

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:



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Table of Contents

| Executive Summary | |
|--|--|
| Preface | |
| Section 1.0Symphony Stream and Lake Kittamaqundi Watersheds71.1Introduction to the Watersheds71.2Complementary Efforts and Activities in the Watersheds9 | |
| Section 2.0Riparian Corridor and Stormwater Retrofit Assessments152.1Introduction to the Assessments152.2Stormwater Retrofit Assessment152.3Riparian Corridor Assessment17 | |
| Section 3.0Watershed Planning and Restoration Recommendations213.1Overview of Planning and Restoration Opportunities213.2Upland Stormwater Retrofit Opportunities213.3Riparian Corridor Restoration Opportunities263.4Integrated Vegetation Management Opportunities273.5Watershed Restoration Implementation Strategy29 | |
| Section 4.0 Annual Pollutant Load Estimates | |
| References | |
| Appendix A: Symphony Stream and Lake Kittamaqundi Watershed Maps Appendix B: Stormwater Retrofit Opportunities in the Wilde Lake Watershed Appendix C: Retrofit Reconnaissance Inventory Field Forms Appendix D: Unified Stream Assessment Field Forms Appendix E: Field Assessments Photo Log Appendix F: Stormwater Retrofit Opportunities Appendix G: Stormwater Retrofit Ranking Data Appendix H: Riparian Corridor Restoration Opportunities Appendix I: Methodology for Determining Annual Pollutant Load Estimates Appendix J: Symphony Stream and Lake Kittamaqundi Watershed Restoration Strategy Implementation Maps | |

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 instream 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.

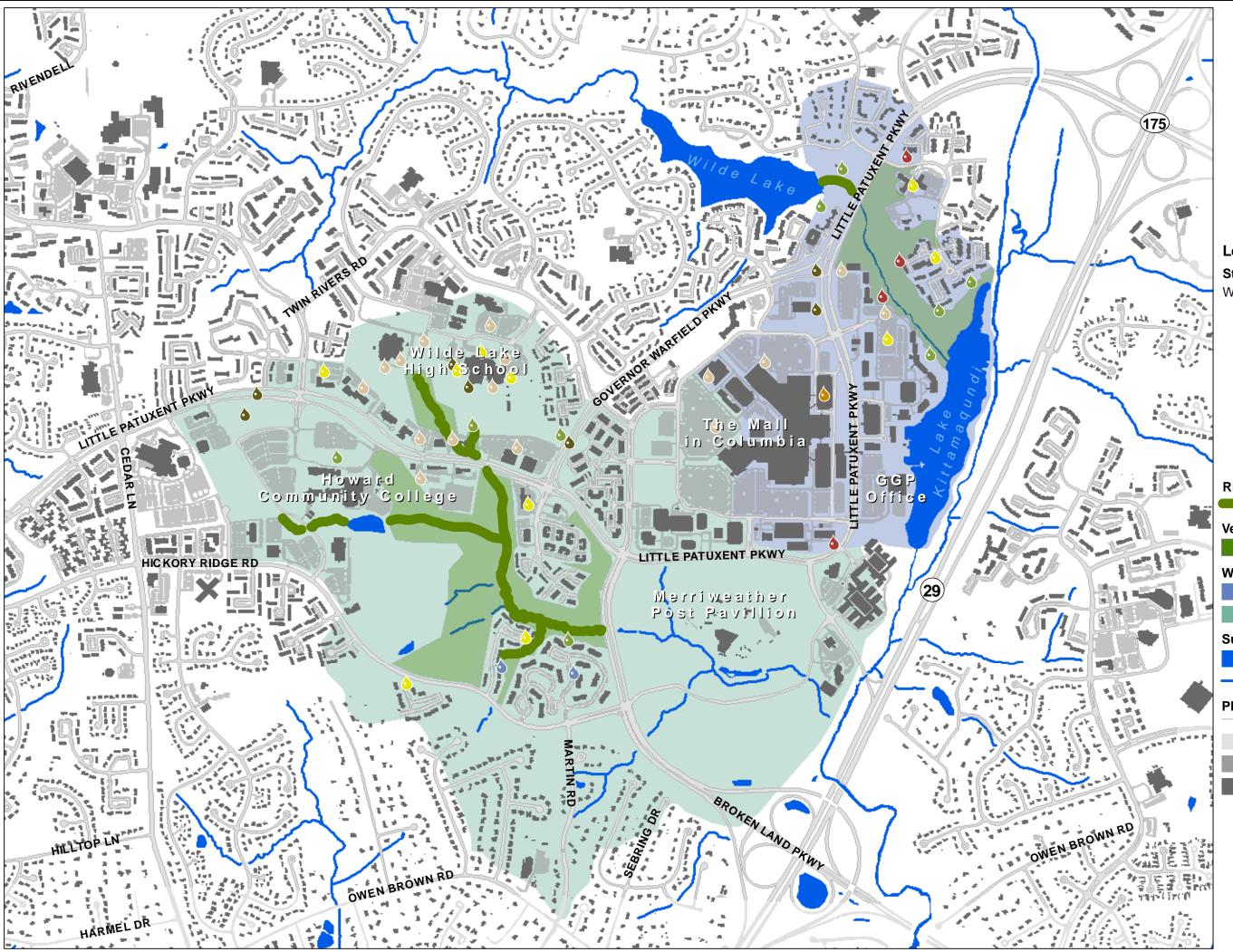
The riparian corridor assessment was used to identify outfall locations, severely eroded stream banks, utility crossings, impacted riparian buffers, trash dumping, stream crossings, and channel modifications within the stream corridor. Collected data was used to develop riparian corridor restoration 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 ongoing 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 ۵
- 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

0 300 600





1,800 1,200

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.

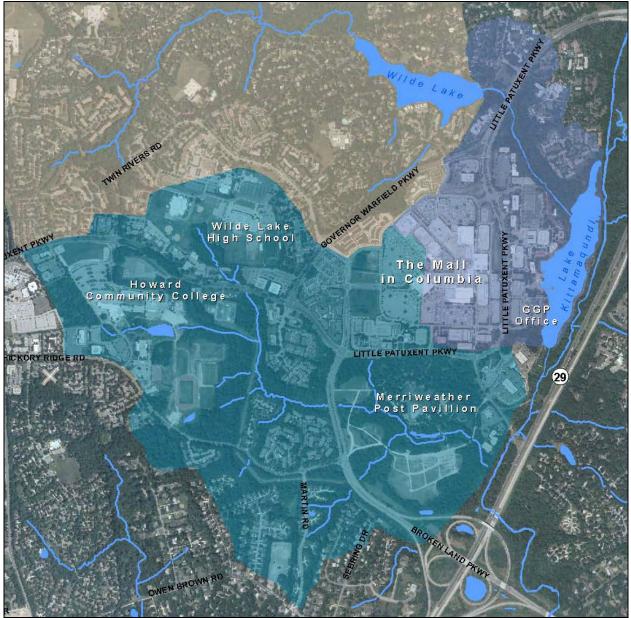


Figure 1-1: Symphony Stream and Lake Kittamaqundi Watersheds

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.

| Water Quality | V | | | |
|---------------|---|--|--|--|
| 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 Outred | uch | | | |
| 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. | | | |

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

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.

| 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 |

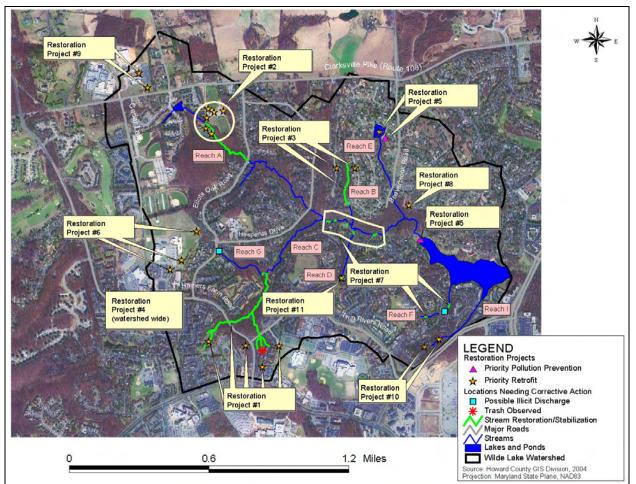


Figure 1-3: Priority Restoration Projects for the Wilde Lake Subwatershed (CWP, 2005)

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 Acronym | I | |
|----------------------|----------------------------|----------------------------------|
| SS | ĺ | |
| LK | ĺ | S |
| | Subwatershed Acronym SS LK | Subwatershed Acronym SS 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 | СМ | | |
| 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 | V 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.

| 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 |

- 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):

| 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 |

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

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

| Property Owner | Location | Restoration Opportunity | | Ciparian r Length (miles) | Planning Level Design and Construction Cost Estimate |
|---------------------|-------------------------------------|--|-------|---------------------------------|--|
| 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 | TAL 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 |
|-------------------|--|---|-----------------------------------|---------|--|
| | | Fleedalain | (feet) | (miles) | Estimate |
| 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 | nor | th of | the Lit | ttle Pati | uxer | ıt | |
|--|-----|-------|---------|-----------|------|----|--|
| 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 |
|-------------------|-------------------------------------|--|-----------------------------------|---------|--|
| Owner | | Opportunity | (feet) | (miles) | Estimate |
| 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):

| 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 |

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

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 |
|-------------------|-----------------------------------|--|-----------------------------------|---------|--|
| • ····• | | - FF | (feet) | (miles) | Estimate |
| 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 integ | 1. An integrated vegetation management plan may call for the following activities: | | | | | | |
| • Forest Restoration and Enhancement (\$10,000 to \$30,000 per acre) | | | | | | | |
| • Re | • Reforestation and Afforestation (\$20,000 to \$40,000 per acre) | | | | | | |
| • W | etland Enhancement (\$15,0 | 00 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 integ | rated vegetation management | nt plan may call for the follo | wing activities: | | | | |
| • Fc | • Forest Restoration and Enhancement (\$10,000 to \$30,000 per acre) | | | | | | |
| • Re | • Reforestation and Afforestation (\$20,000 to \$40,000 per acre) | | | | | | |
| • W | etland Enhancement (\$15,0 | 00 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 | Corrido | Ciparian r Length | Planning Level Design and Construction Cost |
|-------------------|--|--|---------|----------------------|--|
| Owner | | Opportunity | (feet) | (miles) | Estimate |
| 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 andLake Kittamaqundi Watersheds | | | | |
|---|--------------|--------------|--|--|
| Symphony StreamLake KittamaqundiWatershedWatershed | | | | |
| 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 andLake Kittamaqundi Watersheds | | | | |
|--|-----------------|-----------------|--|--|
| Symphony StreamLake KittamaqundiWatershedWatershed | | | | |
| 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

Wilde Lake High School

Howard Community College

TWIN RIVERS RD

PATUXENT PKWY

The Mall in Columbia

Lake

TTA GGP GGP Office

(29)

