Best Management Practices for Symphony Stream and Lake Kittamaqundi Watersheds

Supplemental Document
General Plan Amendment

September 2008

SEPTEMBER 2008

BEST MANAGEMENT PRACTICES FOR SYMPHONY STREAM AND LAKE KITTAMAQUNDI WATERSHEDS




ASSOCIATED WITH COLUMBIA TOWN CENTER GENERAL PLAN 2000 AMENDMENT



Prepared by:

Biohabitats Incorporated

2081 Clipper Park Road
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Prepared for:

GGP

General Growth Properties, Inc.
10275 Little Patuxent Parkway
Columbia, MD 21044

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Executive Summary

Biohabitats, Inc. has been retained by General Growth Properties (GGP) to develop watershed assessments targeting stormwater retrofitting and riparian corridor restoration opportunities for the watersheds of the two streams that flow through Columbia Town Center. The watershed assessment consists of compilation and analyses of existing information as well as field reconnaissance to identify stormwater retrofit and riparian corridor restoration opportunities.

General Observations

The approximately 1.1 square mile Symphony Stream watershed is southwest of Town Center and Merriweather Post Pavilion, and the approximately 0.4 square mile Lake Kittamaqundi watershed is northwest of Town Center. The Symphony Stream originates southwest of Town Center and flows easterly until its confluence with the Little Patuxent River. The tributary stream to Lake Kittamaqundi drains Wilde Lake and flows southeasterly to the northern end of Lake Kittamaqundi.

With few exceptions, most of the Symphony Stream watersheds is developed. Perhaps the most notable feature of the Symphony Stream watershed is the forested and open space areas of Symphony Woods, which comprises the eastern portion of the watershed. In addition, a forested corridor and associated wetlands runs through the center of the watershed along the stream from the Howard County Community College, through Symphony Woods to the Little Patuxent River. Finally, a small area of contiguous forest can be found on the College's campus, east of the athletic fields. With the exception of a forested corridor along the lake's tributary stream, the Lake Kittamaqundi watershed is fully developed.

Institutional campuses, including the 120-acre Howard County Community College campus, Wilde Lake High School, and Wilde Lake Middle School, are located in the northwestern portion of the Symphony Stream watershed. Commercial development, mainly office and the edges of the Mall in Columbia, line Little Patuxent Parkway and can be found predominantly in the northeastern portion of the watershed. Mixed residential, including single family homes and townhomes, are prevalent throughout the southern portion of the watershed. Although newer development appears to be employing sufficient post-construction stormwater management practices, much of the older development in the watershed has little (e.g., dry ponds and oil/grit separators) to no stormwater treatment.

The southwestern portion of the Lake Kittamaqundi watershed is dominated by the Mall in Columbia. Commercial development, including offices, restaurants, and a hotel, line Little Patuxent Parkway and the lakefront. Mixed residential, including townhomes and apartments, are prevalent throughout the northern portion of the watershed. Little Patuxent Parkway bisects the watershed.

All stream reaches assessed by Biohabitats have been impacted by the storm flows associated with this older development as well as by direct encroachment of development into the riparian corridor. This has led to morphological changes within the stream channel – the stream has become disconnected from its floodplain, an undersized channel is causing high amounts of bank

erosion, and culverts are perched on the downstream end, resulting in fish passage obstructions. Parts of the channel have been straightened. Much of the riparian buffer has become dominated by invasive species.

Due to the developed nature of the watersheds, there are limited opportunities for new and larger stormwater storage facilities. There are, however, abundant opportunities for smaller on-site practices that could be well integrated with the existing land use and incorporated in a manner that provides aesthetic improvement, habitat value and educational opportunities to the sites.

Stormwater Retrofit and Riparian Corridor Restoration Opportunities

Biohabitats conducted stream and upland field assessments in the Symphony Stream and Lake Kittamaqundi watersheds in the spring of 2008. The goal of these assessments was to identify riparian corridor restoration and stormwater retrofit opportunities in the watersheds. As such, field crews assessed approximately 2 miles of stream and over 60 potential retrofit sites.

The retrofit reconnaissance investigation identified opportunities for stormwater retrofit practices in the upland areas of the watersheds. Stormwater retrofits are structural practices that are inserted into the urban landscape where little or no stormwater management currently exists. They are an essential element to successfully restore the overall aquatic health of a stream. Without establishing a stable, predictable hydrologic regime, which regulates the volume, duration, frequency, and rate of flow, many of the other restoration strategies such as bank stabilization, riparian reforestation, and aquatic habitat enhancement may fail. In addition, stormwater retrofits provide important water quality benefits that can result in improved in-stream conditions.

Of the 60 sites visited, Biohabitats identified 49 opportunities to implement stormwater retrofits. Specific types of stormwater treatment options prescribed for the different retrofit locations vary, but include bioretention, bioswales, modification of existing stormwater basins, rain gardens and rain barrels, rainwater cisterns, sand filters, permeable pavement, wooded wetlands, and regenerative stormwater conveyance.

The riparian corridor assessment was used to identify outfall locations, severely eroded stream banks, utility crossings, impacted riparian buffers, trash dumping, stream crossings, and channel modifications within the stream corridor. Collected data was used to develop riparian corridor restoration opportunities along ten impacted stream reaches. Specific types of restoration options identified include floodplain reconnection, riparian buffer enhancement, stream restoration, bank stabilization, and regenerative stormwater conveyance.

Restoration opportunities identified in the Symphony Stream and Lake Kittamaqundi watersheds are displayed in Map E-1.

General Watershed Recommendations and Considerations

Watershed-wide considerations and recommended next steps include:

- Poorly managed stormwater runoff and direct encroachment by development in the riparian corridor are the main contributing factors to the degraded conditions of the watersheds. As most of the watersheds are developed, limited opportunities exist for new stormwater storage facilities. Watershed restoration should balance implementation of identified stormwater retrofits and riparian corridor restoration projects with protection and restoration of remaining sensitive areas and on-site management of stormwater runoff.

- Many on-going activities in the watershed are complementary to these findings. For instance: Howard County is in the implementation stage of the Little Patuxent Watershed Restoration Action Strategy; the Columbia Association is developing a Little Patuxent River watershed plan; and Howard Community College recently completed a master plan for the campus that takes into account ecological protection and stormwater management. GGP should coordinate with these stakeholders and other private property owners throughout the watershed to identify areas where restoration opportunities may be incorporated into on-going activities. In addition, additional opportunities for storage facilities that can be incorporated into future development plans may be revealed.

- Hydrologic and hydraulic modeling should be conducted to determine the hydrologic response of the proposed stormwater retrofits to ensure that they will improve, not exacerbate, the flashy hydrologic regime. Water surface elevations under a range of implementation scenarios should also be conducted to better understand the spatial extent of potential flooding under various design storms.

- The remaining natural areas in the watershed serve important functions such as habitat, hydrologic reserves, and community amenities. A natural area remnant analysis should be conducted to assess the quality and function of these natural areas, including upland forested areas and wetlands. These areas should then be prioritized for conservation, restoration, or management measures.

- Opportunities to reduce stormwater runoff from residential areas through widespread implementation of on-site practices, such as downspout disconnection, should be examined.

- There are abundant opportunities for on-site stormwater retrofits to manage uncontrolled runoff throughout the watershed. The on-site retrofit practices identified in this assessment should be the first focus for implementation. These practices may then be "duplicated" on similar land uses or land covers throughout the watershed.

- Stormwater should be managed on-site for all new development and redevelopment throughout the watershed. Developers and designers should emphasize green infrastructure and runoff reduction techniques that will provide aesthetic amenities as well as groundwater recharge, water quality treatment, and channel protection.

Map E-1: Watershed Restoration Opportunities

Watershed Assessments Associated with Columbia Town Center

General Plan 2000 Amendment

September 2008

Legend

Stormwater Management

Water Quality Best Management Practice

- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Riparian Corridor Restoration

- Riparian Corridor Restoration

Vegetation Management Opportunity

- Integrated Vegetation Management

Watershed Boundaries

- Lake Kittamaqundi
- Symphony Stream

Surface Water

- Ponds/Lakes/Dams
- Streams

Planimetrics

- Roads
- Roads
- Parking Lots
- Buildings

Biohabitats

0 300 600 1,200 1,800 Feet

Preface

Biohabitats, Inc. has been retained by General Growth Properties (GGP) to develop watershed assessments targeting stormwater retrofitting and riparian corridor restoration opportunities for the watersheds of the two streams that flow through Columbia Town Center. The approximately 1.1 square mile Symphony Stream watershed is southwest of Town Center and Merriweather Post Pavilion, and the approximately 0.4 square mile Lake Kittamaqundi watershed is northwest of Town Center. The Symphony Stream originates southwest of Town Center and flows easterly until its confluence with the Little Patuxent River. The tributary stream to Lake Kittamaqundi drains Wilde Lake and flows southeasterly to the northern end of Lake Kittamaqundi.

The watershed assessment consists of compilation and analyses of existing information as well as field reconnaissance to identify stormwater retrofit and riparian corridor restoration opportunities. Watershed scale analysis (as opposed to site analysis) allows us to more fully understand the ecological patterns, connections and flows responsible for maintaining the ecological integrity of the site. It also enables us to understand and document existing conditions that may be contributing to ecological degradation in the watersheds and within GGP controlled lands. Those opportunities identified off of GGP lands will be of interest to community stakeholders and may potentially yield opportunities for mutually beneficial partnerships.

The scope of work includes the following major components:

1. Data Collection
2. Field Reconnaissance
3. Report Preparation

More detail on each of these components is provided below.

Data Collection

Biohabitats has collected, compiled and reviewed readily available and relevant information and work performed by others, including detailed topographic and survey information, hydrologic and hydraulic studies, and site engineering and utility information. We also have communicated with Howard County Department of Public Works about existing data and studies on stormwater best management practices (BMPs) and other restoration projects in the watershed, including relevant GIS data layers.

The data collection and mapping provided the foundation to develop base maps for field assessment and supplemented interpretation and understanding of field conditions.

Field Reconnaissance

With the existing data in hand, Biohabitats spent seven (7) days of field reconnaissance in February through June, 2008 to identify stormwater retrofit and riparian corridor restoration opportunities throughout the watersheds. Field reconnaissance efforts included the following:

Stormwater Retrofit Inventory - Based on information derived during the data collection task, Biohabitats performed a retrofit inventory in the Symphony Stream and Lake Kittamaqundi watersheds. Each site was evaluated for feasibility and a preliminary concept was developed for candidate sites. We ranked candidate retrofits based on feasibility, costs, benefits, visibility, and other factors.

Biohabitats targeted three major categories of retrofits – offsite storage, onsite nonresidential, and onsite residential. Application of practices in the different categories will vary according to the impervious cover and land use makeup. Storage retrofits provide the widest range of benefits; however, onsite retrofit practices can provide a substantial benefit when applied over large areas. For this assessment, we identified retrofit opportunities under all three of the categories throughout the watershed, with the primary objectives being to identify water quality treatment and water quantity management opportunities.

Riparian Corridor Restoration Opportunities – Biohabitats conducted a physical stream assessment of over two stream miles (perennial, intermittent, and ephemeral) in the Symphony Stream watershed. Specific assessments included identifying severely eroded stream banks, impacted riparian buffers, trash dumping, stream crossings, and channel modifications within the stream corridor that may be candidates for restoration projects such as discharge prevention, stream restoration, and riparian reforestation.

Watershed Assessment Plan Development

Using a geographic information system (ArcGIS), Biohabitats prepared maps illustrating the stormwater retrofit and riparian restoration opportunities throughout the watershed. The ultimate Biohabitats deliverable under this project effort is this watershed assessment report that summarizes the data collected, analyses conducted, and stormwater retrofit and riparian corridor restoration opportunities.

Section 1.0 Symphony Stream and Lake Kittamaqundi Watersheds

1.1 Introduction to the Watersheds

Symphony Stream, a tributary of the Little Patuxent River, drains approximately 1.1 square miles of Columbia in Howard County, Maryland. Lake Kittamaqundi and its tributary stream drain approximately 0.4 square miles (see Figure 1-1 and Maps 1 and 2 in Appendix A). The watersheds, which comprise a mixture of forest, open space, and suburban land uses, have been developing over the last forty years.

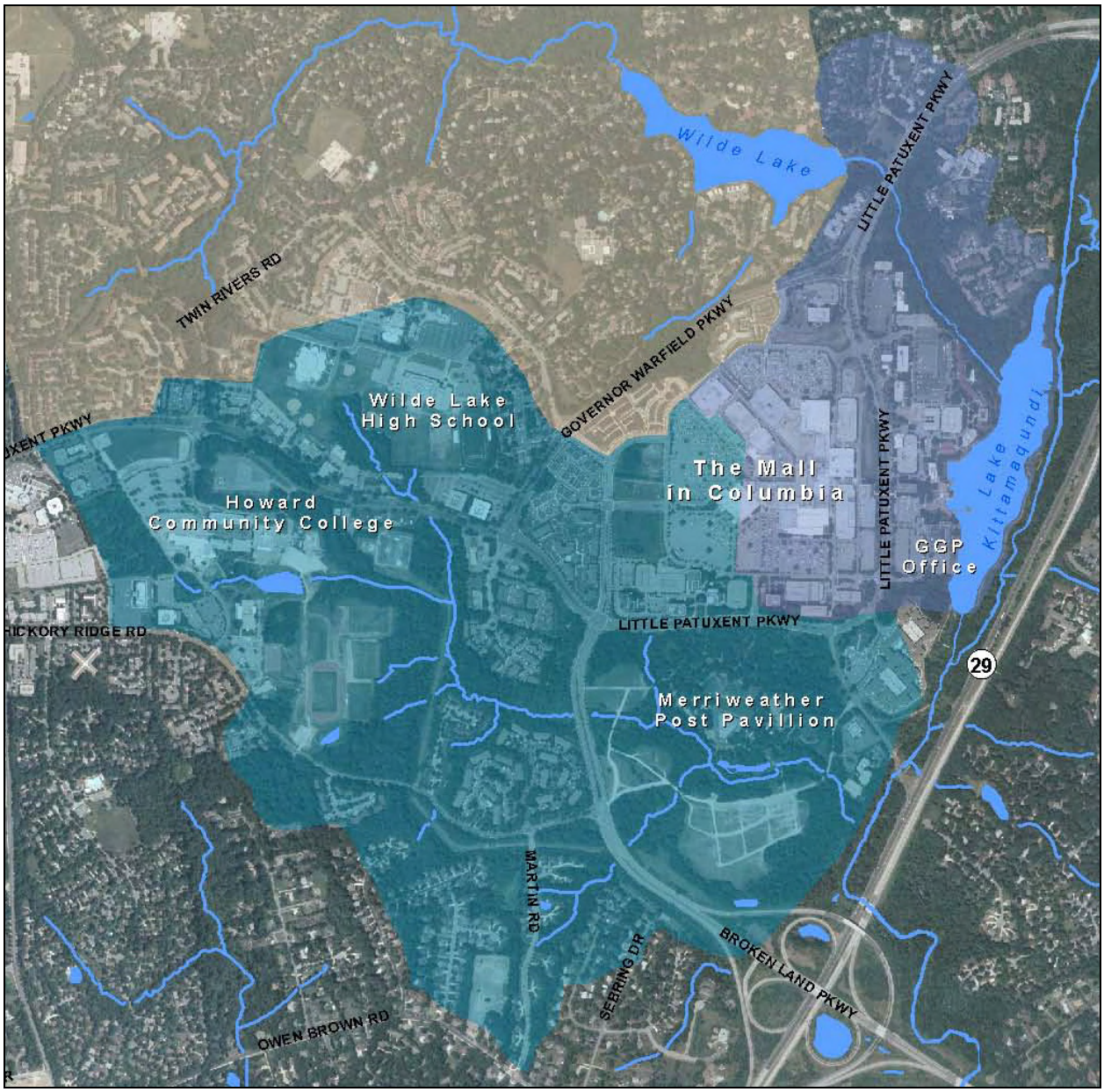

Figure 1-1: Symphony Stream and Lake Kittamaqundi Watersheds

The Symphony Stream originates southwest of Town Center and flows easterly until its confluence with the Little Patuxent River. The northwestern portion of the watershed is dominated by institutional campuses, including the 120-acre Howard Community College campus, Wilde Lake High School, and Wilde Lake Middle School. Commercial development, mainly office and the edges of the Mall in Columbia, line Little Patuxent Parkway and can be found predominantly in the northeastern portion of the watershed. Mixed residential, including single family homes and townhomes, are prevalent throughout the southern portion of the watershed. Major roads in the watershed include Cedar Lane to the west, Broken Land Parkway to the east, Little Patuxent Parkway, and Hickory Ridge Road. The current imperviousness for the watershed is estimated to be 27%.

With few exceptions, most of the Symphony Stream watershed is developed. Perhaps the most notable feature of the watershed is the forested and open space areas of Symphony Woods, which comprises the eastern portion of the watershed, surrounding its mouth. In addition, a forested corridor and associated wetlands runs through the center of the watershed along the stream from the Community College, through Symphony Woods to the Little Patuxent River. Finally, a small area of contiguous forest can be found on the College's campus, east of the athletic fields.

The tributary stream to Lake Kittamaqundi drains Wilde Lake and flows southeasterly to the northern end of Lake Kittamaqundi. The southwestern portion of the watershed is dominated by the Mall in Columbia. Commercial development, including offices, restaurants, and a hotel, line Little Patuxent Parkway and the lakefront. Mixed residential, including townhomes and apartments, are prevalent throughout the northern portion of the watershed. Little Patuxent Parkway bisects the watershed. The current imperviousness for the watershed is estimated to be 42%. With the exception of a forested corridor along the lake's tributary stream, the watershed is fully developed.

The majority of development in both watersheds pre-date current stormwater management standards. In many areas, storm drains deliver untreated stormwater runoff directly to the streams. Many of the stormwater BMPs in the watershed provide peak control, and provide little to no groundwater recharge, water quality treatment, and channel protection benefit. Although a handful of bioretention and wet extended detention practices were noted, most of the existing BMPs are dry detention, oil/grit separators, and hydrodynamic devices. Most of the BMPs are privately owned and maintained, the rest are publicly owned and maintained (Saltzman, 2008). Examples of typical infrastructure observed in the watershed are provided in Figure 1-2.

Figure 1-2: Stormwater infrastructure observed throughout the watershed, including: a dry pond that treats runoff from a townhome community (top left); a bioretention practice that treats runoff from a college parking lot (top right); an outfall that discharges unmanaged runoff from an apartment complex (bottom left); and channel erosion resulting from the outfall in the previous photo (bottom right).

1.2 Complementary Efforts and Activities in the Watersheds

Three complementary efforts and activities related to the watersheds merit discussion.

Little Patuxent Watershed Restoration Action Strategy

In 2002, the Howard County Department of Public Works published the Little Patuxent Watershed Restoration Action Strategy (WRAS). The WRAS outlines goals and objectives for restoring the Little Patuxent Watershed. Summarized in Table 1-1, these goals and objectives may also serve as guidance for the Symphony Stream and Lake Kittamaqundi watersheds.

Table 1-1: Restoration Goals and Objectives for the Little Patuxent Watershed (Howard County DPW, 2002)

Water Quality	
Goal:	Achieve and maintain the water quality necessary to support the aquatic living resources of the Little Patuxent River watershed and to protect human health.
Objectives:	• Improve biological and physical habitat ratings. • Meet State water quality standards. • Reduce sediment and nutrient loads.
Habitat	
Goal:	Protect, enhance and restore those habitats and natural areas that are vital to the survival and diversity of the living resources of the Little Patuxent River watershed.
Objectives:	• Retain, enhance, and restore forests, wetlands, meadows and other areas of natural cover. • Increase the habitat value of lakes and ponds. • Enhance and restore in-stream physical habitat, including streambeds and streambanks. • Manage wildlife to support healthy and diverse populations of native species.
Public Outreach	
Goal:	Promote environmental stewardship and assist individuals, community-based organizations, businesses, schools and others to undertake watershed restoration initiatives.
Objectives:	• Increase awareness and personal involvement. • Encourage participation in land preservation programs. • Promote land management practices that conserve resources, reduce pollution and enhance habitat. • Support the establishment of watershed protection organizations and partnerships.

For the purposes of the WRAS study, the Symphony Stream drainage (as defined by Biohabitats in this report) was lumped into the "Little Patuxent below Lake Kittamaqundi" subwatershed. The WRAS split the Lake Kittamaqundi drainage (as defined in this Biohabitats watershed assessment) into two subwatersheds: "Wilde Lake" and "Lake Kittamaqundi".

In preparation for the WRAS, the Maryland Conservation Corp conducted a Stream Corridor Assessment of the Little Patuxent and its tributaries, including Symphony Stream, in 1999. The SCA provided an overview of the stream network and of potential problem locations. Several areas of severe erosion and inadequate buffer were noted along Symphony Stream. In addition, the WRAS details specific restoration recommendations. Most of these recommendations focus on actions to be taken by various County agencies. However, implementation of several of these recommendations may be facilitated by private property owners and developers in the Symphony Stream and Lake Kittamaqundi watersheds, namely:

- *Land Conservation* (e.g., Protect sensitive land and water resources and habitats)
    - Improve land management practices and enforcement on protected lands.

- *Riparian Buffers* (e.g., Establish, protect and enhance forested buffers for streams, wetlands and lakes)
    - Prioritize locations where buffers are absent and develop a planting strategy.
    - Develop and implement a strategy for control of invasive plants.
    - Encourage private property owners to plant forested buffers, and to reduce mowing and use best management practices in existing buffers.

- *Better Site Design* (e.g., Minimize impervious surfaces and maximize open space through techniques such as cluster development)
    - Prepare case studies documenting successful projects that reduce impervious cover and increase open space.

- *Erosion and Sediment Control* (e.g., Reduce sediment loss during construction and ensure sensitive areas are protected)
    - Identify occurrences of land erosion outside of the construction process that contribute to stream erosion and sedimentation, and develop a strategy to encourage stabilization and repair. Examples of such occurrences include all-terrain vehicle trails, areas lacking vegetation, and unpaved roads and trails.

- *Stormwater Best Management Practices* (e.g., Install practices to maintain groundwater recharge, reduce pollutant loads, protect stream channels and reduce flooding)
    - Identify privately maintained facilities that are retrofit candidates and secure funding for retrofits of these facilities.
    - Encourage communities, agencies and nongovernmental organizations to convert existing dry ponds to stormwater wetlands or otherwise increase the habitat value of existing facilities.

- *Other Discharges* (e.g., Manage septic systems, sanitary sewers and industrial discharges)
    - Address priority pipe outfalls, exposed pipes and unusual conditions

- *Stream Channel Stabilization and Restoration* (e.g., Improve aquatic habitat and reduce sediment loads to the stream)
    - Address priority erosion sites using bioengineering techniques where feasible.
    - Develop long-term strategies to address channelized stream sections and the removal of fish passage blockages

- *Habitat and Wildlife Management* (e.g., Establish, protect and enhance valuable habitat, and manage wildlife to support healthy and diverse populations of native species)
    - Protect and create areas of forest interior habitat, threatened and endangered species habitat, and other areas of diverse sensitive habitat.
    - Develop a forest management plan to ensure forest diversity and resilience.
    - Plant forests in targeted areas to link, connect and extend forests.
    - Promote native plant landscaping and encourage non-turf alternatives.
    - Enhance existing wetlands and create new wetlands where feasible.

- *Watershed Stewardship Programs* (e.g., Increase public understanding and promote better private land management)
    - Develop a generic public outreach strategy that can be tailored to promote specific messages for each identified target audience.

- *Subwatershed Studies* (e.g., Develop more detailed restoration plans for priority subwatersheds)
    - Develop and implement subwatershed restoration plans

Wilde Lake Watershed Restoration Plan

In 2005, the Center for Watershed Protection (CWP) completed a watershed restoration plan for the Wilde Lake Watershed, which abuts the Symphony Stream Watershed to the north and Lake Kittamqaundi Watershed to the west. The Wilde Lake watershed is largely developed and evidence of impacts can by found throughout the riparian corridor. As Wilde Lake Watershed encompasses the northern portion of Columbia Town Center, the restoration recommendations set forth by CWP should be incorporated into larger, local planning efforts. These restoration recommendations are summarized in Table 1-2 and Figure 1-3. The full suite of stormwater retrofits identified for Wilde Lake Watershed is detailed in Appendix B.

Table 1-2: Priority Restoration Projects for the Wilde Lake Subwatershed (CWP, 2005)

Project	Site Name/ Practice Type	Description
1 of 11	Reach C / Retrofits and Stream Restoration	Series of retrofits including a stormwater wetland and bioretention facilities to provide water quality benefits and flow attenuation, stream restoration to improve channel stability and reduce sediment transport
2 of 11	Reach A / Stormwater Projects and Stream Restoration	Cedar Lane Park series of bioretention and small scale retrofits to treat park – use adaptive management to determine if additional stream instability continues, if so, consider hydrologic modeling to determine appropriate flow attenuation upstream
3 of 11	Reach B / Beaverbrook Streetscapes and Stream Stabilization	Provide street edge runoff management demonstration projects and 200 ft of stream stabilization in area closest to outfalls – utilize adaptive management to determine if additional in-stream work is needed
4 of 11	Pollution Prevention Program	Residents – Lawn care, rain gardens, rain barrels, bayscapes, car washing, buffer education, and pet waste HOAs – Reforestation, turf management Municipal, Schools, County/CA-owned land Businesses
5 of 11	Waterfowl Management/ Wetland Fringe	Reduce goose pollutant transport from Beaverbrook farm pond and Wilde Lake; manage lakeside areas, create wetland fringe and pond improvements at Beaverbrook. Educate residents and look to convert mowed areas to wildflower meadow or field
6 of 11	Reach G / Three Dry Pond Retrofits	Three dry ponds in close proximity to one another near schools and CA fitness center
7 of 11	Multiple reaches / Wilde Lake Impacted Buffer/Mini Restoration	Reforestation/ stream repair projects to fill in gaps in the forested stream buffer and address minor stream instability problems caused in part by lack of buffer
8 of 11	Reach E / Beaverbrook dry pond retrofit	Dry pond retrofit to eliminate stormflow short-circuiting, and improve water quality treatment
9 of 11	Reach A / Board of Education Retrofit/ Innovative Treatment Park	Retrofit dry pond to provide smaller storm control and water quality treatment; and/or implement several small on-site treatment demo projects (Innovative treatment park)
10 of 11	Upper I / Outfall Stabilization and Retrofit	Outfall stabilization/stream restoration and infiltration practice
11 of 11	Reach D /Adaptive Management	Practice adaptive management— monitor stability of recent stream restoration project and downstream conditions; if stability and erosion issues, consider feasibility of this large wet pond retrofit with water quality and channel protection

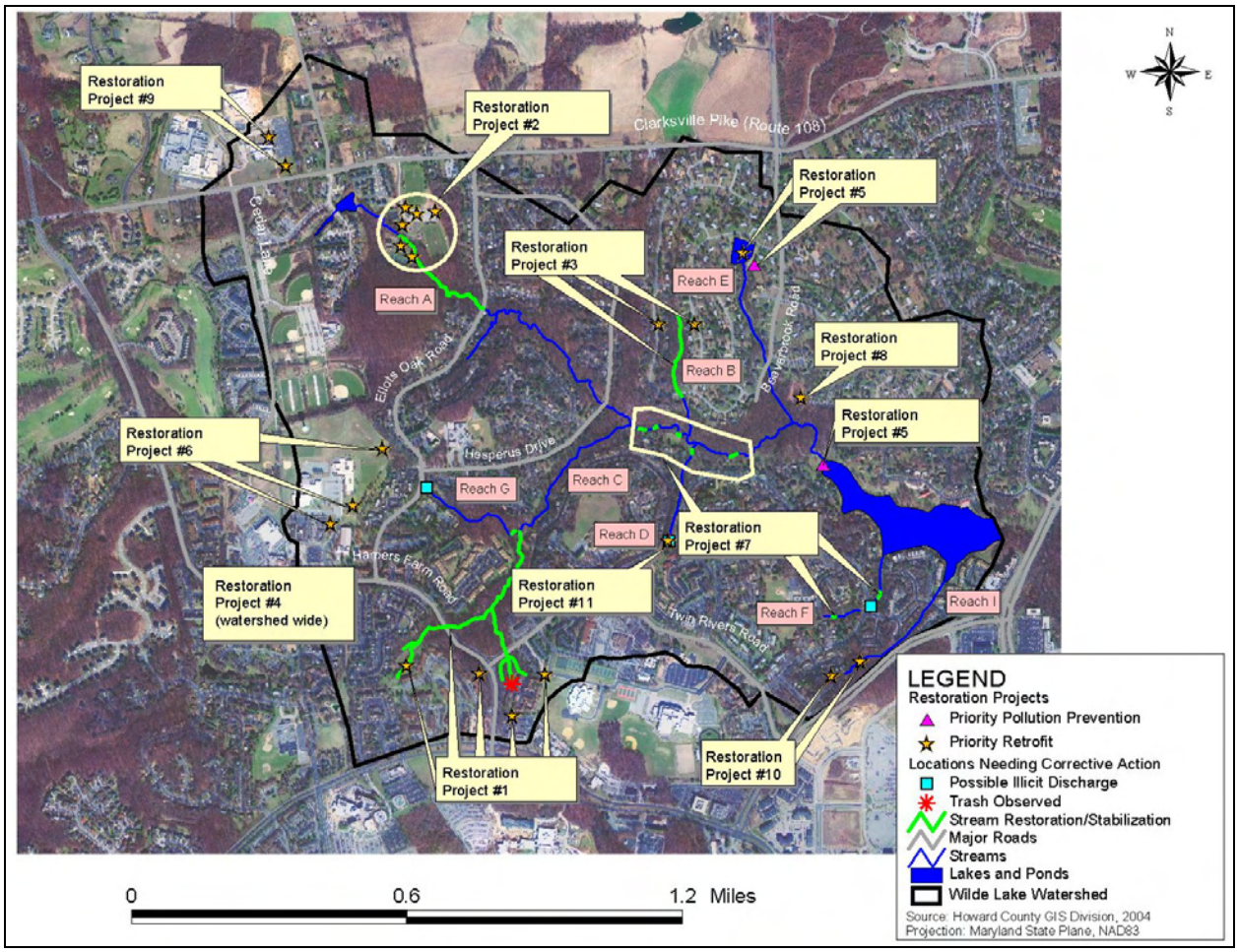

Figure 1-3: Priority Restoration Projects for the Wilde Lake Subwatershed (CWP, 2005)

Little Patuxent River Watershed Plan

The Columbia Association has recently contracted with Versar, Inc., to develop a watershed plan for the Little Patuxent River. This effort will focus on six subwatersheds, which Versar will select through a Comparative Subwatershed Analysis. Once the subwatersheds are selected, Versar will conduct stream and upland assessments to gauge current conditions and identify opportunities watershed restoration and enhancements. Once field investigations are complete, Versar will develop specific recommendations for each subwatershed as well as the overall Little Patuxent River watershed.

The field assessment methodologies that Versar will use include two assessments used by Biohabitats in this assessment – the Unified Stream Assessment and the Retrofit Reconnaissance Investigation. Biohabitats has begun efforts to collaborate with the Columbia Association and Versar on their planning efforts. Staff from Biohabitats spent one day in the field with staff from Versar to review field methodologies and ensure consistency in approaches.

Versar will not assess the Symphony Stream and Lake Kittamaqundi subwatersheds that have been assessed by Biohabitats. Instead, recommendations from Biohabitats' effort will be referenced and incorporated into the larger Little Patuxent River watershed plan.

Section 2.0 Riparian Corridor and Stormwater Retrofit Assessments

2.1 Introduction to the Assessments

Biohabitats conducted riparian corridor and stormwater retrofit field assessments in the Symphony Stream and Lake Kittamaqundi watershed over seven days in the spring of 2008. The goal of these assessments was to identify riparian corridor restoration and stormwater retrofit opportunities in the watershed. As such, field crews assessed approximately 2 miles of riparian corridor and over 60 potential stormwater retrofit sites. Completed field sheets are provided in Appendices C and D, and a photo log is provided in Appendix E. The findings of this fieldwork are summarized in this section.

The focus of the field efforts in Symphony Stream watershed was west of Symphony Woods and Broken Land Parkway, and north of Hickory Ridge Road. Concurrent efforts by Biohabitats identify environmental enhancement opportunities in the Symphony Woods area. A desktop analysis of aerial photos prior to the field assessment did not identify obvious retrofit opportunities south of Hickory Ridge Road, so the field effort was focused on areas where there were more likely retrofit opportunities. The stormwater retrofit assessment was performed across the Lake Kittamaqundi watershed.

A key to the nomenclature used by field teams during the assessment work is provided in Table 2-1. Identifiers consist of three parts: 1) the abbreviation of the watershed, 2) the type of assessment conducted, and 3) a unique identifier that is employed sequentially as a team evaluates a subwatershed or reach (e.g. the first three retrofits identified in one subwatershed reach would be numbered R1, R2, R3…). This nomenclature has carried through the project and is used elsewhere in this report.

Table 2-1: Field Assessment Nomenclature Key

Subwatershed Name	Subwatershed Acronym
Symphony Stream	SS
Lake Kittamaqundi	LK

Sequential Numbering begins at "1" for each investigation type

Investigation Type	Acronym
Stormwater Retrofit	R
Stream / Riparian Corridor Restoration	S
Outfall	OT
Stream Crossing	SC
Eroded Bank	ER
Impacted Buffer	IB
Trash and Debris	TR
Utility	UT
Channel Modification	CM
Miscellaneous	MI

2.2 Stormwater Retrofit Assessment

Biohabitats conducted a Retrofit Reconnaissance Investigation in the Symphony Stream and Lake Kittamaqundi watersheds over six days in the spring of 2008. Stormwater retrofits are structural practices that are inserted into the urban landscape where little or no stormwater

management currently exists. They are an essential element to successfully restore the overall aquatic health of a stream. Without establishing a stable, predictable hydrologic regime, which regulates the volume, duration, frequency, and rate of flow, many of the other restoration strategies such as bank stabilization, riparian reforestation, and aquatic habitat enhancement may fail. In addition, stormwater retrofits provide important water quality benefits that can result in improved in-stream conditions.

Stormwater retrofits generally fall into two categories: storage retrofits and on-site retrofits. Storage retrofits treat drainage areas ranging from five to 500 acres. In comparison, on-site retrofits normally treat less than five acres of contributing drainage area, and frequently less than one. Application of practices in the different categories vary according to the impervious cover and land use makeup of each subwatershed as well as the restoration goals being pursued. Storage retrofits, such as ponds and wetlands, often provide the widest range of watershed restoration benefits; however, on-site retrofit practices, such as bioretention and filtering practices, can provide a substantial benefit when applied over large areas. For this watershed assessment, the goal was to identify all categories of retrofits.

Assessment Protocol

Biohabitats used the Retrofit Reconnaissance Investigation field form to evaluate retrofit opportunities at candidate sites. Candidate sites were initially identified using aerial photos and maps of impervious cover, topography, and hydrology. Additional sites to visit were identified by GGP staff.

Each candidate site was visited and assessed for retrofit potential. This involved an assessment of the site's drainage area, impervious cover, and land use; an evaluation of existing stormwater management and drainage patterns at the site; and identification of site constraints that may impede implementation, such as utilities and permitting factors. Candidate retrofit sites in the watershed generally had one or more of the following characteristics:

- Located upstream of potential stream restoration projects
- Located at uncontrolled hotspots
- Have a large amount of impervious cover in the drainage area
- Have existing drainage infrastructure or existing, insufficient stormwater practices
- On publicly-owned or operated lands
- Could serve as a demonstration project

Summary of Sites Assessed and General Findings

Field crews visited over 60 sites throughout the watersheds and identified 49 opportunities to implement stormwater retrofits (see Map 3 in Appendix A). These opportunities are on public and private land. Specific types of stormwater treatment options prescribed for the different retrofit locations vary, but include bioretention, bioswales, modification of existing stormwater basins, rain gardens and rain barrels, rainwater cisterns, sand filters, permeable pavement, wooded wetlands, and regenerative stormwater conveyance (see Map 4 in Appendix A). More

information on these sites is provided in Section 3. Completed RRI field forms are provided in Appendix C.

Throughout the watershed, it was noted that although newer development appears to be employing sufficient post-construction stormwater management practices, much of the older development in the watershed has little (e.g., dry ponds and oil/grit separators) to no stormwater treatment. Due to the developed nature of the watershed, there are limited opportunities for new storage facilities outside of the stream corridor. There are, however, abundant opportunities for on-site practices that could be well integrated with the existing land use and incorporated in a manner that provides aesthetic improvement and educational opportunities to the sites.

"Hotspot" land uses, such as gas stations and institutional facilities management areas, should be targeted for on-site stormwater retrofits that provide water quality treatment as well as pollution prevention practices. Opportunities for on-site stormwater retrofits, particularly in parking lots and at publicly owned facilities are plentiful. These areas also represent good opportunities for evaluating different technologies such as porous pavement. Multiple opportunities exist for stormwater retrofits within the public right-of-way to treat street runoff. Examples of retrofit opportunities are displayed in Figure 2-1.

2.3 Riparian Corridor Assessment

Biohabitats conducted a riparian corridor assessment along two stream miles in the Symphony Stream and Lake Kittamaqundi watersheds. The assessment was used to identify outfall locations, severely eroded stream banks, utility crossings, impacted riparian buffers, trash dumping, stream crossings, and channel modifications within the stream corridor. Potential restoration opportunities at impacted locations were also identified.

Assessment Protocol

The assessment protocol used was the Unified Stream Assessment (USA), which is a comprehensive stream walk protocol developed by the Center for Watershed Protection for evaluating the physical riparian and floodplain conditions in small urban watersheds. The USA integrates qualitative and quantitative components of various stream survey and habitat assessment methods and is used to identify locations of suspected illicit connections, impacted buffer, severe stream bank erosion, excessive trash accumulation and dumping, and impacted stream crossings. Restoration opportunities for discharge prevention, stream restoration, stormwater retrofits, and riparian reforestation are also identified.

The USA utilizes eight individual impact assessment forms for evaluating restoration potential for common urban stream impairments, including:

- Stormwater pipe outfalls
- Severe erosion
- Impacted upland buffers adjacent to streams
- Utilities in the stream corridor
- Trash and debris

- Stream crossings (e.g., road bridges)
- Channel modification
- Other miscellaneous impacts

Figure 2-1: Retrofit opportunities include: creating a bioretention practice along the perimeter of a parking lot (top left); converting an eroding drainage channel into a bioswale (top right); installing a bioswale in a road median (middle left); installing a bioretention practice to treat rooftop runoff (middle right); converting a paved drainage channel into a bioswale (bottom left); and installing perimeter sand filter to treat runoff from a gas station (bottom right).

More detail on conducting the USA protocol can be obtained directly from CWP (2004).

Summary of Sites Assessed and General Findings

Field crews assessed approximately 2 miles of stream and identified 10 opportunities for riparian corridor restoration (see Maps 5 and 6 in Appendix A). These opportunities are on public and private land along Symphony Stream and the upstream end of the tributary stream to Lake Kittamaqundi. Specific types of restoration options identified include stream restoration, riparian buffer reforestation, floodplain reconnection, and bank stabilization. More information on these sites is provided in Section 3. Completed USA field forms are provided in Appendix D. Downstream sections of Symphony Stream and the tributary stream to Lake Kittamaqundi that are not identified as priorities for riparian corridor restoration still present opportunities for integrated vegetation management in the corridor and adjacent areas. More information is provided in Section 3.

Throughout the watersheds the stream has been impacted by higher storm flows associated with urbanization. This has led to morphological changes within the stream channels; the streams have become disconnected from their floodplains, an undersized channel is causing high amounts of bank erosion, and culverts are perched on the downstream end, causing fish passage obstructions. Parts of the channels have been straightened. Much of the riparian buffer within the area assessed has become dominated by invasive species. Examples of typical impacts are displayed in Figure 2-1.

Figure 2-1: Examples of typical impacts observed along Symphony Stream: impacted buffer (top left); a blocked road culvert (top right); severe bank erosion (bottom left); and accumulated trash (bottom right).

Section 3.0 Watershed Planning and Restoration Recommendations

3.1 Overview of Planning and Restoration Opportunities

This section presents recommendations on the application of specific watershed management or restoration practices throughout the Symphony Stream and Lake Kittamaqundi watersheds. These practices focus on treatment of polluted runoff and natural resources restoration and re-establishment. They are broadly classified into two major groups:

- *Upland Stormwater Retrofits* – Structural practices installed in upland areas to capture and treat stormwater runoff before it is delivered to the storm drainage system, and ultimately, the streams.
- *Riparian Corridor Restoration* – Floodplain reconnection, riparian buffer enhancement, stream restoration, and bank stabilization techniques used to enhance the appearance, structure, or function of riparian corridors.

Specific locations for the application of these restoration and management practices were identified and evaluated during the field assessments conducted by Biohabitats (see Section 2). During these field assessments, Biohabitats visited numerous locations in the watersheds and used various field assessment methodologies to evaluate the feasibility of implementing a management or restoration practice. The recommended management and restoration practices are described in more detail below.

3.2 Upland Stormwater Retrofit Opportunities

Upland stormwater retrofits are structural practices installed in upland areas to capture and treat stormwater runoff before it is delivered to the storm drainage system, and ultimately, the stream. Forty-nine opportunities to implement stormwater retrofits in the Symphony Stream and Lake Kittamaqundi watershed are summarized in Table 3-1 and displayed on Maps 3 and 4 in Appendix A. More detailed information on each opportunity is provided in Appendix F.

Specific types of stormwater treatment options prescribed for the different retrofit locations vary, but include bioretention, bioswales, modification of existing stormwater basins, rain gardens and rain barrels, rainwater cisterns, sand filters, permeable pavement, wooded wetlands, and regenerative stormwater conveyance. If implemented, these stormwater retrofits will increase stormwater runoff quality and recharge; mitigate localized channel erosion areas; protect riparian corridor restoration sites; and serve as demonstration and education sites.

After the field assessments were completed, Biohabitats conducted pollutant load modeling (described in Section 4 and Appendix I), developed planning-level design and construction cost estimates, and developed a ranking system to prioritize these stormwater retrofit opportunities. Using best professional judgment, each retrofit location was assigned points and ranked according to the factors listed below.

- Improve water quality – Potential for treatment or prevention of pollutants, specifically, total phosphorus (TP) and total suspended solids (TSS). Treats water quality volume or eliminates exposure of pollutants to stormwater runoff.
- Allow for groundwater recharge – Potential for infiltration of stormwater runoff through bottom of practice.
- Provide storage – Retrofit is a storage facility that may provide management of storms larger than the water quality storm.
- Cost – Planning-level design and construction cost estimate for the retrofit, normalized at cost per impervious acre.
- Visibility – Project with high visibility and potential to raise the public's awareness of the watershed (visible from street or located in public park).
- Feasibility – Project with high potential that it will be implemented. The site has access for equipment, low maintenance burden, is publicly owned.

Higher scoring retrofits are considered higher priority. More detailed data used to rank the retrofits is displayed in Appendix G. The results of this ranking exercise, along with planning-level construction and design cost estimates, are summarized in Table 3-1.

