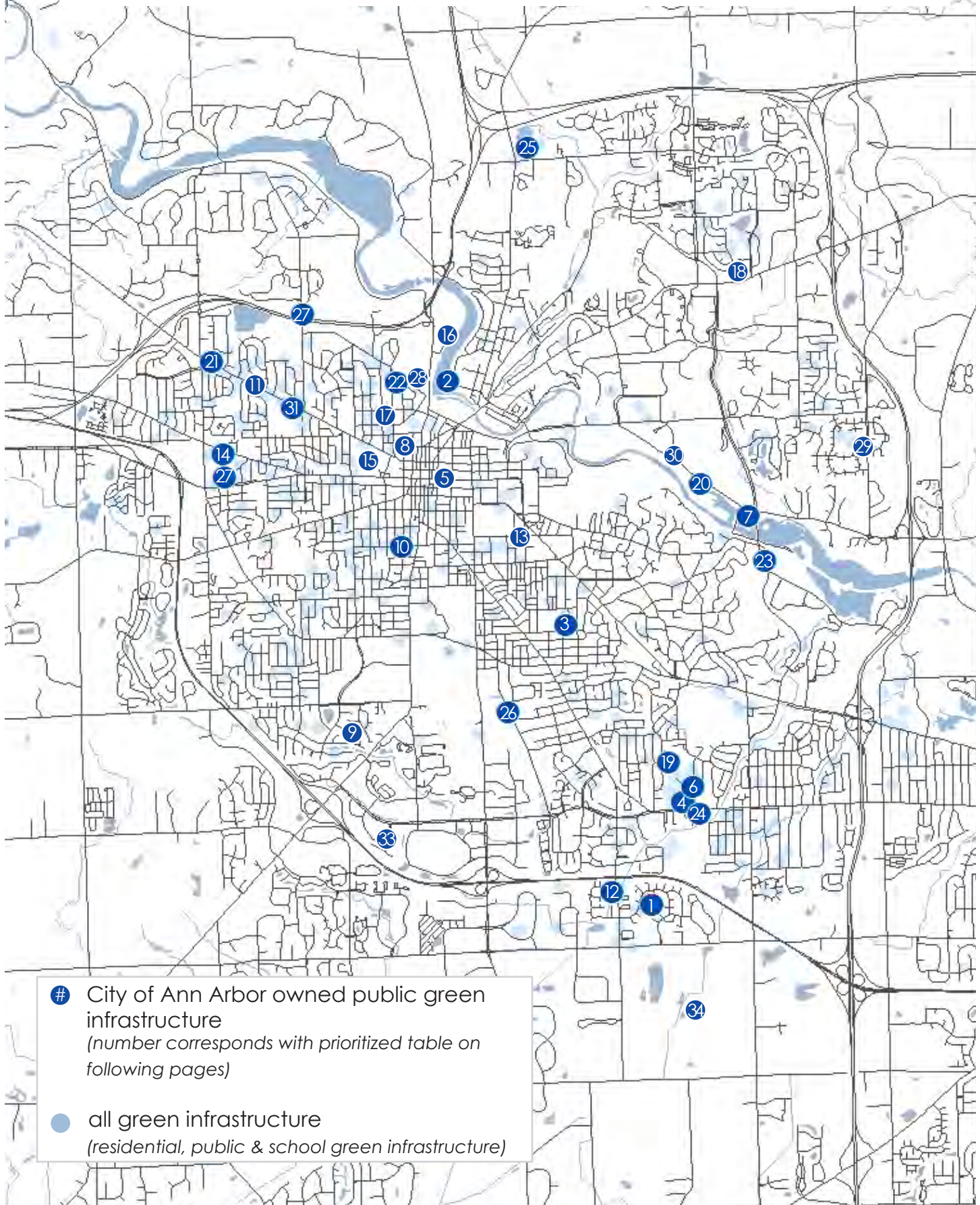
Plant loss or failure is another common issue, and can be caused by lack of watering during extreme drought, excessive foot traffic, impaired drainage, over watering and over fertilizing, or inappropriate plant choice. Less common problems include wind scour or uplift, and biodegradation of the planting medium, or the accumulation of organic matter in the soil, which can lead to drainage problems that make the roof less effective and can compromise the health of plants (GSA 2011).

Live Roof, the manufacturer of the roof system used at City Hall, recommends a brief biweekly inspection and weeding. Frequent weeding is recommended because it makes each visit easier, catches woody seedlings before they become large enough to damage the roof membrane, and creates an opportunity to discover problems such as water pooling, or shifting of the growing medium before they become serious. Biweekly inspection also allows better tracking of plant conditions. Plants stressed enough by drought may go dormant in summer, reducing the effectiveness of the green roof. Extreme drought may necessitate irrigation, but over-irrigating can have negative effects, so decisions should be based on inspections. Live Roof also recommends annual soil testing to ensure an appropriate pH and nutrient profile.

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City of Ann Arbor Public Green Infrastructure Sites



Stormwater Best Management Practices Assets

High Aesthetic Level Required

	Location Name	BMP Type	Separate Units	Responsible Parties
1	Arbor Oaks Park	Rain Garden	9	Stormwater
2	Argo Park	Rain Garden	1	Stormwater & Parks
3	Burns Park	Rain Garden	2	Stormwater
4	Buhr Park: Cobblestone Farm	Rain Garden	1	Stormwater & Parks
5	City Hall	Rain Garden	2	Stormwater
	City Hall	Green Roof	5	Stormwater
6	Easy Street	Rain Garden	8	Stormwater
7	Gallup Park	Rain Garden	1	Stormwater
8	Kingsley and 1st	Rain Garden	1	Stormwater
9	Landsdowne Park	Rain Garden	1	Stormwater
10	Madison Street	Rain Garden	6	Stormwater
11	Miller Ave	Rain Garden	23	Stormwater
12	Stone School Road	Rain Garden	6	Stormwater
13	South University Ave	Rain Garden		
14	Vet's Park: Skatepark	Rain Garden	1	
	Vet's Park: Ice Arena	Rain Garden	1	Stormwater
15	West Park	Wetland	3	Stormwater
	West Park	Bioswale	2	Stormwater
	West Park	Detention Pond	1	Stormwater

LOCATIONS: 15

SUM OF
UNITS: 74

STORMWATER: 72 units
PARKS & SW: 2 units

Medium Aesthetic Level Required

	Location Name	BMP Type	Separate Units	Responsible Parties
16	Bandemer Nature Area	Detention Basin	1	Stormwater & Parks
17	Belize Park	Rain Garden	1	Stormwater
18	Briarcliff	Rain Garden	1	Stormwater
19	Buhr Park: Children's Wet Meadow I	Rain Garden	2	Stormwater & Parks
	Buhr Park: Children's Wet Meadow II	Rain Garden	2	Stormwater & Parks
	Buhr Park: Children's Wet Meadow III	Rain Garden	1	Stormwater & Parks
	Buhr Park: Swale Meadow	Rain Garden	1	Stormwater & Parks
	Buhr Park: Pool Parking Lot	Rain Garden	1	Stormwater & Parks
	Buhr Park: North Annex	Rain Garden	1	Stormwater & Parks
	Buhr Park: South Parking Lot	Rain Garden	2	Stormwater & Parks
	Buhr Park: Tennis Court	Rain Garden	1	Stormwater & Parks
20	Furstenberg Nature Area	Rain Garden	1	Stormwater & Parks
21	Garden Homes	Rain Garden	1	Stormwater
22	Hunt Park	Rain Garden	1	Stormwater
23	Huron Hills Golf Course	Rain Garden	1	Stormwater
24	Mary Beth Doyle: Packard Parking Lot	Rain Garden	1	Water Resources Commissioner
	Mary Beth Doyle: Birch Hollow	Detention Basin	1	Water Resources Commissioner
	Mary Beth Doyle	Wetland	1	Water Resources Commissioner
	Mary Beth Doyle	Detention Basin	1	Water Resources Commissioner
25	Olson Park	Bioswale	2	Stormwater
	Olson Park	Wetland	4	Parks
	Olson Park: Picnic Pavilion	Rain Garden	1	Parks
26	South Industrial	Rain Garden	3	Stormwater
27	Vet's Park: Dexter Ave	Rain Garden	2	Stormwater
	Vet's Park: Fire Station	Rain Garden	2	Stormwater
	Vet's Park: Zamboni	Rain Garden	1	Stormwater

LOCATIONS: 11

SUM OF
UNITS:
37

STORMWATER: 15 units
PARKS: 5 units
PARKS & SW: 13 units
WATER RESOURCES: 4 units

Low Aesthetic Level Required

	Location Name	BMP Type	Separate Units	Responsible Parties
27	Bird Hills Nature Area	Rain Garden	1	Stormwater & Parks
28	Bluffs Nature Area	Rain Garden	1	Stormwater & Parks
29	Earhart Park	Detention Basin	1	Stormwater
30	Fuller Road	Detention Basin	1	Stormwater
31	Miller Nature Area	Rain Garden	1	Stormwater & Parks
32	Water Treatment Settling Pond	Detention Basin	1	Stormwater
33	Waymarket Park	Detention Basin	1	Stormwater
34	Wheeler Compost Ponds	Detention Basin	5	Stormwater
	Wheeler Wetlands	Wetland	1	Stormwater
LOCATIONS: 8			SUM OF UNITS: 13	STORMWATER: 10 units PARKS & SW: 3 units

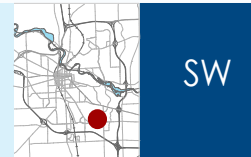
Summary of BMPs in Ann Arbor

LOCATIONS	TYPES OF BMPS	SUM OF UNITS	RESPONSIBLE PARTIES
34	RAIN GARDENS, DETENTION BASINS, WETLANDS	124	STORMWATER: 98 units PARKS: 5 units PARKS & SW: 17 units WATER RESOURCES: 4 units

KEY TO MAINTENANCE CARDS

Arbor Oaks Park Rain Gardens

Approximate Address: Champagne Dr. and Stratton Ct.



red dot denotes location of
green infrastructure feature
geographically

letters indicate who is responsible
for feature

SW- stormwater fund
P- general fund for parks

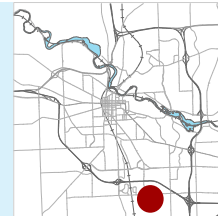
color of box indicates type of feature
orange- re/detention basin or
constructed wetlands
blue- rain garden, bioswale or
naturalized wet area



photo monitoring station

Arbor Oaks Park Rain Gardens

Approximate Address: Champagne Dr. and Stratton Ct.



SW



0 225 450 900 Feet

Year Built: 2013-2014

Designer: InSite Design Studio, Inc.

Aesthetic Level Required: High

DESCRIPTION:

There are eight rain garden depressions, some connected by small culverts below walking paths. One additional rain garden unit formed naturally and needs to be planted with natives. The unit south of the pathway is dominated by cat-tails and has heavy clay soils. An underdrain was added but standing water is still common. Stormwater runoff comes from overland flow. This site was burned in '17.

MAINTENANCE NOTES:

Collect seeds from natives in fall. Invasives include Canada Thistle, Sow Thistle, Yellow Sweet Clover, Field Bindweed, Cat-tail and Purple Loosestrife. Cut standing dead, especially switchgrass in winter/early spring. Remove saplings.



June 2016

SEASON	ACTIVITY
Spring	Pull: Canada Thistle, Sow Thistle
Summer	Pull: Curly Dock, Queen Anne's Lace; Cut: Yellow Clover
Fall	Hrbcd: Field Bindweed, Purple Loosestrife, Phragmites, cattail (Certified Applicator)
Winter	Cut Standing Dead

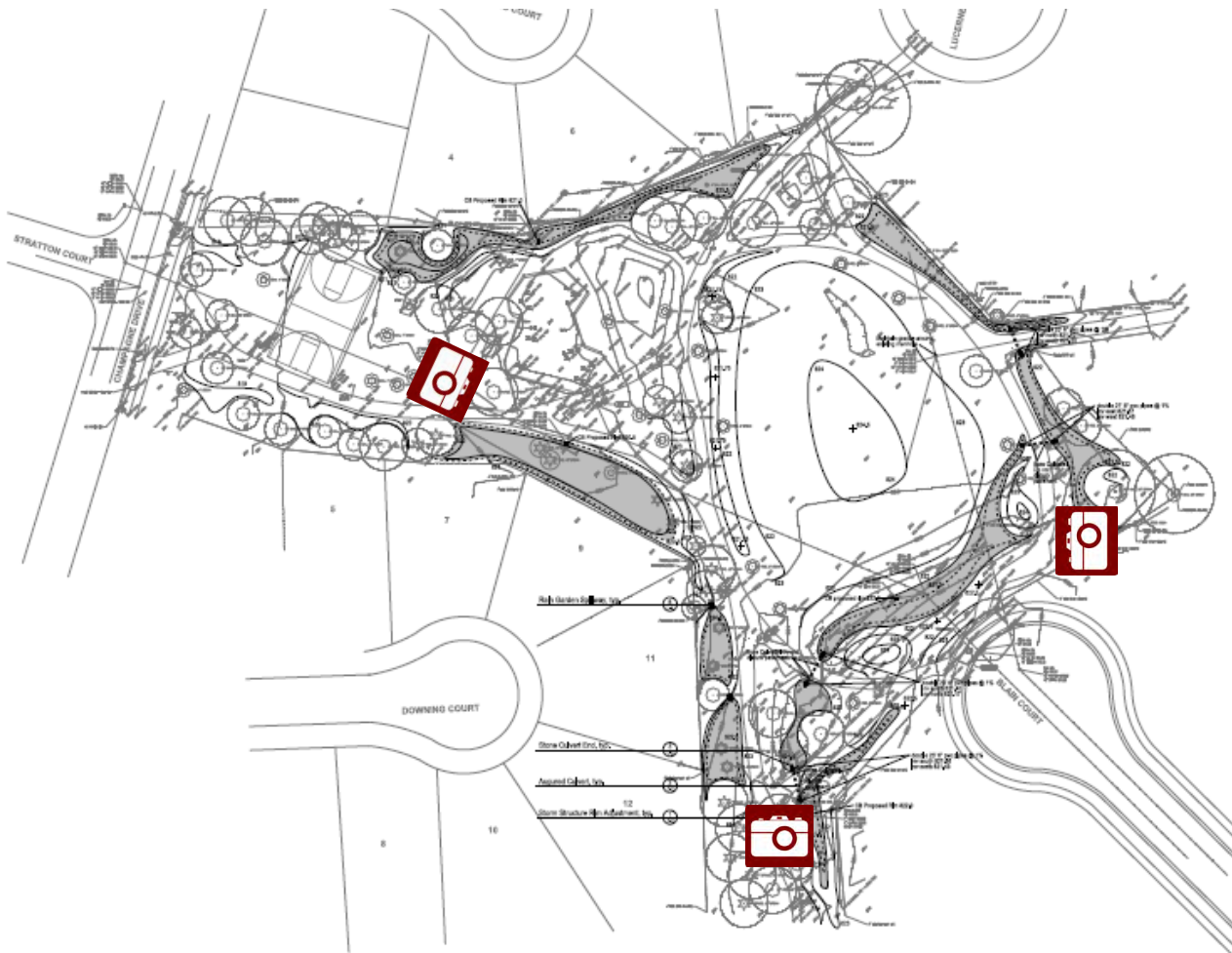
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	32	\$1,302
Volunteer Labor	90	\$1,800
Equipment		\$149
Controlled Burns*		\$208
Herbicide	0.25	\$9
Contingency (10%)		\$334
SUM		\$3,801

*per estimate from PlantWise. Burn every three years so cost spread across years

Arbor Oaks Rain Gardens

Site Plan

Acres: 0.1
SF: 4,560



NATIVE PLANTS TO LOOK FOR:

Perennials:

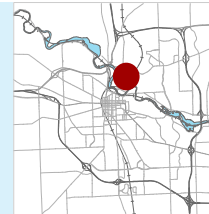
Blue Flag Iris (*Iris virginica*)
Boneset (*Eupatorium perfoliatum*)
Brown Fox Sedge (*Carex vulpinoidea*)
Canada Anemone (*Anemone canadensis*)
Common Cinquefoil (*Potentilla simplex*)
Great Blue Lobelia (*Lobelia siphilitica*)
Ironweed (*Vernonia missurica*)
Joe-Pye Weed (*Eutrochium maculatum*)
Mountain Mint (*Pycnanthemum tenuifolium*)
Swamp Milkweed (*Asclepias incarnata*)
Switch Grass (*Panicum virgatum*)
Umbrella Sedge (*Carex muskingumensis*)
Wild Senna (*Senna herbearpa*)
Wild Strawberry (*Fragaria virginiana*)

Shrubs and Trees:

Red-twig Dogwood (*Cornus sericea*)
Pussy Willow (*Salix discolor*)
Northern Red Oak (*Quercus rubra*)

Argo Park Rain Garden

Approximate Address: 1055 Longshore Drive



SW
P



0 115 230 460 Feet

Year Built: 2007

Designer: Ann Arbor Parks & Recreation

Aesthetic Level Required: High

DESCRIPTION:

Rain garden crossed by a short boardwalk located between a parking lot and canoe livery. The garden detains water from the parking lot and overflow goes to the Huron River. NAP will burn this rain garden regularly. Cow parsnip is a large plant that is abundant in this garden. Since it is often confused with poisonous Giant Hogweed, an educational sign should be installed.

MAINTENANCE NOTES:

Trim back vegetation from boardwalk in spring and fall. Canada Thistle and Burdock should be pulled. Cut standing dead in winter/early spring.



June 2014

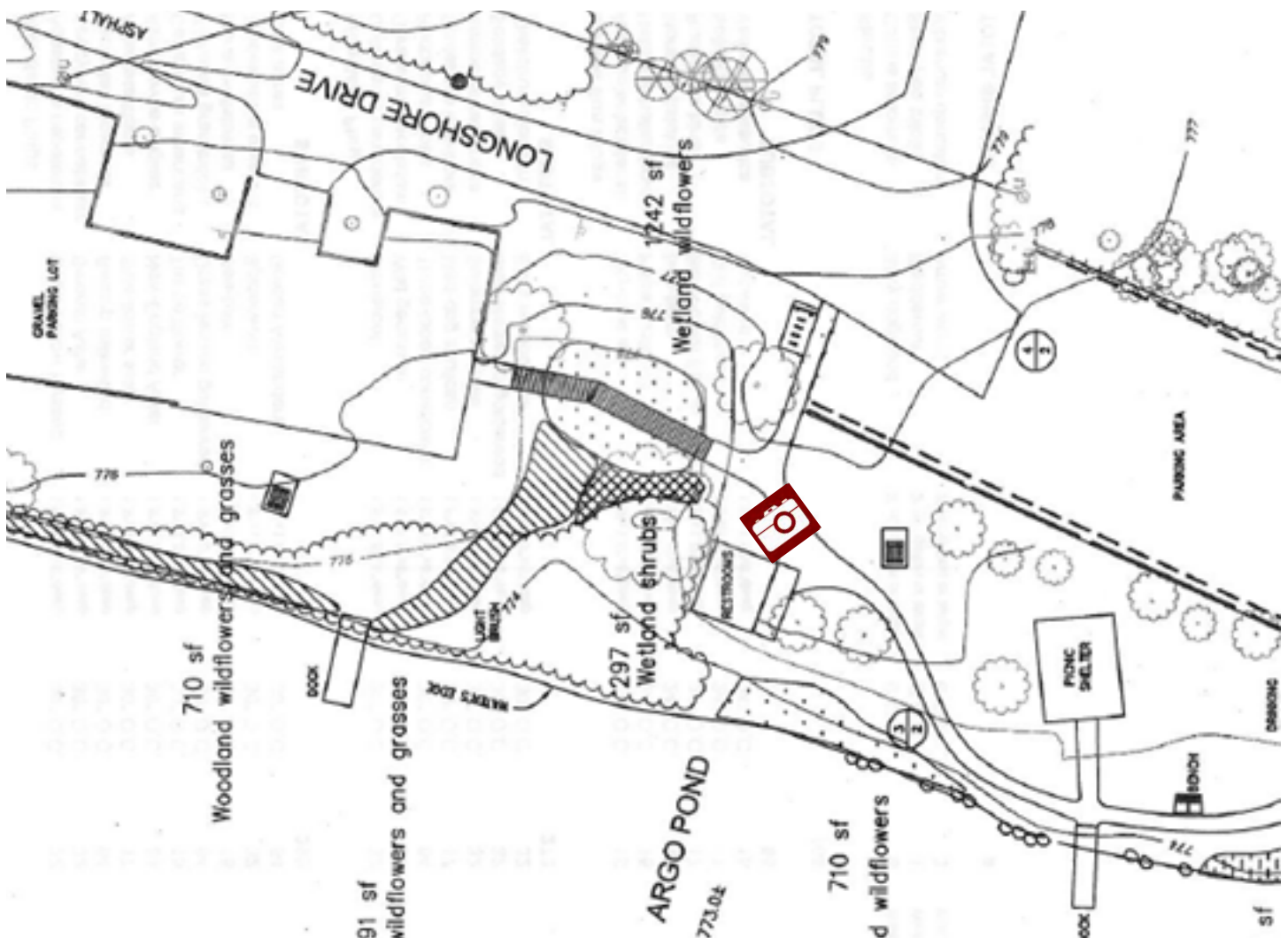
SEASON	ACTIVITY
Spring	Pull: Canada Thistle, Sow Thistle, Burdock
Summer	Trim vegetation 2' back from walkway; Weed as needed
Fall	Hrbcd: Buckthorn, Honeysuckle (Certified Applicator)
Winter	Cut Standing Dead

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	18	\$733
Volunteer Labor	20	\$400
Equipment		\$118
Controlled Burns		\$45
Herbicide	0.25	\$9
Contingency (10%)		\$130
SUM		\$1,435

Argo Park Rain Garden

Site Plan

Acres: 0.06
SF: 2,666



NATIVE PLANTS TO LOOK FOR:

Perennials:

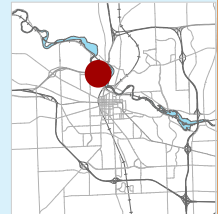
- Canada Goldenrod (*Solidago Canadensis*)
- Cow Parsnip (*Heracleum maximum*)
- Cup Plant (*Silphium perfoliatu*)
- Evening Primrose (*Oenothera biennis*)
- False Sunflower (*Heliopsis helianthoides*)
- Green Headed Coneflower (*rudbeckia laciniata*)
- Jewel Weed *Impatiens capensis*)
- Meadow Rue (*Thalictrum dasycarpum*)
- Rose Mallow (*Hibiscus moscheutos*)
- Whorled Milkweed (*Asclepias verticillata*)

Shrubs and Trees:

Arrow-wood (*Viburnum dentatum*)
Bladdernut (*Staphylea trifolia*)
Silky Dogwood (*Cornus amomum*)

Bandemer Nature Area Detention Basin

Approximate Address: 1352 Lakeshore Drive



SW
P



Year Built: 2008

Designer: Midwestern Consulting

Aesthetic Level Required: Medium

DESCRIPTION:

Small detention basin that collects runoff from gravel parking lot. A controlled burn was conducted in the spring of 2014 by NAP. NAP will burn regularly.

MAINTENANCE NOTES:

Invasives include Yellow Sweet Clover, Teasel, Crown Vetch, Canada Thistle, Buckthorn and Reed Canary Grass



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Dredge				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

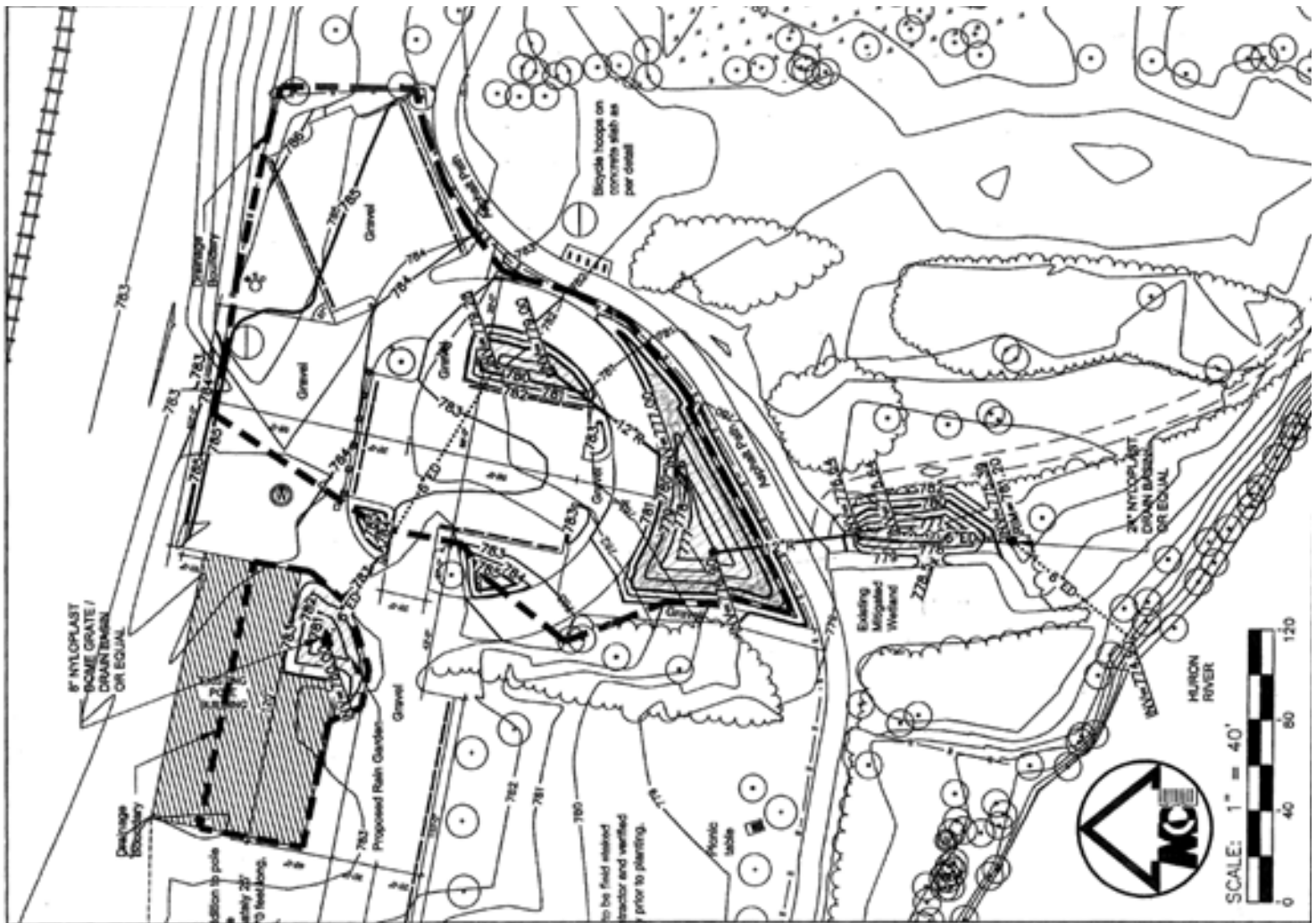
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	18	\$733
Volunteer Labor	0	0
Equipment		\$87
Controlled Burns*		\$150
Herbicide	0.5	\$20
Dredge on-site disposal \$40/CY		
Dredge off-site disposal \$70/CY		
Contingency (10%)		
SUM		\$990

*per estimate from PlantWise. Burn every three years so cost spread across years

Bandemer Nature Area Detention Basin

Site Plan

Acres: 0.41
SF: 18,041



NATIVE PLANTS TO LOOK FOR:

Perennials:

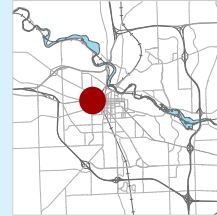
Bottle Gentian (*Gentiana andrewsii*)
Canadian Rush (*Juncus canadensis*)
Common Boneset (*Eupatorium perfoliatum*)
Common Milkweed (*Asclepias syriaca*)
Indian Hemp (*Apocynum cannabinum*)
Marsh Bedstraw (*Galium palustre*)
Marsh Bellflower (*Campanula aparinoides*)
March-Marigold (*Caltha palustris*)
Sedge (*Carex aurea*)
Smooth Swamp Aster (*Aster firmus*)
Southern Blue Flag (*Iris virginica*)
Swamp Milkweed (*Asclepias incarnata*)
Thimbleweed (*Anemone virginiana*)
Turtlehead (*Chelone glabra*)

Shrubs and Trees:

Gray Dogwood (*Cornus foemina*)
Red Ash (*Fraxinus pennsylvanica*)
Red-osier Dogwood (*Cornus stolonifera*)
Silver Maple (*Acer saccharium*)

Belize Park Rain Garden

Approximate Address: 742 Fountain Street



SW



Year Built: 2009

Designer: Ann Arbor Parks & Recreation

Aesthetic Level Required: Medium

DESCRIPTION:

Small rain garden intended to reduce flooding in the surrounding area. In the summer of 2015, the Water Resources Commissioner's Office, the City of Ann Arbor & volunteers regraded the garden to better route water into the garden. A controlled burn was conducted in the spring of 2016. Stormwater runoff comes from overland flow.

MAINTENANCE NOTES:

Invasives include Burdock, Reed Canary Grass, Honeysuckle, Buckthorn, Canada Thistle and Ragweed.



June 2014

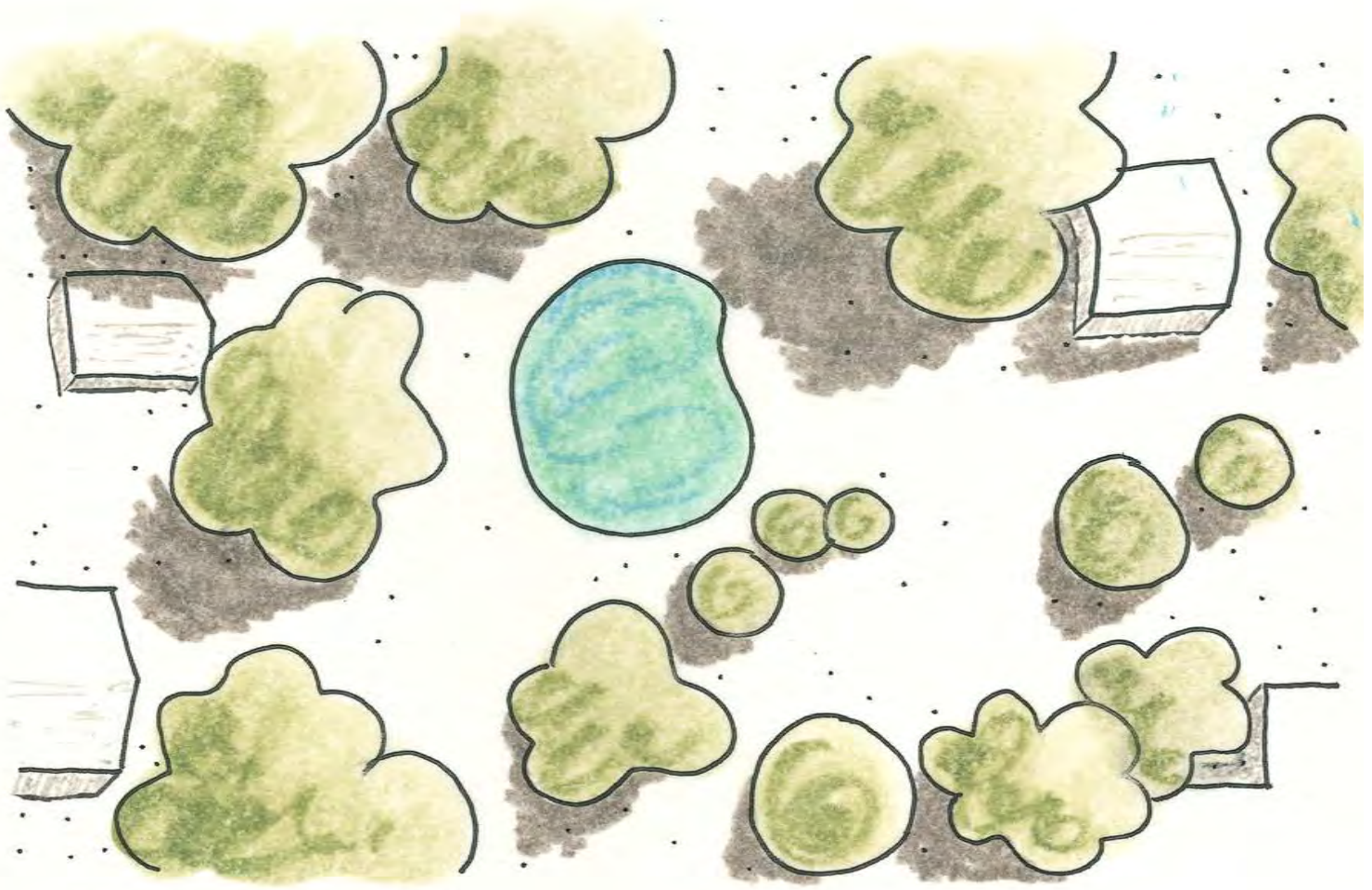
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	24	\$1,009
Volunteer Labor	124	\$2,480
Equipment		\$149
Controlled Burns		\$15
Herbicide	0.25	\$9
Contingency (10%)		\$366
SUM		\$4,028

Belize Park Rain Garden

Site Plan

Acres: 0.02
SF: 885



NATIVE PLANTS TO LOOK FOR:

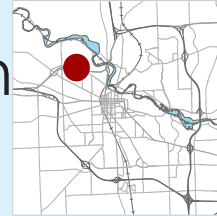
Perennials:

Blue Lobelia (*Lobelia siphilitica*)
Boneset (*Eupatorium perfoliatum*)
Canada Anemone (*Anemone canadensis*)
Culver's Root (*Veronicastrum virginicum*)
Foxglove Beardtongue (*Penstemon digitalis*)
Golden Alexanders (*Zizia aurea*)
Gray's Sedge (*Carex grayii*)
Green-headed Coneflower (*Rudbeckia laciniata*)
Jumpseed (*Polygonum virginianum*)
Mad-dog Skullcap (*Scutellaria lateriflora*)
Nodding Wild Onion (*Allium cernuum*)
Obedient Plant (*Physostegia virginiana*)
Rattlesnake Master (*Eryngium yuccifolium*)
Soft Rush (*Juncus effusus*)
Spikenard (*Aralia racemosa*)

Swamp Buttercup (*Ranunculus hispidus*)
Swamp Goldenrod (*Solidago patula*)
Tall Coreopsis (*Coreopsis tripteris*)
Tall Meadow Rue (*Thalictrum dasycarpum*)

Bird Hills Nature Area Rain Garden

Approximate Address: Newport Rd. at M-14



SW
P



Year Built: 2008

Designer: Natural Area Preservation

Aesthetic Level Required: Low

DESCRIPTION:

Small naturalistic rain garden, with a constructed berm. This garden was built to treat stormwater and prevent erosion on trails caused by runoff from the parking lot. A drain in the southeast corner of the parking lot likely intercepts a large portion of runoff before it enters the garden. Overland stormwater runoff enters from the south. NAP will burn this rain garden regularly.

MAINTENANCE NOTES:

If rain garden appears too saturated, an overflow could be created to allow water to flow into the park to the east. Since the garden blends into the natural area, little maintenance is necessary.



June 2014

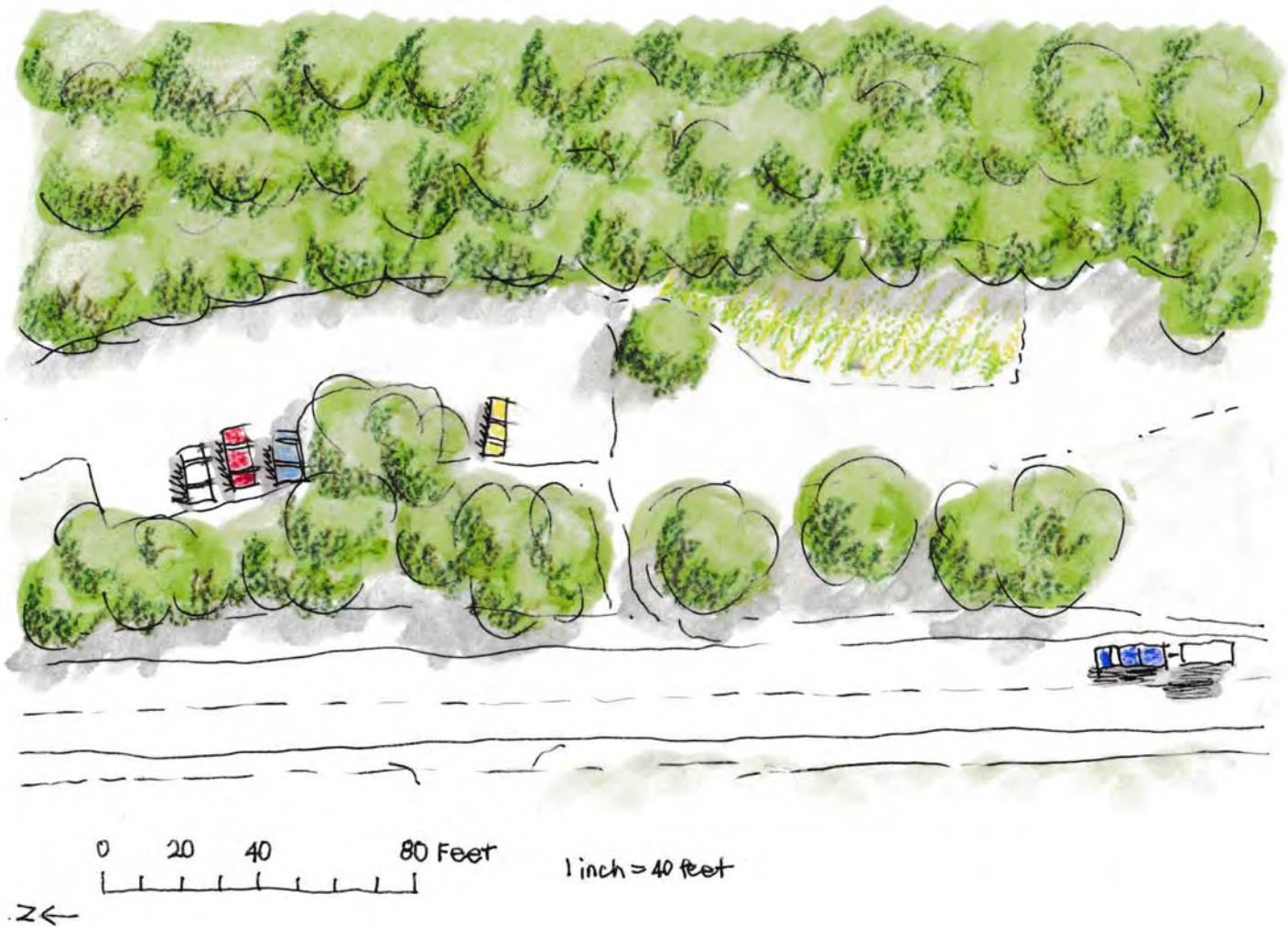
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Remove Sediment			spring	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	12	\$488.40
Volunteer Labor	0	0
Equipment		\$87
Controlled Burns		\$51
Herbicide	0.25	\$10
Contingency (10%)		\$64
SUM		\$700

Bird Hills Nature Area Rain Garden

Site Plan

Acres: 0.07
SF: 3,057



NATIVE PLANTS TO LOOK FOR:

Perennials:

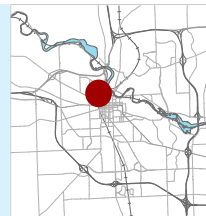
Aster sp.
Awlfruit Sedge (*Carex stipata*)
Big Bluestem (*Andropogon gerardii*)
Black-eyed Susan (*Rudbeckia hirta*)
Bulrush (*Scirpus atrovirens*)
Fox Sedge (*Carex vulpinoidea*)
Iron Weed (*Vernonia* sp.)
Indian Grass (*Sorghastrum nutans*)
Joe Pye Weed (*Eutrochium maculatum*)
Mountain Mint (*Pycnanthemum* sp.)
Showy Goldenrod (*Solidago speciosa*)
Swamp Milkweed (*Asclepias incarnata*)
Torrey's Rush (*Juncus torreyi*)
Turtlehead (*Chelone glabra*)
Wild Geranium (*Geranium maculatum*)
Woolgrass (*Scirpus cyperinus*)

Shrubs and Trees:

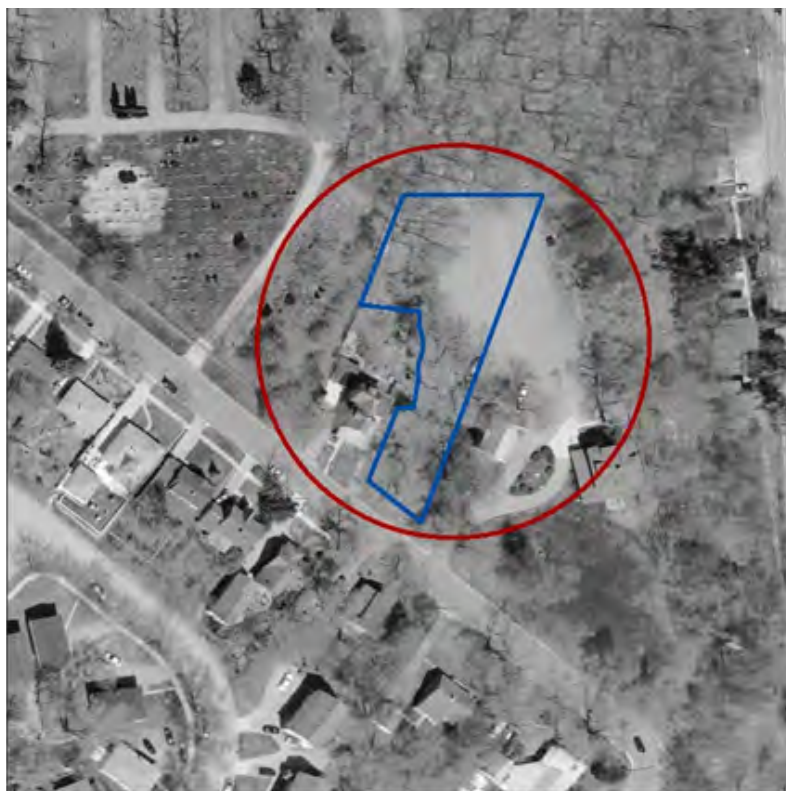
Sandbar Willow (*Salix interior*)

Bluffs Nature Area Rain Garden

Approximate Address: West of 220 Sunset Rd.



SW
P



Year Built: 2012

Designer: Ann Arbor Parks & Recreation

Aesthetic Level Required: Low

DESCRIPTION:

This parcel was bought by Ann Arbor Parks and Recreation to connect Bluffs Nature Area to Sunset road and to create another park entrance. Native prairie species were planted. NAP will burn this rain garden regularly. Stormwater runoff comes from overland flow.

MAINTENANCE NOTES:

Remove invasives, collect native seeds and scatter. Few invasive species are currently growing in the area.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds		late summer & fall		

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	32	\$1,302
Volunteer Labor	90	\$1,800
Equipment		\$149
Controlled Burns		\$37
Herbicide	0.25	\$9
Contingency (10%)		\$330
SUM		\$3,627

Bluffs Nature Area Rain Garden

Site Plan

Acres: 0.05
SF: 2,178



NATIVE PLANTS TO LOOK FOR:

Perennials:

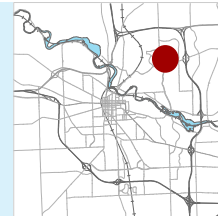
Aster sp.
Bee Balm (*Monarda*)
Big Bluestem (*Andropogon gerardii*)
Blackeyed Susan (*Rudbeckia hirta*)
Blue Flag Iris (*Iris versicolor*)
Golden Alexanders (*Zizia aurea*)
Goldenrod (*Solidago* spp.)
Ostrich Fern (*Matteuccia*)
Oxeye Sunflower (*Heliopsis helianthoides*)
Prairie Dock (*Silphium terebinthinaceum*)
Purple Coneflower (*Echinacea purpurea*)
Tickseed (*Coreopsis tripteris*)
Virginia Creeper (*Parthenocissus quinquefolia*)
Wild Geranium (*Geranium maculatum*)
Wild Strawberry (*Fragaria vesca*)

Shrubs and Trees:

Bur Oak (*Quercus macrocarpa*)
Common Witchhazel (*Hamamelis virginiana*)
Downy Serviceberry (*Amelanchier arborea*)
Flowering Dogwood (*Cornus florida*)
Ninebark (*Physocarpus opulifolius*)
Red-osier Dogwood (*Cornus stolonifera*)
Redbud (*Cercis canadensis*)
Swamp White Oak (*Quercus bicolor*)
Sycamore (*Platanus occidentalis*)
Tulip Tree (*Liriodendron tulipifera*)
White Pine (*Pinus strobus*)

Briarcliff Rain Garden

Approximate Address: North of 2050 Prairie St.