LITLE PATUKEW

LITTLE PATUXENT PKWY

COVERNOR WARFIELD PKWY

Merriweather Post Pavillion

LANDPKWY

OWEN BROWN RD



MAP 1: 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



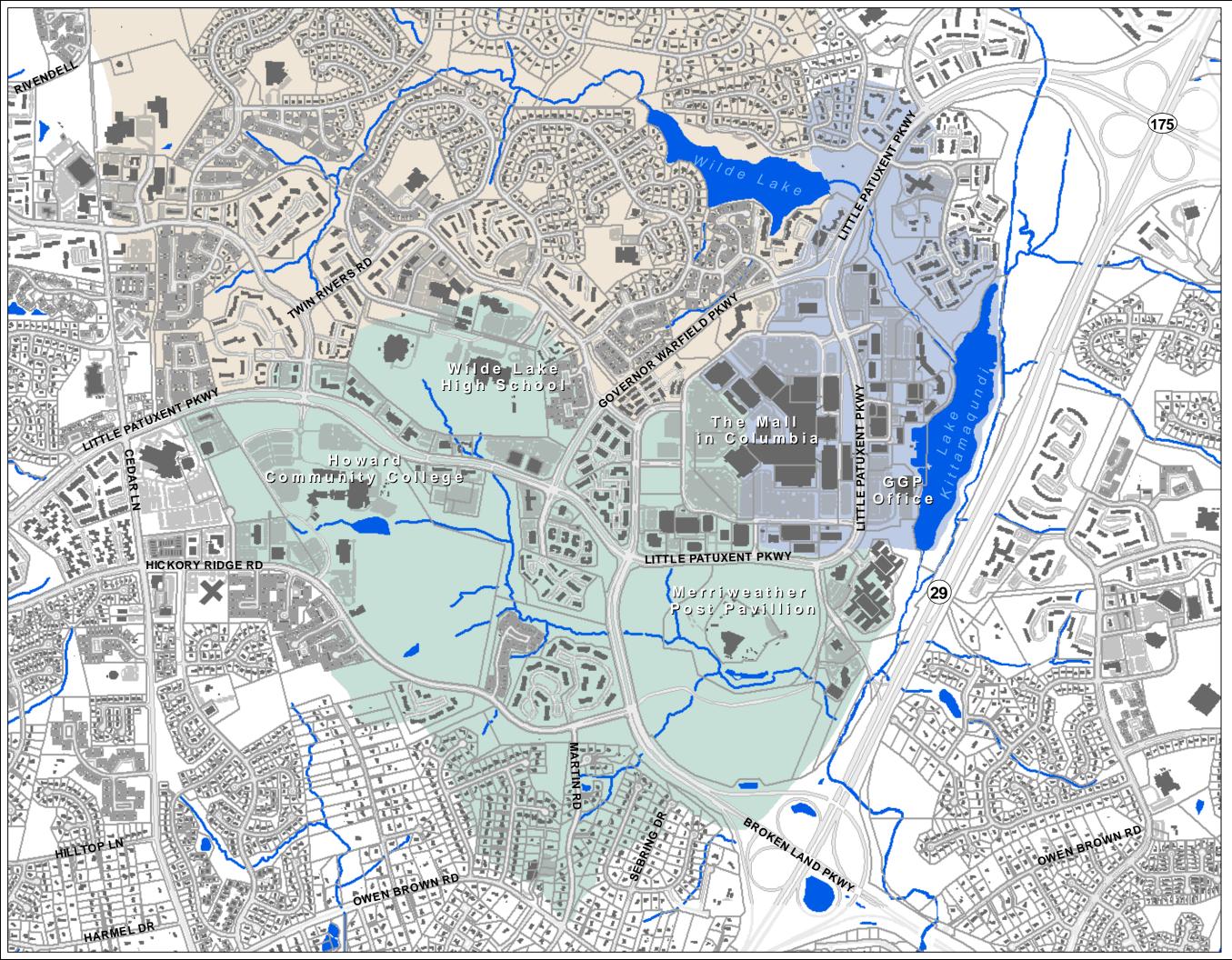
Ponds and Lakes



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

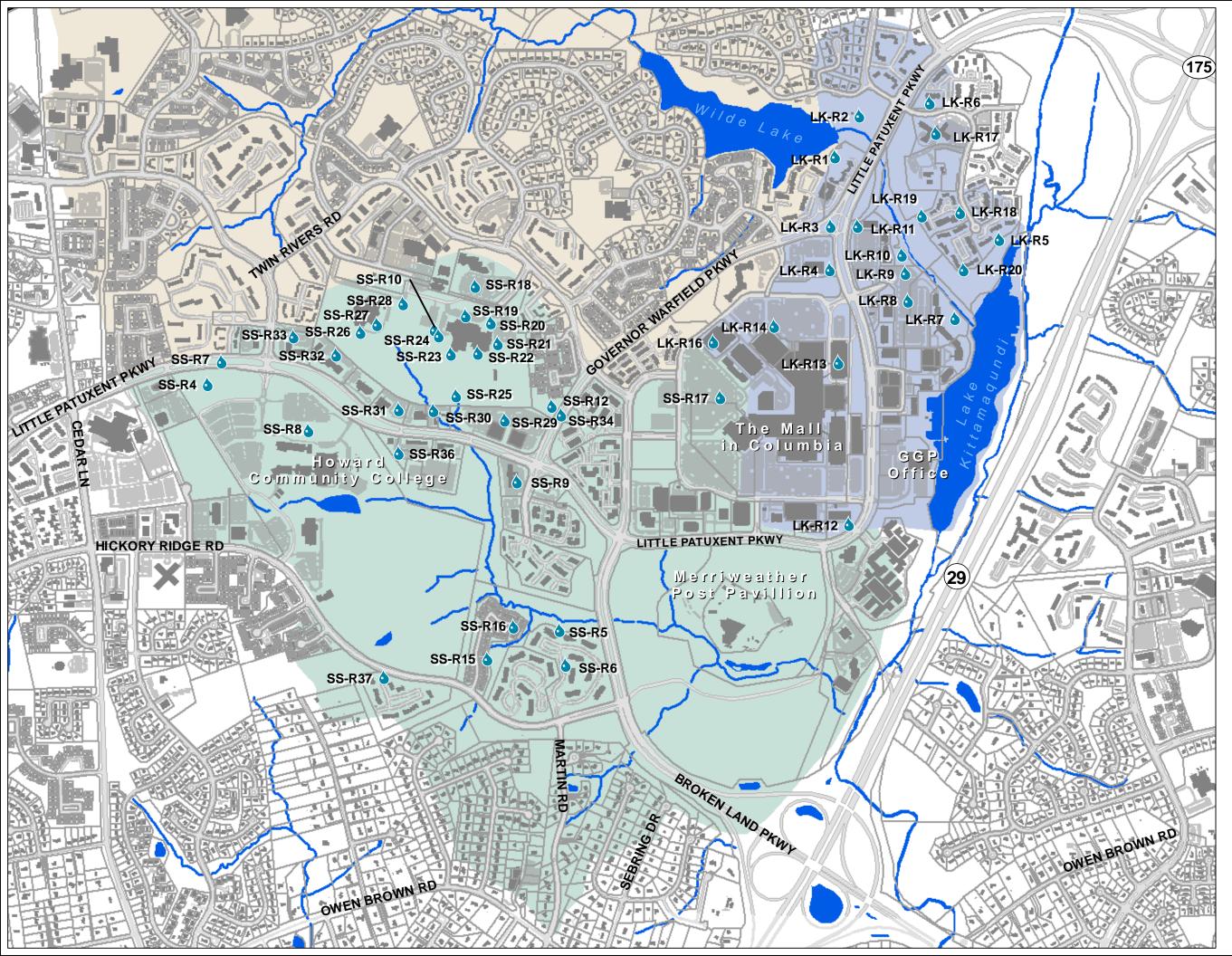
Watershed Boundary

| | Lake Kittamaqund |
|--------|------------------|
| | Symphony Stream |
| | Wilde Lake |
| Surfac | e Water |
| | Ponds and Lakes |
| \sim | Streams |
| Planim | netrics |
| | Property |
| | Roads |
| | Roads |
| | Parking Lots |
| | Buildings |





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

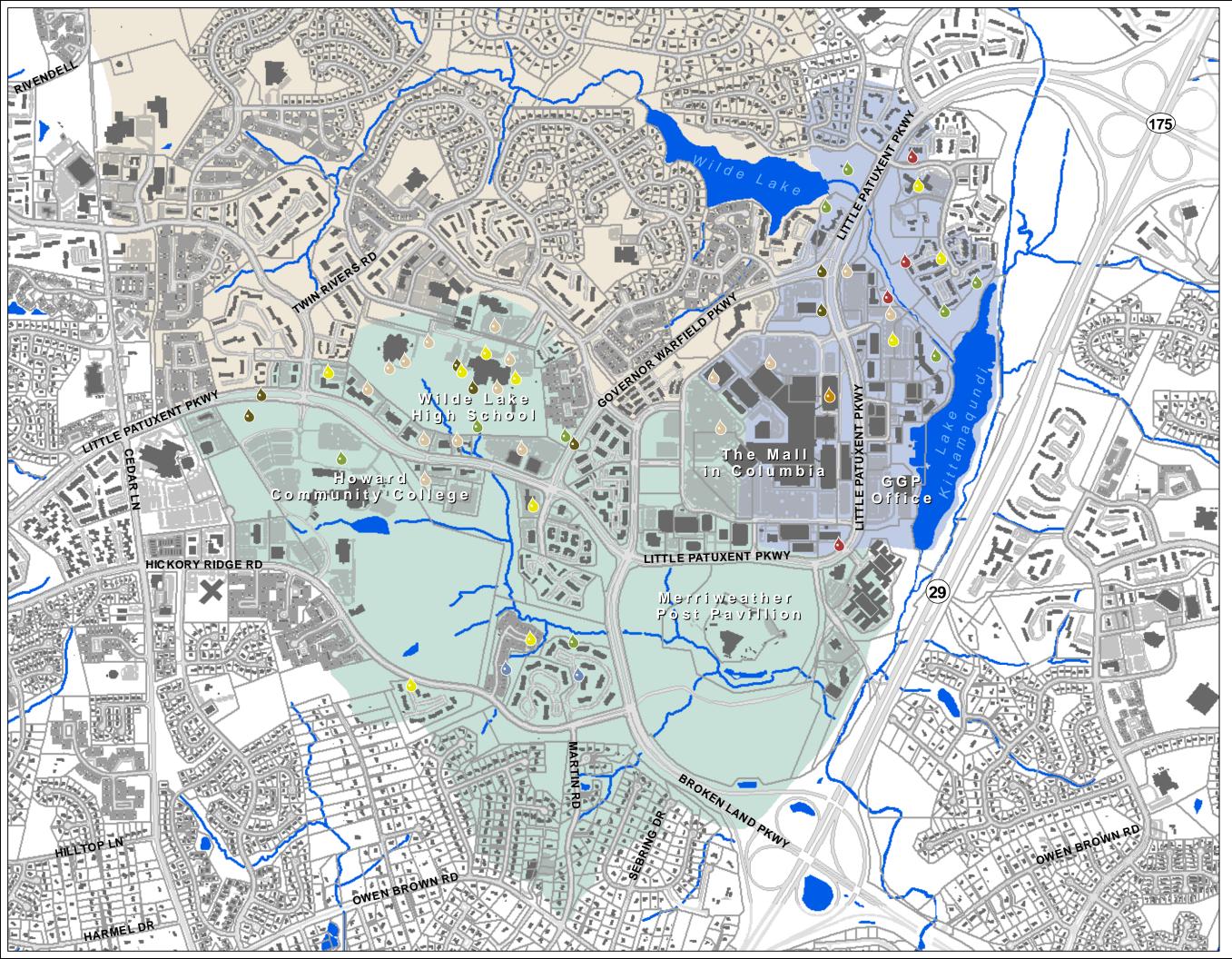
Planimetrics

- Property
- ---- Roads
- Roads
- Parking Lots
- Buildings









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
- Aain Gardens and Rain Barrels
- Aainwater 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