Table 3-1: Stormwater Retrofit Opportunities

Total Score	Location	Existing Conditions	Type of Treatment Proposed	Planning Level Design / Construction Cost Estimate (2007 dollars)
85	SS-R04 (Howard Community College)	Stormwater runoff from a parking lot and Little Patuxent Parkway has formed eroding drainage channels across a field at Howard County Community College. The eroded sediment is blocking an inadequate drainage system downstream.	Bioswales	$115,900
81	LK-R07 (Sheraton Hotel)	Outfall conveying flows from hotel, adjacent parking lot, and commercial areas discharges to channel behind the Sheraton. The channel cuts through an open space with trees and grass before crossing the recreational path and entering Lake Kittamaqundi	Wooded Wetlands and Regenerative Stormwater Conveyance (RSC)	$166,400
78	LK-R02 (Wilde Lake Park Downstream of Dam)	Storm drains from Hyla Brook Rd and W Running Brook Road pass under open field and discharge directly to stream.	Wooded Wetlands and RSC	$226,000
78	LK-R12 (10-70 Columbia Corp Center)	Outfall conveying flows from parking deck, adjacent parking lot, and commercial areas discharges to open channel/ existing stormwater facility. The vegetated channel cuts through an open space with trees and grass before passing under Governor Warfield P	Existing Stormwater Basins	$190,100
78	SS-R10 (Wilde Lake High School)	Paved drainage swales drain parking lots at the high school.	Bioswales	$75,700
78	SS-R23 (Wilde Lake High School)	A paved area drains to a concrete swale, which flows directly to a storm drain inlet.	Bioswales	$45,200

Table 3-1: Stormwater Retrofit Opportunities				
Total Score	**Location**	**Existing Conditions**	**Type of Treatment Proposed**	**Planning Level Design / Construction Cost Estimate (2007 dollars)**
76	LK-R01 (Watermark Place Condos / Wilde Lake Park)	Two outfalls discharge to an open space between Wilde Lake Dam and Little Patuxent Parkway. Flows are conveyed in downcut channel.	Wooded Wetlands and RSC	$180,300
76	LK-R19 (Glen Meadows)	A dry pond manages runoff from a portion of the Glen Meadows complex. It appears to be for flood control only.	Existing Stormwater Basins	$53,500
76	LK-R20 (Water's Edge Townhomes)	Runoff from the Water's Edge complex drains to a single inlet in the parking lot and is discharged to a grassy area.	Wooded Wetlands and RSC	$57,400
71	LK-R05 (Water's Edge Townhomes)	Storm drain conveying flows from Vantage Point Road and associated development discharges directly to Lake Kittamaqundi.	Wooded Wetlands and RSC	$188,500
68	SS-R07 (Little Patuxent Parkway)	Stormwater runoff from Little Patuxent Parkway flows across the median to a storm drain inlet. The area near the inlet is eroding.	Bioswales	$243,600
68	SS-R34 (Governor Warfield Parkway)	Stormwater runoff from Governor Warfield Parkway flows across the median to a storm drain inlet.	Bioswales	$201,700
66	LK-R10 (Chamber of Commerce Office Building on Little Patuxent Parkway)	Existing pond lacks direct inflow and may or may not have been designed for stormwater management.	Existing Stormwater Basins	$193,700
65	SS-R25 (Wilde Lake High School)	A major storm drain runs under the athletic fields on the south side of the school and discharges to Symphony Stream.	Wooded Wetlands and RSC	$459,000
65	SS-R26 (Wilde Lake Middle School)	Runoff from the parking lot and dumpster area drains to a storm drain inlet, which is adjacent to a grassy area.	Bioretention	$15,000
65	SS-R27 (Wilde Lake Middle School)	An external roof drain on the school discharges to a grassy area.	Bioretention	$20,000
63	SS-R06 (Avalon at Symphony Glen)	The roof drains of several apartment buildings drain to common areas covered with turf. The apartment complex parking areas appear to drain to the storm sewer system with no stormwater treatment.	Rain Gardens and Rain Barrels	$205,400
63	SS-R21 (Wilde Lake High School)	Runoff from a portion of the parking lot on the east side of the school drains to a storm drain inlet.	Sand Filters	$99,200
61	LK-R14 (Columbia Mall)	The north parking lot of the mall appears to drain to the storm sewer system with no stormwater treatment.	Bioretention	$1,432,900
58	SS-R12 (Bryant Square Apartment Complex)	The roof drains of several apartment buildings drain to common areas covered with turf. The apartment complex parking areas appear to drain to the storm sewer system with no stormwater treatment.	Wooded Wetlands and RSC	$105,800

Table 3-1: Stormwater Retrofit Opportunities				
Total Score	**Location**	**Existing Conditions**	**Type of Treatment Proposed**	**Planning Level Design / Construction Cost Estimate (2007 dollars)**
58	SS-R19 (Wilde Lake High School)	Runoff from the drop off area and parking lot in front of the school's main entrance drains to two storm drain inlets.	Sand Filters	$110,000
58	SS-R24 (Wilde Lake High School)	The dumpster storage area and a portion of the parking lot on the west side of the school drain to a storm drain inlet.	Sand Filters	$30,000
58	SS-R28 (Wilde Lake Middle School)	Runoff from the road leading to the school drains to a storm drain inlet, which is adjacent to a grassy area.	Bioretention	$28,800
56	LK-R09 (Parking Lot between Chamber of Commerce and Sheraton Hotel on Little Patuxent Parkway)	Outfall conveying flows from parking lot and commercial areas discharges to top of steep streambank, causing pipe sections to separate and large scour hole and eroded channel.	Bioretention	$584,400
56	SS-R09 (Exxon Gas Station)	A gas station appears to drain to the storm sewer system with no stormwater treatment. Numerous pollution producing opportunities were observed, including poorly managed dumpsters, signage for car washing, stained pavement, and outdoor materials storage with no containment.	Sand Filters and Permeable Pavement	$227,200
56	SS-R17 (Columbia Mall)	The west parking lot of the mall appears to drain to the storm sewer system with no stormwater treatment.	Bioretention	$2,315,900
54	LK-R16 (Columbia Mall)	The roof drains of the AMC Columbia 14 Cinemas building appear to drain to the storm sewer system with no stormwater treatment.	Bioretention	$243,800
53	LK-R06 (Townhomes on Vantage Point)	Existing dry pond has no inflowing pipes.	Existing Stormwater Basins	$69,000
51	LK-R18 (Glen Meadows)	Runoff from portion of parking lots and roofs drain to a storm drain inlet.	Sand Filters	$74,500
51	SS-R20 (Wilde Lake High School)	Runoff from a portion of the parking lot on the northeast side of the school drains to a storm drain inlet, which is adjacent to a landscaped island.	Bioretention	$130,800
49	SS-R18 (Wilde Lake Interfaith Center)	The parking lot drains to several storm drain inlets with no apparent treatment.	Bioretention	$450,500
48	LK-R03 (Intersection of Governor Warfield Parkway and Little Patuxent Parkway)	Storm drains pass large landscaped island at intersection.	Bioswales	$25,000

Table 3-1: Stormwater Retrofit Opportunities				
Total Score	**Location**	**Existing Conditions**	**Type of Treatment Proposed**	**Planning Level Design / Construction Cost Estimate (2007 dollars)**
48	SS-R08 (Howard Community College)	The stream between a building and a parking lot on the Howard County Community College campus is incised with eroding banks and has poor riparian habitat. This is adjacent to a stormwater wetland, which appears to be overgrown and in need of maintenance.	Wooded Wetlands and RSC	$1,284,500
46	LK-R08 (Sheraton Hotel)	Outfall conveying flows from hotel parking lot and adjacent commercial areas discharges to top of steep streambank.	Sand Filters and Permeable Pavement	$748,700
46	LK-R11 (Chamber of Commerce Office Building on Little Patuxent Parkway)	Small portion of Chamber of Commerce parking lot drains to eroded swale via curb cut.	Bioretention	$33,900
46	SS-R15 (Townhomes on College Square)	The roof drains of several townhome buildings drain to onsite areas covered with turf. The apartment complex parking areas appear to drain to the storm sewer system with no stormwater treatment.	Rain Gardens and Rain Barrels	$43,900
46	SS-R36 (Firestone)	Runoff from the parking lot and service area behind Firestone drain to two storm drain inlets.	Bioretention	$189,200
45	SS-R05 (Avalon at Symphony Glen)	A large outfall discharges stormwater runoff from an apartment complex to the riparian corridor. Extensive erosion and downcutting is present.	Wooded Wetlands and RSC	$291,700
44	SS-R31 (Patuxent Publishing Company)	A large portion of the parking lot drains to storm drain inlets with no obvious stormwater treatment.	Bioretention	$111,600
44	SS-R32 (Columbia Professional Center)	The parking lot drains to storm drain inlets with no obvious stormwater treatment.	Bioretention	$191,100
43	LK-R13 (Columbia Mall)	The east parking structure of the mall appears to drain to the storm sewer system with no stormwater treatment.	Rainwater Cisterns	$229,200
41	LK-R04 (One Mall North on Little Patuxent Parkway)	West side of parking lot drains to single storm drain inlet that is upstream of an unutilized swale and depression.	Bioswales	$107,800
41	SS-R16 (Townhomes on College Square)	The roof drains of several townhome buildings drain to onsite areas covered with turf. The apartment complex parking areas appear to drain to the storm sewer system with no stormwater treatment.	Sand Filters and Permeable Pavement	$142,300
41	SS-R22 (Wilde Lake High School)	Internal roof drains direct stormwater runoff directly to the underground storm drains. A grassy slope is adjacent to the school on the southeast side of the school.	Bioretention	$70,100

Table 3-1: Stormwater Retrofit Opportunities				
Total Score	**Location**	**Existing Conditions**	**Type of Treatment Proposed**	**Planning Level Design / Construction Cost Estimate (2007 dollars)**
38	LK-R17 (Vantage House Retirement Community)	Roof drains, a portion of a parking lot, a loading area, and the dumpster storage areas all drain to a storm drain inlet with no stormwater treatment. Another roof drain discharges to a paved area. Runoff from the garage and the entry way drains directly to the storm drain system.	Sand Filters	$259,700
38	SS-R33 (Office Building at the intersection of Little Patuxent Parkway and Harpers Farm Road)	Runoff from the parking lot drains to three storm drain inlets.	Sand Filters	$178,000
36	SS-R29 (Century Plaza Office Building)	Runoff from the parking lot and roof drains to storm drain inlets with no apparent treatment.	Bioretention	$1,029,300
30	SS-R37 (The Bluffs at Hawthorn)	The parking lot at the complex drains to two storm drain inlets.	Sand Filters	$383,800
23	SS-R30 (Princeton Sports and Neighboring Businesses)	Runoff from the parking lot and dumpster areas behind Princeton Sports and the neighboring business drain to a storm drain inlet, which then discharges directly to Symphony Stream.	Bioretention	$248,900

3.3 Riparian Corridor Restoration Opportunities

Riparian corridor restoration involves the application of a variety of techniques to enhance the appearance, structure, or function of the stream corridor. The combination of techniques recommended for any given site is location-specific, but may include floodplain reconnection, riparian buffer enhancement, stream restoration, and bank stabilization.

Ten opportunities to restore the riparian corridor in the Symphony Stream and Lake Kittamaqundi watersheds are presented in Table 3-2 and on Map 6 in Appendix A. More detailed information on each opportunity is provided in Appendix H. Specific techniques prescribed to these ten locations include floodplain reconnection, riparian buffer enhancement, stream restoration, bank stabilization, and regenerative stormwater conveyance. If implemented, these riparian corridor restoration projects will result in enhanced riparian habitat and improved stormwater runoff quality.

Biohabitats performed a more qualitative ranking of the riparian corridor restoration opportunities based on severity of observed impacts and associated downstream impacts; opportunity to coordinate multiple projects; phasing of projects; and feasibility.

Table 3-2: Riparian Corridor Restoration Opportunities				
Priority	**Location**	**Existing Conditions**	**Restoration Opportunity**	**Planning Level Design and Construction Cost Estimate (2007 dollars)**
1	SS-S6 (Symphony Stream Corridor)	Entrenched and undersized channel, lots of bank erosion, over-wide channel, presence of trash.	Bank stabilization, regenerative stormwater conveyance	$ 457,500
2	SS-S2 (Symphony Stream Corridor)	Straightened and entrenched, some large debris jams; a low flow channel is forming within the larger channel, wide riparian buffer.	Floodplain reconnection, riparian buffer enhancement, stream restoration	$ 389,700
3	SS-S3 (Symphony Stream Corridor)	Poor riparian buffer on the right side of the stream, good step/pool morphology, poor connection to available floodplain.	Floodplain reconnection, riparian buffer enhancement, stream restoration	$ 424,000
4	SS-S4 (Symphony Stream Corridor)	Straightened and entrenched channel, possible aggradation from undersized pipe located downstream.	Floodplain reconnection, stream restoration	$ 366,500
5	SS-S5 (Symphony Stream Corridor)	Anamorphous channel, wooded wetland, eroding banks on upper left side, large amounts of trash present, disconnected upstream culvert and failing drainage from Little Patuxent Parkway.	Bank stabilization	$ 90,200
6	SS-S1 (Howard County Community College)	Poor riparian zone, frequent headcuts, downstream end entrenched. Stream opening under footbridge is blocked.	Floodplain reconnection, riparian buffer enhancement	$ 190,200
7	SS-S8 (Symphony Stream Corridor)	Over-wide channel developing new planform with channel banks, bank erosion, potential for exposed sewer lines within channel bottom.	Stream restoration	$ 387,400
8	SS-S7 (Symphony Stream Corridor)	Good step pool morphology, floodplain on right constrained due to sewer line, poor buffer on right, entrenched.	Floodplain reconnection, riparian buffer enhancement	$ 131,400
9	SS-S10 (Symphony Stream Corridor)	Entrenched channel, some bank erosion.	Bank stabilization	$ 29,400
Not Ranked	LK-S1 (Wilde Lake Park Downstream of Dam)	Poor riparian buffer on both sides of the stream below the Wilde Lake Dam, poor connection to available floodplain, gabion lined channel.	Riparian buffer enhancement	$ 100,000

3.4 Integrated Vegetation Management Opportunities

During the riparian corridor restoration field assessments, invasive plant species were noted throughout both watersheds. As such, contiguous parcels were identified where integrated vegetation management plans should be developed and implemented.

Integrated vegetation management focuses on the removal of invasive plant species while regenerating native plant species, resulting in more diverse and healthy riparian systems. The specific activities necessary to restore and regenerate an area are determined during the development of the integrated vegetation management plan. These may include:

- Forest restoration and enhancement – removal of invasive vegetation, establishment of native tree species, and establishment of missing vegetative strata (e.g., herb and shrub layers).
- Reforestation and afforestation – re-establishment of appropriate forest communities through planting of areas that have been cleared or will be cleared of native forest.
- Wetland enhancement – activities that will improve the structure and function of existing wetland areas such as invasive plant removal, planting of native wetland species, or grading to improve hydrology.

Recommended parcels for integrated vegetation management are presented in Table 3-3 and Map 7 in Appendix A. As specific restoration and enhancement opportunities would be identified during plan development, Table 3-3 identifies the potential cost range associated with planning and implementation of each integrated vegetation management plan.

Table 3-3: Opportunities for Integrated Vegetation Management

Location	Area (acres)	Cost Estimate for Development and Implementation of Integrated Vegetation Management Plan (2007 dollars)[1]
SS-V1 (Symphony Stream Corridor)	7	$77,000 to $287,000
SS-V2 (Symphony Stream Corridor)	35	$364,000 to $1,414,000
SS-V3 (Symphony Stream Corridor)	30	$314,000 to $1,214,000
LK-V1 (Lake Kittamaqundi Tributary Stream Corridor)	30	$314,000 to $1,214,000
TOTAL	**102 acres**	**$49,000**

1. An integrated vegetation management plan may call for the following activities:
   - Forest Restoration and Enhancement ($10,000 to $30,000 per acre)
   - Reforestation and Afforestation ($20,000 to $40,000 per acre)
   - Wetland Enhancement ($15,000 to $30,000 per acre)

3.5 Watershed Restoration Implementation Strategy

While all of the stormwater retrofit, riparian corridor restoration projects, and integrated vegetation management opportunities are valid candidates for further investigation and design, the reality is that fiscal and staff resources will limit the number of projects that can be implemented in a timely fashion. In addition, it is most appropriate to implement projects that complement each other and limit the overall disturbance of existing natural resources as much as possible. In other words, those sites that should be pursued first should be pursued in the context of the overall benefit to the watershed(s) through a management strategy and approach that seeks to combine stormwater retrofits with other rehabilitation strategies. Ultimately, however, GGP, the Columbia Association (CA) and the County may wish to implement all of the sites to maximize the benefits. Based on the results of the analyses performed to date, a proposed watershed restoration implementation strategy has been developed for each watershed which optimizes the pollutant removal capabilities of stormwater retrofits and, where feasible, associates the stormwater retrofits with riparian corridor restoration and integrated vegetation management opportunities.

Symphony Stream Watershed Restoration Strategy

Stage 1 (see Map 1, Appendix J):

Work with Howard County to retrofit the Wilde Lake High School campus, the Wilde Lake Middle School campus, and the Wilde Lake Interfaith Center.

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Public	SS-R10 (Wilde Lake High School)	Bioswales	0.7	$ 75,700
Private	SS-R18 (Wilde Lake Interfaith Center)	Bioretention	3.7	$ 450,500
Public	SS-R19 (Wilde Lake High School)	Sand Filters	1.8	$ 110,000
Public	SS-R20 (Wilde Lake High School)	Bioretention	1.4	$ 130,800
Public	SS-R21 (Wilde Lake High School)	Sand Filters	1.0	$ 99,200
Public	SS-R22 (Wilde Lake High School)	Bioretention	0.5	$ 70,100
Public	SS-R23 (Wilde Lake High School)	Bioswales	0.4	$ 45,200
Public	SS-R24 (Wilde Lake High School)	Sand Filters	0.2	$ 30,000
Public	SS-R25 (Wilde Lake High School)	Wooded Wetlands / RSC	37.6	$ 459,000
Public	SS-R26 (Wilde Lake Middle School)	Bioretention	0.3	$ 15,000
Public	SS-R27 (Wilde Lake Middle School)	Bioretention	0.6	$ 20,000
Public	SS-R28 (Wilde Lake Middle School)	Bioretention	0.4	$ 28,800
TOTAL			**48.6**	**$ 1,534,300**

Pursue the recommended riparian corridor restoration opportunity immediately downstream of the Wilde Lake High School and Middle School campuses.

Property Owner	Location	Restoration Opportunity	Total Riparian Corridor Length		Planning Level Design and Construction Cost Estimate
			(feet)	(miles)	
Public / Private	SS-S6 (Symphony Stream Corridor)	Bank stabilization, regenerative stormwater conveyance	1,460	0.3	$ 457,500
TOTAL			**1,460**	**0.3**	**$ 457,500**

Develop and implement an integrated vegetation management plan for the recommended area near the Wilde Lake High School and Middle School campuses.

Property Owner	Location	Activity	Area (acres)	Planning Level Cost Estimate[1]
Public / Private	SS-V1 (Symphony Stream Corridor)	Develop and Implement Integrated Vegetation Management Plan	7	$ 77,000 to $ 287,000
TOTAL			**7**	**$77,000 to $287,000**

1. An integrated vegetation management plan may call for the following activities:
   - Forest Restoration and Enhancement ($10,000 to $30,000 per acre)
   - Reforestation and Afforestation ($20,000 to $40,000 per acre)
   - Wetland Enhancement ($15,000 to $30,000 per acre)

Stage 2 (see Map 2, Appendix J):

Work with Howard Community College to retrofit its campus.

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Public	SS-R04 (Howard Community College)	Bioswales	10.9	$ 115,900
Public	SS-R08 (Howard Community College)	Wooded Wetlands / RSC	29.5	$ 1,284,500
TOTAL			**40.4**	**$ 1,400,400**

Pursue the recommended riparian corridor restoration opportunities throughout and adjacent to the Howard Community College campus.

Property Owner	Location	Restoration Opportunity	Total Riparian Corridor Length		Planning Level Design and Construction Cost Estimate
			(feet)	(miles)	
Public	SS-S2 (Symphony Stream Corridor)	Floodplain reconnection, riparian buffer enhancement, stream restoration	450	0.1	$ 389,700
GGP	SS-S3 (Symphony Stream Corridor)	Floodplain reconnection, riparian buffer enhancement, stream restoration	500	0.1	$ 424,000
GGP	SS-S4 (Symphony Stream Corridor)	Floodplain reconnection, stream restoration	440	0.1	$ 366,500
Public	SS-S1 (Howard County Community College)	Floodplain reconnection, riparian buffer enhancement	660	0.1	$ 190,200
TOTAL			**2050**	**0.4**	**$ 1,370,400**

Stage 3 (see Map 3, Appendix J):

Retrofit the Century Office Building property; use this as a demonstration and education opportunity for private property owners.

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Private	SS-R29 (Century Plaza Office Building)	Bioretention	6.4	$ 1,029,300
TOTAL			**6.4**	**$ 1,029,300**

Work with Howard County to retrofit the Little Patuxent Parkway and the Governor Warfield Parkway.

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Public	SS-R07 (Little Patuxent Parkway)	Bioswales	4.1	$ 243,600
Public	SS-R34 (Governor Warfield Parkway)	Bioswales	3.0	$ 201,700
TOTAL			**7.1**	**$ 445,300**

Encourage or work with private property owners along and north of the Little Patuxent Parkway to implement stormwater retrofit opportunities.

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Private	SS-R36 (Firestone)	Bioretention	1.5	$ 189,200
Private	SS-R33 (Office Building at the intersection of Little Patuxent Parkway and Harpers Farm Road)	Sand Filters	2.0	$ 178,000
Private	SS-R32 (Columbia Professional Center)	Bioretention	1.7	$ 191,100
Private	SS-R31 (Patuxent Publishing Company)	Bioretention	1.0	$ 111,600
Private	SS-R30 (Princeton Sports and Neighboring Businesses)	Bioretention	1.8	$ 248,900
Private	SS-R12 (Bryant Square Apartment Complex)	Wooded Wetlands / RSC	15.1	$ 105,800
Private	SS-R09 (Exxon Gas Station)	Sand Filters	1.8	$ 227,200
TOTAL			**24.9**	**$ 1,251,800**

Pursue the recommended riparian corridor restoration opportunities downstream of the Little Patuxent Parkway.

Property Owner	Location	Restoration Opportunity	Total Riparian Corridor Length		Planning Level Design and Construction Cost Estimate
			(feet)	(miles)	
GGP	SS-S5 (Symphony Stream Corridor)	Bank stabilization	860	0.2	$ 90,200
GGP	SS-S8 (Symphony Stream Corridor)	Stream restoration	800	0.2	$ 387,400
GGP	SS-S7 (Symphony Stream Corridor)	Floodplain reconnection, riparian buffer enhancement	420	0.1	$ 131,400
TOTAL			**2080**	**0.5**	**$ 609,000**

Stage 4 (see Map 4, Appendix J):

Retrofit the Avalon at Symphony Glen residential complex, the townhomes on College Square, and The Bluffs at Hawthorn residential complex.

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Private	SS-R05 (Avalon at Symphony Glen)	Wooded Wetlands / RSC	22.8	$ 291,700
Private	SS-R06 (Avalon at Symphony Glen)	Rain Gardens / Barrels	3.6	$ 205,400
Private	SS-R16 (Townhomes on College Square)	Sand Filters / Permeable Pavement	2.5	$ 142,300
Private	SS-R15 (Townhomes on College Square)	Rain Gardens / Barrels	2.4	$ 43,900
Private	SS-R37 (The Bluffs at Hawthorn)	Sand Filters	2.4	$ 383,800
TOTAL			**33.7**	**$ 1,067,100**

Pursue the recommended riparian corridor restoration opportunity adjacent to the Avalon at Symphony Glen residential complex and the townhomes on College Square.

Property Owner	Location	Restoration Opportunity	Total Riparian Corridor Length		Planning Level Design and Construction Cost Estimate
			(feet)	(miles)	
GGP	SS-S10 (Symphony Stream Corridor)	Bank stabilization	700	0.1	$ 29,400
TOTAL			**700**	**0.1**	**$ 29,400**

Stage 5 (see Map 5, Appendix J):

Develop and implement integrated vegetation management plans for the remaining recommended areas in the Symphony Stream watershed.

Property Owner	Location	Activity	Area (acres)	Planning Level Cost Estimate[1]
GGP/CA/ Public	SS-V2 (Symphony Stream Corridor)	Develop and Implement Integrated Vegetation Management Plan	35	$ 364,000 to $ 1,414,000
Public	SS-V3 (Symphony Stream Corridor)	Develop and Implement Integrated Vegetation Management Plan	30	$ 314,000 to $ 1,214,000
TOTAL			**75**	**$678,000 to $2,628,000**

1. An integrated vegetation management plan may call for the following activities:
   - Forest Restoration and Enhancement ($10,000 to $30,000 per acre)
   - Reforestation and Afforestation ($20,000 to $40,000 per acre)
   - Wetland Enhancement ($15,000 to $30,000 per acre)

Stage 6 (see Map 6, Appendix J):

Pursue additional stormwater retrofits in the Symphony Stream watershed as opportunities arise.

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Private	SS-R17 (Columbia Mall)	Bioretention	18.7	$ 2,315,900
TOTAL			**18.7**	**$ 2,315,900**

Lake Kittamaqundi Watershed Restoration Implementation Strategy

Stage 1 (see Map 7, Appendix J):

Pursue priority stormwater retrofits in the Lake Kittamaqundi Watershed

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Private	LK-R01 (Watermark Place Condos / Wilde Lake Park)	Wooded Wetlands / Regenerative Stormwater Conveyance (RSC)	8.7	$ 180,300
Private	LK-R02 (Wilde Lake Park Downstream of Dam)	Wooded Wetlands / RSC	21.4	$ 226,000
Public	LK-R03 (Intersection of Governor Warfield Parkway and Little Patuxent Parkway)	Bioswales	0.4	$ 25,000
Private	LK-R05 (Water's Edge Townhomes)	Wooded Wetlands / RSC	12.2	$ 188,500
Private	LK-R07 (Sheraton Hotel)	Wooded Wetlands / RSC	8.5	$ 166,400
Private	LK-R19 (Glen Meadows)	Existing Stormwater Basins	1.1	$ 53,500
Private	LK-R20 (Water's Edge Townhomes)	Wooded Wetlands / RSC	3.8	$ 57,400
TOTAL			**56.1**	**$ 897,100**

Stage 2 (see Map 8, Appendix J):

Develop and implement an integrated vegetation management plan for the recommended area in the Lake Kittamaqundi Watershed

Property Owner	Location	Activity	Area (acres)	Planning Level Cost Estimate[1]
Public / Private	LK-V1 (Lake Kittamaqundi Tributary Stream Corridor)	Develop and Implement Integrated Vegetation Management Plan	30	$ 314,000 to $ 1,214,000
TOTAL			**30**	**$314,000 to $1,214,000**

1. An integrated vegetation management plan may call for the following activities:
   - Forest Restoration and Enhancement ($10,000 to $30,000 per acre)
   - Reforestation and Afforestation ($20,000 to $40,000 per acre)
   - Wetland Enhancement ($15,000 to $30,000 per acre)

Stage 3 (see Map 9, Appendix J):

Pursue the recommended riparian corridor restoration opportunity in the Lake Kittamaqundi watershed.

Property Owner	Location	Restoration Opportunity	Total Riparian Corridor Length		Planning Level Design and Construction Cost Estimate
			(feet)	(miles)	
Public	LK-S1 (Wilde Lake Park Downstream of Dam)	Riparian buffer enhancement	500	0.1	$ 100,000
TOTAL			**500**	**0.1**	**$ 100,000**

Stage 4 (see Map 10, Appendix J):

Pursue additional stormwater retrofits in the Lake Kittamaqundi watershed as opportunities arise.

Property Owner	Location	Type of Stormwater Retrofit	Drainage Area to the Retrofit (acres)	Planning Level Design and Construction Cost Estimate
Private	LK-R18 (Glen Meadows)	Sand Filters	0.6	$ 74,500
Private	LK-R17 (Vantage House Retirement Community)	Sand Filters	2.0	$ 259,700
GGP	LK-R16 (Columbia Mall)	Bioretention	1.7	$ 243,800
GGP	LK-R14 (Columbia Mall)	Bioretention	10.2	$ 1,432,900
GGP	LK-R13 (Columbia Mall)	Rainwater Cisterns	1.8	$ 229,200
GGP	LK-R12 (10-70 Columbia Corp Center)	Existing Stormwater Basins	6.7	$ 190,100
GGP	LK-R11 (Chamber of Commerce Office Building on Little Patuxent Parkway)	Bioretention	0.6	$ 33,900
GGP	LK-R10 (Chamber of Commerce Office Building on Little Patuxent Parkway)	Existing Stormwater Basins	6.9	$ 193,700
GGP	LK-R09 (Parking Lot between Chamber of Commerce and Sheraton Hotel on Little Patuxent Parkway)	Bioretention	4.7	$ 584,400
GGP	LK-R08 (Sheraton Hotel)	Sand Filters / Permeable Pavement	3.4	$ 748,700
Private	LK-R06 (Townhomes on Vantage Point)	Existing Stormwater Basins	3.6	$ 69,000
Private	LK-R04 (One Mall North on Little Patuxent Parkway)	Bioswales	1.5	$ 107,800
TOTAL			**43.7**	**$ 4,167,700**

Section 4.0 Annual Pollutant Load Estimates

To assist in evaluating identified stormwater retrofits, Biohabitats developed annual pollutant load estimates for Symphony Stream and Lake Kittamaqundi watersheds. Total suspended solids (TSS) and/or Total Phosphorus (TP) serve as the keystone pollutants in this analysis, as these are the typical pollutants of concern cited and used by both MDE and the Critical Areas stormwater programs.

For each watershed, Biohabitats first estimated current pollutant loads. The current annual TP and TSS loads were computed using the Simple Method (Schueler, 1987). The Simple Method is a technique used for estimating storm pollutant export delivered from urban areas. It is used in the *Critical Area 10% Rule Guidance Manual* (CWP, 2003) to determine phosphorus loading for a site.

Biohabitats then estimated the annual pollutant load reduction that may be achieved by each proposed stormwater retrofit. This involved a four-step process:

1. Compute the pre-retrofit (e.g., post-development) annual pollutant load from the retrofit contributing drainage area
2. Estimate the retrofit pollutant removal efficiency
3. Compute the post-retrofit annual pollutant load
4. Compute the pollutant load reduction of the retrofit

The results of this effort are summarized in Tables 4.1, 4.2, and 4.3. More detail on the methodology and assumptions used are provided in Appendix I.

Table 4.1: Annual TP Loading Under Various Scenarios in the Symphony Stream and Lake Kittamaqundi Watersheds

	Symphony Stream Watershed	Lake Kittamaqundi Watershed
Current Annual TP Load	465 lbs/year	259 lbs/year
Potential Annual TP Load That May be Removed through Stormwater Retrofitting	59 lbs/year	41 lbs/year

Table 4.2: Annual TSS Loading Under Various Scenarios in the Symphony Stream and Lake Kittamaqundi Watersheds

	Symphony Stream Watershed	Lake Kittamaqundi Watershed
Current Annual TSS Load	99,919 lbs/year	55,558 lbs/year
Potential Annual TP Load That May be Removed through Stormwater Retrofitting	26,612 lbs/year	17,523 lbs/year

Table 4-3: Potential Annual TP and TSS Load Reductions Associated with Stormwater Retrofits in the Lake Kittamaqundi and Symphony Stream Watersheds		
Location	**Annual TP Load Removed by Retrofit (lbs/year)**	**Annual TSS Load Removed by Retrofit (lbs/year)**
SS-R04 (Howard Community College)	2	1,099
SS-R05 (Avalon at Symphony Glen)	10	2,944
SS-R06 (Avalon at Symphony Glen)	<1	971
SS-R07 (Little Patuxent Parkway)	1	660
SS-R08 (Howard Community College)	13	3,902
SS-R09 (Exxon Gas Station)	2	688
SS-R10 (Wilde Lake High School)	<1	252
SS-R12 (Bryant Square Apartment Complex)	4	1,179
SS-R15 (Townhomes on College Square)	<1	207
SS-R16 (Townhomes on College Square)	1	430
SS-R17 (Columbia Mall)	1	3,656
SS-R18 (Wilde Lake Interfaith Center)	<1	716
SS-R19 (Wilde Lake High School)	1	343
SS-R20 (Wilde Lake High School)	<1	203
SS-R21 (Wilde Lake High School)	1	299
SS-R22 (Wilde Lake High School)	<1	90
SS-R23 (Wilde Lake High School)	<1	144
SS-R24 (Wilde Lake High School)	<1	76
SS-R25 (Wilde Lake High School)	15	4,650
SS-R26 (Wilde Lake Middle School)	<1	34
SS-R27 (Wilde Lake Middle School)	<1	81
SS-R28 (Wilde Lake Middle School)	<1	56
SS-R29 (Century Plaza Office Building)	<1	1,215
SS-R30 (Princeton Sports and Neighboring Businesses)	<1	288
SS-R31 (Patuxent Publishing Company)	<1	169
SS-R32 (Columbia Professional Center)	<1	310
SS-R33 (Office Building at the intersection of Little Patuxent Parkway and Harpers Farm Road)	2	556
SS-R34 (Governor Warfield Parkway)	1	542
SS-R36 (Firestone)	<1	293
SS-R37 (The Bluffs at Hawthorn)	2	558
LK-R01 (Watermark Place Condos / Wilde Lake Park)	6	1,737
LK-R02 (Wilde Lake Park Downstream of Dam)	8	2,337
LK-R03 (Intersection of Governor Warfield Parkway and Little Patuxent Parkway)	<1	42
LK-R04 (One Mall North on Little Patuxent Parkway)	1	390
LK-R05 (Water's Edge Townhomes)	6	1,862
LK-R06 (Townhomes on Vantage Point)	1	473
LK-R07 (Sheraton Hotel)	5	1,608
LK-R08 (Sheraton Hotel)	4	1,080

Table 4-3: Potential Annual TP and TSS Load Reductions Associated with Stormwater Retrofits in the Lake Kittamaqundi and Symphony Stream Watersheds		
Location	**Annual TP Load Removed by Retrofit (lbs/year)**	**Annual TSS Load Removed by Retrofit (lbs/year)**
LK-R09 (Parking Lot between Chamber of Commerce and Sheraton Hotel on Little Patuxent Parkway)	<1	700
LK-R10 (Chamber of Commerce Office on Little Patuxent Parkway)	2	1,289
LK-R11 (Chamber of Commerce Office on Little Patuxent Parkway)	<1	90
LK-R12 (10-70 Columbia Corp Center)	2	1,262
LK-R13 (Columbia Mall)	<1	74
LK-R14 (Columbia Mall)	1	2,271
LK-R16 (Columbia Mall)	<1	394
LK-R17 (Vantage House Retirement Community)	3	764
LK-R18 (Glen Meadows)	1	229
LK-R19 (Glen Meadows)	1	346
LK-R20 (Water's Edge Townhomes)	2	573

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Appendix A: Symphony Stream and Lake Kittamaqundi Watershed Maps

MAP 1: Symphony Stream and Lake Kittamaqundi Watersheds

Watershed Assessments Associated with Columbia Town Center

General Plan 2000 Amendment

September 2008

RIVENDELL
TWIN RIVERS RD
Wilde Lake
LITTLE PATUXENT PKWY
175
GOVERNOR WARFIELD PKWY
Wilde Lake High School
LITTLE PATUXENT PKWY
CEDAR LN
Howard Community College
The Mall in Columbia
LITTLE PATUXENT PKWY
GGP Office
Lake Kittamaqundi
HICKORY RIDGE RD
LITTLE PATUXENT PKWY
29
Merriweather Post Pavillion
MARTIN RD
SEBRING DR
BROKEN LAND PKWY
OWEN BROWN RD
HILLTOP LN
OWEN BROWN RD
HARMEL DR

Legend

Watershed Boundary

- Lake Kittamaqundi
- Symphony Stream
- Wilde Lake

Surface Water

- Ponds and Lakes
- Streams

Biohabitats

0 300 600 1,200 1,800 Feet

MAP 2: Symphony Stream and Lake Kittamaqundi Watersheds

Watershed Assessments Associated with Columbia Town Center

General Plan 2000 Amendment

September 2008

Legend

Watershed Boundary

- Lake Kittamaqundi
- Symphony Stream
- Wilde Lake

Surface Water

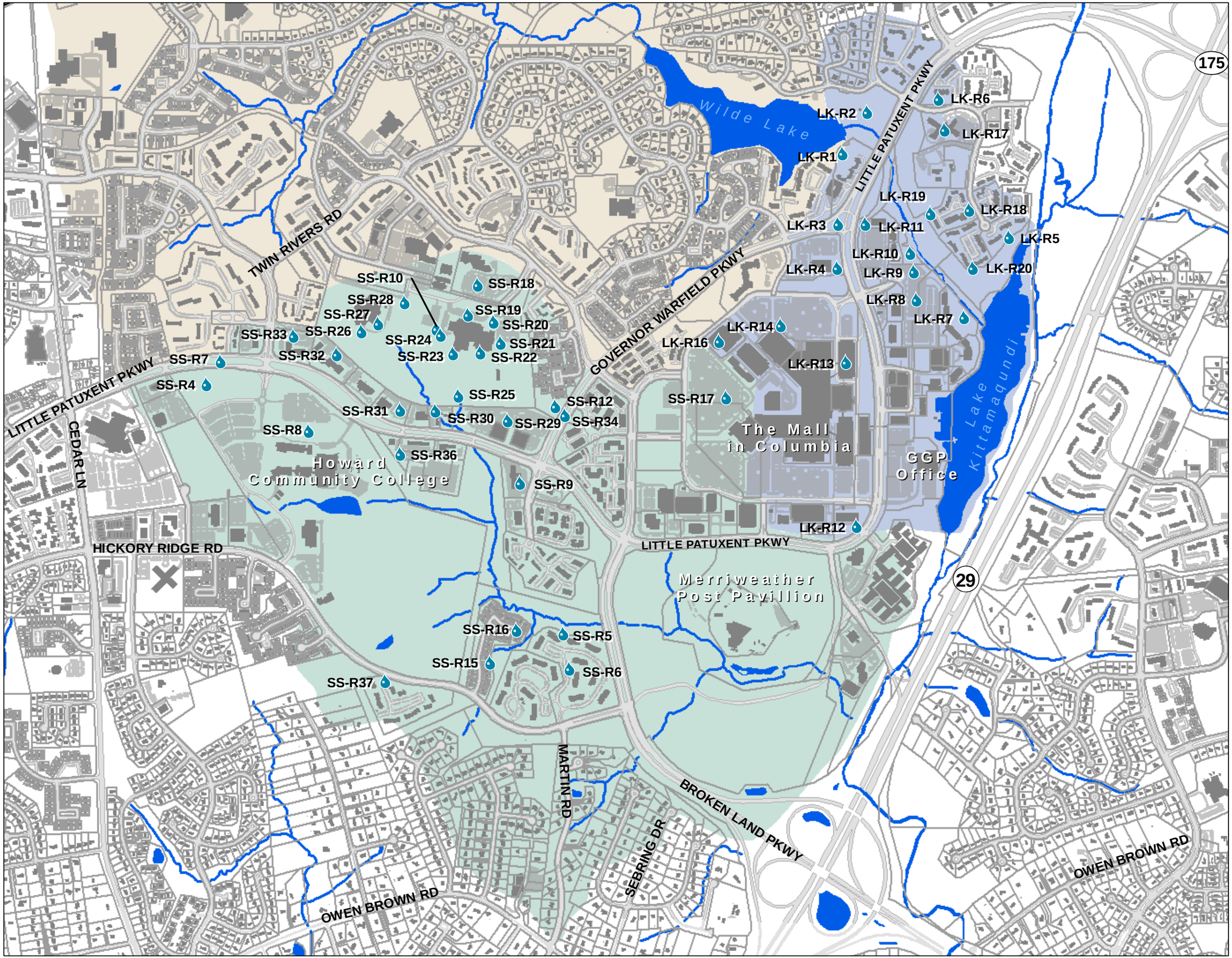
- Ponds and Lakes
- Streams

Planimetrics

- Property
- Roads
- Roads
- Parking Lots
- Buildings

Biohabitats

0 300 600 1,200 1,800 Feet



MAP 3: Opportunities for Stormwater Retrofits and Water Quality Best Management Practices in Symphony Stream and Lake Kittamaqundi Watersheds

Watershed Assessments Associated with Columbia Town Center

General Plan 2000 Amendment

September 2008

Legend

Stormwater Management

- Water Quality Best Management Practice

Watershed Boundaries

- Lake Kittamaqundi
- Symphony Stream
- Wilde Lake

Surface Water

- Ponds and Lakes
- Streams

Planimetrics

- Property
- Roads
- Roads
- Parking Lots
- Buildings

Biohabitats

0 300 600 1,200 1,800 Feet

MAP 4: Opportunities for Stormwater Retrofits and Water Quality Best Management Practices in Symphony Stream and Lake Kittamaqundi Watersheds

Watershed Assessments Associated with Columbia Town Center

General Plan 2000 Amendment

September 2008

Legend

Stormwater Management

Water Quality Best Management Practice

- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Watershed Boundaries

- Lake Kittamaqundi
- Symphony
- Wilde Lake

Surface Water

- Ponds/Lakes/Dams
- Streams

Planimetrics

- Property
- Roads
- Roads
- Parking Lots
- Buildings

Biohabitats

0 300 600 1,200 1,800 Feet

MAP 5: Impacts Identified During Stream Assessments in Symphony Stream Watershed

Watershed Assessments Associated with Columbia Town Center

General Plan 2000 Amendment

September 2008

Legend

Stream Assessment

- Identified Impacts

Watershed Boundaries

- Lake Kittamaqundi
- Symphony
- Wilde Lake

Surface Water

- Ponds and Lakes
- Streams

Planimetrics

- Property
- Roads
- Roads
- Parking Lots
- Buildings

Biohabitats

0 100 200 400 600 800 Feet

MAP 6: Riparian Corridor Restoration Opportunities in Symphony Stream and Lake Kittamaqundi Watersheds

Watershed Assessments Associated with Columbia Town Center

General Plan 2000 Amendment

September 2008

Legend

Riparian Corridor Restoration Opportunities

- Stream Reach

Watershed Boundaries

- Lake Kittamaqundi
- Symphony
- Wilde Lake

Surface Water

- Ponds and Lakes
- Streams

Planimetrics

- Property
- Roads
- Roads
- Parking Lots
- Buildings

Biohabitats

0 300 600 1,200 1,800 Feet

MAP 7: Integrated Vegetation Management Opportunities in Symphony Stream and Lake Kittamaqundi Watersheds

Watershed Assessments Associated with Columbia Town Center

General Plan 2000 Amendment

September 2008

RIVENDELL
TWIN RIVERS RD
LITTLE PATUXENT PKWY
CEDAR LN
HICKORY RIDGE RD
Wilde Lake
LITTLE PATUXENT PKWY
175
LK-V1
Wilde Lake High School
SS-V1
SS-V1
GOVERNOR WARFIELD PKWY
The Mall in Columbia
LITTLE PATUXENT PKWY
GCP Office
Lake Kittamaqundi
Howard Community College
SS-V2
SS-V3
LITTLE PATUXENT PKWY
Merriweather Post Pavilion
29
MARTIN RD
SEBRING DR
BROKEN LAND PKWY
OWEN BROWN RD
OWEN BROWN RD
HILLTOP LN
HARMEL DR

Legend

Watershed Boundary

- Lake Kittamaqundi
- Symphony Stream
- Wilde Lake

Surface Water

- Ponds and Lakes
- Streams

Planimetrics

- Property
- Roads
- Roads
- Parking Lots
- Buildings

Vegetation Management Opportunities

- ID# — Vegetation Management Opportunity

Biohabitats

0 300 600 1,200 1,800 Feet

Appendix B: Stormwater Retrofit Opportunities in the Wilde Lake Watershed

Excerpted from: Center for Watershed Protection. 2005. Centennial and Wilde Lake Watershed Restoration Plan. Prepared for Howard County Department of Public Works. Ellicott City, MD.

Table 3.9 Wilde Lake Retrofit Sites					
Site Number	**Site Name**	**Existing Conditions**	**Potential Retrofit**	**Obvious Constraints**	**Property Owner**
WL01a	Reach C Bioretention Option #1	Untreated parking area and entrance drive	Bioretention	Private property	Private Property/ HOA
WL01b	Reach C Bioretention Option #2	Untreated parking area and entrance drive	Bioretention	Some movement of utilities required	Columbia Association (CA)
WL02	Reach C Century 21 Bioretention	Uncontrolled commercial building and parking lot	Bioretention to treat rooftop and parking lot runoff (0.5")	Loss of approximately 12 parking spaces	Private commercial
WL03	Reach C Shallow Marsh Wetland	Uncontrolled apartment complex	Shallow Marsh Wetland	Possible wetlands impacts (low quality) and loss of community open space	CA
WL04	Reach C Harpers Forest Apts. Rain Garden	Unmanaged runoff from apartment complex (rooftops and parking)	Rain garden "fingerprinted" around existing mature trees with flow splitter in existing storm-drain to divert flow	Mature trees would require careful site management protection measures	Private
WL05	Reach C Rideout Heath Apts. Rain Garden	Existing 12" RCP outfall discharges runoff from streets to open forested area	Provide rain garden at end of existing outfall	Existing forest area; however, poor quality	Private
WL06	Reach C Harpers Forest Rain Garden #2	Unmanaged flow from townhouses west of Harpers Forest	Rain garden with flow splitter in existing storm-drain to divert flow into it; bioretention system that ties flow back into storm-drain	Use of Columbia Association open space may be an issue	CA
WL07	Reach C High Tide Ct. Rain Garden	Unmanaged street runoff around existing turf circle within court	Rain garden with curb cuts to divert street drainage into it	Existing trees; adjacent residents may use turf area for recreation	County Right-of-way
WL08a	Reach C Deering Woods Rain Garden	Open area/park access area adjacent to an existing storm-drain	Provide flow splitter to divert runoff into a rain garden, sited carefully adjacent to sewer; relocate footpath	Removal of three trees and relocation of footpath	CA and HOA
WL08b	Reach C Deering Woods Infiltration Trench	Existing storm-drain through green space with yard inlets	Convert green space to shallow infiltration with underdrains to attenuate flow volume	Need soil tests; residents may use open space for recreation	Private
WL09	Reach C Longfellow ES Dry Pond Retrofit	Existing dry pond with brick riser provides quantity control for portion of school site	Improve water quality treatment with modifications to pond bottom to provide rain garden area with overflow into infiltration trench. Good education opportunity	None	Public-school
WL10a	Reach D Plunge Pool /Step Pool	Existing uncontrolled high-density residential and commercial areas	Create plunge pool and step pool to dissipate energy	Stream stabilization project has been constructed Spring 2005	CA
WL10b	Reach D Wet-Pond Retrofit	Existing uncontrolled high-density residential and commercial areas	Create a large wet-pond to provide flow attenuation and water quality treatment	Limited space/sewer line	CA

Table 3.9 Wilde Lake Retrofit Sites (continued)					
Site Number	**Site Name**	**Existing Conditions**	**Potential Retrofit**	**Obvious Constraints**	**Property Owner**
WL12a	Reach I Thicket Lane	Townhomes and parking discharge to existing storm-drain (downstream channel erosion)	On-line infiltration/detention in surface sand filter with level spreader	Proximity of townhomes	Private
WL12b	Reach I May Wind Ct. Outfall Treatment	Damaged outfall and eroded stream channel	Pervious pavement for overflow parking; roof leader disconnection; velocity reduction measures and outfall repair; stabilize downstream channel	Possible sanitary sewer line	Private
WL13	Reach H Twin Rivers Rd. Bioretention	Open landscaped area between uncontrolled parking and road runoff	Bioretention with curb cuts from parking area and roadway; grass filter strip along edge of parking; relocate path if necessary	Several medium-sized landscaping trees and footpath	Private or CA
WL14	Reach D Faulkner Ridge	Uncontrolled runoff from two parking areas	Provide bioretention and infiltration in a combination of three locations: convert existing swale below playground to bioretention; provide infiltration trench between parking and Marble Fawn Ct.; create vegetated island in Ct.	Existing utilities, street lights	Private
WL15	Reach G Harpers Choice Middle School Dry Pond Retrofit #1	Existing dry pond providing quantity control for school	Convert dry pond to provide QL treatment in micropool with berm and two forebays; divert additional flow to pond	Possible safety concerns from school and downstream homes; possible dam safety permitting issue	Public
WL16	Reach G Harpers Choice Middle School Dry Pond Retrofit #2	Existing dry pond (smaller drainage area with no potential for additional flow)	Convert dry pond to bioretention/rain garden or sand filter combination to improve QL treatment; provide forebay, add trash rack, and stabilize inlet and outlet structures	Minimal; may be safety concerns if design includes extended detention	Public
WL17	Reach G CA Sports Complex Dry Pond Retrofit	Existing unmaintained dry pond	Convert dry pond to improve QL treatment; provide forebay, micropool. Remove trees from embankment and extend roof leaders to pond. Alternative design: convert to bioretention for QL and divert runoff to school dry pond for CPv (QN) treatment	Proximity to existing homes may create aesthetic concerns	CA
WL18	Reach C Produce Galore Outfall Retrofit	Severely eroded outfall and channel downstream of parking area	Potential bioretention at edge of parking area and plunge pool/velocity dissipater at outfall	Adjacent forest and steep slopes adjacent to channel	Private or CA
WL101	Reach E Durham Rd. East Pond Retrofit #1	Existing dry pond quantity control with extensive marsh bottom; severe short-circuiting	Reduce short-circuiting w/berm and add small storm control	Small size of existing facility and proximity of homes; existing wetlands	HOA or Private

Table 3.9 Wilde Lake Retrofit Sites (continued)					
Site Number	**Site Name**	**Existing Conditions**	**Potential Retrofit**	**Obvious Constraints**	**Property Owner**
WL102a	Reach B Lake Circle Dr. Streetscape	30”-wide existing roadway serving small number of homes draining to stream reach with documented erosion problems	Combination or curb cuts to create small rain gardens, and street edge alternatives/ impervious reduction measures	Locations of utilities and mature landscaping will drive design options	Private/ public
WL102b	Reach B Durham Rd. W. Streetscape	30”-wide existing roadway serving small number of homes draining to stream reach with documented erosion problems	Combination or curb cuts to create small rain gardens, and street edge alternatives/ impervious reduction measures	Locations of utilities and mature landscaping will drive design options	Private/ public road
WL103	Reach E Beaverbrook Farm Pond	Existing farm pond, mowed to edge; high levels of nutrient enrichment/algal growth apparent; wildfowl management issue	Establish aquatic fringe and landscaping to improve shade along shallow edges; develop wildfowl management program	Aesthetics—resident preference for mowed edge	HOA/ private
WL104	Reach A Cedar Lane Park Retrofit Options	Existing park with facilities on both sides of stream channel. Storm-drain outfall just above stream crossing	1. Parking lot bioretention in expanded parking islands and a curb-cut in the NE corner of lot 2. Tennis court bioretention along NE corner of tennis courts in low-lying area 3. Storage retrofit to provide floodplain storage using stormflow diversion from stream channel onto floodplain 4. Small bioretention/rain barrels at bathrooms 5. Entrance road rain garden to intercept runoff and convey through a new grassed swale	Primarily minor conflicts with current park uses; need to reconfigure some parking. Storage option will require coordination with maintenance access.	Public
WL105	Reach A Cedar Lane Park Ballfields Existing Pond Retrofit	Existing dry pond with marsh bottom; no riser—quantity control provided by outlet pipe directly through embankment	Provide riser control structure to improve water quality, by increasing the residence time; provide a forebay to improve ease of maintenance	Existing wetland developed in pond bottom; ability to expand pond footprint limited	Public
WL106	Reach A Cedar Lane Park Entrance Bioretention	Parking lot and entrance road runoff enters storm-drain, bypassing a grassed open area that could be utilized for small treatment area	Close off inlets at edge of parking area and allow runoff to flow through a curb cut and grassed swale into a bioretention cell	Primarily aesthetic considerations	Public

Table 3.9 Wilde Lake Retrofit Sites (continued)					
Site Number	**Site Name**	**Existing Conditions**	**Potential Retrofit**	**Obvious Constraints**	**Property Owner**
WL107	Reach A Olde Woods Way	Upstream of Beech Creek Rd., road embankment and undersized culvert forming partial dam along stream channel	Enhance stream valley storage through weir wall or new control structure and/or minor excavation in stream valley to form pocket wetlands	Existing stream with perennial baseflow and wetlands; proximity of houses	Public/ private
WL109	Lake Direct Hyla Brook Rd. Lakeside Demo Project #1	Open grassed area with several trees adjacent to lake with potential space to accommodate adjacent road drainage prior to entering storm-drain	Divert roadway runoff through curb cuts into a bioretention cell	Avoidance of critical root zones around mature trees; primarily aesthetic and maintenance issues	Public
WL110	Lake Direct Hyla Brook Rd. Catchbasin Diversion	Road runoff conveyed directly to outfall into lake	Divert runoff from catchbasin into an excavated area forming a micropool/wetland	Inadequate space—mature trees, paths	Public
WL111/ 112	Multiple Cul-de-sacs	Large paved cul-de-sacs suitable for landscaped islands (e.g., Snowy Brook throughout Beaverbrook)	Provide a landscaped island with curb cuts to divert runoff into center; either with or without structural underdrain bioretention system	Minor aesthetic considerations; many cul-de-sacs in the area are already landscaped—need to fill in the gaps	Public
WL113	Reach A Board of Ed. Dry Pond Retrofit	Dry pond built for quantity control with concrete channel—short circuiting	Add small storm control and extended detention; convert to stormwater wetland or other wet pond design if hydrology permits. Add manhole and extend storm-drain to far end of pond; create circuitous flowpath through pond bottom	Sewer line may limit pond expansion.	Public
WL114	Reach F Bryant Woods	Portion of parking lot treated with infiltration practice	Add a bioretention facility to provide additional treatment for the school site	Limited space	Public
WL115	Reach F Bryant Gardens Apartments	Untreated existing development	Underground infiltration system	Adjacent to sewer	Public
WL116	Lake Direct High Rise Apartments	Untreated parking lot	Add a bioretention system to treat parking lot	Loss of parking spaces	Private
WL117	Reach A Longfellow	Untreated existing residential development	Add a bioretention system next to existing “tot lot “	Limited space	CA or private

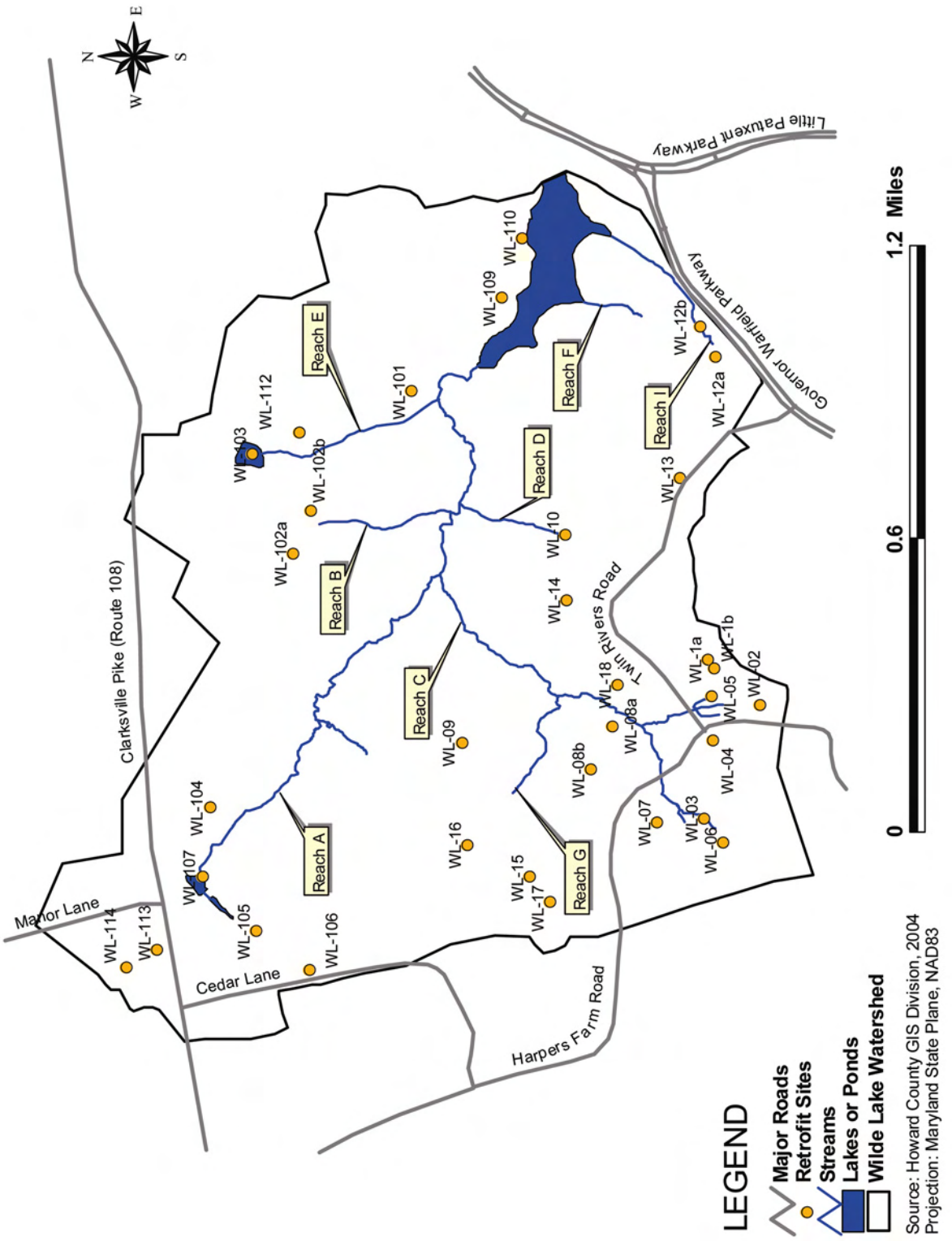


Figure 3.16 Stormwater retrofit inventory concept locations in Wilde Lake.