SW



Year Built: 2010

Designer: JFNew

Aesthetic Level Required: Medium

DESCRIPTION:

This rain garden was built where a road stub was removed. It was built to reduce impervious area as well as treat runoff. This garden was built as a joint effort with the Huron River Watershed Council. A pathway extends three quarters of the way through the parcel. Stormwater runoff comes from overland flow. This site was burned in the spring of '18.

MAINTENANCE NOTES:

Burn regularly and seed afterwards. Invasive species include Field Bindweed, Honeysuckle, Buckthorn and Canada Thistle. Cut back vegetation from path when overgrown.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

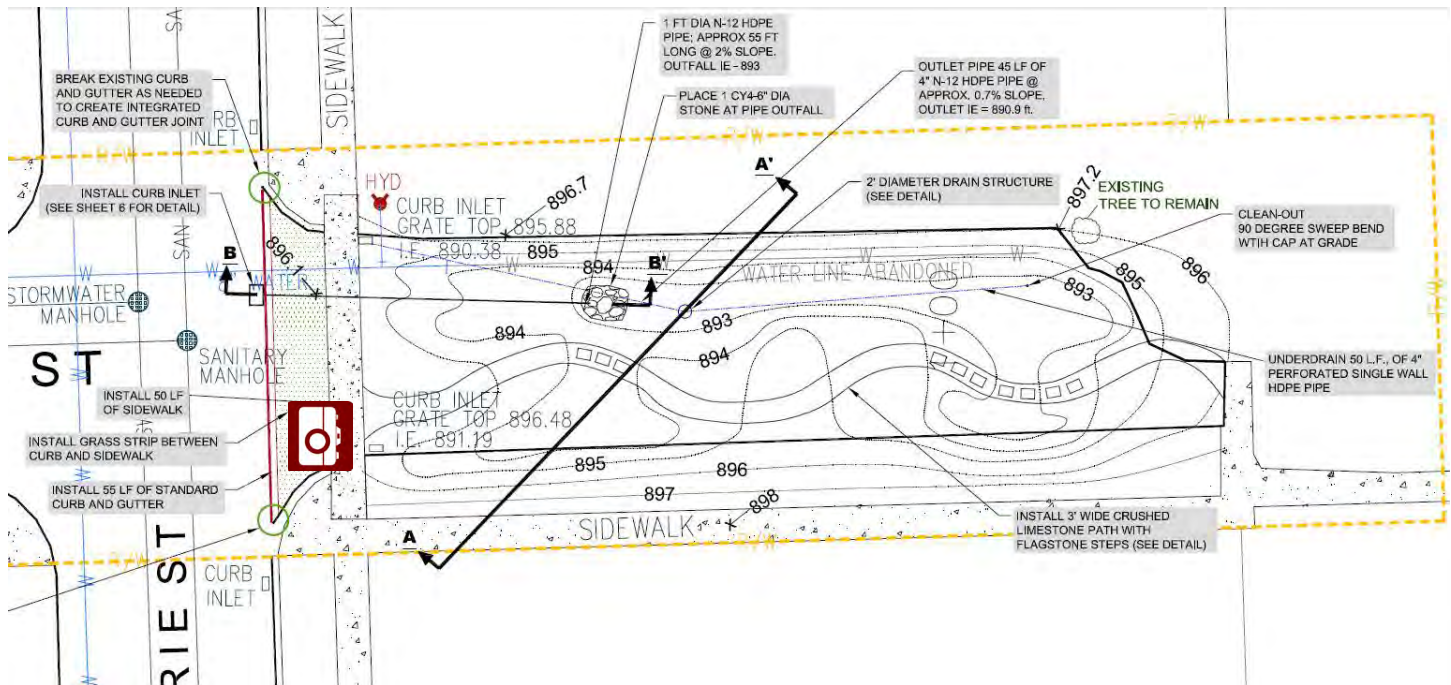
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	26	\$1,058
Volunteer Labor	40	\$800
Equipment		\$118
Controlled Burns		\$116
Herbicide	0.25	\$9
Contingency (10%)		\$210
SUM		\$2,311

**per estimate from PlantWise. Burn every three years so cost spread across years*

Briarcliff Rain Garden

Site Plan

Acres: 0.03
SF: 1,400



NATIVE PLANTS TO LOOK FOR:

Perennials:

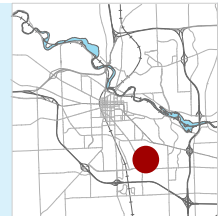
Aster Spp. (*Asteraceae aster*)
Bee Balm (*Monarda fistulosa*)
Bush Clover (*Typha latifolia*)
Canada Goldenrod (*Solidago Canadensis*)
Green Headed Coneflower (*rudbeckia laciniata*)
Mint Spp. (*Lamiaceae menthe*)
Virginia Wild Rye (*Elymus virginicus*)

Shrubs and Trees:

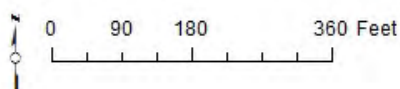
American Elderberry (*Sambucus canadensis*)
Eastern Redbud (*Cercis canadensis*)
Flowering Dogwood (*Cornus florida*)
Ninebark (*Physocarpus opulifolius*)
Pin Oak (*Quercus palustris*)
Red Maple (*Acer rubrum*)
Red Oak (*Quercus rubra*)
Silky Dogwood (*Cornus amomum v. schuetzeana*)
Winterberry (*Ilex verticillata*)

Buhr Park Green Stormwater Features

Approximate Address: 2751 Packard

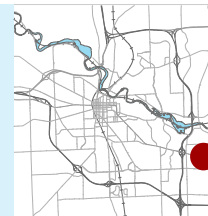


SW
P

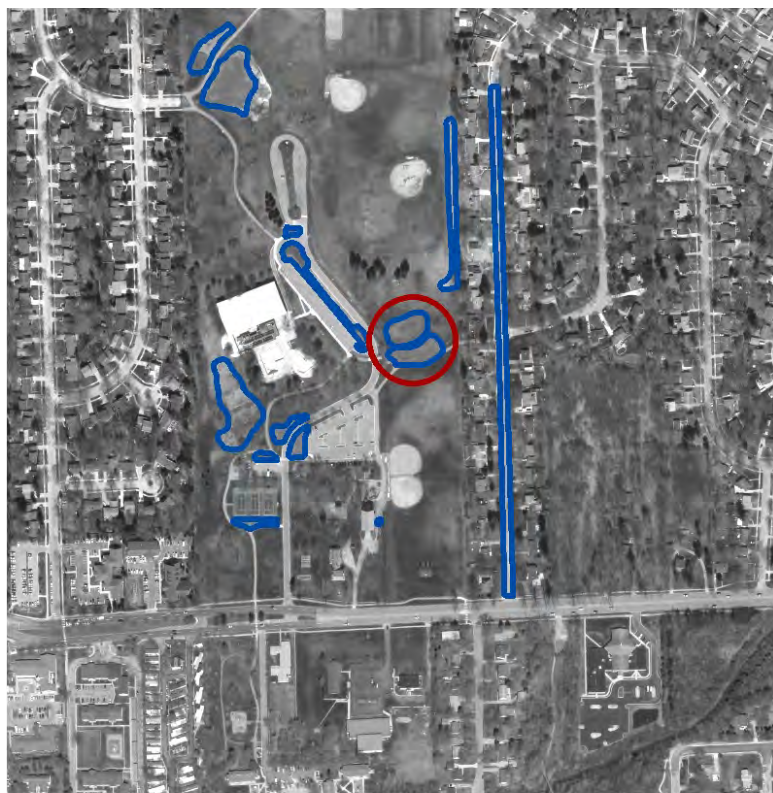


Buhr Park: Children's Wet Meadow I & Children's Wet Meadow Annex

Approximate Address: 2751 Packard



SW
P



Year Built: CWM I- 1997, Annex- 2011

Designer: Tilton & Associates, Inc

Aesthetic Level Required: Medium

DESCRIPTION:

The original children's wet meadow is located south of the path and the annex is located to the north. Both were built by the wet meadow team, Blossom Preschool, friends, neighbors and the Super Swampers. Support was provided by Wild Ones, Ann Arbor Parks & Recreation, the Water Resources Commissioner's Office, and the Ann Arbor Area Community Foundation. A controlled burn was conducted in the spring of 2016 north of the path. Stormwater runoff comes from overland flow.

MAINTENANCE NOTES:

Crown Vetch, Reed Canary Grass and saplings need to be removed regularly.



August 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds		late summer & fall		

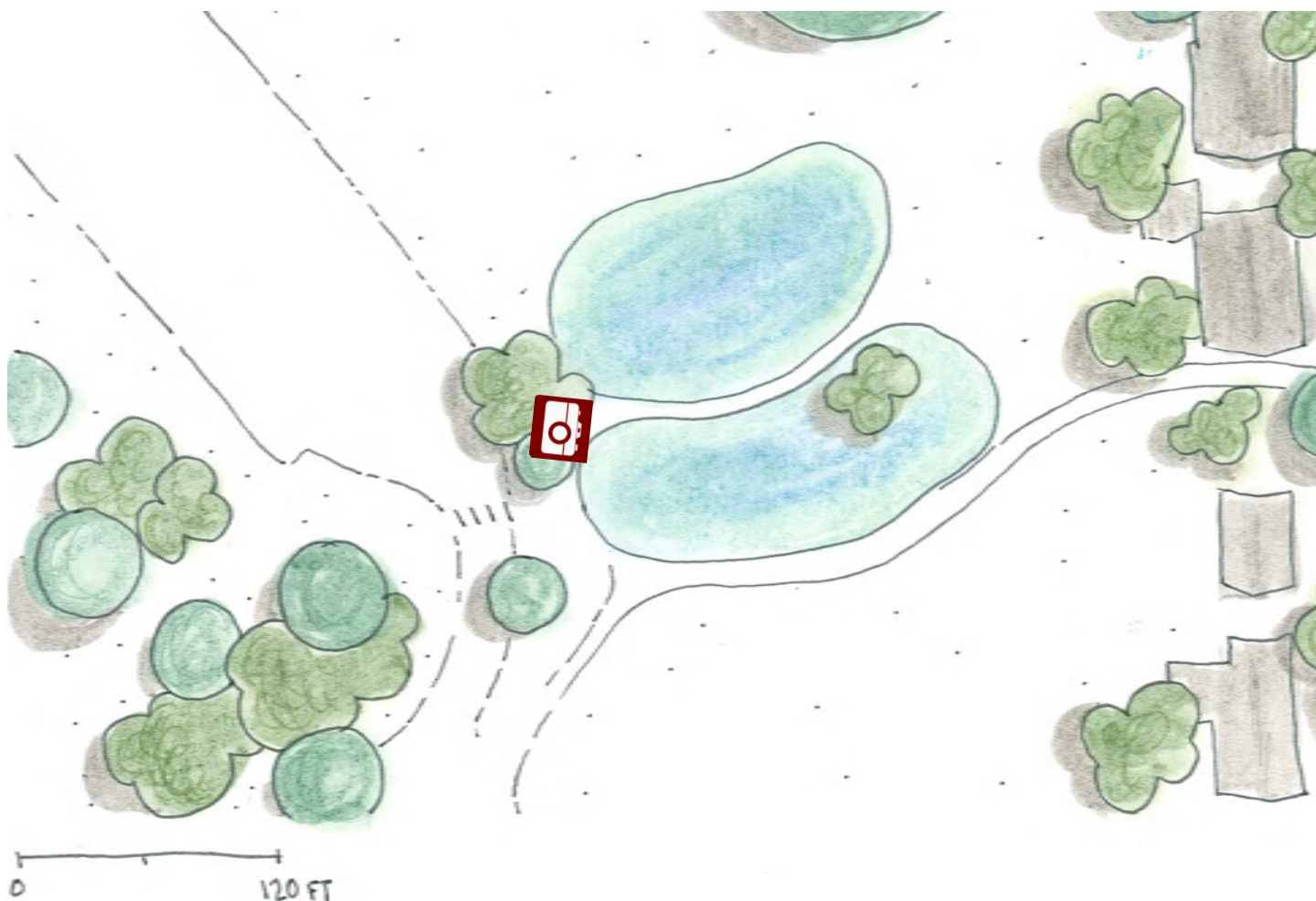
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	24	\$977
Volunteer Labor	40	\$800
Equipment		\$118
Controlled Burns		\$426
Herbicide	0.75	\$27
Contingency (10%)		\$243
SUM		\$2,591

Buhr Park: Children's Wet Meadow I

Site Plan

Acres: 0.58

SF: 25,417



NATIVE PLANTS TO LOOK FOR:

Perennials:

Beardtongue (*Penstemon digitalis*)
Bee Balm (*Monarda fistulosa*)
Black Raspberry (*Rubus occidentalis*)
Blue Vervain (*Verbena hastata*)
Brown-eyed Susan (*Rudbeckia triloba*)
Canada Goldenrod (*Solidago Canadensis*)
Common Milkweed (*Asclepias syriaca*)
Evening Primrose (*Oenothera biennis*)
Fleabane Aster (*Erigeron peregrinus*)
Fowl bluegrass (*Poa palustris*)
Gray-headed Coneflower (*Ratibida pinnata*)
Helianthus Spp
Ironweed (*Vernonia missurica*)
New England Aster (*Aster novae-angliae*)
Ohio Goldenrod (*Oligoneuron ohioense*)
Persimmon (*Diospyros virginiana*)
Prairie Dock (*Silphium terebinthinaceum*)

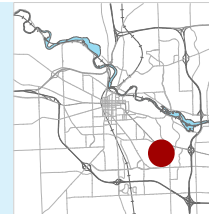
Spreading Dogbane (*Apocynum androsaemifolium*)
Steambank Wild Rye (*elymos Canadensis*)
Switch Grass (*Panicum virgatum*)
Tick Trefoil (*Desmodium canadense*)
Virginia Creeper (*Parthenocissus quinquefolia*)
Wild Geranium (*Geranium maculatum*)

Shrubs and Trees:

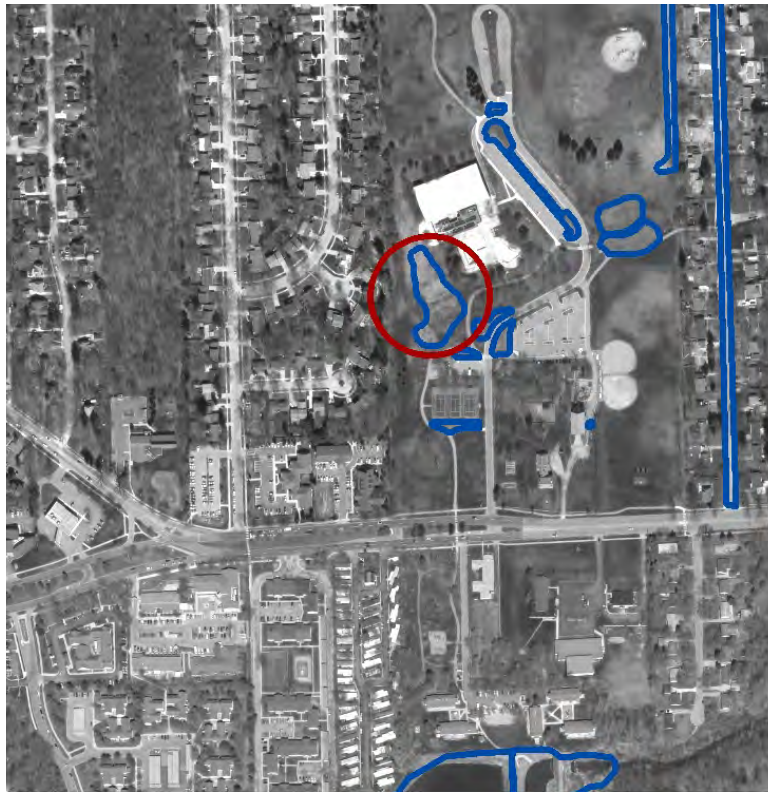
American Elm (*Ulmus americana*)
Eastern Black Walnut (*Juglans nigra*)
Box Elder (*Acer negundo*)
Elderberry (*Sambucus canadensis*)
Gooseberry (*Ribes grossularia*)
Paw Paw (*Asimina triloba*)
Red Current (*Ribes rubrum*)
Swamp Rose (*Rosa palustris*)

Buhr Park: Children's Wet Meadow II

Approximate Address: 2751 Packard



SW



Year Built: 2004

Designer: Tilton & Associates, Inc.

Aesthetic Level Required: Medium

DESCRIPTION:

This swale receives water from the ice arena building. The shape is tiered to slow water flowing down the slope. This project was completed by the Children's Wet Meadow team. A controlled burn was conducted in the spring of 2016. NAP will burn this rain garden regularly.

MAINTENANCE NOTES:

Invasive species include Tree of Heaven (Basal bark treatment), Honeysuckle, Canada Thistle and Yellow Sweet Clover.



July 2014

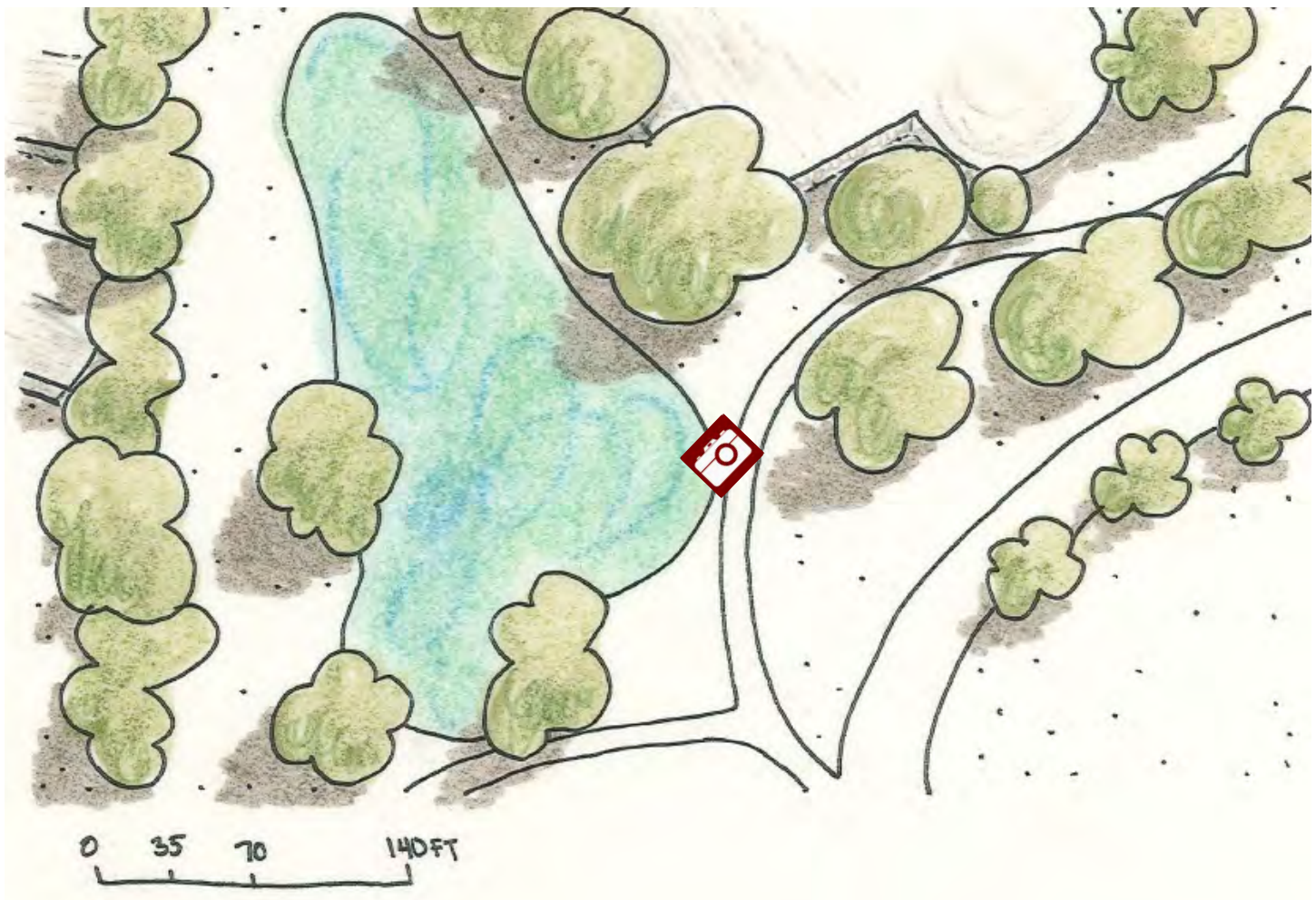
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds		late summer & fall		

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	26	\$1,058
Volunteer Labor	40	\$800
Equipment		\$118
Controlled Burns		\$576
Herbicide	1	\$37
Contingency (10%)		\$259
SUM		\$2,848

Buhr Park: Children's Wet Meadow II

Site Plan

Acres: 0.79
SF: 34,354



NATIVE PLANTS TO LOOK FOR:

Perennials:

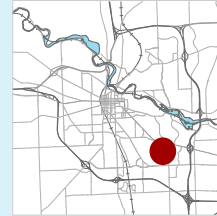
Aster spp.
Bergamot (*Monarda fistulosa*)
Blue Flag Iris (*Iris virginica*)
Butterfly Milkweed (*Asclepias tuberosa*)
Goldenrod (*Solidago* spp.)
Golden Alexander (*Zizia aurea*)
Little Bluestem (*Schizachyrium scoparium*)
Lupine (*Lupinus*)
Prairie Clover (*Dalea*)
Prickly Pear (*Opuntia*)
Wild Geranium (*Geranium maculatum*)
Wild Strawberry (*Fragaria vesca*)

Shrubs and Trees:

Box Elder (*Acer negundo*)
Elderberry (*Sambucus canadensis*)
Flowering Dogwood (*Cornus florida*)
Honey Locust (*Gleditsia triacanthos*)
Redbud (*Cercis canadensis*)
Swamp White Oak (*Quercus bicolor*)

Buhr Park: Children's Wet Meadow III

Approximate Address: 2751 Packard



SW
P



0 255 510 1,020 Feet

Year Built: 2010

Designer: Tilton & Associates, Inc. and
Ann Arbor Parks & Recreation

Aesthetic Level Required: Medium

DESCRIPTION:

This garden is the third addition to the Children's Wet Meadow project. This wet meadow was installed as part of the Stormwater Management Plan. A controlled burn was conducted in the spring of 2016. NAP will burn this rain garden regularly. Stormwater runoff comes from overland flow.

MAINTENANCE NOTES:

Take care when burning near plastic outlet structure. Invasives include Canada Thistle and Chickory.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds		late summer & fall		

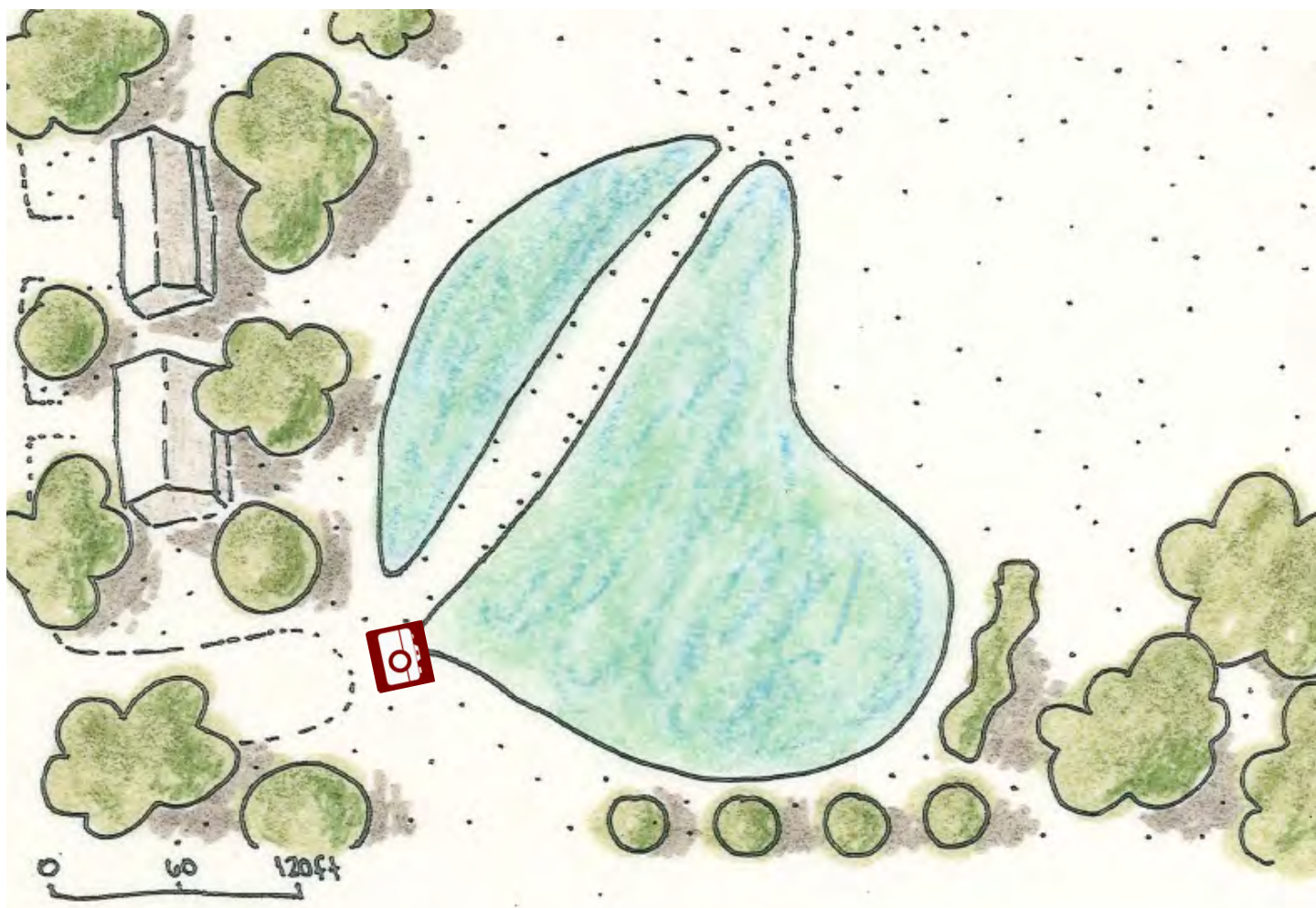
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	26	\$1,302
Volunteer Labor	40	\$800
Equipment		\$118
Controlled Burns		\$796
Herbicide	1.25	\$50
Contingency (10%)		\$282
SUM		\$3,348

Buhr Park: Children's Wet Meadow III

Site Plan

Acres: 1.09

SF: 47,476



NATIVE PLANTS TO LOOK FOR:

Perennials:

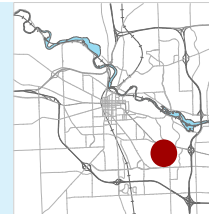
Beardtongue (*Penstemon digitalis*)
Bee Balm (*Monarda fistulosa*)
Black Raspberry (*Rubus occidentalis*)
Black-eyed Susan (*Rudbeckia hirta*)
Boneset (*Eupatorium perfoliatum*)
Compass Plant (*Silphium laciniatum*)
Evening Primrose (*Oenothera biennis*)
Gray-headed Coneflower (*Ratibida pinnata*)
Ironweed (*Vernonia missurica*)
Joe Pye Weed (*Eutrochium maculatum*)
Jumpseed (*Polygonum virginianum*)
Marsh Agrimony (*Agrimonia pariflora*)
Mountain Mint (*Pycnanthemum tenuifolium*)
Switch Grass (*Panicum virgatum*)
Tick Trefoil (*Desmodium canadense*)

Shrubs and Trees:

Eastern Cottonwood (*Populus deltoides*)
Red Osier Dogwood (*Cornus sericea*)
Silver Maple (*Acer saccharinum*)
Willow (*Salix* spp)

Buhr Park: Swale Meadow

Approximate Address: 2751 Packard



SW
P



Year Built: 2003

Designer: Tilton & Associates, Inc

Aesthetic Level Required: Medium

DESCRIPTION:

This rain garden was built in 2003 to infiltrate stormwater runoff as part of the Stormwater Management Plan. Stormwater runoff is held back from entering residential parcels downhill. A controlled burn was conducted in the spring of 2016. NAP will burn this rain garden regularly. Stormwater runoff comes from overland flow.

MAINTENANCE NOTES:

Maintenance work done to the electrical lines above this swale has damaged plantings in the past. Invasives include black locust.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds		late summer & fall		

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	26	\$1,058
Volunteer Labor	40	\$800
Equipment		\$118
Controlled Burns		\$257
Herbicide	0.25	\$10
Contingency (10%)		\$225
SUM		\$2,468

Buhr Park: East Swale

Site Plan

Acres: 0.35

SF: 15,301



NATIVE PLANTS TO LOOK FOR:

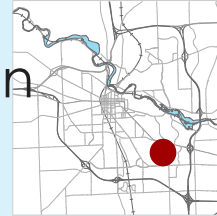
Perennials:

Bee Balm (*Monarda fistulosa*)
Big bluestem (*Andropogon gerardii*)
Black Eyed Susan (*Rudbeckia hirta*)
Common Milkweed (*Asclepias syriaca*)
Compass Plant (*Asclepias syriaca*)
Evening Primrose (*Oenothera biennis*)
Golden Alexander (*Zizia aurea*)
Grass Leaved Goldenrod (*Euthamia graminifolia*)
Gray-headed Coneflower (*Ratibida pinnata*)
Hard Leaved Goldenrod (*Solidago rigida*)
Ironweed (*Vernonia missurica*)
Joe Pye Weed (*Eutrochium maculatum*)
Jumpseed (*Polygonum virginianum*)
Meadow Rue (*Thalictrum dasycarpum*)

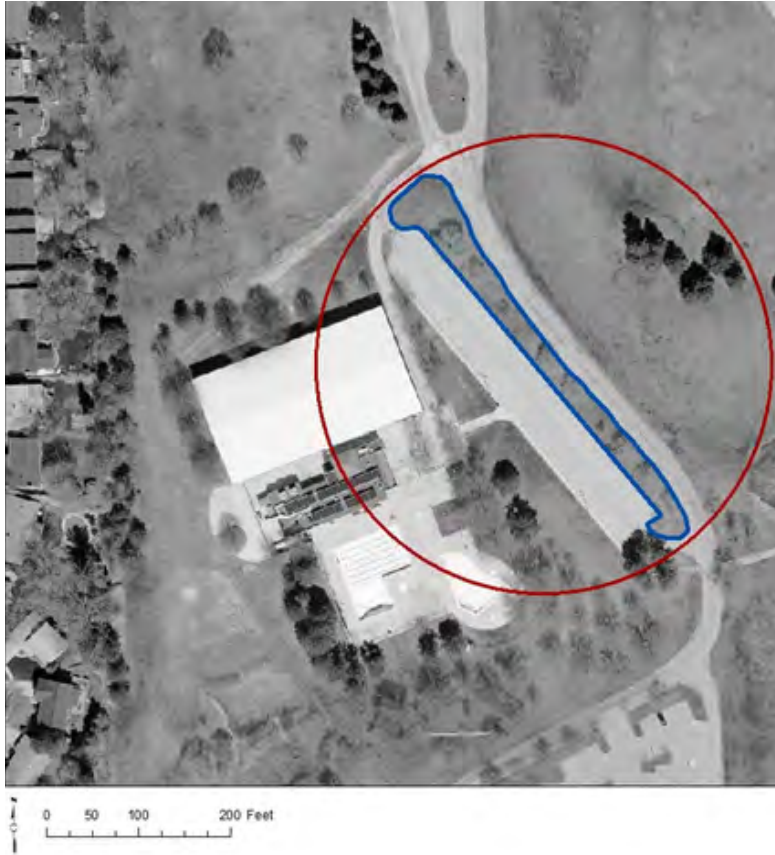
New England Aster (*Aster novae-angliae*)
Beardtongue (*Penstemon digitalis*)
Smooth boneset (*Eupatorium perfoliatum*)
Spreading Dogbane (*Apocynum androsaemifolium*)
Switch Grass (*Panicum virgatum*)

Buhr Park: Pool Parking Lot Rain Garden

Approximate Address: 2751 Packard



SW



Year Built: 2012

Designer: Conservation Design Forum

Aesthetic Level Required: Medium

DESCRIPTION:

This swale receives water from the parking lot and road. Along the eastern side runs a pervious parking lot. The City of Ann Arbor installed this garden. A controlled burn was conducted in the spring of 2016. NAP will burn this rain garden regularly.

MAINTENANCE NOTES:

Purple Loosestrife, Crown Vetch and other aggressive invasives will need to be treated with herbicide. Additional invasives include Yellow Sweet Clover and Canada Thistle. Cut back standing dead between late fall and early spring.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment		X		
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds		late summer & fall		

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	15	\$611
Volunteer Labor	8	\$160
Equipment		\$103
Controlled Burns		\$292
Herbicide	0.5	\$19
Contingency (10%)		\$118
SUM		\$1,303

Buhr Park: Pool Parking Lot Rain Garden

Site Plan

Acres: 0.4
SF: 17,420



NATIVE PLANTS TO LOOK FOR:

Perennials:

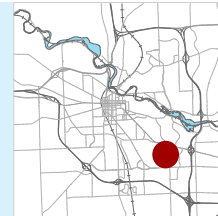
Beardtongue (*Penstemon digitalis*)
Blazing star (*Solidago aspera*)
Blue Vervain (*Verbena hastata*)
Boneset (*Eupatorium perfoliatum*)
Common Milkweed (*Asclepias syriaca*)
Evening Primrose (*Oenothera biennis*)
Fringed Brome (*Bromus ciliates*)
Gray-headed Coneflower (*Ratibida pinnata*)
Helianthus Spp.
Ironweed (*Vernonia missurica*)
Little Bluestem (*Schizachyrium scoparium*)
Purple Coneflower (*Echinacea purpurea*)
Sneezeweed (*Helenium autumnale*)
Steambank Wild Rye (*elymos Canadensis*)
Torrey's Rush (*Juncus torreyi*)

Shrubs and Trees:

Red Oak (*Quercus rubra*)
Boxelder (*Acer negundo*)

Buhr Park: North Annex Rain Garden

Approximate Address: 2751 Packard



SW



Year Built: 2012

Designer: Conservation Design Forum

Aesthetic Level Required: Medium

DESCRIPTION:

This rain garden receives water from the parking lot and road. The City of Ann Arbor installed this garden. A controlled burn was conducted in the spring of 2016 by NAP. NAP will regularly burn this area.

MAINTENANCE NOTES:

Invasives include Purple Loosestrife and Chickory. Cut back standing dead between late fall and early spring.



July 2014

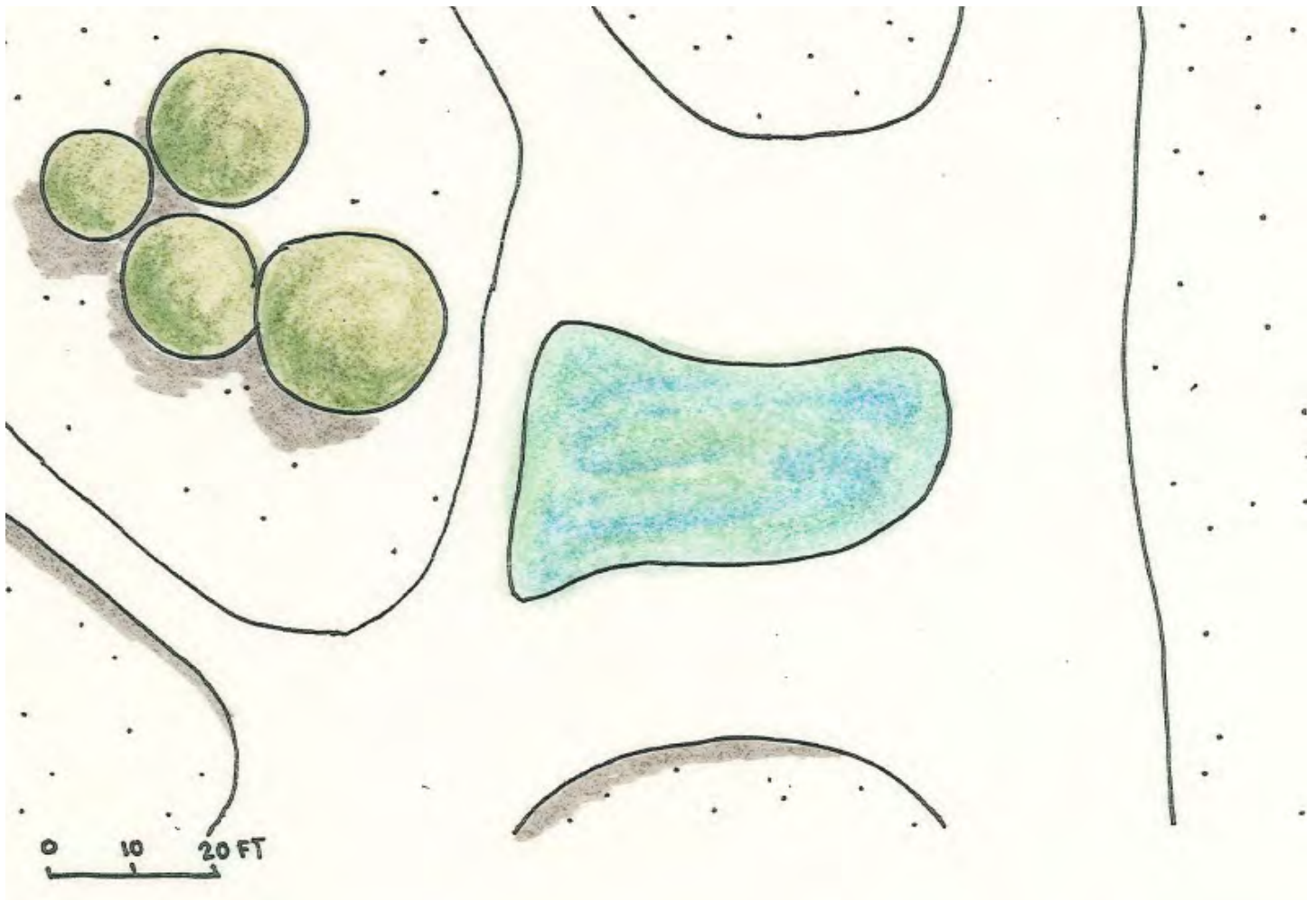
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	13	\$529
Volunteer Labor	7	\$140
Equipment		\$103
Controlled Burns		\$23
Herbicide	0.25	\$9
Contingency (10%)		\$80
SUM		\$884

Buhr Park: North Annex Rain Garden

Site Plan

Acres: 0.03
SF: 1,362



NATIVE PLANTS TO LOOK FOR:

Perennials:

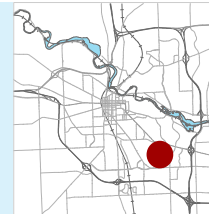
Aster spp.
Black Eyed Susan (*Rudbeckia hirta*)
Golden Alexander (*Zizia aurea*)
Goldenrod (*Solidago* spp)
Prairie Dock (*Silphium terebinthinaceum*)

Shrubs and Trees:

Boxelder (*Acer negundo*)

Buhr Park: South Parking Lot

Approximate Address: 2751 Packard



SW



Year Built: 2012

Designer: Conservation Design Forum

Aesthetic Level Required: Medium

DESCRIPTION:

The City of Ann Arbor installed these rain gardens. The garden south of the parking lot receives stormwater runoff from the parking lot. The garden north of the road receives runoff from the grassy hill and the road. A controlled burn was conducted in the spring of 2016. NAP will burn this rain garden regularly.

MAINTENANCE NOTES:

Invasives include Purple Loosestrife, Yellow Sweet Clover, Sow Thistle and Canda Thistle.



August 2016

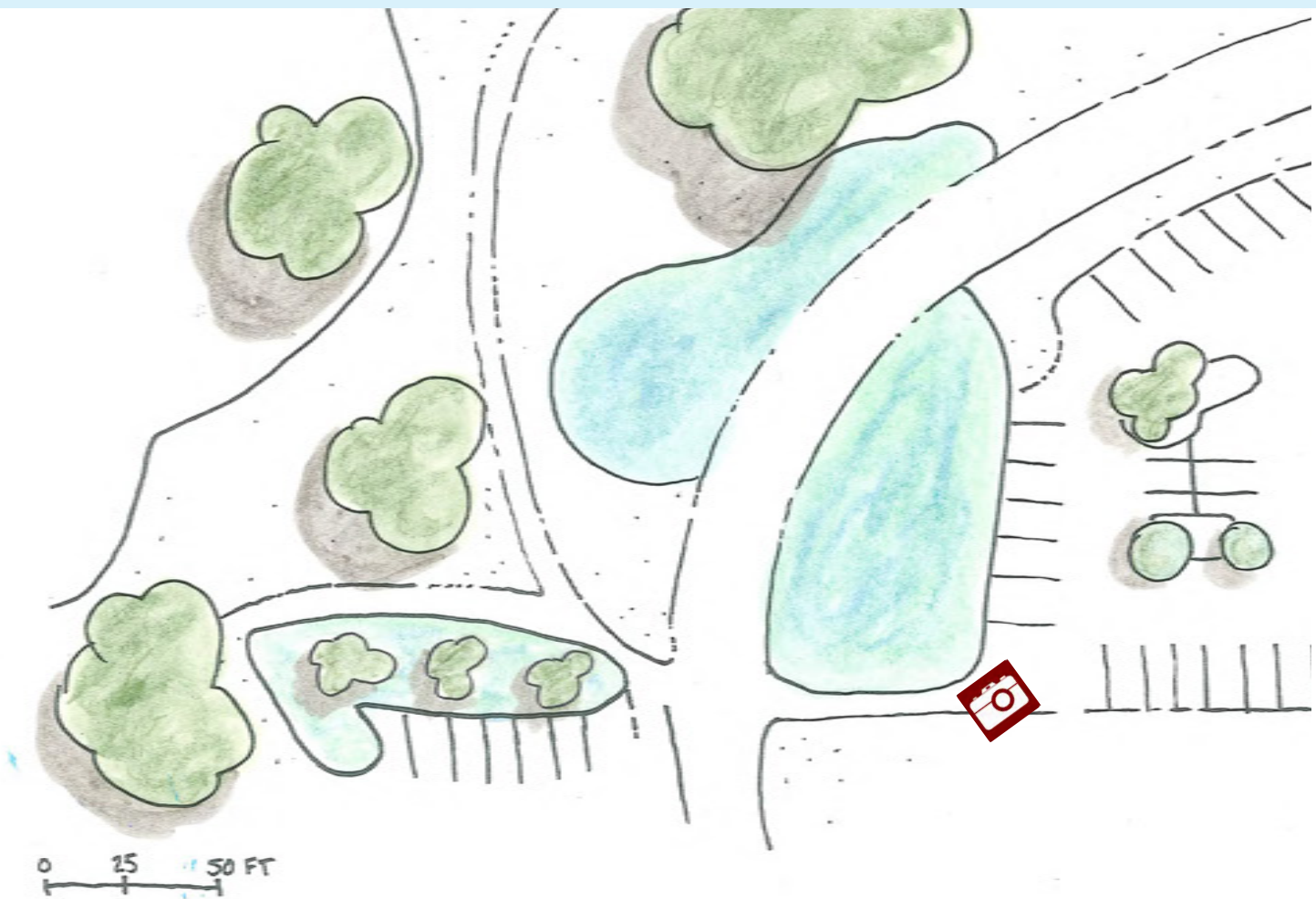
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	15	\$611
Volunteer Labor	8	\$160
Equipment		\$103
Controlled Burns		\$198
Herbicide	0.4	\$13
Contingency (10%)		\$108
SUM		\$1,193

Buhr Park: South Parking Lot

Site Plan

Acres: 0.27
SF: 11,830



NATIVE PLANTS TO LOOK FOR:

Perennials:

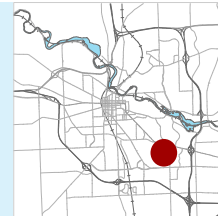
Bee Balm (*Monarda fistulosa*)
Boneset (*Eupatorium perfoliatum*)
Calico Aster (*Symphyotrichum lateriflorum*)
Common Milkweed (*Asclepias syriaca*)
Evening Primrose (*Oenothera biennis*)
Gray-headed Coneflower (*Ratibida pinnata*)
Ironweed (*Vernonia missurica*)
Jumpseed (*Polygonum virginianum*)
Blazing Star (*Solidago aspera*)
Switch Grass (*Panicum virgatum*)

Trees and Shrubs:

Ninebark (*Physocarpus opulifolius*)

Buhr Park: Tennis Court Rain Garden

Approximate Address: 2751 Packard



SW



Year Built: 2012

Designer: Ann Arbor Parks & Recreation

Aesthetic Level Required: Medium

DESCRIPTION:

This swale receives and stores stormwater from the tennis courts. The City of Ann Arbor installed this garden. A controlled burn was conducted in the spring of 2016. NAP will burn this rain garden regularly.