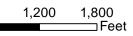
- Property
- Roads
- Roads
- Parking Lots

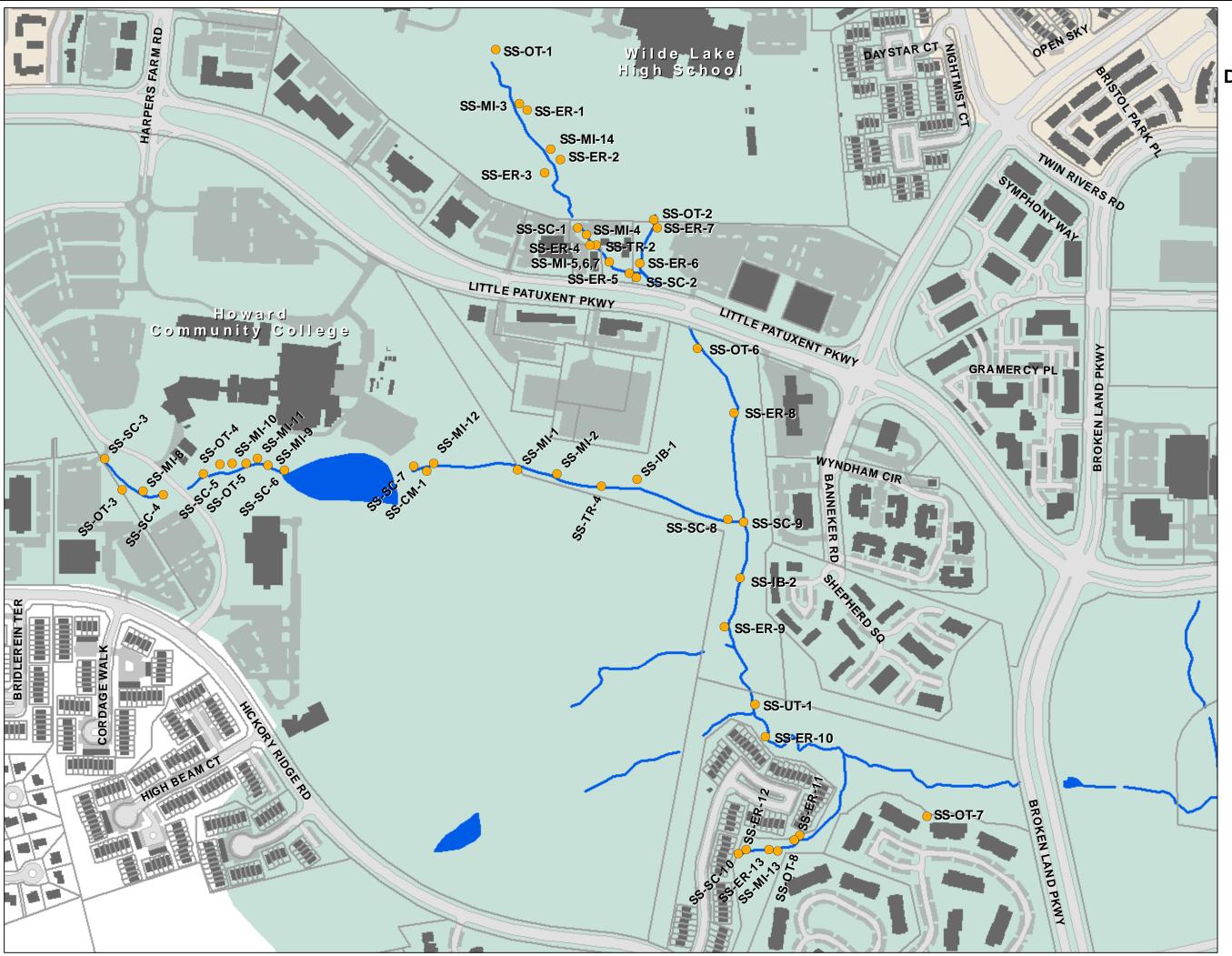
0 300 600

Buildings









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 | | | |
| Waters | shed Boundaries | | | |
| | Lake Kittamaqund | | | |
| | Symphony | | | |
| | Wilde Lake | | | |
| Surfac | e Water | | | |
| | Ponds and Lakes | | | |
| \sim | Streams | | | |
| Planim | netrics | | | |
| | Property | | | |
| | Roads | | | |
| | Roads | | | |
| | Parking Lots | | | |
| | Buildings | | | |
| | | | | |