Appendix C: Retrofit Reconnaissance Inventory Field Forms

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:	UNIQUE SITE ID: LK-R01	
DATE: 4/19/04	ASSESSED BY: SCH/BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: Watermark Place Condos / Wilde Lake Park
Address: 10001 Windstream Dr

Ownership: ☐ Public ☑ Private ☑ Unknown COLUMBIA ASSOC + UNKNOWN (CONDO)
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☑ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes: DA includes Watermark Place Condos Parking, Townhouse Parking on Windstream Dr, One Mall North parking lot (& possibly building), & portions of Cpx Warfield & Little Patuxent Pkwy's

Drainage Area Land Use:
- ☑ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☑ Townhouses
  - ☑ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☑ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible

If Yes, Describe:

NA

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

OPEN SPACE BETWEEN CONDOS (ACCESS FROM FIRELANE ON NORTH SIDE OF BUILDING). TWO OUTFALLS DISCHARGE TO THIS SPACE ONE IS ~36" W/ LARGE DA, OTHER IS SMALLER - LIKELY ON-SITE DRAINAGE FROM WATERMARK PLACE. LARGE OUTFALL HAS DEFINED ERODED CHANNEL THAT FLOWS NORTH TO MAIN STEM + JOINS IMMEDIATELY UPSTREAM OF TWIN CULVERTS UNDER LITTLE PATUXENT PARKWAY. AREA IS EASTOF IMMEDIATELY DOWNSTREAM OF WILDE LAKE

Existing Head Available and Points Where Measured:

NA

PARK. SPACE IS WOODED, BUT MOST TREES ARE < 6" DBH.

Unique Site ID: LK-R01

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☑ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☑ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☑ Other: REGEN STORMWATER

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:
CREATE FORESTED WETLAND BY USING BERMS ACROSS STREAM TO FORCE FLOWS INTO FLOODPLAIN. THIS WILL CREATE SEVERAL WETLAND CELLS. VARIED AMOUNTS OF EXCAVATION ARE POSSIBLE... SUGGEST DESIGNING TO BALANCE EXCAVATION OF FLOODPLAIN W/ FILL NEEDED FOR BERMS.
REPLANT W/ NATIVE WETLAND SPECIES + MAINTAIN W/ INVASIVE SPECIES CONTROL PLAN.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☑ Transport-Related ☑ Park
☐ Undeveloped ☐ Other:
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☑ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☑ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☑	☐	Sewer
☐	☐	Water NO
☐	☐	Gas not likely
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☑ Probable	☐ Not Probable
Impacts to a Stream	☑ Probable	☐ Not Probable
Floodplain Fill	☐ Probable	☐ Not Probable
Impacts to Forests	☑ Probable	☐ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many? 2 many < 6" DBH
Approx. DBH 12"-18"

Other factors: Area is adjacent to Wilde Lake Dam, which may trigger additional review + analysis to ensure no impact to dam. Concept is not anticipated to impact dam

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☑ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R01

SKETCH

Unique Site ID: LK-R01

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- [x] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [ ] Obtain existing stormwater practice as-builts
- [ ] Obtain site as-builts
- [x] Obtain detailed topography → survey recommended for design
- [x] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [ ] Confirm soil types
- [ ] Other: _____

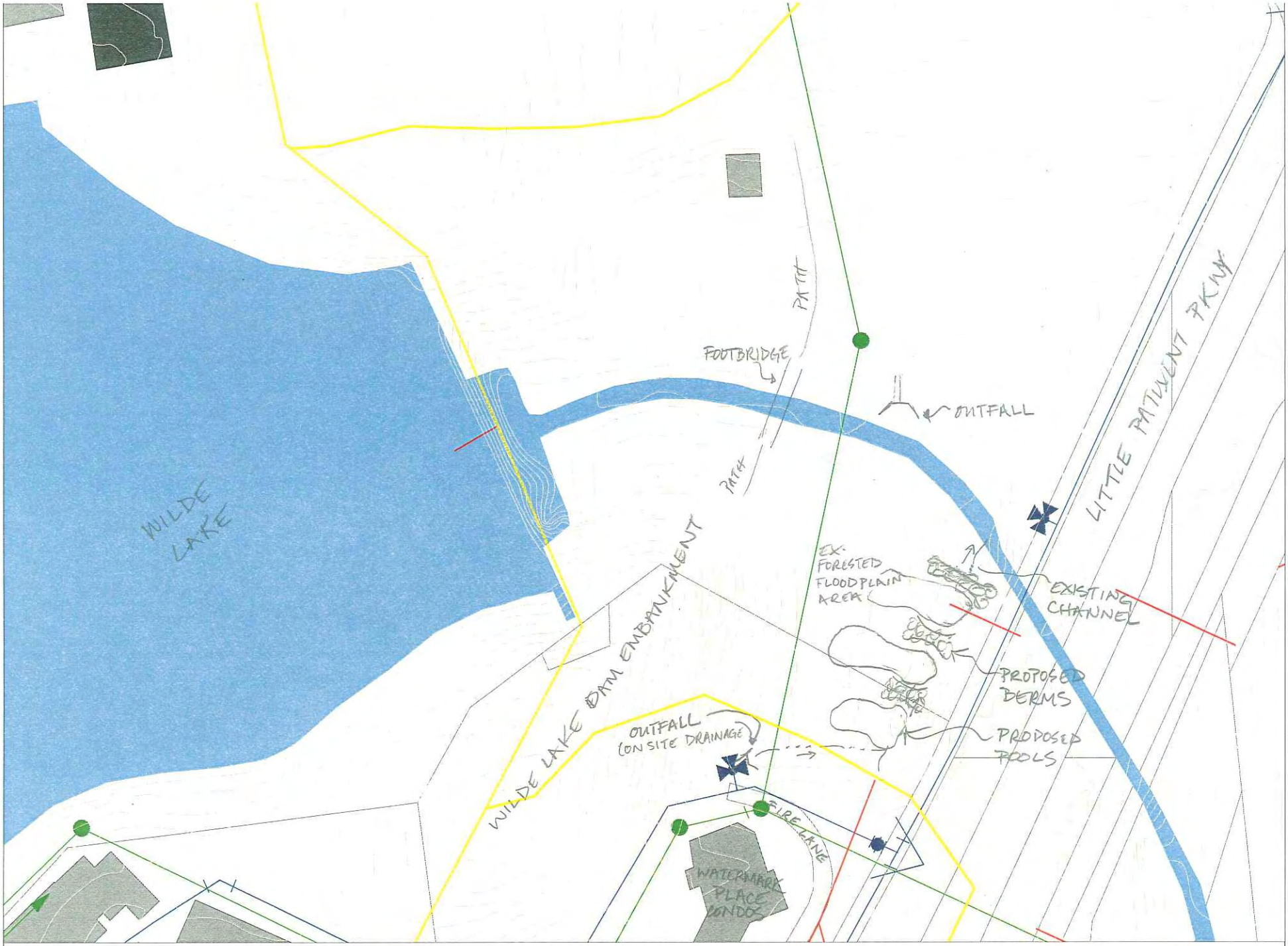
INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

→ INVESTIGATE CONSTRAINTS TO WILDE LAKE DAM WHEN/IF DESIGN IS CHOSEN TO PROCEED

SITE CANDIDATE FOR FURTHER INVESTIGATION:	[x] YES	[ ] NO	[ ] MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	[ ] YES	[x] NO	[ ] MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	[ ] YES	[ ] NO	[ ] MAYBE

IF YES, TYPE(S): _____

Unique Site ID: LK-R01



Columbia Town Center
Ecological and Sustainable Design

Area LK-R1

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkingIotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:	UNIQUE SITE ID: LK-R02
DATE: 4/16/08	ASSESSED BY: SH/EWS CAMERA ID:	PICTURES:
GPS ID:	LMK ID: LAT:	LONG:

SITE DESCRIPTION

Name: WILDE LAKE PARK - DOWNSTREAM OF DAM
Address: INTERSECTION HYLA BROOK RD AND W RUNNING BROOK RD

Ownership: ☐ Public ☑ Private ☐ Unknown COLUMBIA ASSOC
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☑ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes: DA includes townhomes + SFH's (w/ assoc rooftop, parking lot, road driveway + pervious area) plus road runoff

Drainage Area Land Use:
- ☑ Residential
  - ☑ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☑ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☑ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Storm drains from Hyla Brook + W Running Brook Rd cross open space in park + presumably join at yard inlet in center of field. Outfall is ~10ft from mainstem. Outfall ~24" w/ erosion in small channel. Area is mowed turf w/ some older trees + 15 new trees adjacent to path.

Existing Head Available and Points Where Measured:

NA Did not open yard inlet to assess. Slope from roadway to field suggests that pipes could be daylit.

Unique Site ID: LK-R02

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☑ Channel Protection ☐ Flood Control
☑ Demonstration / Education ☐ Repair ☐ Other:

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☑ Created Wetland ☑ Bioretention ← Alternate
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:
Daylight pipes at upstream end of field. (Running Brook pipe at base of roadway embankment; if/a Brook pipe where feasible -- preferably east of sewer.

Also plant trees along stream banks to provide shade.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☑ Transport-Related ☑ Park
☐ Undeveloped ☐ Other:
Possible Conflicts Due to Adjacent Land Use? ☑ Yes ☐ No
If Yes, Describe: Would impact aesthetics + possibly recreational usage in park.

Access:
☑ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts (protect trees to be saved.)
☐ Structures ☐ Property Ownership
☐ Other:

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☑	☐	Sewer
☐	☐	Water NO
☐	☐	Gas not likely
☐	☐	Cable not likely
☐	☐	Electric not likely
☐	☑	Electric to Streetlights
☐		Overhead Wires NO
☐	☐	Other:

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☑ Probable	☐ Not Probable

How many? → could avoid, but need to consider during design
Approx. DBH

Other factors:

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R02

SKETCH

Unique Site ID: UK-ROZ

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- [ ] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [ ] Obtain existing stormwater practice as-builts
- [x] Obtain site as-builts
- [x] Obtain detailed topography
- [x] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [ ] Confirm soil types
- [ ] Other: _____

site as-builts may contain sufficient topo

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

Information re: usage of field is needed.

SITE CANDIDATE FOR FURTHER INVESTIGATION:	[x] YES	[ ] NO	[ ] MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	[ ] YES	[x] NO	[ ] MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	[ ] YES	[ ] NO	[ ] MAYBE

IF YES, TYPE(S): _____

Unique Site ID: LK-R02

Columbia Town Center
Ecological and Sustainable Design

Area LK-R2

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkingIotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: Lake Kittamaqundi	SUBWATERSHED:	UNIQUE SITE ID: LK-R03
DATE: 4/16/08	ASSESSED BY: SCH/BS CAMERA ID:	PICTURES:
GPS ID:	LMK ID: LAT:	LONG:

SITE DESCRIPTION

Name: Island in highway/intersection
Address: Intersection of Gov Warfield Little Patuxent

Ownership: ☑ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☑ Local ☐ State ☑ DOT ☐ Other: unknown - County Road?

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☑ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☑ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☑ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☑ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☑ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☑ Yes ☐ No ☐ Possible

If Yes, Describe:
Stormceptor (in line) treats runoff from One Mall North parking lot
Roadway runoff doesn't receive treatment

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:
Conveyance system passes landscaped area

Existing Head Available and Points Where Measured:
Not measured - info needed (location where needed is in roadway on major road)

Unique Site ID: LK-R03

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☑ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:
Flowsplit storm drain to landscaped island. Create stair-stepped bioretention + tie back to existing yard inlet.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☑ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☑ Space
☑ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☑ Other: MAINT. OF TRAFFIC

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer NO
☐	☐	Water NO
☐	☑	Gas
☑	☐	Cable
☐	☑	Electric
☑	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to ~~Specimen~~ individual Trees	☐ Probable	☐ Not Probable

How many? 8 → possible impact to 8 ornamental pear trees - may design to avoid/limit impacts with fence.
Approx. DBH <6"

Other factors:

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R03

SKETCH

Unique Site ID: LK-R03

Design or Delivery Notes

Follow-up Needed to Complete Field Concept

- ☐ Confirm property ownership
- ☑ Confirm drainage area
- ☑ Confirm drainage area impervious cover
- ☑ Confirm volume computations
- ☑ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☑ Obtain site as-builts → As-builts probably contain this info
- ☑ Obtain detailed topography
- ☑ Obtain utility mapping
- ☑ Confirm storm drain invert elevations
- ☑ Confirm soil types
- ☐ Other: _____

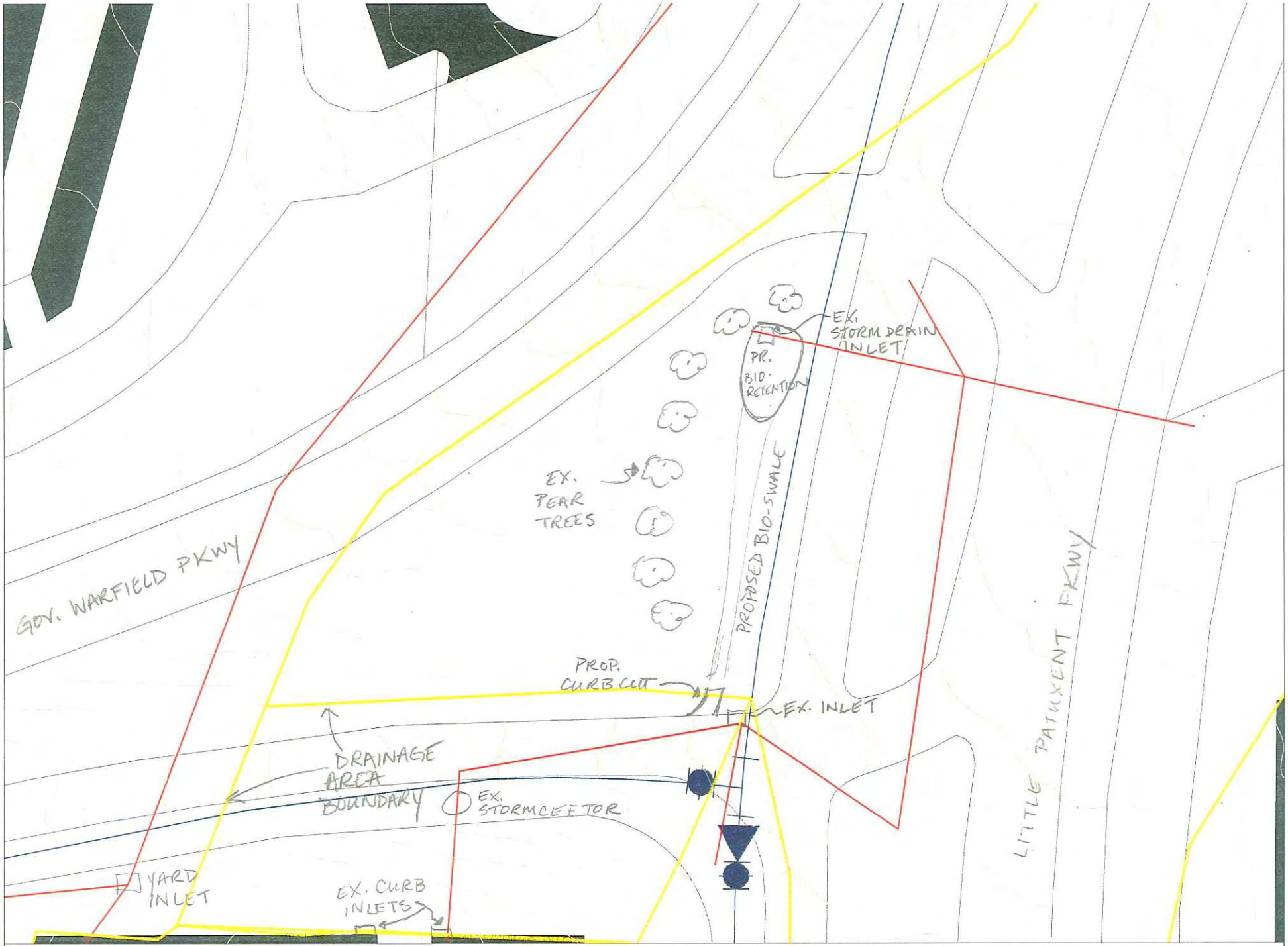
Initial Feasibility and Construction Considerations

* Utilities will be Key constraint
* Desired aesthetics 2nd Key constraint
* Because large % of DA treated w/ Stormceptor, limited additional WQv credit available

Site Candidate for Further Investigation:	☐ Yes	☐ No	☑ Maybe (not recommended)
Is Site Candidate for Early Action Project(s):	☐ Yes	☐ No	☐ Maybe
If no, Site Candidate for Other Restoration Project(s):	☐ Yes	☐ No	☐ Maybe

If yes, type(s): _____

Unique Site ID: LK-R03



Columbia Town Center
Ecological and Sustainable Design

Area LK-R3

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkinglotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:		UNIQUE SITE ID: LK-R04
DATE: 4/16/08	ASSESSED BY: SCHOWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: ONE MALL NORTH
Address: 1005 Governor Warfield Parkway

Ownership: ☐ Public ☑ Private ☑ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☑ In Conveyance System
- ☑ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes: DA = Parking Lot

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:
Parking lot on west side of site drains to one inlet near dumpster. Storm drain runs under swale along south side of building. Inlet in depression is very deep... possibly to capture sump from building basement. Unknown where drainage goes after this inlet. Depression has rough grass.

Existing Head Available and Points Where Measured:
Not measured

Unique Site ID: LK-R04

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☑ Channel Protection (if possible) ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other: _____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☑ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other: _____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Keep flows out of storm drain - convey via swale to depression. Convert depression to bioretention.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☑ Transport-Related ☐ Park
☐ Undeveloped ☑ Other: possible future construction site

Possible Conflicts Due to Adjacent Land Use? ☑ Yes ☐ No

If Yes, Describe: Area could be changed during future construction. Area next to site that will be under const. shouldn't build bioretention

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other: _____

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☑	☐	Sewer (conflict in swale)
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐	☐	Overhead Wires
☑	☐	Other: new storm drain, not mapped

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many? _____
Approx. DBH _____

Other factors: _____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R04

SKETCH

Unique Site ID: LK-R04

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☑ Confirm drainage area
- ☑ Confirm drainage area impervious cover
- ☑ Confirm volume computations
- ☑ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☑ Obtain site as-builts
- ☑ Obtain detailed topography
- ☑ Obtain utility mapping
- ☑ Confirm storm drain invert elevations
- ☑ Confirm soil types
- ☐ Other: _____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

Adjacent area appears to be graded for building pad/parking. Site is stabilized, but may be under construction in future; therefore, bioretention (or other BMP) shouldn't be constructed until that site is built out.

New storm drain may prevent use of swale for conveyance from parking lot

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☑ MAYBE	(Not recommended)
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE	
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE	

IF YES, TYPE(S): _____

Unique Site ID: LK-R04

Columbia Town Center
Ecological and Sustainable Design

Area LK-R4

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkingIotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KATHERINE (GROUND)	SUBWATERSHED:		UNIQUE SITE ID: LK-R05
DATE: 4/16/08	ASSESSED BY: SCK/BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: Vantage Point / Waters Edge Townhomes
Address: Vantage Point Rd (House # Unknown)

Ownership: ☐ Public ☐ Private ☑ Unknown → concept includes 2 parcels
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☑ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes: DA includes: Vantage Point Parking, Vantage Point Rd, Townhomes + parking, portion of Historic Oakland, Playground

Drainage Area Land Use:
- ☑ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☑ Townhouses
  - ☑ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☑ Transport-Related
- ☐ Park
- ☑ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

OUTFALL TO LAKE, DOWNSTREAM OF TOWNHOUSES, OUTFALL ~ 35-40' FROM LAKE EDGE (CLOSER THAN SHOWN IN MAPPING). CROSSES GRASS AREA.

Existing Head Available and Points Where Measured:

Not measured

Unique Site ID: LK-R05

PROPOSED RETROFIT

Purpose of Retrofit:

☑ Water Quality ☐ Recharge ☑ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:

☐ Extended Detention ☐ Wet Pond ☑ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Daylight pipe immediately behind townhomes. Excavate depression between sewer lines + create berm on downstream edge. Plant as forested wetland - model after adjacent natural forested wetland.

SITE CONSTRAINTS

Adjacent Land Use:

☑ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____

Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No

If Yes, Describe: conflict only during construction

Access:

☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☑ Utilities (sewer) ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☑ Other: proximity to residential

Conflicts with Existing Utilities:

☐ None
☐ Unknown

Yes	Possible	
☑	☐	Sewer
☐	☐	Water - NO
☐	☑	Gas
☑	☐	Cable
☐	☑	Electric
☐	☐	Electric to Streetlights NO
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill (possible)	☑ Probable	☐ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☑ Probable	☐ Not Probable

How many?_____
Approx. DBH_____

possible → can work around + incorporate into design

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R05

SKETCH

Unique Site ID: LK-R05

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- [x] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [ ] Obtain existing stormwater practice as-builts
- [x] Obtain site as-builts
- [x] Obtain detailed topography
- [x] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [ ] Confirm soil types
- [ ] Other: _____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	[x] YES	[ ] NO	[ ] MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	[ ] YES	[ ] NO	[ ] MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	[ ] YES	[ ] NO	[ ] MAYBE

IF YES, TYPE(S): _____

Unique Site ID: LK-R05

Columbia Town Center
Ecological and Sustainable Design

Area LK-R5

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkinglotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:		UNIQUE SITE ID: LK-R06
DATE: 4/16/08	ASSESSED BY: SCH/BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: VANTAGE POINT TOWNHOMES - DRY POND
Address: XXXX SMOOTH MEADOW WAY

Ownership: ☐ Public ☐ Private ☑ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☑ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes: DA TO PARKING + ROADWAY FROM SMOOTH MEADOW WAY

Drainage Area Land Use:
- ☑ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☑ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☑ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☑ Yes ☐ No ☐ Possible

If Yes, Describe:
EXCAVATED POND W/O INFLOW. EXCAVATED BASIN HAS SMALL PIPE FOR OUTFLOW, BUT NO PIPES ENTER THE POND. SIDE SLOPES ARE MOWED + SOMEWHAT STEEP. BOTTOM FAIRLY FLAT GRASSED/PONDED WATER.

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:
CONVEYANCE FROM PARKING LOTS BYPASSES POND, JOINS STORM DRAIN SYSTEM ALONG LITTLE PATUXENT PARKWAY

Existing Head Available and Points Where Measured:
NA

Unique Site ID: LK-R06

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☑ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☑ Extended Detention ☐ Wet Pond ☑ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:
Use flow splitter to divert flow from yard inlet in ROW (downstream of junction w/ parking lot runoff) into existing excavated pond. Design baffle to prevent short-circuit of treatment area. Plant w/ wetland species + change maintenance regimen.

SITE CONSTRAINTS

Adjacent Land Use:
☑ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☑ Space
☑ Utilities ☑ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☑	Sewer (not on map
☐	☐	Water no
☑	☐	Gas
☐	☑	Cable
☐	☑	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☑ Probable	☐ Not Probable

How many?_____
Approx. DBH_____
→ adding new pipe to divert flow to pond may require removal of small trees

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R06

SKETCH

Unique Site ID: LK-R#6

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- [ ] Confirm property ownership
- [ ] Confirm drainage area
- [ ] Confirm drainage area impervious cover
- [ ] Confirm volume computations
- [ ] Complete concept sketch
- [x] Obtain existing stormwater practice as-builts
- [x] Obtain site as-builts
- [x] Obtain detailed topography
- [x] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [ ] Confirm soil types
- [ ] Other: _____

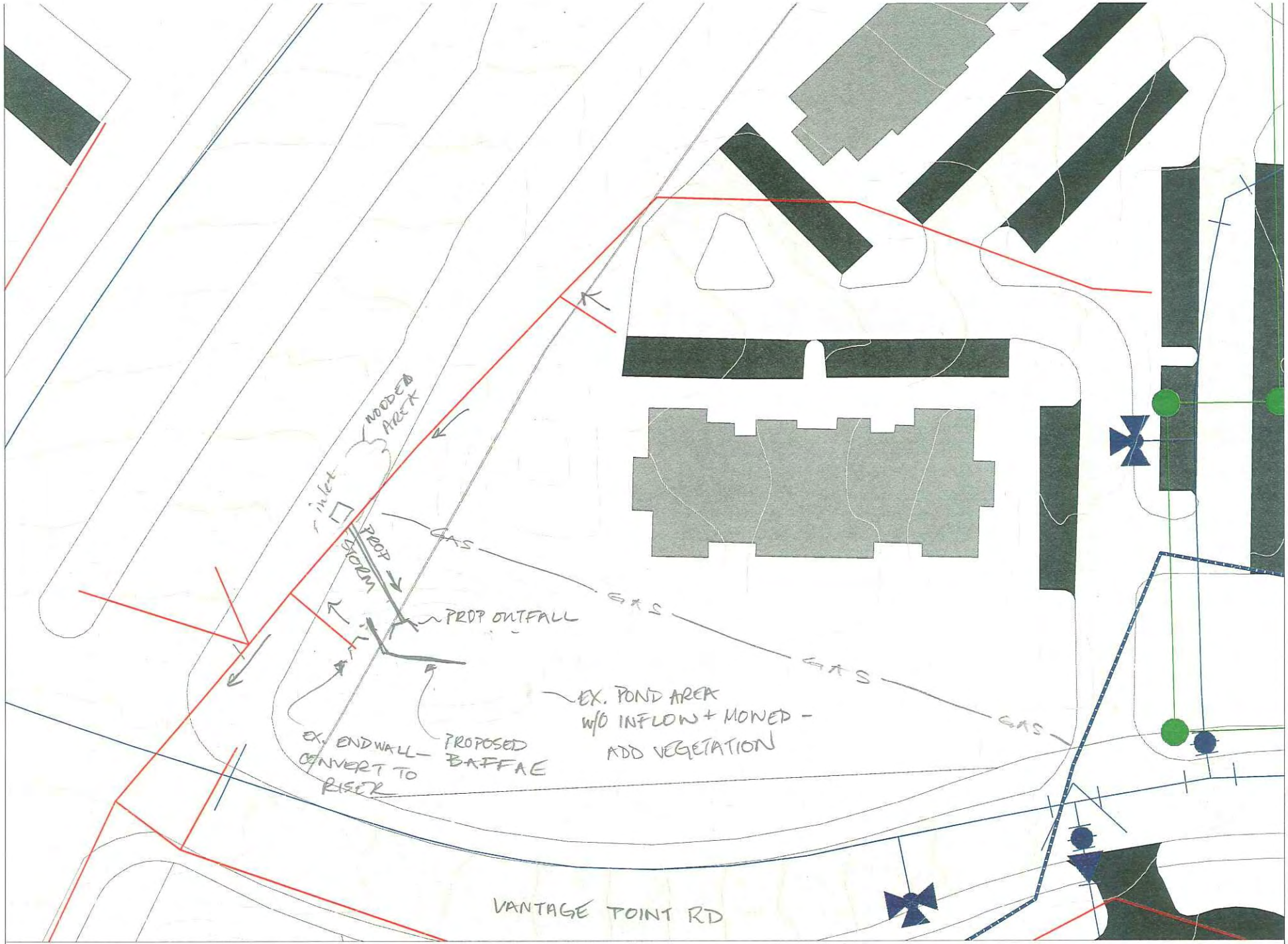
INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

* Tree impacts from adding new pipe are key constraint
* Gas line may also constrain adding new pipe

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☑ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S): _____

Unique Site ID: LK-R06



Columbia Town Center
Ecological and Sustainable Design

Area LK-R-O6

0 10 20 40 60 80 100 Feet

Legend

- Watershed Boundary
- Building Footprints
- ParkingIotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:	UNIQUE SITE ID: LK - R07	
DATE: 4/16/08	ASSESSED BY: SEH/BNS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: SHERATON
Address: 10207 Wincopin Circle

Ownership: ☐ Public ☐ Private ☑ Unknown (same parcel as Sheraton)
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☑ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☑ Near Large Parking Lot (in DA)

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes: DA includes Sheraton, ReMax Bldg, Parking Garage, Surface Lot

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☑ Multi-Family
- ☑ Commercial (Hotel, Parking, Other Bldgs)
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Outfall (~27") to ~10' Concrete Channel to RipRap, under foot bridge, to lake
Possible Illicit discharge (discolored low flow) - building under renovation
Channel cuts through open space w/ many trees.

Existing Head Available and Points Where Measured:

NA

Unique Site ID: LK - R07

PROPOSED RETROFIT

Purpose of Retrofit:
- [x] Water Quality
- [ ] Recharge
- [x] Channel Protection
- [ ] Flood Control
- [ ] Demonstration / Education
- [ ] Repair
- [ ] Other:

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
- [ ] Extended Detention
- [ ] Wet Pond
- [x] Created Wetland
- [x] Bioretention
- [ ] Filtering Practice
- [ ] Infiltration
- [ ] Swale
- [ ] Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

SITE CONSTRAINTS

Adjacent Land Use:
- [ ] Residential
- [x] Commercial
- [ ] Institutional
- [ ] Industrial
- [ ] Transport-Related
- [x] Park
- [ ] Undeveloped
- [ ] Other:

Possible Conflicts Due to Adjacent Land Use? [x] Yes [ ] No

If Yes, Describe: Poss. conflict w/ desired aesthetics @ hotel. Can't disturb trail along lake

Access:
- [ ] No Constraints

Constrained due to
- [ ] Slope
- [ ] Space
- [ ] Utilities
- [x] Tree Impacts
- [ ] Structures
- [ ] Property Ownership
- [ ] Other:

Conflicts with Existing Utilities:
- [ ] None
- [x] Unknown

Yes	Possible		
[ ]	[ ]	Sewer	No
[ ]	[ ]	Water	No
[ ]	[ ]	Gas	Not likely
[ ]	[ ]	Cable	
[ ]	[ ]	Electric	
[ ]	[ ]	Electric to Streetlights	
[ ]		Overhead Wires	
[ ]	[ ]	Other:	

Potential Permitting Factors:

Dam Safety Permits Necessary	[ ] Probable	[x] Not Probable
Impacts to Wetlands	[ ] Probable	[x] Not Probable
Impacts to a Stream	[ ] Probable	[x] Not Probable
Floodplain Fill	[ ] Probable	[x] Not Probable
Impacts to Forests	[ ] Probable	[x] Not Probable
Impacts to ~~Specimen~~ Trees	[x] Probable	[ ] Not Probable

How many? 3 Will avoid areas w/ most trees. Save many trees that area not planted

Approx. DBH

Other factors:

Soils:

Soil auger test holes:	[ ] Yes	[x] No	
Evidence of poor infiltration (clays, fines):	[ ] Yes	[ ] No	[ ] Unknown
Evidence of shallow bedrock:	[ ] Yes	[ ] No	[ ] Unknown
Evidence of high water table (gleying, saturation):	[ ] Yes	[ ] No	[ ] Unknown

Unique Site ID: LK-R07

SKETCH

Unique Site ID: LK-R07

Design or Delivery Notes

Follow-up Needed to Complete Field Concept

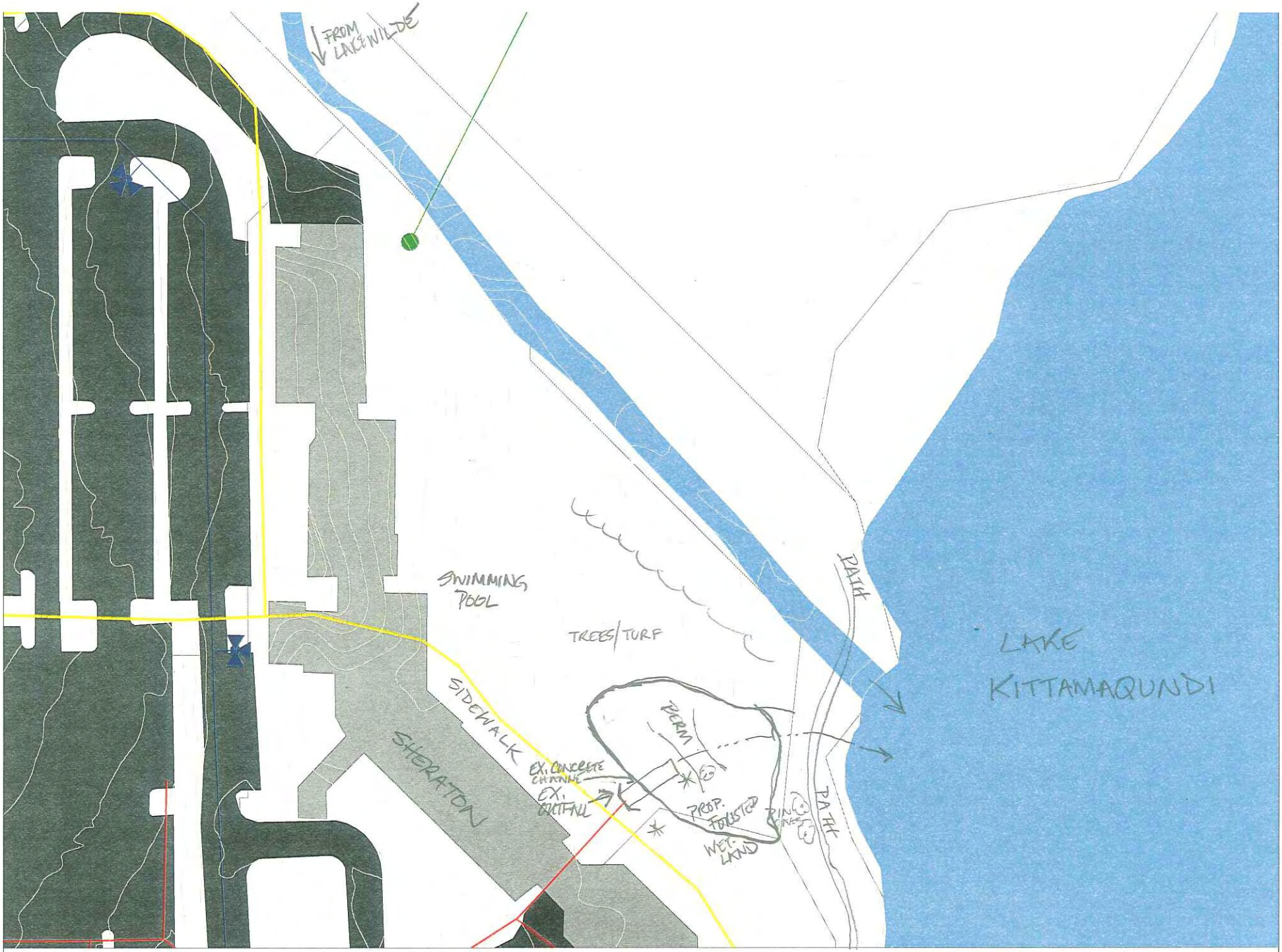
- [x] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [ ] Obtain existing stormwater practice as-builts
- [x] Obtain site as-builts
- [x] Obtain detailed topography
- [x] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [x] Confirm soil types
- [ ] Other: _____

Initial Feasibility and Construction Considerations

Site Candidate for Further Investigation:	[x] Yes	[ ] No	[ ] Maybe
Is Site Candidate for Early Action Project(s):	[ ] Yes	[ ] No	[ ] Maybe
If no, site candidate for other Restoration Project(s):	[ ] Yes	[ ] No	[ ] Maybe

If yes, type(s): _____

Unique Site ID: LK-07



Columbia Town Center
Ecological and Sustainable Design

Area LK-R7

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkingIotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:	UNIQUE SITE ID: LK-R08	
DATE: 4/16/08	ASSESSED BY: SEH/BMS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: SHERATON
Address: 10207 Wincopin Circle

Ownership: ☐ Public ☐ Private ☑ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☑ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes: Parking lot @ Sheraton

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial Parking
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Flow from North part of large parking lot goes into storm drain inlets + conveyed to outfall at top of slope adjacent to stream. Outfall has some erosion... bank is somewhat protected by large stone.

Existing Head Available and Points Where Measured:

NA

Unique Site ID: LK-R08

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☑ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other: _____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☑ Other: Permeable pavement, underground sand filter

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:
Due to proximity of outfall to stream, only option is to treat runoff in the parking lot. Landscaped islands are not large enough to use for Tx. Lot appears heavily used, therefore losing spaces probably not an option. Therefore underground practices or permeable pavement is recommended.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other: _____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☑ No
If Yes, Describe: Only during construction

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☑ Other: Loss of use during construction

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer None Shown
☑	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐	☐	Overhead Wires
☐	☑	Other: _____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many? _____
Approx. DBH _____

Other factors: _____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☐ Unknown
Evidence of high water table (glcying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R06

SKETCH

Unique Site ID: LK-R06

Design or Delivery Notes

Follow-up Needed to Complete Field Concept

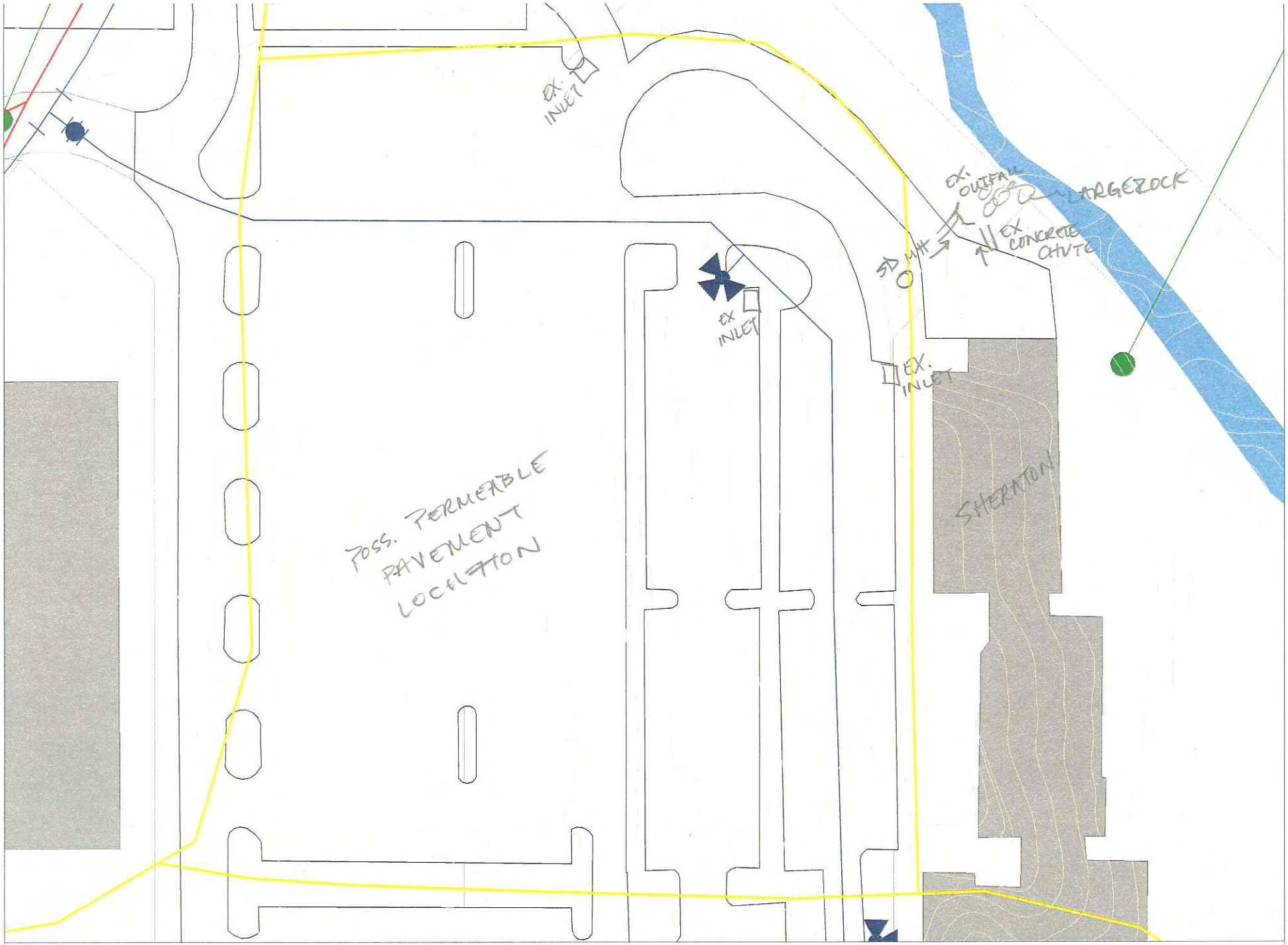
- [x] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [ ] Obtain existing stormwater practice as-builts
- [x] Obtain site as-builts
- [x] Obtain detailed topography
- [x] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [x] Confirm soil types
- [ ] Other: _____

Initial Feasibility and Construction Considerations

Site Candidate for Further Investigation:	[x] Yes	[ ] No	[ ] Maybe
Is Site Candidate for Early Action Project(s):	[ ] Yes	[ ] No	[ ] Maybe
If no, site candidate for other Restoration Project(s):	[ ] Yes	[ ] No	[ ] Maybe

If yes, type(s): _____

Unique Site ID: LK-R06



Columbia Town Center
Ecological and Sustainable Design

Area LK-R8

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkinglotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:	UNIQUE SITE ID: LK-R09
DATE: 4/16/08 ASSESSED BY: SCH/BWS	CAMERA ID:	PICTURES:
GPS ID: LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: PARKING BTWN CLARK BLDG & KIM LAKEFRONT NORTH
Address:

Ownership: ☐ Public ☐ Private ☑ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☑ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes: DA = Parking lot, Clark Bldg, Exxon Station, Roadway

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:
Storm drains pass under parking lot that appeared underutilized during daytime hours. Parking lot surface in poor condition. Storm drains discharge to outfall at top of slope adjacent to stream. Pipe sections have separated & end section has fallen off. Large scour hole & eroded channel have formed.