MAINTENANCE NOTES:

Due to a lack of maintenance, this area is heavily infested with invasives like Canada Thistle, Yellow Sweet Clover and Honeysuckle. Cut back standing dead between late fall and early spring.



June 2014

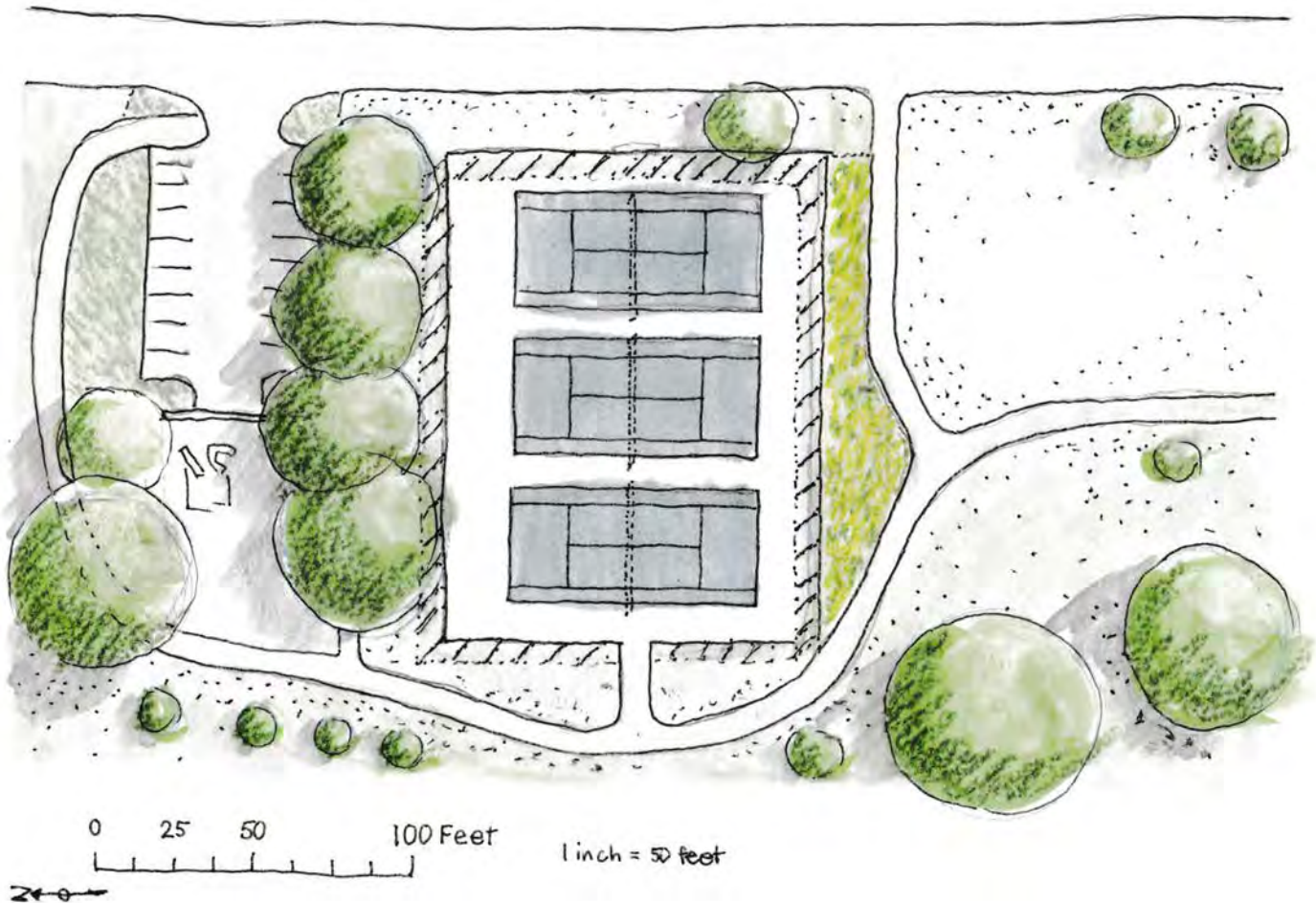
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	15	\$611
Volunteer Labor	7	\$140
Equipment		\$103
Controlled Burns		\$49
Herbicide	0.25	\$9
Contingency (10%)		\$91
SUM		\$1,003

Buhr Park Tennis Court Rain Garden

Site Plan

Acres: 0.07
SF: 2,900



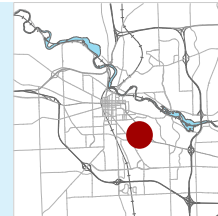
NATIVE PLANTS TO LOOK FOR:

Perennials:

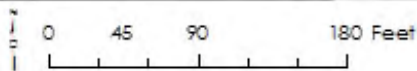
Aster spp.
Bergamot (*Monarda fistulosa*)
Blue Wild Indigo (*Baptisia australis*)
Common Milkweed (*Asclepias syriaca*)
Compass Plant (*Silphium laciniatum*)
Evening Primrose (*Oenothera biennis*)
Fox Sedge (*Carex vulpinoidea*)
Golden Alexander (*Zizia aurea*)
Goldenrod (*Solidago* spp.)
Gray-headed Coneflower (*Ratibida pinnata*)
Green-headed Coneflower (*Rudbeckia laciniata*)
Virginia Wild Rye (*Elymus virginicus*)

Burns Park Petanque Court Rain Garden

Approximate Address: 1300 Baldwin Ave



SW



Year Built: 2008

Designer: Ann Arbor Parks & Recreation

Aesthetic Level Required: High

DESCRIPTION:

This rain garden receives stormwater runoff from the parking lot and the surrounding grass within the park. A controlled burn was conducted in the spring of 2016 by NAP.

MAINTENANCE NOTES:

Make sure mowers are mowing close to the garden's edge. Regularly edge the garden to reduce grass encroachment. Cut back standing dead between late fall and early spring.



July 2014

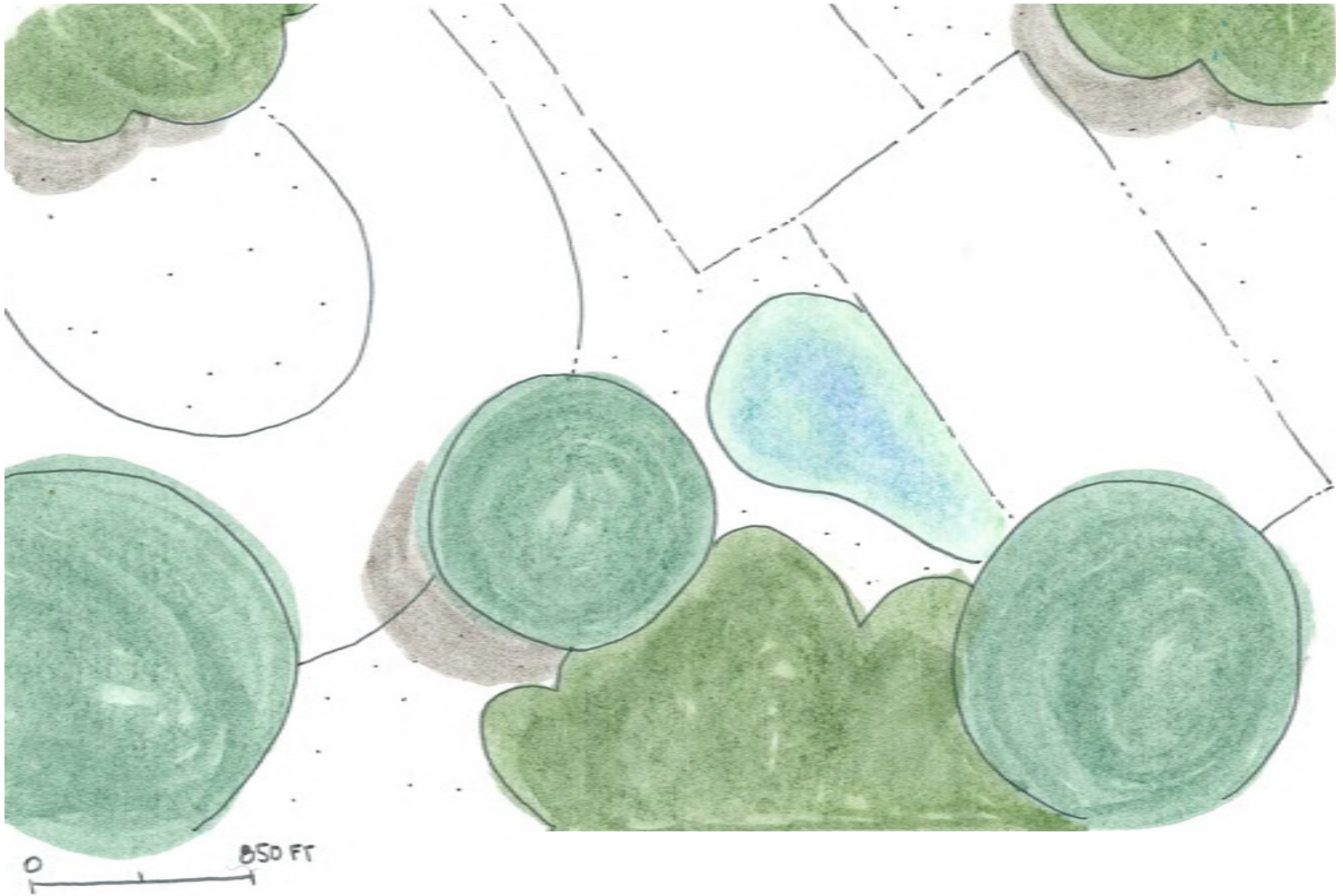
SEASON	ACTIVITY
Spring	Scatter seeds
Summer	
Fall	
Winter	Cut Standing Dead

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	10	\$407
Volunteer Labor		
Equipment		\$87
Controlled Burns		
Herbicide	0.25	\$9
Contingency (10%)		\$50
SUM		\$553

Burns Park Petanque Court Rain Garden

Site Plan

Acres: 0.01
SF: 524



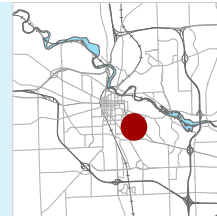
NATIVE PLANTS TO LOOK FOR:

Perennials:

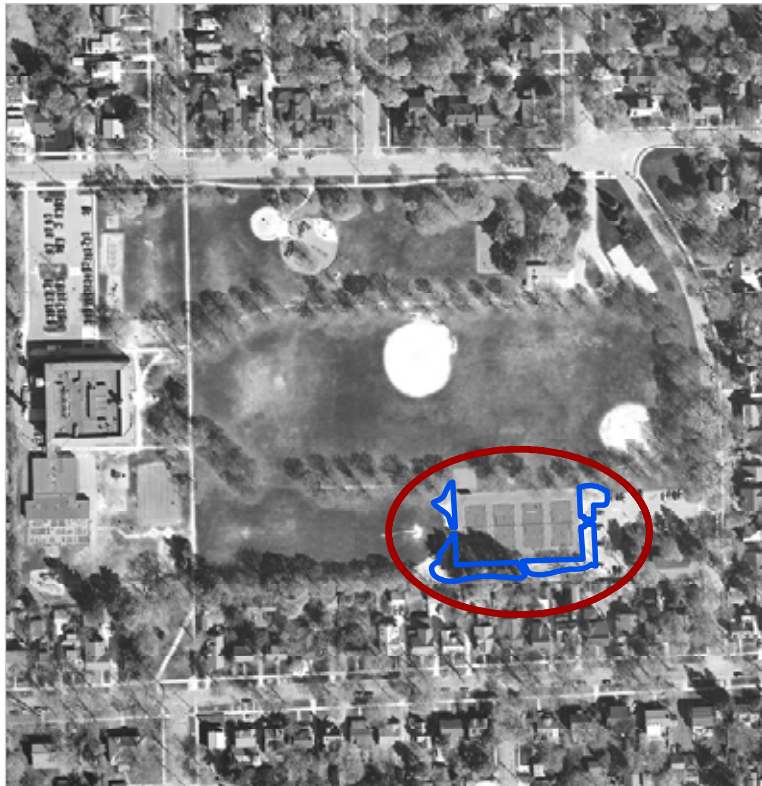
- Black-eyed Susan (*Rudbeckia hirta*)
- Canada Goldenrod (*Solidago canadensis*)
- Columbine (*Aquilegia*)
- Fox Sedge (*Carex vulpinoidea*)
- New England Aster (*Symphyotrichum novae-angliae*)
- Nodding Wild Onion (*Allium cernuum*)
- Sunflower (*Helianthus* sp)
- Wild Strawberry (*Fragaria vesca*)
- White Beardtongue (*Penstemon digitalis*)

Burns Park Tennis Courts Rain Gardens

Approximate Address: 1300 Baldwin Ave



SW



Year Built: 2011

Designer: InSite Design Studio, Inc.

Aesthetic Level Required: High

DESCRIPTION:

This rain garden surrounds three sides of the tennis courts and receives runoff from the court, the surrounding neighborhood, and the Senior Center parking lot. Native, salt tolerant plants were placed on the eastern side because the parking lot is heavily salted. Eastern sections of the rain garden may need to be re-planted on occasion because of heavy salt intake.

MAINTENANCE NOTES:

Natives can be cut back in the early spring to allow for new growth. Invasives include Canada Thistle, Honeysuckle, Field Bindweed, Ragweed and woody saplings like Cottonwood and Walnut.



July 2014

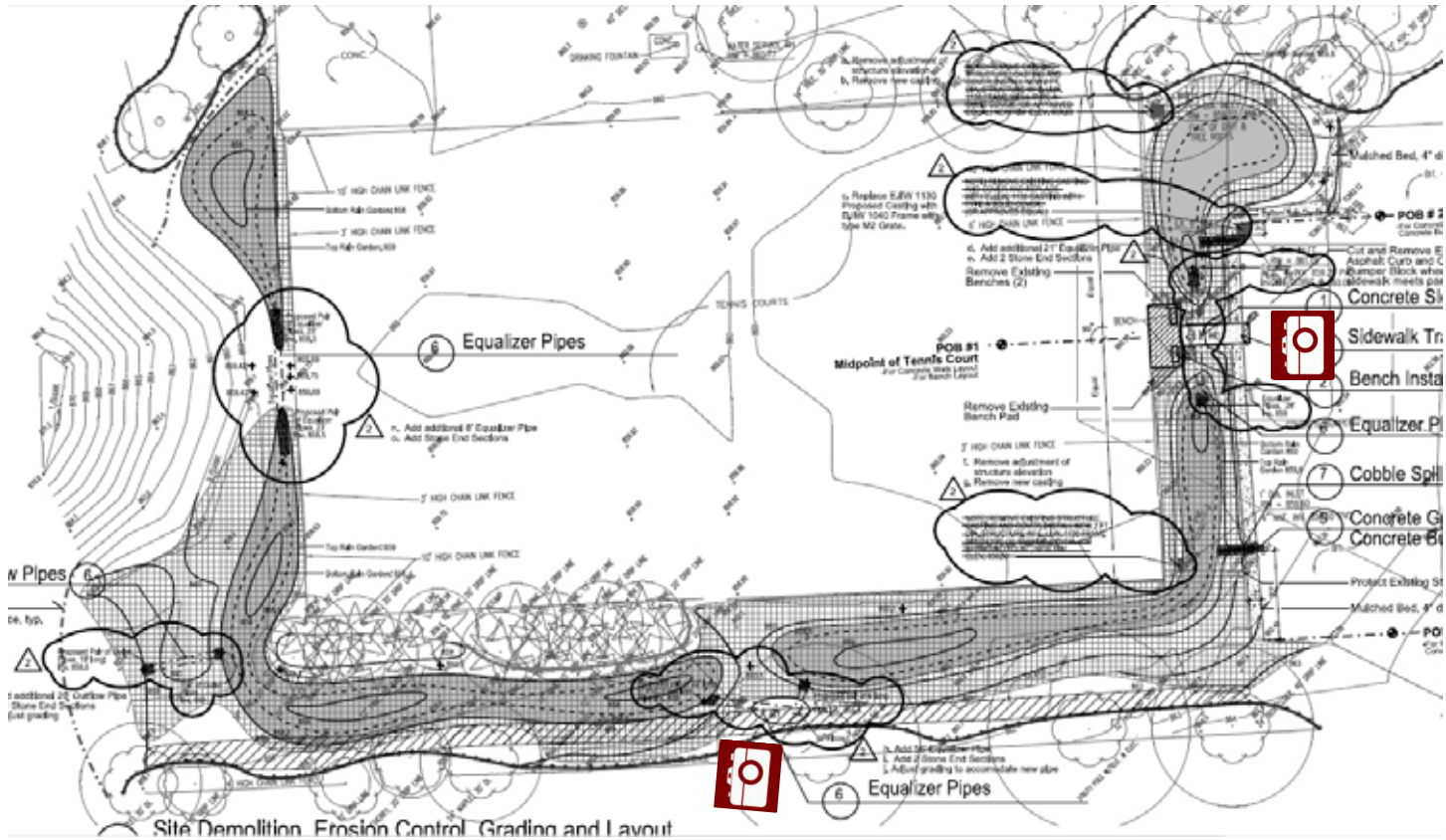
SEASON	ACTIVITY
Spring	Pull: Canada Thistle, Saplings
Summer	Pull: Canada Thistle, Field Bindweed, Ragweed
Fall	
Winter	Cut Standing Dead

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	34	\$1,384
Volunteer Labor	200	\$4,000
Equipment		\$149
Controlled Burns		
Herbicide	0.3	\$13
Contingency (10%)		\$555
SUM		\$6,101

Burns Park Tennis Courts Rain Gardens

Site Plan

Acres: 0.27
SF: 11,724



PLANTS TO LOOK FOR:

Perennials:

Beardtongue (*Penstemon digitalis*)
 Bushy Aster (*Symphotrichum dumosum*)
 Canada Anemone (*Anemone canadensis*)
 Catmint (*Nepeta x faassenii* 'Walker's Low')
 Columbine (*Aquilegia canadensis*)
 Common Milkweed (*Asclepias syriaca*)
 False Sunflower (*Heliopsis helianthoides*)
 Fox Sedge (*Carex vulpinoidea*)
 Great Blue Lobelia (*Lobelia siphilitica*)
 Heart-leaved Aster (*Symphotrichum cordifolium*)
 New England Aster (*Aster nove-angliae* 'Honeysong Pink')
 Ohio Goldenrod (*Oligoneuron ohioense*)
 Prairie Dropseed (*Sporobolus heterolepis*)
 Purple Coneflower (*Echinacea purpurea*)
 Wild Strawberry (*Fragaria virginiana*)
 Turtlehead (*Chelone lyonii* 'Hot Lips')
 Sensitive Fern (*Onoclea sensibilis*)

Shenandoah Switchgrass (*Panicum virgatum*
'Shenandoah')

Sneezeweed (*Helenium autumnale*)

Southern Blue Flag Iris (*Iris virginica*)

Swamp Milkweed (*Asclepias incarnata*)

Switch Grass (*Panicum virgatum*)

Virginia Waterleaf (*Hydrophyllum virginianum*)

Wild Geranium (*Geranium maculatum*)

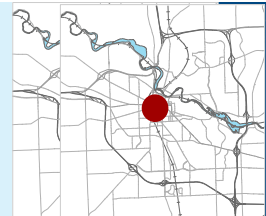
Zig-Zag Goldenrod (*Solidago flexicaulis*)

Shrubs and Trees:

Fragrant Sumac (*Rhus aromatica* 'Gro-low')
Shrubby Cinquefoil (*Potentilla fruticosa* 'Goldfinger')

City Hall Rain Gardens & Green Roof

Approximate Address: 301 E. Huron



SW



0 125 250 500 Feet

Year Built: 2011

Designer: InSite Design Studio, Inc.

Aesthetic Level Required: High

DESCRIPTION:

Throughout the City Hall property, there is a series of rain gardens, swales and green roofs that help store, infiltrate and cool stormwater. Native plants were planted to improve wildlife habitat in the urban setting. Stormwater runoff comes from the building, pathways and parking lot.

MAINTENANCE NOTES:

Regular weeding and infrastructure monitoring is required. Currently, maintenance is done by a landscaping contractor.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

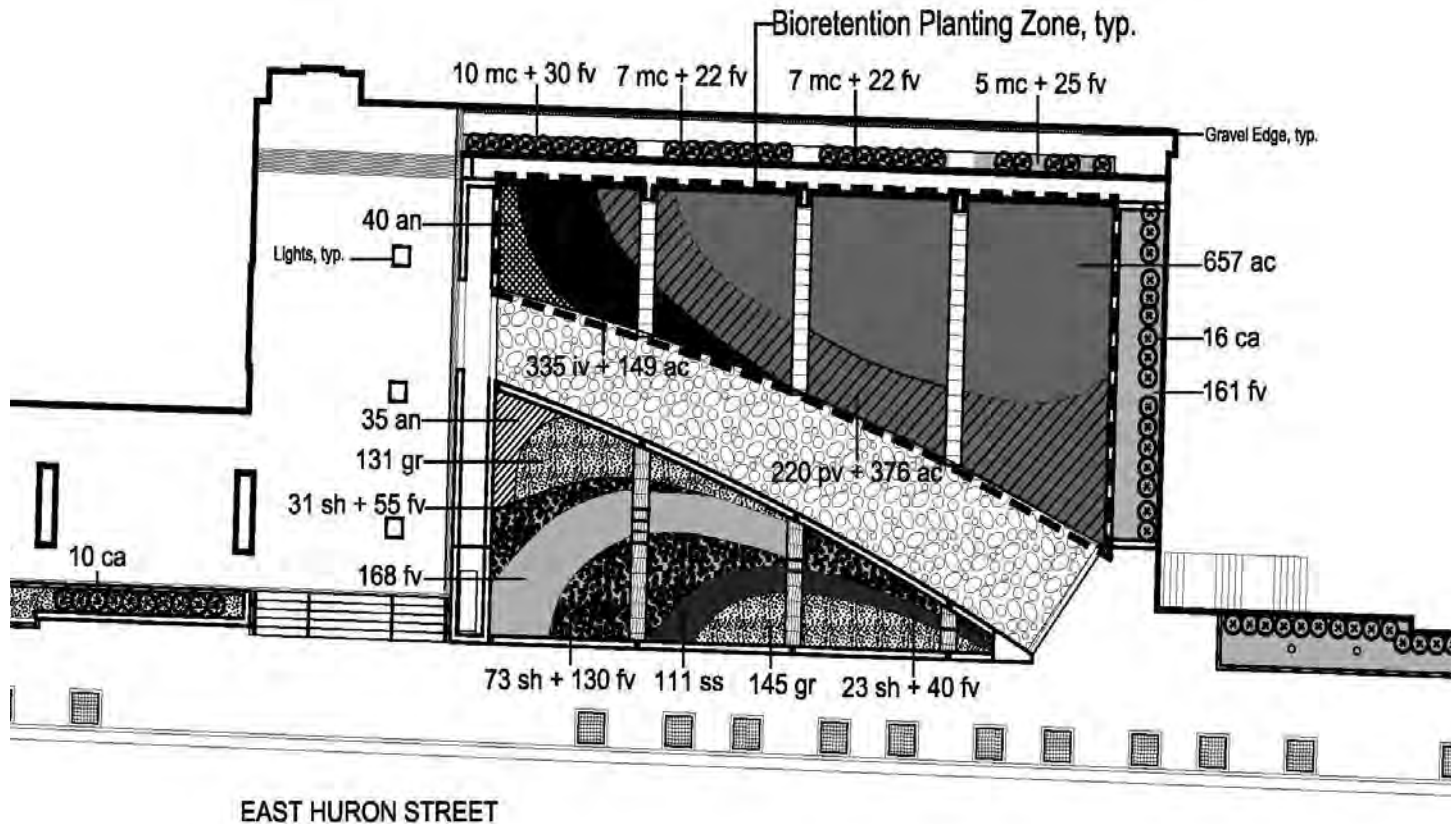
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor		
Volunteer Labor		
Equipment		
Controlled Burns		
Herbicide		
Contingency (10%)		
SUM		

Maintenance cost pending contractor invoice

City Hall Rain Gardens

Site Plan

Acres: 1.3
SF: 56,584



NATIVE PLANTS TO LOOK FOR:

Perennials:

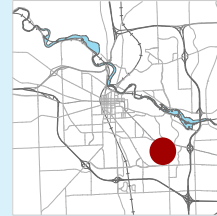
Canada Anemone (*Anemone canadensis*)
Feather Reed Grass (*Calamagrostis x acutiflora*)
Golden Creeping Charley (*Lysmachia nummularia*)
Golden Fleece Goldenrod (*Solidago sphacelata*)
Native Columbine (*Aquilegia canadensis*)
New England Aster (*Aster novae-angliae* 'Purple Dome')
New England Aster (*Iris virginica*)
Prairie Dropseed (*Sporobolus heterolepis*)
Purpleleaf Wintercreeper (*Euonymus fortunei coloratus*)
Rozanne Geranium (*Geranium x 'Rozanne'*)
Shanandoah Switch Grass (*Panicum virgatum*)
Skyracer Moor Grass (*Molinia caerulea* 'Skyracer')
Wild Geranium (*Geranium maculatum*)
Wild Strawberry (*Fragaria virginiana*)

Shrubs and Trees:

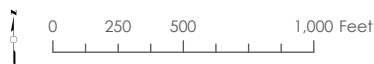
Alpine Currant (*Ribes alpinum*)
Autumn Brilliance Serviceberry (*Amalanchier x grandiflora*, 'Autumn Brilliance')
Eastern Redbud (*Cercis canadensis*)
Climbing Hydrangea ('*Hydrangea anomala petiolaris*)
Dwarf Fothergilla (*Fothergilla gardenii*)
Grow Low Fragrant Sumac (*Rhus aromatica* var 'Grow Low')
Ironwood (*Ostrya virginiana*)
Isanti Red Twig Dogwood (*Cornus sericea* 'Isanti')
Musclewood (*Carpinus caroliniana*)
Northern Red Oak (*Quercus rubra*)
Shademaster Honey Locust (*Gleditsia triacanthos* Inermis 'Shademaster')
Sugar Maple (*Acer saccharum*)
Tulip Tree (*Liriodendron tulipifera*)
Wintergreen Korean Boxwood (*Buxus sinica* var. *insulus* 'Wintergreen')

Cobblestone Farm Rain Garden

Approximate Address: 2781 Packard



SW



Year Built: 2008

Designer: Ann Arbor Parks & Recreation

Aesthetic Level Required: High

DESCRIPTION:

Small, formal rain garden capturing run-off associated with the large barn/ rental facility. Maintained mainly by Master Rain Gardeners, and currently planted with an emphasis on ornamental horticultural plants. This garden can not be burned because of the formal events at Cobblestone Farm.

MAINTENANCE NOTES:

This garden should continue being maintained to look neat and tidy to match the surrounding landscaping. Cut back standing dead between late fall and early spring.



July 2014

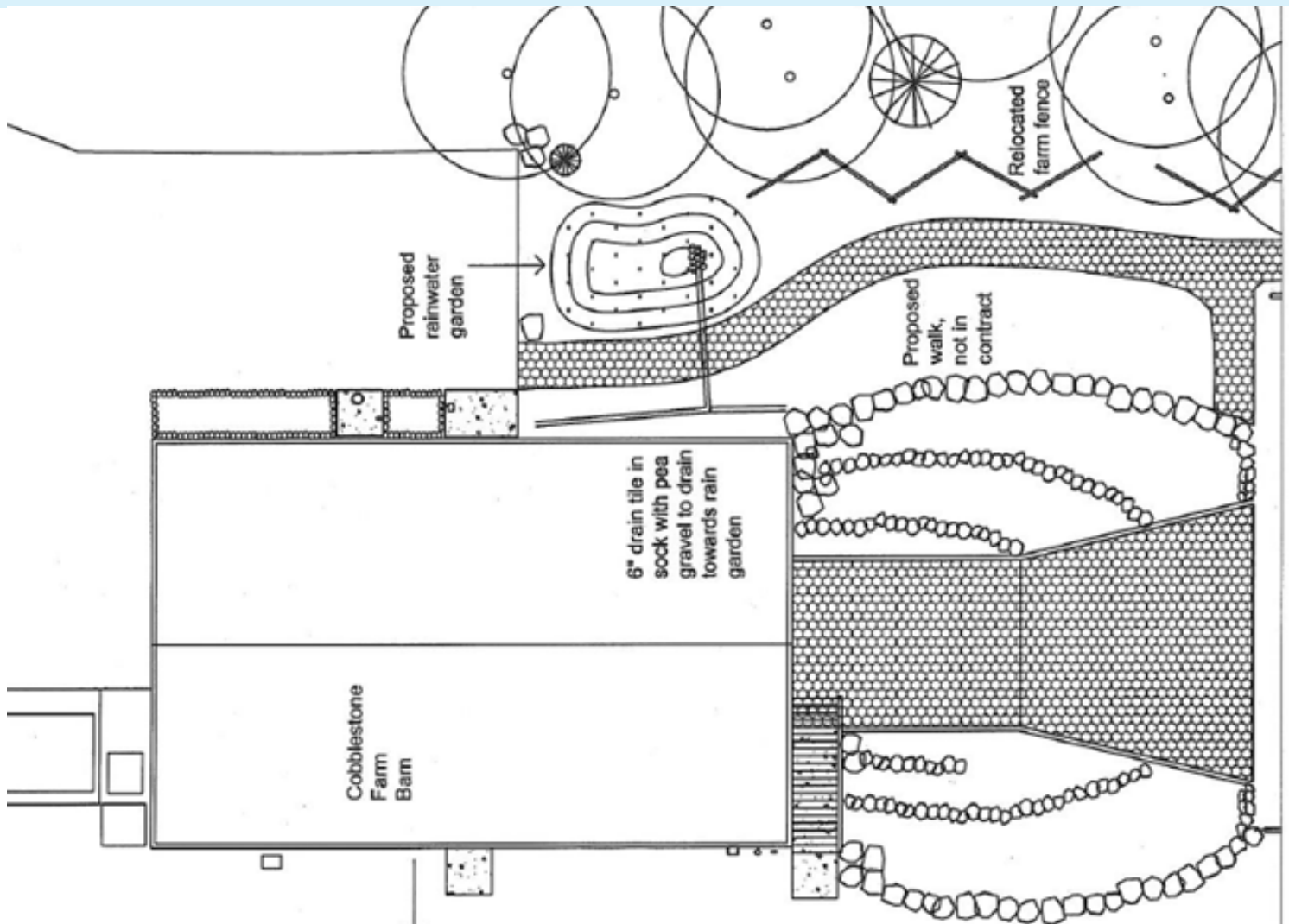
SEASON	ACTIVITY
Spring	
Summer	
Fall	
Winter	Cut Standing Dead

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	14	\$570
Volunteer Labor	20	\$400
Equipment		\$87
Controlled Burns		
Herbicide	0.25	\$9
Contingency (10%)		\$107
SUM		\$1,173

Cobblestone Farm Rain Garden

Site Plan

Acres: 0.03
SF: 1,320



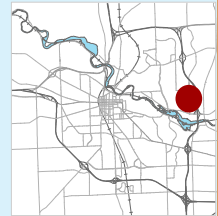
NATIVE PLANTS TO LOOK FOR:

Perennials:

Black Eyed Susan (*Rudbeckia hirta*)
Boneset (*Eupatorium perfoliatum*)
Butterfly Milkweed (*Asclepias tuberosa*)
Canada Wild Rye (*Elmys canadensis*)
Lanceleaf Coreopsis (*Coreopsis lanceolata*)
New England Aster (*Aster novae-angliae*)
Prairie Dock (*Silphium terebinthinaceum*)
Showy Goldenrod (*Solidago speciosa*)
Stiff Goldenrod (*Solidago rigida*)

Earhart Park Detention Basin

Approximate Address: North of 3964 Penberton Dr



SW



Year Built: ~1965

Aesthetic Level Required: Low

DESCRIPTION:

Large detention basin that receives stormwater from the uphill condominiums to the north. Surrounded by thick vegetation, this basin is difficult to see from the sidewalk and hard to access.

MAINTENANCE NOTES:

Invasive species include Buckthorn, Honeysuckle, Garlic Mustard and Phragmites.



August 2016

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Dredge				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	2	\$81.40
Controlled Burns		
Dredge on-site disposal \$40/CY		
Dredge off-site disposal \$70/CY		
Contingency (10%)		
SUM		\$81.40

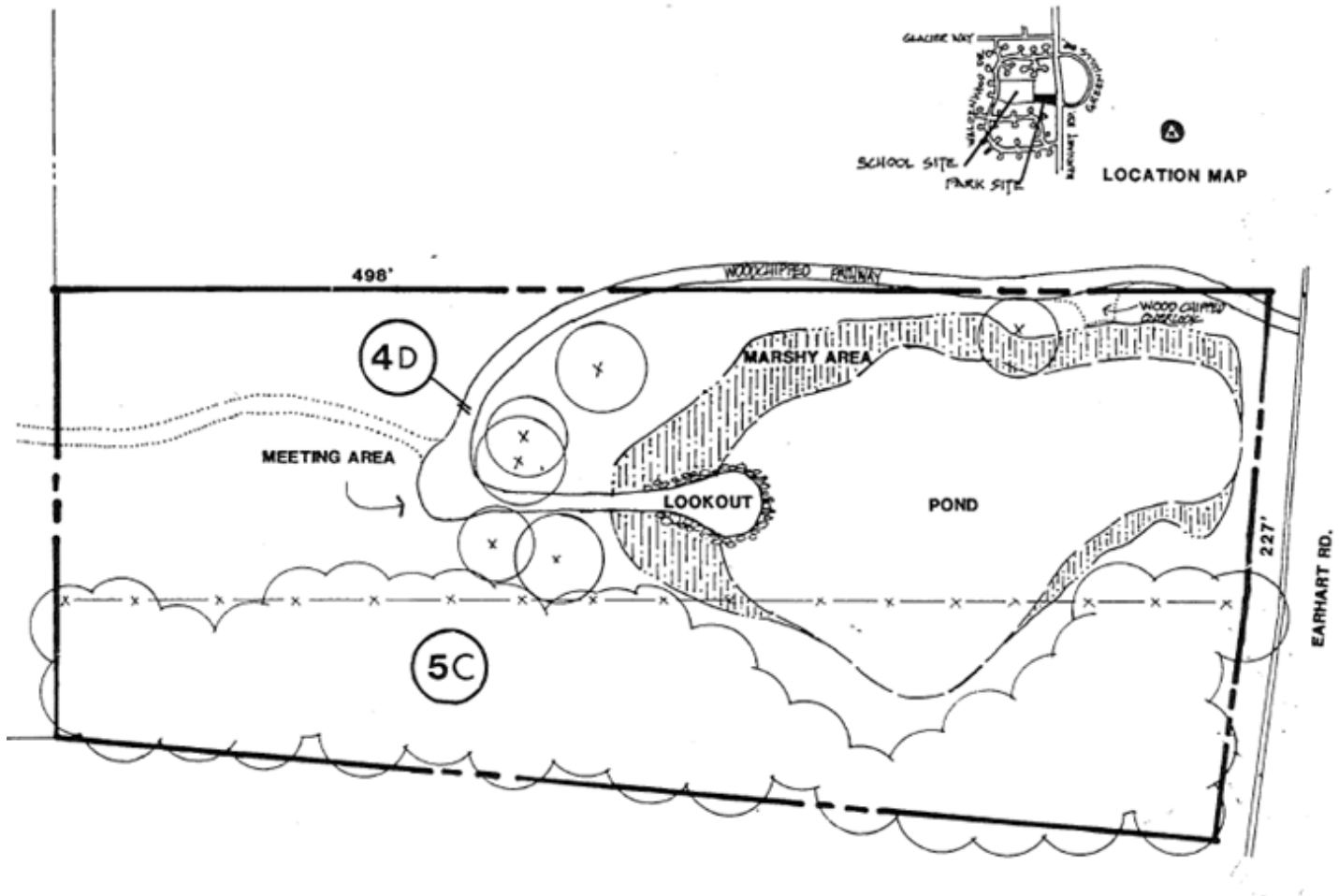
Dredging cost pending

Earhart Park Detention Basin

Site Plan

Acres: 2.23

SF: 97,278



NATIVE PLANTS TO LOOK FOR:

Perennials:

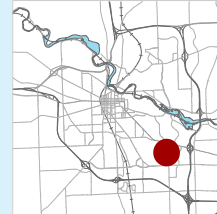
Blue Vervain (*Verbena hastata*)
Buttonbush (*Cephalanthus occidentalis*)
Doll's Eyes (*Actaea pachypoda*)
Goldenrod (*Solidago* spp.)
Rue Anemone (*Anemonella thalictroides*)
Swamp Milkweed (*Asclepias incarnate*)
Swamp White Oak (*Quercus bicolor*)

Trees and Shrubs:

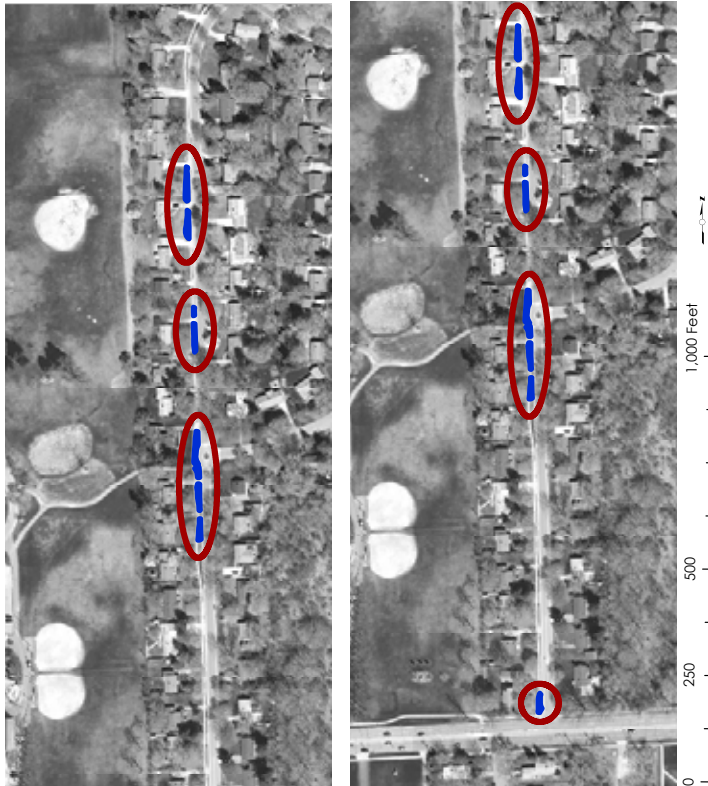
American Elm (*Ulmus americana*)
Eastern Cottonwood (*Populus deltoides*)
Ninebark (*Physocarpus opulifolius*)

Easy Street Rain Gardens

Approximate Address: Easy Street north of Packard



SW



Year Built: 2007

Designer: Pollack Design Associates,
Conservation Design Forum, Cardno JFNew
and Stantec

Aesthetic Level Required: High

DESCRIPTION:

Originally, eight small rain gardens were installed to capture run-off from a newly installed sidewalk and from the road. Pervious pavers line portions of the street.