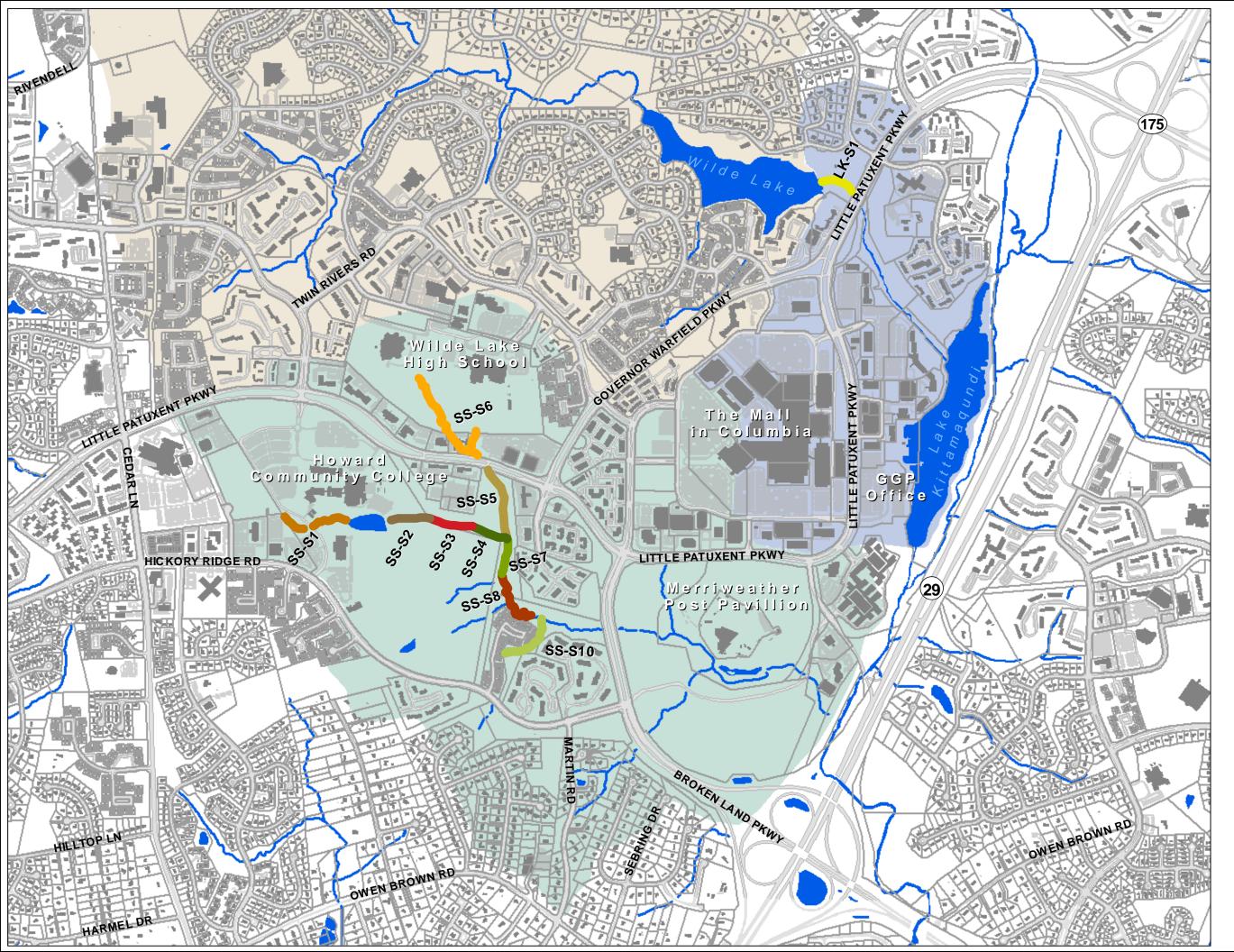


0 100 200



600





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

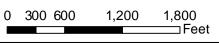
- Ponds and Lakes
- Streams

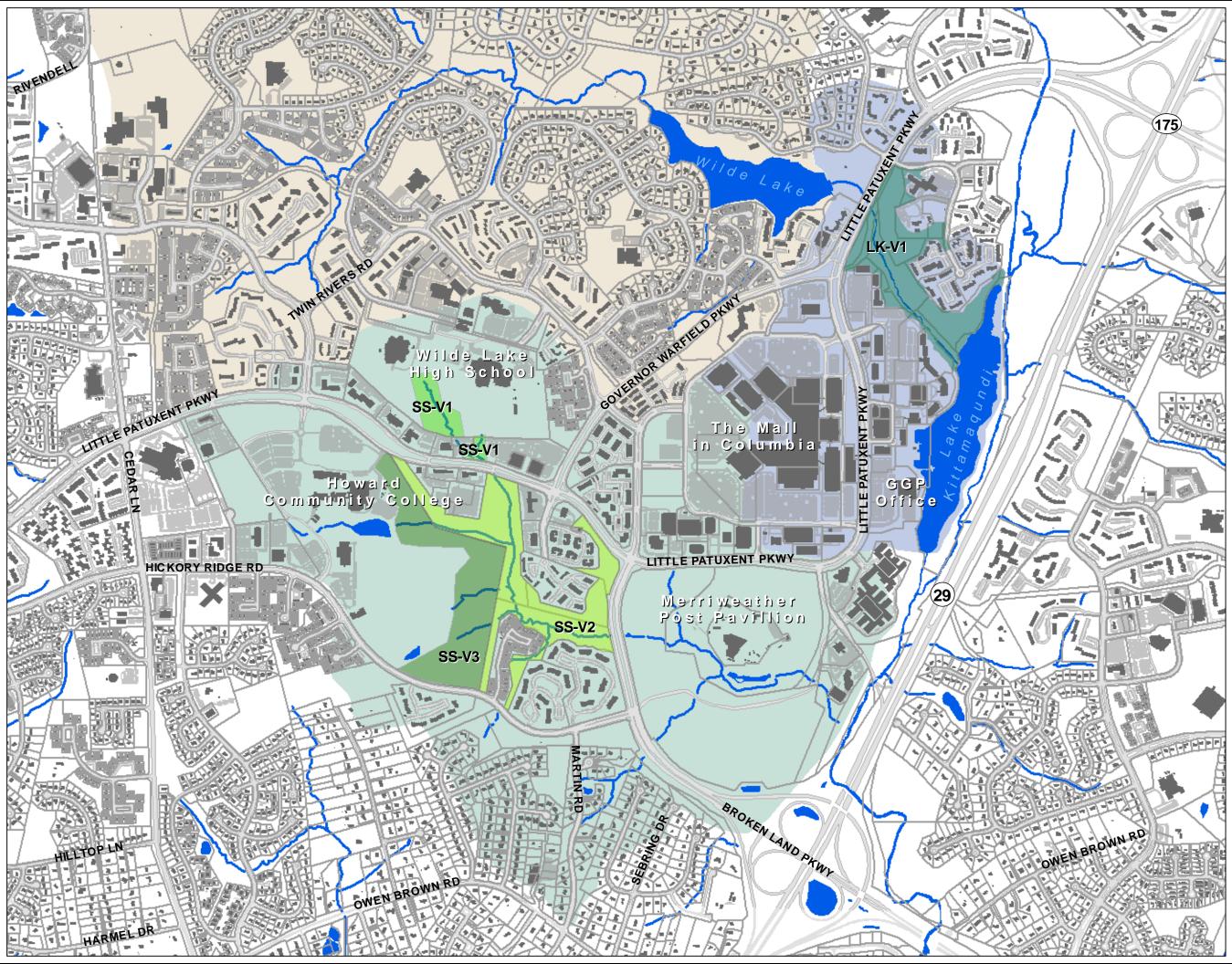
Planimetrics

- Property Roads Roads Parking Lots
 - Buildings









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

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





1,800 1,200 0 300 600

Appendix B: Stormwater Retrofit Opportunities in the Wilde Lake Watershed

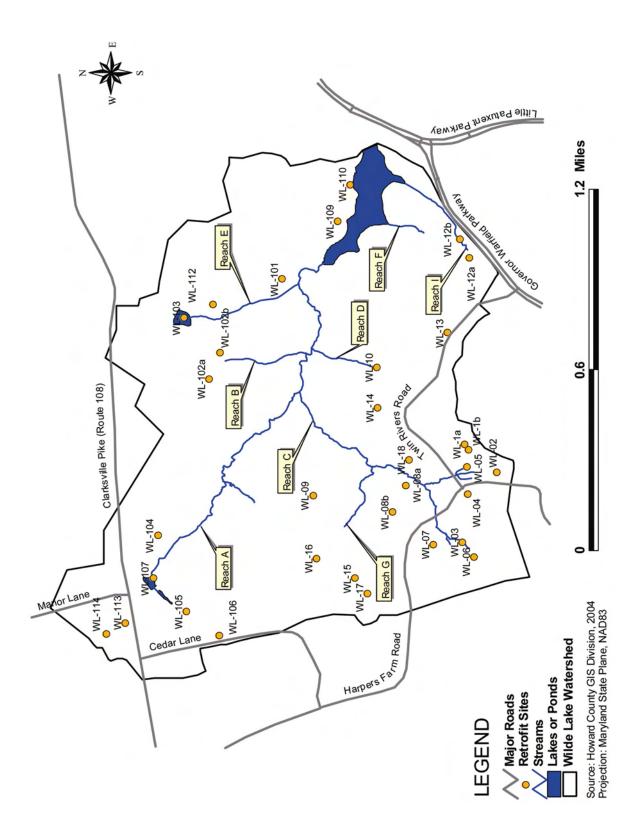
Excerpted from: Center for Watershed Protection. 2005. Centennial and Wilde Lake Watershed Restoration Plan. Prepared for Howard County Department of Public Works. Ellicott City, MD.

| | | 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 | СА |
| 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 | СА |
| 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 | СА |

| | | Table 3.9 Wild | e Lake Retrofit Sites (continue | ed) | |
|----------------|---|--|--|---|-------------------|
| 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 | 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 |

| G •4 | | Table 3.9 Wild | e Lake Retrofit Sites (continue | ed) | D |
|----------------|---|--|---|--|-------------------------|
| 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 | above stream crossing | Parking lot bioretention in expanded parking islands and a curb- cut in the NE corner of lot Tennis court bioretention along NE corner of tennis courts in low- lying area Storage retrofit to provide floodplain storage using stormflow diversion from stream channel onto floodplain Small bioretention/rain barrels at bathrooms 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 |

| Site | Table 3.9 Wilde Lake Retrofit Sites (continued) | | | | | | |
|---------------|--|---|--|---|--------------------|--|--|
| 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 | | |



Appendix C: Retrofit Reconnaissance Inventory Field Forms

Retrofit Reconnaissance Investigation RRI

| | GUNDI | | |
|--|---|--|---|
| WATERSHED: LAKE 14 | LUTA SUBWATERSHED: | | UNIQUE SITE ID: LK-EOI |
| DATE: 4/14/04 | ASSESSED BYECK BY | CAMERA ID: | PICTURES: |
| GPS ID: | LMK ID: | LAT: | LONG: |
| SITE DESCRIPTION | | | |
| Name: Watermark Address: 10001 Wi. | Place Condos / nistream Dr | Wilde Lak | |
| Ownership: If Public, Government Jurisdi | Public Privection: Decal Stat | ate 🗹 Ünknown e 🛄 DOT | COLUMENT RESECT + UNKNOWN S(CO |
| Below Outfall In C In Road ROW Nea Other: | we Roadway Culvert Conveyance System r Large Parking Lot | On-Site Hotspot Opera Small Parking Individual Stre Underground | Lot 🔲 Small Impervious Area |
| DRAINAGE AREA TO PROP | POSED RETROFIT | | |
| Drainage Area ≈ Impervious Area ≈ Impervious Area ≈ Impervious Area ≈ Notes: DA Actuales Wal Townware Tarking on North Tarking of (Prost of Gor Warfeld+Lille Pat | | Drainage Area L Residential SFH (< 1 = SFH (> 1 = Multi-Far Commercial | ac lots) Industrial ac lots) Industrial ac lots) Industrial ses Park |
| EXISTING STORYWATER | | | |
| Existing Stormwater Practic If Yes, Describe: | xe: Yes ·· INo | Possible | |
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Retrofit Reconnaissance Investigation RRI



| PROPOSED RETROFIT | | |
|---|---|--|
| Parpose of Retrofit: Water Quality Demonstration / Education | * _ | Flood Control |
| Retrofit Volume Computations - Target St | orage: Retrofit Volume Com | putations - Available Storage: |
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| Proposed Treatment Option: Extended Detention Vet Pond Piltering Practice Infiltration | Z Created Wotland Dioretentia | on Cars STORMWATER |
| Describe Elements of Proposed Retrofit, Ir | cluding Surface Area, Maximum Dep | th of Treatment, and Conveyance: |
| CREATE FORESTED WETLE | NTO BY USING BORN | IS ACROSS STREAM |
| TO FORCE FLOWS INT | O FLOOD PLAIN. T | HIS WILL CREATE |
| SEVERAL WETLAND CET ARE POSSIBLE SUG | HEST DESIGNING TO | UTS OF EXCAVATION |
| OF FLOODPLAIN W/ FI | 4 NEEDED FOR B | ERMS. |
| REPLANT WINATIVE WETT | HAND SPECIES + MAIN | |
| SPECIES CONTROL PLA | N. | |
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| SITE CONSTRAINTS | | |
| Adjacent Land Use: | nstitutional Access: | nstraints |
| 🔲 Industrial 🛛 🖸 Transport-Related 🖽 1 | ark Constraine | _ |
| Dudeveloped Other: Possible Conflicts Due to Adjacent Land U | | ope Space filities Tree Impacts |
| If Yes, Describe: | St | ructures 🔄 Property Ownership ther: |
| Conflicts with Existing Utilities: | Potential Permitting Factors: | |
| None · | Dam Safety Permits Necessary | Probable Not Probable |
| Unknown Yes – Possible | Impacts to Wetlands Impacts to a Stream | Probable 🗌 Not Probable |
| Sewer | Floodplain Fill | 🗌 Probable 📃 Not Probable |
| Gas not ikelen | Impacts to Forests Impacts to Specimen Trees | Probable Not Probable |
| Cable r | How many? 2 | |
| Electric | Арртох. DBH_12"-18" | |
| Overhead Wires | Other factors: Area is ad jac | ent to Wilde Lake Dam, |
| U Other V | <u>which may takacis a</u> | alyers to ensure no mipar |
| Soils: Soil auger test holes: | Yes Ko | alycis to ensure no impact its dam. Concept is not anticipated to impact a |
| Evidence of poor infiltration (clays, fines): | Yes Xes Unknown | anticipated 46 impact a |
| Evidence of shallow bedrock: Evidence of high water table (gleying, satura | | · · · |
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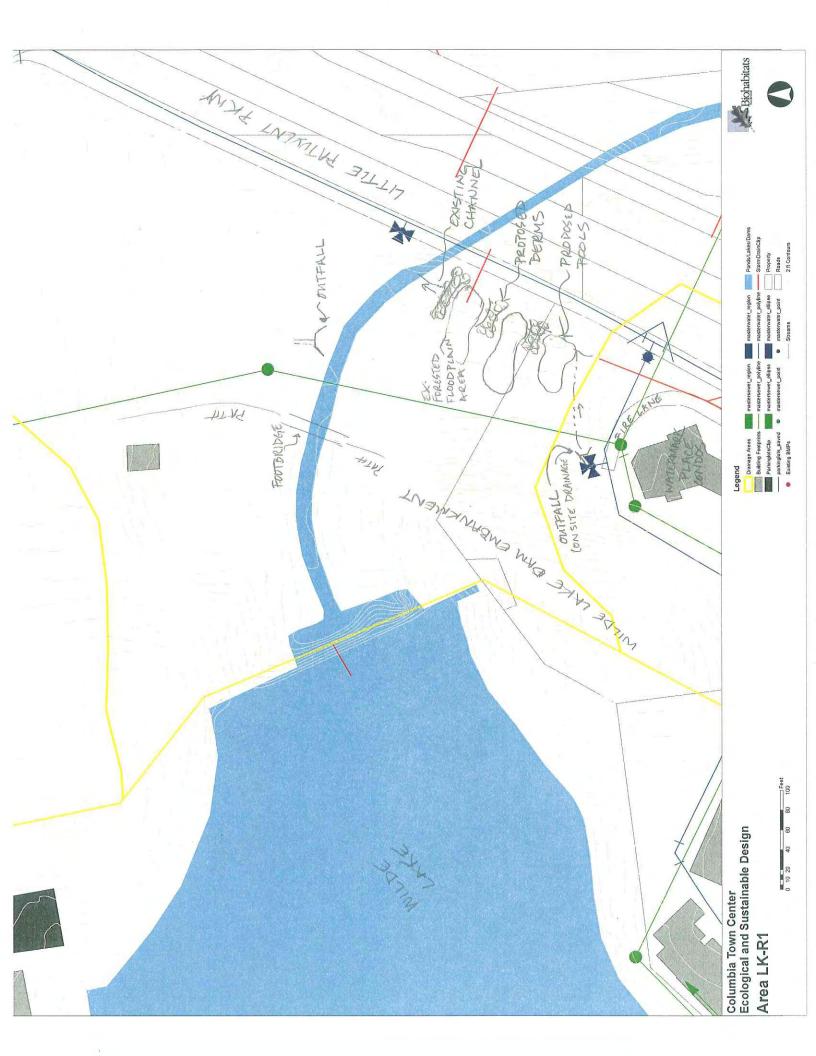
Unique Site ID:<u>LK-</u>ROI