Existing Head Available and Points Where Measured:
Not measured.

Unique Site ID: LK-R09

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☑ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☑ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☑ Created Wetland ☑ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

2 options: ① if space available, combine w/ LK-R10
② Use eastern half of parking lot to construct stormwater practice

If ②: Daylight storm drain system (or use flow splitter) Excavation likely required. Create bioretention of shallow wetland. Reconstruct outfall, use drop inlet to discharge flows to stream elevation. Stabilize eroded areas

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____

Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☑ Slope ☐ Space
☐ Utilities (Poss. Sewer Line) ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible		
☑	☐	Sewer	but easy to avoid
☑	☐	Water	
☐	☑	Gas	
☐	☑	Cable	
☐	☑	Electric	
☑	☐	Electric to Streetlights	
☐		Overhead Wires	
☐	☐	Other:_____	

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☑ Probable	☐ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☑ Probable	☐ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many?_____
Approx. DBH_____

access to eroded channel may impact (temp) small trees

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R09

SKETCH

Unique Site ID: LK-R09

Design or Delivery Notes

Follow-up Needed to Complete Field Concept

- [x] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [ ] Obtain existing stormwater practice as-builts
- [x] Obtain site as-builts
- [x] Obtain detailed topography
- [x] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [x] Confirm soil types
- [ ] Other: _____

Initial Feasibility and Construction Considerations

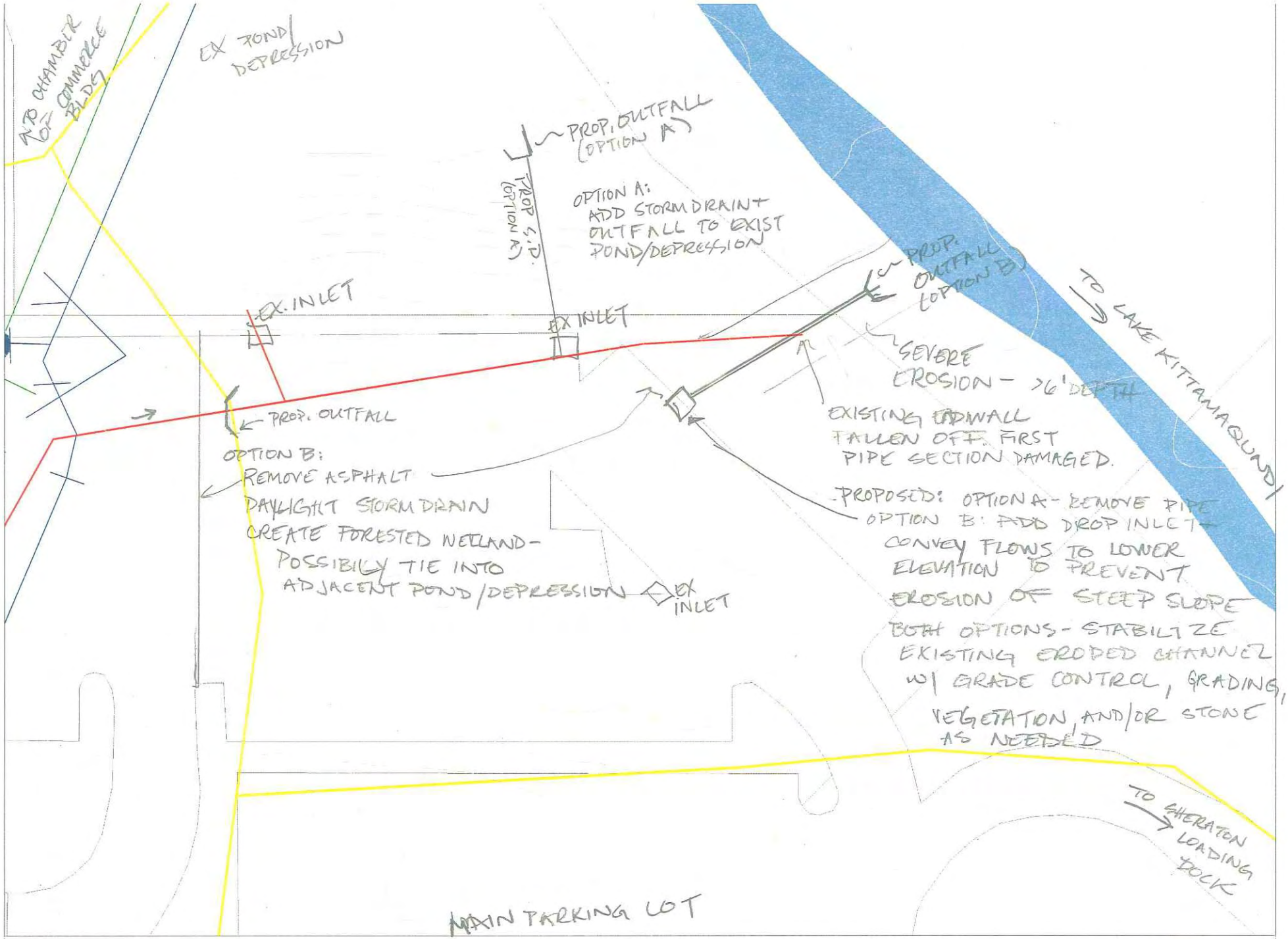
Major constraints:
- Loss of parking spaces
- Poss. Future redevelopment
- Depth of storm drain

Benefit:
Storm drain repair is necessary independent of retrofit

Site Candidate for Further Investigation:	[x] Yes	[ ] No	[ ] Maybe
Is Site Candidate for Early Action Project(s):	[ ] Yes	[ ] No	[ ] Maybe
If no, Site Candidate for Other Restoration Project(s):	[ ] Yes	[ ] No	[ ] Maybe

If yes, type(s): _____

Unique Site ID: LK-R09



Columbia Town Center
Ecological and Sustainable Design

Area LK-R9

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkinglotsClip
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:	UNIQUE SITE ID: LK-R10	
DATE: 4/16/08	ASSESSED BY: EH/BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: CHAMBER OF COMMERCE
Address: 5560 Sterrett Place

Ownership: ☐ Public ☐ Private ☑ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage		On-Site	
☑ Existing Pond (2)	☐ Above Roadway Culvert	☐ Hotspot Operation	☐ Individual Rooftop
☐ Below Outfall	☐ In Conveyance System	☐ Small Parking Lot	☐ Small Impervious Area
☐ In Road ROW	☐ Near Large Parking Lot	☐ Individual Street	☐ Landscape / Hardscape
☐ Other:		☐ Underground	☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes: DA includes 2 large buildings, parking lot. MAY include one Mall N/S → direction of that storm drain unknown. Also, option ② includes DA described in LK-R09

Drainage Area Land Use:

☐ Residential	☐ Institutional
☐ SFH (< 1 ac lots)	☐ Industrial
☐ SFH (> 1 ac lots)	☑ Transport-Related (poss)
☐ Townhouses	☐ Park
☐ Multi-Family	☐ Undeveloped
☑ Commercial	☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☐ No ☑ Possible

If Yes, Describe:
Floodplain area behind buildings has embankment creating pond-like depression. Embankment is ~8' high & top is ~6' wide. Two inlets exist in pond area, but no outfall exists. One of inlets receives the storm drains from upstream (36" pipe) and goes into 12" pipe — it is suspected that flows back up, pop out of inlet, and flood pond area.

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:
At the inlet, 36" pipe has ~1' cover. Flow from 2 inlets goes through dam & discharges to small channel before joining the mainstem.

Existing Head Available and Points Where Measured:
N/A

Unique Site ID: LK-R10

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☑ Recharge ☑ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☑ Extended Detention ☑ Wet Pond ☑ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

(1) Divert flows from drainage area described in LK-R09 into pond.
(2) Excavate around inlet w/ 36" pipe inflow to get flows to surface. Raise 2nd inlet to act as riser. Manage invasive species on site

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:

Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to:
☑ Slope ☐ Space
☑ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:

Slope is major constraint. Access will have to be constructed / graded.

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☑	☐	Sewer
☑	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:

lines bisect the pond + will impact ability to excavate

Potential Permitting Factors:

Dam Safety Permits Necessary	☑ Probable	☐ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☑ Probable	☐ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many? Many small trees present, would be removed to gain access + excavate
Approx. DBH

Other factors:

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☐ Unknown
Evidence of high water table (glcying, saturation):	☐ Yes	☐ No	☐ Unknown

Unique Site ID: LK-R10

SKETCH

Unique Site ID: LK-R10

Design or Delivery Notes

Follow-up Needed to Complete Field Concept

- [x] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [x] Obtain existing stormwater practice as-builts → determine if designed for SWM (or is abandoned sed basin?)
- [x] Obtain site as-builts
- [ ] Obtain detailed topography
- [x] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [x] Confirm soil types
- [ ] Other: _____

Initial Feasibility and Construction Considerations

Site Candidate for Further Investigation:	[x] Yes	[ ] No	[ ] Maybe
Is Site Candidate for Early Action Project(s):	[ ] Yes	[ ] No	[ ] Maybe
If no, site candidate for other Restoration Project(s):	[ ] Yes	[ ] No	[ ] Maybe

If yes, type(s): _____

Unique Site ID: LK-R10

Columbia Town Center
Ecological and Sustainable Design

Area LK-R10

Feet
0 10 20 40 60 80 100

Legend

- Drainage Areas
- Building Footprints
- ParkingLotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: LAKE KITTAMAQUNDI	SUBWATERSHED:	UNIQUE SITE ID: LK-R11
DATE: 4/16/08	ASSESSED BY: SLH BMS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: CHAMBER OF COMMERCE
Address: _____

Ownership: ☐ Public ☐ Private ☑ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other: _____

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other: _____
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☑ Near Large Parking Lot (not small DA)

On-Site
- ☐ Hotspot Operation
- ☑ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other: _____

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes: DA = parking lot

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other: _____

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Small portion of large parking lot discharges via curb cut to swale which joins concrete channel (w/ road runoff). Headcut exists in swale.

Existing Head Available and Points Where Measured:

NA

Unique Site ID: LK-R11

PROPOSED RETROFIT

Purpose of Retrofit:

- [x] Water Quality
- [ ] Recharge
- [x] Channel Protection
- [ ] Flood Control
- [ ] Demonstration / Education
- [x] Repair
- [ ] Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:

- [ ] Extended Detention
- [ ] Wet Pond
- [ ] Created Wetland
- [x] Bioretention
- [ ] Filtering Practice
- [ ] Infiltration
- [x] Swale
- [ ] Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Use check dams / berms to spread + slow water. Stabilize eroded area + use drop inlet if needed. Plant w/ bioretention plants.

SITE CONSTRAINTS

Adjacent Land Use:

- [ ] Residential
- [x] Commercial
- [ ] Institutional
- [ ] Industrial
- [x] Transport-Related
- [ ] Park
- [ ] Undeveloped
- [ ] Other:_____

Possible Conflicts Due to Adjacent Land Use? [ ] Yes [x] No

If Yes, Describe:

Access:

- [ ] No Constraints

Constrained due to

- [ ] Slope
- [ ] Space
- [x] Utilities (OSS)
- [ ] Tree Impacts
- [ ] Structures
- [ ] Property Ownership
- [ ] Other:_____

Conflicts with Existing Utilities:

- [ ] None
- [ ] Unknown

Yes	Possible	
[ ]	[ ]	Sewer (Not on map)
[ ]	[ ]	Water
[ ]	[x]	Gas
[ ]	[x]	Cable
[ ]	[x]	Electric
[ ]	[x]	Electric to Streetlights
[ ]		Overhead Wires
[ ]	[ ]	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	[ ] Probable	[x] Not Probable
Impacts to Wetlands	[ ] Probable	[x] Not Probable
Impacts to a Stream	[ ] Probable	[x] Not Probable
Floodplain Fill	[ ] Probable	[x] Not Probable
Impacts to Forests	[ ] Probable	[x] Not Probable
Impacts to Specimen Trees	[ ] Probable	[x] Not Probable

How many?_____

Approx. DBH_____

Other factors:_____

Soils:

Soil auger test holes:	[ ] Yes	[x] No	
Evidence of poor infiltration (clays, fines):	[ ] Yes	[ ] No	[ ] Unknown
Evidence of shallow bedrock:	[ ] Yes	[ ] No	[ ] Unknown
Evidence of high water table (gleying, saturation):	[ ] Yes	[ ] No	[ ] Unknown

Unique Site ID: LK-R11

SKETCH

Unique Site ID: LK-R11

Design or Delivery Notes

Follow-up Needed to Complete Field Concept

- [x] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [ ] Obtain existing stormwater practice as-builts
- [ ] Obtain site as-builts
- [ ] Obtain detailed topography
- [x] Obtain utility mapping
- [ ] Confirm storm drain invert elevations
- [ ] Confirm soil types
- [ ] Other: _____

Initial Feasibility and Construction Considerations

Site Candidate for Further Investigation:	[x] Yes	[ ] No	[ ] Maybe
Is Site Candidate for Early Action Project(s):	[ ] Yes	[ ] No	[ ] Maybe
If no, site candidate for other Restoration Project(s):	[ ] Yes	[ ] No	[ ] Maybe

If yes, type(s): _____

→ but not priority

Unique Site ID: LK-R14

Columbia Town Center
Ecological and Sustainable Design

Area LK-R11

0 10 20 40 60 80 100 Feet

Legend

- Drainage Areas
- Building Footprints
- ParkinglotsClip
- parkinglots_paved
- Existing BMPs
- mastersewer_region
- mastersewer_polyline
- mastersewer_ellipse
- mastersewer_point
- masterwater_region
- masterwater_polyline
- masterwater_ellipse
- masterwater_point
- Streams
- Ponds/Lakes/Dams
- StormDrainClip
- Property
- Roads
- 2 ft Contours

Biohabitats

WATERSHED: SS LK	SUBWATERSHED:	UNIQUE SITE ID: LK-R12	
DATE: 4-9-08	ASSESSED BY: BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: _____
Address: 10-70 COLUMBIA CORPORATE CENTER

Ownership: ☐ Public ☑ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☑ Other: GGP

Proposed Retrofit Location:

Storage
- ☑ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other: _____
- ☐ Above Roadway Culvert
- ☑ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☑ Small Parking Lot
- ☐ Individual Street
- ☑ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☑ Landscape / Hardscape
- ☐ Other: _____

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other: _____

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☐ No ☑ Possible
If Yes, Describe:

DEPRESSION IN GREENSPACE W/ SMALL DIAMETER OUTLET AND RISER STRUCTURE. WETLAND PLANTS IN DEPRESSION.

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Existing Head Available and Points Where Measured:

Unique Site ID: _____

PROPOSED RETROFIT

Purpose of Retrofit:
- [x] Water Quality
- [x] Demonstration / Education
- [x] Recharge
- [ ] Repair
- [ ] Channel Protection
- [ ] Other:
- [x] Flood Control

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
- [ ] Extended Detention
- [ ] Filtering Practice
- [ ] Wet Pond
- [x] Infiltration
- [ ] Created Wetland
- [x] Swale
- [x] Bioretention
- [ ] Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

UNDERGROUND STORAGE IN PARKING LOT ISLAND. CONTINUE TO VEGETATED SWALE OR BIORETENTION ALONG LITTLE PAX PARKWAY.

SITE CONSTRAINTS

Adjacent Land Use:
- [ ] Residential
- [x] Commercial
- [ ] Institutional
- [ ] Industrial
- [x] Transport-Related
- [ ] Park
- [ ] Undeveloped
- [ ] Other:

Possible Conflicts Due to Adjacent Land Use? [x] Yes [ ] No

If Yes, Describe: ROAD ROW

Access:
- [ ] No Constraints

Constrained due to
- [ ] Slope
- [ ] Space
- [x] Utilities
- [x] Tree Impacts
- [ ] Structures
- [ ] Property Ownership
- [ ] Other:

Conflicts with Existing Utilities:
- [ ] None
- [ ] Unknown

Yes	Possible	
[ ]	[x]	Sewer
[ ]	[x]	Water
[ ]	[ ]	Gas
[ ]	[ ]	Cable
[ ]	[ ]	Electric
[ ]	[ ]	Electric to Streetlights
[ ]		Overhead Wires
[ ]	[ ]	Other:

Potential Permitting Factors:

Dam Safety Permits Necessary	[ ] Probable	[ ] Not Probable
Impacts to Wetlands	[ ] Probable	[ ] Not Probable
Impacts to a Stream	[ ] Probable	[ ] Not Probable
Floodplain Fill	[ ] Probable	[ ] Not Probable
Impacts to Forests	[ ] Probable	[ ] Not Probable
Impacts to Specimen Trees	[x] Probable	[ ] Not Probable

How many? 2-3

Approx. DBH 18-24"

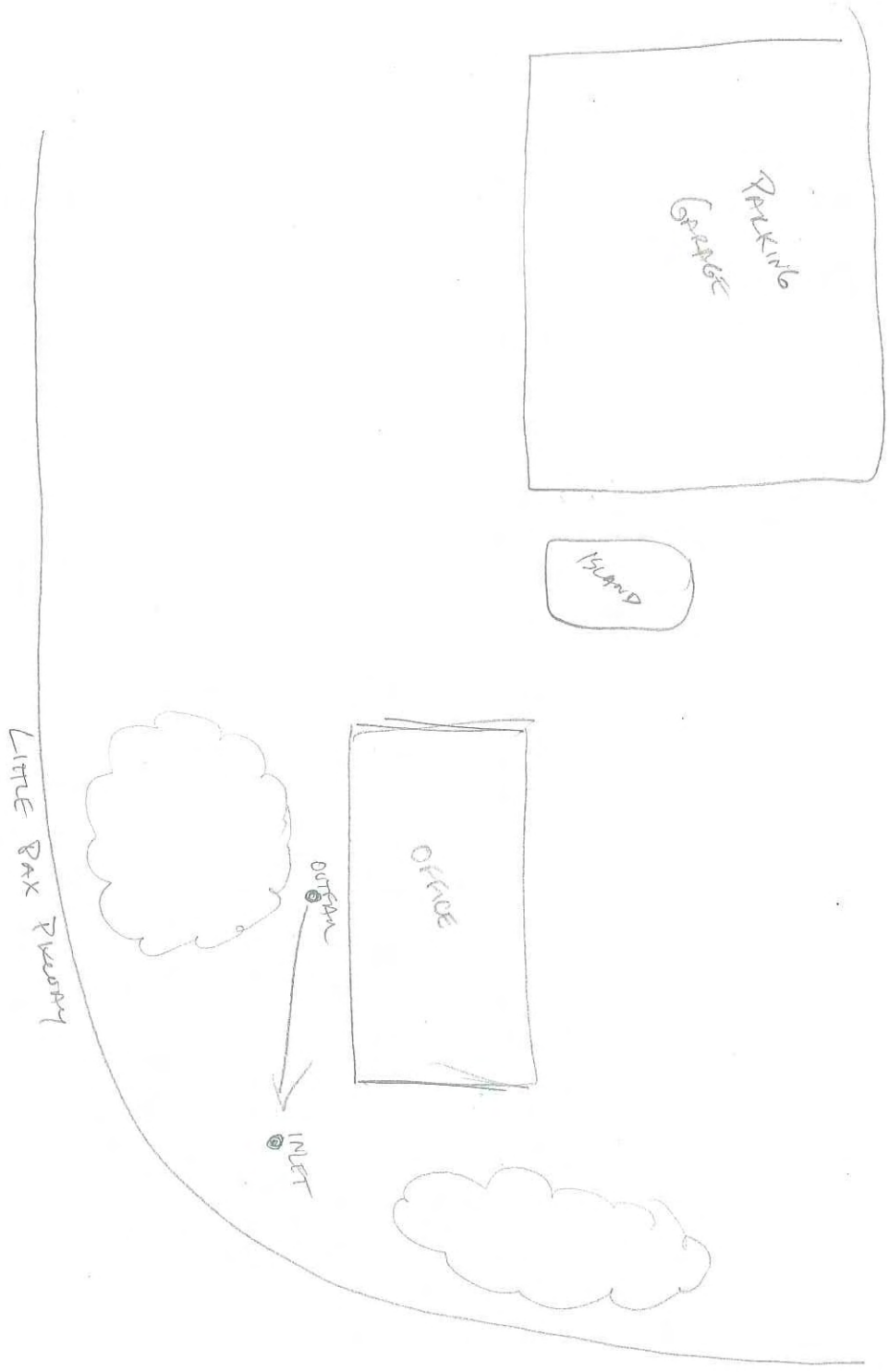
Other factors:

Soils:

Soil auger test holes:	[ ] Yes	[x] No	
Evidence of poor infiltration (clays, fines):	[ ] Yes	[ ] No	[x] Unknown
Evidence of shallow bedrock:	[ ] Yes	[ ] No	[x] Unknown
Evidence of high water table (gleying, saturation):	[ ] Yes	[ ] No	[x] Unknown

Unique Site ID:

SKETCH



Unique Site ID:_____

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- [ ] Confirm property ownership
- [x] Confirm drainage area
- [x] Confirm drainage area impervious cover
- [x] Confirm volume computations
- [x] Complete concept sketch
- [ ] Obtain existing stormwater practice as-builts
- [ ] Obtain site as-builts
- [ ] Obtain detailed topography
- [ ] Obtain utility mapping
- [x] Confirm storm drain invert elevations
- [x] Confirm soil types
- [ ] Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☑ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID:_____

WATERSHED: Little-Pax	SUBWATERSHED: Symphony	UNIQUE SITE ID: LK-R13
DATE: 23 May 08	ASSESSED BY: BnS, BM	CAMERA ID:
GPS ID:	LMK ID:	LAT:
PICTURES:		LONG:

SITE DESCRIPTION

Name: Parking Structure - East
Address: Columbia Mall

Ownership: ☐ Public ☑ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☑ Underground
- ☑ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 76,573 SF
Imperviousness ≈ 91 %
Impervious Area ≈ 69,817 SF

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☑ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Parking surface direct drainage to storm drain.

Existing Head Available and Points Where Measured:

Unique Site ID:

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☐ Channel Protection ☑ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other: _____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☑ Filtering Practice ☐ Infiltration ☐ Swale ☑ Other: CISTERN

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

SUBSURFACE OR VERTICAL CISTERNS ALONG PARKING STRUCTURE COLUMNS.
PRE STORAGE FILTRATION REQUIRED FOR AUTO CONTAMINANTS

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☑ Transport-Related ☐ Park
☐ Undeveloped ☐ Other: _____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☑ Structures ☐ Property Ownership
☐ Other: _____

Conflicts with Existing Utilities:
☑ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other: _____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many? _____
Approx. DBH _____

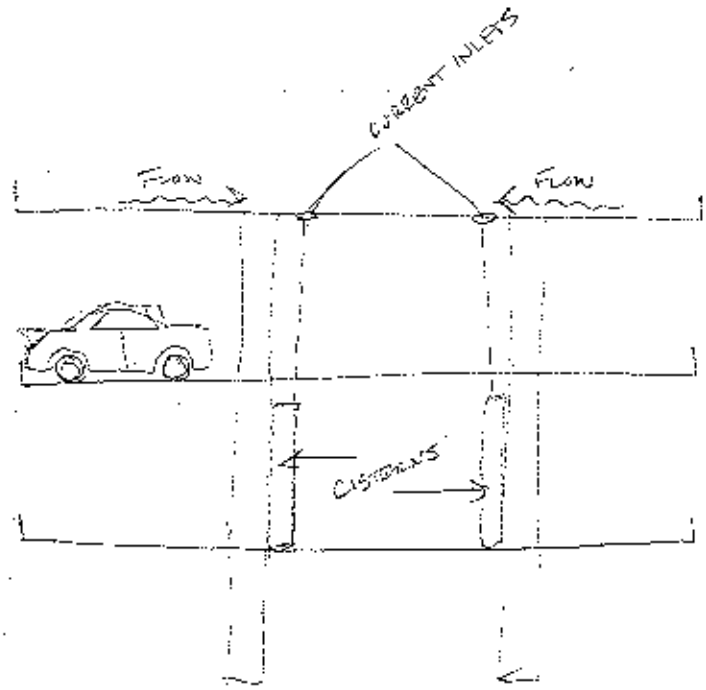
Other factors: _____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☑ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☑ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☑ No	☐ Unknown

Unique Site ID: _____

SKETCH



Unique Site ID:_____

Design or Delivery Notes

Follow-up Needed to Complete Field Concept

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

Initial Feasibility and Construction Considerations

Site Candidate for Further Investigation:	☐ Yes	☐ No	☐ Maybe
Is Site Candidate for Early Action Project(s):	☐ Yes	☐ No	☐ Maybe
If no, site candidate for Other Restoration Project(s):	☐ Yes	☐ No	☐ Maybe

If yes, type(s):_____

Unique Site ID:_____

WATERSHED: Little Pax	SUBWATERSHED: Kittamaqundi	UNIQUE SITE ID: LK-R14	
DATE: 28 May 08	ASSESSED BY: BNS, SM	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: Parking Area - North
Address: Columbia Mall

Ownership: ☐ Public ☑ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☑ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 443,039 SF
Imperviousness ≈ 82 %
Impervious Area ≈ 361,360 SF

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFII (< 1 ac lots)
  - ☐ SFII (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☑ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Large paved surface parking with small tree islands, connected to stormwater drains.

Existing Head Available and Points Where Measured:

Unique Site ID:

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☐ Channel Protection ☑ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☑ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

BIORETENTION ISLANDS PARALLEL TO CONTOURS WITHIN PARKING LOT

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☑ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☑ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☑ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many?_____
Approx. DBH_____

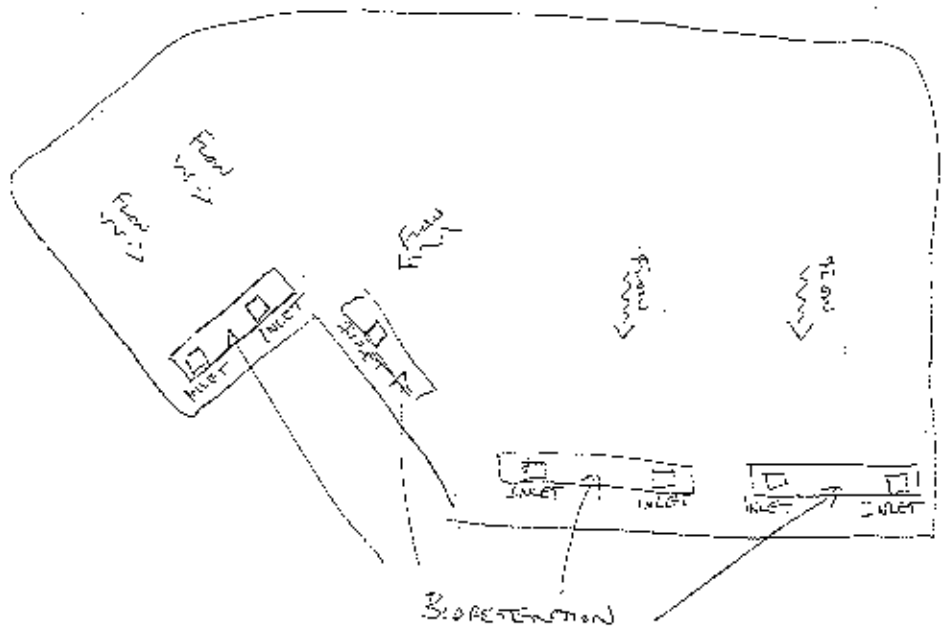
Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☑ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☑ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☑ No	☐ Unknown

Unique Site ID:_____

SKETCH



Unique Site ID:_____

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID:_____

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: Little Pax	SUBWATERSHED: Kittamaquindi	UNIQUE SITE ID: LK-R15
DATE: 28 May 08	ASSESSED BY: BNS, BM	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: Lulo's Tavern

Address: Columbia Mall

Ownership: ☐ Public ☐ Private ☐ Unknown

If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage

- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site

- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☑ Individual Rooftop
- ☑ Small Impervious Area
- ☑ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 90,088 SF

Imperviousness ≈ 77 %

Impervious Area ≈ 61,977 SF

Notes:

Drainage Area Land Use:

- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible

If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Surface drainage from roadway, hardscape and rooftop lines direct to stormdrain.

Existing Head Available and Points Where Measured:

Unique Site ID:_____

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☑ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

BIORETENTION OR UNDERGROUND STORAGE IN PAVED LANDSCAPE AREA TO CAPTURE MOSTLY ROOFTOP RUNOFFS.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☑ Space
☑ Utilities ☑ Tree Impacts
☑ Structures ☐ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☐ None
☑ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many?_____
Approx. DBH_____

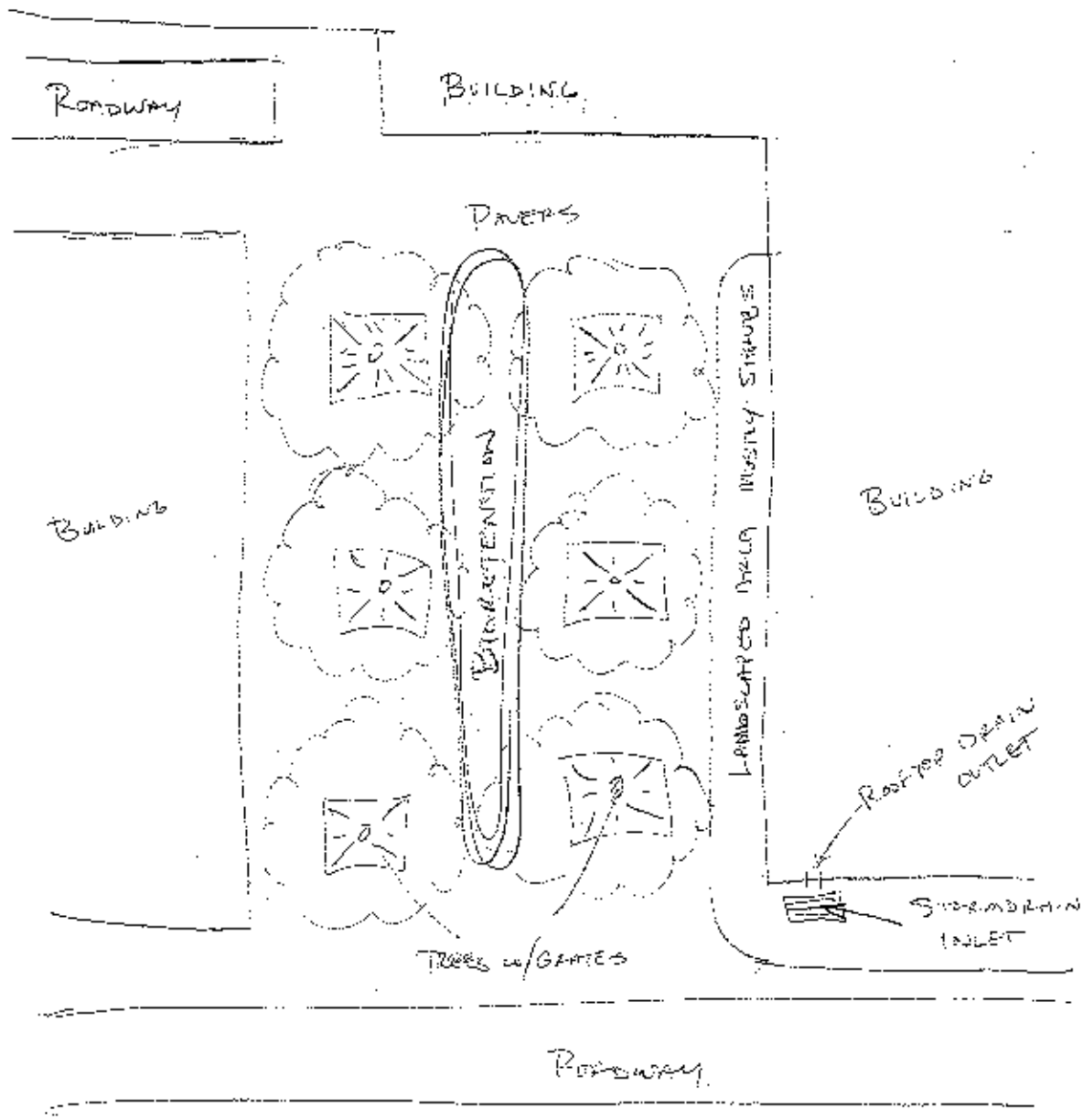
Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☑ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☑ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☑ No	☐ Unknown

Unique Site ID:_____

SKETCH



Unique Site ID:_____

Design or Delivery Notes

Follow-up Needed to Complete Field Concept

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

Initial Feasibility and Construction Considerations

Site Candidate for Further Investigation:	☐ Yes	☐ No	☐ Maybe
Is Site Candidate for Early Action Project(s):	☐ Yes	☐ No	☐ Maybe
If no, site candidate for Other Restoration Project(s):	☐ Yes	☐ No	☐ Maybe

If yes, type(s):_____

Unique Site ID:_____

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: Little Pax	SUBWATERSHED: Kittamaqundi	UNIQUE SITE ID: LK-R16	
DATE: 28 MAY 08	ASSESSED BY: BM, BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: AMC Columbia 14 Cinemas
Address: Columbia Mall

Ownership: ☐ Public ☑ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☑ Individual Rooftop
- ☑ Small Impervious Area
- ☑ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 72,410 SF
Imperviousness ≈ 85 %
Impervious Area ≈ 61,652 SF

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Surface drainage from parking lot, paved driveway, and rooftop direct to storm drains.

Existing Head Available and Points Where Measured:

Unique Site ID:

PROPOSED RETROFIT

Purpose of Retrofit:
☐ Water Quality ☑ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☑ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

BIORETENTION IN TURF AREA ADJACENT TO LARGE BUILDING CAPTURING ROOF DRAIN DISCHARGE.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☑ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____

Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☑ Space
☑ Utilities ☐ Tree Impacts
☐ Structures ☑ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☑	Sewer
☐	☑	Water
☐	☐	Gas
☐	☐	Cable
☐	☑	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☐ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many?_____
Approx. DBH_____

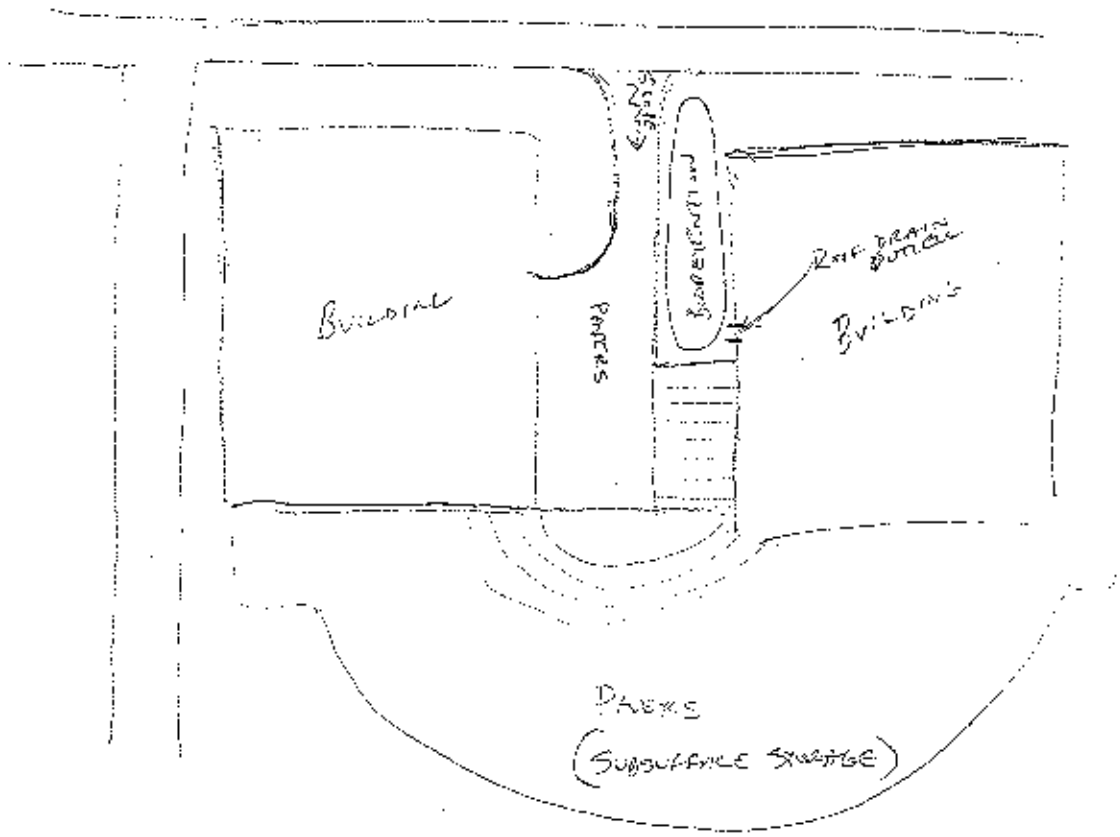
Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☑ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☑ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☑ No	☐ Unknown

Unique Site ID:_____

SKETCH



Unique Site ID:_____

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID:_____

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: Symphony Stream	**SUBWATERSHED:**		**UNIQUE SITE ID:** SS-R1
DATE: 2/11/08	**ASSESSED BY:** JZ/SH	**CAMERA ID:** Olympus	**PICTURES:** 1-8
GPS ID: N/A	**LMK ID:** N/A	**LAT:** N/A	**LONG:** N/A

SITE DESCRIPTION

Name: Howard County General Hospital
Address: Cedar Lane

Ownership: ☐ Public ☒ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☒ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 15 acres
Imperviousness ≈ 95 %
Impervious Area ≈ 14.25 acres

Notes:
DA is hospital parking lot
$R_v = 0.05 + 0.009(95) = 0.905$

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☒ Institutional
- ☐ Industrial
- ☒ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☒ Yes ☐ No ☐ Possible
If Yes, Describe:
Square ED w/ forebay. 3 inlets to forebay - Gabion weir (needs maint)
Low flow orifice - perforated riser. Possibly clogged!
Riser structure - smaller, larger @ same elevation. 2 larger.

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:
Hospital parking lot drains through storm drains to a dry pond.

Existing Head Available and Points Where Measured:
Roughly 6' of storage available in pond.

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:
$WQ_v = (\frac{1}{12})(0.905)(15ac) = 1.1\ ac\text{-}ft$ ✓

Retrofit Volume Computations - Available Storage:
$V_{AV} = (\frac{2}{3})(6\ ft)(100' \times 150')$
$= 60,000\ ft^3 = 1.4\ ac\text{-}ft$ ✓

Proposed Treatment Option:
☒ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Current practice is a dry pond. Convert to extended detention with a permanent pool or micropool at the out let, and a permanent pool in the forebay.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☒ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☒ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☒ Other: temporary loss of parking

Conflicts with Existing Utilities:
☒ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☐ Probable	☒ Not Probable

How many?_____
Approx. DBH_____

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☒ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☒ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☒ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☒ Unknown

Unique Site ID: SS-R1

SKETCH

See attached aerial photo

Unique Site ID: SS-R1

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

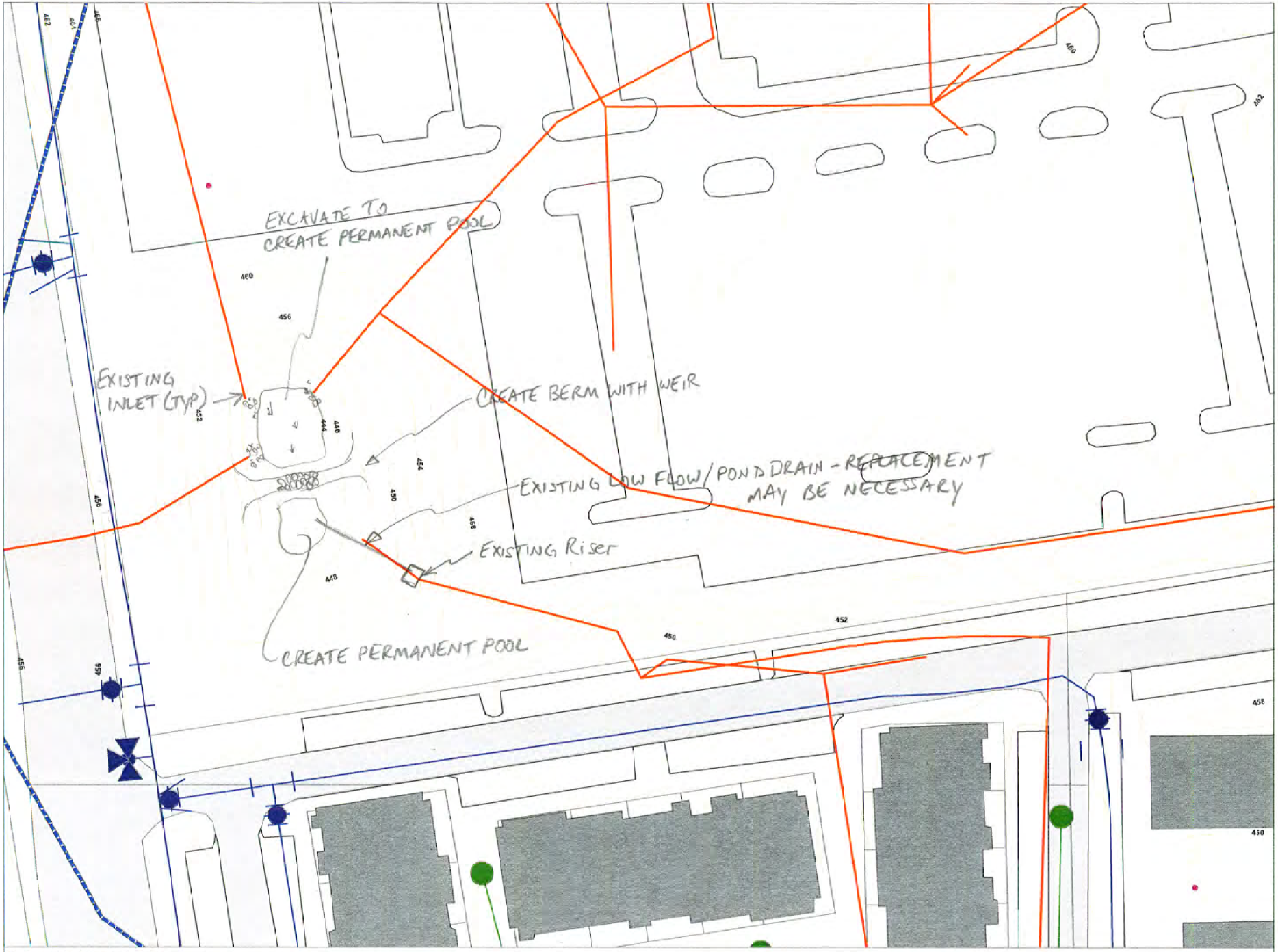
- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☒ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☒ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☒ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID: SS-R1



Columbia Town Center
Ecological and Sustainable Design

~~Area 11~~

SS-R1

0 12.5 25 50 75 100 125 Feet

Legend

Watershed Boundary
Building Footprints
parkinglots_raved
Existing BMPs
mastersewer_region
mastersewer_polyline
mastersewer_ellipse
mastersewer_point
masterwater_region
masterwater_polyline
masterwater_ellipse
masterwater_point
Streams
Ponds/Lakes/Dams
StormDrainClip
Property
Roads
2 ft Contours

Biohabitats

WATERSHED: Symphony Stream	SUBWATERSHED:	UNIQUE SITE ID: SS-R2	
DATE: 2/11/08	ASSESSED BY: JZ/SH	CAMERA ID: Olympus	PICTURES: 9-17
GPS ID: N/A	LMK ID: N/A	LAT: N/A	LONG: N/A

SITE DESCRIPTION

Name: Howard County General Hospital
Address: Cedar Lane

Ownership: ☐ Public ☒ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☒ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 100,000 ft² = 2.3 ac
Imperviousness ≈ 95 %
Impervious Area ≈ 95,000 ft² = 2.2

Notes:

$R_v = 0.05 + 0.009(95) = 0.905$

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☒ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☒ Yes ☐ No ☐ Possible
If Yes, Describe:

Parking lot drains to storm drains, which then direct runoff to a dry pond.

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Existing inlet adjacent to landscaped islands.