MAINTENANCE NOTES:

Most of the rain gardens have been filled in, are mowed over and/or unmaintained. Woodyies are present. All the gardens need to be re-graded and/or re-planted.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Dredge				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

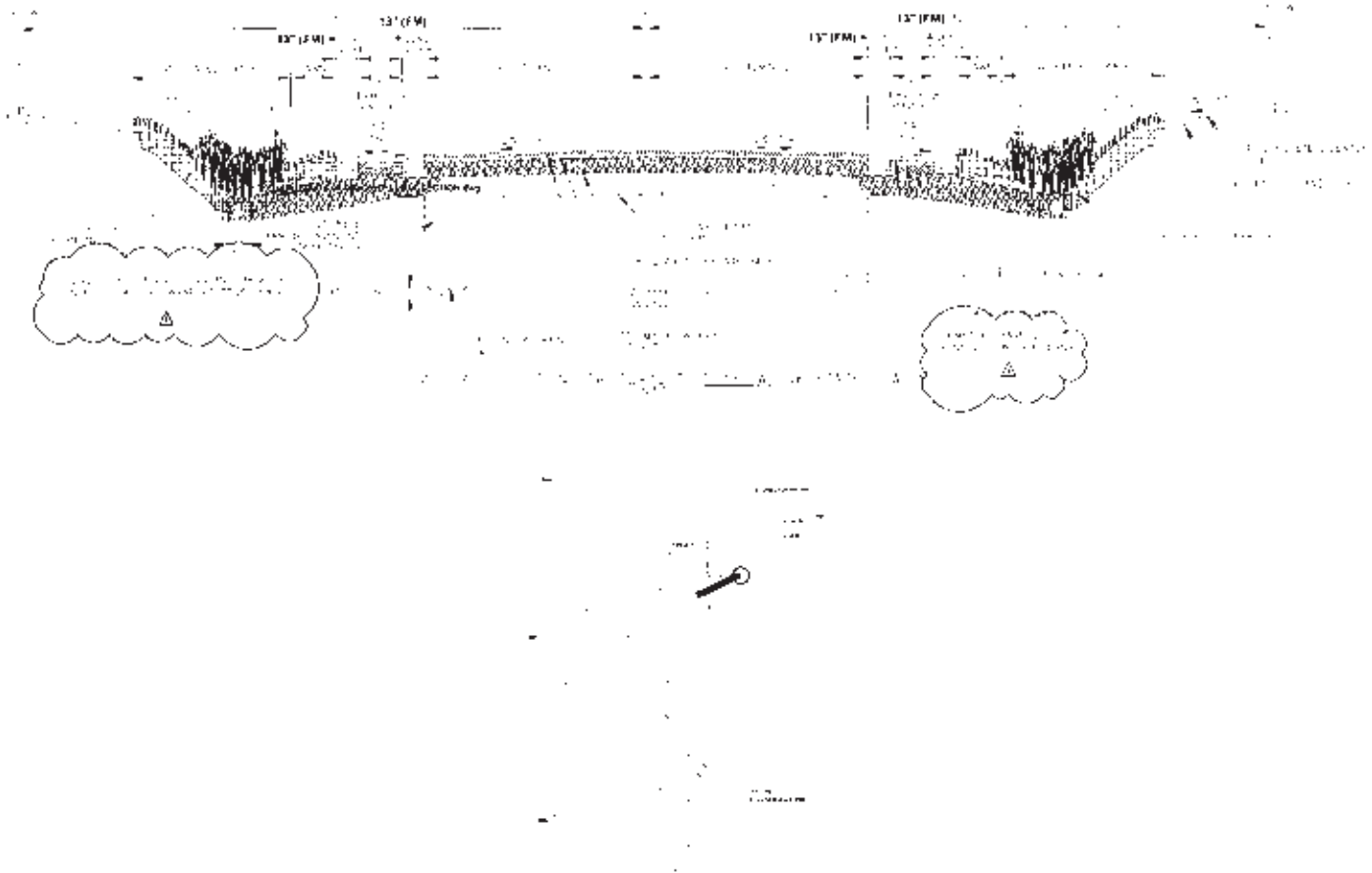
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	2	\$81.40
Volunteer Labor		
Equipment		
Controlled Burns		
Herbicide		
Contingency (10%)		\$8.14
SUM		\$90

Additional maintenance dependent on funding to restore rain garden sites

Easy Street Rain Gardens

Site Plan

Acres: 0.06
SF: 2,761



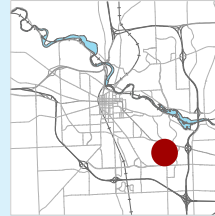
NATIVE PLANTS ORIGINALLY PLANTED:

Perennials:

Blue Vervain (*Verbena hastata*)
Cardinal Flower (*Lobelia cardinalis*)
Fox Sedge (*Carex vulpinoidea*)
Golden Alexanders (*Zizia aurea*)
Great Blue Lobelia (*Lobelia siphilitica*)
Joe Pye Weed (*Eutrochium maculatum*)
Marsh Blazing Star (*Liatris spicata*)
Northern Blue-flag Iris (*Iris versicolor*)
Soft Rush (*Juncus effusus*)
Swamp Aster (*Aster puniceus*)
Swamp Milkweed (*Asclepias incarnata*)
Tussock Sedge (*Carex stricta*)
Wool-Grass (*Scirpus cyperinus*)

Farmer's Market Rain Gardens

Approximate Address: 4th Ave and Detroit Street



SW

Year Built: 2018

Designer:

Aesthetic Level Required: High

DESCRIPTION:

MAINTENANCE NOTES:

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			X
Remove Invasives	X			X
Remove Sediment		X		X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor		
Volunteer Labor		
Equipment		
Controlled Burns		
Herbicide		
Contingency (10%)		
SUM		

Farmer's Market Rain Gardens

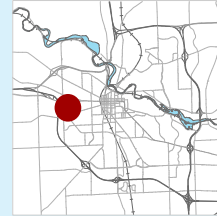
Site Plan

Acres: SF:

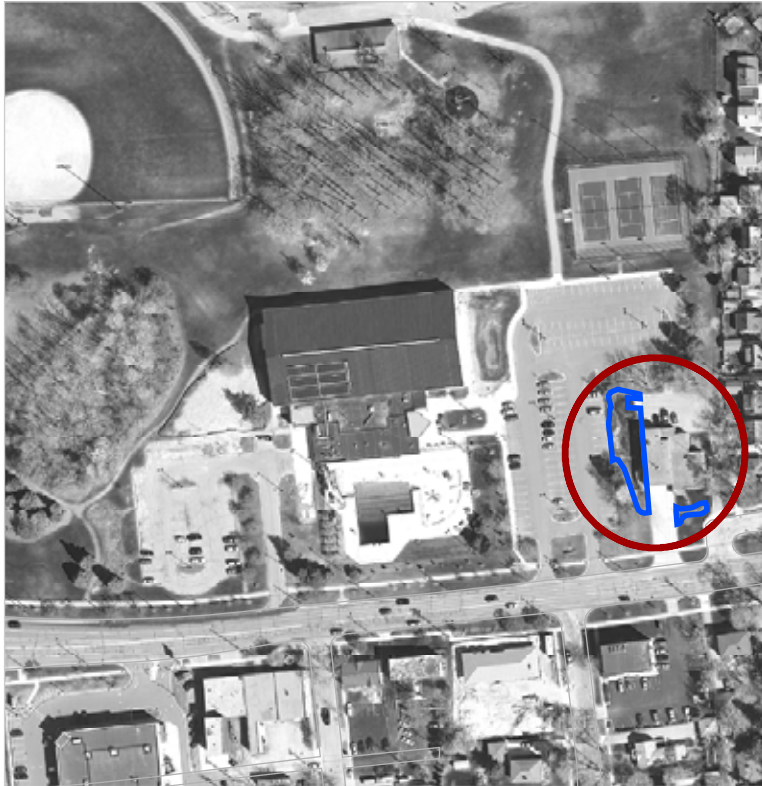
NATIVE PLANTS TO LOOK FOR:
Perennials:

Fire Station 3 Rain Garden

Approximate Address: 2130 Jackson



SW



Year Built: 2011

Designer: InSite Design Studio, Inc.

Aesthetic Level Required: Medium

DESCRIPTION:

This two part rain garden receives water from the roof, parking lot, and driveway of the Fire Station. Curving around the western edge of the station, one rain garden has water entering from the parking lot and roof to the east and the driveway to the south. The second garden takes water from the driveway. A controlled burn was conducted in the spring of 2016 by PlantWise.

MAINTENANCE NOTES:

Persistent wet conditions because of clay soils. Until the driveway is re-graded, water will pool at inlets. Invasives include Canada Thistle, Ragweed, Sow Thistle and Buckthorn. Snow plowers should move snow beyond swale.



May 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

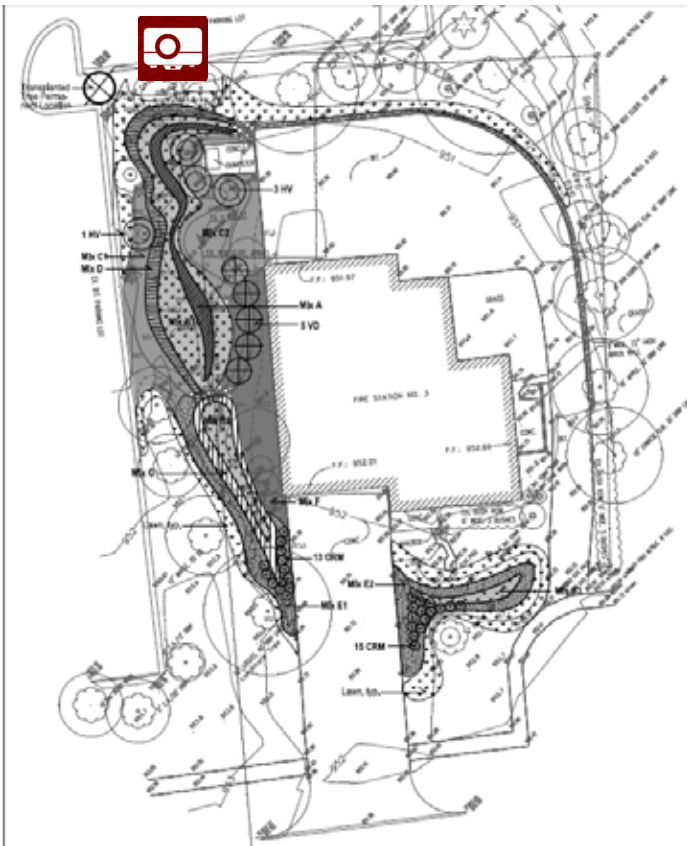
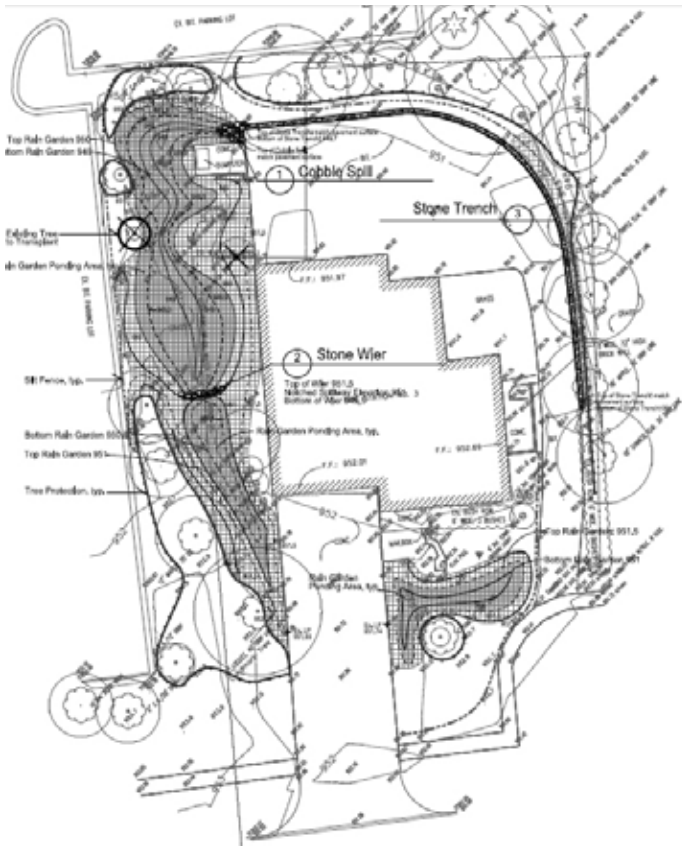
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	18	\$715
Volunteer Labor	25	\$500
Equipment		\$103
Controlled Burns*		\$81
Herbicide	0.25	\$9
Contingency (10%)		\$131
SUM		\$1,539

**per estimate from PlantWise. Burn every three years so cost spread across years*

Firestation 3 Rain Garden

Site Plan

Acres: 0.11
SF: 4,822



NATIVE PLANTS TO LOOK FOR:

Perennials:

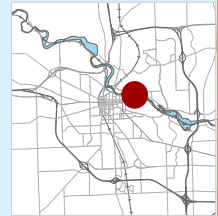
Blue Flag Iris (*Iris virginica*)
Blue Lobelia (*Lobelia siphilitica*)
Butterfly Weed (*Asclepias tuberosa*)
Columbine (*Aquilegia canadensis*)
Canada Anemone (*Anemone canadensis*)
Common Cinquefoil (*Potentilla simplex*)
Fox Sedge (*Carex vulpinoidea*)
Marsh Cinquefoil (*Potentilla palustris*)
Nodding Wild Onion (*Allium cernuum*)
Obedient Plant (*Physostegia virginiana*)
Rose Mallow (*Hibiscus moscheutos*)
Swamp Milkweed (*Asclepias incarnata*)
Wild Geranium (*Geranium maculatum*)
Wild Strawberry (*Fragaria virginiana*)

Shrubs and Trees:

Arrowwood Viburnum (*Viburnum dentatum*)
Eastern Black Walnut (*Juglans nigra*)
Grey Dogwood (*Cornus racemosa*)
Witch Hazel (*Hamamelis virginiana*)

Fuller Road Detention Basin

Approximate Address: Between the intersection of Fuller Road and Fuller Court



SW



Year Built: ~2000

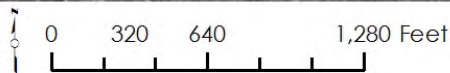
Aesthetic Level Required: Low

DESCRIPTION:

When Fuller Road was reconstructed, this detention basin was built to hold stormwater runoff from the road.

MAINTENANCE NOTES:

Invasives include Teasel, Honeysuckle, Black Locust and Bittercress.



August 2016

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	2	\$81.40
Volunteer Labor		
Equipment		
Controlled Burns		
Herbicide		
Contingency (10%)		
SUM		\$81.40

Fuller Road Detention Basin

Site Plan

Acres: 0.44
SF: 19,084



NATIVE PLANTS TO LOOK FOR:

Perennials:

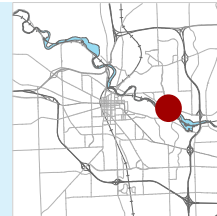
Aster spp.
Goldenrod (*Solidago spp*)
Prairie Cordgrass (*Spartina pectinata*)
Wild Ginger (*Asarum caudatum*)

Shrubs and Trees:

Box Elder (*Acer negundo*)

Furstenberg Rain Garden

Approximate Address: 2626 Fuller Rd.



SW
P



Year Built: 1994

Designer: Pollack Design Associates

Aesthetic Level Required: Medium

DESCRIPTION:

Large rain garden that captures runoff from a paved parking area. This facility has a prairie aesthetic that is appropriate for the natural area setting. NAP will burn regularly.

MAINTENANCE NOTES:

Can be maintained primarily by fire. Invasive species include Yellow Sweet Clover and Buckthorn. Regularly clear sediment from southern inlets.



July 2014

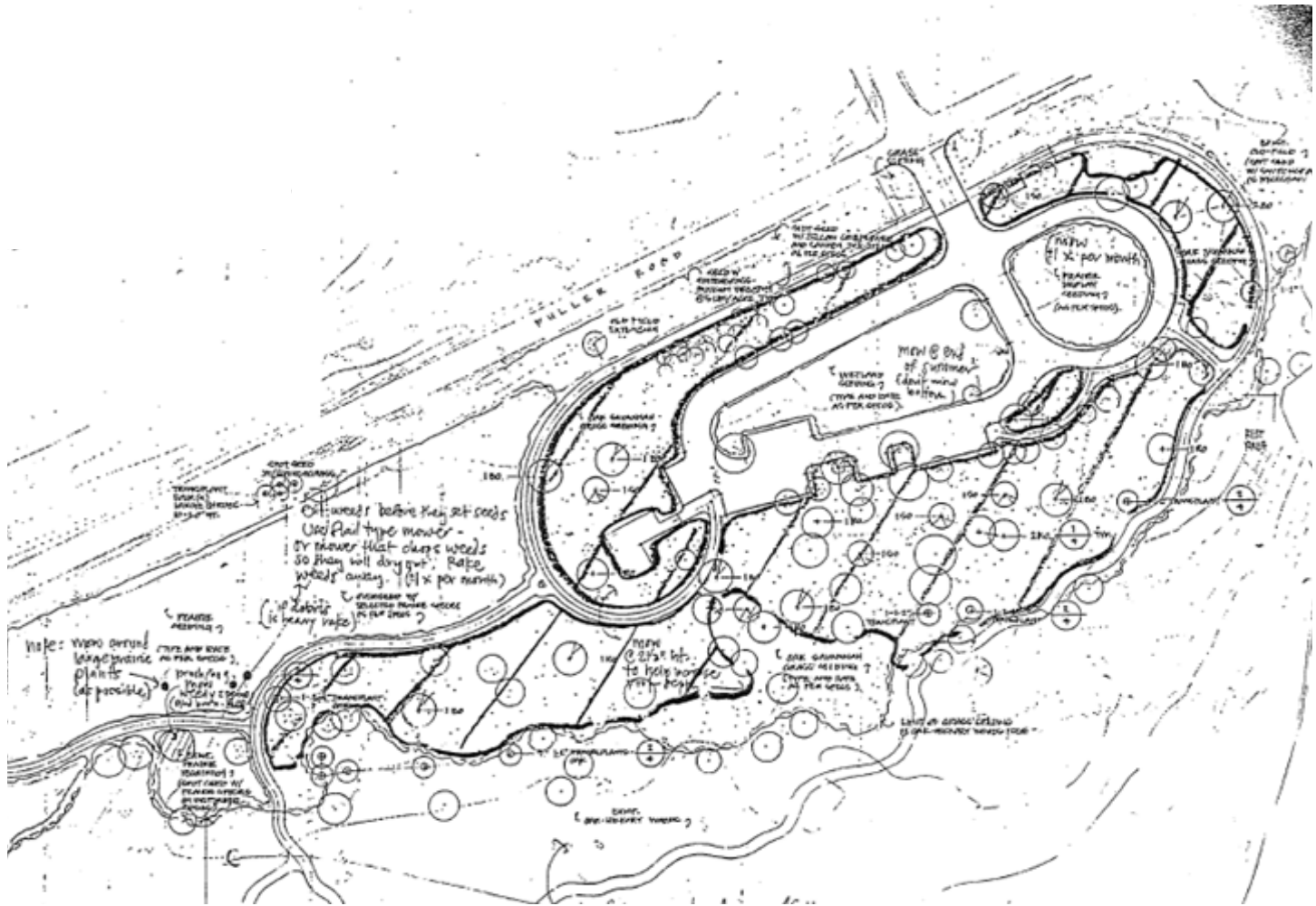
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	12	\$488
Volunteer Labor		
Equipment		\$103
Controlled Burns		\$290
Herbicide	0.5	\$18
Contingency (10%)		\$88
SUM		\$987

Furstenberg Rain Garden

Site Plan

Acres: 0.4
SF: 17,282



NATIVE PLANTS TO LOOK FOR:

Perennials:

Aster spp.
Bergamot (*Monarda fistulosa*)
Big Bluestem (*Adropogon gerardii*)
Common Milkweed (*Asclepias syriaca*)
Blue Vervain (*Verbena hastata*)
Canada Anemone (*Anemone canadensis*)
Golden Alexander (*Zizia aurea*)
Goldenrod (*Solidago* spp)
Gray-headed Coneflower (*Ratibida pinnata*)
Indian Grass (*Sorghastrum nutans*)
Ohio Goldenrod (*Oligoneuron ohioense*)
Rough Blazing Star (*Liatris aspera*)
Slender Mountain Mint (*Pycnanthemum tenuifolium*)
Swamp Milkweed (*Asclepias incarnata*)
Switchgrass (*Panicum* spp)

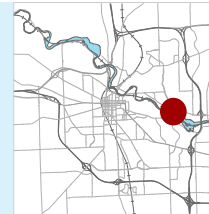
Whorled Milkweed (*Asclepias verticillata*)
Zigzag Goldenrod (*Solidago flexicaulis*)

Shrubs and Trees:

Eastern Red Cedar (*Juniperus virginiana*)
Swamp White Oak (*Quercus bicolor*)

Gallup Park Rain Garden

Approximate Address: 3000 Fuller Rd.



SW



Year Built: 2006

Designer: Ann Arbor Parks & Recreation

Aesthetic Level Required: High

DESCRIPTION:

This small, formal rain garden was rebuilt in 2014. It collects water from the play area and upslope grassy area. The location next to a play area for young children means that pesticide use should be minimized and care should be taken to remove any poisonous weeds.

MAINTENANCE NOTES:

The adjacent sandbox may be a source of sediment build-up. Invasive Field Bindweed exists but the area is otherwise weed free. Cut back standing dead between late fall and early spring.



July 2014

SEASON	ACTIVITY
Spring	Pull: Field Bindweed; Remove sediment
Summer	
Fall	
Winter	Cut Standing Dead

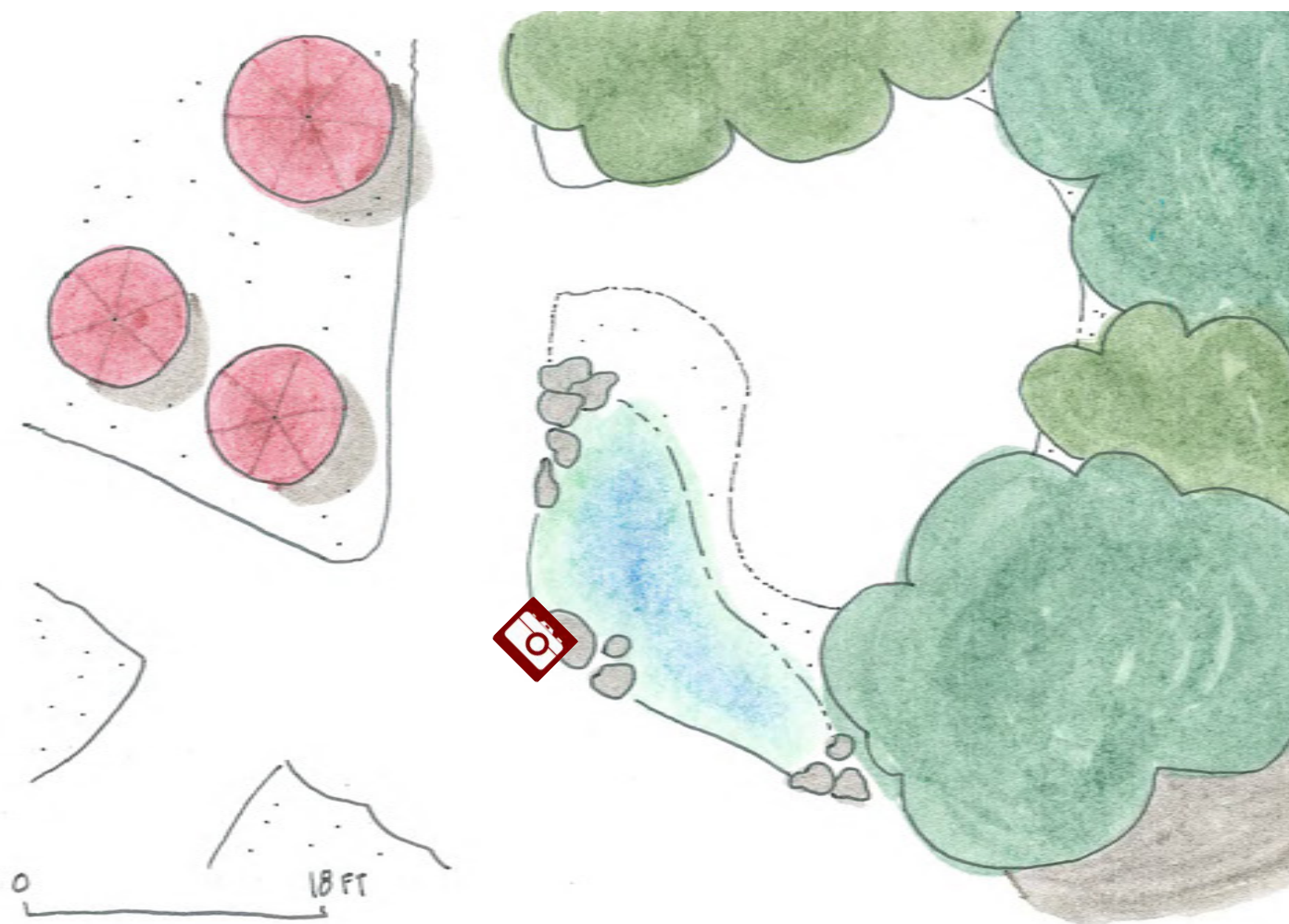
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	15	\$611
Volunteer Labor	15	\$300
Equipment		\$87
Controlled Burns		\$8
Herbicide		
Contingency (10%)		\$101
SUM		\$1,107

Gallup Park Rain Garden

Site Plan

Acres: 0.01

SF: 500



NATIVE PLANTS TO LOOK FOR:

Perennials

Black-eyed Susan (*Rudbeckia hirta*)
Blue Flag Iris (*Iris versicolor*)
Calico Aster (*Aster lateriflorus*)
Canada Anemone (*Anemone canadensis*)
False Sunflower (*Heliopsis helianthoides*)
Foxglove Beard-tongue (*Penstemon digitalis*)
Golden Alexander (*Zizia aurea*)
Gold Finger (*Potentilla fruticosa*)
Great Blue Lobelia (*Lobelia siphilitica*)
Husker Red (*Penstemon digitalis*)
Indian Grass (*Sorghastrum nutans*)
Mountain Mint (*Pycnanthemum virginianum*)
Penstemon digitalis
Sneezeweed (*Helenium autumnale*)
Spiderwort (*Tradescantia ohimensis*)
Stiff Goldenrod (*Solidago rigida*)

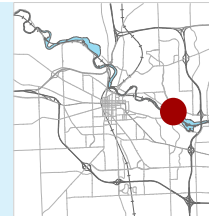
Switchgrass (*Panicum virgatum* 'Shenandoah')
Tall beggar ticks (*Bidens vulgate*)
Wild Bergamot (*Monarda fistulosa*)
Wild Strawberry (*Fragaria virginiana*)
White Swan Coneflower (*Echinacea purpurea*)

Shrubs and Trees:

Goldfinger Potentilla (*Potentilla fruticosa* 'Goldfinger')

Gallup Park River Rain Gardens

Approximate Address: 3000 Fuller Rd.



SW



Year Built: 2017

Designer: Ann Arbor Parks & Recreation
SmithGroup JJR

Aesthetic Level Required: High

DESCRIPTION:

pending

MAINTENANCE NOTES:

pending



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment		X		
Controlled Burns				X
Herbicide				
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor		
Volunteer Labor		
Equipment		
Controlled Burns		
Herbicide		
Contingency (10%)		
SUM		

Acres: 0.01
SF: 500

NATIVE PLANTS TO LOOK FOR:

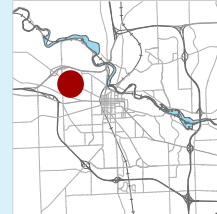
Perennials

Blue Flag Iris (*Iris virginicus*)
Dark Green Bulrush (*Scirpus atrovirens*)
Foxtail Sedge (*Carex vulpinoidea*)
'Prairie Sky' Switch Grass (*Panicum virgatum* 'Prairie Sky')
Virginia Wild Rye (*Elymus virginicus*)

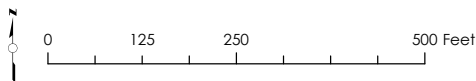


Garden Homes Park Rain Garden

Approximate Address: East of 2350 Miller Ave



SW



Year Built: 2013

Designer: Susan Bryan & Chris Carson, City of Ann Arbor

Aesthetic Level Required: Medium

DESCRIPTION:

This rain garden is located in a section of Garden Homes park, which is a series of small parcels. The rain garden receives water from Miller Ave and was designed along with the road reconstruction. A pathway leads from Franklin St, through the rain garden to Miller Ave. This garden was burned in '18.

MAINTENANCE NOTES:

Invasive species include Phragmites, Purple Loosestrife, Buckthorn, Yellow Sweet Clover and Canada Thistle. Invasives are abundant. Vegetation should be cut back along the sidewalk and as needed along the pathway.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

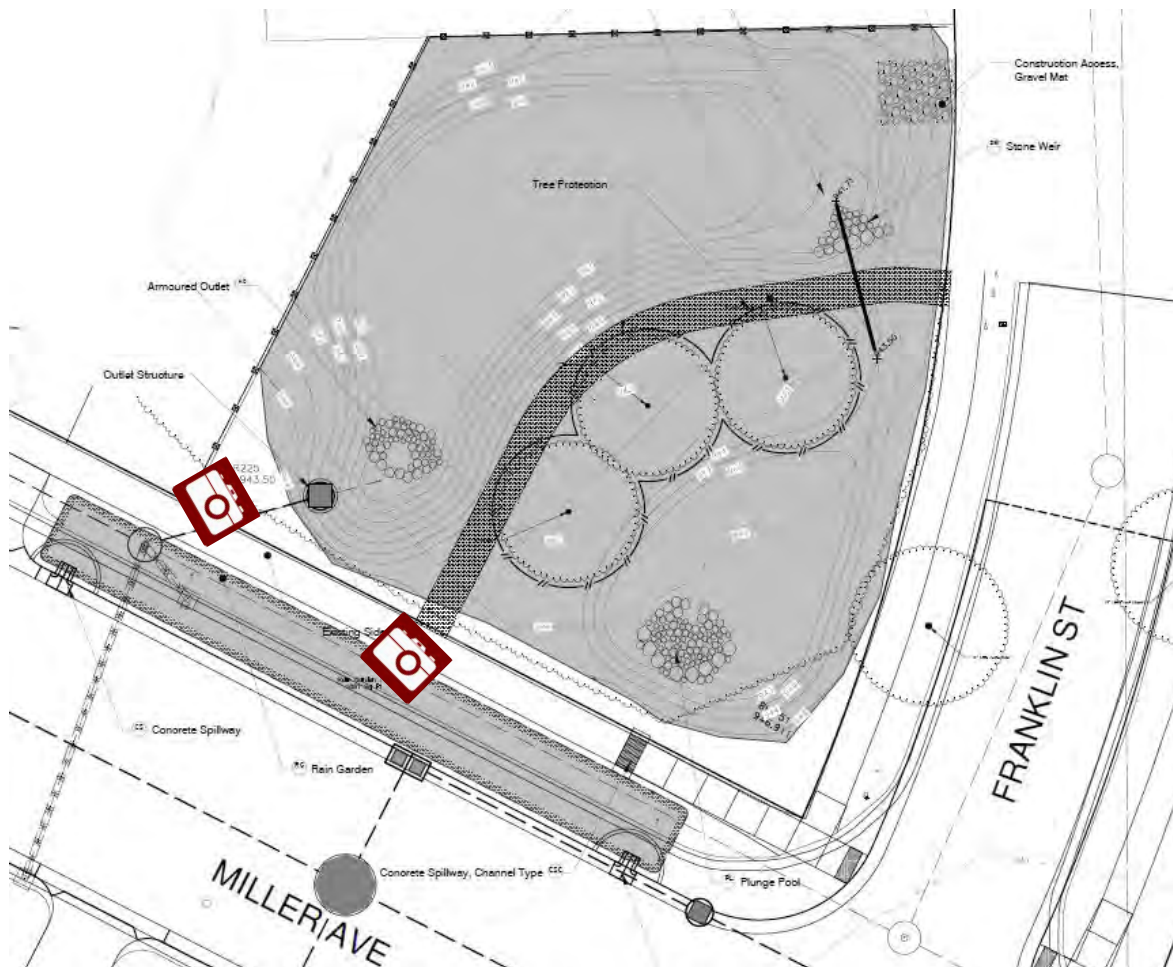
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	25	\$1,018
Volunteer Labor	45	\$900
Equipment		\$118
Controlled Burns*		\$150
Herbicide	0.25	\$9
Contingency (10%)		\$222
SUM		\$2,417

*per estimate from PlantWise. Burn every three years so cost spread across years

Garden Homes Park Rain Garden

Site Plan

Acres: 0.19
SF: 8,223



NATIVE PLANTS TO LOOK FOR:

Perennials:

Big Bluestem (*Andropogon gerardii*)
Black Eyed Susan (*Rudbeckia hirta*)
Butterfly Weed (*Asclepias tuberosa*)
Canada Anemone (*Anemone canadensis*)
Culver's Root (*Veronicastrum virginicum*)
Common Cinquefoil (*Potentilla simplex*)
Fox Sedge (*Carex vulpinoidea*)
Foxtail Sedge (*Carex alopecoidea*)
Indian Grass (*Sorghastrum nutans*)
Little Bluestem (*Schizachyrium scoparium*)
Muskingum Sedge (*Carex muskingumensis*)
New England Aster (*Aster novae-angliae*)
Nodding Wild Onion (*Allium cernuum*)
Prairie Heart Leaved Aster (*Symphyotrichum oolentangiense*)

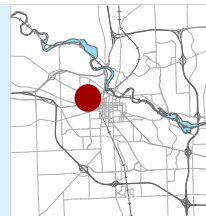
Rose Mallow (*Hibiscus moscheutos*)
Smooth Aster (*Symphyotrichum laeve*)
Southern Blue Flag Iris (*Iris virginica*)
Spiderwort (*Tradescantia ohiensis*)
Swamp Buttercup (*Ranunculus hispidus*)
Switchgrass (*Panicum virgatum*)
Tall Flat Top White Aster (*Doellingeria umbellata*)
Wild Strawberry (*Fragaria virginica*)

Shrubs and Trees:

Shagbark Hickory (*Carya ovata*)

Hunt Park Naturalized Wet Area

Approximate Address: 1035 Daniel St.



SW



Year Built: 2010

Designer: Ann Arbor Parks & Recreation

Aesthetic Level Required: Medium

DESCRIPTION:

Small wet area just downslope of a play area, has been naturalized by planting native species because it is usually too wet to mow. The water source appears to be a groundwater seep, rather than significant stormwater runoff. A controlled burn was conducted in the spring of 2016 by NAP.

MAINTENANCE NOTES:

Weed regularly and make sure mowers are creating a clean line around natives. Edge regularly to reduce turf grass encroachment. Cut back standing dead between late fall and early spring.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	18	\$733
Volunteer Labor	20	\$400
Equipment		\$118
Controlled Burns		\$9
Herbicide	0.25	\$9
Contingency (10%)		\$127
SUM		\$1,396

Hunt Park Naturalized Wet Area

Site Plan

Acres: 0.01
SF: 555



NATIVE PLANTS TO LOOK FOR:

Perennials:

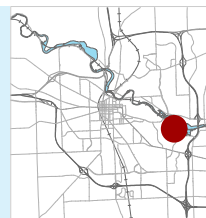
Bebb's Sedge (*Carex bebbii*)
Blue Vervain (*Verbena hastata*)
Bulrush (*Scirpus atrovirens*)
Cow Parsnip (*Heracleum maximum*)
Fox Sedge (*Carex vulpinoidea*)
Foxglove Beard-tongue (*Penstemon digitalis*)
Golden Ragwort (*Senecio aurea*)
Gray's sedge (*Carex grayi*)
Great Blue Lobelia (*Lobelia siphilitica*)
Ironweed (*Vernonia fasciculata*)
Mad-dog Skullcap (*Scutellaria lateriflora*)
Missouri Ironweed (*Vernonia missurica*)
Mountain Mint (*Pycnanthemum virginianum*)
New England Aster (*Aster novae-angliae*)
Riddell's Goldenrod (*Solidago riddellii*)

Soft-stemmed bulrush (*Juncus effusus*)
Southern Blue Flag Iris (*Iris virginica*)
Swamp Goldenrod (*Solidago patula*)
Swamp Milkweed (*Asclepias incarnata*)
Swamp Thistle (*Cirsium muticum*)
Tall Meadow-rue (*Thalictrum dasycarpum*)
Tussock Sedge (*Carex stricta*)
Wild Senna (*Cassia hebecarpa*)
Black Willow (*Salix nigra*)

Huron Hills Golf Course

Rain Garden

Approximate Address: 3465 E. Huron River Drive



SW



Year Built: 2009

Designer: Mike Appel

Aesthetic Level Required: High

DESCRIPTION:

Small rain garden, originally built as a demonstration project. Collects runoff from a maintenance shed and gravel parking area. A controlled burn was conducted in the spring of 2013 by NAP. Since the garden was mulched in 2015, it can't be burned until the mulch has completely decomposed. This will likely be in 2018.

MAINTENANCE NOTES:

This garden is adjacent to a golf course, and therefore should look attractive. It currently has few weeds. Cut back standing dead between late fall and early spring.



July 2014

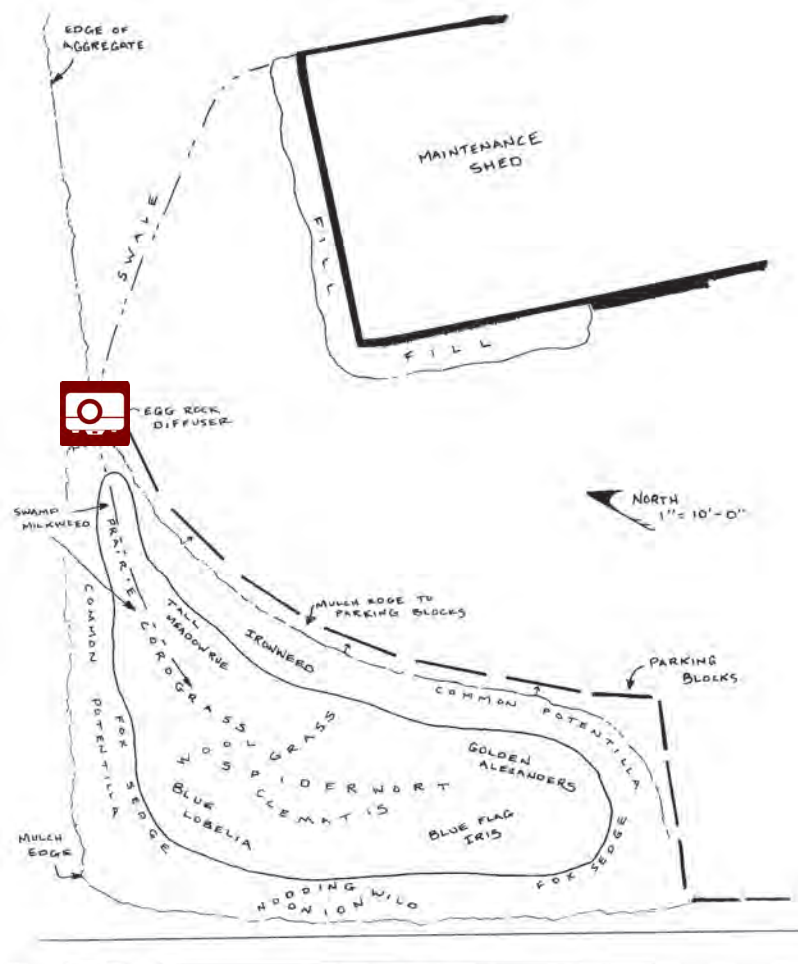
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment		X		
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	15	\$611
Volunteer Labor	15	\$300
Equipment		\$87
Controlled Burns		\$23
Herbicide	0.25	\$9
Contingency (10%)		\$103
SUM		\$1,133

Huron Hills Golf Course Rain Garden

Site Plan

Acres: 0.03
SF: 1,328



NATIVE PLANTS TO LOOK FOR:

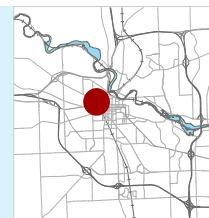
Perennials:

Blue Flag Iris (*Iris versicolor*)
Blue Lobelia (*Lobelia siphilitica*)
Common Cinquefoil (*Potentilla simplex*)
Common Evening Primrose (*Oenothera biennis*)
Fox Sedge (*Carex vulpinoidea*)
Golden Alexanders (*Zizia aurea*)
New England Aster (*Aster novae-angliae*)
New York Ironweed (*Vernonia noveboracensis*)
Nodding Wild Onion (*Allium cernuum*)
Prairie Cordgrass (*Spartina pectinata*)
Small-headed Sunflower (*Helianthus microcephalus*)
Snowbank False Aster (*Boltonia asteroides*)
Spiderwort (*Tradescantia ohimensis*)
Swamp Milkweed (*Asclepias incarnata*)
Tall Meadowrue (*Thalictrum sp.*)

Tall Sunflower (*Helianthus giganteus*)
Virgin's Bower (*Clematis virginiana*)
Wool Grass (*Scirpus cyperinus*)
Yellow Coneflower (*Ratibida pinnata*)

Kingsley & 1st Rain Garden

Approximate Address: 219 W. Kingsley



SW



Year Built: 2014

Designer: Conservation Design Forum

Aesthetic Level Required: High

DESCRIPTION:

Built on a site from which an abandoned home was removed, this garden features a sculptures of fish created by the artist, Josh Weiner. The lot is now a pocket park. Stormwater flows over land from the surrounding neighborhood. A controlled burn was conducted in the spring of 2016 by PlantWise.

MAINTENANCE NOTES:

Vegetation should be trimmed away from the path occasionally. Grass along the edges is mowed by the City. Invasives include Sow Thistle and Cottonwood saplings but are sparse.



August 2014

SEASON	ACTIVITY
Spring	
Summer	Pull: Sow Thistle, Saplings; Cut: Yellow Clover
Fall	Dig out Buckthorn; Collect Seeds
Winter	Cut Standing Dead

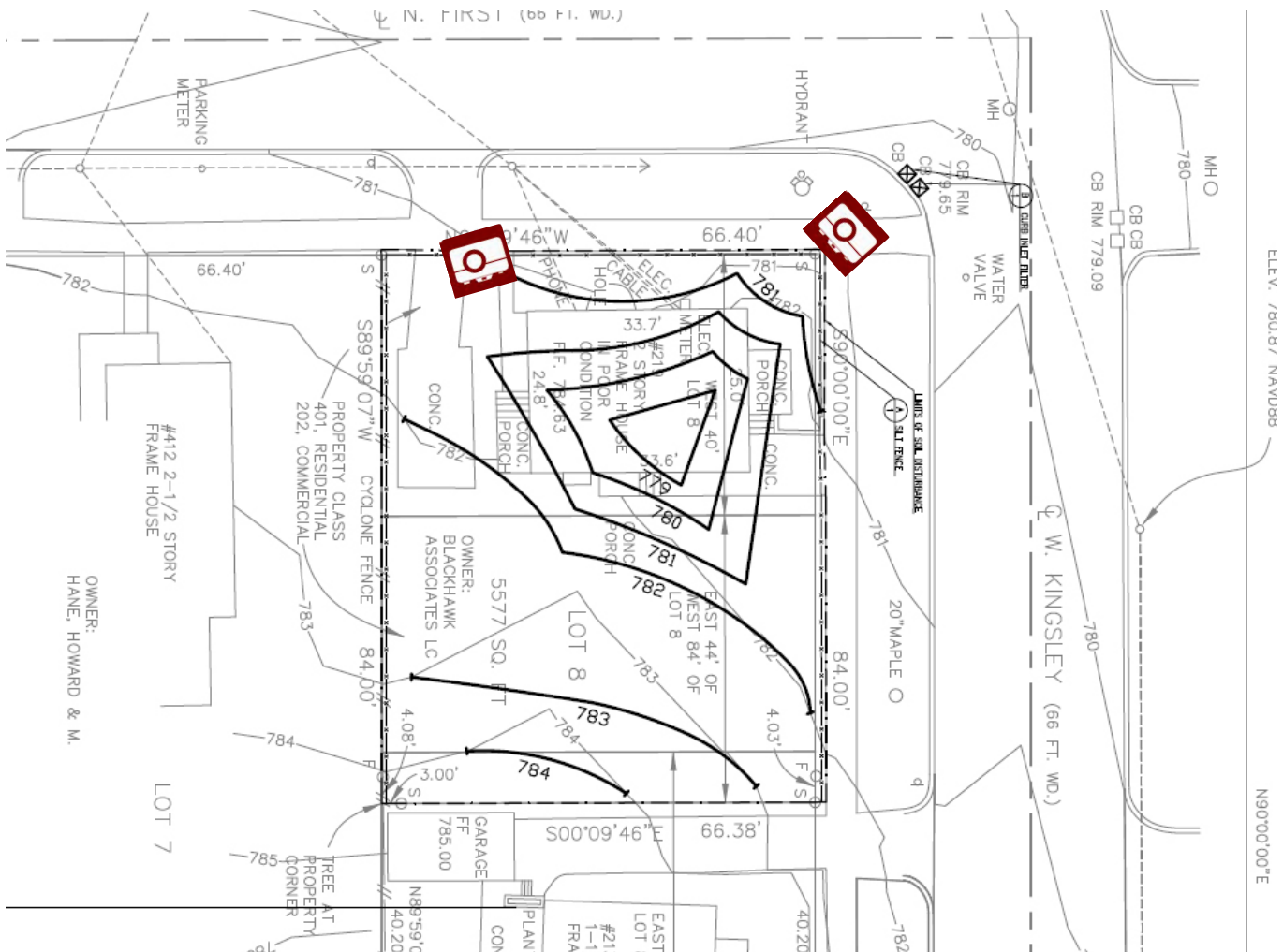
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	28	\$1,140
Volunteer Labor	40	\$800
Equipment		\$118
Controlled Burns		\$34
Herbicide	0.25	\$9
Contingency (10%)		\$210
SUM		\$2,311

**per estimate from PlantWise. Burn every three years so cost spread across years*

Kingsley & 1st Rain Garden

Site Plan

Acres: 0.05
SF: 2,000



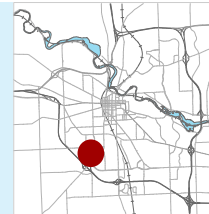
NATIVE PLANTS TO LOOK FOR:

Perennials:

- Beardtongue (*Penstemon digitalis*)
- Black Eyed Susan (*Rudbeckia fulgida*)
- Blazing Star (*Liatris spicata*)
- Blue Vervain (*Verbena hastata*)
- Boneset (*Eupatorium perfoliatum*)
- Canadian Anemone (*Anemone canadensis*)
- Cup Plant (*Silphium perfoliatu*)
- Fox Sedge (*Carex vulpinoidea*)
- Little Bluestem (*Schizachyrium scoparium*)
- Prairie Dock (*Silphium terbinthinaceum*)
- Purple Coneflower (*Echinacea purpurea*)
- Riddell's Goldenrod (*Oligoneuron riddellii*)
- Yellow Coneflower (*Ratibida pinnata*)

Lansdowne Park Rain Garden

Approximate Address: Lans Way at Ascot Rd.