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DESIGN OR DELIVERY NOTES



Retrofit Reconnaissance Investigation

| | KITTA SUBWATE | <i>y</i> / | · | | | | |
|--|--|--|---|--|--|--|--|
| WATERSHED: LALE | KITTA SUBWATE | RSHED: | UNIQUE SITE ID: LK- 702 | | | | |
| DATE: 4/16/08 | ASSESSED BY | BWS CAMERAID: | PICTURES: | | | | |
| GPS ID: | LMK ID: | LAT: | LONG: | | | | |
| SITE DESCRIPTION | | | | | | | |
| Name: WILDE L Address: INTERSECTION | | | | | | | |
| Ownership: If Public, Government Jurisdi | ction: Dublic | Private Unknown | COLUMBIA ASSOC | | | | |
| Below Ontfall In Control In Road ROW Nea Other: | ove Roadway Culvert Conveyance System Ir Large Parking Lot | On-Site Itotspot Opera Small Parking Individual Stre Underground | Lot 🗌 Small Impervious Area | | | | |
| DRAINAGE AREA TO PRO | POSED RETROFIT | | | | | | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ Notes: DA includes to Chocc rooftep, parkin Proviono area) plus | g 12, road diven 50ad rune ff | Drainage Area L Residential SFII (< 1 = | ac lots) Institutional ac lots) Industrial ac lots) Iransport-Related res Park | | | | |
| EXISTING STORMWATER Existing Stormwater Practi | | ANO Possible | | | | | |
| If Yes, Describe: | | | | | | | |
| Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance: Storm drains from Hyla Brook & WRUNNING Brook Rd cross open space in park & presumably join at yard indet in center of field. Ontfall is willft from mainstern. Outfall wR4" will crossion in small channel. Area is mowed that will some older thes & 15 new these edjacent to pash. | | | | | | | |
| Existing Head Available an NA Did not d Slope fro Pipes c | d Points Where Measu pen yard in le M Noad War could be | ned: t to assess 1 72 field s daylit. | uggests that | | | | |

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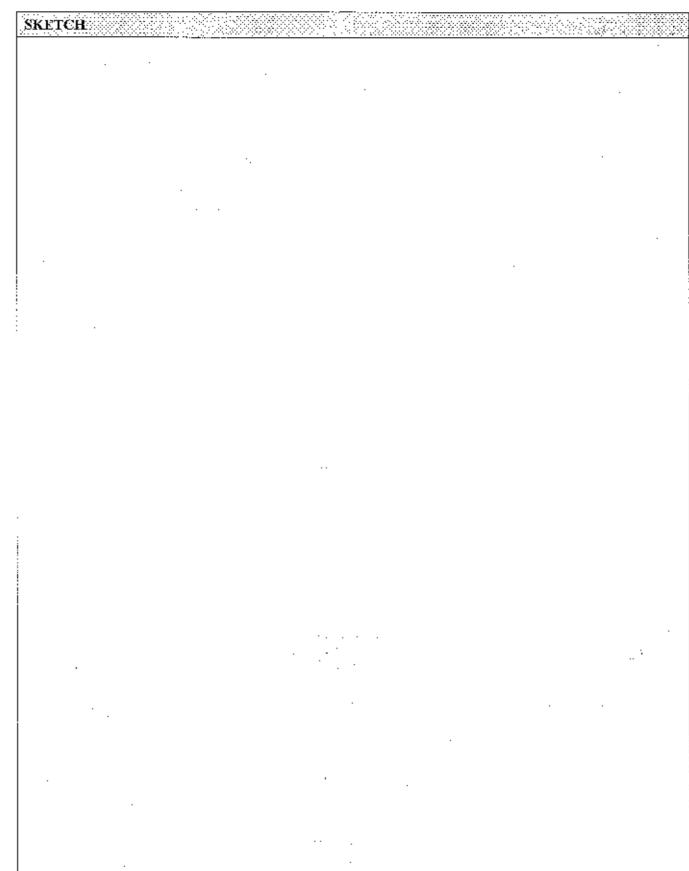
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Unique Site ID: <u>LK-</u>1202

| Purpue of Retrofit: Recharge Channel Protection Flood Control Demonstration / Education Repair Other: Flood Control Retrofit Volume Computations - Target Storage: Retrofit Volume Computations - Available Storage: Proposed Treatment Option: Retrofit Volume Computations - Available Storage: Extended Detention Wet Pond Created Wetland Bioretention Prilering Practice Infiltration Swale Other: Other: Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Couveyance: Daylight Pipes at upstream und of field . (Running Brock Pipe at base of road way umb ank ment; Hya Brock Brock Fipe where flashible - prefirrately east of source: Also plant Tules along stillam bawks to -provide Still CONSTRAINTS Adjacent Land Use: Provide Residential Connercial Institutional Industrial Connercial Institutional Mustrial Pransport-Related Prink Store provide Undeveloped Other: Store provide Industrial Connercial Institutional Store provide If Yes, Describe: Ward of addingent accel ace to Store provenexibity |
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| □ Filtering Practice □ Infiltration □ Swale □ Other: |
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| Residential Commercial Institutional Industrial Transport-Related Park Undeveloped Other: |
| If Yes, Describe: Would in pact acotherics + Distructures Property Ownership possibly recreational usage in Dark. Other. |
| Conflicts with Existing Utilities: Potential Permitting Factors: |
| Image: None Dam Safety Permits Necessary Image: Probable Probable Image: Unknown Image: Store Wetlands Image: Probable Probable |
| Yes Possible Impacts to a Stream Probable Impacts Impacts Stream Probable Impacts Floodplain Floodplain |
| Water NO Impacts to Forests Probable Not Probable |
| Gas not likely Impacts to Specimen Trees Probable Not Probable |
| Cable not likely I low many? Could avoid byt Approx. DBH Need to powerder |
| Overhead Wires NC Other factors: |
| Soils: |
| Soil auger test holes: |
| Evidence of poor infiltration (clays, fines): |
| Evidence of high water table (gleying, saturation): |

Unique Site ID: <u>LK-</u>RGZ





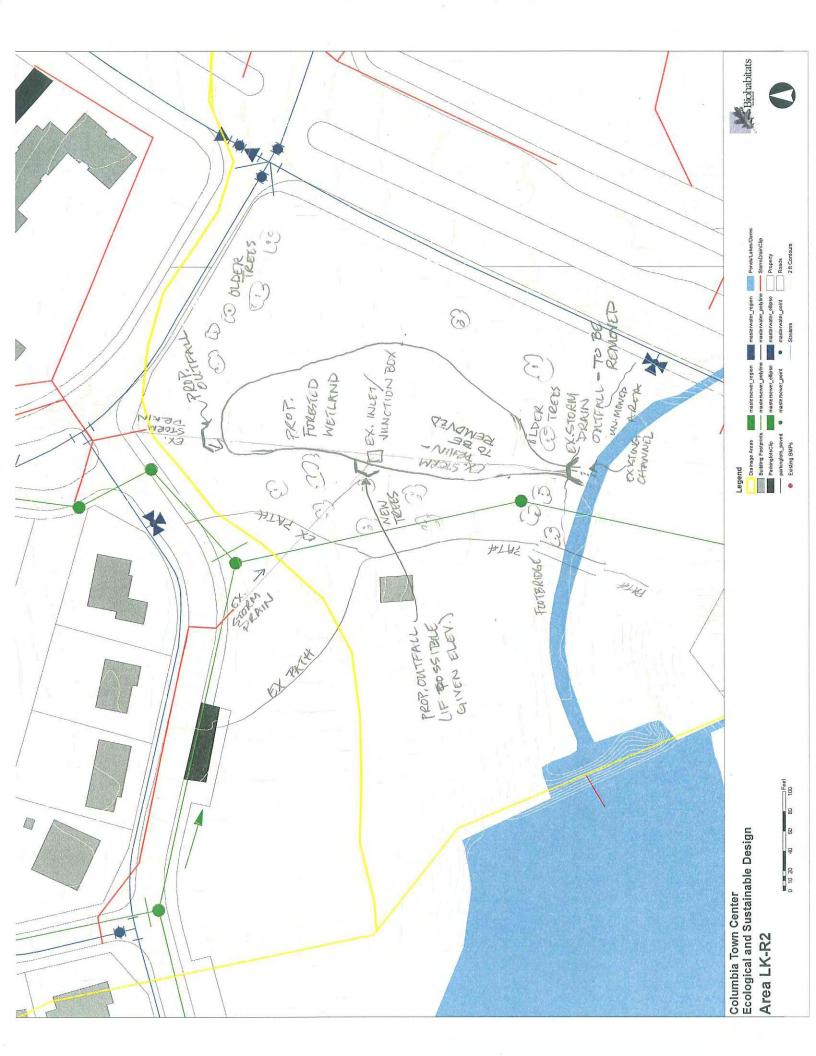
Unique Site ID: <u>LK-</u>ROZ

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| Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch Other: Other: Information are: asage SITE CANDIDATE FOR FURTHER INVESTIGAT | Gentain site as-builts Gentain detailed topography Frontain a sufficient Gentain utility mapping Confirm storm drain invert elevations Confirm soil types Considerations Gentain soil types Considerations of field is needed. TION: Confirm Soil types Considerations Constantions |

DESIGN OR DELIVERY NOTES.



| WATERSHED: 1.876KIP | AMAGU SOBWATERSHED | • | UNIQUE SITE ID: LK-RO3 |
|--|--|---|--|
| DATE: A 16 04 | ASSESSED BY: 5CK/35 | | PICTURES: |
| GPS ID: | LMKID: | LAT: | Long: |
| SITE DESCRIPTION | | | <u> </u> |
| Name: Klaud in highe Address: bitusections of | Bar Warfield Little | Patrixent | |
| Ownership: If Public, Government Jurisdie | Public Priv ction: CLocal Stat | | Other: Unzuown County E |
| 🗌 Below Outfall 🛛 🛃 In C | we Roadway Culvert Conveyance System r Large Parking Lot | On-Site Hotspot Opera Small Parking Individual Stre Underground | Lot 🔲 Small Impervious Area |
| DRAINAGE AREA TO PRO | POSED RETROFIT | | |
| Ðrainage Area ≈ Imperviousness ≈ Impervious Area ≈ Notes: | % | Drainage Area I. Residential SFH (< 1 SFH (> 1 Townhou Multi-Fan | ac lots) Transport-Related acs Park |
| EXISTING STORMWATER | | Commercial | Other: |
| Existing Stormwater Practice If Yes, Describe: Storm ceptor tr (in line) Roadway run off | xe: ⊡res □No reats runoff fran docsn't neceive | □Possible 1 Cine Mali +reatme | North parking lot |
| Describe Existing Site Cond Conveyance System | itions, Including Existing Site Passes land sca | Drainage and Con ped anec | iveyance: |
| Existing Head Available and | | | |
| Not measured | - info needed | (location coadway | where needed is in , on major roads |
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| PROPOSED RETROFIT | | |
|--|---|--|
| Purpose of Retrofit: Water Quality Recharge Demonstration / Education Repair | Channel Protection | T Flood Control |
| Retrofit Volume Computations - Target Storage | e: Retrofit Volume Comp | utations - Available Storage: |
| | · . | |
| | reated Wetland Bioretention wale Other. | _:: |
| Describe Elements of Proposed Retrotit, Includ Flowsplit storm drainagto stair-stepped bioretentic inlet. | anascapea islai on + fie back 7 | o wisting yard |
| SITE CONSTRAINTS Adjacent Land Use: Residential Commercial Industrial Institution Industrial Intansport-Related Park Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? | Constrained | I due to |
| If Yes, Describe: | <u> </u> 0 | ictures Property Ownership er: <u>MAIAT, OF TRAFFIC</u> |
| Conflicts with Existing Utilities: None Unknown Yes Possible Water №C Gas Cable Electric Electric to Streetlights Overhead Wires Other: | Potential Permitting Factors: Dam Safety Permits Necessary Impacts to Wetlands Impacts to a Stream Floodplain Fill Impacts to Forests Impacts to Specimen Trees How many? Approx. DBH | Probable Not Probable Probable Not Probable Not Probable Probable Not Probable Not Probable Probable Not Probable Not Probable Not Probable Probable Not Probable Not Probabl |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation) | ☐ Yes ☐ No ☐ Yes ☐ No ☐ Unknown ☐ Yes ☐ No ☐ Unknown r. ☐ Yes ☐ No ☐ Unknown r. ☐ Yes ☐ No ☐ Unknown | · · · · · · |