Existing Head Available and Points Where Measured:

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

$WQ_V = (\frac{1"}{12})(0.905)(100{,}000\ ft^2)$
$= 7{,}540\ ft^3$

-OR- $SA = 8\%\ (DA) = 8\%\ (100{,}000\ ft^2)$
$SA = 8000\ ft^2$

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☒ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Convert existing landscaped islands to bioretention.
Create addition bioretention areas.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☒ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☒ Other: Loss of parking

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☒	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☐ Probable	☒ Not Probable

How many?_____
Approx. DBH_____

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☒ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☒ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☒ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☒ Unknown

Unique Site ID: SS-R2

SKETCH

See attached

Unique Site ID: SS-R2

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☒ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other: _____

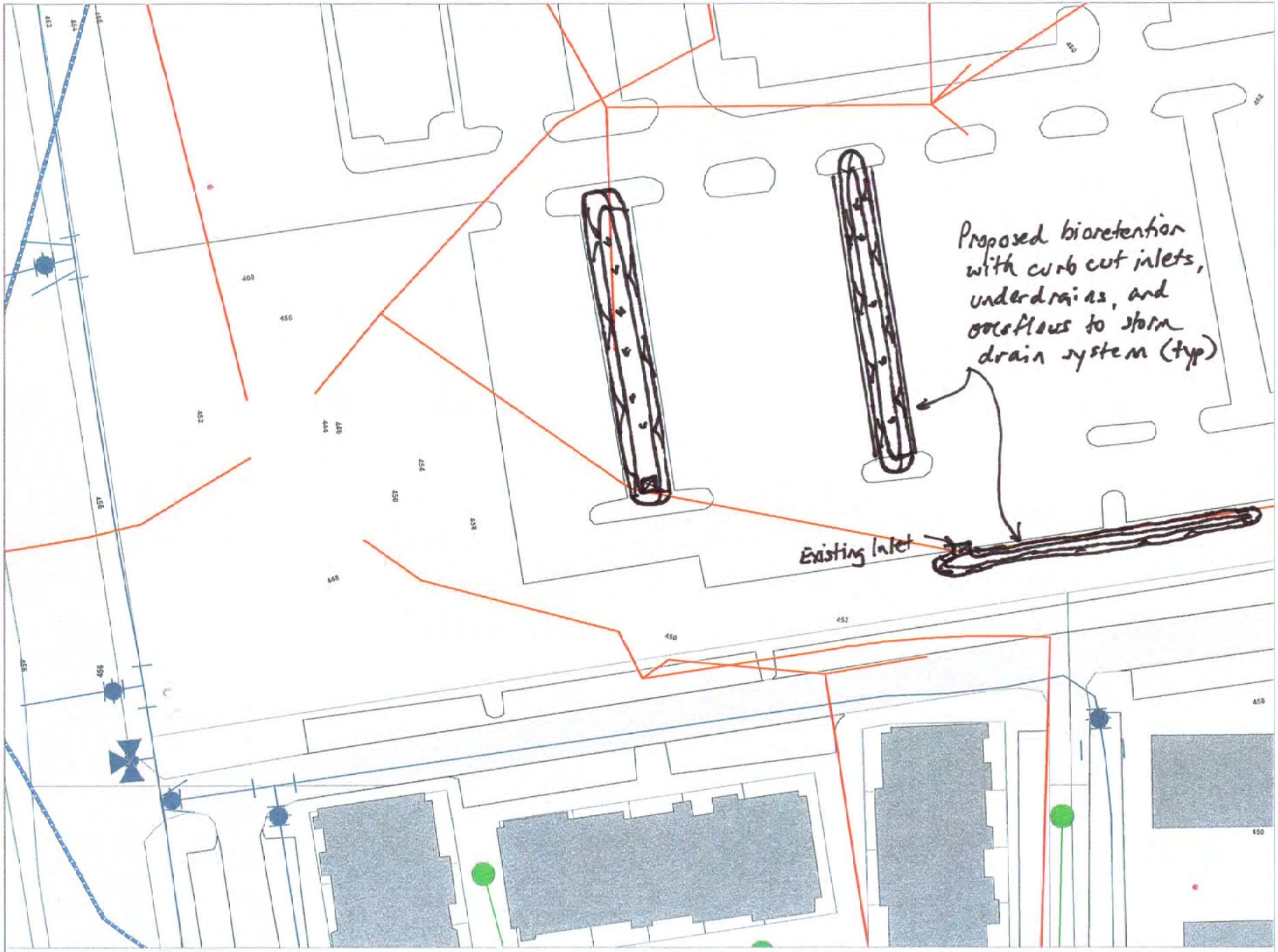
INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

Requires reducing width of drive aisles in parking lot, and may result in loss of parking stalls.

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☒ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☒ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S): _____

Unique Site ID: SS-12



Columbia Town Center
Ecological and Sustainable Design

Area 11

SS-R2

0 12.5 25 50 75 100 125 Feet

Legend

Biohabitats

WATERSHED: Symphony Stream	SUBWATERSHED:	UNIQUE SITE ID: SS-R3	
DATE: 2/11/08	ASSESSED BY: JZ/SH	CAMERA ID: Olympus	PICTURES: 18-20
GPS ID: N/A	LMK ID: N/A	LAT: N/A	LONG: N/A

SITE DESCRIPTION

Name: Office Complex
Address: Cedar Lane and Hickory Ridge Road

Ownership: ☐ Public ☒ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☒ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 36,000 ft²
Imperviousness ≈ 95 %
Impervious Area ≈ 34,200 ft²

Notes:
$R_v = 0.05 + 0.009(95) = 0.905$

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☒ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☐ No ☒ Possible
If Yes, Describe:

No practice observed, storm drain may lead to one downstream or underground.

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Small parking lot drains to a storm drain inlet along the perimeter of the lot.

Existing Head Available and Points Where Measured:

N/A

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Target SA = 5% (DA)
= 5% (36,000 ft²)
= 1,800 ft²

Retrofit Volume Computations - Available Storage:

Available SA ≈ 125' x 15'
≈ 1,875 ft²

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☒ Bioretention
☐ Filtering Practice ☐ Infiltration ☒ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Create a vegetated filtration system in the grassed area adjacent to the existing storm drain inlet. Direct runoff from the parking lot the the practice. Include an underdrain and overflow that connects to the existing storm drain.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☒ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☒ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☒ Other: temporary loss of parking

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☒	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☐ Probable	☒ Not Probable

How many?_____
Approx. DBH_____

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☒ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☒ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☒ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☒ Unknown

Unique Site ID: SS-R3

SKETCH

See attached

Unique Site ID: SS-R3

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☒ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☒ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☒ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID: SS-R3


Install new overflow outlet to storm drain
Proposed bioretention
Cover existing storm drain inlet, Create curb cut inlet to proposed bioretention
446
448
450
452
454
456
458
460
Columbia Town Center
Ecological and Sustainable Design
Area 12
SS-R3
0 12.5 25 50 75 100 125 Feet
Legend
Watershed Boundary
Building Footprints
parkinglots_paved
Existing BMPs
mastersewer_region
mastersewer_polyline
mastersewer_ellipse
mastersewer_point
masterwater_region
masterwater_polyline
masterwater_ellipse
masterwater_point
Streams
Ponds/Lakes/Dams
StormDrainClip
Property
Roads
2 ft Contours
Biohabitats

WATERSHED: Symphony Stream	SUBWATERSHED:	UNIQUE SITE ID: SS-R4	
DATE: 2/11/08	ASSESSED BY: JZ/SH	CAMERA ID: Olympus	PICTURES: 21-29
GPS ID: N/A	LMK ID: N/A	LAT: N/A	LONG: N/A

SITE DESCRIPTION

Name: Howard Community College
Address: Little Patuxent Parkway

Ownership: ☐ Public ☒ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☒ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 219,000 ft² = 5ac
Imperviousness ≈ 30 %
Impervious Area ≈ 65,700 ft² = 1.5ac

Notes:
$R_v = 0.05 + 0.009(30) = 0.32$

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☒ Institutional
- ☐ Industrial
- ☒ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Runoff from Little Patuxent Parkway is discharged to an open field, an eroding channel has formed.

Runoff from adjacent office bldg and parking lot discharged to same field, forming a severely eroding channel

Existing Head Available and Points Where Measured:

N/A

Unique Site ID: SS-R4

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☒ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☒ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Target SA - 5% (DA)
= 5% (219,000 ft²)
= 10,950 ft²

Retrofit Volume Computations - Available Storage:

* sufficient space
* assume a 15-ft wide swale,
length = $\frac{10,950 ft^2}{15 ft}$ = 730 ft ✓

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☒ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Replace existing eroded channels with vegetated swales that will convey and treat runoff. Base should consist of washed gravel and filtering media. Checkdams may be necessary.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☒ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☒ Yes ☐ No
If Yes, Describe:
Swales may interfere with recreational activities

Access:
☒ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☒ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☐ Probable	☒ Not Probable

How many?_____
Approx. DBH_____

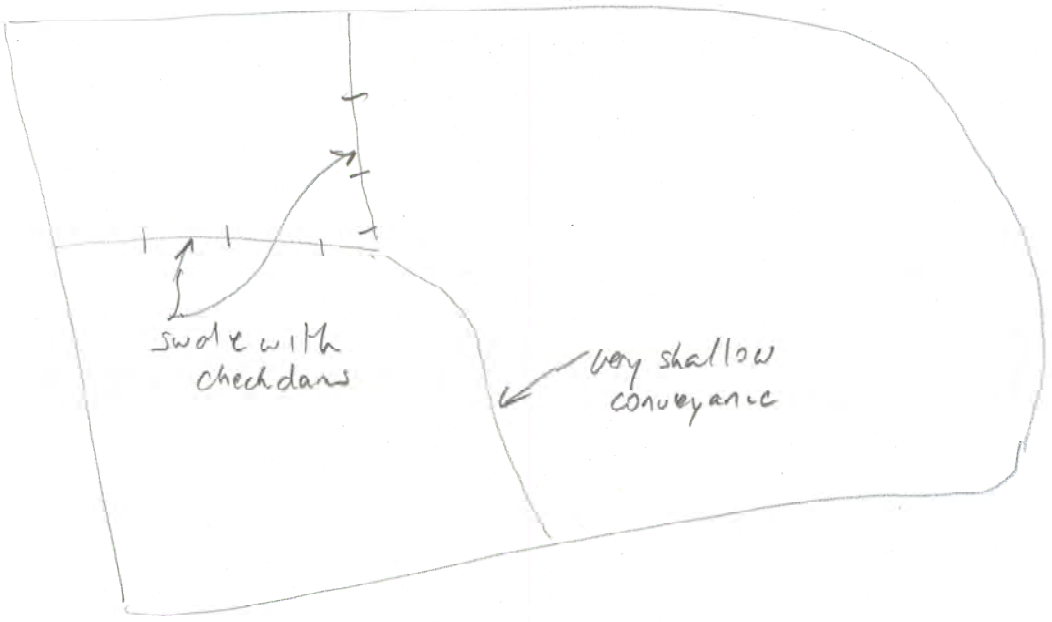
Other factors:_____

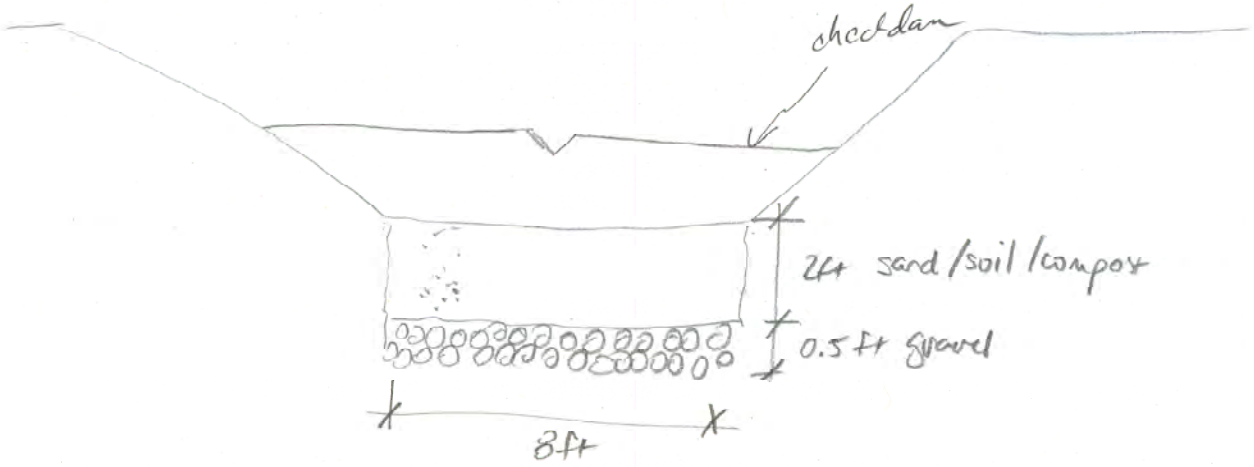
Soils:

Soil auger test holes:	☐ Yes	☒ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☒ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☒ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☒ Unknown

Unique Site ID: SS-R4

SKETCH


swale with
check dams
very shallow
conveyance


check dam
2ft sand/soil/compost
0.5ft gravel
8ft

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

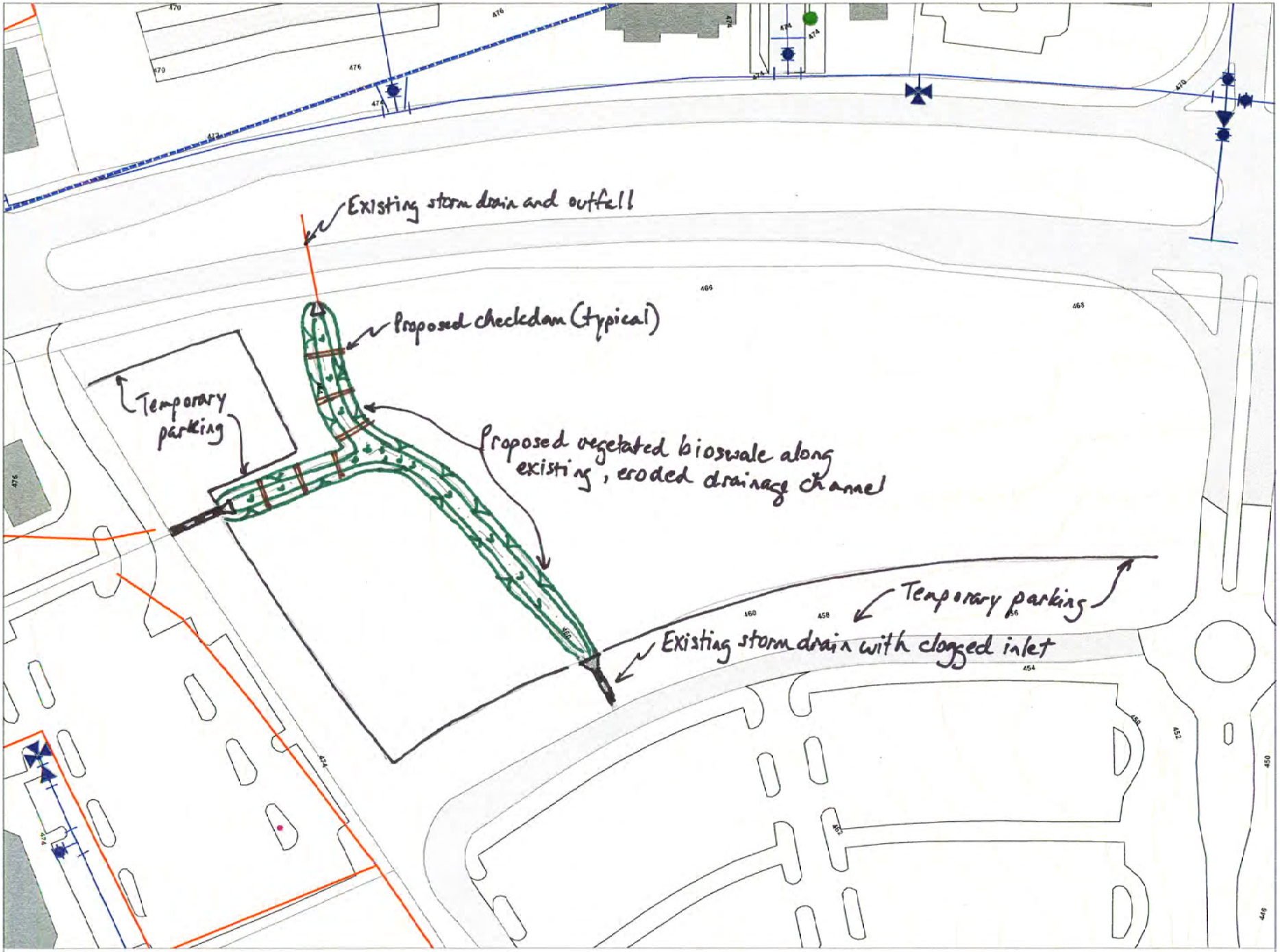
- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☒ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☒ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☒ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID: SS-R4



Columbia Town Center
Ecological and Sustainable Design

Area 9 - 10

SS-R4

0 12.5 25 50 75 100 125 Feet

Legend

Watershed Boundary
Building Footprints
parkinglots_paved
Existing BMPs
mastersewer_region
mastersewer_polyline
mastersewer_ellipse
mastersewer_point
masterwater_region
masterwater_polyline
masterwater_ellipse
masterwater_point
Streams
Ponds/Lakes/Dams
StormDrainClip
Property
Roads
2 ft Contours

Biohabitats

WATERSHED: Symphony Stream	SUBWATERSHED:	UNIQUE SITE ID: SS-R6	
DATE: 2/11/08	ASSESSED BY: JZ/SH	CAMERA ID: Olympus	PICTURES:
GPS ID: N/A	LMK ID: N/A	LAT: N/A	LONG: N/A

SITE DESCRIPTION

Name: Avalon at Symphony Glen apartment complex
Address: 10310 Hickory Ridge Road

Ownership: ☐ Public ☒ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☒ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 157,000 ft² = 3.6 ac
Imperviousness ≈ 95 %
Impervious Area ≈ 149,150 ft² = 3.4 ac

Notes:

Drainage Area Land Use:
- ☒ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☒ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Roof drain appear to discharge to storm drain system.

Existing Head Available and Points Where Measured:

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☒ Recharge ☐ Channel Protection ☐ Flood Control
☒ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Avg bldg roof SA = 9,800 ft²
Target SA = 5% (9,800 ft²)
= 490 ft² per roof

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☒ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Create a bioretention / rain garden adjacent to each building to treat runoff. If setback from building foundation available, create as infiltration with surface overflow.

SITE CONSTRAINTS

Adjacent Land Use:
☒ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☒ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☒ Structures ☒ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☐ None
☒ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☐ Probable	☒ Not Probable

How many?_____
Approx. DBH_____

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☒ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☒ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☒ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☒ Unknown

Unique Site ID: SS-R6

SKETCH

Unique Site ID: SS-R6

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

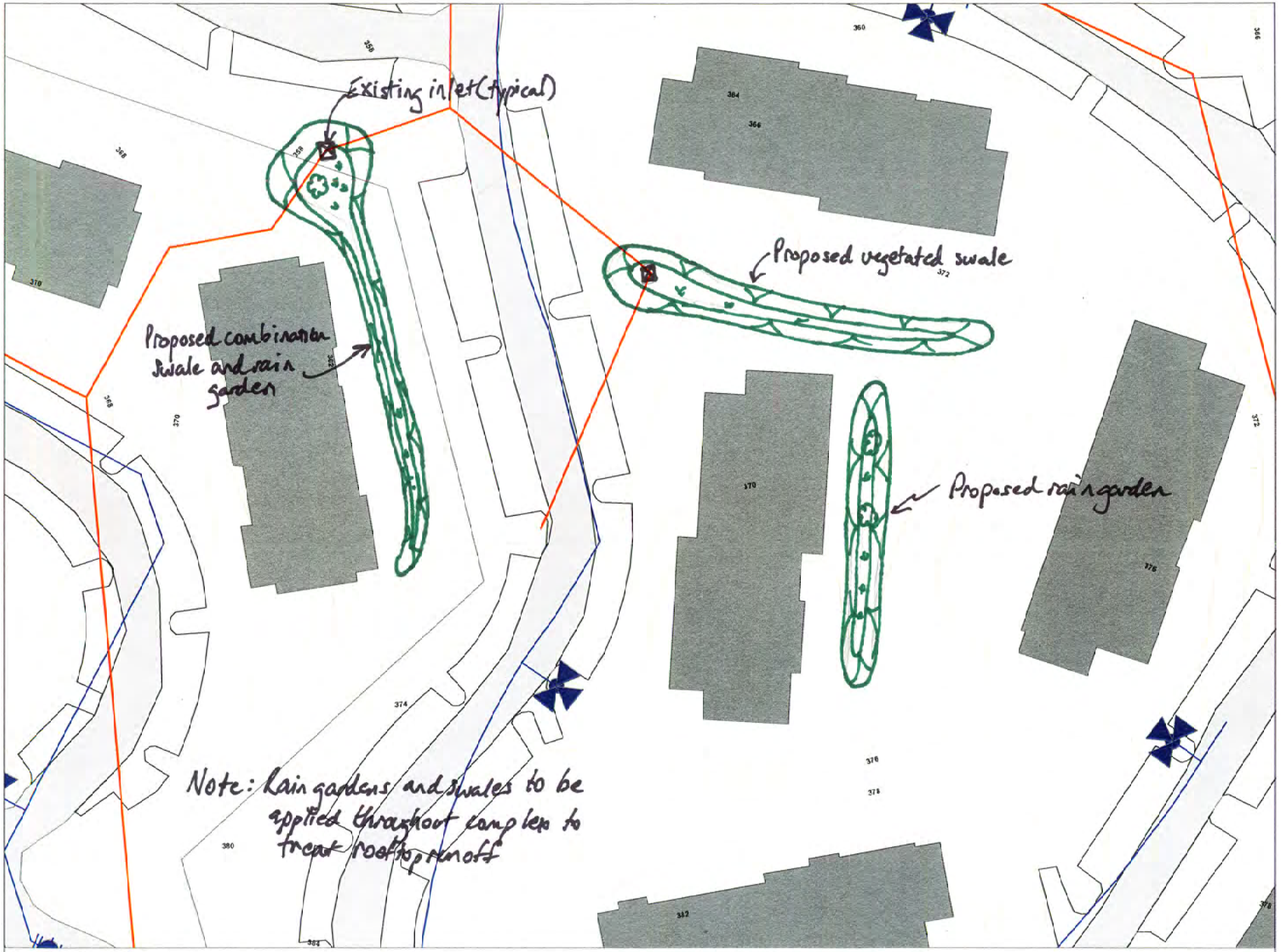
- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☒ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☒ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☒ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID: SS-R6



Columbia Town Center
Ecological and Sustainable Design

Area 3

SS-R6

0 12.5 25 50 75 100 125 Feet

Legend

Watershed Boundary
Building Footprints
parkinglots_paved
Existing BMPs
mastersewer_region
mastersewer_polyline
mastersewer_ellipse
mastersewer_point
masterwater_region
masterwater_polyline
masterwater_ellipse
masterwater_point
Streams
Ponds/Lakes/Dams
StormDrainClip
Property
Roads
2 ft Contours

Biohabitats

WATERSHED: Symphony Stream	SUBWATERSHED:	UNIQUE SITE ID: SS-R7	
DATE: 2/11/08	ASSESSED BY: JZ/SH	CAMERA ID: Olympus	PICTURES: 33-35
GPS ID: N/A	LMK ID: N/A	LAT: N/A	LONG: N/A

SITE DESCRIPTION

Name: Little Patuxent Parkway
Address:

Ownership: ☐ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☒ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 750' × 120' = 90,000 ft²
Imperviousness ≈ 30 %
Impervious Area ≈ 27,000 ft²

Notes:
$R_v = 0.05 + 0.009(30) = 0.32$

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☒ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Stormwater runoff from Little Patuxent Parkway flows off pavement and over grassed area. Flow concentrates into a channel and is directed to a storm drain inlet

Existing Head Available and Points Where Measured:

N/A

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☒ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Target SA = 5% (DA)
= 5% (90,000 ft²)
= 4,500 ft² ✓

Retrofit Volume Computations - Available Storage:

Available SA ≈ 350 ft × 20 ft
≈ 7,000 ft² ✓

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☒ Swale ☐ Other:_____

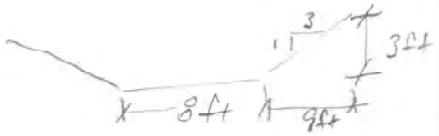
Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Excavate and add filtering media along bottom of swale.

Include underdrain if infiltration is infeasible.

Raise invert of existing inlet to allow for temporary ponding of water

Checkdams may be necessary



SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☒ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☒ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☒ Other: Traffic management

Conflicts with Existing Utilities:
☒ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☐ Probable	☒ Not Probable

How many?_____
Approx. DBH_____

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☒ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☒ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☒ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☒ Unknown

Unique Site ID: SS-R7

SKETCH

See attached

Unique Site ID: SS-R7

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

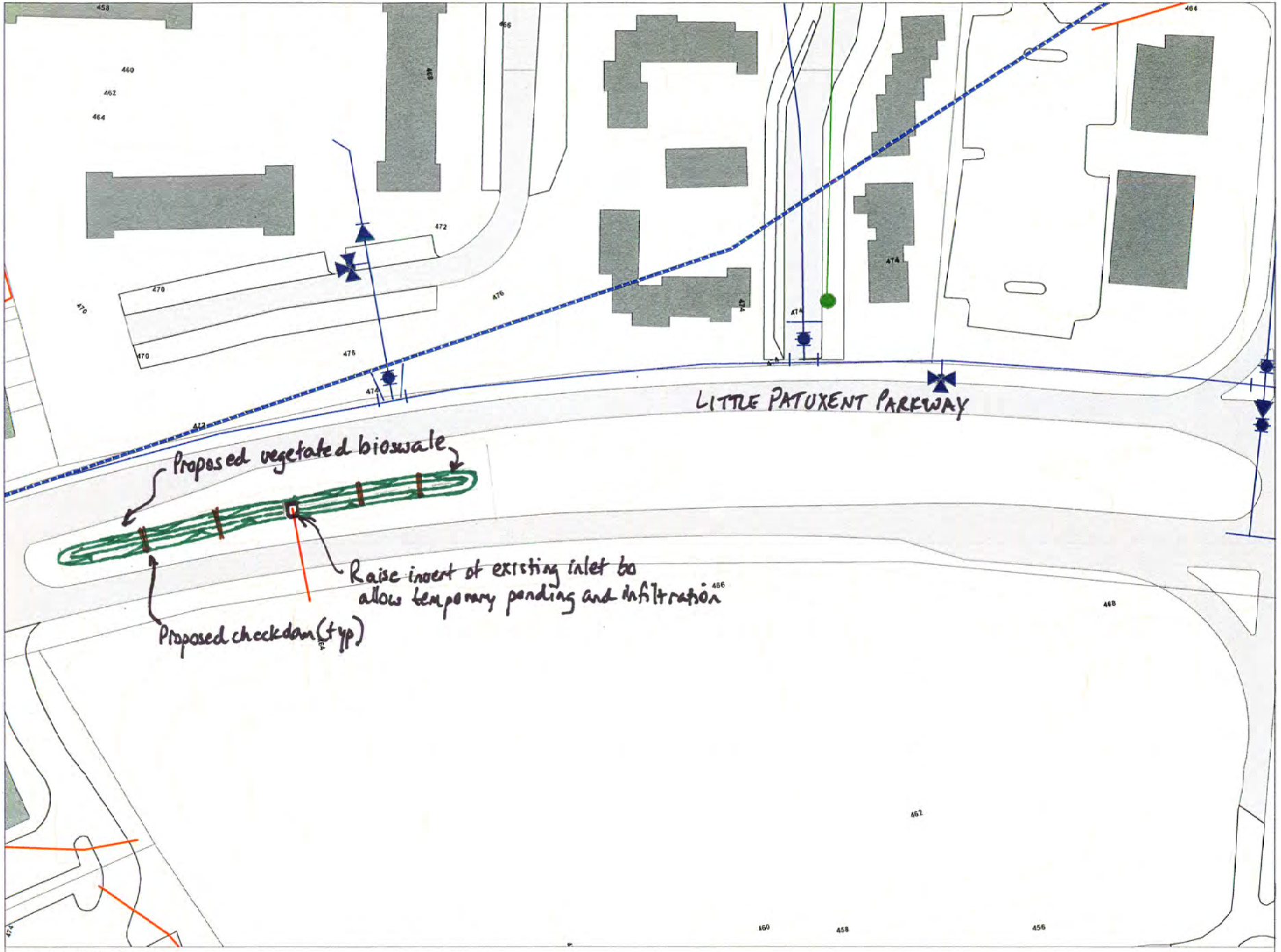
- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☑ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☒ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☒ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID: SS-27



Columbia Town Center
Ecological and Sustainable Design

Area 10

SS-R7

0 12.5 25 50 75 100 125 Feet

Legend

Watershed Boundary
Building Footprints
parkinglots_paved
Existing BMPs
mastersewer_region
mastersewer_polyline
mastersewer_ellipse
mastersewer_point
masterwater_region
masterwater_polyline
masterwater_ellipse
masterwater_point
Streams
Ponds/Lakes/Dams
StormDrainClip
Property
Roads
2 ft Contours

Biohabitats

WATERSHED: Symphony Stream	SUBWATERSHED:	UNIQUE SITE ID: SS-R10	
DATE: 2/11/08	ASSESSED BY: SZ/SH	CAMERA ID: Olympus	PICTURES: 80-85
GPS ID: N/A	LMK ID: N/A	LAT: N/A	LONG: N/A

SITE DESCRIPTION

Name: Wilde Lake High School
Address: 5460 Trumpeter Road

Ownership: ☒ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☒ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☒ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 30,200 ft² = 0.7 ac
Imperviousness ≈ 95 %
Impervious Area ≈ 28,690 ft² = 0.65 ac

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☒ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Paved drainage channels drain runoff from a parking lot and dumpster area to a storm drain inlet.

Existing Head Available and Points Where Measured:

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:
Target SA = 5% (30,200) = 1,500ft²

Retrofit Volume Computations - Available Storage:
Available SA ≈ 150ft x 15ft
≈ 2,250 ft²

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☒ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:
Convert paved drainage channel to vegetated swale

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☒ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☒ No
If Yes, Describe:

Access:
☒ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☒ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☐ Probable	☒ Not Probable

How many?_____
Approx. DBH_____

Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☒ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No	☒ Unknown
Evidence of shallow bedrock:	☐ Yes	☐ No	☒ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No	☒ Unknown

Unique Site ID: SS-R10

SKETCH

Unique Site ID: SS-1210

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

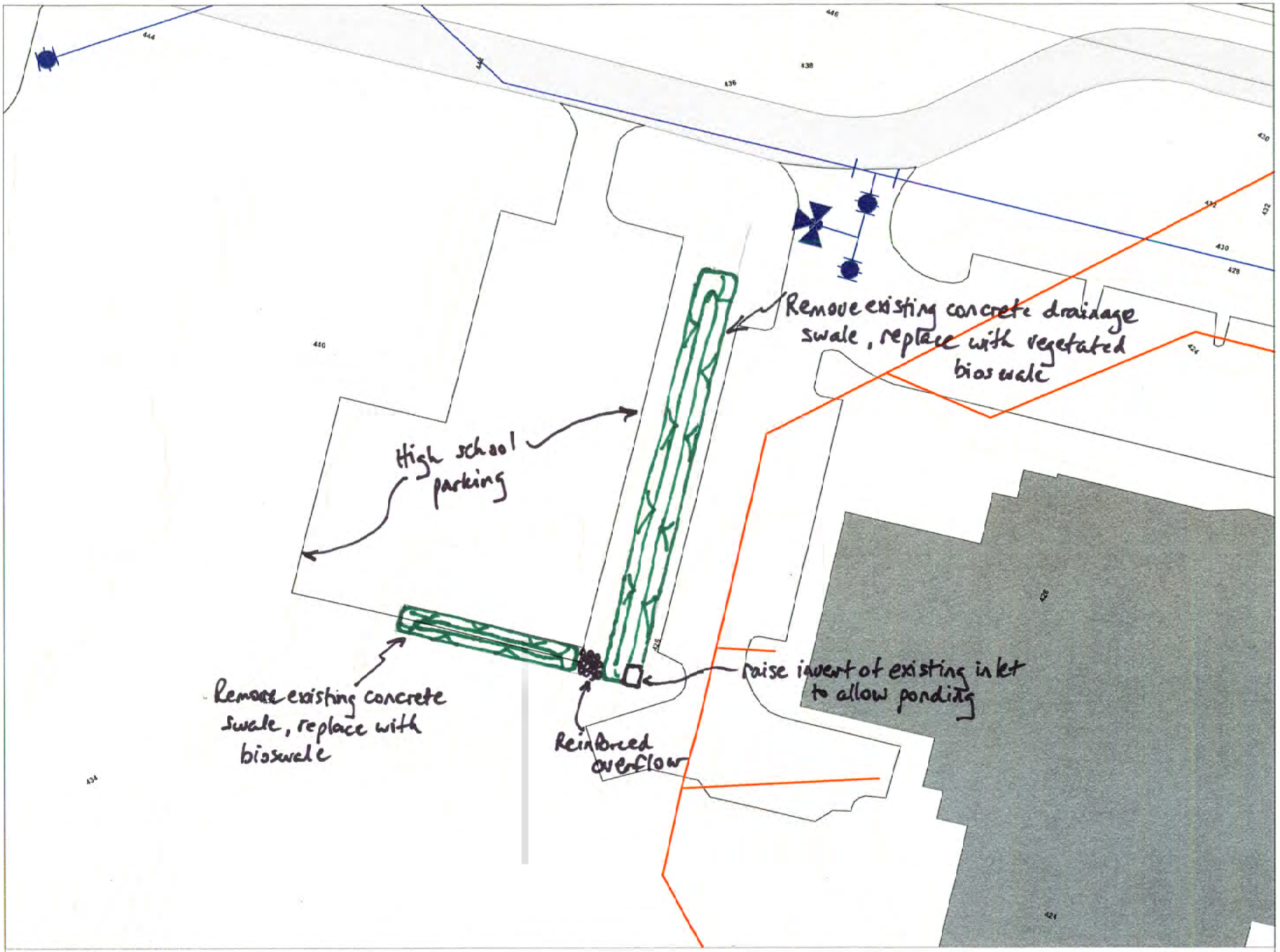
- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☒ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☒ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☒ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID: SS-R10



Columbia Town Center
Ecological and Sustainable Design

Area 6

SS-R10

0 12.5 25 50 75 100 125 Feet

Legend

Watershed Boundary
Building Footprints
parkinglots_paved
Existing BMPs
mastersewer_region
mastersewer_polyline
mastersewer_ellipse
mastersewer_point
masterwater_region
masterwater_polyline
masterwater_ellipse
masterwater_point
Streams
Ponds/Lakes/Dams
StormDrainClip
Property
Roads
2 ft Contours

Biohabitats

WATERSHED: SS	SUBWATERSHED:	UNIQUE SITE ID: R11, R12	
DATE: 4-9-08	ASSESSED BY: BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: High School
Address: _____

Ownership: ☑ Public ☑ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other: _____

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☑ Below Outfall
- ☐ In Road ROW
- ☐ Other: _____
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☑ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☑ Underground
- ☐ Individual Rooftop
- ☑ Small Impervious Area
- ☑ Landscape / Hardscape
- ☐ Other: _____

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☑ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other: _____

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

- OVERSIZED PARKING DRAINING TO STORMDRAINS
- STORMDRAIN FROM SCHOOL COMPLEX TO WOODED CHANNEL

Existing Head Available and Points Where Measured:

Unique Site ID: _____

PROPOSED RETROFIT

Purpose of Retrofit:
- [x] Water Quality
- [ ] Demonstration / Education
- [x] Recharge
- [ ] Repair
- [x] Channel Protection
- [ ] Other:_____
- [ ] Flood Control

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
- [x] Extended Detention
- [ ] Filtering Practice
- [ ] Wet Pond
- [ ] Infiltration
- [ ] Created Wetland
- [ ] Swale
- [ ] Bioretention
- [ ] Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

- CONVERT PARTIAL PARKING AREA AND PARTIAL SPORTS FIELD TO DETENTION AREA.

- SWALE OR DETENTION FOR RESIDENTIAL AREA NEAR PED. CROSSING

SITE CONSTRAINTS

Adjacent Land Use:
- [ ] Residential
- [x] Commercial
- [x] Institutional
- [ ] Industrial
- [ ] Transport-Related
- [ ] Park
- [ ] Undeveloped
- [ ] Other:_____

Possible Conflicts Due to Adjacent Land Use? [x] Yes [ ] No

If Yes, Describe: PARKING LOT / SPORTS FIELD

Access:
- [ ] No Constraints

Constrained due to
- [ ] Slope
- [ ] Space
- [ ] Utilities
- [ ] Tree Impacts
- [ ] Structures
- [x] Property Ownership
- [ ] Other:_____

Conflicts with Existing Utilities:
- [x] None
- [ ] Unknown

Yes	Possible	
[ ]	[ ]	Sewer
[ ]	[ ]	Water
[ ]	[ ]	Gas
[ ]	[ ]	Cable
[ ]	[ ]	Electric
[ ]	[ ]	Electric to Streetlights
[ ]		Overhead Wires
[ ]	[ ]	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	[ ] Probable	[ ] Not Probable
Impacts to Wetlands	[ ] Probable	[ ] Not Probable
Impacts to a Stream	[ ] Probable	[ ] Not Probable
Floodplain Fill	[ ] Probable	[ ] Not Probable
Impacts to Forests	[x] Probable	[ ] Not Probable
Impacts to Specimen Trees	[ ] Probable	[x] Not Probable

How many?_____

Approx. DBH_____

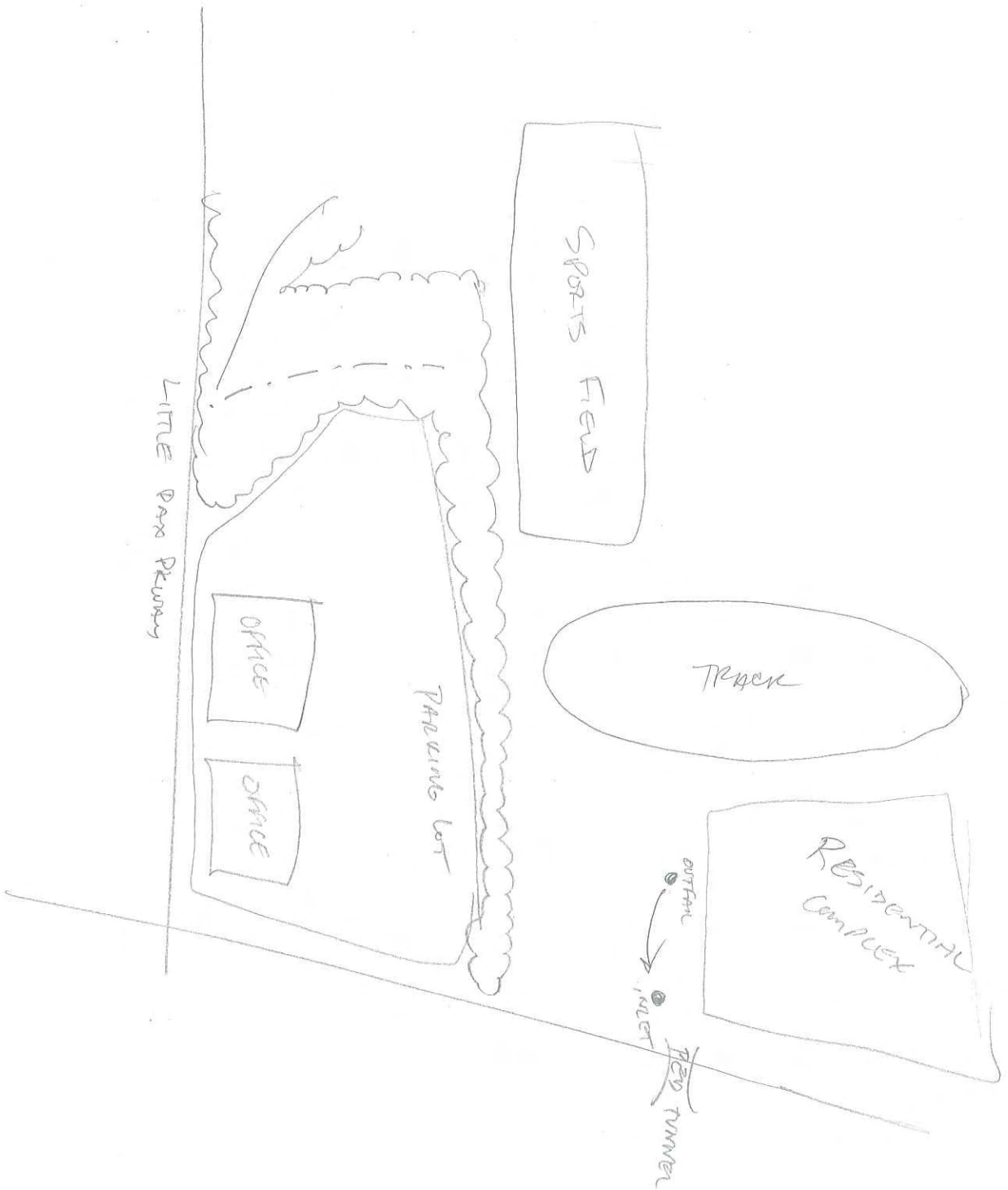
Other factors:_____

Soils:

Soil auger test holes:	[ ] Yes	[x] No	
Evidence of poor infiltration (clays, fines):	[ ] Yes	[ ] No	[x] Unknown
Evidence of shallow bedrock:	[ ] Yes	[ ] No	[x] Unknown
Evidence of high water table (gleying, saturation):	[ ] Yes	[ ] No	[x] Unknown

Unique Site ID:_____

SKETCH



Unique Site ID:_____

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID:_____

WATERSHED: SS	SUBWATERSHED:	UNIQUE SITE ID: SS-R13, R14	
DATE: 4-9-08	ASSESSED BY: BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: COLUMBIA MALL

Address:

Ownership: ☐ Public ☑ Private ☐ Unknown

If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage

- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☑ Near Large Parking Lot

On-Site

- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☑ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☑ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____

Imperviousness ≈ _____ %

Impervious Area ≈ _____

Notes:

Drainage Area Land Use:

- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☑ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☑ Yes ☐ No ☐ Possible

If Yes, Describe:

OIL AND GRIT SEPARATOR

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

LARGE AREAS OF ROOF AND PARKING DRAINING TO STORM DRAIN

Existing Head Available and Points Where Measured:

Unique Site ID: _____

PROPOSED RETROFIT

Purpose of Retrofit:
- [x] Water Quality
- [x] Recharge
- [ ] Channel Protection
- [x] Flood Control
- [ ] Demonstration / Education
- [ ] Repair
- [ ] Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
- [ ] Extended Detention
- [ ] Wet Pond
- [ ] Created Wetland
- [ ] Bioretention
- [x] Filtering Practice
- [ ] Infiltration
- [x] Swale
- [ ] Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

BIOFILTRATION ISLANDS IN PARKING
RAINGARDENS IN COMMERCIAL COMMON AREA
UNDERGROUND STORAGE IN HARDSCAPE AREAS

SITE CONSTRAINTS

Adjacent Land Use:
- [ ] Residential
- [x] Commercial
- [ ] Institutional
- [ ] Industrial
- [ ] Transport-Related
- [ ] Park
- [x] Undeveloped
- [ ] Other:_____

Possible Conflicts Due to Adjacent Land Use? [ ] Yes [ ] No

If Yes, Describe:

Access:
- [ ] No Constraints

Constrained due to
- [ ] Slope
- [ ] Space
- [ ] Utilities
- [ ] Tree Impacts
- [ ] Structures
- [ ] Property Ownership
- [ ] Other:_____

Conflicts with Existing Utilities:
- [x] None
- [ ] Unknown

Yes	Possible	
[ ]	[ ]	Sewer
[ ]	[ ]	Water
[ ]	[ ]	Gas
[ ]	[ ]	Cable
[ ]	[ ]	Electric
[ ]	[ ]	Electric to Streetlights
[ ]		Overhead Wires
[ ]	[ ]	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	[ ] Probable	[x] Not Probable
Impacts to Wetlands	[ ] Probable	[x] Not Probable
Impacts to a Stream	[ ] Probable	[x] Not Probable
Floodplain Fill	[ ] Probable	[x] Not Probable
Impacts to Forests	[ ] Probable	[x] Not Probable
Impacts to Specimen Trees	[ ] Probable	[x] Not Probable

How many?_____
Approx. DBH_____

Other factors:_____

Soils:

Soil auger test holes:	[ ] Yes	[x] No	
Evidence of poor infiltration (clays, fines):	[ ] Yes	[ ] No	[x] Unknown
Evidence of shallow bedrock:	[ ] Yes	[ ] No	[x] Unknown
Evidence of high water table (gleying, saturation):	[ ] Yes	[ ] No	[x] Unknown

Unique Site ID:_____

SKETCH

Unique Site ID:_____

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID:_____

WATERSHED: SS	SUBWATERSHED:	UNIQUE SITE ID: R15 16 SA

DATE: 4-9-08	ASSESSED BY: BWS	CAMERA ID: TIGER	PICTURES:
GPS ID: JACK	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: HICKORY RIDGE TOWNHOMES
Address: _____

Ownership: ☐ Public ☒ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other: _____

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other: _____
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☑ Small Parking Lot
- ☐ Individual Street
- ☑ Underground
- ☑ Individual Rooftop
- ☐ Small Impervious Area
- ☑ Landscape / Hardscape
- ☐ Other: _____

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____ %
Impervious Area ≈ _____

Notes:

Drainage Area Land Use:
- ☑ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☑ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other: _____

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

- ROOFTOP AND PARKING TO STORM DRAIN
- MANY ROOFTOP DISCONNECTED

Existing Head Available and Points Where Measured:

Unique Site ID: _____

PROPOSED RETROFIT

Purpose of Retrofit:
- [x] Water Quality
- [x] Recharge
- [x] Channel Protection
- [ ] Flood Control
- [ ] Demonstration / Education
- [ ] Repair
- [ ] Other: _____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
- [ ] Extended Detention
- [ ] Wet Pond
- [ ] Created Wetland
- [ ] Bioretention
- [x] Filtering Practice
- [x] Infiltration
- [ ] Swale
- [ ] Other: _____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

- SAND FILTER IN PARKING
- RAINBARRELS FOR RESIDENCE

SITE CONSTRAINTS

Adjacent Land Use:
- [x] Residential
- [ ] Commercial
- [ ] Institutional
- [ ] Industrial
- [ ] Transport-Related
- [ ] Park
- [x] Undeveloped
- [x] Other: UTILITIES

Possible Conflicts Due to Adjacent Land Use? [ ] Yes [ ] No

If Yes, Describe:

Access:
- [ ] No Constraints

Constrained due to
- [ ] Slope
- [ ] Space
- [x] Utilities
- [ ] Tree Impacts
- [ ] Structures
- [x] Property Ownership
- [ ] Other: _____

Conflicts with Existing Utilities:
- [ ] None
- [ ] Unknown

Yes	Possible	
[ ]	[x]	Sewer
[ ]	[ ]	Water
[ ]	[ ]	Gas
[ ]	[ ]	Cable
[ ]	[x]	Electric
[ ]	[ ]	Electric to Streetlights
[ ]		Overhead Wires
[ ]	[ ]	Other: _____

Potential Permitting Factors:

Dam Safety Permits Necessary	[ ] Probable	[ ] Not Probable
Impacts to Wetlands	[ ] Probable	[ ] Not Probable
Impacts to a Stream	[ ] Probable	[ ] Not Probable
Floodplain Fill	[x] Probable	[ ] Not Probable
Impacts to Forests	[ ] Probable	[ ] Not Probable
Impacts to Specimen Trees	[ ] Probable	[ ] Not Probable

How many? _____

Approx. DBH _____

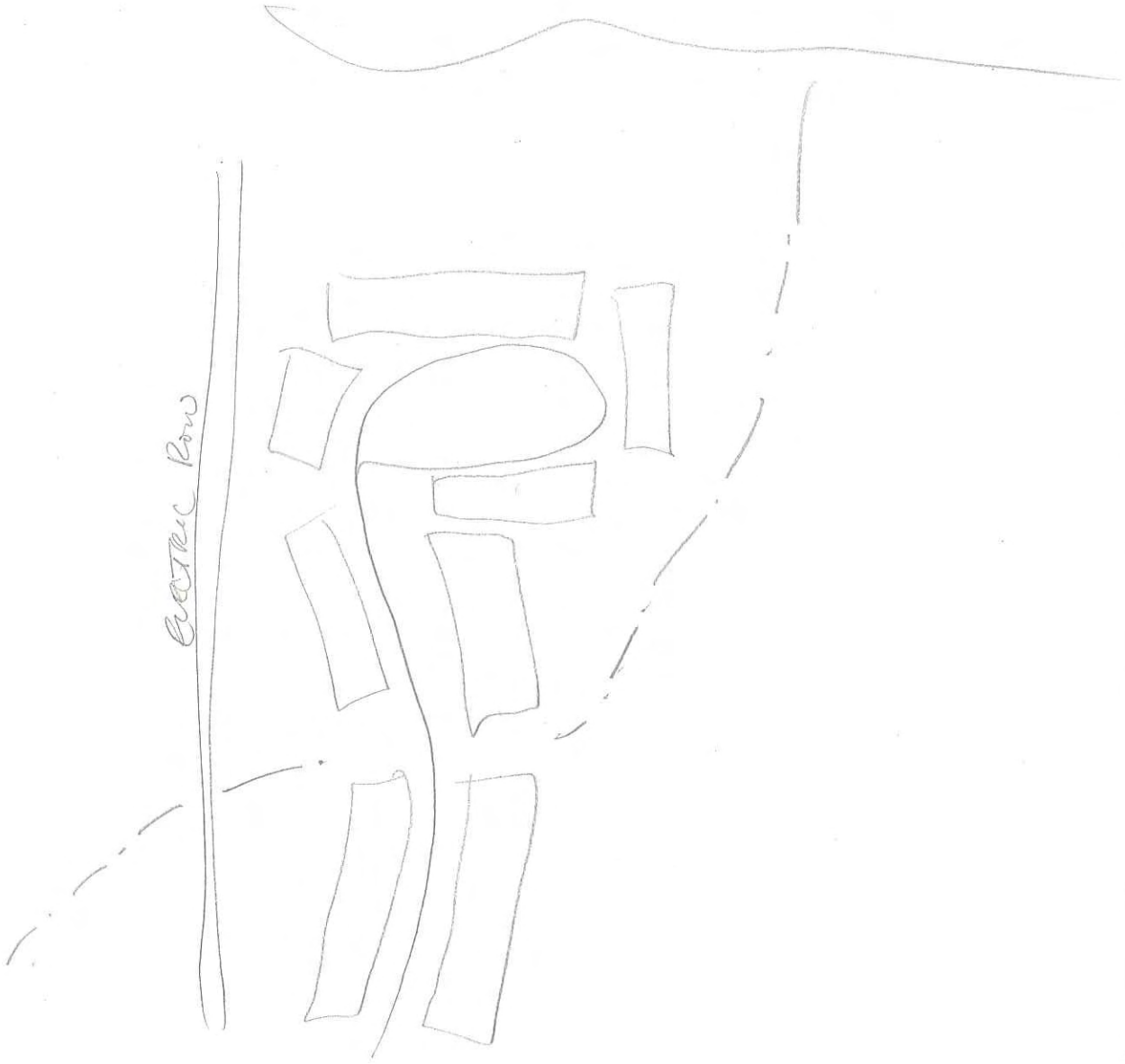
Other factors: _____

Soils:

Soil auger test holes:	[ ] Yes	[x] No	
Evidence of poor infiltration (clays, fines):	[ ] Yes	[ ] No	[x] Unknown
Evidence of shallow bedrock:	[ ] Yes	[ ] No	[x] Unknown
Evidence of high water table (gleying, saturation):	[ ] Yes	[ ] No	[x] Unknown

Unique Site ID: _____

SKETCH



Unique Site ID:_____

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID:_____

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: Little Pax	SUBWATERSHED: Kitchawan	UNIQUE SITE ID: SS-R17	
DATE: 28 May 08	ASSESSED BY: BM, BWS	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name: Parking Area - West
Address: Cocoanut Mall

Ownership: ☐ Public ☑ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☑ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ 815,479 SF
Imperviousness ≈ 71 %
Impervious Area ≈ 578,512 SF

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☑ Commercial
- ☐ Institutional
- ☐ Industrial
- ☑ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☑ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Large paved surface parking with small islands.