SW



Year Built: 2007

Designer: Susan Bryan, City of Ann Arbor

Aesthetic Level Required: High

DESCRIPTION:

This rain garden takes runoff from the asphalt walkway, the neighbor's back yards, and an underground spring. The garden easily blends into the natural plantings surrounding it.

MAINTENANCE NOTES:

Stays wet all winter due to groundwater, so only plants who can take standing water will survive.



June 2014

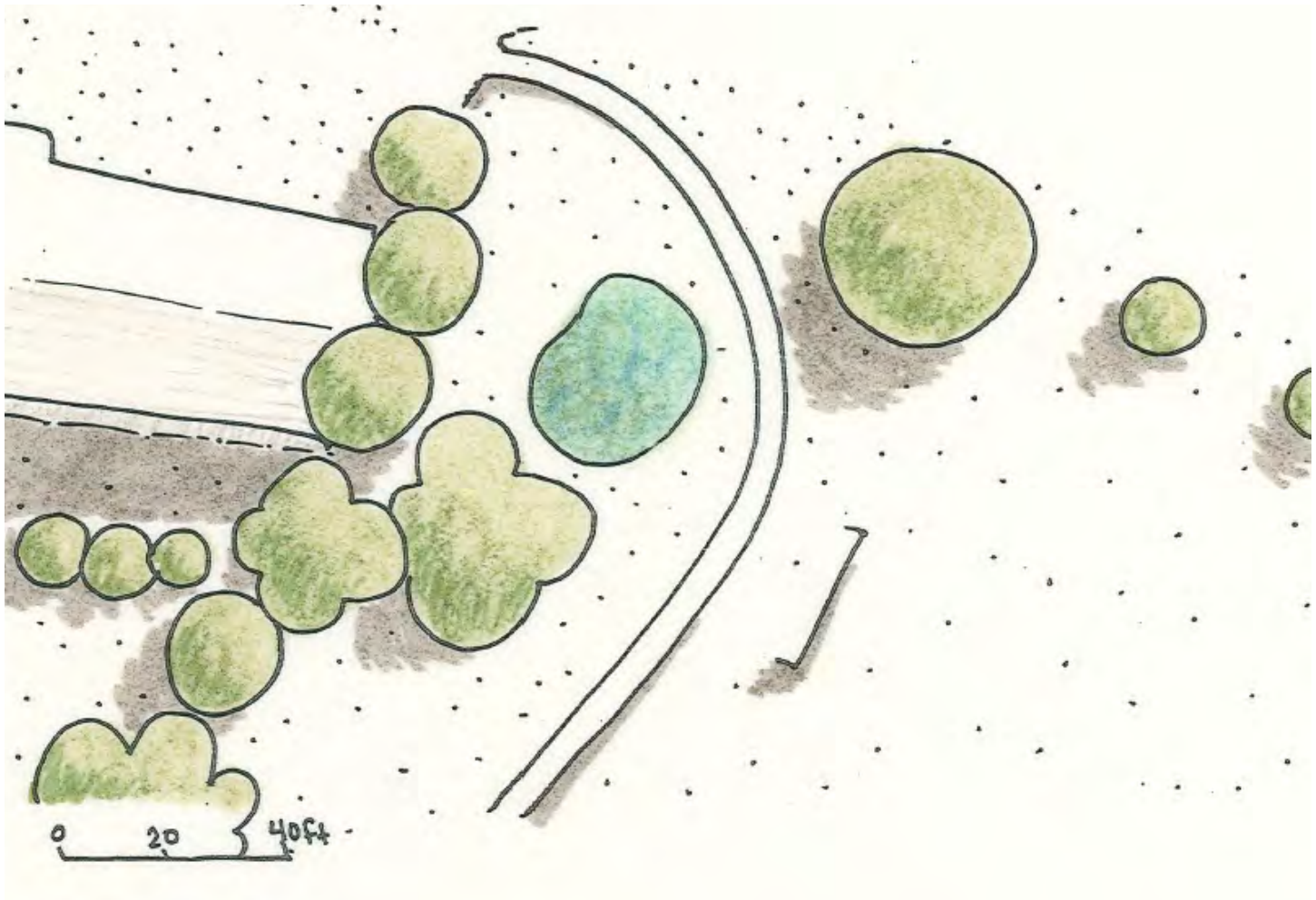
SEASON	ACTIVITY
Spring	Scatter Seeds
Summer	Pull: Curley Dock, Field Bindweed
Fall	
Winter	Cut Standing Dead

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	12	\$488
Volunteer Labor		
Equipment		\$87
Controlled Burns		\$7
Herbicide		
Contingency (10%)		\$58
SUM		\$640

Lansdowne Park Rain Garden

Site Plan

Acres: 0.01
SF: 420



NATIVE PLANTS TO LOOK FOR:

Perennials:

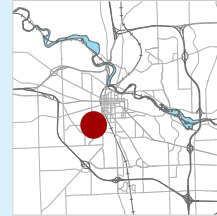
Aster spp.
Blue Flag Iris (*Iris versicolor*)
Fox Sedge (*Carex vulpinoidea*)
Golden Alexanders (*Zizia aurea*)
Swamp Milkweed (*Asclepias incarnata*)

Shrubs and Trees:

Eastern Cottonwood (*Populus deltoides*)
Elderberry (*Sambucus canadensis*)
Red-osier Dogwood (*Cornus sericea*)

Madison Street Swales

Approximate Address: Madison St. between 1st & 6th St.



SW

Year Built: 2016

Designer: J. Lawson, City of Ann Arbor

Aesthetic Level Required: High

DESCRIPTION:

Set of highly engineered swales with underground infiltration capacity. Catch basins along the road drain stormwater into an underground stone reservoir. When full, the reservoir will overflow into the rain gardens. Water also enters the rain gardens through overland flow and from the road through curb cuts.

MAINTENANCE NOTES:

Remove sediment regularly because of road run-off. Edge gardens to avoid turf grass encroachment. Cut back standing dead between late fall and early spring.



May 2016 | Photo Credit: Linda Prieskorn

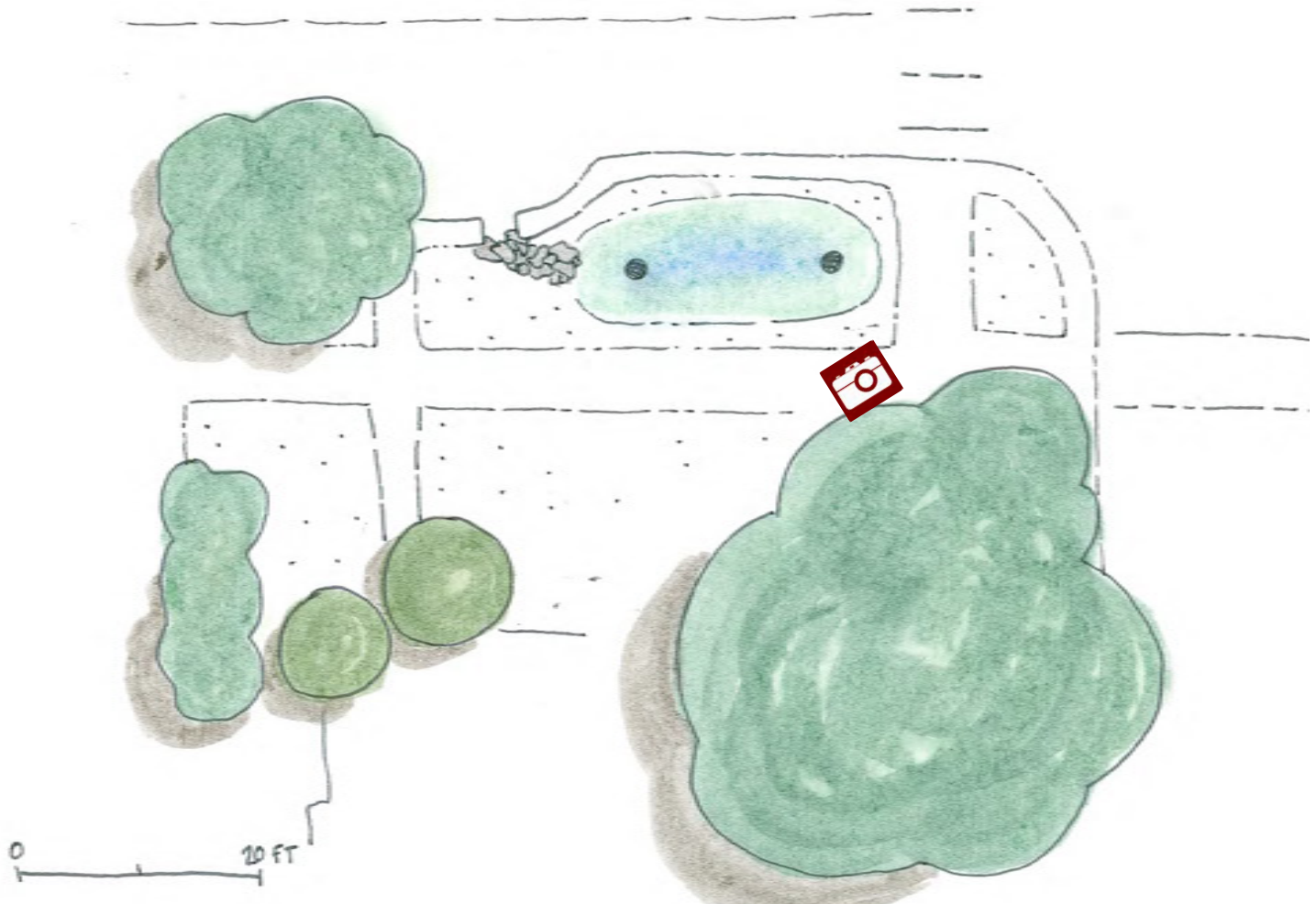
SEASON	ACTIVITY
Spring	Remove Sediment
Summer	Pull: Canada Thistle, Field Bindweed
Fall	
Winter	Cut Standing Dead

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	38	\$1,547
Volunteer Labor	120	\$2,400
Equipment		\$149
Controlled Burns		\$34
Herbicide	0.25	\$9
Contingency (10%)		\$414
SUM		\$4,553

Madison Steet Swales


Site Plan

Acres: 0.05
SF: 2,000



NATIVE PLANTS TO LOOK FOR:

1st: Blue Flag Iris (*Iris versicolor*)
Spiderwort (*Tradescantia virginiana*)

2nd: Blue Flag Iris (*Iris versicolor*) 
Canada Anemone (*Anemone canadensis*)

3rd: Blue Flag Iris (*Iris versicolor*)
Purple Coneflower (*Echinacea purpurea*)

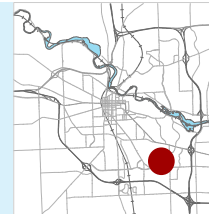
4th: Blue Flag Iris (*Iris versicolor*)
Spiderwort (*Tradescantia virginiana*)

5th: Blue Flag Iris (*Iris versicolor*)
Canada Anemone (*Anemone canadensis*)

6th: Blue Flag Iris (*Iris versicolor*)
Stonecrop (*Sedum 'Autumn Joy'*)

Mary Beth Doyle Park: Packard Parking Rain Garden

Approximate Address: East of 2898 Packard



WRC



Year Built: 2008

Designer: NAP

Aesthetic Level Required: Medium

DESCRIPTION:

Small rain garden designed to alleviate puddling in the gravel parking area as well as treat stormwater before it enters the natural area. There is a hand-dug swale leading to the rain garden from the parking lot.

MAINTENANCE NOTES:

Check with mowers to make sure edges are being mowed. Invasives include ragweed, curly dock, purple loosestrife and canada thistle.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

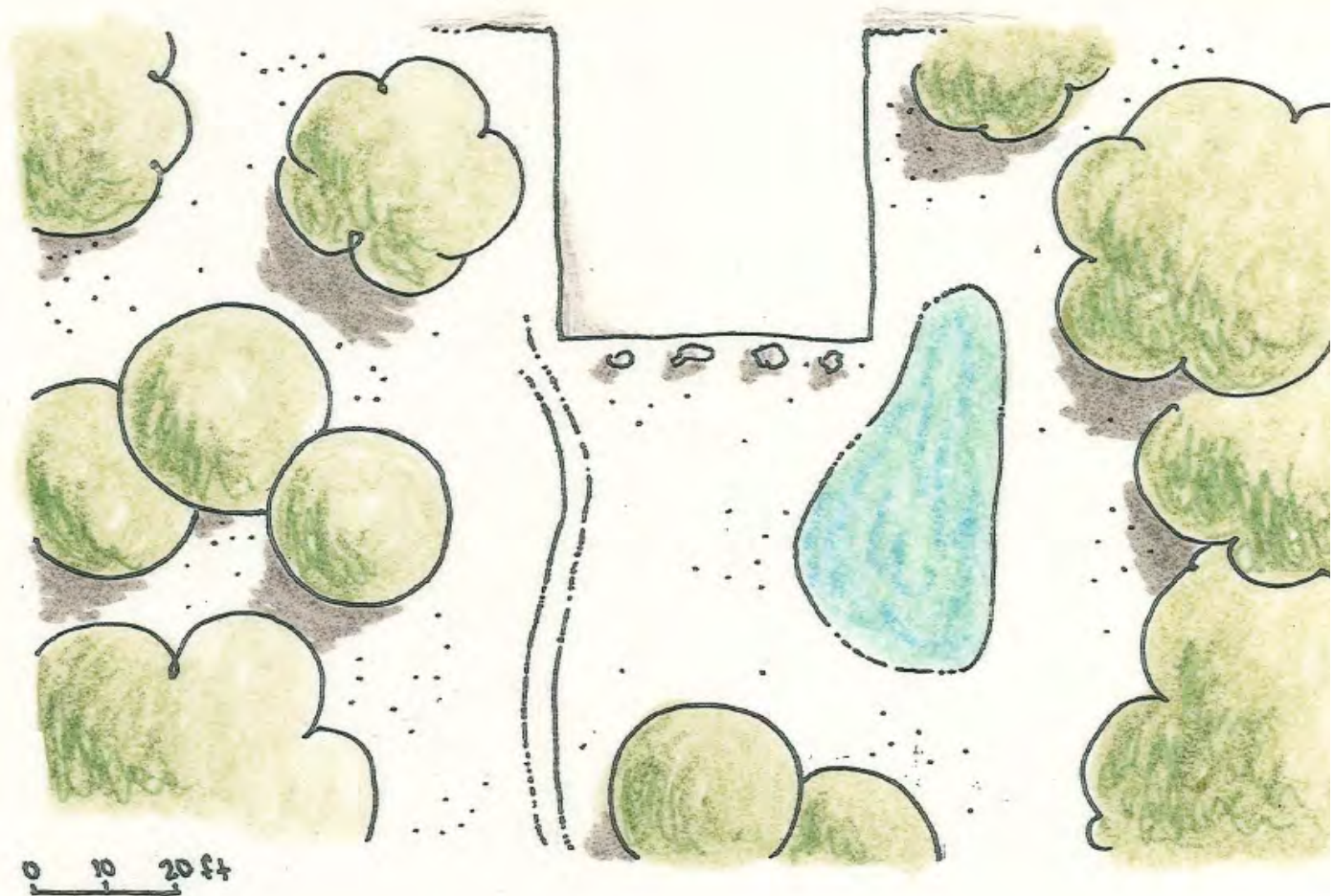
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	15	\$611
Volunteer Labor	5	\$100
Equipment		\$103
Controlled Burns		\$9
Herbicide	0.25	\$9
Contingency (10%)		\$83
SUM		\$915

Mary Beth Doyle Park: Packard Parking Rain Garden

Site Plan

Acres: 0.01

SF: 557



NATIVE PLANTS TO LOOK FOR:

Perennials:

Beardtongue (*Penstemon digitalis*)
Bergamot (*Monarda fistulosa*)
Blue Vervain (*Verbena hastata*)
Canada Anemone (*Anemone canadensis*)
Compass Plant (*Silphium laciniatum*)
Golden Alexander (*Zizia aurea*)
Golden Ragwort (*Senecio aureus*)
Green bulrush (*Scirpus atrovirens*)
Heart-leaved Aster (*Aster cordifolius*)
Ironweed (*Vernonia missurica*)
Jewel Weed (*Impatiens capensis*)
Joe Pye Weed (*Eutrochium maculatum*)
Lance-leaved Goldenrod (*Euthamia graminifolia*)
Meadow Rue (*Thalictrum*)
New England Aster (*Aster novae-angliae*)
Nodding Wild Onion (*Allium cernuum*)

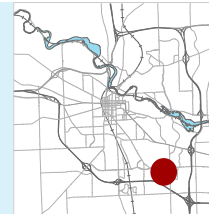
Obedient Plant (*Physostegia virginiana*)
Ohio Goldenrod (*Oligoneuron ohioense*)
Path Rush (*Juncus tenuis*)
Riddell's Goldenrod (*Solidago riddelli*)
Rue-anemone (*Thalictrum thalictroides*)
Switch Grass (*Panicum virgatum*)
Torreys Rush (*Juncus torreyi*)
Tall Coneflower (*Rudbeckia laciniata*)
Thimbleweed (*Anemone virginiana*)
Virginia Wild Rye (*Elymus virginicus*)
Wild Bergamot (*Monarda fistulosa*)
Water Plantain (*Alisma plantago-aquatica*)
Wild Strawberry (*Fragaria vesca*)

Shrubs and Trees:

Red-twig Dogwood (*Cornus sericea*)

Mary Beth Doyle Park: Birch Hollow Parking Detention

Approximate Address: Birch Hollow Dr. Dead End



WRC



Year Built: 2007

Designer: Conservation Design Forum

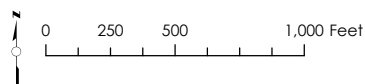
Aesthetic Level Required: Medium

DESCRIPTION:

This detention basin holds water from the parking lot and is planted with natives. By infiltrating stormwater running off the parking lot, this basin protects the wetland from receiving polluted, hot and fast moving water.

MAINTENANCE NOTES:

Canada Thistle is common and should be removed.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

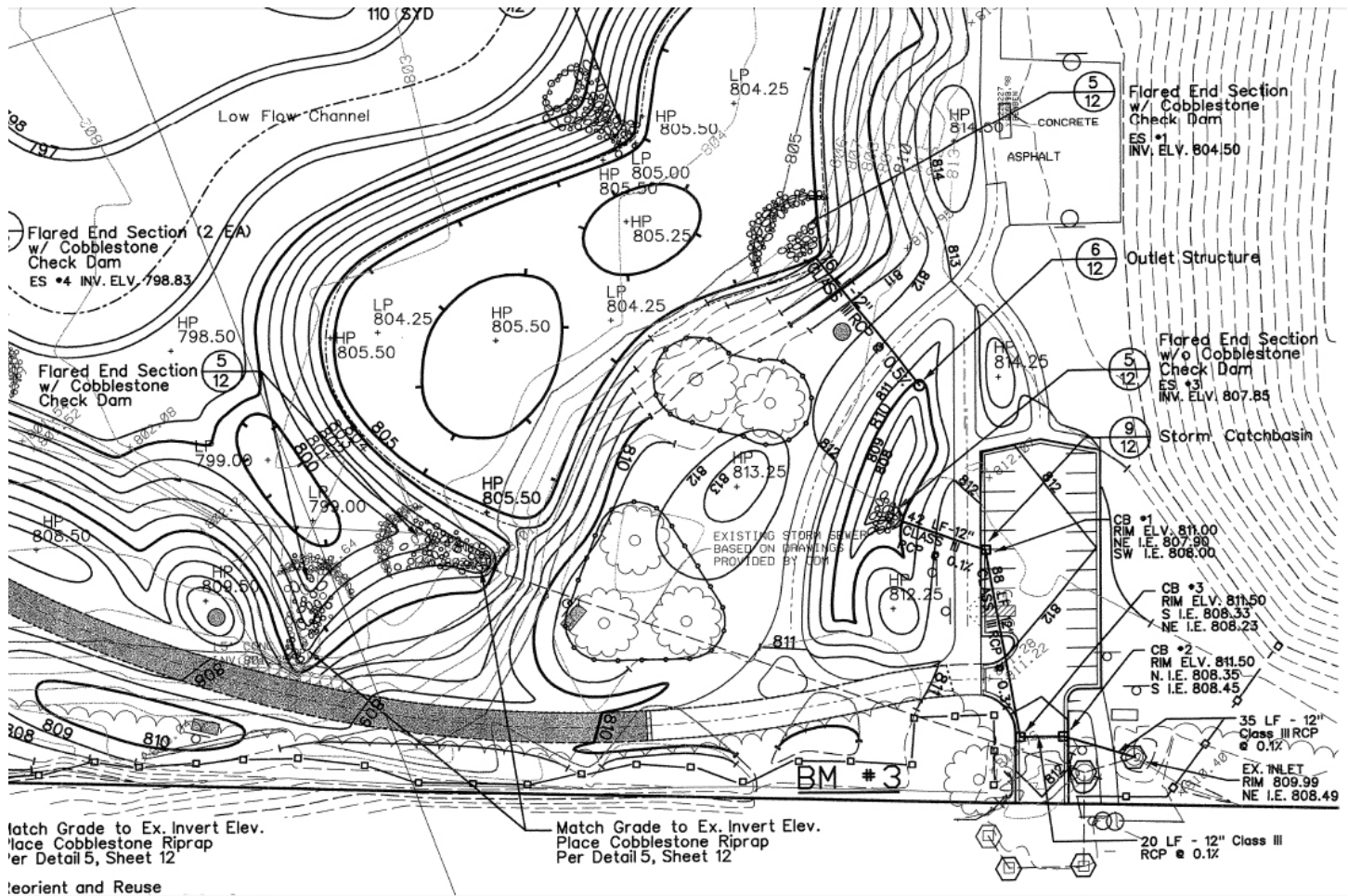
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	13	\$529
Volunteer Labor	5	\$100
Equipment		\$102.5
Controlled Burns*		\$82
Herbicide	0.25	\$9
Contingency (10%)		\$82
SUM		\$905

*per estimate from PlantWise. Burn every three years so cost spread across years

Mary Beth Doyle Park: Birch Hollow Parking Detention

Site Plan

Acres: 0.11
SF: 4,880



NATIVE PLANTS TO LOOK FOR:

Perennials:

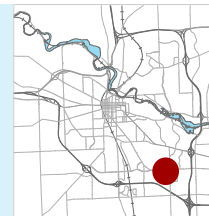
Big Bluestem (*Andropogon gerardi*)
Canada Anemone (*Anemone canadensis*)
Goldenrod (*Solidago spp.*)
Jewel Weed (*Impatiens capensis*)
Prairie Dock (*Silphium terebinthinaceum*)
Switchgrass (*Panicum virgatum*)

Shrubs and Trees:

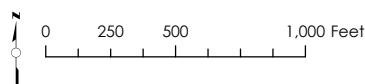
American Elm (*Ulmus americana*)
Eastern Cottonwood (*Populus deltoides*)
Silver Maple (*Acer saccharinum*)

Mary Beth Doyle Mitigation Wetland

Approximate Address: Birch Hollow Dr. Dead End



WRC



Year Built: 2007

Designer: Conservation Design Forum

Aesthetic Level Required: Medium

DESCRIPTION:

Built as a mitigation for impacts to the original stormwater wetland that was renovated and expanded to create the current regional detention basin. Located directly adjacent to the detention basin, and takes advantage of natural groundwater seepage to create a fen-like habitat. Monitoring showed a Floristic Quality Index in the lower 20s, which is an improvement over pre-construction conditions, but is not floristically significant from a statewide perspective. Stormwater is captured from overland flow. A burn was conducted in 2015 by PlantWise. Few invasives currently are growing in the area. Watch for teasel re-growth, bull thistle and ragweed.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds		late summer & fall		

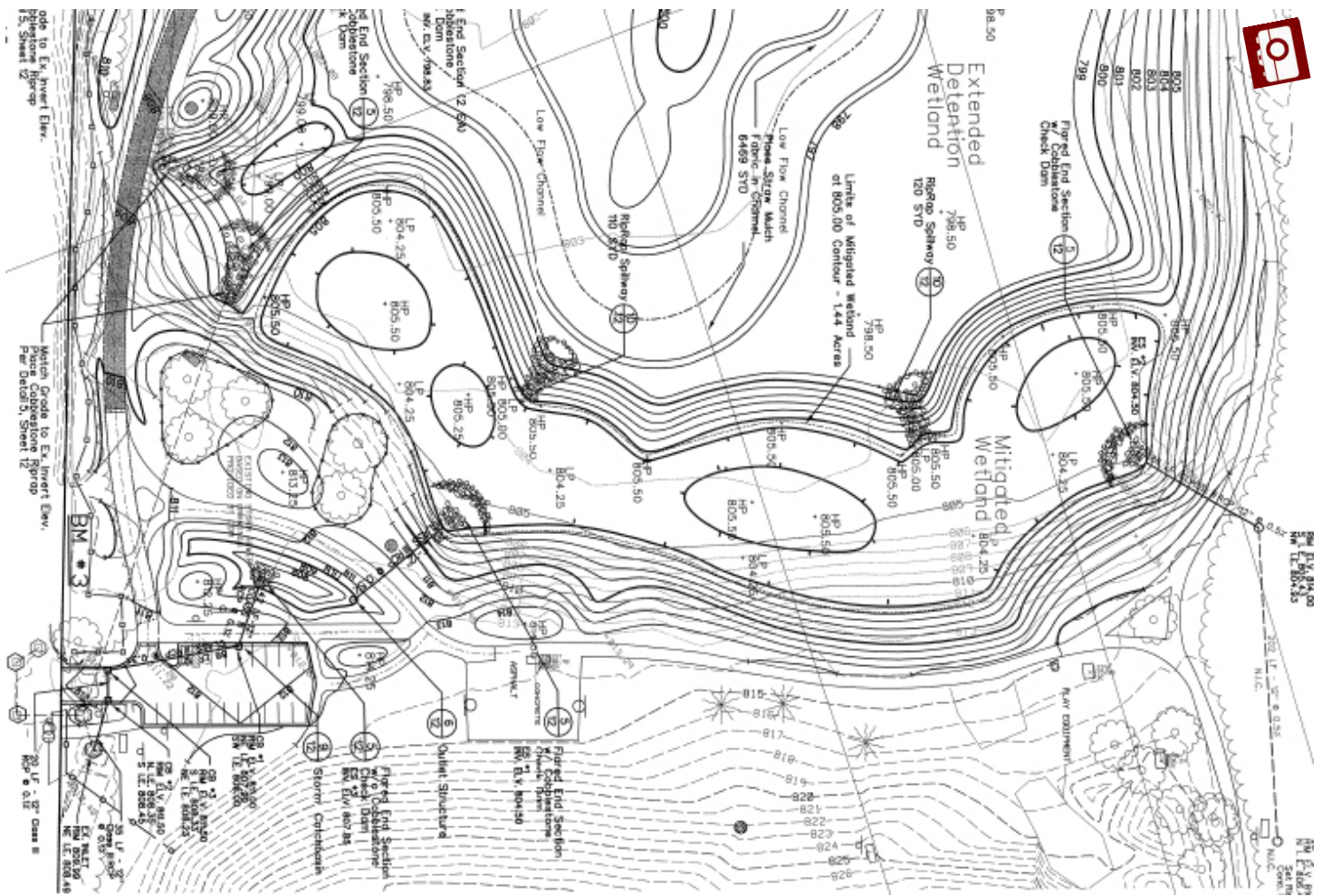
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	24	\$977
Volunteer Labor	20	\$400
Equipment		\$118
Controlled Burns*		\$1,300
Herbicide	2	\$82
Contingency (10%)		\$288
SUM		\$3,165

*per estimate from PlantWise. Burn every three years so cost spread across years

Mary Beth Doyle Mitigation Wetland

Site Plan

Acres: 1.78
SF: 77,563



NATIVE PLANTS TO LOOK FOR:

Perennials:

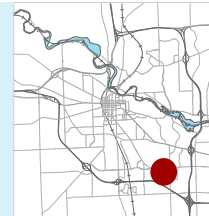
Beardtongue (*Penstemon digitalis*)
Big Bluestem (*Andropogon gerardii*)
Black-eyed Susan (*Rudbeckia hirta*)
Boneset (*Eupatorium perfoliatum*)
False Sunflower (*Heliopsis helianthoides*)
Fleabane Aster (*Erigeron peregrinus*)
Golden Alexander (*Zizia aurea*)
Lance-leaved Goldenrod (*Euthamia graminifolia*)
Ohio Goldenrod (*Oligoneuron ohioense*)
Prairie Coreopsis (*Coreopsis tinctoria*)
Prairie Cordgrass (*Spartina pectinatus*)
Switch Grass (*Panicum virgatum*)
Tick Trefoil (*Desmodium canadense*)
Virginia Wild Rye (*Elymus virginicus*)

Shrubs and Trees:

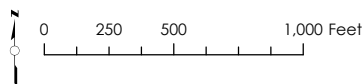
American Elderberry (*Sambucus canadensis*)
Buttonbush (*Cephalanthus occidentalis*)
Cottonwood (*Populus deltoides*)
Nannyberry (*Viburnum lentago*)
Silky Dogwood (*Cornus amomum*)
Swamp Rose (*Rosa palustris*)

Mary Beth Doyle Regional Detention Basin

Approximate Address: Birch Hollow Dr. Dead End



WRC



Year Built: 2007

Designer: Conservation Design Forum

Aesthetic Level Required: Medium

DESCRIPTION:

The Mary Beth Doyle Park and Wetland Preserve is located along Malletts Creek. Constructed in 2007 as part of a Chapter 20 drain project, the facility is a complete redesign of a 15 acre flood control impoundment built 30 years ago. The project site is leased to the City for park use, such as walking, biking, birding and disc golf. The 15 acre preserve includes a maintainable sediment capture pool, low flow channel, and an extended detention wetland. It provides first flush water quality treatment for eight square miles of upstream urban runoff, reduces downstream channel velocities, and maintains the pre existing flood control function needed to protect downstream properties. A controlled burn was conducted in the spring of 2015 throughout all but the northern basin. The north eastern basin was burned in 2018.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Dredge				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds		late summer & fall		

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	18	\$733
Volunteer Labor		
Equipment		\$87
Controlled Burns***		\$7,637
Herbicide	13	\$484
Dredge and haul (\$30/CY)*		\$20,988**
Contingency (10%)		\$2,293
SUM		\$32,222

* based off of 2015 cost to dredge

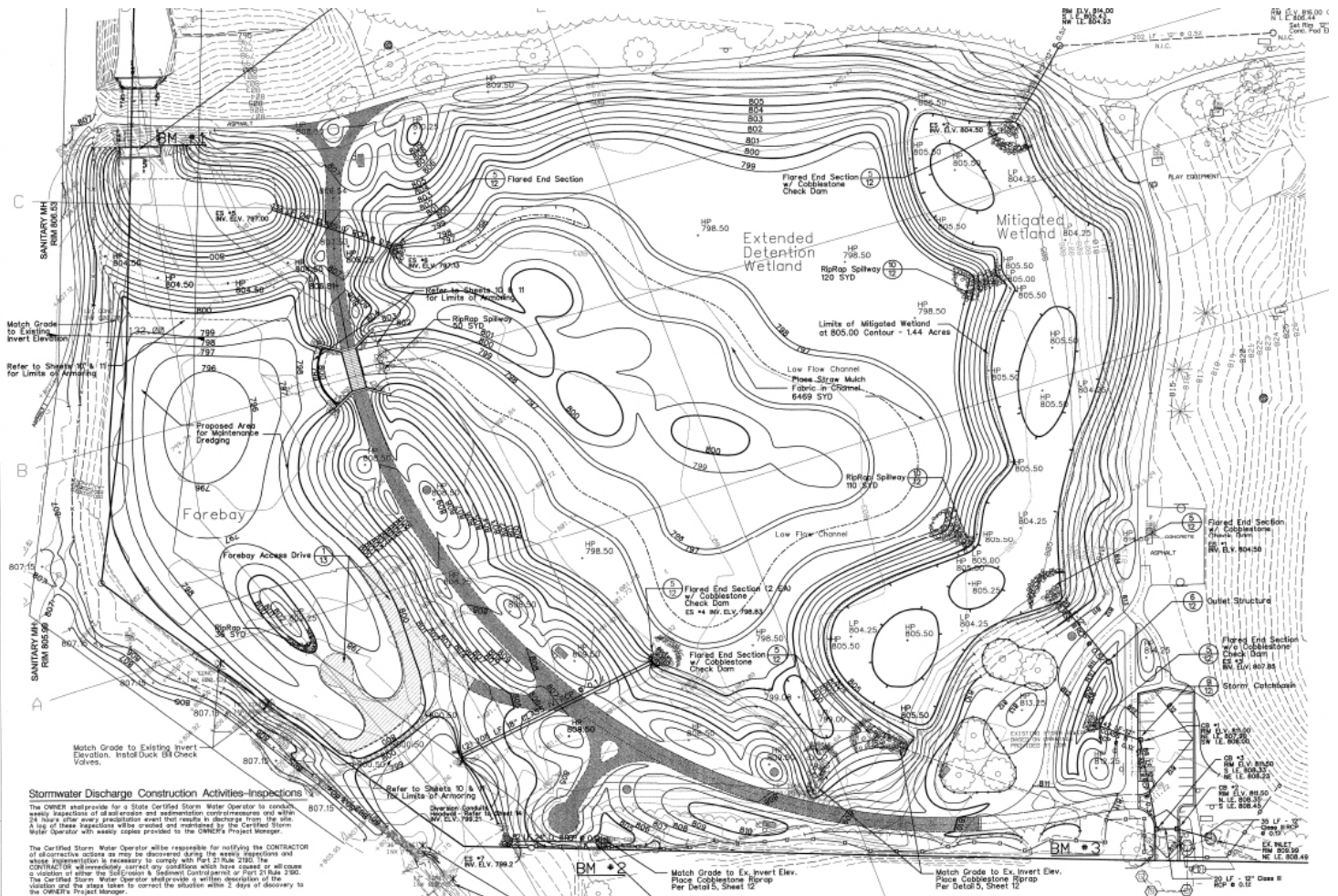
** cost divided over 5 years. Total cost is \$104,940

*** per estimate from PlantWise. Burn every three years so cost spread across years

Mary Beth Doyle Regional Detention Basin

Site Plan

Acres: 10.46
SF: 455,721



NATIVE PLANTS TO LOOK FOR:

Perennials:

Awl-fruited Sedge (*Carex stipata*)
Blue Vervain (*Verbena hastata*)
Canada Wild Rye (*Elymus canadensis*)
Common Boneset (*Eupatorium perfoliatum*)
Fox Sedge (*Carex vulpinoidea*)
Fowl Manna Grass (*Glyceria striata*)
Joe Pye Weed (*Eutrochium maculatum*)
Missouri Ironweed (*Vernonia missurica*)
Nodding Beggar-tick (*Bidens cernua*)
Obedient Plant (*Physostegia virginiana*)
Rice cut Grass (*Leersia oryzoides*)
Sedge (*Carex comosa*)
Sedge (*Carex hystericina*)
Soft-stemmed Bulrush (*Juncus effusus*)
Swamp Aster (*Aster puniceus*)

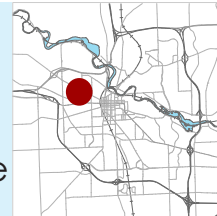
Swamp Milkweed (*Asclepias incarnata*)
Torrey's Rush (*Juncus torreyi*)
Tussock Sedge (*Carex striata*)
Wool-grass (*Scirpus cyperinus*)

Shrubs and Trees:

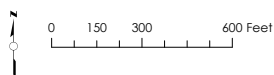
Buttonbush (*Cephalanthus occidentalis*)

Miller Avenue Right-of-Way Rain Gardens

Approximate Address: Miller Ave between Newport & Maple



SW



Year Built: 2013

Designer: Susan Bryan & Chris Carson, City of Ann Arbor

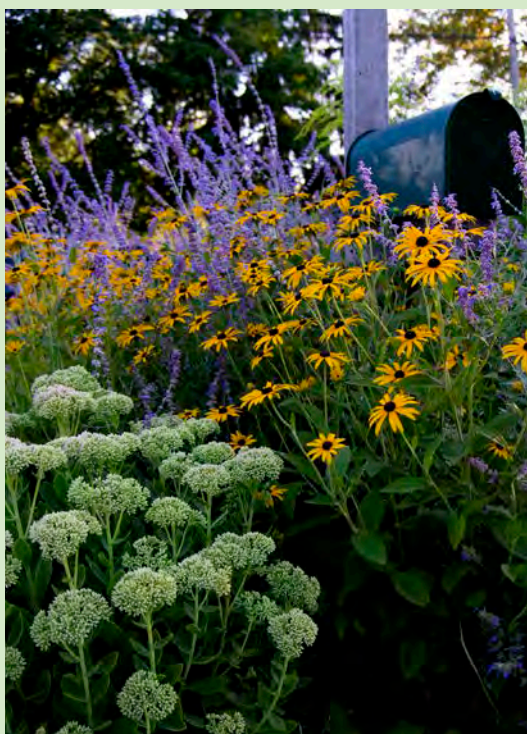
Aesthetic Level Required: High

DESCRIPTION:

A series of rain gardens between the sidewalk and road that take runoff from Miller Ave. These rain gardens were installed when the road was reconstructed. Neighborhood volunteers and Master Rain Gardeners meet a few times each year to maintain the rain gardens.

MAINTENANCE NOTES:

Sediment should be removed in the spring and fall from the sediment traps. Cut back standing dead, especially switch grass, between late fall and early spring. Collect seeds from mid summer through fall. Cut Rose Mallow in early June so it flowers shorter and doesn't block visibility for drivers.



July 2014

SEASON	ACTIVITY
Spring	Trim: Rose Mallow; Remove Sediment; Pull: Canada Thistle
Summer	Trim as needed if too tall; Collect Seeds
Fall	Remove Sediment; Collect Seeds Hrbcd: Crown Vetch (Certified Applicator)
Winter	Cut Standing Dead

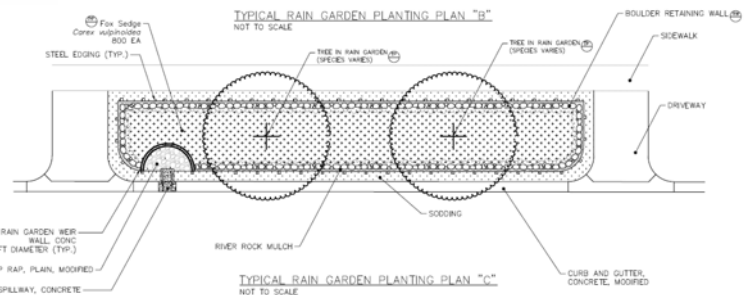
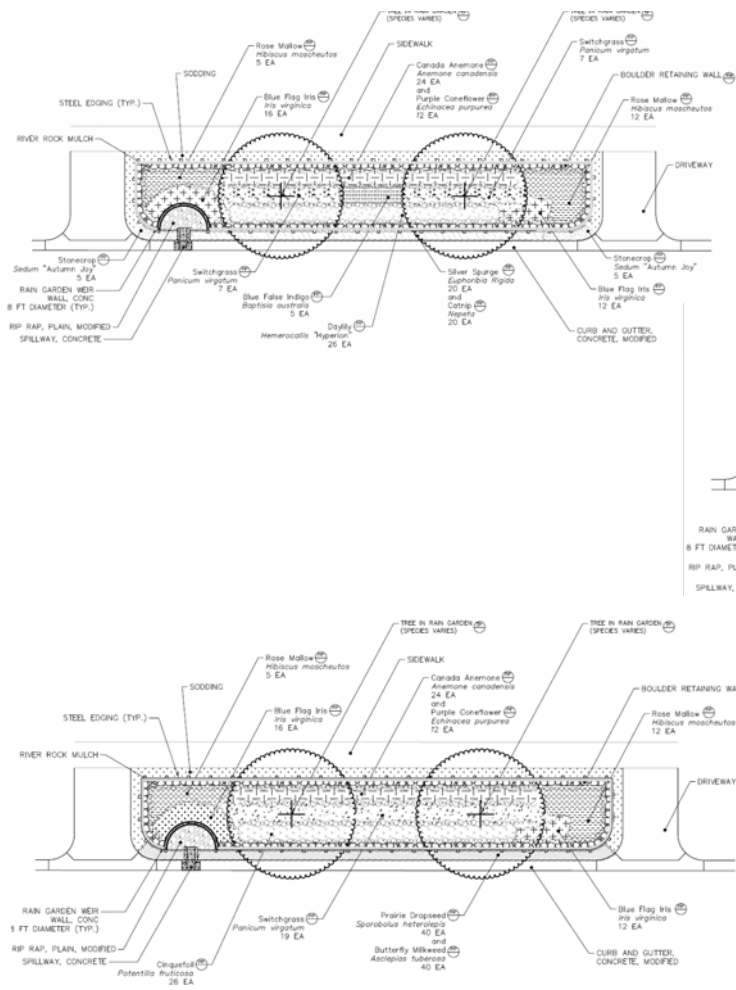
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	70	\$2,849
Volunteer Labor	220	\$4,400
Equipment		\$273
Controlled Burns*		\$410
Herbicide	0.5	\$17
Contingency (10%)		\$795
SUM		\$8,744

*per estimate from PlantWise. Burn every three years so cost spread across years

Miller Ave Right-of-Way Rain Gardens

Site Plan

Acres: 0.37
SF: 16,000



NATIVE PLANTS TO LOOK FOR:

Perennials:

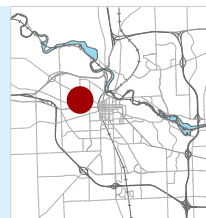
Autumn Joy Sedum (*Sedum x 'Autumn Joy'*)
Blue Wild Indigo (*Baptisia australis*)
Blue Wonder Catmint (*Nepeta x faassenii 'Blue Wonder'*)
Butterfly Weed (*Asclepias tuberosa*)
Canada Anemone (*Anemone canadensis*)
Fantasia Rose Mallow (*Hibiscus moscheutos 'Fantasia'*)
Fox Sedge (*Carex vulpinoidea*)
Hyperion Daylily (*Hemerocallis 'Hyperion'*)
Prairie Dropseed (*Sporobolus heterolepis*)
Purple Coneflower (*Echinacea purpurea*)
Shenandoah Switchgrass (*Panicum virgatum 'Shenandoah'*)
Shrubby Cinquefoil (*Potentilla fruticosa*)
Silver Spurge (*Euphorbia rigida*)
Southern Blue Flag Iris (*Iris virginica*)

Shrubs and Trees:

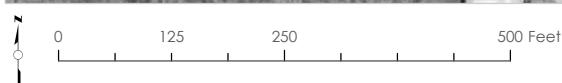
Black Gum (*Nyssa sylvatica*)
Swamp White Oak (*Quercus bicolor*)

Miller Nature Area Rain Garden

Approximate Address: Between 1553 and 1575 Miller Ave



SW



Year Built: 2013

Designer: Susan Bryan & Chris Carson, City of Ann Arbor

Aesthetic Level Required: Low

DESCRIPTION:

This rain garden receives runoff from Miller Ave and slows stormwater before it overflows into Miller Park. Consisting of two tiered basins, this rain garden is large and has a wild look that matches the surrounding natural area.