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Unique Site ID:<u>LK-R</u>03

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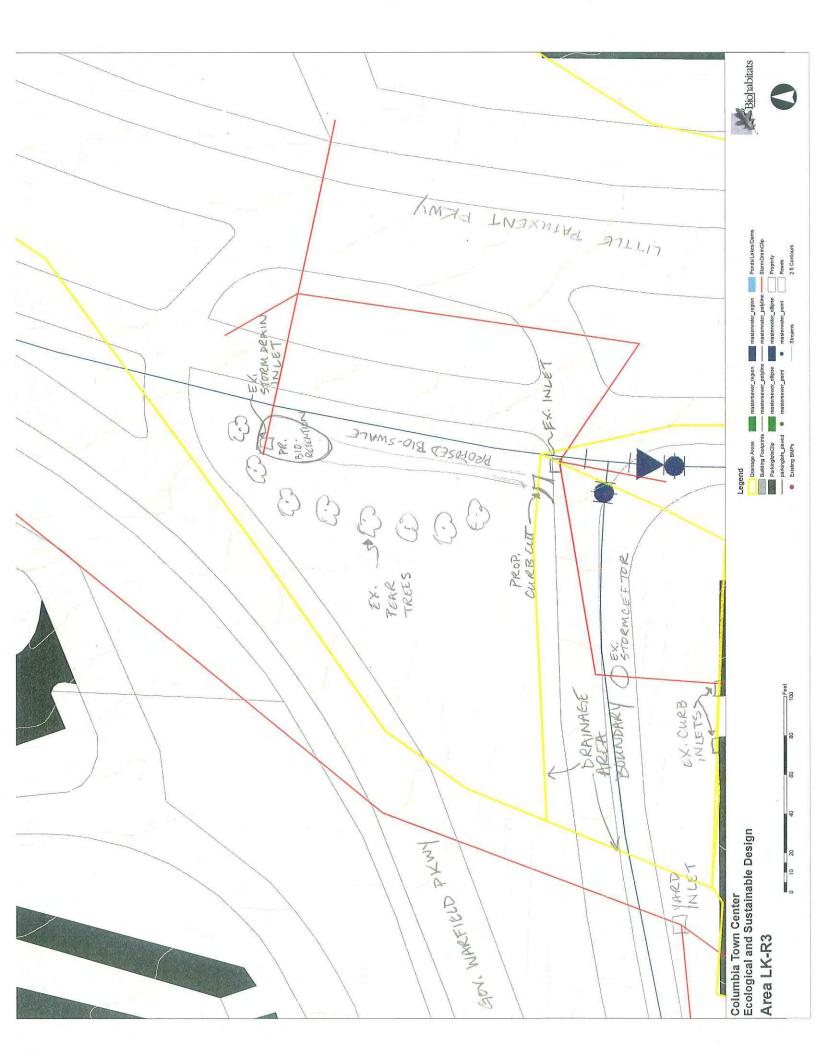
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Unique Site ID: LK-RD3

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FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT Obtain existing stormwater practice as-builts Confirm property ownership Obtain site as builts Confirm drainage area > Asbuilts probably Cobtain detailed topography-Confirm drainage area impervious cover Confirm volume computations Obtain utility mapping contain 4 Confirm storm drain invert elevations Complete concept sketch Confirm soil types Other: INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS * Milities will be Key constraint * Desired aesthetics 2nd Key constraint * Because large 20 of DA treated of Stormceptor, linited additional WQV credit available MATBE (not uccanousede No YES: SITE CANDIDATE FOR FURTHER INVESTIGATION: IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): YES NO MAYBIS IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): NO MAYBE IF YES, TYPE(S):



| | NDI | | Ļ |
|---|--|---|--|
| WATERSHED: LAKE K | ITTR MACL SUBWATERSHED: | UNIC | DUE SITE ID: 14- PO4 |
| DATE: 4 16/08 | ASSESSED BY S | CAMERA ID: | PICTURES: |
| GPS ID: 1 | LMK ID: | LAT: | LONG: |
| SITE DESCRIPTION | | | |
| | WORTH NORTH | Id Farkwarf | |
| Ownership: If Public, Government Jurisd | iction: Dublic Priv | | er |
| Below Outfall In G | ove Roadway Culvert Conveyance System ar Large Parking Lot | On-Site Hotspot Operation Small Parking Lot Individual Street Underground | Individual Rooftop Small Impervious Area Hardscape Other: |
| DRAINAGE AREA TO PRO | POSED RETROFIT | | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ Notes: DA = Farking | · | Drainage Area Land Use Residential SFH (< 1 ac lots) SFH (> 1 ac lots) Townhouses Multi-Family Commercial | 🔟 Institutional |
| EXISTING STORMWATER | n an | | |
| Existing Stormwater Practi If Yes, Describe: | ice: 🗌 Yes 🖵 No | Possible | |
| Describe Existing Site Con Parking lot on west Storm drain n Inlet in depress from building a free this inlet. | litions, Including Existing Site T side of site ins under swal ion is <u>very</u> de basement. Un Depussion has | Drainage and Conveyance drains to st e along south ep pessible Chown where nongh glass. | icintet rear dumps réde of building to capture sump ducinage goes |

Existing Head Available and Points Where Measured:

Not measure A

Unique Site ID: <u>LK-</u>RØ4

| PROPOSED RETROFIT | |
|---|-----|
| Purpose of Retrofit: Water Quality Recharge Demonstration / Education Repair | j |
| Retrofit Volume Computations - Target Storage: Retrofit Volume Computations - Available Storage: | |
| | |
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| | ĺ |
| Proposed Treatment Option: | 1 |
| Extended Detention Wet Pond Created Wetland Afforetention 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 | ! |
| Keep flows out of storm drain - convey via Enale to depression. Convert depression to bioretur | tis |
| privice to papasotore. | |
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| | 1 |
| SITE CONSTRAINTS | |
| Adjacent Land Use: Access: Residential Commercial Institutional | |
| Industrial Iransport-Related Park constrained due to | |
| Industrial Transport-Related Park Constrained due to Undeveloped Other: <u>Possible future</u> unstruction Slope Space Possible Conflicts Due to Adjacent Land Use? Even No Utilities Tree Impacts | |
| If Yes, Describe: June diving future construction _ Structures _ Property Ownership | ! |
| | — |
| None UNAL UN51 Dam Safety Permits Necessary Probable Thot Probable | İ |
| Unknown Impacts to Wetlands Probable Not Probable Impacts to a Stream Probable Not Probable | |
| Yes Possible Impacts to a Stream Probable Impacts Sewer Floodplain Fill Probable | |
| Water Impacts to Forests Probable | |
| Gas Impacts to Specimen Trees Probable Not Probable | ļ |
| Cable How many? Electric Approx. DBH | • |
| Image: Decode in the second of the second | i |
| T Overhead Wires Other factors: I Other: <u>New Storm drain</u> , | |
| Soils: not mapped | |
| Sons: Ves No | |
| Evidence of poor infiltration (clays, fines): | |
| Evidence of shallow bedrock: Evidence of high water table (gloving, saturation): Yes No Unknown | |
| Evidence of high water table (gleying, saturation): 🗌 Yes 🗌 No 📄 Unknown | |

Unique Site ID: $\frac{FK}{FK}$



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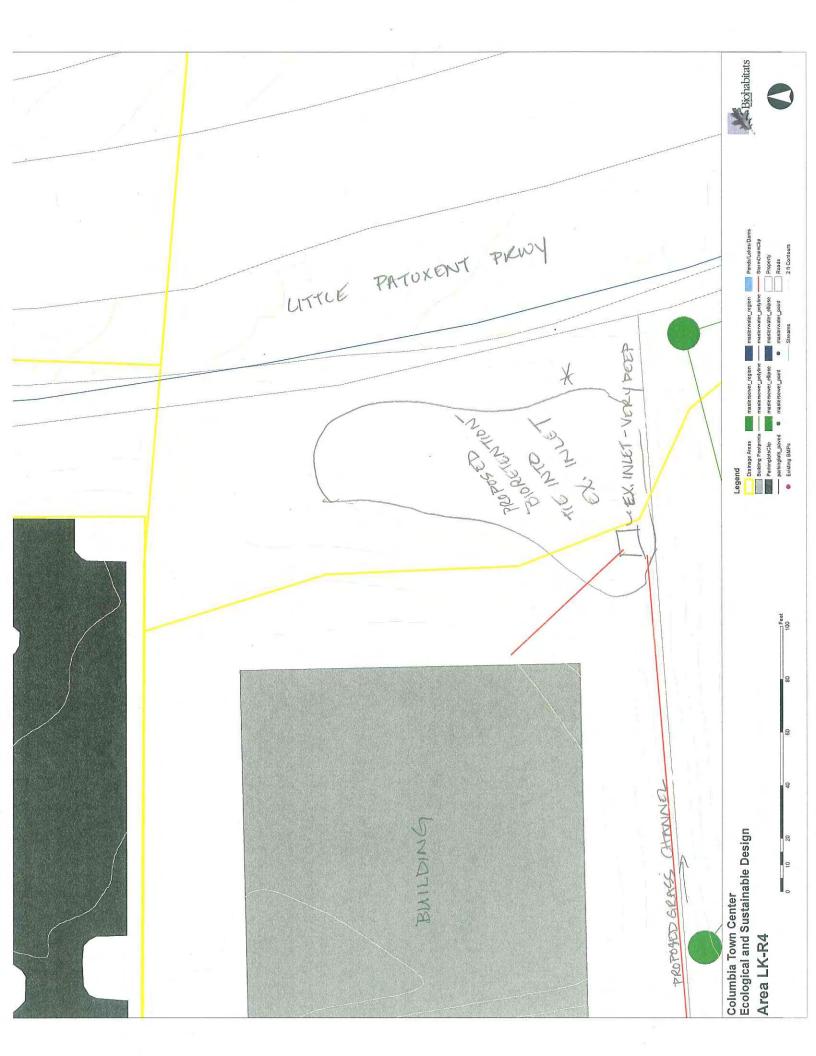
Unique Site ID: <u>LK-R</u>Ø4