Existing Head Available and Points Where Measured:

Unique Site ID:_____

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☐ Channel Protection ☑ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☑ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

PARALLEL CONTOUR BIORETENTION AREAS WITHIN THE PARKING LOT.

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☑ Commercial ☐ Institutional
☐ Industrial ☑ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____

Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No

If Yes, Describe:

Access:
☑ No Constraints
Constrained due to
☐ Slope ☑ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☑ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☐ Probable	☑ Not Probable

How many?_____
Approx. DBH_____

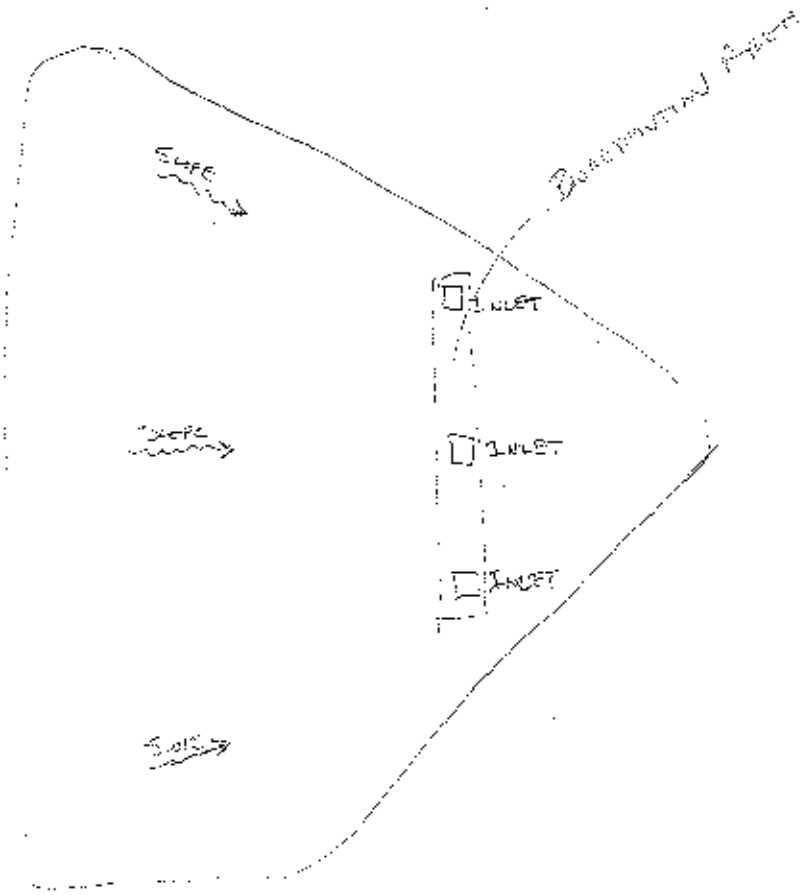
Other factors:_____

Soils:

Soil auger test holes:	☐ Yes	☑ No	
Evidence of poor infiltration (clays, fines):	☐ Yes	☑ No	☐ Unknown
Evidence of shallow bedrock:	☐ Yes	☑ No	☐ Unknown
Evidence of high water table (gleying, saturation):	☐ Yes	☑ No	☐ Unknown

Unique Site ID:_____

SKETCH



Unique Site ID:_____

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID:_____

Appendix D: Unified Stream Assessment Field Forms

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony	**DATE:** 2 / 12 / 08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) SC-6	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK**___	**GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☒ Other: Path Xing

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☒ Bottomless
☐ Box ☐ Elliptical
☐ Circular
☒ Other:

 # BARRELS:
☐ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☐ Concrete
☐ Metal
☒ Other: wood

ALIGNMENT:
☒ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: _____(ft)
Height: _____(ft)
Culvert length: _____(ft)
Width: 12 (ft)
Roadway elevation: _____(ft)

CONDITION: (*Evidence of...*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☒ Sediment deposition ☐ Failing embankment
☒ Other (*describe*): blocked by boulders

CULVERT SLOPE:
☐ Flat
☐ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE
☐ no
☒ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☒ No ☐ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☒ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: _____ (in)
☐ Flow too shallow Water Depth: _____ (in)
☒ Other: boulders under bridge

BLOCKAGE SEVERITY: (*circle #*)

5	4	3	2	1
A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

NOTES/SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony		**DATE:** 2 / 12 / 08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID: (*Condition-#*) **SC-** 7(8)	**LAT** ___°___'___" **LONG** ___°___'___" **LMK**___		**GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☒ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☐ Box ☐ Elliptical
☐ Circular
☐ Other:

 # BARRELS:
☐ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☐ Concrete
☐ Metal
☐ Other:

ALIGNMENT:
☐ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: _____(ft)
Height: _____(ft)
Culvert length: _____(ft)
Width: _____(ft)
Roadway elevation: _____(ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE:
☐ Flat
☐ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☒ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: _____ (in)
☐ Flow too shallow Water Depth: _____ (in)
☒ Other: dam

BLOCKAGE SEVERITY: (*circle #*)

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	
(5)	4	3	2	1

NOTES/SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) SC-8(a)	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK**___	**GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☐ Box ☐ Elliptical
☒ Circular
☐ Other:

 # BARRELS:
☒ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☐ Concrete
☒ Metal
☐ Other:

ALIGNMENT:
☒ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 48" (ft)
Height: _____(ft)
Culvert length: 20 (ft)
Width: _____(ft)
Roadway elevation:_____(ft)

CONDITION: (*Evidence of...*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☒ Sediment deposition VS ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE:
☐ Flat
☒ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: _____ (in)
☐ Flow too shallow Water Depth:_____ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

5	4	3	2	1
A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

NOTES/SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony		**DATE:** 2 / 12 / 08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID: (*Condition-#*) **SC-** 9(10)	**LAT** ___°___'___" **LONG** ___°___'___" **LMK**___		**GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☒ Other: culvert?

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☐ Box ☐ Elliptical
☒ Circular
☐ Other:

 # BARRELS:
☒ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☐ Concrete
☒ Metal
☐ Other:

ALIGNMENT:
☒ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 36 (ft)
Height: _____(ft)
Culvert length: _____(ft)
Width: _____(ft)
Roadway elevation: _____(ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☒ Other (*describe*): no fill on top

CULVERT SLOPE:
☐ Flat
☐ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☒ Other: remove, no obvious

IS SC ACTING AS GRADE CONTROL ☐ No ☐ Yes ☒ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: _____ (in)
☐ Flow too shallow Water Depth: _____ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

5	4	3	2	1
A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

NOTES/SKETCH:

-not sure of purpose, could be to protect utility line stakes or sewer xing, remove + replace w/ appropriate open channel str.

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SN/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) SC-10(12)	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK**___	**GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☒ Other: underground pipe

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☐ Box ☐ Elliptical
☒ Circular
☐ Other:

 # BARRELS:
☒ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☒ Concrete
☐ Metal
☐ Other:

ALIGNMENT:
☐ Flow-aligned
☒ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 5 (ft)
Height: _____(ft)
Culvert length: _____(ft)
Width: _____(ft)
Roadway elevation: _____(ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE:
☐ Flat
☐ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☒ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: _____ (in)
☐ Flow too shallow Water Depth: _____ (in)
☒ Other: too long pipe

BLOCKAGE SEVERITY: (*circle #*)

5	4	3	2	1
A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

NOTES/SKETCH:

- upstream piped under development

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony Stream		**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH:	**TIME:** 9 : 45 AM/PM	**PHOTO ID** (CAMERA-PIC #):	/# 5
SITE ID: (Condition #) ER- 1	*START* **LAT** 39 °12'59" **LONG** 76 °52'29"	**LMK**	**GPS:** (*Unit ID*)
	END **LAT** ° ' " **LONG** ° ' "	**LMK**	

PROCESS: ☐ Currently unknown

- ☒ Downcutting
- ☐ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☐ Bank failure
- ☒ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☒ LT ☐ RT ☐ Both (*looking downstream*)

LOCATION: ☒ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT 50'	and/or RT ____ ft	Bottom width ____ ft
Bank Ht	LT 5 1/2 ft	and/or RT ____ ft	Top width ____ ft
Bank Angle	LT 0 °	and/or RT ____ °	Wetted Width ____ ft

LAND OWNERSHIP: ☐ Private ☐ Public ☐ Unknown

LAND COVER: ☒ Forest ☐ Field/Ag ☐ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☒ Bank stabilization ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☐ No ☒ Yes (Describe): close to road

EXISTING RIPARIAN WIDTH: LT ☒ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☐ 75-100ft ☐ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	5	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	(4) 3 2	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use. 1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	5	**Fair access**: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	4 (3) 2	**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required. 1

NOTES/CROSS SECTION SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony Stream		**DATE:** 2/12/08	**ASSESSED BY:** SN BS
SURVEY REACH: SR4	**TIME:** 9:59 AM/PM	**PHOTO ID** (CAMERA-PIC #):	/# 61
SITE ID: (*Condition-#*) ER- 2	*START* **LAT** 39°12'57" **LONG** 76°52'27"	**LMK**	**GPS:** (*Unit ID*)
	END **LAT** °' " **LONG** °' "	**LMK**	

PROCESS: ☐ Currently unknown

- ☐ Downcutting
- ☒ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☒ Bank failure
- ☒ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☐ LT ☐ RT ☒ Both (*looking downstream*)

LOCATION: ☒ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT 45 ft	and/or RT 10 ft	Bottom width	ft
Bank Ht	LT 3 ft	and/or RT 2 ft	Top width	ft
Bank Angle undercut	LT °	and/or RT undercut °	Wetted Width	ft

LAND OWNERSHIP: ☐ Private ☒ Public ☐ Unknown

LAND COVER: ☑ Forest ☐ Field/Ag ☐ Developed:

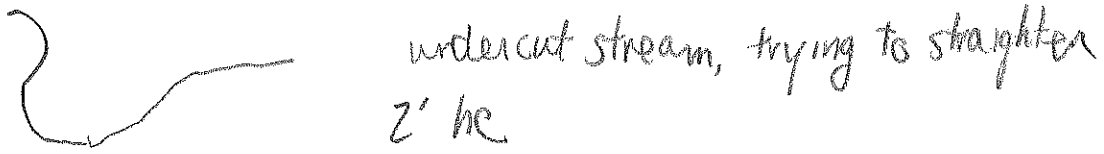
POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☐ Bank stabilization ☑ Other: total

THREAT TO PROPERTY/INFRASTRUCTURE: ☑ No ☐ Yes (Describe):

EXISTING RIPARIAN WIDTH: ☐ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☑ 75-100ft ☑ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5	(4)	3	2	1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.		**Fair access:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.		**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5	4	(3)	2	1

NOTES/CROSS SECTION SKETCH:



REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony Stream	**DATE:** 2/12/08	**ASSESSED BY:** SN/BS
SURVEY REACH: SR-10	**TIME:** 10:03 AM/PM	**PHOTO ID** (CAMERA-PIC #): /# 7
SITE ID: (*Condition-#*) ER-3	*START* **LAT** 39 ° 12 ' 56 " **LONG** 76 ° 52 ' 28 " **LMK** ____	**GPS:** (*Unit ID*)
	END **LAT** ___ ° ___ ' ___ " **LONG** ___ ° ___ ' ___ " **LMK** ____	

PROCESS: ☐ Currently unknown

- ☐ Downcutting
- ☐ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☐ Bank failure
- ☐ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☐ LT ☑ RT ☐ Both (*looking downstream*)

LOCATION: ☑ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT ____ ft	and/or RT 20 ft	Bottom width ____ ft
Bank Ht	LT ____ ft	and/or RT 6 ft	Top width ____ ft
Bank Angle	LT ____ °	and/or RT 90 °	Wetted Width ____ ft

LAND OWNERSHIP: ☐ Private ☑ Public ☐ Unknown

LAND COVER: ☑ Forest ☐ Field/Ag ☐ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☑ Bank stabilization ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☑ No ☐ Yes (Describe):

EXISTING RIPARIAN WIDTH: ☐ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☑ 75-100ft ☐ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	5	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	4 3 2	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use. (1)
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	5	**Fair access:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	4 (3) 2	**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required. 1

NOTES/CROSS SECTION SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

10724 LPP - address of building Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH: SR 01	**TIME:** ___:___ AM/PM	**PHOTO ID** (CAMERA-PIC #):	/#
SITE ID: (*Condition-#*) ER- 4	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		**GPS:** (*Unit ID*)
	END **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		

PROCESS: ☐ Currently unknown

- ☑ Downcutting
- ☐ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☐ Bank failure
- ☐ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☐ LT ☐ RT ☐ Both (*looking downstream*) - curb cut

LOCATION: ☐ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT_____ft	and/or RT_____ft	Bottom width _____ft
Bank Ht	LT_____ft	and/or RT_____ft	Top width _____ft
Bank Angle	LT_____°	and/or RT_____°	Wetted Width _____ft

LAND OWNERSHIP: ☑ Private ☐ Public ☐ Unknown

LAND COVER: ☐ Forest ☐ Field/Ag ☑ Developed:

POTENTIAL RESTORATION CANDIDATE: ☑ Grade control ☐ Bank stabilization ☐ No ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☑ No ☐ Yes (Describe):

EXISTING RIPARIAN WIDTH: ☐ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☑ 75-100ft ☐ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5	4	3	2 1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair access:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.		**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5	4	3	2 1

NOTES/CROSS SECTION SKETCH:

not stream, from curb cut RT Bank from parking lot

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH:	**TIME:** ___:___ AM/PM	**PHOTO ID** (CAMERA-PIC #): /# 3693
SITE ID: (*Condition-#*) ER-5	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___	**GPS:** (*Unit ID*)
	END **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___	

PROCESS: ☐ Currently unknown

- ☑ Downcutting
- ☑ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☐ Bank failure
- ☑ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☐ LT ☐ RT ☑ Both (*looking downstream*)

LOCATION: ☑ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT 400 ft	and/or RT ___ ft	Bottom width 5-8 ft
Bank Ht	LT 5-6 ft	and/or RT ___ ft	Top width 15 ft
Bank Angle	LT ___ °	and/or RT ___ °	Wetted Width ___ ft

LAND OWNERSHIP: ☐ Private ☑ Public ☐ Unknown

LAND COVER: ☑ Forest ☐ Field/Ag ☐ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☐ Bank stabilization ☑ Other: floodplain improvement

THREAT TO PROPERTY/INFRASTRUCTURE: ☐ No ☐ Yes (Describe):

EXISTING RIPARIAN WIDTH: ☐ ≤25 ft ☑ 25 - 50 ft ☐ 50-75ft ☐ 75-100ft ☐ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	6 5	4 3	2 1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair access**: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5	4 3	2 1

NOTES/CROSS SECTION SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony	**DATE:** 2 / 12 / 08	**ASSESSED BY:** SW/BS
SURVEY REACH:	**TIME:** ___:___ AM/PM	**PHOTO ID** (CAMERA-PIC #): /#
SITE ID: (*Condition-#*) ER-6	*START* **LAT** ___° ___ ' ___ " **LONG** ___° ___ ' ___ " **LMK** ___	**GPS:** (*Unit ID*)
	END **LAT** ___° ___ ' ___ " **LONG** ___° ___ ' ___ " **LMK** ___	

PROCESS: ☐ Currently unknown

- ☐ Downcutting
- ☒ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☐ Bank failure
- ☒ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☐ LT ☐ RT ☒ Both (*looking downstream*)

LOCATION: ☐ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT 100 ft	and/or RT 100 ft	Bottom width 8 ft
Bank Ht	LT 4-5 ft	and/or RT 4-5 ft	Top width 12 ft
Bank Angle	LT ___°	and/or RT ___°	Wetted Width ___ ft

LAND OWNERSHIP: ☐ Private ☒ Public ☐ Unknown

LAND COVER: ☒ Forest ☐ Field/Ag ☐ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☒ Bank stabilization ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☒ No ☐ Yes (Describe):

EXISTING RIPARIAN WIDTH: ☐ ≤25 ft ☐ 25 - 50 ft ☒ 50-75ft ☐ 75-100ft ☐ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5 4	3	2 1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair access**: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5 4	3	2 1

NOTES/CROSS SECTION SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SA/BS
SURVEY REACH: SR-2	**TIME:** ___:___ AM/PM	**PHOTO ID** (CAMERA-PIC #):	/#
SITE ID: (*Condition-#*) ER-1	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		**GPS:** (*Unit ID*)
	END **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		

PROCESS: ☐ Currently unknown

- ☐ Downcutting
- ☐ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☐ Bank failure
- ☒ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☑ LT ☐ RT ☐ Both (*looking downstream*)

LOCATION: ☐ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT 40 ft	and/or RT ___ ft	Bottom width 16 ft
Bank Ht	LT 10 ft	and/or RT ___ ft	Top width 20 ft
Bank Angle	LT 90 °	and/or RT ___ °	Wetted Width ___ ft

LAND OWNERSHIP: ☐ Private ☑ Public ☐ Unknown

LAND COVER: ☑ Forest ☐ Field/Ag ☐ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☑ Bank stabilization ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☐ No ☑ Yes (Describe):

EXISTING RIPARIAN WIDTH: ☐ ≤25 ft ☐ 25 - 50 ft ☑ 50-75ft ☐ 75-100ft ☐ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5	4	3	2 1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair access**: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.		**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5	4	3	2 1

NOTES/CROSS SECTION SKETCH:

ill angled culvert aimed at bank

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SN/BS
SURVEY REACH: 0	**TIME:** ___:___ AM/PM	**PHOTO ID** (CAMERA-PIC #):	/#
SITE ID: (*Condition-#*) **ER-** 8	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___"	**LMK** A	**GPS:** (*Unit ID*)
	END **LAT** ___° ___' ___" **LONG** ___° ___' ___"	**LMK** B	

PROCESS: ☐ Currently unknown

- ☐ Downcutting
- ☒ Widening
- ☐ Headcutting
- ☒ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☒ Bank failure
- ☒ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☒ LT ☐ RT ☐ Both (*looking downstream*)

LOCATION: ☒ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT ____ ft	and/or RT ____ ft	Bottom width ____ ft
Bank Ht	LT 3 ft	and/or RT ____ ft	Top width ____ ft
Bank Angle	LT 90 °	and/or RT ____ °	Wetted Width ____ ft

LAND OWNERSHIP: ☐ Private ☒ Public ☐ Unknown

LAND COVER: ☐ Forest ☐ Field/Ag ☐ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☐ Bank stabilization ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☐ No ☐ Yes (Describe):

EXISTING RIPARIAN WIDTH: ☐ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☒ 75-100ft ☐ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5	4 3	2 1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair access:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5	4 3	2 1

NOTES/CROSS SECTION SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SN/BS
SURVEY REACH:	**TIME:** ___:___ AM/PM	**PHOTO ID** (CAMERA-PIC #):	/#
SITE ID: (*Condition-#*) ER- 9 (11)	*START* **LAT** ___° ___ ' ___ " **LONG** ___° ___ ' ___ " **LMK** ___		**GPS:** (*Unit ID*)
	END **LAT** ___° ___ ' ___ " **LONG** ___° ___ ' ___ " **LMK** ___		

PROCESS: ☐ Currently unknown

- ☐ Downcutting
- ☐ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☐ Bank failure
- ☒ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☐ LT ☒ RT ☐ Both (*looking downstream*)

LOCATION: ☒ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT ___ ft	and/or RT 30 ft	Bottom width ___ ft
Bank Ht	LT ___ ft	and/or RT 4½ ft	Top width ___ ft
Bank Angle	LT ___ °	and/or RT undercut	Wetted Width ___ ft

LAND OWNERSHIP: ☒ Private ☐ Public ☐ Unknown

LAND COVER: ☐ Forest ☒ Field/Ag ☐ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☒ Bank stabilization ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☐ No ☒ Yes (Describe): Pathway Imp

EXISTING RIPARIAN WIDTH: ☒ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☐ 75-100ft ☐ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	5	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	4 3 2	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use. 1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	5	**Fair access:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	4 3 2	**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required. 1

NOTES/CROSS SECTION SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SW/BS
SURVEY REACH:	**TIME:** ___:___ AM/PM	**PHOTO ID** (CAMERA-PIC #):	/#
SITE ID: (*Condition-#*) ER-10 (12)	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		**GPS:** (*Unit ID*)
	END **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		

PROCESS: ☐ Currently unknown

- ☐ Downcutting
- ☐ Widening
- ☐ Headcutting
- ☒ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☒ Bank failure
- ☐ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☐ LT ☒ RT ☐ Both (*looking downstream*)

LOCATION: ☐ Meander bend ☐ Straight section ☒ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT ___ ft	and/or RT 50 ft	Bottom width ___ ft
Bank Ht	LT ___ ft	and/or RT 8 ft	Top width ___ ft
Bank Angle	LT ___ °	and/or RT ___ °	Wetted Width ___ ft

LAND OWNERSHIP: ☐ Private ☐ Public ☐ Unknown

LAND COVER: ☒ Forest ☐ Field/Ag ☒ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ Grade control ☒ Bank stabilization ☐ No ☒ Other: more channel

THREAT TO PROPERTY/INFRASTRUCTURE: ☐ No ☒ Yes (Describe): houses @ top of slope

EXISTING RIPARIAN WIDTH: LT ☐ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☐ 75-100ft ☒ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.		Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5	4	3	2	1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.		**Fair access**: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.		**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5	4	3	2	1

NOTES/CROSS SECTION SKETCH:

- not currently eroding except during large events
bar protecting toe

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH:	**TIME:** ___:___ AM/PM	**PHOTO ID** (CAMERA-PIC #):	/#
SITE ID: (*Condition-#*) ER- 11 (13)	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		**GPS:** (*Unit ID*)
	END **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		

PROCESS: ☐ Currently unknown

- ☐ Downcutting
- ☐ Widening
- ☐ Headcutting
- ☐ Aggrading
- ☐ Sed. deposition
- ☐ Bed scour
- ☒ Bank failure
- ☒ Bank scour
- ☐ Slope failure
- ☐ Channelized

BANK OF CONCERN: ☒ LT ☐ RT ☐ Both (*looking downstream*)

LOCATION: ☐ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*)	LT 20 ft	and/or RT ___ ft	Bottom width ___ ft
Bank Ht	LT 6 ft	and/or RT ___ ft	Top width ___ ft
Bank Angle	LT 90 °	and/or RT ___ °	Wetted Width ___ ft

LAND OWNERSHIP: ☒ Private ☐ Public ☐ Unknown

LAND COVER: ☐ Forest ☐ Field/Ag ☒ Developed: house

POTENTIAL RESTORATION CANDIDATE: ☐ No ☐ Grade control ☒ Bank stabilization ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☐ No ☒ Yes (Describe): Townhouse

EXISTING RIPARIAN WIDTH: RT ☐ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☐ 75-100ft ☒ >100ft

EROSION SEVERITY(*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure		Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5	4	3	2 1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair access**: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.		**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5	4	3	2 1

NOTES/CROSS SECTION SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Symphony Stream		**DATE:** 2 / 12 / 08	**ASSESSED BY:** SH/BS
SURVEY REACH ID: SR-1 U 1	**TIME:** 9 : 32 AM/PM	**PHOTO ID:** (*Camera-Pic #*) 11	# 21
SITE ID (*Condition-#*): **OT-** 1	**LAT** 39 ° 13 ' 01 " **LONG** 76 ° 52 ' 31 "	**LMK**	**GPS:** (*Unit ID*)

BANK: ☐ LT ☐ RT ☒ Head

FLOW: ☐ None ☒ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☒ Closed pipe ☐ Open channel

MATERIAL: ☒ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Single ☒ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS: Diameter: 24 / 18 (in)

Depth: ____ (in) Width (Top): ____ (in) " (Bottom): ____ (in)

NOT APPLICABLE

SUBMERGED: ☒ No ☐ Partially ☐ Fully

CONDITION: ☒ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☒ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☒ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☒ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY

COLOR: ☒ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☒ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☒ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☒ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization ☐ no ☒ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: _____ ft Type of existing vegetation: _____ Slope: _____ °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☒ No ☐ Not investigated

Land Use description: woods, have some area

Area available:

OUTFALL SEVERITY: *(circle #)*

5	4	3	2	1
Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.		Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

SKETCH/NOTES: - outfall at start, lots of evosion on banks, banging back + forth

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SW/BS
SURVEY REACH ID: SR-2	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID (*Condition-#*): **OT-** 2	**LAT** ___° ___' ___" **LONG** ___° ___' ___"	**LMK**___	**GPS:** (*Unit ID*)

BANK: ☐ LT ☐ RT ☒ Head

FLOW: ☐ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☐ Closed pipe

MATERIAL: ☒ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

SHAPE: ☐ Single ☒ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

DIMENSIONS: Diameter: 42 (in)

SUBMERGED: ☒ No ☐ Partially ☐ Fully

☐ Open channel ☐ Concrete ☐ Earthen ☐ Other:

☐ Trapezoid ☐ Parabolic ☐ Other:

Depth: ___ (in) Width (Top): ___ (in) " (Bottom): ___ (in)

NOT APPLICABLE

CONDITION: ☐ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☐ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☐ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☐ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☒ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☒ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY

COLOR: ☒ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☒ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☒ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☒ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ no ☐ Discharge investigation ☒ Stream daylighting ☐ Local stream repair/outfall stabilization ☐ Storm water retrofit ☐ Other: in school field or retrofit

If yes for daylighting:

Length of vegetative cover from outfall: 10' ft Type of existing vegetation: grass Slope: flat °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☒ No ☐ Not investigated

Land Use description: baseball field

Area available:

OUTFALL SEVERITY: *(circle #)*

5	4	3	2	1
Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.		Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

SKETCH/NOTES:

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID: SR-3 **TIME:** 0 ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#	
SITE ID (*Condition-#*): **OT-** 3 **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		**GPS:** (*Unit ID*)

BANK: ☐ LT ☒ RT ☐ Head

FLOW: ☒ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☒ Closed pipe

MATERIAL: ☒ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

SHAPE: ☐ Single ☐ Double ☐ Triple ☒ Circular ☐ Elliptical ☐ Other:

DIMENSIONS: Diameter: 30 (in)

SUBMERGED: ☐ No ☐ Partially ☐ Fully

TYPE: ☐ Open channel

MATERIAL: ☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS: Depth: ___ (in) Width (Top): ___ (in) " (Bottom): ___ (in)

NOT APPLICABLE

CONDITION: ☒ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☒ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☒ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☒ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY		
	COLOR:	☒ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:
	TURBIDITY:	☒ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque
	FLOATABLES:	☒ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization ☒ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:
Length of vegetative cover from outfall: ______ft Type of existing vegetation:________ Slope: ______°

If yes for stormwater:
Is stormwater currently controlled? ☐ Yes ☐ No ☐ Not investigated
Land Use description:________
Area available:

OUTFALL SEVERITY: *(circle #)*	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.	Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5 — 4	3 — 2	1

SKETCH/NOTES: from StormH2O Basin, HC directly ds 2' fall - 30' ds HC=?

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Symphony Stream		**DATE:** 2 / 12 /08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID (*Condition-#*): **OT-** 4	**LAT** ___° ___' ___" **LONG** ___° ___' ___"	**LMK** ___	**GPS:** (*Unit ID*)

BANK: ☒ LT ☐ RT ☐ Head

FLOW: ☐ None ☐ Trickle ☐ Moderate ☒ Substantial ☐ Other:

TYPE: ☒ Closed pipe ☐ Open channel

MATERIAL: ☒ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Single ☒ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS: Diameter: 24 (in)

Depth: ___ (in) Width (Top): ___ (in) " (Bottom): ___ (in)

NOT APPLICABLE

SUBMERGED: ☐ No ☑ Partially ☐ Fully

CONDITION: ☒ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☒ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☐ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☐ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY

COLOR: ☐ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☐ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☐ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☒ Other: warm water

POTENTIAL RESTORATION CANDIDATE ☒ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization ☐ no ☒ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ___ ft Type of existing vegetation: ___ Slope: ___ °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☐ No ☐ Not investigated

Land Use description: ___

Area available:

OUTFALL SEVERITY: (*circle #*)	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.		Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	(5)	4	3	2	1

SKETCH/NOTES: HC on main channel Y/C

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SR/BS
SURVEY REACH ID: SR-	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID (*Condition-#*): **OT-**5	**LAT** ___° ___' ___" **LONG** ___° ___' ___"	**LMK**___	**GPS:** (*Unit ID*)

BANK: ☑ LT ☐ RT ☐ Head

FLOW: ☐ None ☑ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☑ Closed pipe ☐ Open channel

MATERIAL: ☑ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other: ☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Single ☑ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other: ☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS: Diameter: 7 (in) Depth: ___(in) Width (Top): ___(in) " (Bottom): ___(in) — NOT APPLICABLE

SUBMERGED: ☐ No ☐ Partially ☑ Fully

CONDITION: ☑ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☑ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☑ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☐ None ☑ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☑ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☑ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

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COLOR: ☑ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☑ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☑ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☑ Excessive Sedimentation ☑ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization ☐ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ___ft Type of existing vegetation: ___ Slope: ___°

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☐ No ☐ Not investigated

Land Use description: ___

Area available:

OUTFALL SEVERITY: *(circle #)*	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.	Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5	4 3 2	1

SKETCH/NOTES:

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SW/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID (*Condition-#*): **OT-** 6 (10)	**LAT** ___° ___' ___" **LONG** ___° ___' ___"	**LMK** ___	**GPS:** (*Unit ID*)

BANK: ☑ LT ☐ RT ☐ Head

FLOW: ☑ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☑ Closed pipe ☐ Open channel

MATERIAL: ☑ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Single ☑ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS: Diameter: 18 (in)

Depth: ___ (in) Width (Top): ___ (in) " (Bottom): ___ (in)

NOT APPLICABLE

SUBMERGED: ☐ No ☐ Partially ☐ Fully

CONDITION: ☐ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☑ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☑ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☑ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☑ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☑ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

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COLOR: ☑ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☐ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☐ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☑ Needs Regular Maintenance ☑ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☑ Local stream repair/outfall stabilization ☐ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ___ ft Type of existing vegetation: ___ Slope: ___ °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☐ No ☐ Not investigated

Land Use description: ___

Area available:

OUTFALL SEVERITY: (*circle #*)	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.		Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5	4	3	2	1

SKETCH/NOTES: spillway to channel broken + eroding underneath

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID (*Condition-#*): **OT-** 71(20)	**LAT** ___° ___' ___" **LONG** ___° ___' ___"	**LMK**___	**GPS:** (*Unit ID*)

BANK: ☐ LT ☒ RT ☐ Head

FLOW: ☐ None ☒ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☒ Closed pipe ☐ Open channel

MATERIAL: ☐ Concrete ☒ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Single ☒ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS: Diameter: 30 (in)

Depth: ___ (in) Width (Top): ___ (in) " (Bottom): ___ (in)

NOT APPLICABLE

SUBMERGED: ☐ No ☐ Partially ☐ Fully

CONDITION: ☐ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☒ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☒ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☒ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

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COLOR: ☒ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☒ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☒ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☒ Needs Regular Maintenance ☒ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☒ Local stream repair/outfall stabilization ☐ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ___ ft Type of existing vegetation: ___ Slope: ___ °

If yes for stormwater:

Is stormwater currently controlled?. ☐ Yes ☐ No ☐ Not investigated

Land Use description: ___

Area available:

OUTFALL SEVERITY: *(circle #)*	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.		Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5	4	3	2	1

SKETCH/NOTES: massive erosion below outfall, reduced 5'

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID (*Condition-#*): **OT-** 8(21)	**LAT** ___° ___' ___" **LONG** ___° ___' ___"	**LMK** ___	**GPS:** (*Unit ID*)

BANK: ☒ LT ☐ RT ☐ Head

FLOW: ☒ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☒ Closed pipe ☐ Open channel

MATERIAL: ☐ Concrete ☒ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Single ☒ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS: Diameter: 12 (in)

Depth: ___ (in) Width (Top): ___ (in) " (Bottom): ___ (in)

NOT APPLICABLE

SUBMERGED: ☐ No ☒ Partially ☐ Fully

CONDITION: ☐ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☒ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☒ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☐ No pool ☒ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY

COLOR: ☒ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☒ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☒ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization ☒ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ___ ft Type of existing vegetation: ___ Slope: ___ °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☐ No ☐ Not investigated

Land Use description: ___

Area available:

OUTFALL SEVERITY: (*circle #*)	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.		Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5	4	3	2	1

SKETCH/NOTES:

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Utility Impacts **UT**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SN/BS
SURVEY REACH ID: UT-3	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) #
SITE ID: (*Condition-#*) UT-3(SC-7)	**LAT** ___° ____' ____" **LONG** ___° ____' ____"	**LMK:** ____ **GPS:** (*Unit ID*)

TYPE:
- ☐ Leaking sewer
- ☒ Exposed pipe
- ☐ Exposed manhole
- ☐ Other:

MATERIAL:
- ☐ Concrete
- ☐ Corrugated metal
- ☐ Smooth metal
- ☒ PVC
- ☐ Other:

LOCATION:
- ☐ Floodplain
- ☐ Stream bank
- ☐ Above stream
- ☒ Stream bottom
- ☐ Other:

POTENTIAL FISH BARRIER:
- ☐ Yes ☒ No

PIPE DIMENSIONS:
Diameter: 4 in
Length exposed: 12 ft

CONDITION: ☐ Joint failure ☐ Pipe corrosion/cracking ☐ Protective covering broken ☐ Manhole cover absent ☐ Other:

EVIDENCE OF DISCHARGE:

COLOR	☒ None ☐ Clear ☐ Dark Brown ☐ Lt Brown ☐ Yellowish ☐ Greenish ☐ Other:
ODOR	☒ None ☐ Sewage ☐ Oily ☐ Sulfide ☐ Chlorine ☐ Other:
DEPOSITS	☒ None ☐ Tampons/Toilet Paper ☐ Lime ☐ Surface oils ☐ Stains ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Structural repairs ☐ Pipe testing ☐ Citizen hotlines ☐ Dry weather sampling
☐ no ☐ Fish barrier removal ☒ Other: cover

If yes to fish barrier, Water Drop: _____ (in)

UTILITY IMPACT SEVERITY: (*Circle #*)

Leaking= ☐ 5

5	4	3	2	1
Section of pipe undermined by erosion and could collapse in the near future; a pipe running across the bed or suspended above the stream; a long section along the edge of the stream where nearly the entire side of the pipe is exposed; or a manhole stack that is located in the center of the stream channel and there is evidence of stack failure.	A moderately long section of pipe is partially exposed but there is no immediate threat that the pipe will be undermined and break in the immediate future. The primary concern is that the pipe may be punctured by large debris during a large storm event.		Small section of exposed pipe, stream bank near the pipe is stable; the pipe is across the bottom of the stream but only a small portion of the top of the pipe exposed; the pipe is exposed but is reinforced with concrete and it is not causing a blockage to upstream fish movement; a manhole stack that is at the edge of the stream and does not extend very far out into the active stream channel.	

NOTES:

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

Miscellaneous **MI**

WATERSHED/SUBSHED: Symphony	DATE: 2/12/08	ASSESSED BY: SH/BS
SURVEY REACH ID:	TIME: ___:___ AM/PM	PHOTO ID: (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-4(HC-3)	LAT ___° ___' ___" LONG ___° ___' ___" LMK: ___	GPS: (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☒ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: LT bank has 10' rprap, to protect an outfall from curb cut HC-3) is located directly ds, 3' tall

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED: Symphony	DATE: 2/12/08	ASSESSED BY: SH/BS
SURVEY REACH ID:	TIME: ___:___ AM/PM	PHOTO ID: (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-5(HC-4)	LAT ___° ___' ___" LONG ___° ___' ___" LMK: ___	GPS: (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: 1' tall, 25' us HC 6 which is BPS

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED: Symphony	DATE: 2/12/08	ASSESSED BY: SH/BS
SURVEY REACH ID:	TIME: ___:___ AM/PM	PHOTO ID: (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-6(HC-5)	LAT ___° ___' ___" LONG ___° ___' ___" LMK: ___	GPS: (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: 1' tall, held by log, located 25' us 6,

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

Miscellaneous **MI**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-** 1	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK:** ___	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☒ Other: Debris blockage

DESCRIBE: much woody debris in stream

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-** 2(3)	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK:** ___	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☒ Other: ~~debris~~ log blocking stream c

DESCRIBE: causing fish blockage, erosion on RT bank 5' by 15'

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-** 3 (HC-1)	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK:** ___	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: headcut 2'

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

Miscellaneous **MI**

WATERSHED/SUBSHED: Symphony	DATE: 2/12/08	ASSESSED BY: SW/BS
SURVEY REACH ID:	TIME: ___:___ AM/PM	PHOTO ID: (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-7(HC-6) LAT ___° ___' ___" LONG ___° ___' ___" LMK: ___		GPS: (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: 3' tall

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED:	DATE: ___/___/___	ASSESSED BY:
SURVEY REACH ID:	TIME: ___:___ AM/PM	PHOTO ID: (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-8(HC-7) LAT ___° ___' ___" LONG ___° ___' ___" LMK: ___		GPS: (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE:

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED: Symphony	DATE: 2/12/08	ASSESSED BY: SW/BS
SURVEY REACH ID:	TIME: ___:___ AM/PM	PHOTO ID: (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-9(HC-8) LAT ___° ___' ___" LONG ___° ___' ___" LMK: ___		GPS: (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: Headcut - 4' tall, tree holding

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

Miscellaneous **MI**

WATERSHED/SUBSHED: Symphony	**DATE:** 2 / 12 / 08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-10(HC-9)	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK:** ___	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management ☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: 3' tall headcut, small 80-cm boulders holding

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED: Symphony	**DATE:** 2 / 12 / 08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-11(HC-10)	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK:** ___	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management ☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: 2' tall headcut, held by tree

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED: Symphony	**DATE:** 2 / 12 / 08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) MI-12(HC-11)	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK:** ___	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management ☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: 3' tall headcut @ end of spillway

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

Miscellaneous **MI**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-**13(MC-12) **LAT** ___°___'___" **LONG** ___°___'___" **LMK:** ___		**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE: - Stream from road where joins SC-12 stream 2' tall, held by log

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED:	**DATE:** ___/___/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-**___	**LAT** ___°___'___" **LONG** ___°___'___" **LMK:** ___	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE:

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED:	**DATE:** ___/___/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-**___	**LAT** ___°___'___" **LONG** ___°___'___" **LMK:** ___	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE:

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

Impacted Buffer **IB**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID: (*Condition-#*) IB-4	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		**GPS:** (*Unit ID*)
	END **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		

IMPACTED BANK: ☒ LT ☐ RT ☐ Both

REASON INADEQUATE: ☒ Lack of vegetation ☐ Too narrow ☐ Widespread invasive plants ☐ Recently planted ☒ Other: Powerline

LAND USE:	Private	Institutional	Golf Course	Park	Other Public
(*Facing downstream*) LT Bank	☒	☐	☐	☐	☐: Utility
RT Bank	☒	☐	☐	☐	☒: Utility

DOMINANT LAND COVER:	Paved	Bare ground	Turf/lawn	Tall grass	Shrub/scrub	Trees	Other
LT Bank	☐	☐	☐	☒	☐	☐	☐:
RT Bank	☐	☐	☐	☐	☒	☒	☐:

INVASIVE PLANTS: ☐ None ☐ Rare ☐ Partial coverage ☒ Extensive coverage ☐ unknown

STREAM SHADE PROVIDED? ☐ None ☒ Partial ☐ Full

WETLANDS PRESENT? ☒ No ☐ Yes ☐ Unknown

POTENTIAL RESTORATION CANDIDATE ☒ Active reforestation ☐ Greenway design ☐ Natural regeneration ☒ Invasives removal ☐ no ☐ Other:

RESTORABLE AREA

	LT BANK	RT
Length (ft):	721'	
Width (ft):	~80'	

REFORESTATION POTENTIAL: (*Circle #*)

Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting		Impacted area on either public or private land that is presently used for a specific purpose; available area for planting		Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting
(5)	4	3	2	1

POTENTIAL CONFLICTS WITH REFORESTATION ☐ Widespread invasive plants ☐ Potential contamination ☐ Lack of sun ☐ Poor/unsafe access to site ☐ Existing impervious cover ☐ Severe animal impacts (deer, beaver) ☒ Other: UT

NOTES:

Impacted Buffer **IB**

WATERSHED/SUBSHED: Symphony | **DATE:** 2/12/08 | **ASSESSED BY:** SH/BS

SURVEY REACH: | **TIME:** ___:___ AM/PM | **PHOTO ID:** (*Camera-Pic #*) /#

SITE ID: (*Condition-#*) IB- 2

START **LAT** ___ ° ___ ' ___ " **LONG** ___ ° ___ ' ___ " **LMK** _____

END **LAT** ___ ° ___ ' ___ " **LONG** ___ ° ___ ' ___ " **LMK** _____

GPS: (*Unit ID*)

IMPACTED BANK: ☐ LT ☒ RT ☐ Both

REASON INADEQUATE: ☒ Lack of vegetation ☐ Too narrow ☒ Widespread invasive plants ☐ Recently planted ☐ Other:

LAND USE:

(Facing downstream)	Private	Institutional	Golf Course	Park	Other Public
LT Bank	☐	☐	☐	☐	☒ : woods, open space
RT Bank	☒	☐	☐	☐	☐ : utility line overhead

DOMINANT LAND COVER:

	Paved	Bare ground	Turf/lawn	Tall grass	Shrub/scrub	Trees	Other
LT Bank	☐	☐	☐	☑	☐	☒	☐:
RT Bank	☐	☐	☐	☒	☐	☑	☐:

INVASIVE PLANTS: ☐ None ☐ Rare ☐ Partial coverage ☒ Extensive coverage ☐ unknown

STREAM SHADE PROVIDED? ☐ None ☒ Partial ☐ Full | **WETLANDS PRESENT?** ☒ No ☐ Yes ☐ Unknown

POTENTIAL RESTORATION CANDIDATE ☐ Active reforestation ☐ Greenway design ☐ Natural regeneration ☒ Invasives removal ☐ no ☒ Other: plant w/ app. species for utility area

RESTORABLE AREA

	LT BANK	RT
Length (ft):		600'
Width (ft):		~90'

REFORESTATION POTENTIAL: (*Circle #*)

Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting	Impacted area on either public or private land that is presently used for a specific purpose; available area for planting	Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting
5 (4) 3	2	1

POTENTIAL CONFLICTS WITH REFORESTATION ☐ Widespread invasive plants ☐ Potential contamination ☐ Lack of sun ☐ Poor/unsafe access to site ☐ Existing impervious cover ☐ Severe animal impacts (deer, beaver) ☒ Other: utility line

NOTES:

Channel Modification **CM**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SN/BS
SURVEY REACH ID: SN-3	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID: (*Condition-#*) CM-1	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		**GPS:** (*Unit ID*)
	END **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___		

TYPE: ☒ Channelization ☐ Bank armoring ☐ concrete channel ☐ Floodplain encroachment ☐ Other:

MATERIAL:
☐ Concrete ☐ Gabion
☐ Rip Rap ☒ Earthen
☐ Metal
☐ Other:

Does channel have perennial flow? b/c of dam	☑ Yes ☐ No
Is there evidence of sediment deposition?	☐ Yes ☒ No
Is vegetation growing in channel?	☐ Yes ☒ No
Is channel connected to floodplain?	☐ Yes ☒ No

DIMENSIONS:
Height 2 (ft)
Bottom Width 4 (ft)
Top Width: 5 (ft)
Length: 100' (ft)

BASE FLOW CHANNEL
Depth of flow 4 (in)
Defined low flow channel? ☐ Yes ☒ No
% of channel bottom 100 %

ADJACENT STREAM CORRIDOR
Available width LT 1000 (ft) RT 1000 (ft)
Utilities Present? ☒ Yes ☐ No
Fill in floodplain? ☐ Yes ☐ No

POTENTIAL RESTORATION CANDIDATE ☐ Structural repair ☐ Base flow channel creation ☐ Natural channel design ☐ Can't tell ☐ no ☐ De-channelization ☐ Fish barrier removal ☐ Bioengineering

CHANNEL-IZATION SEVERITY: (*Circle #*)	A long section of concrete stream (>500') channel where water is very shallow (<1" deep) with no natural sediments present in the channel.	A moderate length (> 200') ,but channel stabilized and beginning to function as a natural stream channel. Vegetated bars may have formed in channel.	An earthen channel less than 100 ft with good water depth, a natural sediment bottom, and size and shape similar to the unchannelized stream reaches above and below impacted area.
	5	4 3	2 1

NOTES: ds of dam on HCC property

Trash and Debris **TR**

WATERSHED/SUBSHED: Symphony	**DATE:** 3 / 12 / 08	**ASSESSED BY:** SH/BS
SURVEY REACH ID: SR-9	**TIME:**___:___AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **TR-**1	**LAT** ___° ____' ____" **LONG** ___° ____' ____" **LMK** ____	**GPS:** (*Unit ID*)

TYPE:
- ☐ Industrial
- ☒ Commercial
- ☒ Residential

MATERIAL:
- ☒ Plastic
- ☒ Paper
- ☐ Metal
- ☐ Tires
- ☐ Construction
- ☐ Medical
- ☐ Appliances
- ☐ Yard Waste
- ☐ Automotive
- ☐ Other:

SOURCE:
- ☒ Unknown
- ☐ Flooding
- ☒ Illegal dump
- ☐ Local outfall

LOCATION:
- ☐ Stream
- ☒ Riparian Area
  - ☐ Lt bank
  - ☒ Rt bank

LAND OWNERSHIP:
- ☒ Public
- ☐ Unknown
- ☐ Private

AMOUNT (*# Pickup truck loads*): 1

POTENTIAL RESTORATION CANDIDATE ☒ Stream cleanup ☐ Stream adoption segment ☐ Removal/prevention of dumping
☐ no ☐ Other:

If yes for trash or debris removal

EQUIPMENT NEEDED : ☐ Heavy equipment ☒ Trash bags ☐ Unknown

WHO CAN DO IT: ☒ Volunteers ☐ Local Gov ☐ Hazmat Team ☐ Other

DUMPSTER WITHIN 100 FT: ☒ Yes ☐ No ☐ Unknown

CLEAN-UP POTENTIAL: (*Circle #*)

5	4	3	2	1
A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.		A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials	

NOTES: *near middle school

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Trash and Debris **TR**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID: SR(1)	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **TR-** 2	**LAT** ___° _____' _____" **LONG** ___° _____' _____" **LMK** _____	**GPS:** (*Unit ID*)

TYPE:
- ☐ Industrial
- ☑ Commercial
- ☐ Residential

MATERIAL:
- ☑ Plastic
- ☑ Paper
- ☐ Metal
- ☐ Tires
- ☐ Construction
- ☐ Medical
- ☐ Appliances
- ☐ Yard Waste
- ☐ Automotive
- ☐ Other:

SOURCE:
- ☐ Unknown
- ☐ Flooding
- ☑ Illegal dump
- ☐ Local outfall

LOCATION:
- ☐ Stream
- ☑ Riparian Area
  - ☐ Lt bank
  - ☑ Rt bank

LAND OWNERSHIP:
- ☐ Public
- ☐ Unknown
- ☑ Private

AMOUNT (*# Pickup truck loads*): 4

POTENTIAL RESTORATION CANDIDATE ☑ Stream cleanup ☐ Stream adoption segment ☑ Removal/prevention of dumping ☐ no ☐ Other:

If yes for trash or debris removal

EQUIPMENT NEEDED : ☐ Heavy equipment ☑ Trash bags ☐ Unknown

WHO CAN DO IT: ☑ Volunteers ☑ Local Gov ☐ Hazmat Team ☐ Other

DUMPSTER WITHIN 100 FT: ☑ Yes ☐ No ☐ Unknown

CLEAN-UP POTENTIAL: (*Circle #*)

5	4	3	2	1
A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access		A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.		A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials

NOTES: Use HC-3 GPS, tires, all the way to LPP, chairs, wire, rope, plastic etc.