MAINTENANCE NOTES:

Burn regularly and re-seed with natives. Invasives include Phragmites, Canada Thistle, Yellow Sweet Clover, Dames Rocket and Garlic Mustard.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

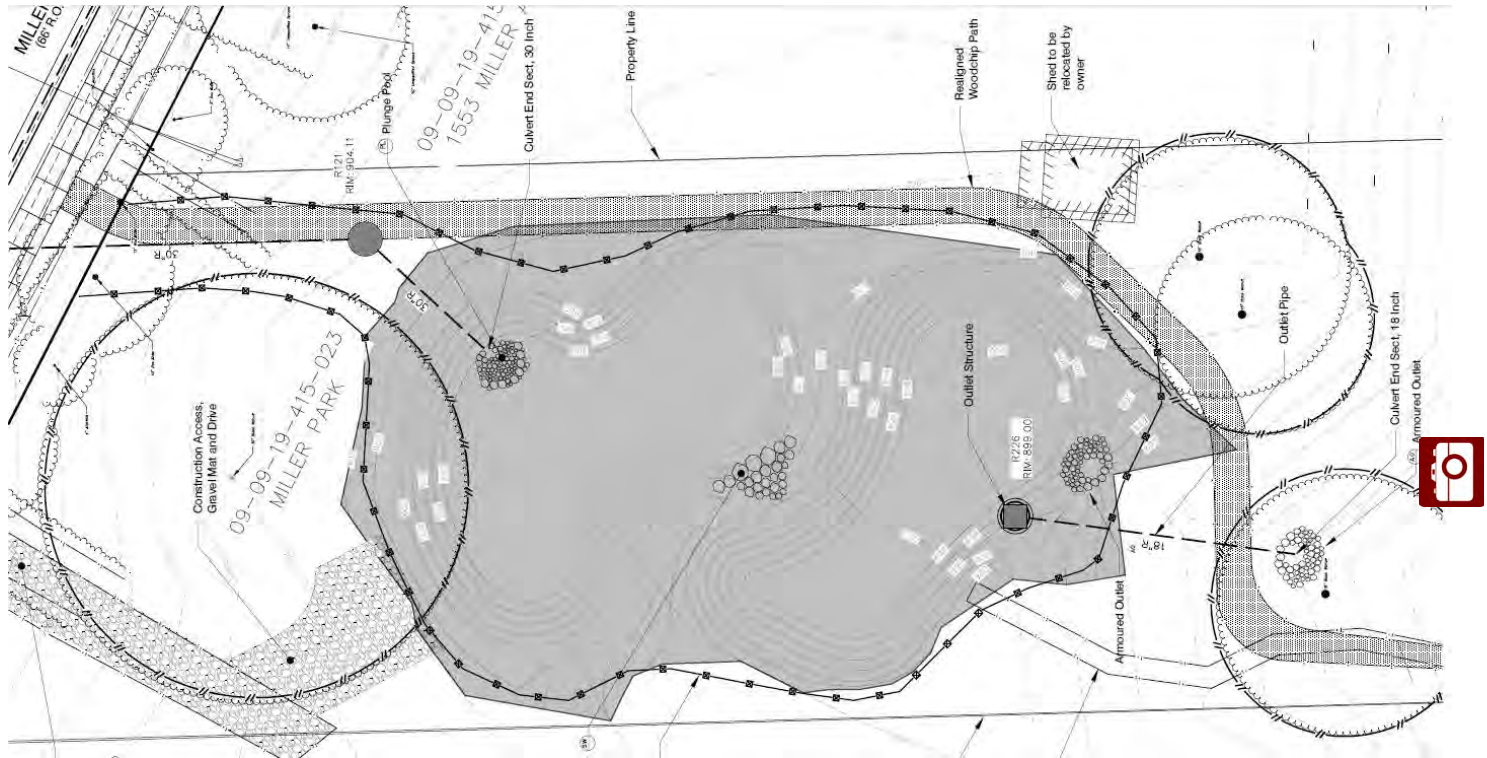
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	26	\$1,058
Volunteer Labor	40	\$800
Equipment		\$118
Controlled Burns*		\$100
Herbicide	0.25	\$9
Contingency (10%)		\$209
SUM		\$2,294

*per estimate from PlantWise. Burn every three years so cost spread across years

Miller Nature Area Rain Garden

Site Plan

Acres: 0.14
SF: 5,978



NATIVE PLANTS TO LOOK FOR:

Perennials:

Big Bluestem (*Andropogon gerardii*)
Black Eyed Susan (*Rudbeckia hirta*)
Blue Wild Indigo (*Baptisia australis*)
Brown Eyed Susan (*Rudbeckia trilobum*)
Butterfly Weed (*Asclepias tuberosa*)
Canada Anemone (*Anemone canadensis*)
Canada Wild Rye (*Elymus canadensis*)
Columbine (*Aquilegia canadensis*)
Common Boneset (*Eupatorium perfoliatum*)
Common Cinquefoil (*Potentilla simplex*)
Fox Sedge (*Carex vulpinoidea*)
Golden Alexanders (*Zizia aurea*)
Hoary Vervain (*Verbena stricta*)
Indian Grass (*Sorghastrum nutans*)
Ironweed (*Vernonia fasciculata*)
Missouri Ironweed (*Vernonia missurica*)
New England Aster (*Aster novae-angliae*)
Nodding Wild Onion (*Allium cernuum*)
Obedient Plant (*Physostegia virginiana*)

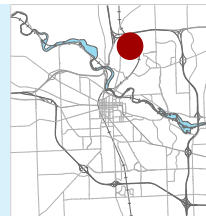
Prairie Dropseed (*Sporobolus heterolepis*)
Purple Coneflower (*Echinacea purpurea*)
Rough Blazing Star (*Liatris aspera*)
Rose Mallow (*Hibiscus moscheutos*)
Sand Coreopsis (*Coreopsis lanceolata*)
Showy Goldenrod (*Solidago speciosa*)
Smooth Blue Aster (*Aster laevis*)
Sneezeweed (*Helenium autumnale*)
Southern Blue Flag Iris (*Iris virginica*)
Stiff Goldenrod (*Solidago rigida*)
Switchgrass (*Panicum virgatum*)
Tall Coreopsis (*Coreopsis tripteris*)
Tufted Hair Grass (*Deschampsia caespitosa*)
Wild Strawberry (*Fragaria virginica*)

Shrubs and Trees:

Shagbark Hickory (*Carya ovata*)

Olson Park Parking Lot Bioswale

Approximate Address: 1515 Dhu Varren Rd.



SW



Year Built: 2003

Designer: Ayres, Lewis, Norris & May, Inc.

Aesthetic Level Required: Medium

DESCRIPTION:

Stormwater runoff from the parking lot and upslope road enter these bioswales. A controlled burn was conducted in the spring of 2018 by PlantWise. Sediment accumulates in the southeastern section, likely as dirt erodes from the dog park.

MAINTENANCE NOTES:

Sediment should be removed in the spring and fall from the spaces between the curbs. Invasives include Crown Vetch, Teasel, Buckthorn, Spotted Knapweed, Leafy Spurge and Canada Thistle. Burn two years in a row to reduce Crown Vetch.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

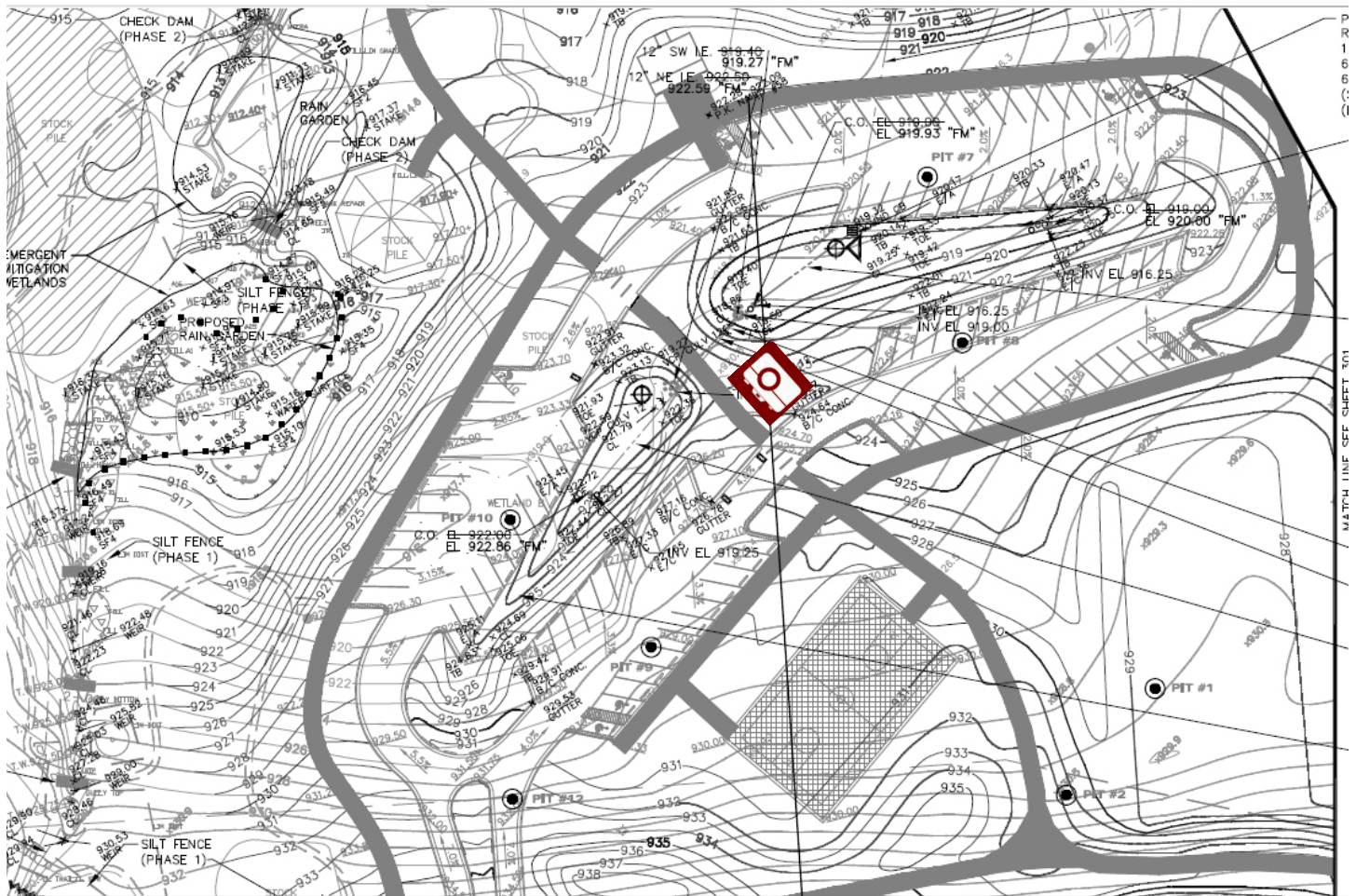
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	21	\$855
Volunteer Labor	5	\$100
Equipment		\$103
Controlled Burns*		\$443
Herbicide	10	\$370
Contingency (10%)		\$187
SUM		\$2,058

*per estimate from PlantWise. Burn every three years so cost spread across years

Olson Park Parking Lot Bioswale

Site Plan

Acres: 0.61
SF: 26,408



NATIVE PLANTS TO LOOK FOR:

Perennials:

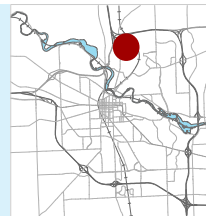
Aster spp.
Butterfly Milkweed (*Asclepias tuberosa*)
Daisy (*Bellis perennis*)
False Sunflower (*Heliopsis helianthoides*)
Golden Alexanders (*Zizia aurea*)
Goldenrod (*Solidago* spp.)
Indian Grass (*Sorghastrum nutans*)
Ironweed (*Vernonia missurica*)
Prairie Dock (*Silphium terebinthinaceum*)
Spiderwort (*Tradescantia ohiensis*)
Switch Grass (*Panicum virgatum*)
Yellow Wild Indigo (*Baptisia tinctoria*)

Shrubs and Trees:

Eastern Cottonwood (*Populus deltoides*)
Swamp White Oak (*Quercus bicolor*)
Willow (*Salix* spp.)

Olson Park West Wetland Complex

Approximate Address: 1515 Dhu Varren Rd.



P



Year Built: 2003

Designer: Ayres, Lewis, Norris & May, Inc.

Aesthetic Level Required: Medium

DESCRIPTION:

This wetland blends in with the surrounding natural area and is full of grasses and forbs. Stormwater runoff comes from overland flow. NAP will burn regularly.

MAINTENANCE NOTES:

Invasive Crown Vetch, Reed Canary Grass, Canada Thistle, Bindweed, Teasel, Spotted Knapweed, Dames Rocket and Purple Loosestrife are present.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	21	\$855
Volunteer Labor	5	\$100
Equipment		\$103
Controlled Burns		\$148
Herbicide	0.25	\$9
Contingency (10%)		\$121
SUM		\$1,336

Olson Park West Wetland Complex

Site Plan

Acres: 0.2
SF: 8,819



NATIVE PLANTS TO LOOK FOR:

Perennials:

Beebalm (*Monarda fistulosa*)
Black Eyed Susan (*Rudbeckia hirta*)
Daisy (*Bellis perennis*)
Goldenrod (*Solidago spp*)
Spiderwort (*Tradescantia ohiensis*)
Swamp Milkweed (*Asclepias incarnata*)

Shrubs and Trees:

Eastern Cottonwood (*Populus deltoides*)
Mulberry (*Morus alba*)
Redbud (*Cercis canadensis*)
Siberian Elm (*Ulmus pumila*)
Staghorn Sumac (*Rhus typhina*)
Swamp White Oak (*Quercus bicolor*)

Olson Park East Wetland Complex

Approximate Address: 1515 Dhu Varren Rd.



P



Year Built: 2003

Designer: Ayres, Lewis, Norris & May, Inc.

Aesthetic Level Required: Medium

DESCRIPTION:

These two constructed wetlands are connected by an underground pipe. They have native species and blend into the natural area. Stormwater runoff comes from overland flow. NAP will burn regularly and maintain this area.

MAINTENANCE NOTES:

Invasives include Crown Vetch, Spotted Knapweed, Buckthorn and Yellow Sweet Clover.



July 2016

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	13.5	\$550
Volunteer Labor	2.5	\$50
Equipment		\$95
Controlled Burns		\$83
Herbicide	0.25	\$9
Contingency (10%)		\$79
SUM		\$860

Olson Park East Wetland Complex

Site Plan

Acres: 0.11
SF: 4,938



NATIVE PLANTS TO LOOK FOR:

Perennials:

- Aster spp.
- Big Bluestem (*Adropogon gerardii*)
- Black Eyed Susan (*Rudbeckia hirta*)
- Daisy (*Bellis perennis*)
- Goldenrod (*Solidago* spp)
- Sedge (*Carex* spp)
- Swamp milkweed (*Asclepias incarnata*)

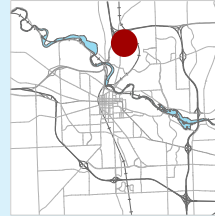
Shrubs and Trees:

Box Elder (*Acer negundo*)
Eastern Redcedar (*Juniperus virginiana*)
Siberian Elm (*Ulmus pumila*)
Peachleaf Willow (*Salix amygdaloides*)

Olson Park

Picnic Pavilion Rain Garden

Approximate Address: 1515 Dhu Varren Rd.



P



Year Built: 2003

Designer: Ayres, Lewis, Norris & May, Inc.

Aesthetic Level Required: High

DESCRIPTION:

Stormwater runoff from the picnic pavilion enters this rain garden. Rain garden blends with natural area and will be maintained by NAP. NAP will burn regularly.

MAINTENANCE NOTES:

Invasives include Crown Vetch, Bittercress, Dames Rocket, Purple Loosestrife, Canada Thistle and Spotted Knapweed.



June 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	13.5	\$550
Volunteer Labor	1	\$20
Equipment		\$95
Controlled Burns		\$54
Herbicide	0.25	\$9
Contingency (10%)		\$73
SUM		\$801

Acres: 0.07
SF: 3,232

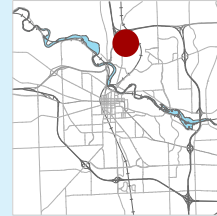
NATIVE PLANTS TO LOOK FOR:

Perennials:

Beebalm (*Monarda fistulosa*)
Foxglove Beardtongue (*Penstemon digitalis*)
Goldenrod (*Solidago* spp)
Sedge (*Carex* spp)
Spiderwort (*Tradescantia ohiensis*)
Swamp Milkweed (*Asclepias incarnata*)

Olson Park Central Wetland

Approximate Address: 1515 Dhu Varren Rd.



P



Year Built: 2003

Designer: Ayres, Lewis, Norris & May, Inc.

Aesthetic Level Required: Medium

DESCRIPTION:

Stormwater runoff from the parking lot enters this wetland area. The wetland blends in with the natural area. NAP will burn regularly and maintains this area.

MAINTENANCE NOTES:

Invasives include Crown Vetch, Reed Canary Grass, Spotted Knapweed, Yellow Sweet Clover, Autumn Olive and Purple Loosestrife.



June 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

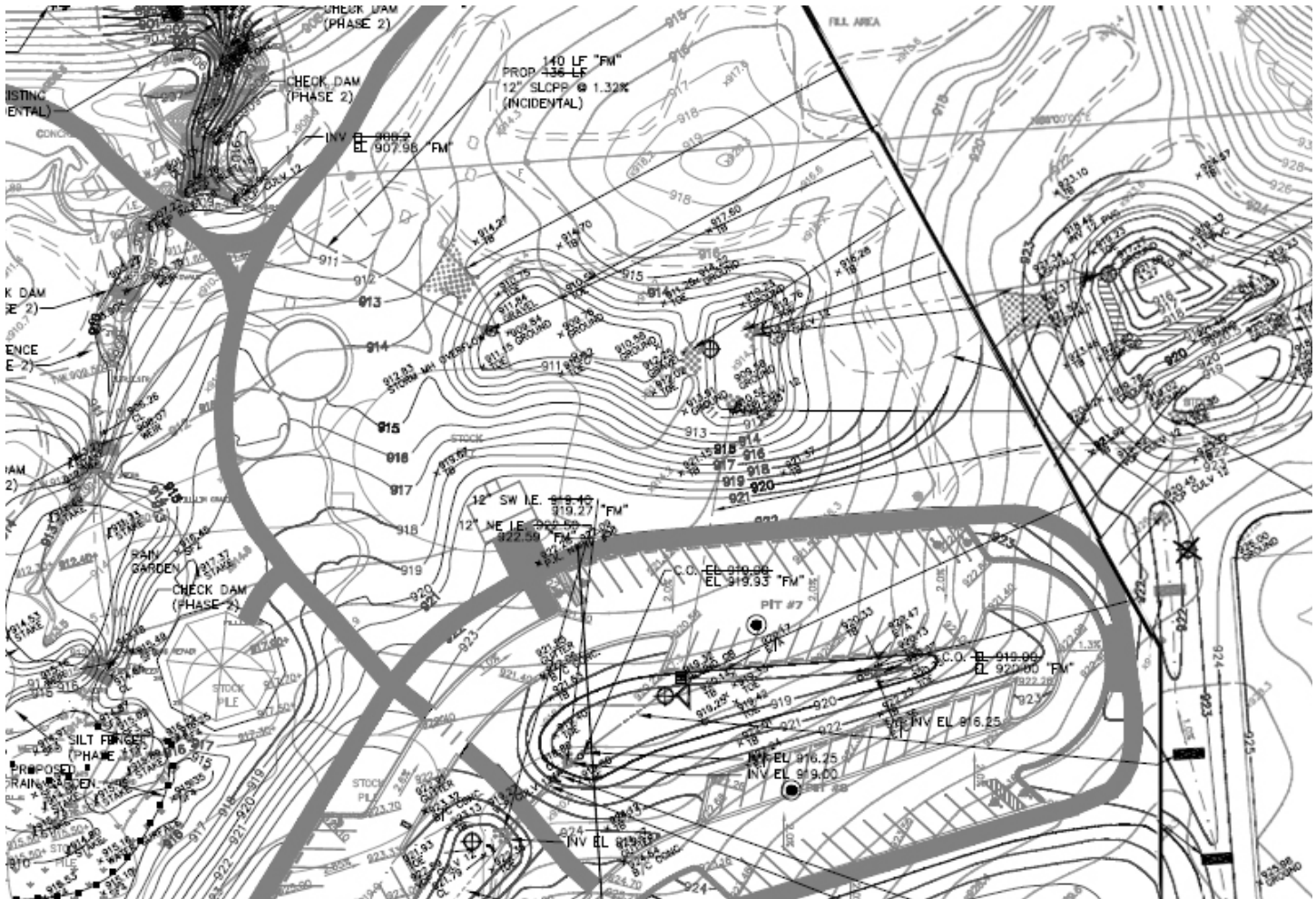
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	21	\$855
Volunteer Labor	3	\$60
Equipment		\$103
Controlled Burns		\$187
Herbicide	0.3	\$12
Contingency (10%)		\$122
SUM		\$1,339

Olson Park Central Wetland Complex

Site Plan

Acres: 0.26

SF: 11,142



NATIVE PLANTS TO LOOK FOR:

Perennials:

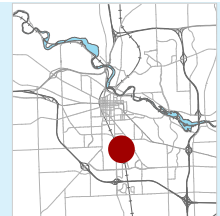
Daisy (*Bellis perennis*)
Goldenrod (*Solidago spp*)
Sedge (*Carex spp*)
Spiderwort (*Tradescantia ohiensis*)
Swamp Milkweed (*Asclepias incarnata*)

Shrubs and Trees:

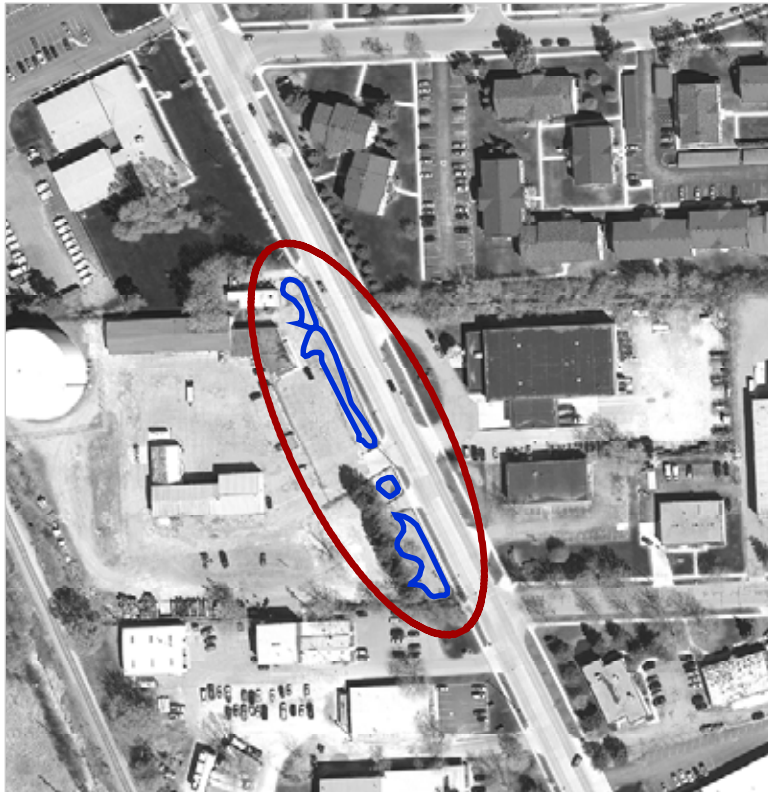
Eastern Cottonwood (*Populus deltoides*)
Eastern Redcedar (*Juniperus virginiana*)
Mulberry (*Morus alba*)
Siberian Elm (*Ulmus pumila*)
Swamp White Oak (*Quercus bicolor*)
Witch Hazel (*Hamamelis virginiana*)

South Industrial Rain Gardens

Approximate Address: 2000 South Industrial



SW



Year Built: 2011

Designer: InSite Design Studio, Inc.

Aesthetic Level Required: Medium

DESCRIPTION:

Rain gardens receive runoff from parking areas at the city-owned facility. Plant material is largely shrubs and trees, including American Elderberry and River Birch. Burns would likely be unsuccessful because of woody plant dominance. The middle unit is heavily infested with Field Bindweed. This garden was burned in '18.

MAINTENANCE NOTES:

Invasive species include Field Bindweed, Mudwort, Canada Thistle, Teasel and Curly Dock.



July 2014

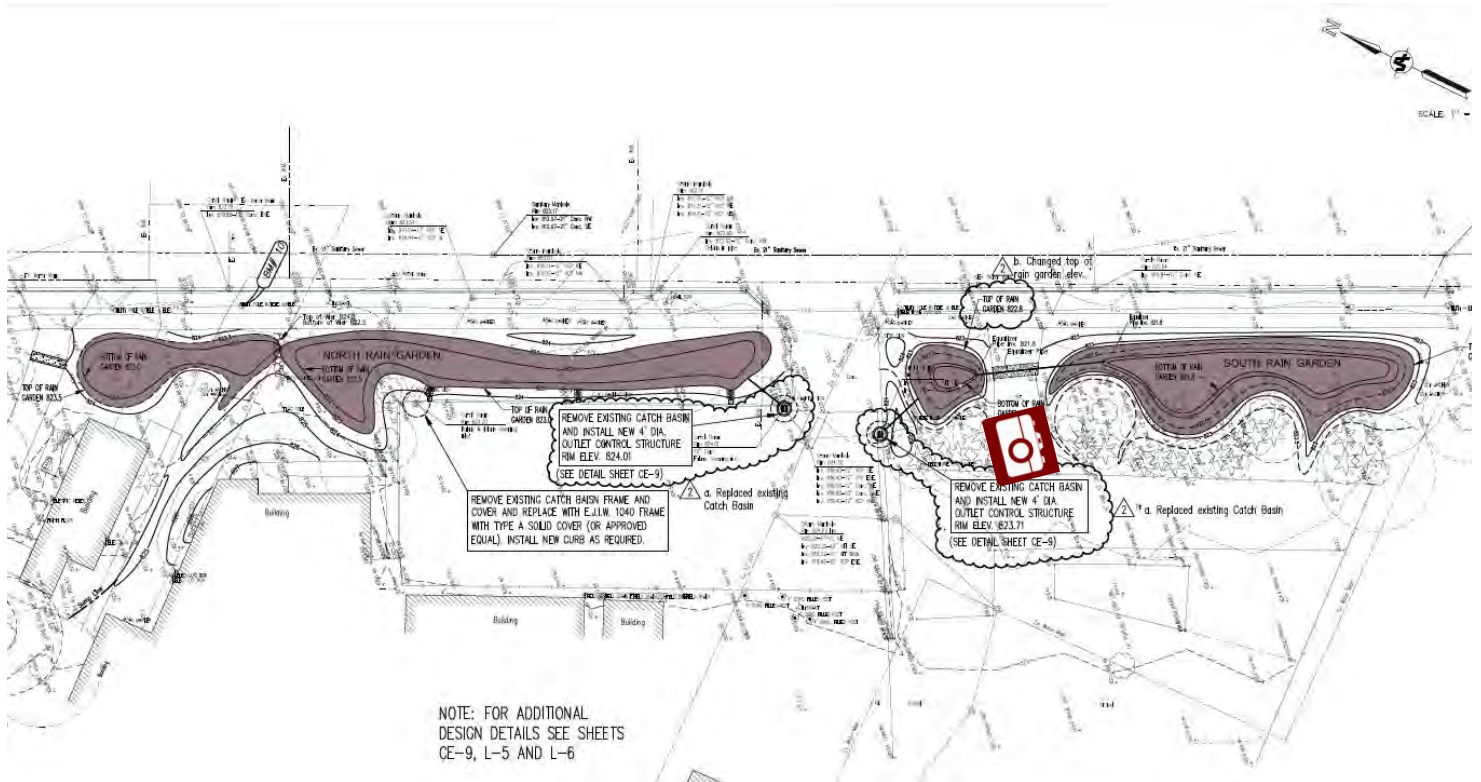
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	21	\$855
Volunteer Labor		
Equipment		\$87
Controlled Burns		
Herbicide	0.25	\$9
Contingency (10%)		\$95
SUM		\$1,046

South Industrial Rain Gardens

Site Plan

Acres: 0.06
SF: 2,500



NATIVE PLANTS TO LOOK FOR:

Perennials:

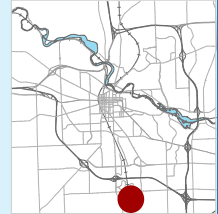
Blue Flag Iris (*Iris virginica*)
Canada Anemone (*Anemone canadensis*)
Fox Sedge (*Carex vulpinoidea*)
Heart-leaved Aster (*Symphyotrichum cordifolium*)
Obedient Plant (*Physostegia virginiana*)
Red-twig Dogwood (*Cornus sericea*)
Wild Strawberry (*Fragaria virginiana*)

Shrubs and Trees:

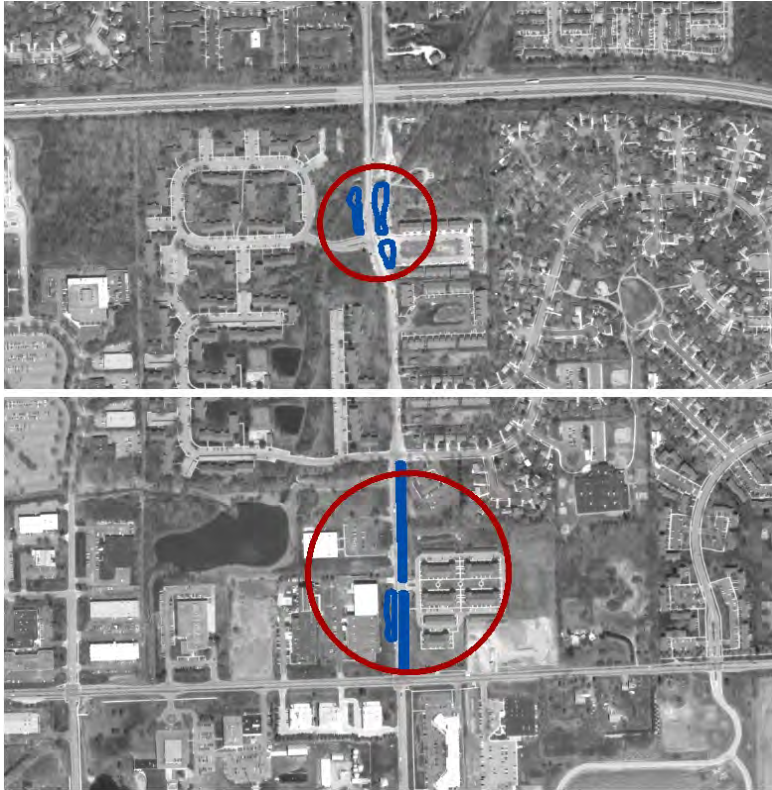
Elderberry (*Sambucus canadensis*)
Ninebark (*Physocarpus opulifolius*)
Pussy Willow (*Salix discolor*)
River Birch (*Betula nigra*)
Shrubby Cinquefoil (*Potentilla fruticosa*)

Stone School Road Rain Gardens

Approximate Address: Stone School Rd north of Ellsworth Rd



SW



0 387.5 775 1,550 Feet

Year Built: 2015

Designer: InSite Design Studio

Aesthetic Level Required: High

DESCRIPTION:

Six vegetated swales line Stone School Road to the west and to the east. Each swale receives stormwater from Stone School Road through a curb cut inlet. Inlets have deep sumps for sediment. Terraced step pools help slow stormwater. This garden was burned in '18

MAINTENANCE NOTES:

Northern most basins were so wet that few of the original plantings survived. Invasives were allowed to grow to stabilize soil. Cut back standing dead between late fall and early spring. Invasives include Cat-tails, Chicory, Phragmites, Japanese Knotweed, Yellow Sweet Clover and Teasel.



August 2016

SEASON	ACTIVITY
Spring	
Summer	Trim as needed if too tall; Cut: Yellow Clover; Pull: Canada Thistle, Sow Thistle
Fall	Pull: Queen Anne's, Chickory, Dandelion, Plantain Hrbcd: Cattail, Phragmites, teasel (Certified Applicator)
Winter	Cut Standing Dead

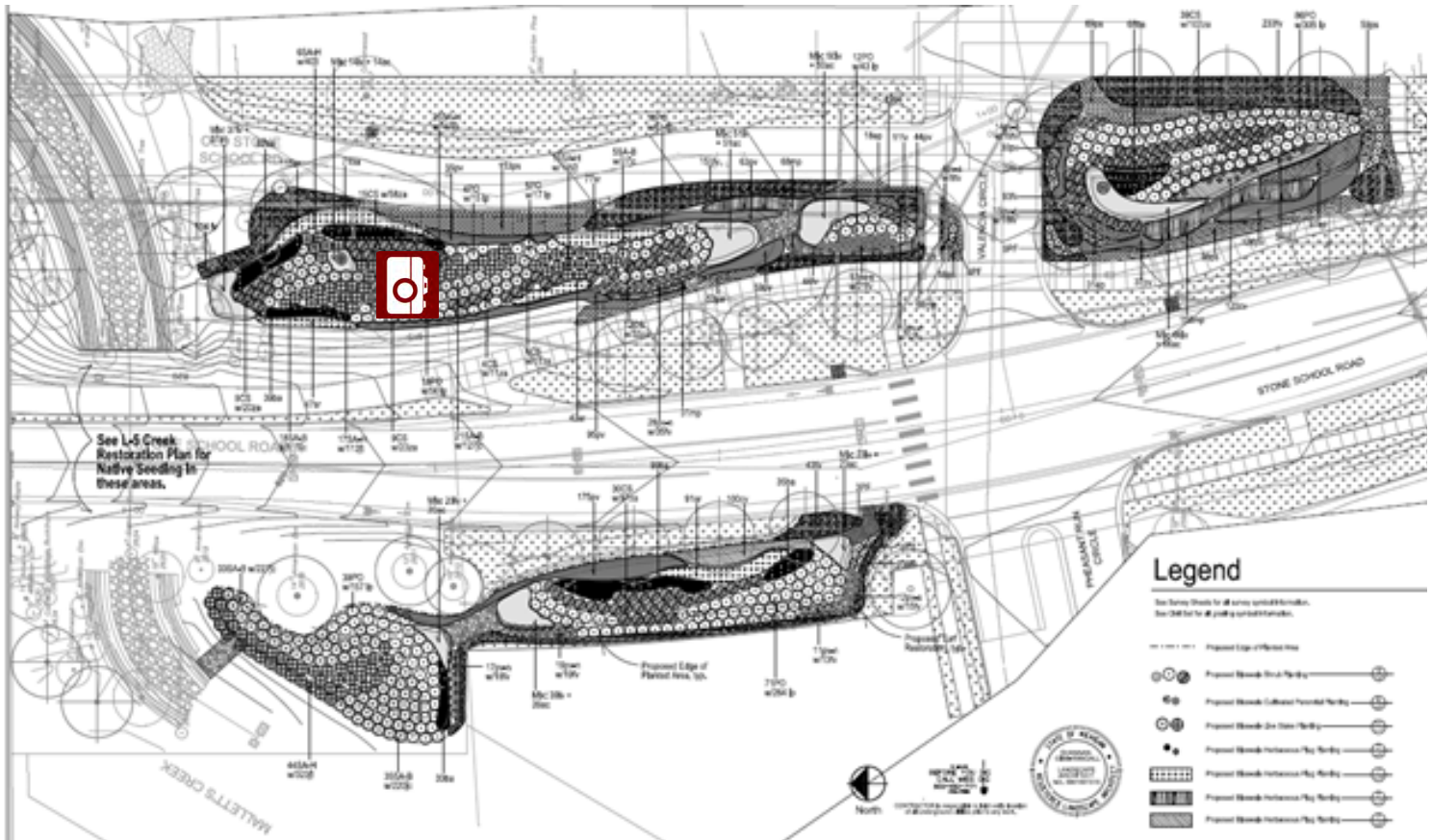
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	34	\$1,384
Volunteer Labor	50	\$1,000
Equipment		\$118
Controlled Burns		\$986
Herbicide	1.4	\$62
Remove Sediment*		
Contingency (10%)		\$355
SUM		\$3,905

* catch basins include deep sediment traps that will be maintained by a City vactor truck.

Stone School Road Rain Gardens

Site Plan

Acres: 1.35
SF: 58,811



NATIVE PLANTS TO LOOK FOR:

Perennials:

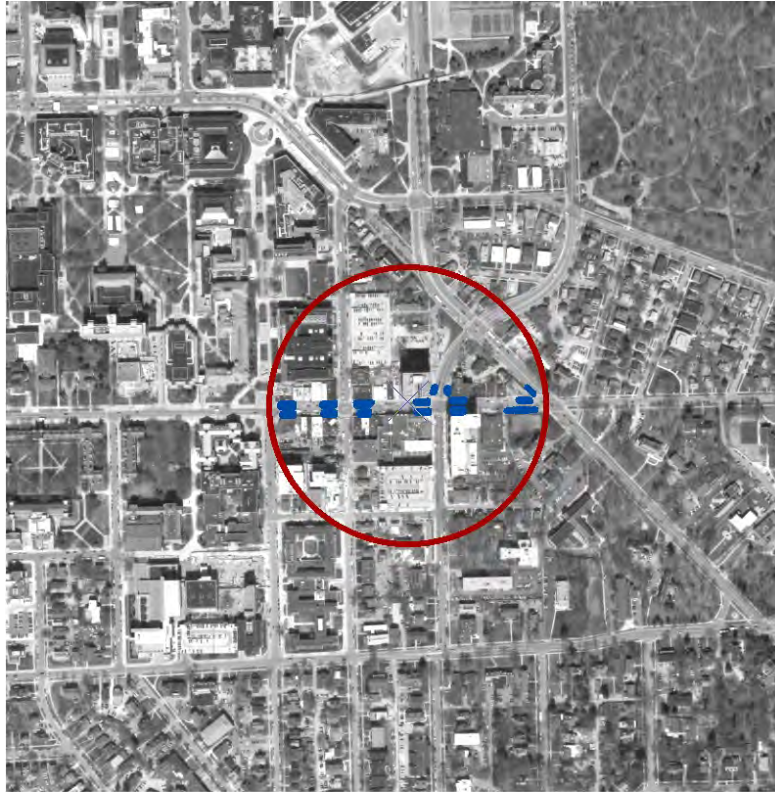
Blue Flag Iris (*Iris virginica*)
Canada Rush (*Juncus canadensis*)
Common Cinquefoil (*Potentilla simplex*)
False Aster (*Boltonia asteroides*)
Fox Sedge (*Carex vulpinoidea*)
Golden Alexanders (*Zizia aurea*)
Horsemint (*Monarda punctata*)
Northwind Switchgrass (*Panicum virgatum*)
Obedient Plant (*Physostegia virginiana*)
Prairie Blazing Star (*Liatris pycnostachya*)
Riddel's Goldenrod (*Solidago ridellii*)
Shenandoah Switchgrass (*Panicum virgatum*)
Swamp Milkweed (*Asclepias incarnate*)
Torrey's Rush (*Juncus torreyi*)
Wild Strawberry (*Fragaria virginiana*)

Shrubs and Trees:

Blackskin Willow (*Salix glabra*)
Common Ninebark (*Physocarpus opulifolius*)
Goldfinger Potentilla (*Potentilla fruticosa*)
Hutchinson's Yellow Red Willow (*Salix x rubens*)
Red-osier Dogwood (*Cornus sericea*)

South University Rain Gardens

Approximate Address: S. University Ave between E. University Ave and Washtenaw Ave



Year Built: 2017

Designer: Smith Group JJR

Aesthetic Level Required: High

DESCRIPTION:

The Downtown Development Association (DDA) was instrumental in developing these gardens. Nineteen rain gardens run between the street and the sidewalk on either side of S. University. Space is provided for benches along the sidewalk. Stormwater runoff comes from the sidewalk. South University is a high traffic area for students.

MAINTENANCE NOTES:

Since these gardens are currently not designed to receive road runoff, funding for maintenance is undetermined.



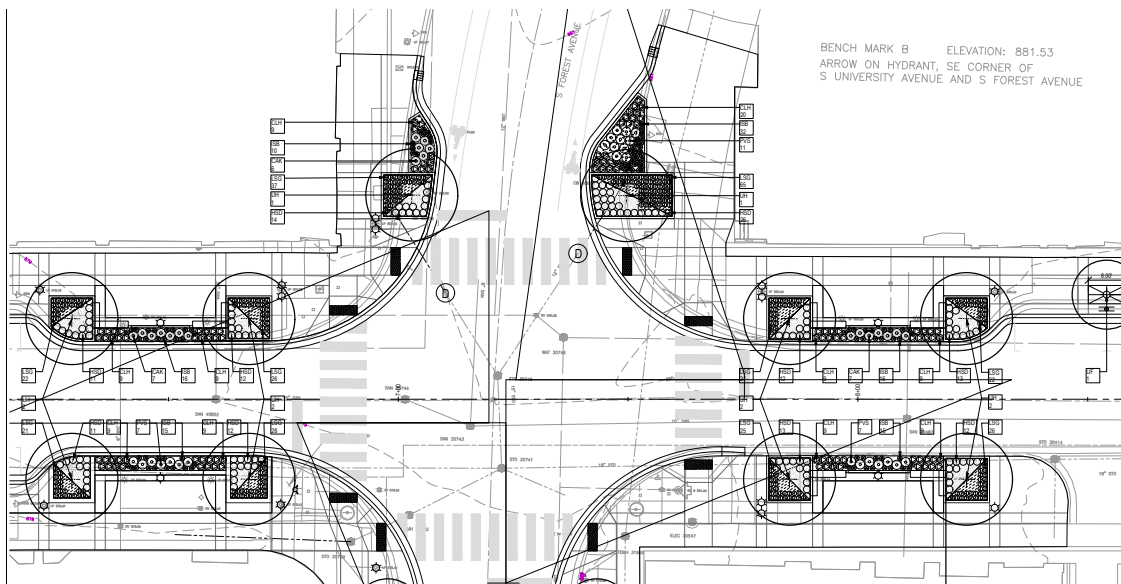
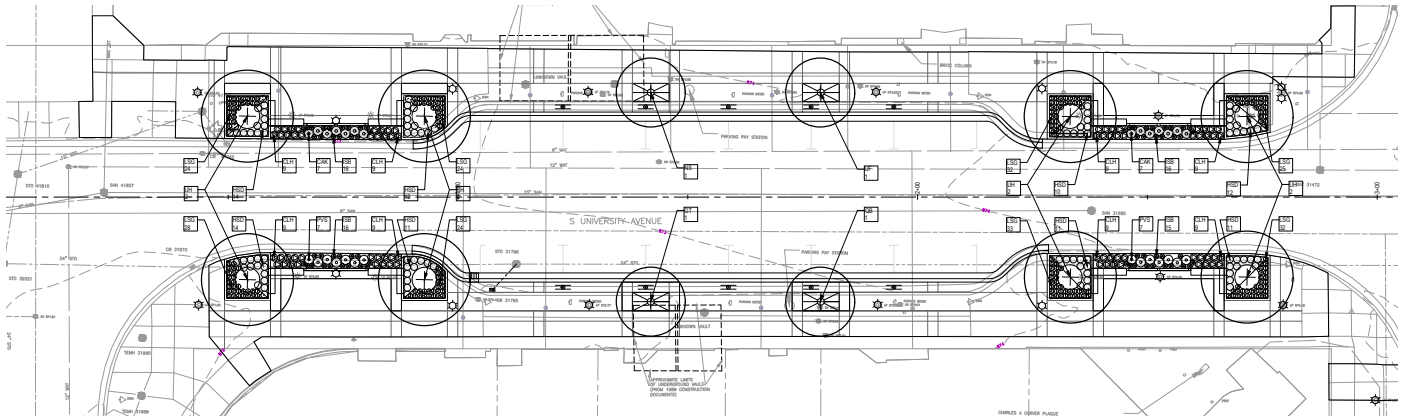
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment		X		
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	44	\$1,791
Volunteer Labor	90	\$1,800
Equipment		\$180
Controlled Burns		\$78
Herbicide	0.25	\$9
Contingency (10%)		\$386
SUM		\$4,244

South University Rain Gardens

Site Plan

Acres: 0.11
SF: 4,630



Above: South University Ave and East University Ave

Left: South University and South Forest Ave

NATIVE PLANTS TO LOOK FOR:

Perennials:

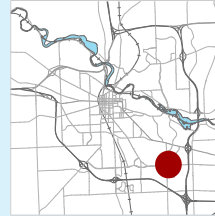
Baby Sister Siberian Iris (*Iris siberica* 'Baby Sister')
Hot Lips Turtle-head (*Chelone lyonii* 'Hot Lips')
Karl Foerster Feather Reed Grass (*Calamagrostis a.*)
Shenandoah Switchgrass (*Panicum virgatum*)
Silver Dragon Liriope (*Liriope spicata* 'Gin-Ryu')
Stella d'Oro Daylily (*Heemerocallis* 'Stella d'Oro')

Shrubs and Trees:

Autumn Gold Ginkgo (*Ginkgo biloba*)
Black Gum (*Nyssa sylvatica*)
Frontier Elm (*Ulmus x 'Frontier'*)
Homestead Elm (*Ulmus x 'Homestead'*)
Skyline Honeylocust (*Gleditsia triacanthos*)
Swamp White Oak (*Quercus bicolor*)

Swift Run Roadside Rain Gardens

Approximate Address: La Salle, La Fere and Fernwood



Year Built: 2018

Designer: City of Ann Arbor & Water Resources Commissioner's Office
Aesthetic Level Required: High

DESCRIPTION:

Seven roadside rain gardens were built in the Swift Run neighborhood. The effort was coordinated by the City of Ann Arbor, the Water Resources Commissioner's Office and the Huron River Watershed Council. The gardens capture stormwater runoff from the residential roads.