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| FOLLOW-LP. NEEDED TO COMPLETE FIELD Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations | D CONCEPT Obtain existing stormwater practice as-builts Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drain invert elevations |
| Gite is stabilized, but m | CONSIDERATIONS TO be graded for bricking pod preting, by be under construction in future. |
| therefore, bioritation for with the site is built new storm drain may pre from garking lot | out: out: event use of swale for converging |
| SITE CANDIDATE FOR FURTHER INVESTIG IS SITE CANDIDATE FOR EARLY ACTION P IF NO, SITE CANDIDATE FOR OTHER REST | |

DESIGN OR DELIVERY NOTES

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| WATERSHED; LACE | KITANI SCHWATERSHED: | | UNIQUE S | STED: LK-RØS |
|--|--|---|-------------------------------|--|
| DATE: 4/16/08 | ASSESSED BY: SONT / BWS | CAMERA 1D: | | PICTURES: |
| GPS ID: | LMK ID: | LAT: | | LONG: |
| SITE DESCRIPTION Name: Vantage Por | | - IENNINS | | |
| Address: <u>Vanhe a. Poi</u> Ownership: If Public, Government Jurisc | i <u>cet Zol (Housse de</u> □ Public □ Priv liction: □ Local □ State | | > Con & | ept includes 2 parcels |
| Delow Outfall In Road ROW No Other: | ove Roadway Culvert Conveyance System ar Large Parking Lot | On-Site Ilotspot Opera Small Parking Individual Stre Underground | tion | Individual Rooftop Small Impervious Arca Landscape / Hardscape Other: |
| DRAINAGE AREA TO PRO | POSED RETROFIT | | | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ Notes: DA included. Vaute Vantage Point Rd, Pertick of Histori | | Drainage Area L Residential SFH (< 1 SFH (> 1 Fownhous Multi-Fan | ac lots) ac lots) ses | Institutional Industrial Park Jodeveloped Other: |
| EXISTING STORMWATER Existing Stormwater Pract If Yes, Describe: | | Possible | | |
| | | | | |
| Describe Existing Site Con BUTFALL TO LAKE FROM LAKE EDGE GRASS AREA. | ditions, Including Existing Site S DHWSTLEAM D CLOSER THAN ST | Drainage and Con F TENNITO ECNAL IN | iveyance: VSES,C MARPIA | SUTFALL & 35-40 (5). CROSSES |
| Existing Head Available as Not Measured | nd Points Where Measured: | | | |

Unique Site ID: <u>LK-R</u>\$5



| PROPOSED RETROFIT | |
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| Purpose of Retrofit: Water Quality Recharged Demonstration / Education Repair | |
| Retrofit Volume Computations - Target St | torage: Retrofit Volume Computations - Available Storage: |
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| Proposed Treatment Option: Extended Detention Wet Pond Filtering Practice Infiltration | Created Wetland Bioretention |
| Beer the Marson to at December 1 December 1 | ncluding Surface Area, Maximum Depth of Treatment, and Conveyance: |
| Daylight Pipe immedi | stely behind townhower. Excavate wer lines + create bern on downstream Ed wetland - model after adjacent and. |
| depression between se | wer lines - create bern on downstream |
| edge. Plant as, foresty | id utland - model after adjacent |
| natural forested wet | and. |
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| SITE CONSTRAINTS | |
| Adjacent Land Use: | Access: |
| Residential Commercial I Industrial Transport-Related I | Institutional I No Constraints Park Constrained due to |
| Undeveloped Other: | Slope Space |
| Possible Conflicts Due to Adjacent Land I If Yes, Describe: | Use? Yes No Tree Impacts |
| If Yes. Describe: Conflict only during construct | Dother: proxingty to residential |
| Conflicts with Existing Utilities: | Potential Permitting Factors: |
| Unknown | Dam Safety Pennits Necessary Probable Not Probable Impacts to Wetlands Probable Sof Probable |
| Yes Possible | Impacts to a Stream |
| Sewer | Floodplain Fill Free Probable Not Probable |
| $\Box \qquad \forall ater \rightarrow 0 $ | Impacts to Forests / Probable Probable Impacts to Specimen Trees Probable Not Probable |
| | How many? |
| Electric | Approx. DBH around + income time |
| Electric to Streetlights ~ | Matan |
| Overhead Wires | Other factors: |
| Soils: | |
| Soil auger test holes: | Yes Vo |
| Evidence of poor infiltration (clays, fines): | Yes No Unknown |
| Evidence of shallow bedrock: Evidence of high water table (gleying, satura | ation): Yes No Unknown |
| Evidence of might water table (greying, same | |

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Unique Site ID: $\frac{LK-R}{95}$



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Unique Site ID: $\underline{LK} - R\phi S$

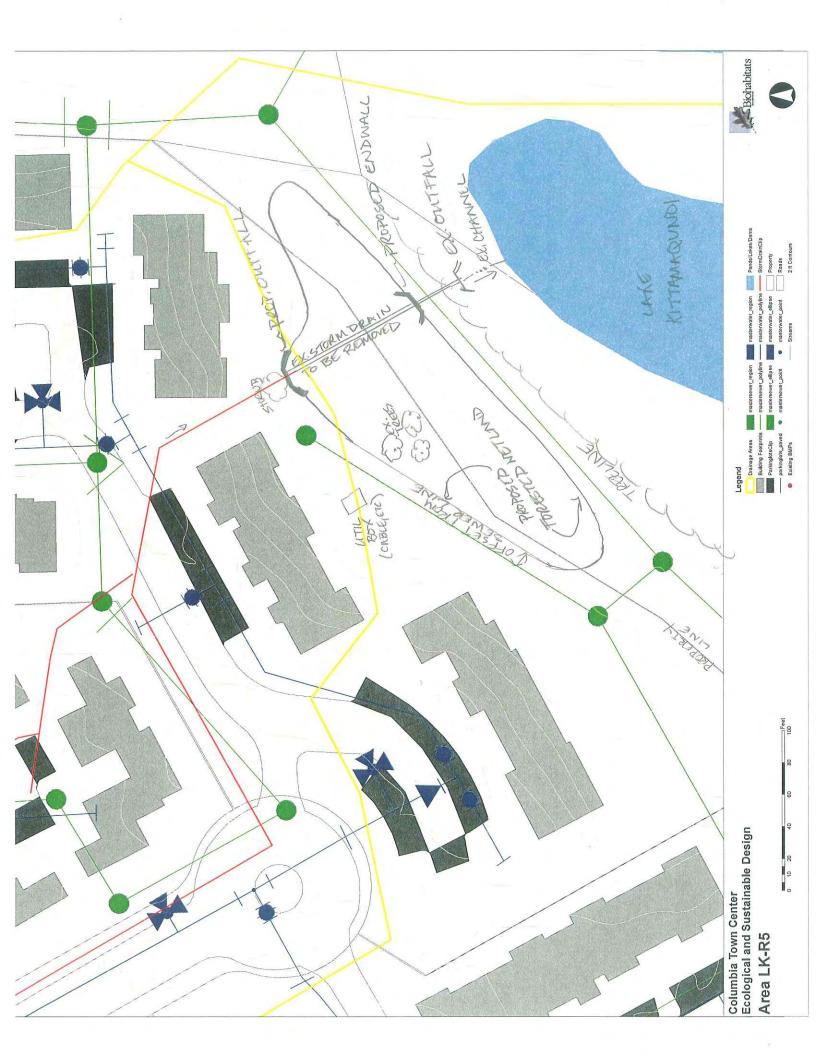
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DESIGN OR DELIVERY NOTES

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| | Unique Site ID: <u>⊥K-</u> R¢≦ |
|--|---|
| SITE CANDIDATE FOR FURTHER INVESTIGATION IS SITE CANDIDATE FOR EARLY ACTION PROJECTION IF NO, SITE CANDIDATE FOR OTHER RESTORATION IF YES, TYPE(S): | T(S): YES NO MAYBE |
| | |
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| TNITIAL FEASIBILITY AND CONSTRUCTION CONS | IDERATIONS |
| Other: | |
| Confirm volume computations | Confirm soil types |
| Confirm drainage area | -Obtain site as-builts -Obtain detailed topography |
| FOLLOW-UP NEEDED TO COMPLETE FIELD CONC | Obtain existing stormwater practice as-builts |
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| WATERSHED: HE KIT | RMAQUA SUBWATERSHED | ; | UNIQUE | SITE ID: LK-ROG |
|--|--|--|----------------------------|--|
| DATE: A 1608 | ASSESSED BY:40+ BW5 | | | PICTURES: |
| GPS ID: | LMK ID: | LAT: | | LONG: |
| STTE DESCRIPTION | SINT TONNHOMO | | <u>ाल्टर</u> | <u>></u> |
| Ownership: If Public, Government Jurisdi | Public Priv | ate DUnknown | Other: | |
| 🗌 🔲 Below Outfall 👘 🗍 in C | we Roadway Culvert Conveyance System ar Large Parking Lot | On-Site Hotspot Operat Small Parking Individual Stre | Lot 🗌 et 🗌 | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ Notes: DA 75 Parking Smoth Meador | % | Drainage Area L: Residential SFH (< 1 a SFH (> 1 a Fownhous Multi-Fam Commercial | ac lots) ac lots) es | Institutional Industrial Transport-Related Park Undeveloped Other: |
| EXISTING STORMWATER | MANAGEMENT | | | |
| PIPE FOR OR BIDE GLOPES | EE: UYES □NO WO INIELOW. E UTFION, BUT NO ARE MOWED + E GRASSED/FORDED | O PIPES C Some WHHT | BASIM ENTER CTEE | J HAS SMALL THE POND P. BOTTOM |
| Describe Existing Site Cond CONVELANCE FR STORM DRAINS | litions, Including Existing Site TM PARKING L SYSTEM ALONG | Drainage and Con UTS BYPAS LITTLE | veyance: SES - THTU | END, JONE KENT TARKWAY |
| Existing Head Available and | d Points Where Measured: | | | |