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Trash and Debris **TR**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID: SR-4	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) TR-3(10)	**LAT** ___°___'___" **LONG** ___°___'___" **LMK** ___	**GPS:** (*Unit ID*)

TYPE:
- ☐ Industrial
- ☐ Commercial
- ☐ Residential

MATERIAL:
- ☑ Plastic
- ☑ Paper
- ☑ Metal
- ☑ Tires
- ☐ Construction
- ☐ Medical
- ☑ Appliances
- ☐ Yard Waste
- ☑ Automotive
- ☐ Other:

SOURCE:
- ☐ Unknown
- ☐ Flooding
- ☑ Illegal dump
- ☐ Local outfall

LOCATION:
- ☐ Stream
- ☑ Riparian Area
  - ☑ Lt bank
  - ☑ Rt bank

LAND OWNERSHIP:
- ☑ Public
- ☐ Unknown
- ☐ Private

AMOUNT (*# Pickup truck loads*): ~3

POTENTIAL RESTORATION CANDIDATE ☑ Stream cleanup ☐ Stream adoption segment ☐ Removal/prevention of dumping ☐ no ☐ Other:

If yes for trash or debris removal

EQUIPMENT NEEDED : ☐ Heavy equipment ☑ Trash bags ☐ Unknown

WHO CAN DO IT: ☑ Volunteers ☐ Local Gov ☐ Hazmat Team ☐ Other

DUMPSTER WITHIN 100 FT: ☐ Yes ☐ No ☒ Unknown

CLEAN-UP POTENTIAL: (*Circle #*)

5	4	3	2	1
A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.		A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials	

NOTES: from powerline up to LPP,

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Trash and Debris **TR**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **TR-**4	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ___	**GPS:** (*Unit ID*)

TYPE:
- ☐ Industrial
- ☐ Commercial
- ☐ Residential

MATERIAL:
- ☐ Plastic ☐ Paper ☐ Metal
- ☐ Tires ☐ Construction ☐ Medical
- ☐ Appliances ☐ Yard Waste
- ☒ Automotive ☒ Other: logs, leaves

SOURCE:
- ☐ Unknown
- ☒ Flooding
- ☐ Illegal dump
- ☐ Local outfall

LOCATION:
- ☒ Stream
- ☐ Riparian Area
  - ☐ Lt bank
  - ☐ Rt bank

LAND OWNERSHIP:
- ☒ Public ☐ Unknown
- ☐ Private

AMOUNT (*# Pickup truck loads*): 1-2

POTENTIAL RESTORATION CANDIDATE ☒ Stream cleanup ☐ Stream adoption segment ☐ Removal/prevention of dumping
☐ no ☐ Other:

If yes for trash or debris removal

EQUIPMENT NEEDED : ☒ Heavy equipment ☐ Trash bags ☒ Unknown

WHO CAN DO IT: ☒ Volunteers ☒ Local Gov ☐ Hazmat Team ☐ Other

DUMPSTER WITHIN 100 FT: ☐ Yes ☒ No ☐ Unknown

CLEAN-UP POTENTIAL: (*Circle #*)

5	4	(3)	2	1
A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.		A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials	

NOTES: remove woody blockage + fence, place woody debris in floodplain

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony Stream	**DATE:** 2/12/08	**ASSESSED BY:** SN/BS
SURVEY REACH ID: SR01 **TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID: (*Condition-#*) **SC-** 1	**LAT** 39 ° 12 ' 54 " **LONG** 76 ° 52 ' 26 " **LMK**___	**GPS** (*Unit ID*)

TYPE: ☒ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☐ Box ☐ Elliptical
☒ Circular
☐ Other:

 # BARRELS:
☒ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☒ Concrete
☐ Metal
☐ Other:

ALIGNMENT:
☒ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 20" (ft)
Height: ___ (ft)
Culvert length: 35 (ft)
Width: ___ (ft)
Roadway elevation: 3' (ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☒ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE:
☐ Flat
☒ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☒ Other: too small causing u/s ag

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: ___ (in)
☒ Flow too shallow Water Depth: ___ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
5	4	3	2	1

NOTES/SKETCH:
-another incoming pipe 8in Ø FT 3' from ds end Princeton sport

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony	**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID: SR 10 **TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/# 3694
SITE ID: (*Condition-#*) **SC-** 2 **LAT** ___°___'___" **LONG** ___°___'___" **LMK** ___		**GPS** (*Unit ID*)

TYPE: ☒ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☐ Box ☐ Elliptical
☒ Circular
☐ Other:

 # BARRELS:
☒ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☒ Concrete
☐ Metal
☐ Other:

ALIGNMENT:
☐ Flow-aligned
☒ Not flow-aligned
☐ Do not know
- 2 streams converge

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 48 (ft)
Height: ___ (ft)
Culvert length: ___ (ft)
Width: ___ (ft)
Roadway elevation: ___ (ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☒ Other (*describe*): blocked

CULVERT SLOPE:
☐ Flat
☒ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☒ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☒ Drop too high Water Drop: ___ (in)
☒ Flow too shallow Water Depth: ___ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
5 4	3	2 1

NOTES/SKETCH:
- crosses LPP
- clean up

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony	**DATE:** 2 / 12 / 08	**ASSESSED BY:** SN/BS
SURVEY REACH ID:	**TIME:** ___ : ___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **SC-** 3	**LAT** ___ ° ___ ' ___ " **LONG** ___ ° ___ ' ___ " **LMK** ___	**GPS** (*Unit ID*)

TYPE: ☒ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☐ Box ☐ Elliptical
☒ Circular
☐ Other:

 # BARRELS:
☐ Single
☒ Double
☐ Triple
☐ Other:

MATERIAL:
☒ Concrete
☐ Metal
☐ Other:

ALIGNMENT:
☒ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 18 (ft)
Height: ___ (ft)
Culvert length: 50 (ft)
Width: ___ (ft)
Roadway elevation: ___ (ft)

CONDITION: (*Evidence of...*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE:
☒ Flat
☐ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☒ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: ___ (in)
☐ Flow too shallow Water Depth: ___ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

5	4	3	2	1
A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.	

NOTES/SKETCH:

- brand new culvert, no H_2O us, construction us of culvert,

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SH/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID: (*Condition-#*) **SC-** 4	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK**___		**GPS** (*Unit ID*)

TYPE: [X] Road Crossing [ ] Railroad Crossing [ ] Manmade Dam [ ] Beaver Dam [ ] Geological Formation [ ] Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
- [ ] Arch
- [ ] Bottomless
- [ ] Box
- [ ] Elliptical
- [X] Circular
- [ ] Other:

 # BARRELS:
- [ ] Single
- [X] Double
- [ ] Triple
- [ ] Other:

MATERIAL:
- [X] Concrete
- [ ] Metal
- [ ] Other:

ALIGNMENT:
- [X] Flow-aligned
- [ ] Not flow-aligned
- [ ] Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 48 (ft)
Height: _____(ft)
Culvert length: 100 (ft)
Width: _____(ft)
Roadway elevation: _____(ft)

CONDITION: (*Evidence of...*)
- [ ] Cracking/chipping/corrosion
- [ ] Downstream scour hole
- [X] Sediment deposition ds
- [ ] Failing embankment
- [ ] Other (*describe*):

CULVERT SLOPE:
- [ ] Flat
- [ ] Slight (2° – 5°)
- [ ] Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE [ ] Fish barrier removal [ ] Culvert repair/replacement [ ] Upstream storage retrofit
[ ] no [ ] Local stream repair [ ] Other:

IS SC ACTING AS GRADE CONTROL [ ] No [ ] Yes [ ] Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
- [ ] Total
- [ ] Partial
- [ ] Temporary
- [ ] Unknown

CAUSE:
- [ ] Drop too high Water Drop: _____ (in)
- [ ] Flow too shallow Water Depth:_____ (in)
- [ ] Other:

BLOCKAGE SEVERITY: (*circle #*)

5	4	3	2	1
A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

NOTES/SKETCH:

- plunge pool designed ds, now aggrading due to smaller structure ds

REPORTED TO AUTHORITIES [ ] YES [ ] NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Symphony		**DATE:** 2/12/08	**ASSESSED BY:** SN/BS
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*)	/#
SITE ID: (*Condition-#*) SC-5	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK**___		**GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☒ Other: Path crossing

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☐ Box ☐ Elliptical
☒ Circular
☐ Other:

 # BARRELS:
☒ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☒ Concrete
☐ Metal
☐ Other:

ALIGNMENT:
☒ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 48 (ft)
Height: _____(ft)
Culvert length: 40 (ft)
Width: _____(ft)
Roadway elevation: _____(ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE:
☐ Flat
☐ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: _____ (in)
☐ Flow too shallow Water Depth:_____ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

5	4	3	2	1
A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.		A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

NOTES/SKETCH:

- causing aggradation as cause 2 small

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Appendix E: Field Assessments Photo Log


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LK-R01_DSCF3771.JPG


LK-R01_DSCF3772.JPG


LK-R01_DSCF3773.JPG


LK-R01_DSCF3774.JPG


LK-R01_DSCF3775.JPG


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LK-R01_DSCF3778.JPG


LK-R01_DSCF3779.JPG


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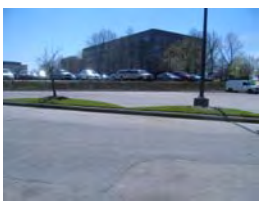
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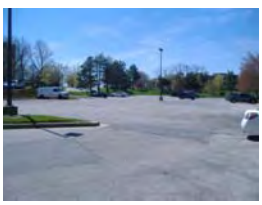
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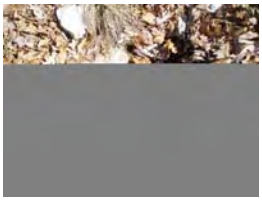
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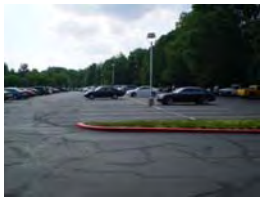
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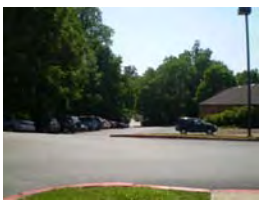
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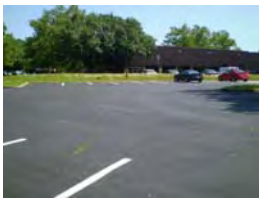
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Appendix F: Stormwater Retrofit Opportunities

Table F-1: Symphony Stream and Lake Kittamaqundi Watersheds Stormwater Retrofit Opportunities

Location	Existing Conditions	Description of Retrofit Opportunity	Type of Treatment Proposed	Drainage Area (acres)	Drainage Area Imperviousness (%)	Target Water Quality Volume (cubic ft)	Total Score	Planning Level Design and Construction Cost Estimate (2007 dollars)
LK-R01 (Watermark Place Condos / Wilde Lake Park)	Two outfalls discharge to an open space between Wilde Lake Dam and Little Patuxent Parkway. Flows are conveyed in downcut channel.	Use berms and excavated depressions to reconnect stream with the floodplain, providing water quality treatment in a forested floodplain wetland.	Wooded Wetlands and Regenerative Stormwater Conveyance (RSC)	8.70	61%	18,920	76	$180,300
LK-R02 (Wilde Lake Park Downstream of Dam)	Storm drains from Hyla Brook Rd and W Running Brook Road pass under open field and discharge directly to stream.	Daylight pipes near toe of roadway embankment and create forested wetland on eastern half of open field. Also, plant trees as a stream buffer.	Wooded Wetlands and RSC	21.40	31%	25,630	78	$226,000
LK-R03 (Intersection of Governor Warfield Parkway and Little Patuxent Parkway)	Storm drains pass large landscaped island at intersection.	Use flow splitter to divert some flows from pipes to landscaped island. Create bioretention cells that tie back to existing yard inlet.	Bioswales	0.40	25%	390	48	$25,000
LK-R04 (One Mall North on Little Patuxent Parkway)	West side of parking lot drains to single storm drain inlet that is upstream of an unutilized swale and depression.	Partially block inlet to divert some flows to the swale. Use swale and depression as bioretention/dry swale.	Bioswales	1.50	71%	3,790	41	$107,800
LK-R05 (Water's Edge Townhomes)	Storm drain conveying flows from Vantage Point Road and associated development discharges directly to Lake Kittamaqundi.	Daylight pipe just downstream of the townhomes and create forested wetland in the space between the sewer lines. Use the adjacent forested wetland as a model.	Wooded Wetlands and RSC	12.20	46%	20,350	71	$188,500
LK-R06 (Townhomes on Vantage Point)	Existing dry pond has no inflowing pipes.	Use flow splitter to divert some flows from pipe parallel to Little Patuxent Parkway into existing dry pond.	Existing Stormwater Basins	3.60	39%	5,210	53	$69,000
LK-R07 (Sheraton Hotel)	Outfall conveying flows from hotel, adjacent parking lot, and commercial areas discharges to channel behind the Sheraton. The channel cuts through an open space with trees and grass before crossing the recreational path and entering Lake Kittamaqundi	Use berms and excavated depressions to spread create a forested wetland.	Wooded Wetlands and RSC	8.50	58%	17,550	81	$166,400
LK-R08 (Sheraton Hotel)	Outfall conveying flows from hotel parking lot and adjacent commercial areas discharges to top of steep streambank.	Use permeable pavement or underground sand filters to provide water quality treatment and partial channel protection control.	Sand Filters and Permeable Pavement	3.40	82%	9,860	46	$748,700
LK-R09 (Parking Lot between Chamber of Commerce and Sheraton Hotel on Little Patuxent Parkway)	Outfall conveying flows from parking lot and commercial areas discharges to top of steep streambank, causing pipe sections to separate and large scour hole and eroded channel.	Either divert flows to pond described in LK-R10 or remove portion of parking lot to create bioretention or created wetland. Use drop inlet to discharge flows at elevation closer to stream and stabilize eroded area.	Bioretention	4.70	53%	8,850	56	$584,400
LK-R10 (Chamber of Commerce Office Building on Little Patuxent Parkway)	Existing pond lacks direct inflow and may or may not have been designed for stormwater management.	Excavate to create depression to discharge 36" pipe to surface. Possibly divert flows from adjacent parking lot described in LK-R09.	Existing Stormwater Basins	6.90	57%	14,030	66	$193,700
LK-R11 (Chamber of Commerce Office Building on Little Patuxent Parkway)	Small portion of Chamber of Commerce parking lot drains to eroded swale via curb cut.	Create bioretention cells to slow and treat runoff between curb cut and tree line.	Bioretention	0.60	53%	1,190	46	$33,900
LK-R12 (10-70 Columbia Corp Center)	Outfall conveying flows from parking deck, adjacent parking lot, and commercial areas discharges to open channel/ existing stormwater facility. The vegetated channel cuts through an open space with trees and grass before passing under Governor Warfield P	Make minor modifications to the extended detention pond to increase the length of its flowpath and enhance water quality treatment. Convert existing landscaped islands into biofiltration practices that will filter stormwater runoff. Add additional landscaping.	Existing Stormwater Basins	6.70	58%	13,750	78	$190,100

Table F-1: Symphony Stream and Lake Kittamaqundi Watersheds Stormwater Retrofit Opportunities

Location	Existing Conditions	Description of Retrofit Opportunity	Type of Treatment Proposed	Drainage Area (acres)	Drainage Area Imperviousness (%)	Target Water Quality Volume (cubic ft)	Total Score	Planning Level Design and Construction Cost Estimate (2007 dollars)
LK-R13 (Columbia Mall)	The east parking structure of the mall appears to drain to the storm sewer system with no stormwater treatment.	Install cisterns or underground storage collection devices within parking structure.	Rainwater Cisterns	1.80	91%	5,560	43	$229,200
LK-R14 (Columbia Mall)	The north parking lot of the mall appears to drain to the storm sewer system with no stormwater treatment.	Convert existing landscaped islands into biofiltration practices that will filter stormwater runoff. Add additional landscaped treatment between parking stalls and along the perimeter of the parking lot.	Bioretention	10.20	82%	28,950	61	$1,432,900
LK-R16 (Columbia Mall)	The roof drains of the AMC Columbia 14 Cinemas building appear to drain to the storm sewer system with no stormwater treatment.	Construct rain gardens in common areas to treat stormwater runoff from commercial building rooftop.	Bioretention	1.70	85%	4,930	54	$243,800
LK-R17 (Vantage House Retirement Community)	Roof drains, a portion of a parking lot, a loading area, and the dumpster storage areas all drain to a storm drain inlet with no stormwater treatment. Another roof drain discharges to a paved area. Runoff from the garage and the entry way drains directly to the storm drain system.	Install underground or perimeter sand filters at the existing inlets in the loading area and entry way. Retrofit a roof drain with a stormwater planter. Direct runoff from the parking garage into cisterns.	Sand Filters	2.00	100%	7,000	38	$259,700
LK-R18 (Glen Meadows)	Runoff from portion of parking lots and roofs drain to a storm drain inlet.	Install a perimeter sand filter at the existing inlet.	Sand Filters	0.60	100%	2,050	51	$74,500
LK-R19 (Glen Meadows)	A dry pond manages runoff from a portion of the Glen Meadows complex. It appears to be for flood control only.	Retrofit the existing dry pond with treatment cells (e.g., regenerative stormwater conveyance) to provide water quality benefits.	Existing Stormwater Basins	1.10	100%	3,730	76	$53,500
LK-R20 (Water's Edge Townhomes)	Runoff from the Water's Edge complex drains to a single inlet in the parking lot and is discharged to a grassy area.	Construct a regenerative stormwater conveyance at the existing outfall.	Wooded Wetlands and RSC	3.80	45%	6,210	76	$57,400
SS-R04 (Howard Community College)	Stormwater runoff from a parking lot and Little Patuxent Parkway has formed eroding drainage channels across a field at Howard County Community College. The eroded sediment is blocking an inadequate drainage system downstream.	Convert the existing drainage channels into vegetated swales with check dams and treatment cells. The swales will serve to infiltrate, filter, and convey stormwater runoff.	Bioswales	10.90	24%	10,490	85	$115,900
SS-R05 (Avalon at Symphony Glen)	A large outfall discharges stormwater runoff from an apartment complex to the riparian corridor. Extensive erosion and downcutting is present.	Develop a wooded wetland area at the existing outfall to treat and manage stormwater runoff from the apartment complex.	Wooded Wetlands and RSC	22.80	38%	32,200	45	$291,700
SS-R06 (Avalon at Symphony Glen)	The roof drains of several apartment buildings drain to common areas covered with turf. The apartment complex parking areas appear to drain to the storm sewer system with no stormwater treatment.	Construct rain gardens in common areas to treat stormwater runoff from apartment building rooftops.	Rain Gardens and Rain Barrels	3.60	100%	12,450	63	$205,400
SS-R07 (Little Patuxent Parkway)	Stormwater runoff from Little Patuxent Parkway flows across the median to a storm drain inlet. The area near the inlet is eroding.	Retrofit the median with a vegetated swale that will convey and filter runoff.	Bioswales	4.10	42%	6,280	68	$243,600
SS-R08 (Howard Community College)	The stream between a building and a parking lot on the Howard County Community College campus is incised with eroding banks and has poor riparian habitat. This is adjacent to a stormwater wetland, which appears to be overgrown and in need of maintenance.	Expand the existing stormwater wetland and create a wooded wetland in the riparian corridor.	Wooded Wetlands and RSC	29.50	39%	42,690	48	$1,284,500

Table F-1: Symphony Stream and Lake Kittamaqundi Watersheds Stormwater Retrofit Opportunities

Location	Existing Conditions	Description of Retrofit Opportunity	Type of Treatment Proposed	Drainage Area (acres)	Drainage Area Imperviousness (%)	Target Water Quality Volume (cubic ft)	Total Score	Planning Level Design and Construction Cost Estimate (2007 dollars)
SS-R09 (Exxon Gas Station)	A gas station appears to drain to the storm sewer system with no stormwater treatment. Numerous pollution producing opportunities were observed, including poorly managed dumpsters, signage for car washing, stained pavement, and outdoor materials storage with no containment.	Numerous restoration and pollution prevention opportunities existing, including the installation of underground sand filters at existing storm sewer inlets and perimeter sand filters across entrance drives; improved dumpster management, and covered storage for outdoor materials.	Sand Filters and Permeable Pavement	1.80	100%	6,120	56	$227,200
SS-R10 (Wilde Lake High School)	Paved drainage swales drain parking lots at the high school.	Convert the paved channels that drain the parking lots into vegetated swales that will filter and convey stormwater runoff.	Bioswales	0.70	100%	2,390	78	$75,700
SS-R12 (Bryant Square Apartment Complex)	The roof drains of several apartment buildings drain to common areas covered with turf. The apartment complex parking areas appear to drain to the storm sewer system with no stormwater treatment.	Develop a wooded wetland area at the existing outfall to treat and manage stormwater runoff from the apartment complex.	Wooded Wetlands and RSC	15.10	21%	12,920	58	$105,800
SS-R15 (Townhomes on College Square)	The roof drains of several townhome buildings drain to onsite areas covered with turf. The apartment complex parking areas appear to drain to the storm sewer system with no stormwater treatment.	Construct rain gardens, permeable pavement, rain barrels in common areas to treat stormwater runoff from apartment building rooftops.	Rain Gardens and Rain Barrels	2.40	28%	2,660	46	$43,900
SS-R16 (Townhomes on College Square)	The roof drains of several townhome buildings drain to onsite areas covered with turf. The apartment complex parking areas appear to drain to the storm sewer system with no stormwater treatment.	Use permeable pavement or perimeter sand filters to provide water quality treatment and runoff reduction.	Sand Filters and Permeable Pavement	2.50	42%	3,920	41	$142,300
SS-R17 (Columbia Mall)	The west parking lot of the mall appears to drain to the storm sewer system with no stormwater treatment.	Convert existing landscaped islands into biofiltration practices that will filter stormwater runoff. Add additional landscaped treatment between parking stalls and along the perimeter of the parking lot.	Bioretention	18.70	71%	46,790	56	$2,315,900
SS-R18 (Wilde Lake Interfaith Center)	The parking lot drains to several storm drain inlets with no apparent treatment.	Retrofit existing landscaped islands with bioretention. Construct new bioretention islands throughout the parking lot.	Bioretention	3.70	70%	9,100	49	$450,500
SS-R19 (Wilde Lake High School)	Runoff from the drop off area and parking lot in front of the school's main entrance drains to two storm drain inlets.	Retrofit the existing storm drain inlets with perimeter or underground sand filters.	Sand Filters	1.80	47%	3,030	58	$110,000
SS-R20 (Wilde Lake High School)	Runoff from a portion of the parking lot on the northeast side of the school drains to a storm drain inlet, which is adjacent to a landscaped island.	Create a bioretention area within the existing landscaped island.	Bioretention	1.40	51%	2,640	51	$130,800
SS-R21 (Wilde Lake High School)	Runoff from a portion of the parking lot on the east side of the school drains to a storm drain inlet.	Retrofit the existing storm drain inlets with perimeter or underground sand filters.	Sand Filters	1.00	77%	2,730	63	$99,200
SS-R22 (Wilde Lake High School)	Internal roof drains direct stormwater runoff directly to the underground storm drains. A grassy slope is adjacent to the school on the southeast side of the school.	Externalize the roof drains and construct a terraced bioretention to treat stormwater runoff.	Bioretention	0.50	65%	1,060	41	$70,100
SS-R23 (Wilde Lake High School)	A paved area drains to a concrete swale, which flows directly to a storm drain inlet.	Convert the concrete swale into a vegetated swale that will filter and convey stormwater runoff.	Bioswales	0.40	100%	1,430	78	$45,200
SS-R24 (Wilde Lake High School)	The dumpster storage area and a portion of the parking lot on the west side of the school drain to a storm drain inlet.	Retrofit the existing storm drain inlets with perimeter or underground sand filters.	Sand Filters	0.20	100%	590	58	$30,000
SS-R25 (Wilde Lake High School)	A major storm drain runs under the athletic fields on the south side of the school and discharges to Symphony Stream.	Daylight the storm drain and construct a small wooded wetlands or extended detention basin to manage stormwater runoff.	Wooded Wetlands and RSC	37.60	36%	51,000	65	$459,000

Table F-1: Symphony Stream and Lake Kittamaqundi Watersheds Stormwater Retrofit Opportunities

Location	Existing Conditions	Description of Retrofit Opportunity	Type of Treatment Proposed	Drainage Area (acres)	Drainage Area Imperviousness (%)	Target Water Quality Volume (cubic ft)	Total Score	Planning Level Design and Construction Cost Estimate (2007 dollars)
SS-R26 (Wilde Lake Middle School)	Runoff from the parking lot and dumpster area drains to a storm drain inlet, which is adjacent to a grassy area.	Create a bioretention area or rain garden in the grassy area. Cover the existing inlet and direct stormwater runoff to the treatment area.	Bioretention	0.30	39%	480	65	$15,000
SS-R27 (Wilde Lake Middle School)	An external roof drain on the school discharges to a grassy area.	Create a bioretention area or rain garden in the grassy area to treat runoff from the roof drain.	Bioretention	0.60	47%	1,110	65	$20,000
SS-R28 (Wilde Lake Middle School)	Runoff from the road leading to the school drains to a storm drain inlet, which is adjacent to a grassy area.	Create a bioretention area or rain garden in the grassy area to treat runoff from the road.	Bioretention	0.40	50%	680	58	$28,800
SS-R29 (Century Plaza Office Building)	Runoff from the parking lot and roof drains to storm drain inlets with no apparent treatment.	Redesign the parking lot to incorporate stormwater treatment practices. These may include bioretention islands, permeable pavement, reduced impervious cover, perimeter sand filters, and increased perimeter landscaping.	Bioretention	6.40	69%	15,590	36	$1,029,300
SS-R30 (Princeton Sports and Neighboring Businesses)	Runoff from the parking lot and dumpster areas behind Princeton Sports and the neighboring business drain to a storm drain inlet, which then discharges directly to Symphony Stream.	Construct a large bioretention cell to treat runoff. This may require removal of paved areas and loss of parking.	Bioretention	1.80	57%	3,770	23	$248,900
SS-R31 (Patuxent Publishing Company)	A large portion of the parking lot drains to storm drain inlets with no obvious stormwater treatment.	Construct bioretention areas in existing landscaped islands throughout the parking lot to provide treatment.	Bioretention	1.00	60%	2,260	44	$111,600
SS-R32 (Columbia Professional Center)	The parking lot drains to storm drain inlets with no obvious stormwater treatment.	Construct bioretention areas in existing landscaped islands throughout the parking lot to provide treatment.	Bioretention	1.70	66%	3,860	44	$191,100
SS-R33 (Office Building at the intersection of Little Patuxent Parkway and Harpers Farm Road)	Runoff from the parking lot drains to three storm drain inlets.	Construct perimeter or underground sand filters at the existing storm drain inlets.	Sand Filters	2.00	71%	4,900	38	$178,000
SS-R34 (Governor Warfield Parkway)	Stormwater runoff from Governor Warfield Parkway flows across the median to a storm drain inlet.	Retrofit the median with a vegetated swale that will convey and filter runoff.	Bioswales	3.00	47%	5,200	68	$201,700
SS-R36 (Firestone)	Runoff from the parking lot and service area behind Firestone drain to two storm drain inlets.	Construct bioretention practices adjacent to the existing storm drain inlets	Bioretention	1.50	71%	3,820	46	$189,200
SS-R37 (The Bluffs at Hawthorn)	The parking lot at the complex drains to two storm drain inlets.	Construct perimeter or underground sand filers at the existing storm drain inlets.	Sand Filters	2.40	59%	5,050	30	$383,800

Appendix G: Stormwater Retrofit Ranking Data

Table G-1: Symphony Stream and Lake Kittamaqundi Watersheds Stormwater Retrofit Ranking Data

Total Score	Location	Type of Treatment	Water Quality, TP			Water Quality, TSS			Recharge		Water Quantity		Feasibility					Visibility		Cost		
			Normalized Annual TP Load Removed (lbs/ac/yr)		Score	Normalized Annual TSS Load Removed (lbs/ac/yr)		Score		Score		Score	Ownership	Access	Utility Conflicts	Overall Feasibility	Score		Score	Planning Level Cost / Impervious Acre Treated (2007 dollars)		Score
85	SS-R04 Howard Community College	Bioswales	0.15	Medium	10	101	Low	5	Yes	15	Possible	15	Private	Good	No	High	15	High	10	$44,400.00	Low	15
81	LK-R07 Sheraton Hotel	Wooded Wetlands and RSC	0.63	High	15	190	Medium	10	Possible	8	Possible	15	Private	OK	Possible	Medium	8	High	10	$33,900.00	Low	15
78	LK-R02 Wilde Lake Park Downstream of Dam	Wooded Wetlands and RSC	0.36	Medium	10	109	Low	5	Possible	8	Possible	15	Private	Good	No	High	15	High	10	$34,000.00	Low	15
78	LK-R12 10-70 Columbia Corp Center	Existing Stormwater Basins	0.25	Medium	10	189	Medium	10	Possible	8	Possible	15	Private	Good	Possible	High	15	Medium	5	$49,500.00	Low	15
78	SS-R10 Wilde Lake High School	Bioswales	0.53	High	15	363	High	15	Yes	15	No	0	Public	Good	No	High	15	High	10	$109,000.00	Medium	8
78	SS-R23 Wilde Lake High School	Bioswales	0.51	High	15	347	High	15	Yes	15	No	0	Public	Good	No	High	15	High	10	$109,100.00	Medium	8
76	LK-R01 Watermark Place Condos / Wilde Lake Park	Wooded Wetlands and RSC	0.67	High	15	201	High	10	Possible	8	Possible	15	Private	OK	No	Medium	8	Medium	5	$34,000.00	Low	15
76	LK-R19 Glen Meadows	Existing Stormwater Basins	1.06	High	15	320	High	15	Possible	8	Possible	15	Private	Poor	No	Medium	8	Low	0	$49,500.00	Low	15
76	LK-R20 Water's Edge Townhomes	Wooded Wetlands and RSC	0.51	High	15	153	Medium	10	Possible	8	Possible	15	Private	OK	Possible	Medium	8	Medium	5	$33,900.00	Low	15
71	LK-R05 Water's Edge Townhomes	Wooded Wetlands and RSC	0.51	High	15	153	Medium	10	Possible	8	Possible	15	Private	OK	Yes	Medium	8	Low	0	$33,900.00	Low	15
68	SS-R07 Little Patuxent Parkway	Bioswales	0.24	Medium	10	162	Medium	10	Yes	15	No	0	Public	Good	No	High	15	High	10	$143,700.00	Medium	8
68	SS-R34 Governor Warfield Parkway	Bioswales	0.26	Medium	10	180	Medium	10	Yes	15	No	0	Public	Good	No	High	15	High	10	$141,600.00	Medium	8
66	LK-R10 Chamber of Commerce Office Building on Little Patuxent Parkway	Existing Stormwater Basins	0.25	Medium	10	188	Medium	10	Possible	8	Possible	15	Private	Poor	Yes	Medium	8	Low	0	$ 49,500.00	Low	15
65	SS-R25 Wilde Lake High School	Wooded Wetlands and RSC	0.41	Medium	10	124	Low	5	No	0	Possible	15	Public	Good	No	High	15	Medium	5	$34,000.00	Low	15
65	SS-R26 Wilde Lake Middle School	Bioretention	0.04	Low	5	105	Low	5	Yes	15	No	0	Public	Good	No	High	15	High	10	$64,900.00	Low	15

Table G-1: Symphony Stream and Lake Kittamaqundi Watersheds Stormwater Retrofit Ranking Data

Total Score	Location	Type of Treatment	Water Quality, TP			Water Quality, TSS			Recharge		Water Quantity		Feasibility					Visibility		Cost		
			Normalized Annual TP Load Removed (lbs/ac/yr)		Score	Normalized Annual TSS Load Removed (lbs/ac/yr)		Score		Score		Score	Ownership	Access	Utility Conflicts	Overall Feasibility	Score		Score	Planning Level Cost / Impervious Acre Treated (2007 dollars)		Score
65	SS-R27 Wilde Lake Middle School	Bioretention	0.05	Low	5	126	Low	5	Yes	15	No	0	Public	Good	No	High	15	High	10	$60,200.00	Low	15
63	SS-R06 Avalon at Symphony Glen	Rain Gardens and Rain Barrels	0.10	Low	5	269	High	15	Yes	15	No	0	Private	Good	No	Medium	8	Medium	5	$56,900.00	Low	15
63	SS-R21 Wilde Lake High School	Sand Filters	0.97	High	15	295	High	15	No	0	No	0	Public	Good	Possible	High	15	High	10	$127,100.00	Medium	8
61	LK-R14 Columbia Mall	Bioretention	0.09	Low	5	223	High	15	Possible	8	No	0	Private	Good	Possible	High	15	High	10	$172,700.00	Medium	8
58	SS-R12 Bryant Square Apartment Complex	Wooded Wetlands and RSC	0.26	Medium	10	78	Low	5	No	0	Possible	15	Private	OK	Possible	Medium	8	Medium	5	$34,000.00	Low	15
58	SS-R19 Wilde Lake High School	Sand Filters	0.64	High	15	195	Medium	10	No	0	No	0	Public	Good	Possible	High	15	High	10	$132,600.00	Medium	8
58	SS-R24 Wilde Lake High School	Sand Filters	1.47	High	15	447	High	15	No	0	No	0	Public	Good	Possible	High	15	Medium	5	$125,000.00	Medium	8
58	SS-R28 Wilde Lake Middle School	Bioretention	0.06	Low	5	148	Low	5	Yes	15	No	0	Public	Good	Possible	High	15	High	10	$153,300.00	Medium	8
56	LK-R09 Parking Lot between Chamber of Commerce and Sheraton Hotel on Little Patuxent Parkway	Bioretention	0.06	Low	5	151	Medium	10	Possible	8	Possible	15	Private	OK	Possible	Medium	8	High	10	$238,300.00	High	0
56	SS-R09 Exxon Gas Station	Sand Filters and Permeable Pavement	1.27	High	15	388	High	15	No	0	No	0	Private	Good	Possible	Medium	8	High	10	$128,000.00	Medium	8
56	SS-R17 Columbia Mall	Bioretention	0.08	Low	5	195	Medium	10	Possible	8	No	0	Private	Good	Possible	High	15	High	10	$174,400.00	Medium	8
54	LK-R16 Columbia Mall	Bioretention	0.09	Low	5	237	High	15	Possible	8	No	0	Private	OK	Possible	Medium	8	High	10	$172,300.00	Medium	8
53	LK-R06 Townhomes on Vantage Point	Existing Stormwater Basins	0.17	Medium	10	131	Low	5	Possible	8	Possible	15	Private	Poor	Yes	Low	0	Low	0	$49,500.00	Low	15
51	LK-R18 Glen Meadows	Sand Filters	1.27	High	15	385	High	15	No	0	No	0	Private	Good	Possible	Medium	8	Medium	5	$125,200.00	Medium	8
51	SS-R20 Wilde Lake High School	Bioretention	0.06	Low	5	142	Low	5	Possible	8	No	0	Public	Good	Possible	High	15	High	10	$179,300.00	Medium	8
49	SS-R18 Wilde Lake Interfaith Center	Bioretention	0.08	Low	5	194	Medium	10	Possible	8	No	0	Private	Good	Possible	Medium	8	High	10	$174,500.00	Medium	8

Table G-1: Symphony Stream and Lake Kittamaqundi Watersheds Stormwater Retrofit Ranking Data

Total Score	Location	Type of Treatment	Water Quality, TP			Water Quality, TSS			Recharge		Water Quantity		Feasibility					Visibility		Cost		
			Normalized Annual TP Load Removed (lbs/ac/yr)		Score	Normalized Annual TSS Load Removed (lbs/ac/yr)		Score		Score		Score	Ownership	Access	Utility Conflicts	Overall Feasibility	Score		Score	Planning Level Cost / Impervious Acre Treated (2007 dollars)		Score
48	LK-R03 Intersection of Governor Warfield Parkway and Little Patuxent Parkway	Bioswales	0.16	Medium	10	107	Low	5	Possible	8	No	0	Public	Poor	Yes	Low	0	High	10	$45,000.00	Low	15
48	SS-R08 Howard Community College	Wooded Wetlands and RSC	0.44	Medium	10	132	Low	5	No	0	Possible	15	Private	OK	No	Low	0	High	10	$112,400.00	Medium	8
46	LK-R08 Sheraton Hotel	Sand Filters and Permeable Pavement	1.03	High	15	314	High	15	Possible	8	No	0	Private	OK	Possible	Medium	8	Low	0	$264,800.00	High	0
46	LK-R11 Chamber of Commerce Office Building on Little Patuxent Parkway	Bioretention	0.06	Low	5	145	Low	5	Possible	8	No	0	Private	Good	Possible	High	15	Medium	5	$102,800.00	Medium	8
46	SS-R15 Townhomes on College Square	Rain Gardens and Rain Barrels	0.03	Low	5	86	Low	5	Possible	8	No	0	Private	OK	Possible	Medium	8	Medium	5	$64,500.00	Low	15
46	SS-R36 Firestone	Bioretention	0.07	Low	5	192	Medium	10	Possible	8	No	0	Private	Good	No	High	15	Low	0	$174,400.00	Medium	8
45	SS-R05 Avalon at Symphony Glen	Wooded Wetlands and RSC	0.43	Medium	10	129	Low	5	No	0	Possible	15	Private	Poor	No	Low	0	Low	0	$34,000.00	Low	15
44	SS-R31 Patuxent Publishing Company	Bioretention	0.06	Low	5	162	Medium	10	Possible	8	No	0	Private	Good	Possible	Medium	8	Medium	5	$176,500.00	Medium	8
44	SS-R32 Columbia Professional Center	Bioretention	0.07	Low	5	187	Medium	10	Possible	8	No	0	Private	Good	Possible	Medium	8	Medium	5	$175,400.00	Medium	8
43	LK-R13 Columbia Mall	Rainwater Cisterns	0.20	Medium	10	42	Low	5	No	0	Possible	15	Private	Poor	Possible	Low	0	Medium	5	$143,000.00	Medium	8
41	LK-R04 One Mall North on Little Patuxent Parkway	Bioswales	0.37	Medium	10	256	High	15	Possible	8	No	0	Private	Poor	Yes	Low	0	Low	0	$100,300.00	Medium	8
41	SS-R16 Townhomes on College Square	Sand Filters and Permeable Pavement	0.56	High	15	171	Medium	10	Possible	8	No	0	Private	OK	Possible	Low	0	Low	0	$134,300.00	Medium	8
41	SS-R22 Wilde Lake High School	Bioretention	0.08	Low	5	194	Medium	10	Possible	8	No	0	Public	Good	Possible	Medium	8	High	10	$234,300.00	High	0
38	LK-R17 Vantage House Retirement Community	Sand Filters	1.24	High	15	377	High	15	No	0	No	0	Private	OK	Possible	Low	0	Low	0	$128,000.00	Medium	8

Table G-1: Symphony Stream and Lake Kittamaqundi Watersheds Stormwater Retrofit Ranking Data

Total Score	Location	Type of Treatment	Water Quality, TP			Water Quality, TSS			Recharge		Water Quantity		Feasibility					Visibility		Cost		
			Normalized Annual TP Load Removed (lbs/ac/yr)		Score	Normalized Annual TSS Load Removed (lbs/ac/yr)		Score		Score		Score	Ownership	Access	Utility Conflicts	Overall Feasibility	Score		Score	Planning Level Cost / Impervious Acre Treated (2007 dollars)		Score
38	SS-R33 Office Building at the intersection of Little Patuxent Parkway and Harpers Farm Road	Sand Filters	0.94	High	15	285	High	15	No	0	No	0	Private	Good	Possible	Low	0	Low	0	$127,800.00	Medium	8
36	SS-R29 Century Plaza Office Building	Bioretention	0.07	Low	5	189	Medium	10	Possible	8	No	0	Private	Good	Possible	Medium	8	Medium	5	$233,100.00	High	0
30	SS-R37 The Bluffs at Hawthorn	Sand Filters	0.76	High	15	232	High	15	No	0	No	0	Private	OK	Possible	Low	0	Low	0	$271,500.00	High	0
23	SS-R30 Princeton Sports and Neighboring Businesses	Bioretention	0.06	Low	5	157	Medium	10	Possible	8	No	0	Private	OK	Possible	Low	0	Low	0	$236,500.00	High	0

Appendix H: Riparian Corridor Restoration Opportunities

Table H-1: Symphony Stream and Lake Kittamaqundi Watersheds Riparian Corridor Restoration Opportunities

Location	Existing Conditions	Description of Restoration Opportunity	Restoration Opportunity	Total Reach Length (feet)	Specific Opportunities					Priority	Planning Level Design and Construction Cost Estimate (2007 dollars)
					Floodplain Reconnection (square feet)	Riparian Buffer (square feet)	Stream Restoration (linear feet)	Bank Stabilization (linear feet)	Regenerative Stormwater Conveyance (linear feet)		
LK-S1 (Wilde Lake Park Downstream of Dam)	Poor riparian buffer on both sides of the stream below the Wilde Lake Dam, poor connection to available floodplain, gabion lined channel.	Planting the riparian buffer on both banks will improve habitat. Replace gabion baskets with natural channel design.	Riparian buffer enhancement	500	N/A	82,800	N/A	N/A	N/A	Not Ranked	$ 100,000
SS-S1 (Howard County Community College)	Poor riparian zone, frequent headcuts, downstream end entrenched. Stream opening under footbridge is blocked.	Expanding the floodplain expansion and enhancing the riparian buffer along this section of the stream will help to stabilize the headcuts, improve the understory layer of vegetation, and could be used as an outdoor learning center for the community college.	Floodplain reconnection, riparian buffer enhancement	660	10,290	38,810	N/A	N/A	N/A	6	$ 190,200
SS-S2 (Symphony Stream Corridor)	Straightened and entrenched, some large debris jams; a low flow channel is forming within the larger channel, wide riparian buffer.	Reconnecting the stream to its floodplain and introducing sinuosity to the stream will help reduce bank erosion.	Floodplain reconnection, riparian buffer enhancement, stream restoration	450	26,800	46,880	320	N/A	N/A	2	$ 389,700
SS-S3 (Symphony Stream Corridor)	Poor riparian buffer on the right side of the stream, good step/pool morphology, poor connection to available floodplain.	Improving the riparian buffer on the right bank will improve habitat. Reconnecting the stream to the floodplain will increase the area available for floodplain storage while improving in-stream habitat.	Floodplain reconnection, riparian buffer enhancement, stream restoration	500	3,280	35,830	350	N/A	N/A	3	$ 424,000
SS-S4 (Symphony Stream Corridor)	Straightened and entrenched channel, possible aggradation from undersized pipe located downstream.	Reconnecting the stream to the floodplain and restoring the natural meanders of the stream will result in improved habitat and diversity.	Floodplain reconnection, stream restoration	440	23,580	N/A	400	N/A	N/A	4	$ 366,500
SS-S5 (Symphony Stream Corridor)	Anamorphous channel, wooded wetland, eroding banks on upper left side, large amounts of trash present, disconnected upstream culvert and failing drainage from Little Patuxent Parkway.	Performing an outfall retrofit at the upstream culvert and stabilizing the banks will help reduce downstream velocities and subsequent bank scour. Opportunities also exist for a trash cleanup that will help to improve the overall appearance of the area.	Bank stabilization	860	N/A	N/A	N/A	190	N/A	5	$ 90,200
SS-S6 (Symphony Stream Corridor)	Entrenched and undersized channel, lots of bank erosion, over-wide channel, presence of trash.	Constructing a regenerative stormwater conveyance will reconnect the stream to the floodplain, raise the groundwater table, and help improve stormwater runoff from the upstream outfall.	Bank stabilization, regenerative stormwater conveyance	1,460	N/A	N/A	N/A	80	1,250	1	$ 457,500
SS-S7 (Symphony Stream Corridor)	Good step pool morphology, floodplain on right constrained due to sewer line, poor buffer on right, entrenched.	Lowering the floodplain on the right bank will allow more frequent out-of-bank events, diminishing velocities and improving bank scour downstream of this entrenched section.	Floodplain reconnection, riparian buffer enhancement	420	11,170	11,940	N/A	N/A	N/A	8	$ 131,400
SS-S8 (Symphony Stream Corridor)	Over-wide channel developing new planform with channel banks, bank erosion, potential for exposed sewer lines within channel bottom.	Restoring the channel will result in reduced downstream sediment loads and improved in-stream habitat.	Stream restoration	800	N/A	N/A	800	N/A	N/A	7	$ 387,400
SS-S10 (Symphony Stream Corridor)	Entrenched channel, some bank erosion.	Stabilizing eroding banks and headcuts on the left side of the valley will reduce sediment loads downstream.	Bank stabilization	700	N/A	N/A	N/A	40	N/A	9	$ 29,400

Appendix I: Methodology for Determining Annual Pollutant Load Estimates

This appendix sets forth the methodology used to develop pollutant loads estimates for the Symphony Stream and the Lake Kittamaqundi watersheds. Total suspended solids (TSS) and/or Total Phosphorus (TP) serve as the keystone pollutants in this analysis, as these are the typical pollutants of concern cited and used by both MDE and the Critical Areas stormwater programs. Biohabitats also developed current with retrofit implementation pollutant load estimates for each of the watersheds.