MAINTENANCE NOTES:

Each garden was built in coordination with the adjacent homeowner. The homeowner will maintain the rain gardens but they should be regularly monitored.



ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment		X		
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor		
Volunteer Labor		
Equipment		
Controlled Burns		
Herbicide		
Contingency (10%)		
SUM		

Swift Run Roadside Rain Gardens

Site Plan

Acres: SF:

NATIVE PLANTS TO LOOK FOR:

3440 La Salle

Happy Returns Daylily (Hemerocallis 'Happy Returns')
'Magnus' Coneflower
Blue Flag Iris (Iris virginica)
Canda Anemone (Anemone canadensis)
Blue Lobelia (Lobelia siphilitica)
Wild Strawberry (Fragaria virginiana)

3320 Fernwood

Happy Returns Daylily (Hemerocallis 'Happy Returns')
Autumn Joy Sedum (Autumn Fire Sedum)
'Magnus' Coneflower
Blue Flag Iris (Iris virginica)
Blue Lobelia (Lobelia siphilitica)

3130 La Salle

Happy Returns Daylily (Hemerocallis 'Happy Returns')

Autumn Joy Sedum (Autumn Fire Sedum)
'Magnus' Coneflower
Blue Flag Iris (Iris virginica)
Canda Anemone (Anemone canadensis)
Blue Lobelia (Lobelia siphilitica)
Wild Strawberry (Fragaria virginiana)
Cinnamon Fern (Osmunda cinnamomea)
Lady Fern (Athyrium filix-femina)

3159 La Fere

Happy Returns Daylily (Hemerocallis 'Happy Returns')
Autumn Joy Sedum (Autumn Fire Sedum)
'Magnus' Coneflower
Blue Flag Iris (Iris virginica)
Blue Lobelia (Lobelia siphilitica)
Common Cinquefoil (Potentilla simplex)
Wild Strawberry (Fragaria virginiana)

3160 La Salle

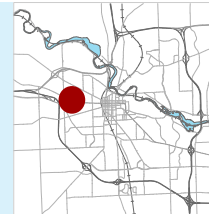
Happy Returns Daylily (Hemerocallis 'Happy Returns')
Blue Flag Iris (Iris virginica)
Canda Anemone (Anemone canadensis)
Blue Lobelia (Lobelia siphilitica)
Common Cinquefoil (Potentilla simplex)
Wild Strawberry (Fragaria virginiana)

3100 Fernwood

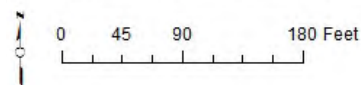
'Magnus' Coneflower
Blue Flag Iris (Iris virginica)
Canda Anemone (Anemone canadensis)
Blue Lobelia (Lobelia siphilitica)
Common Cinquefoil (Potentilla simplex)
Wild Strawberry (Fragaria virginiana)

Veterans Memorial Park Skatepark Rain Gardens

Approximate Address: 2150 Jackson Rd.



SW



Year Built: 2014

Designer: Charles H. Strawter Design, Inc.

Aesthetic Level Required: High

DESCRIPTION:

Large formal rain garden designed to capture run-off from the adjacent concrete skate park. Consists of multiple basins tiered to slow stormwater. A controlled burn was conducted in the spring of 2018 by PlantWise.

MAINTENANCE NOTES:

Cut standing dead yearly for a neater look. Vegetation near the inlet was slow to germinate and may need to be replaced in future years. Trash accumulates quickly. Currently few invasive species in area.



July 2014

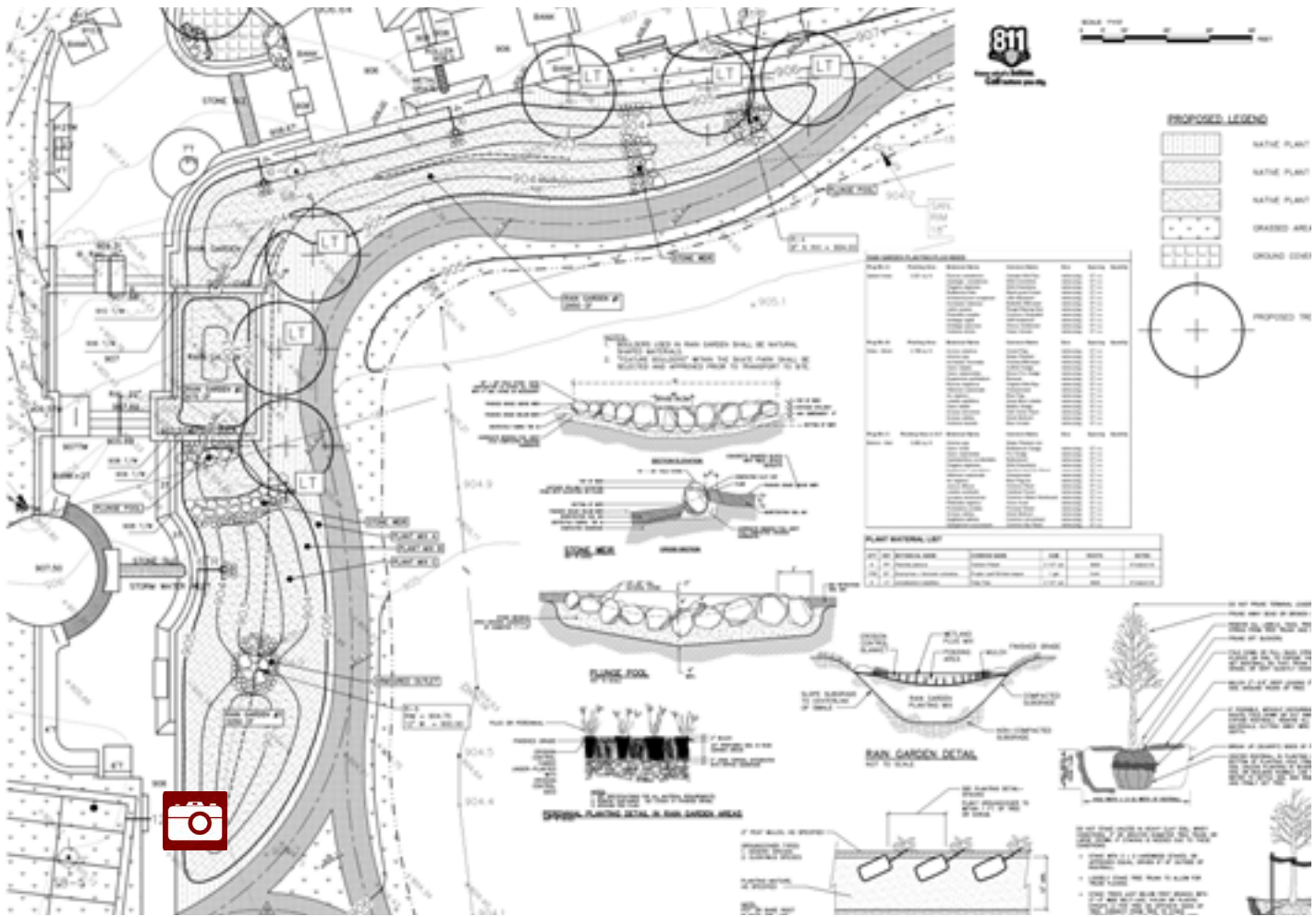
SEASON	ACTIVITY
Spring	
Summer	Pull: Saplings, Sow Thistle
Fall	Collect Seeds
Winter	Cut Standing Dead

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	27	\$1,081
Volunteer Labor	40	\$800
Equipment		\$118
Controlled Burns*		\$92
Herbicide	0.25	\$9
Contingency (10%)		\$210
SUM		\$2,310

*per estimate from PlantWise. Burn every three years so cost spread across years

Veterans Memorial Park Skatepark Rain Gardens Site Plan

Acres: 0.13
SF: 5,500



NATIVE PLANTS TO LOOK FOR:

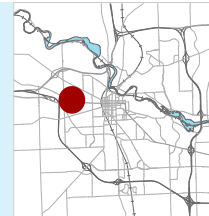
Perennials:

- Arrow Arum (*Peltandra virginica*)
- Bebb's Sedge (*Carex bebbii*)
- Black-eyed Susan (*Rudbeckia hirta*)
- Blue Flag Iris (*Iris virginica*)
- Blue Vervain (*Verbena hastata*)
- Boneset (*Eupatorium perfoliatum*)
- Bottlebrush Sedge (*Carex lurida*)
- Brown Fox Sedge (*Carex vulpenoidea*)
- Butterfly Milkweed (*Asclepias tuberosa*)
- Buttonbush (*Cephalanthus occidentalis*)
- Cardinal Flower (*Lobelia cardinalis*)
- Common Arrowhead (*Sagittaria latifolia*)
- Common Bur Reed (*Sparganium eurycarpum*)
- Common Cinquefoil (*Potentilla simplex*)
- Common Water Horehound (*Lycopus americanus*)

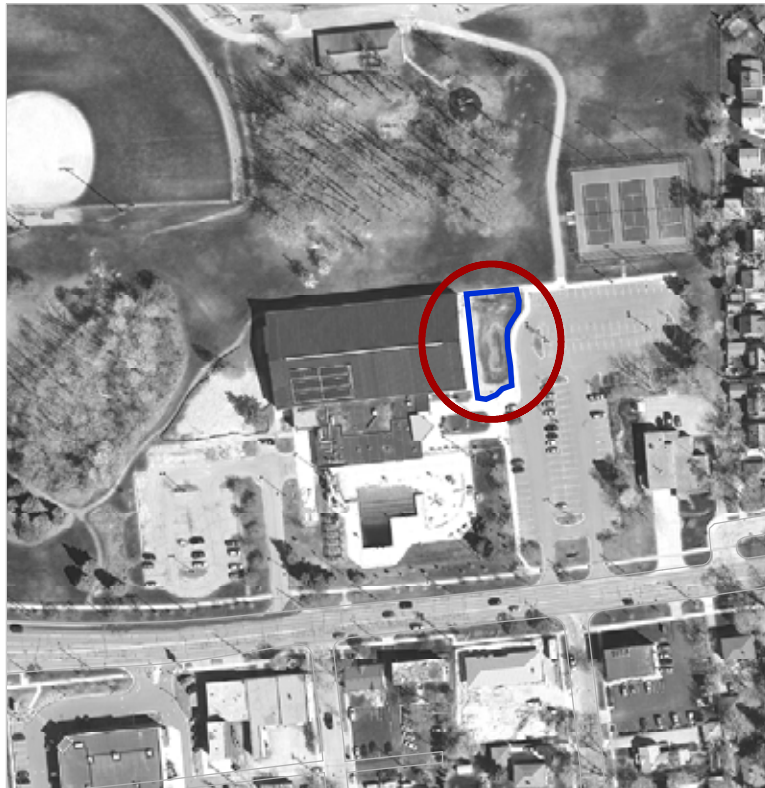
Dark Green Rush (*Scirpus atrovirens*)
Great Bullrush (*Scirpus validus*)
Hoary Vervain (*Verbena stricta*)
Little Bluestem (*Schizachyrium scoparium*)
Pickerel Weed (*Pontederia cordata*)
Rough Blazing Star (*Liatris aspera*)
Showy Goldenrod (*Solidago speciosa*)
Sneezeweed (*Helenium autumnale*)
Spotted Joe-Pye Weed (*Eupatorium maculatum*)
Stiff Goldenrod (*Solidago rigida*)
Swamp Milkweed (*Asclepias incarnate*)
Sweet Flag (*Acorus calamus*)
Water Plantain (*Alisma spp.*)
Wild Columbine (*Aquilegia canadensis*)
Wild Strawberry (*Fragaria virginiana*)

Veterans Memorial Park: Ice Arena East Rain Garden

Approximate Address: 2150 Jackson Rd.



SW



Year Built: 2011

Designer: InSite Design Studio, Inc.

Aesthetic Level Required: High

DESCRIPTION:

This large rain garden replaced a paved area. It receives runoff from sidewalks and the roof of the ice arena building. A controlled burn was conducted in the spring of 2016. The garden was replanted with short plants and trees in the fall of 2016 for a simpler aesthetic.

MAINTENANCE NOTES:

Cut down standing dead between late fall and early spring. Invasives include Phragmites, Canada Thistle, Curly Dock and common yard weeds like Plantain and Dandelion.



July 2014

SEASON	ACTIVITY
Spring	Pull: Curly Dock, Canada Thistle, Chickory, Bull Thistle, Plantain, Dandelion; Cut: Yellow Clover
Summer	Pull: Curly Dock, Canada Thistle, Chickory, Bull Thistle, Plantain, Dandelion; Cut: Yellow Clover
Fall	Hrbcd: Cattail, Oriental Bittersweet
Winter	Cut Standing Dead

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	31	\$1,244
Volunteer Labor	145	\$2,900
Equipment		\$165
Controlled Burns*		\$67
Herbicide	0.25	\$9
Contingency (10%)		\$459
SUM		\$4,844

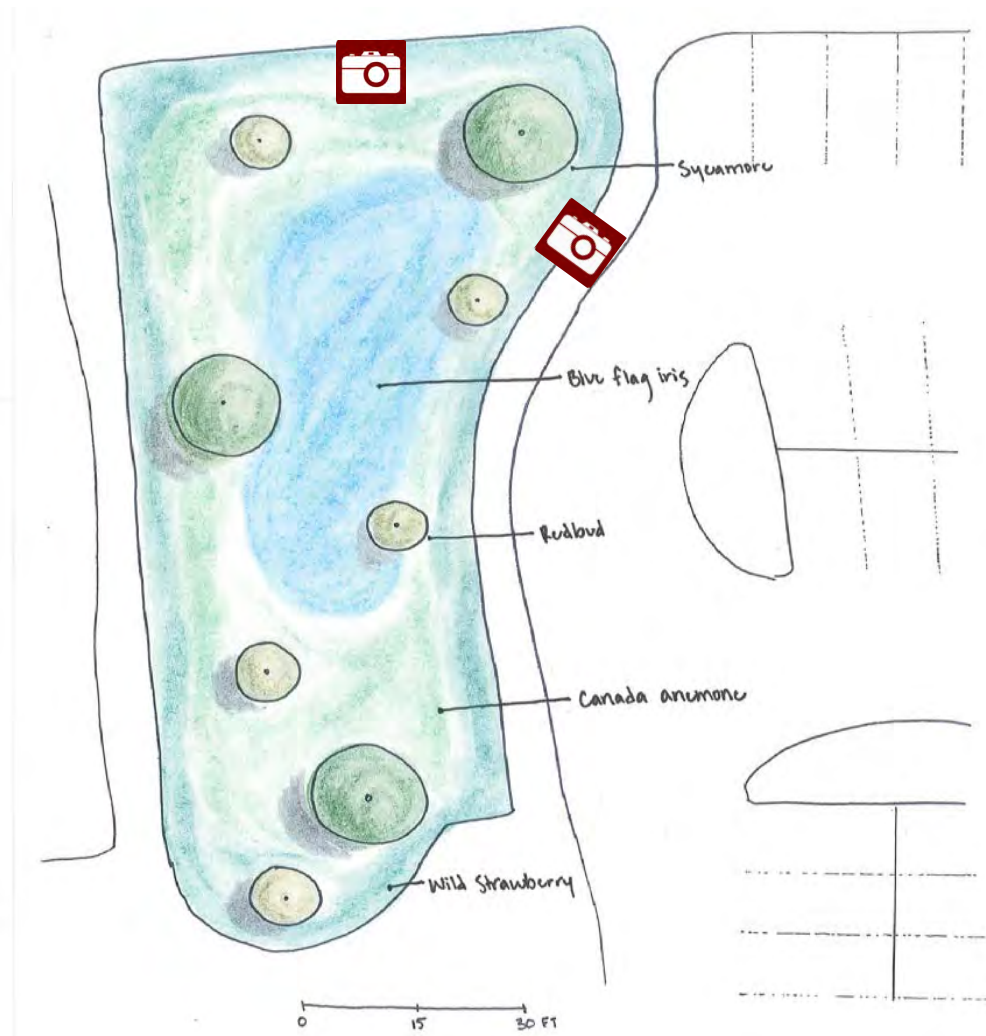
*per estimate from PlantWise. Burn every three years so cost spread across years

Veterans Memorial Park: Ice Arena East Rain Garden

Site Plan

Acres: 0.09

SF: 4,000



NATIVE PLANTS TO LOOK FOR:

Perennials:

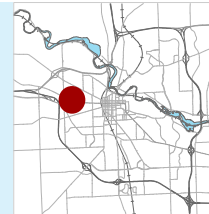
Blue Flag Iris (*Iris virginica*)
Canada Anemone (*Anemone canadensis*)
Fox Sedge (*Carex vulpinoidea*)
Sensitive Fern (*Onoclea sensibilis*)
Wild Strawberry (*Fragaria virginiana*)

Shrubs and Trees:

Redbud (*Cercis canadensis*)
Sycamore (*Platanus occidentalis*)

Veterans Memorial Park: Zamboni Rain Garden

Approximate Address: 2150 Jackson Rd.



SW



Year Built: 2008

Designer: Conservation Design Forum

Aesthetic Level Required: Medium

DESCRIPTION:

West of the ice arena, this rain garden receives runoff from the parking lot. Often ice from the Zamboni is dropped uphill of the rain garden and melts into the garden. As one of Ann Arbor's older rain gardens, there are many well established plants growing. A controlled burn was conducted in the spring of 2016.

MAINTENANCE NOTES:

Native seeds can be collected from this site. The inlets need to regularly be maintained. Cut down standing dead in late fall because vegetation is very tall. Invasives include Field Bindweed, Canada Thistle, Curly Dock, Burdock and Buckthorn. Communicate with mowers to mow upland areas.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment		X		
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	17	\$674
Volunteer Labor	30	\$600
Equipment		\$118
Controlled Burns*		\$77
Herbicide	0.25	\$10
Contingency (10%)		\$156
SUM		\$1,635

*per estimate from PlantWise. Burn every three years so cost spread across years

Veterans Memorial Park: Zamboni Rain Garden

Site Plan

Acres: 0.1
SF: 4,570



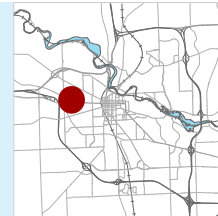
NATIVE PLANTS TO LOOK FOR:

Beardtounge (*Penstemon digitalis*)
 Beebalm (*Monarda fistulosa*)
 Blue Flag Iris (*Iris virginica*)
 Blue Vervain (*Verbena hastata*)
 Canada Anemone (*Anemone canadensis*)
 Canada Wild Rye (*Elymus canadensis*)
 Early Goldenrod (*Solidago juncea*)
 Evening Primrose (*Oenothera biennis*)
 Fox Sedge (*Carex vulpinoidea*)
 Gray Headed Coneflower (*Ratibida pinnata*)
 Green Bulrush (*Scirpus atrovirens*)
 Green-Headed Coneflower (*Rudbeckia laciniata*)
 Hoary Vervain (*Verbena stricta*)
 Indian Grass (*Sorghastrum nutans*)
 Ironweed (*Vernonia missurica*)
 Joe-Pye Weed (*Eupatorium purpureum*)
 Little Bluestem (*Schizachyrium scoparium*)

Missouri Ironweed (*Vernonia missurica*)
 Mountain Mint (*Pycnanthemum tenuifolium*)
 New England Aster (*Aster novae-angliae*)
 Nodding Bulrush (*Scirpus pendulus*)
 Prairie Dock (*Silphium terebinthinaceum*)
 Riddell's Goldenrod (*Solidago riddellii*)
 Rough Blazing Star (*Liatris aspera*)
 Slender Mountain Mint (*Pycnanthemum tenuifolium*)
 Swamp Goldenrod (*Solidago patula*)
 Sweet Flag (*Acorus calamus*)
 Switch Grass (*Panicum virgatum*)
 Thimbleweed (*Anemone virginiana*)
 Tussock Sedge (*Carex stricta*)
 Woolgrass (*Scirpus cyperinus*)
 Yellow Coneflower (*Ratibida pinnata*)

Veterans Memorial Park Dexter Ave Rain Garden

Approximate Address: 2150 Jackson Rd.



SW



Year Built: 2012

Designer: Susan Bryan & Chris Carson, City of
Ann Arbor

Aesthetic Level Required: Medium

DESCRIPTION:

South of the softball parking lot, this rain garden receives water piped from Dexter Road. A large stormwater inlet at the northwest corner was engineered to send overflow water directly into the stormwater system, which means that the rain garden won't overflow. The rain garden has tiered sections with reinforced rock steps. A controlled burn was conducted in the spring of 2018 by PlantWise.

MAINTENANCE NOTES:

This rain garden is dominated by invasives like Canada Thistle and Phragmites. This garden should be replanted.



July 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	30	\$1,207
Volunteer Labor	20	\$400
Equipment		\$118
Controlled Burns*		\$386
Herbicide	8	\$293
Contingency (10%)		\$249
SUM		\$2,653

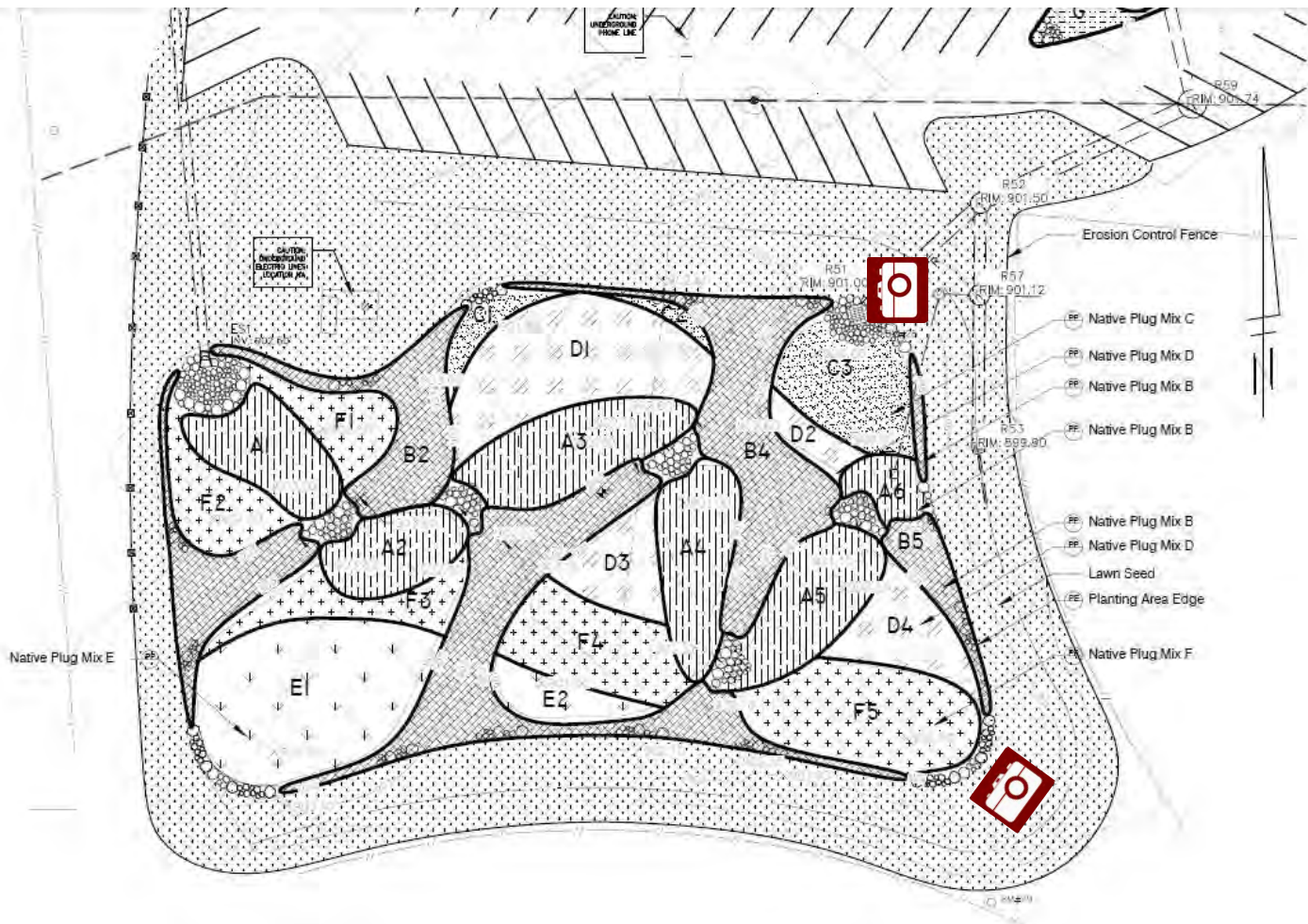
**per estimate from PlantWise. Burn every three years so cost spread across years*

Veterans Memorial Park: Dexter Ave Rain Garden

Site Plan

Acres: 0.53

SF: 23,046



NATIVE PLANTS TO LOOK FOR:

Perennials:

Barren Strawberry (*Geum fragarioides*)
 Big Bluestem (*Andropogon gerardii*)
 Black-Eyed Susan (*Rudbeckia hirta*)
 Canada Anemone (*Anemone canadensis*)
 Common Cinquefoil (*Potentilla simplex*)
 Common Milkweed (*Asclepias syriaca*)
 Cup Plant (*Silphium perfoliatum*)
 Foxtail Sedge (*Carex alopecoidea*)
 Indian Grass (*Sorghastrum nutans*)
 Ironweed (*Vernonia missurica*)
 Little Bluestem (*Schizachyrium scoparium*)
 Muskingum Sedge (*Carex muskingumensis*)
 Nodding Wild Onion (*Allium cernuum*)
 Obedient Plant (*Physostegia virginiana*)
 Pale Leaved Sunflower (*Helianthus strumosus*)

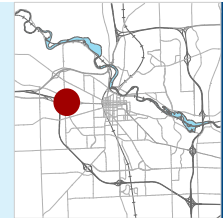
Prairie Heart Leaved Aster (*Symphotrichum oolentangiense*)
 Rose Mallow (*Hibiscus moscheutos*)
 Smooth Aster (*Symphotrichum laeve*)
 Swamp Milkweed (*Asclepias incarnata*)
 Switch Grass (*Panicum virgatum*)
 Tall Flat Topped Aster (*Doellingeria umbellata*)
 Tall Sunflower (*Helianthus giganteus*)
 Tall Tickseed (*Coreopsis tripteris*)
 Wild Strawberry (*Fragaria virginiana*)
 Yellow Coneflower (*Ratibida pinnata*)

Shrubs and Trees:

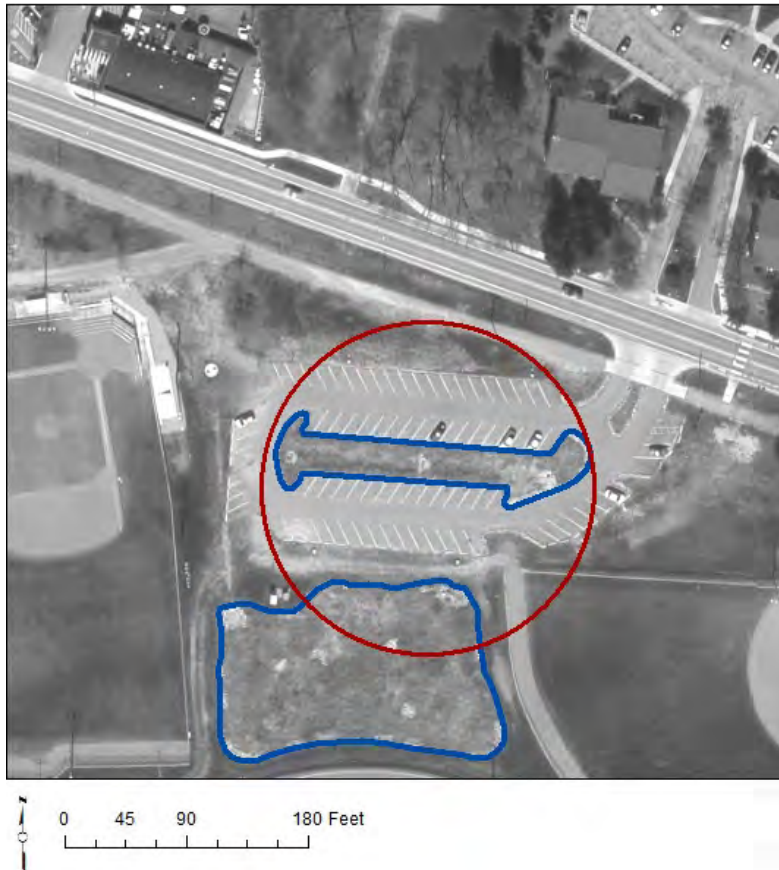
Bur Oak (*Quercus macrocarpa*)
 Swamp White Oak (*Quercus bicolor*)

Veterans Memorial Park North Parking Bioswale

Approximate Address: 2150 Jackson Rd.



SW



Year Built: 2012

Designer: Susan Bryan & Chris Carson, City of
Ann Arbor

Aesthetic Level Required: Medium

DESCRIPTION:

Located in the center of the parking lot off of Dexter Road, this bioswale receives water from the surrounding lot. Few of the original plugs survived which allowed invasives to dominate. A controlled burn was conducted in the spring of 2018.

MAINTENANCE NOTES:

Dominated by invasives, this garden should be re-planted. When burned, it should be done two years in a row to remove Crown Vetch. Invasives include Canada Thistle, Bittercress and Phragmites, Field Bindweed, Yellow Sweet Clover and Reed Canary Grass.



July 2014

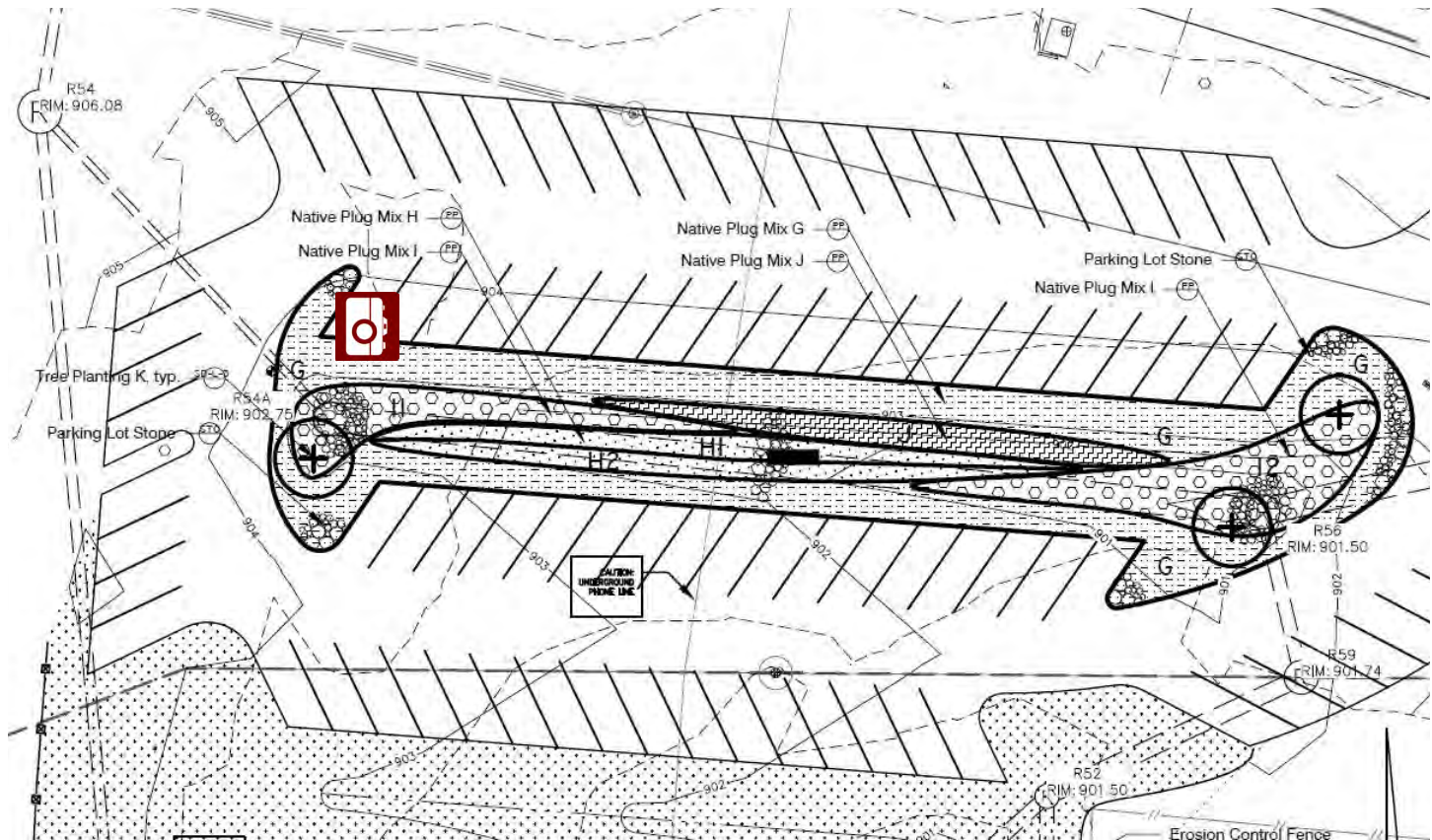
ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash	X			
Remove Invasives	X			
Remove Sediment			X	
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	32	\$1,289
Volunteer Labor	30	\$600
Equipment		\$118
Controlled Burns*		\$122
Herbicide	0.25	\$10
Contingency (10%)		\$223
SUM		\$2,362

*per estimate from PlantWise. Burn every three years so cost spread across years

Veterans Memorial Park North Parking Bioswale Site Plan

Acres: 0.17
SF: 7,303



NATIVE PLANTS TO LOOK FOR:

Perennials:

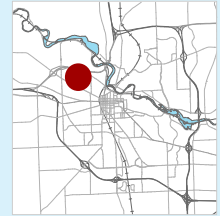
Blue Lobelia (*Lobelia siphilitica*)
Common Cinquefoil (*Potentilla simplex*)
Fox Sedge (*Carex vulpinoidea*)
Muskingum Sedge (*Carex muskingumensis*)
Obedient Plant (*Physostegia virginiana*)
Purple Love Grass (*Eragrostis spectabilis*)
Swamp Milkweed (*Asclepias incarnata*)
Switch Grass (*Panicum virgatum*)
Wild Strawberry (*Fragaria virginiana*)

Shrubs and Trees:

Bur Oak (*Quercus macrocarpa*)

Water Treatment Settling Pond Detention Basin

Approximate Address: 919 Sunset Rd.



SW



0 265 530 1,060 Feet

Year Built: 1999

Designer: Tetra Tech

Aesthetic Level Required: Low

DESCRIPTION:

This deep detention basin has a sediment forbay in the southern corner and a beehive drain overflow in the northeastern corner. Since it is behind lock and key, it is difficult to access without support from staff at the Water Treatment Plant. Overland water flowing in is held in the basin, likely to reduce flow into the spent lime sludge lagoon.

MAINTENANCE NOTES:

Ensure the overflow structure is clear of debris. Invasives include Spotted Knapweed, Thistle, Phragmites, Yellow Sweet Clover, Purple Loosestrife, Buckthorn, Chickory, Autumn Olive and Black Locust.



ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Remove Sediment				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	4	\$163
Volunteer Labor		
Equipment		\$87
Controlled Burns		
Herbicide		
Contingency (10%)		\$25
SUM		\$275

August 2016

Water Treatment Settling Pond

Site Plan

Acres: 58
SF: 25,152



NATIVE PLANTS TO LOOK FOR:

Perennials:

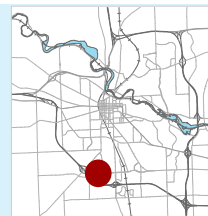
Aster spp.
Black Bulrush (*Scirpus atrovirens*)
Blue Vervain (*Verbena hastata*)
Boneset (*Eupatorium perfoliatum*)
Bottlebrush Sedge (*Carex hystericina*)
Canadian St. Johnswort (*Hypericum canadense*)
Goldenrod (*Solidago* spp.)
Yellow Coneflower (*Ratibida pinnata*)

Shrubs and Trees:

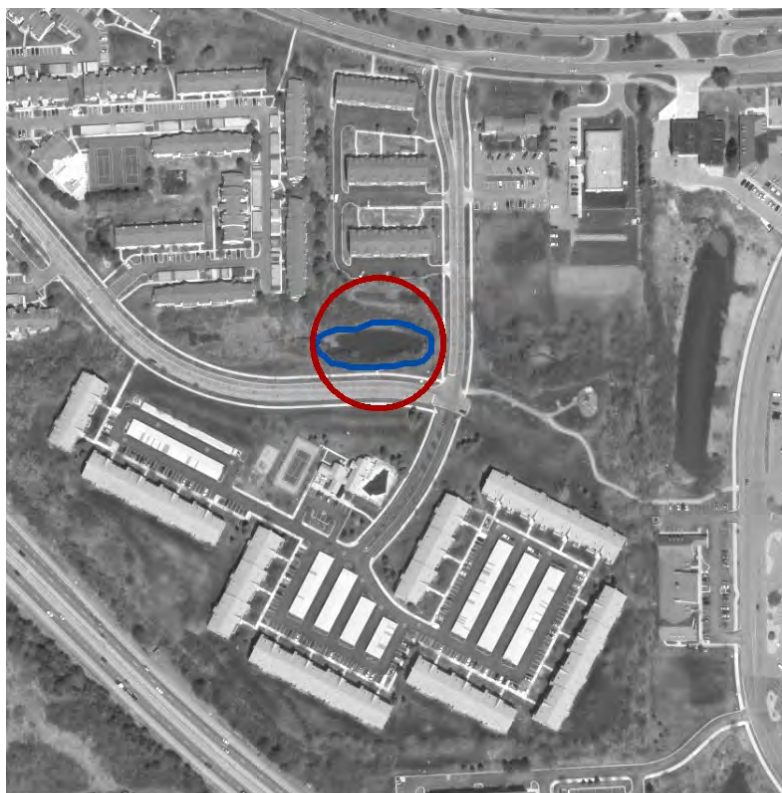
Eastern Black Walnut (*Juglans nigra*)
Gray Dogwood (*Cornus racemosa*)
Staghorn Sumac (*Rhus typhina*)
Willow (*Salix* spp.)

Waymarket Park Detention Basin

Approximate Address: Signature Blvd. at Waymarket Dr.



SW



Year Built: 1988

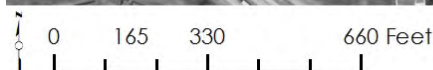
Aesthetic Level Required: Low

DESCRIPTION:

This detention basin receives stormwater from surrounding parking lots and roads. Surrounded by woody trees and shrubs, the detention area appears to be a small natural area.

MAINTENANCE NOTES:

Buckthorn, Honeysuckle and other invasives are abundant. No trails exist through the natural area so it would be difficult to remove invasives.



November 2014

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Dredge				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds				X

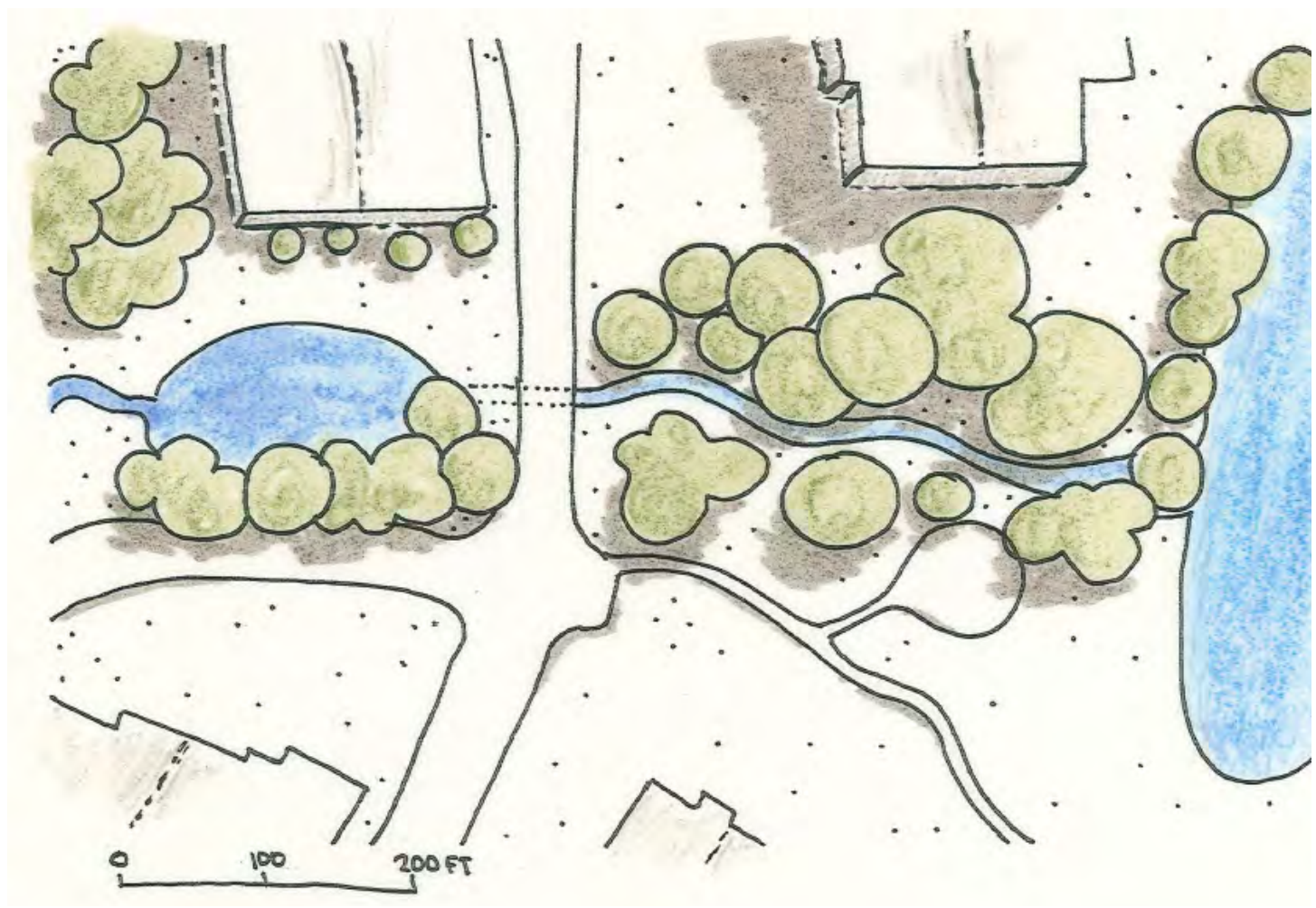
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	2	\$81.40
Controlled Burns		
Dredge on-site disposal \$40/CY		
Dredge off-site disposal \$70/CY		
Contingency (10%)		
SUM		\$81.40

Dredging cost pending

Waymarket Park Detention Basin

Site Plan

Acres: 56
SF: 24,203



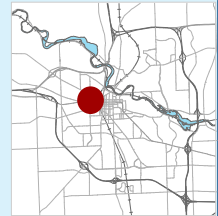
NATIVE PLANTS TO LOOK FOR:

Shrubs and Trees:

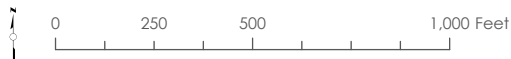
American Elm (*Ulmus americana*)
Boxelder (*Acer negundo*)
Eastern Cottonwood (*Populus deltoides*)
Staghorn Sumac (*Rhus typhina*)
Willow (*Salix* spp)

West Park Bandshell Wetland

Approximate Address: 215 Chapin St.