Step 1. Quantify the current TP and TSS annual loads from the watersheds.

This step uses the Simple Method (Schueler, 1987) to quantify the TP and TSS pollutant loads from the watersheds. The Simple Method is a technique used for estimating storm pollutant export delivered from urban areas. It is used in the *Critical Area 10% Rule Guidance Manual* to determine phosphorus loading for a site. The specific assumptions set forth for Maryland in the *Critical Area 10% Rule Guidance Manual* are used in this methodology.

Pollutant loading (L, in pounds per year) can be determined by solving the equation displayed in Box 1A.

Box 1A: The Simple Method Pollutant Loading Calculation

Pollutant Loading, $L = [(P)(Pj)(Rv)/12] (C) (A) (2.72)$

Where:

L	=	Annual pollutant loading (lbs/year)
P	=	Rainfall depth over the desired time interval (inches)
Pj	=	Fraction of rainfall events that produce runoff
Rv	=	Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff = 0.05 + 0.009 (I)
I	=	Imperviousness (i.e., I = 75 if site is 75% impervious)
C	=	Flow-weighted mean concentration of the pollutant in urban runoff (mg/l)
A	=	Area (acres)

12 and 2.72 are unit conversion factors

Maryland specific assumptions set forth in the *Critical Area 10% Rule Guidance Manual* include:

- P = 40 inches
- Pj = 0.90

Using these assumptions, the equation displayed in Box 1A may be simplified as displayed in Box 1B.

Box 1B: Simplified Pollutant Loading Calculation

Pollutant Loading, L = (Rv) (C) (A) (8.16)

Where:

- L = Annual pollutant loading (lbs/year)
- Rv = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff = 0.05 + 0.009 (I)
- I = Imperviousness (i.e., I = 75 if site is 75% impervious)
- C = Flow-weighted mean concentration of the pollutant in urban runoff (mg/l)
- A = Area (acres)
- 8.16 is a regional constant and unit conversion factor

Specific assumptions for applying the Simple Method to the Symphony Stream and Lake Kittamaqundi watersheds for this analysis:

- Flow-weighted mean concentration for TP, C = 0.27 mg/L, per Pitt et al., 2004
- Flow-weighted mean concentration for TSS, C = 58 mg/L, per Pitt et al., 2004
- For Symphony Stream watershed, Area, A = 728 acres
- For Symphony Stream watershed, Imperviousness, I = 27
- For Lake Kittamaqundi watershed, Area, A = 273 acres
- For Lake Kittamaqundi watershed, Imperviousness, I = 42

The resultant current TP and TSS annual loadings from the watersheds are displayed in Boxes 1C and 1D.

Box 1C: Current TP and TSS Annual Loading for the Symphony Stream Watershed

Annual TP Loading, L_{TP} = (Rv) (C) (A) (8.16)

Where:

- L_{TP} = Annual TP loading (lbs/year)
- Rv = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff = 0.05 + 0.009 (I) = 0.29
- I = Site imperviousness = 27
- C = Flow-weighted mean concentration of TP in runoff (mg/l) = 0.27 mg/L
- A = Area = 728 acres
- 8.16 is a regional constant and unit conversion factor

Therefore:

Annual TP loading = (0.29) (0.27 mg/L) (728 acres) (8.16)

Annual TP loading = 465 lbs/year

Annual TSS Loading, L_{TSS} = (Rv) (C) (A) (8.16)

Where:

- L_{TSS} = Annual TSS loading (lbs/year)
- Rv = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff = 0.05 + 0.009 (I) = 0.29
- I = Site imperviousness = 27
- C = Flow-weighted mean concentration of TSS in runoff (mg/l) = 58 mg/L
- A = Area = 728 acres
- 8.16 is a regional constant and unit conversion factor

Therefore:

Annual TSS loading = (0.29) (58 mg/L) (728 acres) (8.16)

Annual TSS loading = 99,919 lbs/year

Box 1D: Current TP and TSS Annual Loading for the Lake Kittamaqundi Watershed	
Annual TP Loading, L_{TP} = (Rv) (C) (A) (8.16) Where: L_{TP} = Annual TP loading (lbs/year) Rv = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff = 0.05 + 0.009 (I) = 0.43 I = Site imperviousness = 42 C = Flow-weighted mean concentration of TP in runoff (mg/l) = 0.27 mg/L A = Area = 273 acres 8.16 is a regional constant and unit conversion factor Therefore: Annual TP loading = (0.43) (0.27 mg/L) (273 acres) (8.16) **Annual TP loading = 259 lbs/year**	Annual TSS Loading, L_{TSS} = (Rv) (C) (A) (8.16) Where: L_{TSS} = Annual TSS loading (lbs/year) Rv = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff = 0.05 + 0.009 (I) = 0.43 I = Site imperviousness = 42 C = Flow-weighted mean concentration of TSS in runoff (mg/l) = 58 mg/L A = Area = 273 acres 8.16 is a regional constant and unit conversion factor Therefore: Annual TSS loading = (0.43) (58 mg/L) (273 acres) (8.16) **Annual TSS loading = 55,558 lbs/year**

Step 2. Compute targeted TP and TSS load that may be removed through implementation of stormwater retrofits.

The annual pollutant load reduction that may be achieved through the implementation of stormwater retrofits is computed through a four-step process for each individual retrofit, described below.

2.1 Compute the pre-retrofit (e.g., post-development) annual pollutant load from the retrofit contributing drainage area

The pre-retrofit (e.g., post-development) annual pollutant load from the retrofit contributing drainage area is computed using the equation and assumptions used to compute the current annual pollutant loads from the watersheds, described in Step 1 (above). However, drainage area and imperviousness is unique to each retrofit.

2.2 Estimate the retrofit pollutant removal efficiency

The pollutant removal efficiency for each retrofit was estimated using median published removal efficiencies in Schueler, et al., 2007.

2.3 Compute the post-retrofit annual pollutant load

The post-retrofit annual pollutant load is computed by applying the removal efficiency to the pre-retrofit annual pollutant load.

2.4 Compute the pollutant load reduction of the retrofit

The annual pollutant load reduction for each retrofit is calculated by subtracting the post-retrofit annual pollutant load from the pre-retrofit annual pollutant load.

The results of conducting these computations for each stormwater retrofit are displayed in Tables 1 through 4.

Table 1: Potential Annual TSS Load Reductions Associated with Stormwater Retrofits in the Symphony Stream Watershed									
Location	**Stormwater Treatment Option[1]**	**Drainage Area (ac)**	**Imperviousness (%)**	**Runoff Coefficient, Rv**	**TSS Removal Efficiency[2] (%)**	**Flow-weighted Mean Concentration of TSS (mg/L)**	**Post-development Annual TSS Load (lbs/year)**	**Post-retrofit Annual TSS Load (lbs/year)**	**Annual TSS Load Removed by Retrofit (lbs/year)**
SS-R04 Howard Community College	Swale	10.90	24%	0.27	80	58	1,374	275	1,099
SS-R05 Avalon at Symphony Glen	Constructed Wetland	22.80	38%	0.39	70	58	4,205	1,262	2,944
SS-R06 Avalon at Symphony Glen	Bioretention	3.60	100%	0.95	60	58	1,619	647	971
SS-R07 Little Patuxent Parkway	Swale	4.10	42%	0.43	80	58	825	165	660
SS-R08 Howard Community College	Constructed Wetland	29.50	39%	0.40	70	58	5,575	1,672	3,902
SS-R09 Exxon Gas Station	Stormwater Filter	1.80	100%	0.95	85	58	809	121	688
SS-R10 Wilde Lake High School	Swale	0.70	100%	0.95	80	58	315	63	252
SS-R12 Bryant Square Apartment Complex	Constructed Wetland	15.10	21%	0.24	70	58	1,685	505	1,179
SS-R15 Townhomes on College Square	Bioretention	2.40	28%	0.30	60	58	345	138	207
SS-R16 Townhomes on College Square	Stormwater Filter	2.50	42%	0.43	85	58	506	76	430
SS-R17 Columbia Mall	Bioretention	18.70	71%	0.69	60	58	6,093	2,437	3,656
SS-R18 Wilde Lake Interfaith Center	Bioretention	3.70	70%	0.68	60	58	1,193	477	716
SS-R19 Wilde Lake High School	Stormwater Filter	1.80	47%	0.47	85	58	403	61	343
SS-R20 Wilde Lake High School	Bioretention	1.40	51%	0.51	60	58	338	135	203
SS-R21 Wilde Lake High School	Stormwater Filter	1.00	77%	0.74	85	58	352	53	299

Table 1: Potential Annual TSS Load Reductions Associated with Stormwater Retrofits in the Symphony Stream Watershed									
Location	**Stormwater Treatment Option[1]**	**Drainage Area (ac)**	**Imperviousness (%)**	**Runoff Coefficient, Rv**	**TSS Removal Efficiency[2] (%)**	**Flow-weighted Mean Concentration of TSS (mg/L)**	**Post-development Annual TSS Load (lbs/year)**	**Post-retrofit Annual TSS Load (lbs/year)**	**Annual TSS Load Removed by Retrofit (lbs/year)**
SS-R22 Wilde Lake High School	Bioretention	0.50	65%	0.63	60	58	150	60	90
SS-R23 Wilde Lake High School	Swale	0.40	100%	0.95	80	58	180	36	144
SS-R24 Wilde Lake High School	Stormwater Filter	0.20	100%	0.95	85	58	90	13	76
SS-R25 Wilde Lake High School	Constructed Wetland	37.60	36%	0.37	70	58	6,642	1,993	4,650
SS-R26 Wilde Lake Middle School	Bioretention	0.30	39%	0.40	60	58	57	23	34
SS-R27 Wilde Lake Middle School	Bioretention	0.60	47%	0.47	60	58	135	54	81
SS-R28 Wilde Lake Middle School	Bioretention	0.40	50%	0.50	60	58	94	38	56
SS-R29 Century Plaza Office Building	Bioretention	6.40	69%	0.67	60	58	2,025	810	1,215
SS-R30 Princeton Sports and Neighboring Businesses	Bioretention	1.80	57%	0.56	60	58	481	192	288
SS-R31 Patuxent Publishing Company	Bioretention	1.00	60%	0.59	60	58	281	113	169
SS-R32 Columbia Professional Center	Bioretention	1.70	66%	0.64	60	58	516	206	310
SS-R33 Office Building at the intersection of Little Patuxent Parkway and Harpers Farm Road	Stormwater Filter	2.00	71%	0.69	85	58	655	98	556
SS-R34 Governor Warfield Parkway	Swale	3.00	47%	0.48	80	58	677	135	542
SS-R36 Firestone	Bioretention	1.50	71%	0.69	60	58	489	195	293

Table 1: Potential Annual TSS Load Reductions Associated with Stormwater Retrofits in the Symphony Stream Watershed									
Location	**Stormwater Treatment Option[1]**	**Drainage Area (ac)**	**Imperviousness (%)**	**Runoff Coefficient, Rv**	**TSS Removal Efficiency[2] (%)**	**Flow-weighted Mean Concentration of TSS (mg/L)**	**Post-development Annual TSS Load (lbs/year)**	**Post-retrofit Annual TSS Load (lbs/year)**	**Annual TSS Load Removed by Retrofit (lbs/year)**
SS-R37 The Bluffs at Hawthorn	Stormwater Filter	2.40	59%	0.58	85	58	657	99	558

Notes:
1. Refers to stormwater treatment option in Schueler, et al., 2007, that is used to determined pollutant removal efficiency.
2. Uses the median pollutant removal efficiency identified for the stormwater treatment option in Schueler, et al., 2007.

Table 2: Potential Annual TSS Load Reductions Associated with Stormwater Retrofits in the Lake Kittamaqundi Watershed									
Stormwater Retrofit ID Location	**Stormwater Treatment Option**	**Drainage Area (ac)**	**Imperviousness (%)**	**Runoff Coefficient, Rv**	**TSS Removal, Median (%)**	**Post-dev C-TSS (mg/L)**	**Post-dev TSS Load (lbs/year)**	**Post-retrofit TSS Load (lbs/year)**	**Annual TSS Load Removed (lbs/year)**
LK-R01 Watermark Place Condos / Wilde Lake Park	Constructed Wetland	8.70	61%	0.60	70	58	2,481	744	1,737
LK-R02 Wilde Lake Park Downstream of Dam	Constructed Wetland	21.40	31%	0.33	70	58	3,339	1,002	2,337
LK-R03 Intersection of Governor Warfield Parkway and Little Patuxent Parkway	Swale	0.40	25%	0.28	80	58	52	10	42
LK-R04 One Mall North on Little Patuxent Parkway	Swale	1.50	71%	0.69	80	58	487	97	390
LK-R05 Water's Edge Townhomes	Constructed Wetland	12.20	46%	0.46	70	58	2,660	798	1,862
LK-R06 Townhomes on Vantage Point	Extended Detention	3.60	39%	0.40	70	58	676	203	473
LK-R07 Sheraton Hotel	Constructed Wetland	8.50	58%	0.57	70	58	2,297	689	1,608
LK-R08 Sheraton Hotel	Stormwater Filter	3.40	82%	0.79	85	58	1,271	191	1,080

Table 2: Potential Annual TSS Load Reductions Associated with Stormwater Retrofits in the Lake Kittamaqundi Watershed

Stormwater Retrofit ID Location	Stormwater Treatment Option	Drainage Area (ac)	Imperviousness (%)	Runoff Coefficient, Rv	TSS Removal, Median (%)	Post-dev C-TSS (mg/L)	Post-dev TSS Load (lbs/year)	Post-retrofit TSS Load (lbs/year)	Annual TSS Load Removed (lbs/year)
LK-R09 Parking Lot between Chamber of Commerce and Sheraton Hotel on Little Patuxent Parkway	Bioretention	4.70	53%	0.52	60	58	1,167	467	700
LK-R10 Chamber of Commerce Office on Little Patuxent Parkway	Extended Detention	6.90	57%	0.56	70	58	1,842	553	1,289
LK-R11 Chamber of Commerce Office on Little Patuxent Parkway	Bioretention	0.60	53%	0.53	60	58	150	60	90
LK-R12 10-70 Columbia Corp Center	Extended Detention	6.70	58%	0.57	70	58	1,804	541	1,262
LK-R13 Columbia Mall	Best professional judgment[3]	1.80	91%	0.87	10	58	742	667	74
LK-R14 Columbia Mall	Bioretention	10.20	82%	0.78	60	58	3,785	1,514	2,271
LK-R16 Columbia Mall	Bioretention	1.70	85%	0.82	60	58	657	263	394
LK-R17 Vantage House Retirement Community	Stormwater Filter	2.00	100%	0.95	85	58	899	135	764
LK-R18 Glen Meadows	Stormwater Filter	0.60	100%	0.95	85	58	270	40	229
LK-R19 Glen Meadows	Constructed Wetland	1.10	100%	0.95	70	58	495	148	346
LK-R20 Water's Edge Townhomes	Constructed Wetland	3.80	45%	0.46	70	58	819	246	573

Notes:
1. Refers to stormwater treatment option in Schueler, et al., 2007, that is used to determined pollutant removal efficiency.
2. Uses the median pollutant removal efficiency identified for the stormwater treatment option in Schueler, et al., 2007.
3. Assumes pollutant reduction benefit is based on runoff reduction; assumes potential runoff reduction 10%.

Table 3: Potential Annual TP Load Reductions Associated with Stormwater Retrofits in the Symphony Stream Watershed

Location	Stormwater Treatment Option[1]	Drainage Area (ac)	Imperviousness (%)	Runoff Coefficient, Rv	TP Removal Efficiency[2] (%)	Flow-weighted Mean Concentration of TP (mg/L)	Post-development Annual TP Load (lbs/year)	Post-retrofit Annual TP Load (lbs/year)	Annual TP Load Removed by Retrofit (lbs/year)
SS-R04 Howard Community College	Swale	10.90	24%	0.27	25	0.27	6	5	2
SS-R05 Avalon at Symphony Glen	Constructed Wetland	22.80	38%	0.39	50	0.27	20	10	10
SS-R06 Avalon at Symphony Glen	Bioretention	3.60	100%	0.95	5	0.27	8	7	0
SS-R07 Little Patuxent Parkway	Swale	4.10	42%	0.43	25	0.27	4	3	1
SS-R08 Howard Community College	Constructed Wetland	29.50	39%	0.40	50	0.27	26	13	13
SS-R09 Exxon Gas Station	Stormwater Filter	1.80	100%	0.95	60	0.27	4	2	2
SS-R10 Wilde Lake High School	Swale	0.70	100%	0.95	25	0.27	1	1	0
SS-R12 Bryant Square Apartment Complex	Constructed Wetland	15.10	21%	0.24	50	0.27	8	4	4
SS-R15 Townhomes on College Square	Bioretention	2.40	28%	0.30	5	0.27	2	2	0
SS-R16 Townhomes on College Square	Stormwater Filter	2.50	42%	0.43	60	0.27	2	1	1
SS-R17 Columbia Mall	Bioretention	18.70	71%	0.69	5	0.27	28	27	1
SS-R18 Wilde Lake Interfaith Center	Bioretention	3.70	70%	0.68	5	0.27	6	5	0
SS-R19 Wilde Lake High School	Stormwater Filter	1.80	47%	0.47	60	0.27	2	1	1
SS-R20 Wilde Lake High School	Bioretention	1.40	51%	0.51	5	0.27	2	1	0
SS-R21 Wilde Lake High School	Stormwater Filter	1.00	77%	0.74	60	0.27	2	1	1

Table 3: Potential Annual TP Load Reductions Associated with Stormwater Retrofits in the Symphony Stream Watershed									
Location	**Stormwater Treatment Option[1]**	**Drainage Area (ac)**	**Imperviousness (%)**	**Runoff Coefficient, Rv**	**TP Removal Efficiency[2] (%)**	**Flow-weighted Mean Concentration of TP (mg/L)**	**Post-development Annual TP Load (lbs/year)**	**Post-retrofit Annual TP Load (lbs/year)**	**Annual TP Load Removed by Retrofit (lbs/year)**
SS-R22 Wilde Lake High School	Bioretention	0.50	65%	0.63	5	0.27	1	1	0
SS-R23 Wilde Lake High School	Swale	0.40	100%	0.95	25	0.27	1	1	0
SS-R24 Wilde Lake High School	Stormwater Filter	0.20	100%	0.95	60	0.27	0.42	0.17	0.25
SS-R25 Wilde Lake High School	Constructed Wetland	37.60	36%	0.37	50	0.27	31	15	15
SS-R26 Wilde Lake Middle School	Bioretention	0.30	39%	0.40	5	0.27	0	0	0
SS-R27 Wilde Lake Middle School	Bioretention	0.60	47%	0.47	5	0.27	1	1	0
SS-R28 Wilde Lake Middle School	Bioretention	0.40	50%	0.50	5	0.27	0	0	0
SS-R29 Century Plaza Office Building	Bioretention	6.40	69%	0.67	5	0.27	9	9	0
SS-R30 Princeton Sports and Neighboring Businesses	Bioretention	1.80	57%	0.56	5	0.27	2	2	0
SS-R31 Patuxent Publishing Company	Bioretention	1.00	60%	0.59	5	0.27	1	1	0
SS-R32 Columbia Professional Center	Bioretention	1.70	66%	0.64	5	0.27	2	2	0
SS-R33 Office Building at the intersection of Little Patuxent Parkway and Harpers Farm Road	Stormwater Filter	2.00	71%	0.69	60	0.27	3	1	2
SS-R34 Governor Warfield Parkway	Swale	3.00	47%	0.48	25	0.27	3	2	1
SS-R36 Firestone	Bioretention	1.50	71%	0.69	5	0.27	2	2	0

Table 3: Potential Annual TP Load Reductions Associated with Stormwater Retrofits in the Symphony Stream Watershed									
Location	**Stormwater Treatment Option[1]**	**Drainage Area (ac)**	**Imperviousness (%)**	**Runoff Coefficient, Rv**	**TP Removal Efficiency[2] (%)**	**Flow-weighted Mean Concentration of TP (mg/L)**	**Post-development Annual TP Load (lbs/year)**	**Post-retrofit Annual TP Load (lbs/year)**	**Annual TP Load Removed by Retrofit (lbs/year)**
SS-R37 The Bluffs at Hawthorn	Stormwater Filter	2.40	59%	0.58	60	0.27	3	1	2

Notes:
1. Refers to stormwater treatment option in Schueler, et al., 2007, that is used to determined pollutant removal efficiency.
2. Uses the median pollutant removal efficiency identified for the stormwater treatment option in Schueler, et al., 2007.

Table 4: Potential Annual TP Load Reductions Associated with Stormwater Retrofits in the Lake Kittamaqundi Watershed									
Location	**Stormwater Treatment Option[1]**	**Drainage Area (ac)**	**Imperviousness (%)**	**Runoff Coefficient, Rv**	**TP Removal Efficiency[2] (%)**	**Flow-weighted Mean Concentration of TP (mg/L)**	**Post-development Annual TP Load (lbs/year)**	**Post-retrofit Annual TP Load (lbs/year)**	**Annual TP Load Removed by Retrofit (lbs/year)**
LK-R01 Watermark Place Condos / Wilde Lake Park	Constructed Wetland	8.70	61%	0.60	50	0.27	12	6	6
LK-R02 Wilde Lake Park Downstream of Dam	Constructed Wetland	21.40	31%	0.33	50	0.27	16	8	8
LK-R03 Intersection of Governor Warfield Parkway and Little Patuxent Parkway	Swale	0.40	25%	0.28	25	0.27	0	0	0
LK-R04 One Mall North on Little Patuxent Parkway	Swale	1.50	71%	0.69	25	0.27	2	2	1
LK-R05 Water's Edge Townhomes	Constructed Wetland	12.20	46%	0.46	50	0.27	12	6	6
LK-R06 Townhomes on Vantage Point	Extended Detention	3.60	39%	0.40	20	0.27	3	3	1
LK-R07 Sheraton Hotel	Constructed Wetland	8.50	58%	0.57	50	0.27	11	5	5
LK-R08 Sheraton Hotel	Stormwater Filter	3.40	82%	0.79	60	0.27	6	2	4

Table 4: Potential Annual TP Load Reductions Associated with Stormwater Retrofits in the Lake Kittamaqundi Watershed

Location	Stormwater Treatment Option[1]	Drainage Area (ac)	Imperviousness (%)	Runoff Coefficient, Rv	TP Removal Efficiency[2] (%)	Flow-weighted Mean Concentration of TP (mg/L)	Post-development Annual TP Load (lbs/year)	Post-retrofit Annual TP Load (lbs/year)	Annual TP Load Removed by Retrofit (lbs/year)
LK-R09 Parking Lot between Chamber of Commerce and Sheraton Hotel on Little Patuxent Parkway	Bioretention	4.70	53%	0.52	5	0.27	5	5	0
LK-R10 Chamber of Commerce Office on Little Patuxent Parkway	Extended Detention	6.90	57%	0.56	20	0.27	9	7	2
LK-R11 Chamber of Commerce Office on Little Patuxent Parkway	Bioretention	0.60	53%	0.53	5	0.27	1	1	0
LK-R12 10-70 Columbia Corp Center	Extended Detention	6.70	58%	0.57	20	0.27	8	7	2
LK-R13 Columbia Mall	Best professional judgment[3]	1.80	91%	0.87	10	0.27	3	3	0
LK-R14 Columbia Mall	Bioretention	10.20	82%	0.78	5	0.27	18	17	1
LK-R16 Columbia Mall	Bioretention	1.70	85%	0.82	5	0.27	3	3	0
LK-R17 Vantage House Retirement Community	Stormwater Filter	2.00	100%	0.95	60	0.27	4	2	3
LK-R18 Glen Meadows	Stormwater Filter	0.60	100%	0.95	60	0.27	1	1	1
LK-R19 Glen Meadows	Constructed Wetland	1.10	100%	0.95	50	0.27	2	1	1
LK-R20 Water's Edge Townhomes	Constructed Wetland	3.80	45%	0.46	50	0.27	4	2	2

Notes:
1. Refers to stormwater treatment option in Schueler, et al., 2007, that is used to determined pollutant removal efficiency.
2. Uses the median pollutant removal efficiency identified for the stormwater treatment option in Schueler, et al., 2007.
3. Assumes pollutant reduction benefit is based on runoff reduction; assumes potential runoff reduction 10%.

Summary

The results of this modeling effort are summarized in Tables 5 and 6.

Table 5: Annual TP Loading Under Various Scenarios in the Symphony Stream and Lake Kittamaqundi Watersheds		
	Symphony Stream Watershed	Lake Kittamaqundi Watershed
Current Annual TP Load	465 lbs/year	259 lbs/year
Potential Annual TP Load That May be Removed through Stormwater Retrofitting	59 lbs/year	41 lbs/year

Table 6: Annual TSS Loading Under Various Scenarios in the Symphony Stream and Lake Kittamaqundi Watersheds		
	Symphony Stream Watershed	Lake Kittamaqundi Watershed
Current Annual TSS Load	99,919 lbs/year	55,558 lbs/year
Potential Annual TP Load That May be Removed through Stormwater Retrofitting	26,612 lbs/year	17,523 lbs/year

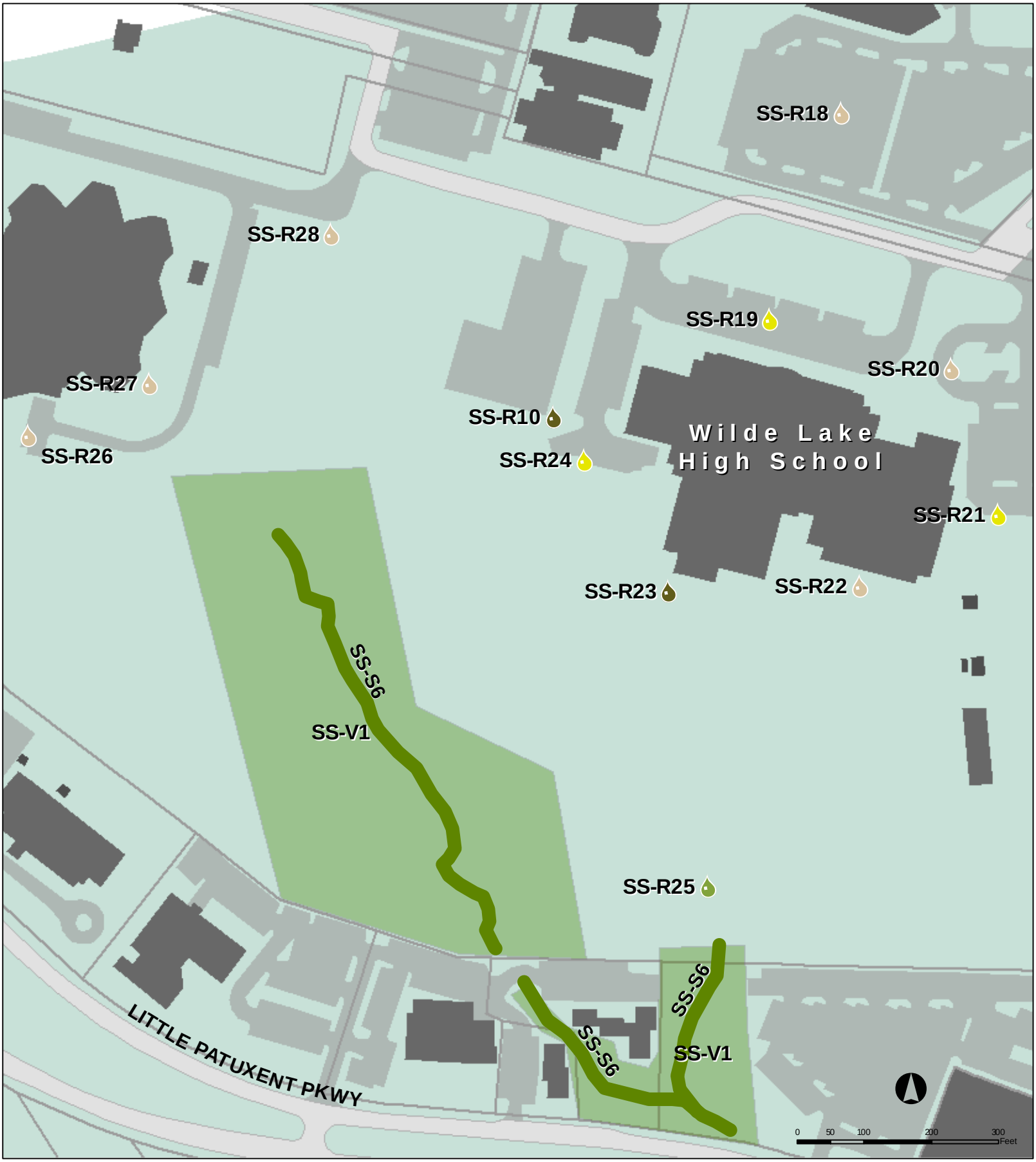
References and Resources

Pitt, R., A. Maestre, and R. Morquecho. 2004. The National Stormwater Quality Database (NSQD), Version 1.1. University of Alabama. Tuscaloosa, AL

Schueler, T. 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban Best Management Practices. Department of Environmental Programs. Metropolitan Washington Council of Governments. Washington, D.C.

Schueler, T., D. Hirschman, M. Novotney, and J. Zielinski. 2007. Urban Subwatershed Restoration Manual No. 3: Urban Stormwater Retrofit Practices. Center for Watershed Protection, Inc. Ellicott City, MD.

Appendix J: Symphony Stream and Lake Kittamaqundi Watershed Restoration Strategy Implementation Maps



September 2008

Map 3-1: Symphony Stream Watershed Implementation Strategy, Stage 1
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management

Water Quality Best Management Practice

- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Riparian Corridor Restoration

- Riparian Corridor Restoration

Vegetation Management Opportunity

- Integrated Vegetation Management

Watershed Boundaries

- Lake Kittamaqundi
- Symphony

Surface Water

- Ponds/Lakes/Dams
- Streams

Planimetrics

- Property
- Roads
- Parking Lots
- Buildings

September 2008

Map 3-2: Symphony Stream Watershed Implementation Strategy, Stage 2
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management
Water Quality Best Management Practice
- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

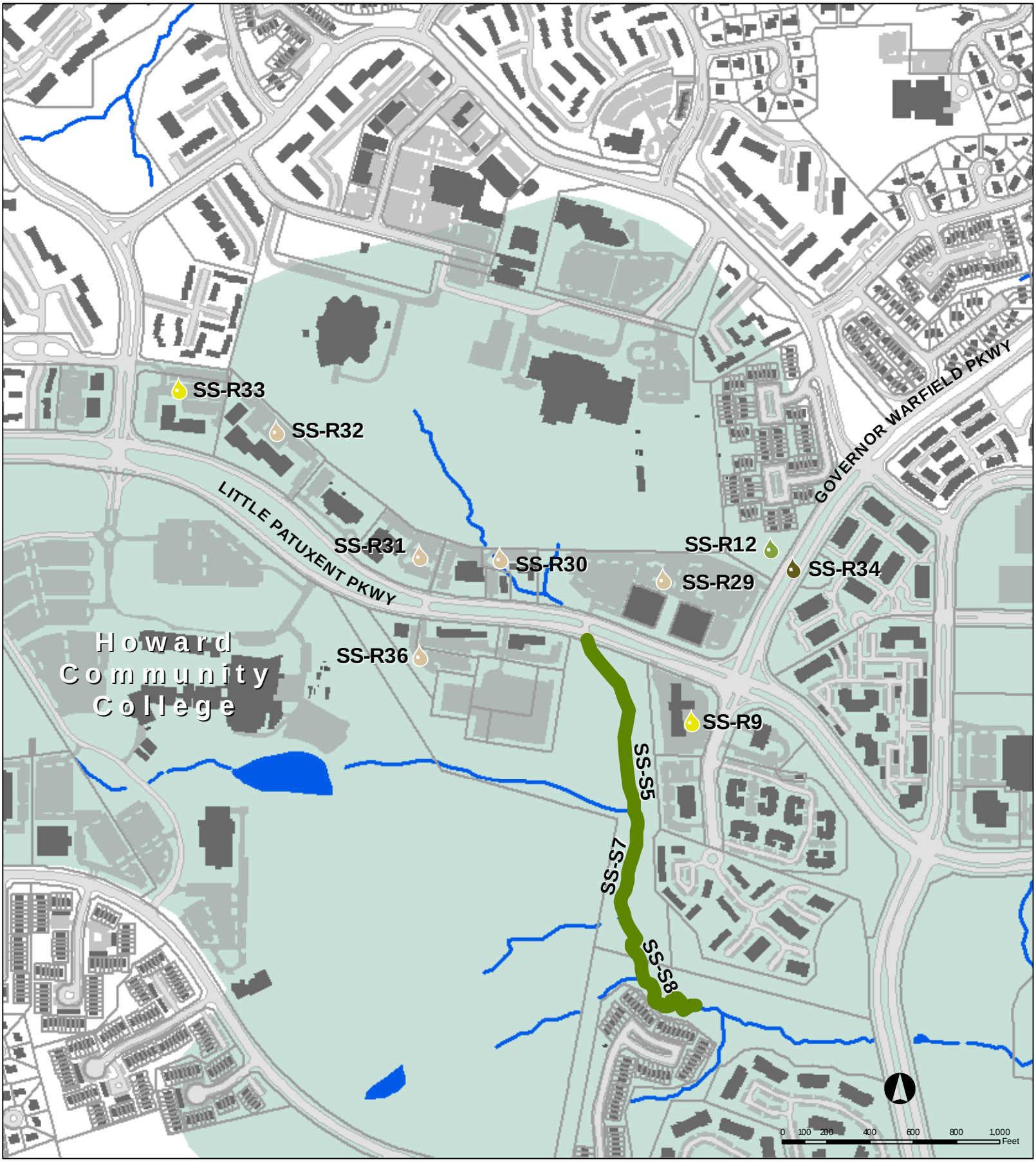
Riparian Corridor Restoration
- Riparian Corridor Restoration

Vegetation Management Opportunity
- Integrated Vegetation Management

Watershed Boundaries
- Lake Kittamaqundi
- Symphony

Surface Water
- Ponds/Lakes/Dams
- Streams

Planimetrics
- Property
- Roads
- Parking Lots
- Buildings



September 2008

Map 3-3: Symphony Stream Watershed Implementation Strategy, Stage 3
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management
Water Quality Best Management Practice
- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

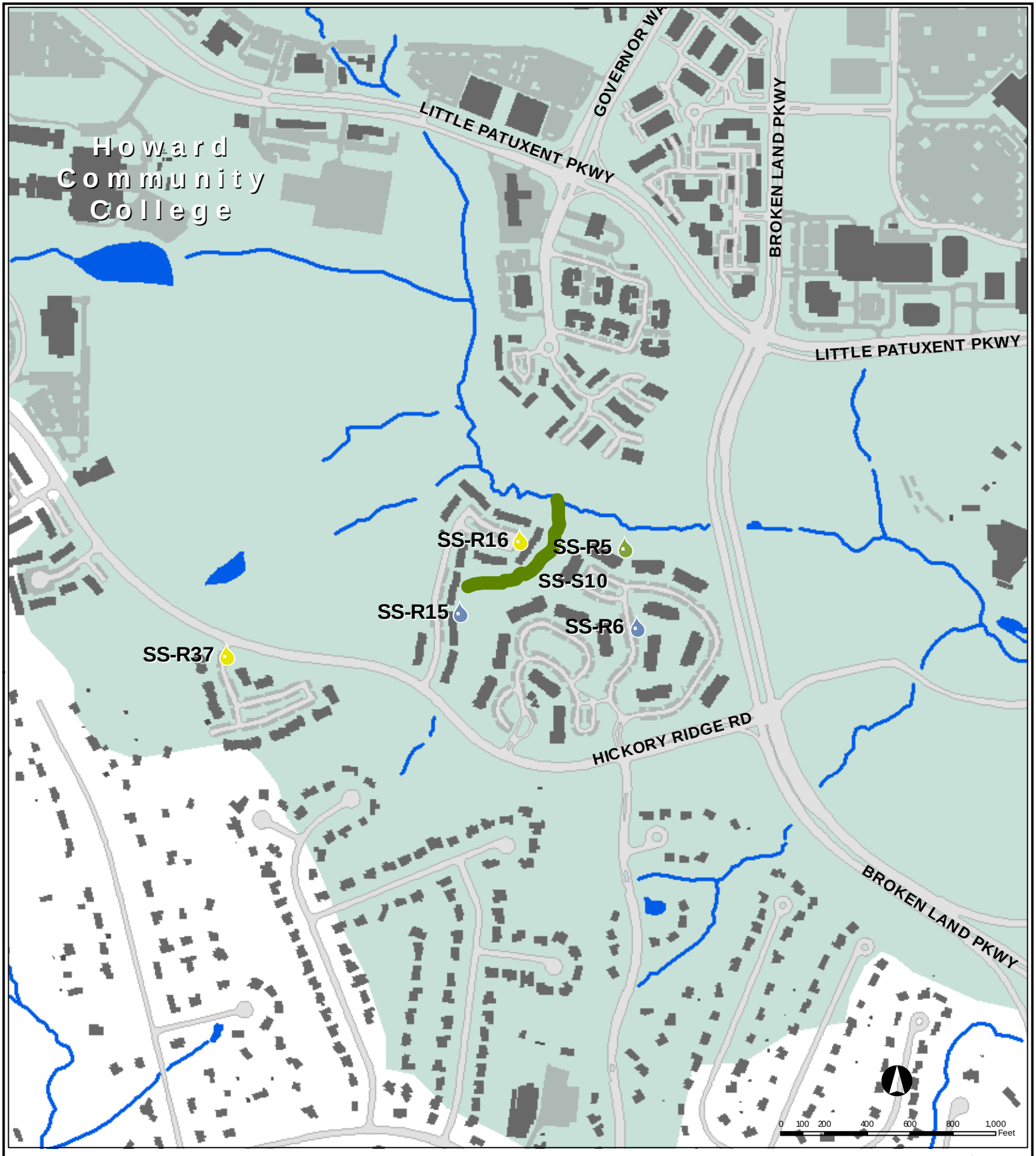
Riparian Corridor Restoration
- Riparian Corridor Restoration

Vegetation Management Opportunity
- Integrated Vegetation Management

Watershed Boundaries
- Lake Kittamaqundi
- Symphony

Surface Water
- Ponds/Lakes/Dams
- Streams

Planimetrics
- Property
- Roads
- Parking Lots
- Buildings



September 2008

Map 3-4: Symphony Stream Watershed Implementation Strategy, Stage 4
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management
Water Quality Best Management Practice
- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

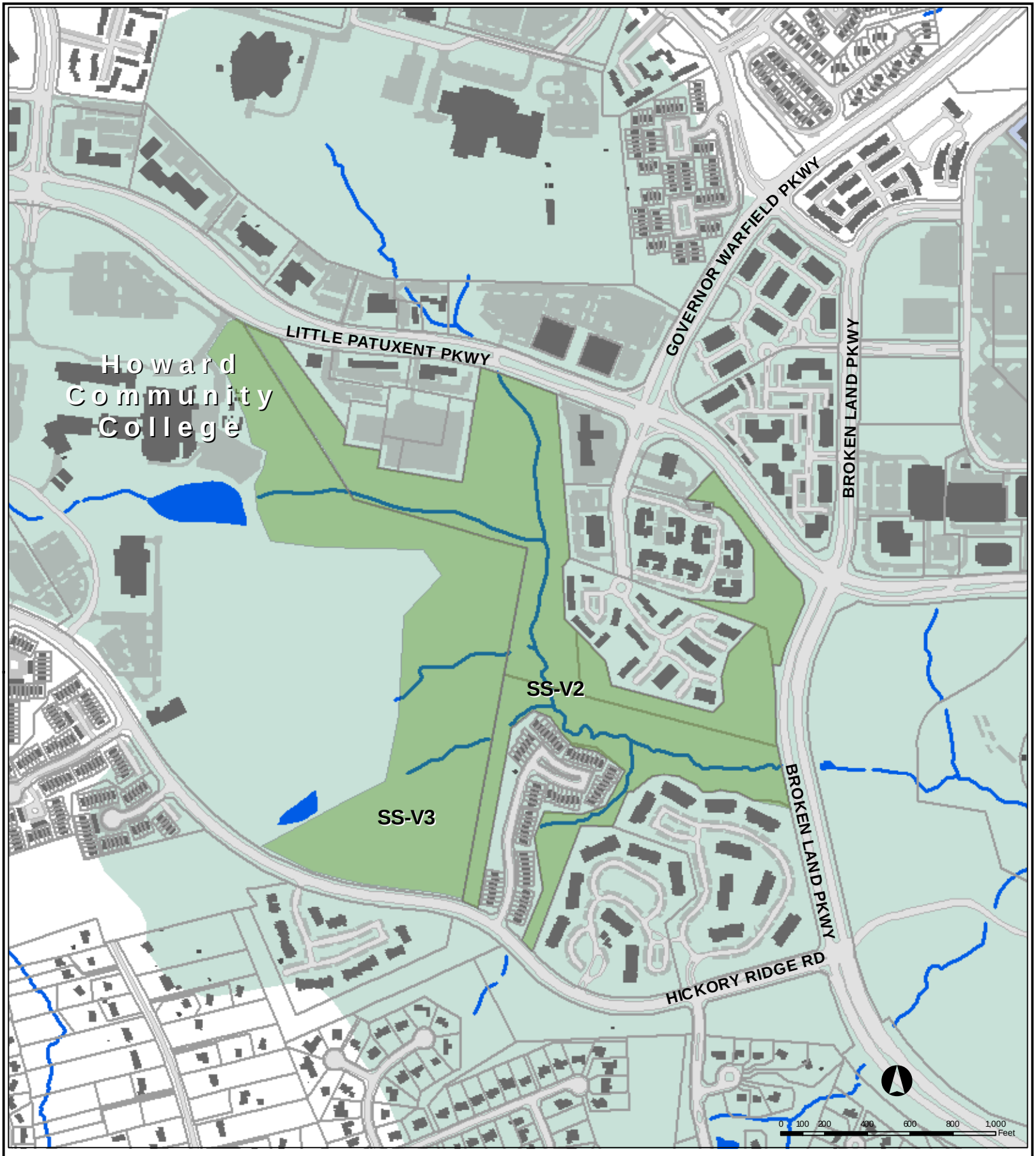
Riparian Corridor Restoration
- Riparian Corridor Restoration

Vegetation Management Opportunity
- Integrated Vegetation Management

Watershed Boundaries
- Lake Kittamaqundi
- Symphony

Surface Water
- Ponds/Lakes/Dams
- Streams

Planimetrics
- Property
- Roads
- Parking Lots
- Buildings



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Map 3-5: Symphony Stream Watershed Implementation Strategy, Stage 5
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management
Water Quality Best Management Practice
- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Riparian Corridor Restoration
- Riparian Corridor Restoration

Vegetation Management Opportunity
- Integrated Vegetation Management

Watershed Boundaries
- Lake Kittamaqundi
- Symphony

Surface Water
- Ponds/Lakes/Dams
- Streams

Planimetrics
- Property
- Roads
- Parking Lots
- Buildings

September 2008

Map 3-6: Symphony Stream Watershed Implementation Strategy, Stage 6
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management
Water Quality Best Management Practice
- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Riparian Corridor Restoration
- Riparian Corridor Restoration

Vegetation Management Opportunity
- Integrated Vegetation Management

Watershed Boundaries
- Lake Kittamaqundi
- Symphony

Surface Water
- Ponds/Lakes/Dams
- Streams

Planimetrics
- Property
- Roads
- Parking Lots
- Buildings

September 2008

Map 3-7: Lake Kittamaqundi Watershed Implementation Strategy, Stage 1
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management
Water Quality Best Management Practice
- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Riparian Corridor Restoration
- Riparian Corridor Restoration

Vegetation Management Opportunity
- Integrated Vegetation Management

Watershed Boundaries
- Lake Kittamaqundi
- Symphony

Surface Water
- Ponds/Lakes/Dams
- Streams

Planimetrics
- Property
- Roads
- Parking Lots
- Buildings

September 2008

Map 3-8: Lake Kittamaqundi Watershed Implementation Strategy, Stage 2
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management

Water Quality Best Management Practice

- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Riparian Corridor Restoration

- Riparian Corridor Restoration

Vegetation Management Opportunity

- Integrated Vegetation Management

Watershed Boundaries

- Lake Kittamaqundi
- Symphony

Surface Water

- Ponds/Lakes/Dams
- Streams

Planimetrics

- Property
- Roads
- Parking Lots
- Buildings

September 2008

Map 3-9: Lake Kittamaqundi Watershed Implementation Strategy, Stage 3
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management

Water Quality Best Management Practice

- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Riparian Corridor Restoration

- Riparian Corridor Restoration

Vegetation Management Opportunity

- Integrated Vegetation Management

Watershed Boundaries

- Lake Kittamaqundi
- Symphony

Surface Water

- Ponds/Lakes/Dams
- Streams

Planimetrics

- Property
- Roads
- Parking Lots
- Buildings

September 2008

Map 3-10: Lake Kittamaqundi Watershed Implementation Strategy, Stage 4
Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management
Water Quality Best Management Practice
- Existing Stormwater Basins
- Bioswales
- Bioretention
- Rain Gardens and Rain Barrels
- Rainwater Cisterns
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance

Riparian Corridor Restoration
- Riparian Corridor Restoration

Vegetation Management Opportunity
- Integrated Vegetation Management

Watershed Boundaries
- Lake Kittamaqundi
- Symphony

Surface Water
- Ponds/Lakes/Dams
- Streams

Planimetrics
- Property
- Roads
- Parking Lots
- Buildings