SW



Year Built: 2010

Designer: Beckett & Raeder / ECT

Aesthetic Level Required: High

DESCRIPTION:

Surrounding the bandshell in West Park is a wetland where Cat-Tails thrive. Stormwater runoff comes from overland flow and from the road via an uphill wetland complex. A controlled burn was conducted in the spring of 2016.

MAINTENANCE NOTES:

The cat-tails need to be monitored and managed regularly. All vegetation should be cut down regularly to allow the stage to be visible.



July 2014

SEASON	ACTIVITY
Spring	Remove Sediment; Pull: Canada Thistle, Chickory, Dames Rocket, Garlic Mustard
Summer	Cut: Yellow Clover; Pull: Curly Dock, Chickory
Fall	Remove Sediment; Hrbcd: Buckthorn, Canada Thistle, Cattails, Phragmites, Teasel, Spotted Knapweed, Saplings
Winter	

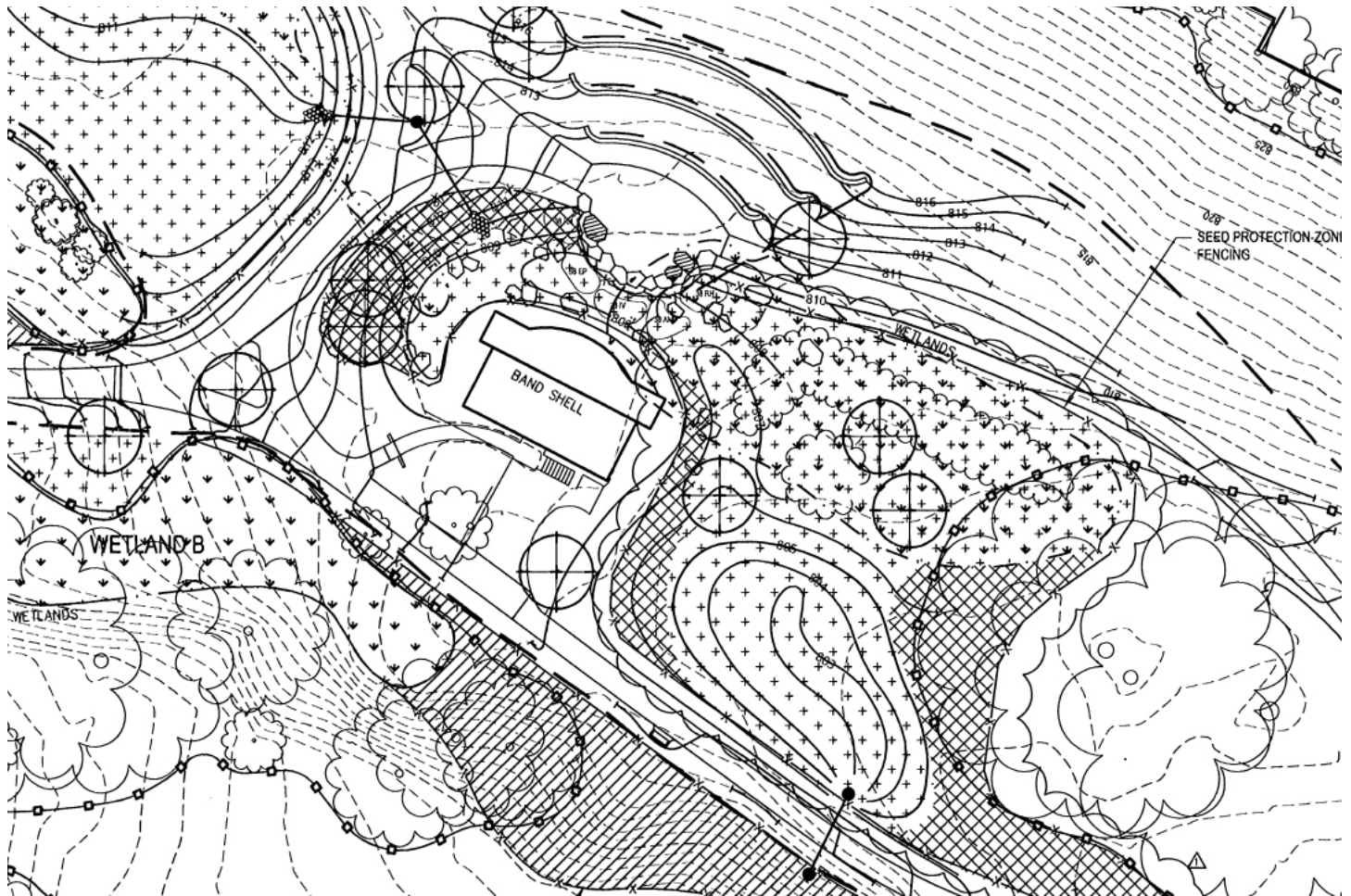
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	21	\$841
Volunteer Labor	30	\$600
Equipment		\$118
Controlled Burns*		\$248
Herbicide	3.5	\$127
Contingency (10%)		\$201
SUM		\$2,135

**per estimate from PlantWise. Burn every three years so cost spread across years*

West Park Bandshell Wetland

Site Plan

Acres: 0.34
SF: 14,774



NATIVE PLANTS TO LOOK FOR:

Perennials:

Black-eyed Susan (*Rudbeckia hirta*)
Broad Leaf Cattail (*Typha latifolia*)
Brown-eyed Susan (*Rudbeckia triloba*)
Calico Aster (*Symphyotrichum lateriflorum*)
Canada Goldenrod (*Solidago Canadensis*)
Evening Primrose (*Oenothera biennis*)
False Sunflower (*Heliopsis helianthoides*)
Fox Sedge (*Carex vulpinoidea*)
Gray-headed Coneflower (*Ratibida pinnata*)
Ironweed (*Vernonia missurica*)
Jewel Weed (*Impatiens capensis*)
Lance-leaved Goldenrod (*Euthamia graminifolia*)
Little Bluestem (*Schizachyrium scoparium*)
Mountain Mint (*Pycnanthemum tenuifolium*)
Northern Ragwort (*Packera paupercula*)
Obedient Plant (*Physostegia virginiana*)
Swamp Aster (*Symphyotrichum puniceum*)
Switch Grass (*Panicum virgatum*)

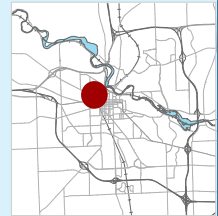
Torrey's Sedge (*Juncus torreyi*)
White Vervain (*Asclepias verticillata*)
Zigzag Goldenrod (*Solidago flexicaulis*)

Trees & Shrubs

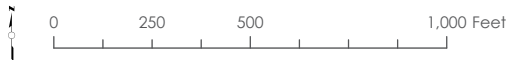
Eastern Cottonwood (*Populus deltoids*)
Sandbar Willow (*Salix interior*)
Swamp White Oak (*Quercus bicolor*)

West Park Northwest Wetland

Approximate Address: 215 Chapin St.



SW



Year Built: 2010

Designer: Beckett & Raeder / ECT

Aesthetic Level Required: High

DESCRIPTION:

This natural area receives stormwater from road runoff. It is terraced in shape to slow water and is full of trees and wetland plants. There is often standing water in portions. A controlled burn was conducted in the spring of 2016 by PlantWise.

MAINTENANCE NOTES:

Burn and seed regularly. Invasives include Black Locust, Teasel, Canada Thistle and Yellow Sweet Clover.



July 2014

SEASON	ACTIVITY
Spring	Remove Sediment; Pull: Canada Thistle, Chickory, Dames Rocket, Garlic Mustard
Summer	Cut: Yellow Clover; Pull: Curly Dock, Chickory
Fall	Remove Sediment; Hrbcd: Buckthorn, Canada Thistle, Cattails, Phragmites, Teasel, Spotted Knapweed, Saplings
Winter	

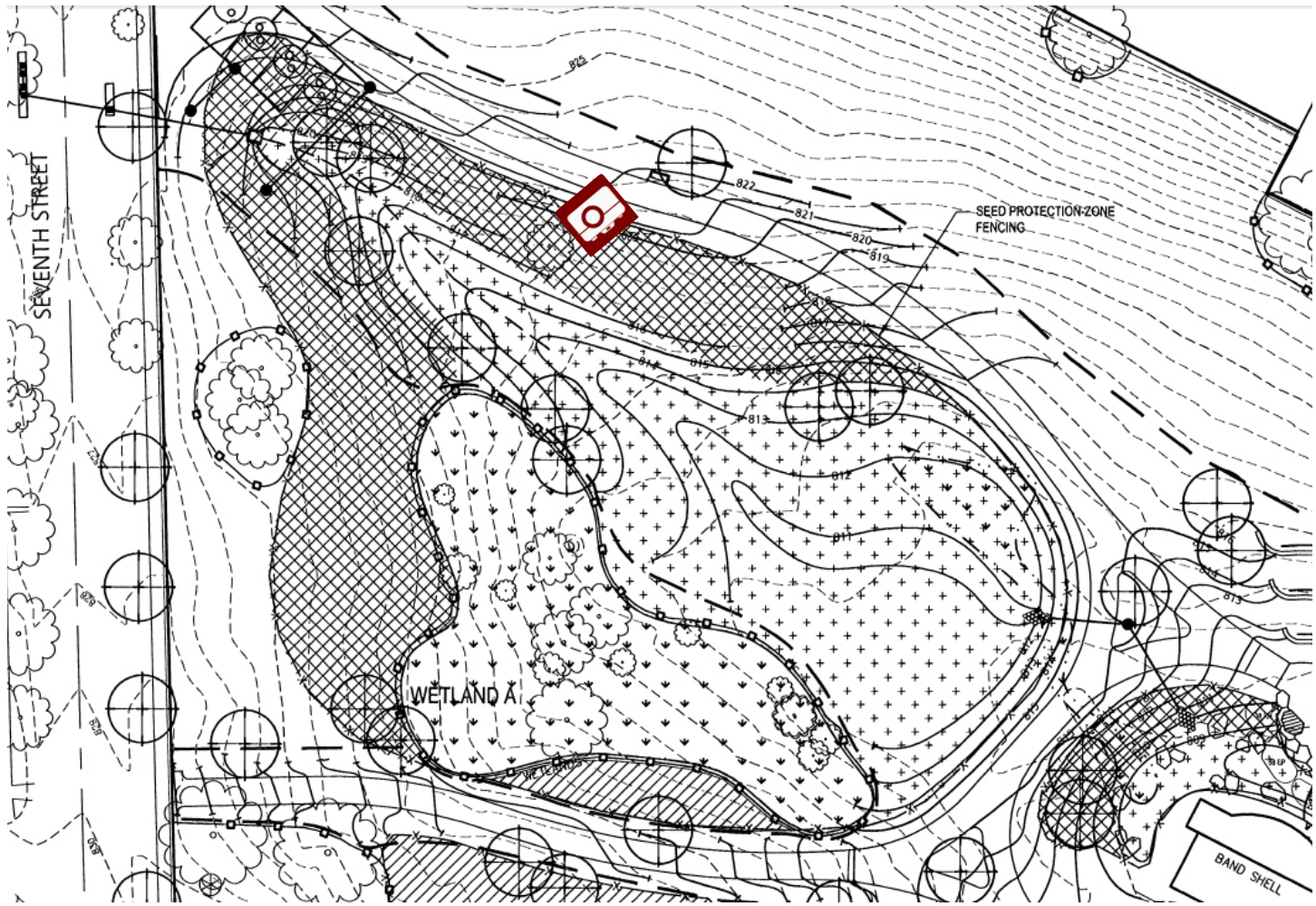
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	25	\$1,004
Volunteer Labor	60	\$1,200
Equipment		\$149
Controlled Burns*		\$307
Herbicide	3.5	\$130
Contingency (10%)		\$295
SUM		\$3,085

*per estimate from PlantWise. Burn every three years so cost spread across years

West Park Northwest Wetland

Site Plan

Acres: 0.42
SF: 18,297



NATIVE PLANTS TO LOOK FOR:

Perennials:

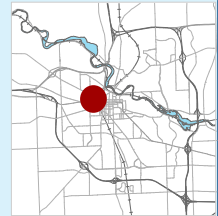
Beardtongue (*Penstemon digitalis*)
Black Raspberry (*Rubus occidentalis*)
Broad Leaf Cattail (*Typha latifolia*)
Calico Aster (*Symphyotrichum lateriflorum*)
Common Milkweed (*Asclepias syriaca*)
Evening Primrose (*Oenothera biennis*)
False Sunflower (*Heliopsis helianthoides*)
Fleabane Aster (*Erigeron peregrinus*)
Gray-headed Coneflower (*Ratibida pinnata*)
Jewel Weed (*Impatiens capensis*)
Lance-leaved Goldenrod (*Euthamia graminifolia*)
Prairie Cordgrass (*Spartina pectinata*)
Purple Coneflower (*Echinacea purpurea*)
Slender Mountain Mint (*Pycnanthemum tenuifolium*)

Trees & Shrubs

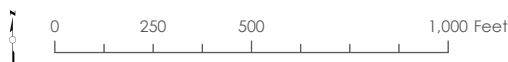
Eastern Black Walnut (*Juglans nigra*)
Eastern Cottonwood (*Populus deltoids*)
Northern Catalpa (*Catalpa speciosa*)
Sandbar Willow (*Salix interior*)
Silver Maple (*Acer saccharinum*)
Swamp White Oak (*Quercus bicolor*)
Sycamore (*Platanus occidentalis*)
Tulip Tree (*Liriodendron tulipifera*)

West Park Southwest Swale

Approximate Address: 215 Chapin St.



SW



Year Built: 2010

Designer: Beckett & Raeder / ECT

Aesthetic Level Required: Medium

DESCRIPTION:

This long thin swale at the base of the forested hillside on the south side of West Park is full of native grasses and forbs. A historic pathway runs south of the swale. Receiving runoff from the uphill neighborhood, this area is often saturated. A bridge crosses the swale for those coming from Huron Street. A controlled burn was conducted in the spring of 2016.

MAINTENANCE NOTES:

Burn and seed regularly, can have a natural look. Invasive species include Canada Thistle, Yellow Sweet Clover, Crown Vetch, Tree of Heaven, Purple Loosestrife and Teasel.



June 2014

SEASON	ACTIVITY
Spring	Remove Sediment; Pull: Canada Thistle, Chickory, Dames Rocket, Garlic Mustard
Summer	Cut: Yellow Clover; Pull: Curly Dock, Chickory
Fall	Remove Sediment; Hrbcd: Buckthorn, Canada Thistle, Cattails, Phragmites, Teasel, Spotted Knapweed, Saplings
Winter	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	21	\$841
Volunteer Labor	30	\$600
Equipment		\$118
Controlled Burns*		\$101
Herbicide	3	\$117
Contingency (10%)		\$203
SUM		\$1,980

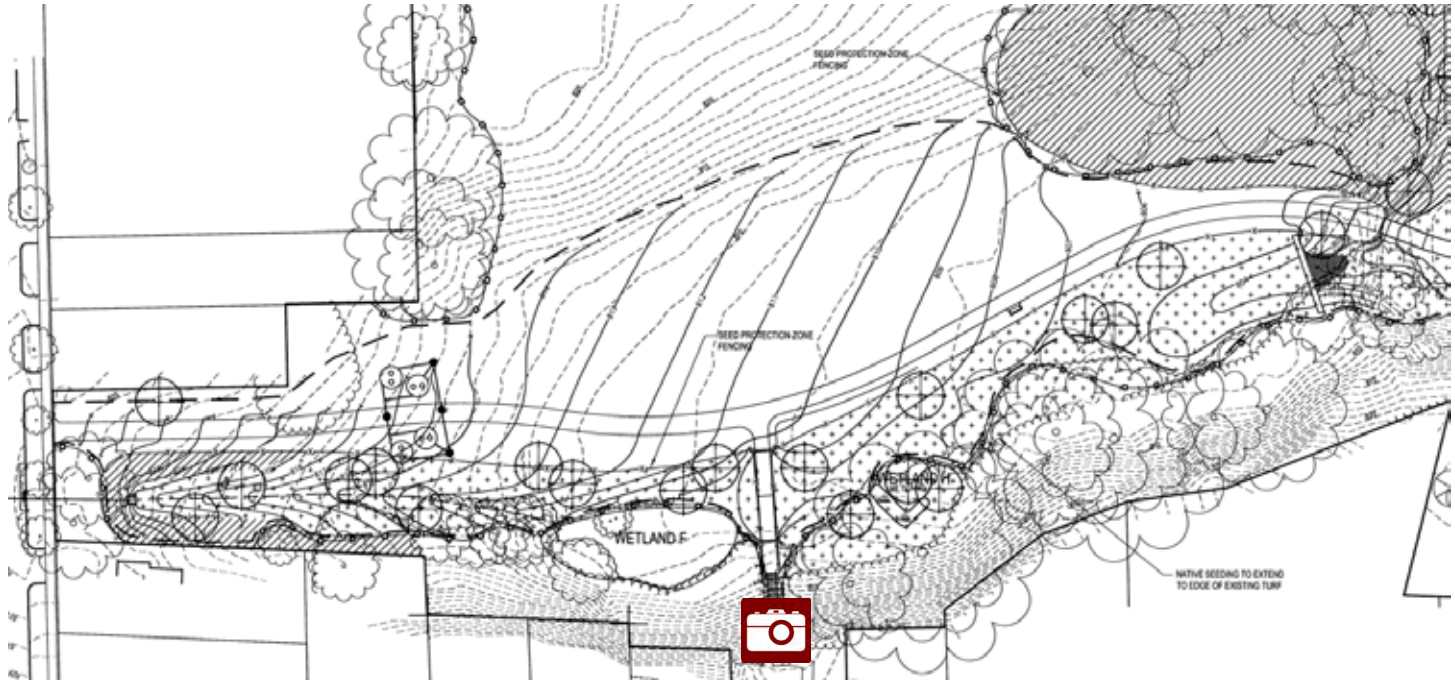
**per estimate from PlantWise. Burn every three years so cost spread across years*

West Park Southwest Wetland

Site Plan

Acres: 0.35

SF: 15,436



NATIVE PLANTS TO LOOK FOR:

Perennials:

Bee Balm (*Monarda fistulosa*)
Big Bluestem (*Andropogon gerardii*)
Black-eyed Susan (*Rudbeckia hirta*)
Blue Vervain (*Verbena hastata*)
Boneset (*Eupatorium perfoliatum*)
Broad Leaf Cattail (*Typha latifolia*)
Brown-eyed Susan (*Rudbeckia triloba*)
Canada Goldenrod (*Solidago Canadensis*)
Common Milkweed (*Asclepias syriaca*)
False Sunflower (*Heliopsis helianthoides*)
Fleabane Aster (*Erigeron peregrinus*)
Fox Sedge (*Carex vulpinoidea*)
Fringed Brome (*Bromus ciliates*)
Gray-headed Coneflower (*Ratibida pinnata*)
Ironweed (*Vernonia missurica*)
Jewel Weed (*Impatiens capensis*)
Joe Pye Weed (*Eutrochium maculatum*)

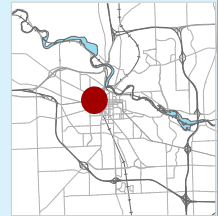
Lance-leaved Goldenrod (*Symphotrichum lanceolatum*)
Prairie Cordgrass (*Spartina pectinata*)
Prairie Dock (*Silphium terebinthinaceum*)
Sneezeweed (*Helenium autumnale*)
Swamp Aster (*Symphotrichum puniceum*)
Torreys Rush (*Juncus torreyi*)
Virginia Creeper (*Parthenocissus quinquefolia*)
Virginia Wild Rye (*Elymus virginicus*)
Zigzag Goldenrod (*Solidago flexicaulis*)

Trees & Shrubs

American basswood (*Tilia Americana*)
Eastern Cottonwood (*Populus deltoids*)
Eastern hackberry (*Celtis occidentalis*)
Red-twig Dogwood (*Cornus sericea*)
Swamp White Oak (*Quercus bicolor*)
Sycamore (*Platanus occidentalis*)

West Park Central Pond

Approximate Address: 215 Chapin St.



SW



Year Built: 2010

Designer: Beckett & Raeder / ECT

Aesthetic Level Required: High

DESCRIPTION:

The central pond is a favorite location for those passing through the park. The pond is estimated to be 1,322 CY and to have a depth of 2 feet. As sediment accumulates, the pond will need to be dredged. Stormwater runoff comes from overland flow.

MAINTENANCE NOTES:

Edges should be seeded regularly because of wear by passing vehicles and people. Purple loosestrife is present and should be herbicided.



July 2014

SEASON	ACTIVITY
Spring	
Summer	
Fall	
Winter	

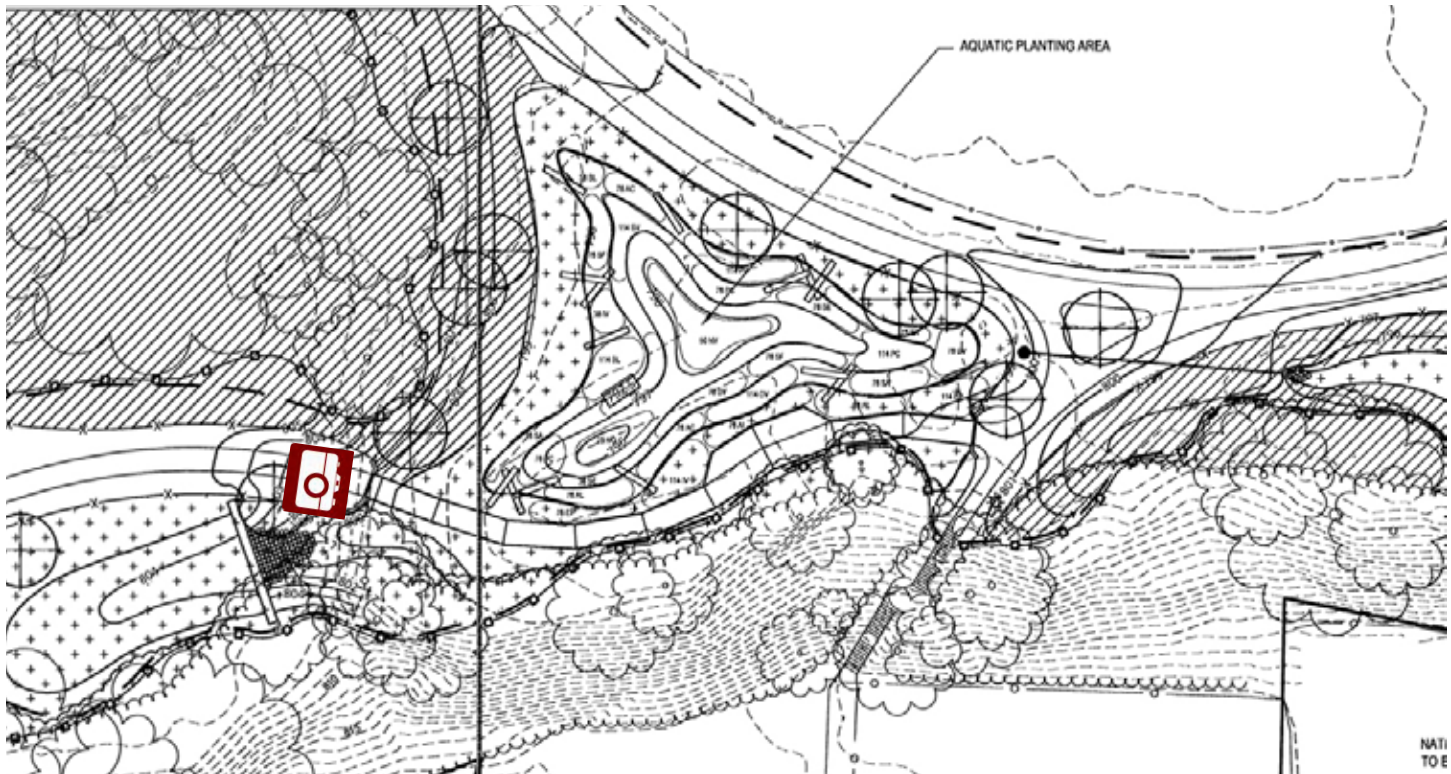
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	5	\$204
Controlled Burns		
Dredge on-site disposal \$40/CY		
Dredge off-site disposal \$70/CY		
Contingency (10%)		
SUM		\$204

Dredging cost pending

West Park Central Pond

Site Plan

Acres: 0.41
SF: 17,860



NATIVE PLANTS TO LOOK FOR:

Perennials:

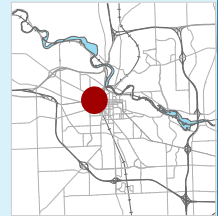
Black Raspberry (*Rubus occidentalis*)
Broad Leaf Cattail (*Typha latifolia*)
Brown-eyed Susan (*Rudbeckia triloba*)
Butterfly Weed (*Asclepias tuberosa*)
Canada Goldenrod (*Solidago Canadensis*)
False Sunflower (*Heliopsis helianthoides*)
Fleabane Aster (*Erigeron peregrinus*)
Gray-headed Coneflower (*Ratibida pinnata*)
Ironweed (*Vernonia missurica*)
Jewel Weed (*Impatiens capensis*)
Marsh Marigold (*Caltha palustris*)
Riverbank Grapevine (*Vitis riparia*)
Sneezeweed (*Helenium autumnale*)
Swamp Aster (*Symphyotrichum puniceum*)
Wool Grass (*Scirpus cyperinus*)
Zigzag Goldenrod (*Solidago flexicaulis*)

Trees & Shrubs

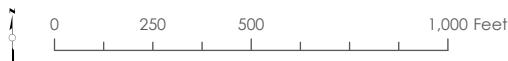
Sycamore (*Platanus occidentalis*)

West Park Southeast Wetland

Approximate Address: 215 Chapin St.



SW



Year Built: 2010

Designer: Beckett & Raeder / ECT

Aesthetic Level Required: Medium

DESCRIPTION:

This long swale often has ponding water but maintains a healthy amount of vegetation. Stormwater runoff comes from overland flow and from the pond's overflow pipe. A controlled burn was conducted in the spring of 2016.

MAINTENANCE NOTES:

Burn and seed regularly, can have a natural look. Invasive species include Crown Vetch, Chickory, Yellow Sweet Clover and Teasel. Woody stems exist in the eastern section.



July 2014

SEASON	ACTIVITY
Spring	Remove Sediment; Pull: Canada Thistle, Chickory, Dames Rocket, Garlic Mustard
Summer	Cut: Yellow Clover; Pull: Curly Dock, Chickory
Fall	Remove Sediment; Hrbcd: Buckthorn, Canada Thistle, Cattails, Phragmites, Teasel, Spotted Knapweed, Saplings
Winter	

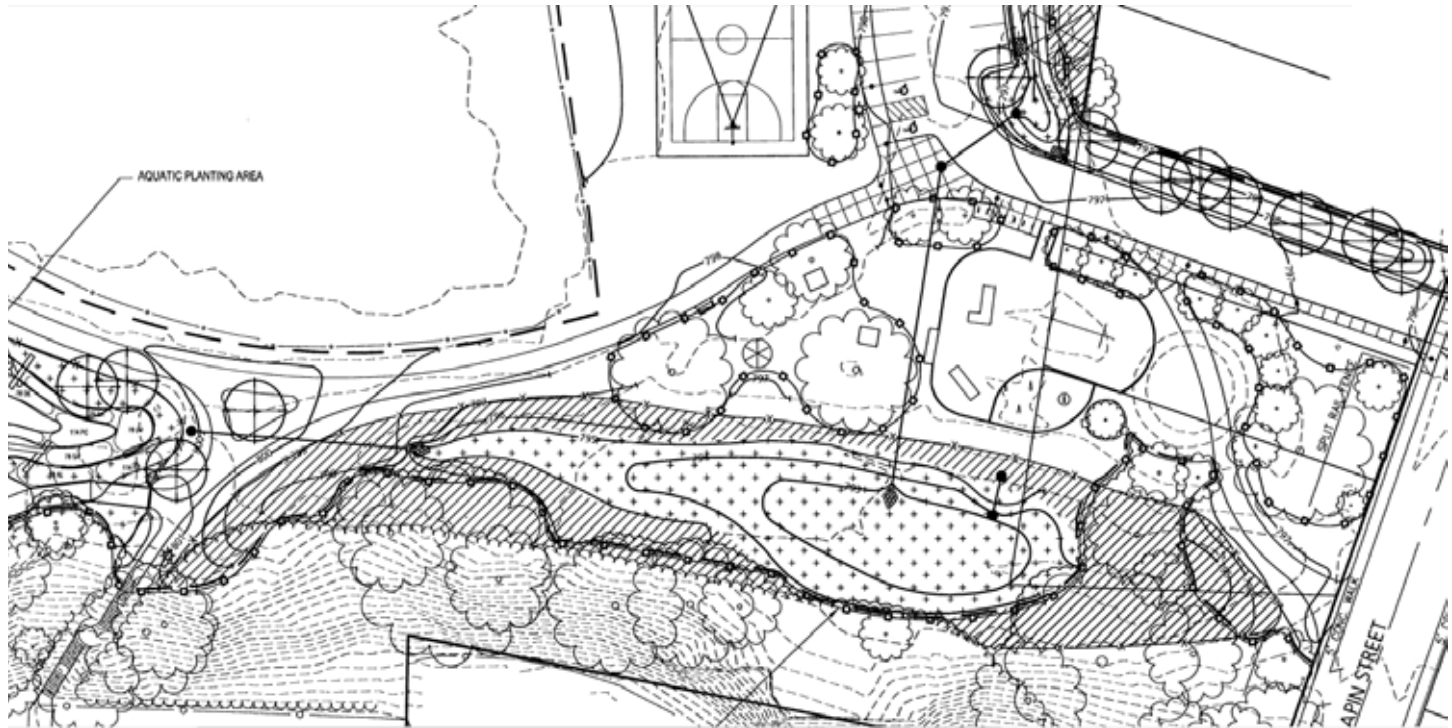
YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	21	\$841
Volunteer Labor	30	\$600
Equipment		\$118
Controlled Burns*		\$101
Herbicide	3	\$117
Contingency (10%)		\$185
SUM		\$1,962

**per estimate from PlantWise. Burn every three years so cost spread across years*

West Park Southeast Wetland

Site Plan

Acres: 0.14
SF: 6,009



NATIVE PLANTS TO LOOK FOR:

Perennials:

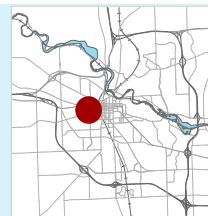
Black-eyed Susan (*Rudbeckia hirta*)
Blue Vervain (*Verbena hastata*)
Broad Leaf Cattail (*Typha latifolia*)
Calico Aster (*Symphyotrichum lateriflorum*)
Canada Goldenrod (*Solidago Canadensis*)
Common Milkweed (*Asclepias syriaca*)
Evening Primrose (*Oenothera biennis*)
False Sunflower (*Heliopsis helianthoides*)
Fleabane Aster (*Erigeron peregrinus*)
Giant Angelica (*Angelica ampla*)
Gray-headed Coneflower (*Ratibida pinnata*)
Ironweed (*Vernonia missurica*)
Jewel Weed (*Impatiens capensis*)
Riverbank Grapevine (*Vitis riparia*)
Swamp Aster (*Symphyotrichum puniceum*)
Switch Grass (*Panicum virgatum*)

Trees & Shrubs

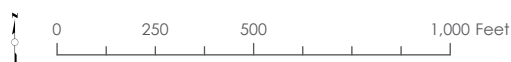
American Basswood (*Tilia Americana*)
American Elm (*Ulmus armericana*)
Corkscrew Willow (*Salix matsudana*)
Eastern Black Walnut (*Juglans nigra*)
Eastern Cottonwood (*Populus deltoids*)
Northern Catalpa (*Catalpa speciosa*)
Sandbar Willow (*Salix interior*)
Silver Maple (*Acer saccharinum*)

West Park East Parking Swale

Approximate Address: 215 Chapin St.



SW



Year Built: 2010

Designer: Beckett & Raeder / ECT

Aesthetic Level Required: Medium

DESCRIPTION:

Receiving water from the parking lot, this swale serves an important purpose of cleaning water before it enters the stormdrain. Cat-tails dominate this area. A controlled burn was conducted in the spring of 2016.

MAINTENANCE NOTES:

Burn regularly and seed. Regularly remove trash. Sediment accumulates quickly because of parking lot. Catalpa saplings are present near outlet. Weeds include ragweed, canda thistle and curly dock.



June 2014

SEASON	ACTIVITY
Spring	Remove Sediment; Pull: Canada Thistle, Chickory, Dames Rocket, Garlic Mustard
Summer	Cut: Yellow Clover; Pull: Curly Dock, Chickory
Fall	Remove Sediment; Hrbcd: Buckthorn, Canada Thistle, Cattails, Phragmites, Teasel, Spotted Knapweed, Saplings
Winter	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	13	\$516
Volunteer Labor	10	\$200
Equipment		\$87
Controlled Burns*		\$68
Herbicide	3	\$115
Contingency (10%)		\$99
SUM		\$1,085

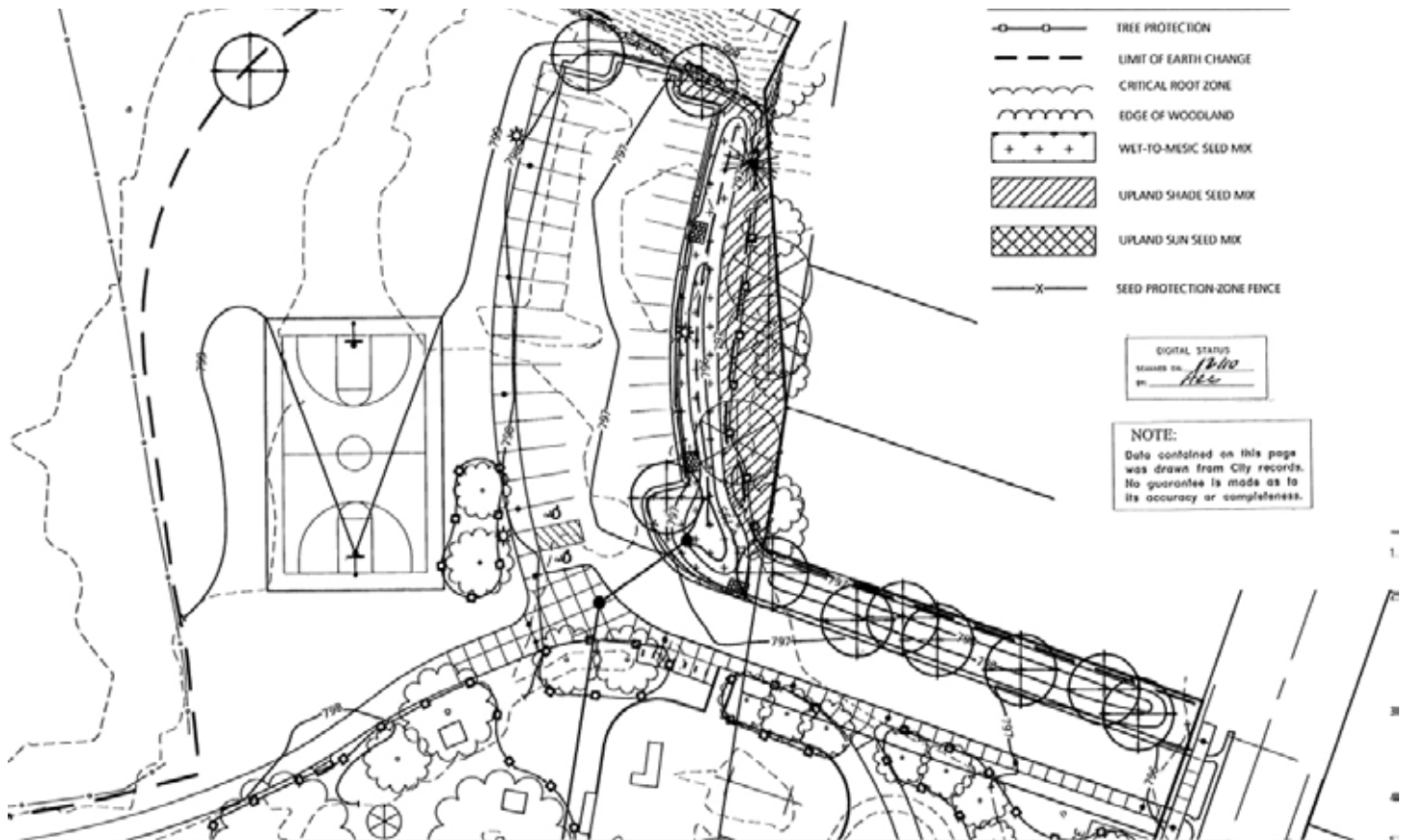
*per estimate from PlantWise. Burn every three years so cost spread across years

West Park East Parking Swale

Site Plan

Acres: 0.09

SF: 4,048



NATIVE PLANTS TO LOOK FOR:

Perennials:

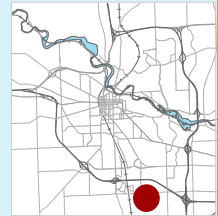
Arrow Arum (*Peltandra virginica*)
Blue Vervain (*Verbena hastata*)
Broad Leaf Cattail (*Typha latifolia*)
Canada Goldenrod (*Solidago Canadensis*)
Evening Primrose (*Oenothera biennis*)
Fleabane Aster (*Erigeron peregrinus*)
Jewel Weed (*Impatiens capensis*)
Swamp Aster (*Symphyotrichum puniceum*)
Switch Grass (*Panicum virgatum*)

Trees & Shrubs

Northern Catalpa (*Catalpa speciosa*)
Sandbar Willow (*Salix interior*)
Skyline Honeylocust (*Gleditsia triacanthos*)

Wheeler Compost ponds

Approximate Address: 4251 Stone School Rd.



SW



Year Built: ~2000

Designer: Resource Recycling Systems, Inc.

Aesthetic Level Required: Low

DESCRIPTION:

The Ann Arbor compost facility lies within a 270 acre site and was designed by Resource Recycling Systems, Inc. (RRS). RRS developed plans for a 17 acre compost pad to accommodate high intensity compost operations. The compost ponds and additional ponds in the Wheeler complex store stormwater runoff.

MAINTENANCE NOTES:

Invasives include Canada Thistle, Teasel, Yellow Sweet Clover, Purple Loosestrife, Curly Dock, Pragmites, Crown Vetch and Autumn Olive. Algae appears on the pond's surface in late summer.



July 2016

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Dredge				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			X	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	10	\$407
Dredging*		\$69,630
Equipment		\$62
Controlled Burns		
Herbicide		
Contingency (10%)		\$7,010
SUM		\$77,109

* see Stormwater Management Study for The Ann Arbor Compost Facility (Cardno JF New 2012) page 36

Wheeler/Compost ponds

Site Plan

Acres: 0.06

SF: 2,666



NATIVE PLANTS TO LOOK FOR:

Perennials:

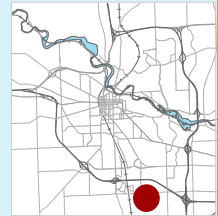
Aster spp.
Black Eyed Susan (*Rudbeckia hirta*)
Goldenrod (*Solidago* spp.)
Joe-pye Weed (*Eutrochium*)
Tall Yellow Coneflower (*Ratibida columnifera*)
Yarrow (*Achillea millefolium*)

Shrubs and Trees:

Black Oak (*Quercus velutina*)
Eastern Cottonwood (*Populus deltoides*)
Northern Hackberry (*Celtis occidentalis*)
Red Oak (*Quercus rubra*)
Silver Maple (*Acer saccharinum*)
Swamp White Oak (*Quercus bicolor*)
Tulip Tree (*Liriodendron tulipifera*)
Willow (*Salix* spp.)

Wheeler Wetlands

Approximate Address: 4251 Stone School Rd.



SW



Year Built: ~2000

Designer: City of Ann Arbor

Aesthetic Level Required: Low

DESCRIPTION:

The city of Ann Arbor created the Wheeler Wetland to offset impacts from the field operations facility, in accordance with the MDEQ. The 2.59 acres of wetland has forested areas, emergent wetland and some scrub/shrub wetland.

MAINTENANCE NOTES:

Invasives include Canada Thistle, Teasel, Yellow Sweet Clover, Purple Loosestrife, Curly Dock, Pragmites, Crown Vetch and Autumn Olive.



July 2016

ACTIVITY	Monthly	Biannually	Annually	As Needed
Remove Trash				X
Remove Invasives				X
Dredge				X
Controlled Burns				X
Herbicide				X
Add/Divide Plants				X
Collect Seeds			fall	

YEARLY ESTIMATE	HOURS	COST
Supervisor Labor	10	\$407
Equipment		
Controlled Burns		\$3,850
Herbicide		\$14,300
Contingency (10%)		\$1,855.70
SUM		\$20,412.70

Costs based on PlantWise proposal

Wheeler Wetlands

Site Plan

Acres: 0.06

SF: 2,666



NATIVE PLANTS TO LOOK FOR:

Perennials:

Aster spp.
Black Eyed Susan (*Rudbeckia hirta*)
Goldenrod (*Solidago* spp.)
Joepyee Weed (*Eutrochium*)
Tall Yellow Coneflower (*Ratibida columnifera*)
Yarrow (*Achillea millefolium*)

Shrubs and Trees:

Black Oak (*Quercus velutina*)
Eastern Cottonwood (*Populus deltoides*)
Northern Hackberry (*Celtis occidentalis*)
Red Oak (*Quercus rubra*)
Silver Maple (*Acer saccharinum*)
Swamp White Oak (*Quercus bicolor*)
Tulip Tree (*Liriodendron tulipifera*)
Willow (*Salix* spp.)

Appendix A

Appendix A- Maintenance Timeline

A1. Maintenance of Green Stormwater Infrastructure

Seasonal stewardship activities are outlined for each site. These activities were developed in 2017, and will change over time as invasive species are eliminated. Maintenance activities are organized by high, medium and low ranking sites to help prioritize stewardship. Where (plantwise) is included in the site name, a contract is established with PlantWise to conduct all maintenance activities.

A2. Controlled Burns in Green Stormwater Infrastructure

A record of controlled burns is included in this document. A timeline of future burns is outlined for each site, by year. Each site should be burned at least once every three years but could be burned as frequently as once every year. Natural Area Preservation (NAP) has agreed to burn the sites indicated in this document on a regular basis.

Appendix B

Appendix B- Invasive Species

- Invasive Species in Green Stormwater Infrastructure

A record of invasive species was developed in 2017. These invasives are shown geographically by site. ArcGIS files are available for each site. Natural Area Preservation (NAP) has herbicided green stormwater infrastructure features in public parks in the past and typically has as much as 5 days with 2 staff people available for these projects each year.

Stormwater Best Management Practices Maintenance Manual



City of Ann Arbor, Michigan
Edited 2017