Unique Site ID:<u>LK-R</u>Ø6

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| PROPOSED RETROFIS | | | |
| Purpose of Retrofit: | | | The A Control |
| Water Quality Demonstration / Education | Recharge Repair | Channel Protection | Flood Control |
| | <u> </u> | | |
| Retrofit Volume Computations | - Target Storage: | Retrofit Volume Comp | outations - Available Storage: |
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| Increased Treatment Options | | | |
| Proposed Treatment Option: | et Pond TCreate | ed Wetland 🛛 🗌 Bioretentio | ם ו |
| | iltration 🔲 Swale | | |
| Describe Elements of Pronosed | Retrofit, Including | Surface Area, Maximum Dept | h of Treatment, and Conveyance: |
| Use flow GDU | itter to | o divert-flo | w from yard |
| inlet in Zou | N Idownstra | lam of innotion, | otaiking let count |
| into existing ann | anded - | A New L | th of Treatment, and Conveyance: W from yard of paiking let runoff affle to preven it wil wetland regimes |
| de la sur a | I transfer | na. Degran ja | affle to preven |
| 410rt-circuit og | f treatment | Mana. Plai | it w/ wetland |
| a recites + and | inge ma | antmance | regime. |
| ş | 7 | | J |
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| SITE CONSTRAINTS | | | |
| Adjacent Land Use: | | Access: | |
| Residential 🗌 Commercia | | | |
| · | Related 🗌 Park | Constraine | |
| Undeveloped Other: | and Land Use? | Yes ∏No []Slo | ppe 🗹 Space lities 🖓 Tree Impacts |
| Possible Conflicts Due to Adja- If Yes, Describe: | tent Land Use: | | uctures Property Ownership |
| IT res, Describe. | | | rer: |
| Conflicts with Existing Utilities | | steptial Permitting Factors: | |
| None | | am Safety Permits Necessary | 🗌 Probable 🔄 Not Probable |
| Unknown | | npacts to Wetlands | Probable Not Probable |
| Yes Possible | | npacts to a Stream | Probable Pr |
| Sewer (not ° | vemaip Fl | oodplain Fill | Probable Not Probable Probable Not Probable |
| | | apacts to Porests apacts to Specimen Trees | Probable [] Not Probable |
| Gas Cable | E 1 | How many? | 7 |
| | | Approx. DBII | - Sodding new pipe to |
| Electric to Stre | etlights | · -pp: 010 ====== | - flow to pend may |
| Overhead Wir | | ther factors: | require reasonal, |
| Other: | | · · · · · · · · · · · · · · · · · · · | <u>shrall trees</u> |
| Soils: | | | |
| Soil auger test holes: | | Yes Yo | |
| Evidence of poor infiltration (cla | ays, fines): | ☐ Yes ☐ No ☐ Unknown ☐ Yes ☐ No ☐ Unknown | |
| Evidence of shallow bedrock: Evidence of high water table (gl | ening saturation) | Yes No Cnknown | • |
| produce of high water table (gi | >)))≝, saturation). | | |

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Unique Site ID: $\underline{-K-R}\phi_{G}$



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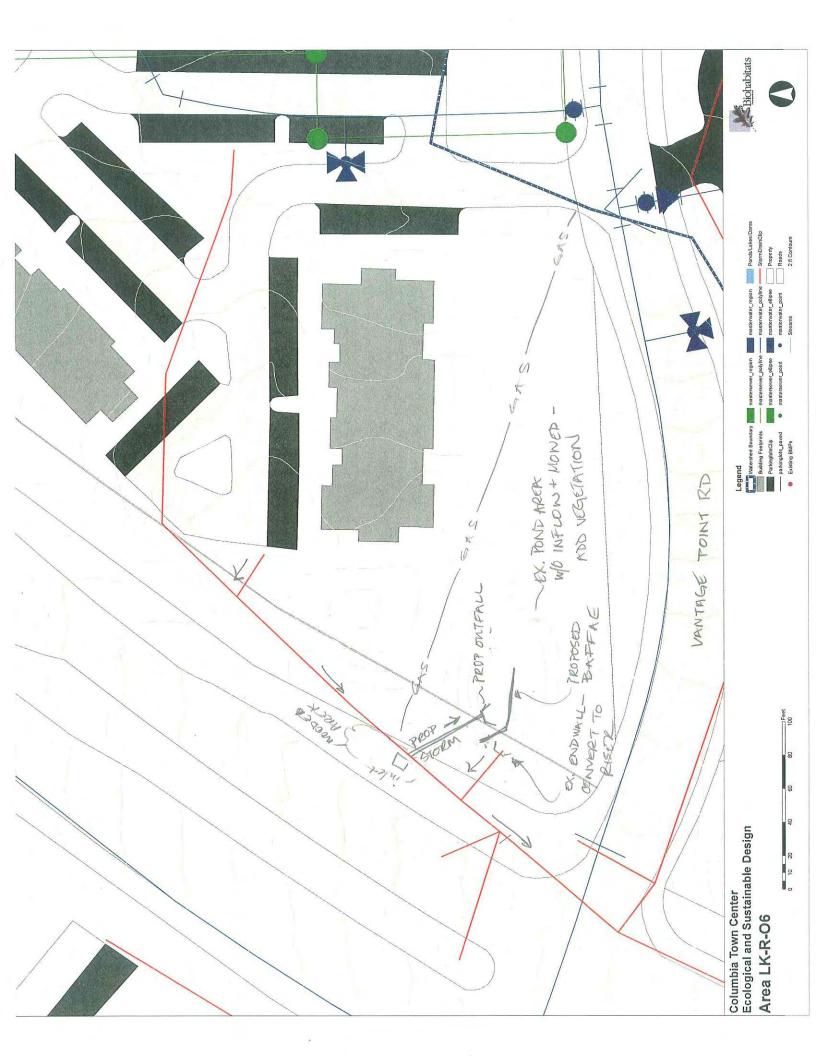
Unique Site ID: <u>LK-</u>R#6



| DESIGN OR DELIVERY NOTES | |
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| FOLLOW-LP NEEDED TO COMPLETE FIELD | CONCEPT |
| -Confirm property ownership | Obtain existing stormwater practice as-builts |
| Continu drainage area | Cobtain site as-builts Cobtain detailed topography |
| Confirm volume computations | Obtain utility mapping Confirm storm drain invert elevations |
| Complete concept sketch | Confirm soil types |
| Other: | |
| INITIAL FEASIBILITY AND CONSTRUCTION | a na bana na mana na mandra ang kana na mana ang kana na mang kana na mang kana na mang kana na mang kana na ma |
| * Tree impacts from adding | y new pipe are key constraint constrain solding new pipe |
| * Clastine May also | constrain solding new pipe |
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| | a na salahan na salah |
| SITE CANDIDATE FOR FURTHER INVESTIG. IS SITE CANDIDATE FOR EARLY ACTION P | an na balan kasa babasa kasa ina 🔚 sasa asa sa 🔚 na babasa kari 🔤 na babasa ka 🔤 na babasa kari kari kari ka |
| IF NO, SITE CANDIDATE FOR OTHER RESTO | 1977 T. S. D. 🕺 🖓 ONDOR BODE AND SAME 🚛 NAMA NAMA 🔚 🗔 ORODOR SA 🚍 MANYAWAYANA ANG SAM |
| JF MES, TYPE(S): | |

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Unique Site ID: <u>LK-</u>R&G



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| WATERSHED: LAKE K | TTAMADUND | UNIC | QUE SITE ID: $LK - \not\in \phi \not$ |
|--|--|--|--|
| DATE: 1/10/08 | ASSESSED BY: 4 Bros | CAMERA ID: | PICTURES: |
| GPS ID: | LMK 1D: | LAT: | LONG: |
| SITE DESCRIPTION Name: <u>9HERATOA/</u> Address: 10207 Mix | opinticola. | | |
| Ownership: If Public, Government Jurisd | Public Priv | | e parcel as Shereton) |
| | : ove Roadway Culvert Conveyance System ar Large Parking Lot (14 DA) | On-Site Hotspot Operation Small Parking Lot Individual Street Underground | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| DRAINAGE AREA TO PRO | POSED RETROFIT | | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ Motes: DA: Includes St Ftn King Garage; | eraton, ReMax Bldg, Surface Lot | Drainage Area Land Us Residential SFH (< 1 ac lots) SFH (> 1 ac lots) Townhouses Multi-Family Commercial (Harte) | ☐ Institutional ☐ Industrial |
| EXISTING STORMWATER | MANAGEMENT | (Sthee | Blågs- |
| Existing Stormwater Practi If Yes, Describe: | ce: []Yes ⊡ ^r No | 🗌 Possible | |
| Describe Existing Site Cont Out(all (-27") to Possible "Illicit of Channel cults H | litions, Including Existing Site "10" Concern Channel Uscharge (discolore wrongh open 3 | Drainage and Conveyance to RipRap, unde d lowflow - bu pace co Man | *: fort in Bridge, to lake ilding Under renovat y trees, |
| Existing Head Available an | d Points Where Measured: | | |
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| PROPOSED RETROFIT | |
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| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Protection Flood Control |
| Retrofit Volume Computations - Target Storage: | Retrofft Volume Computations - Available Storage: |
| Filtering Practice Infiltration Swa | eated Wetland Bioretention vale Other: ing Surface Arca, Maximum Depth of Treatment, and Conveyance: |
| | |
| SITE CONSTRAINTS Adjacent Land Use: Residential Commercial Instituti Industrial Transport-Related Park Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: Park Conflict of Alline | Constrained due to |
| Ehotel, Can't distorts trail alon | |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | ☐ Yes ☐ No ☐ Yes ☐ No ☐ Unknown ☐ Yes ☐ No ☐ Unknown ☐ Yes ☐ No ☐ Unknown |

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Unique Site ID:<u> LK- R</u>ゆ7



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| | 11,000 | - C / F - | | | | | | O. | |

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

Confirm property ownership

Confirm drainage area

Confirm drainage area impervious cover

- Complete concept sketch

- Obtain existing stormwater practice as-builts
- D ∕Obtain site as builts
- Detain detailed topography
- Obtain utility mapping
- Confirm storm drain invert elevations
- Confirm soil types

Other:

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

| | <u> </u> |
|---|----------|
| SITE CANDIDATE FOR FURTHER INVESTIGATION: | vis 🗐 |
| | |
| IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): | YES |
| | VES |
| IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): | YESCOUL |
| an a bar 15,0000,000,000,000 and an | |
| IFYES TYPE(S) | · · |
| a paga na katalahan katalah katalan katalan katalan katalan katalan katalan katalan katalan katalan katalan ka t | |

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NO.



Unique Site ID:<u>ルース</u>のダ

| | MAGUNDA SUBWATERS | | UNIQUE SITE ID: LK- ROOS |
|--|---|--|---|
| DATE: A 1600 | Assessed By: At | | |
| GPS ID: | | LAT: | LONG: |
| SITE DESCRIPTION Name: SHERATON Address: 10207 | wincopin Circle | | |
| Ownership: If Public, Government Juri | diction: Dublic sdiction: |] Private 🗾 Unknown] State 🗌 DOT | Other: |
| 🗌 Below Outfall 🛛 📋 i | on: Above Roadway Culvert n Conveyance System Near Large Parking Lot | On-Site Hotspot Open Small Parking Individual Str Underground | Eot 🛛 🔲 Small Impervious Area |
| DRAINAGE AREA TO PI | ROPOSED RETROFIT | | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ Notes: Farking [| % | Drainage Area I Drainage Area I Residential SFH (< I SFH (> I SFH (> I Townbou Multi-Fai Commercial - | ac lots) Industrial ac lots) Transport-Related ses Park nily Undeveloped |
| EXISTING STORMWATH | R MANAGEMENT | | 7 - |
| Existing Stormwater Pra | ctice: 🗌 Yes 🖬 | No 🗌 Possible | · . |
| If Yes, Describe: | | | |
| Describe Existing Site Co | nditions, Including Existing | g Site Drainage and Co | uveyance: |
| Describe Existing Site Co | enditions, Including Existing large parking exct fall of the | g Site Drainage and Co lot goes into ip of slope | verance: 5 storm drain int adjacent to stra |
| Describe Existing Site Co | large parking excitation to the crossion k | g Site Drainage and Co lot ages inte ip of slope Dank is esm | everance: Storm drain int adjacent to stra ewhat protected |
| Describe Existing Site Co North part of conversed to Outfull has som by large ston | large parking excitation to the crossion k | lot now interpersion of slope pank is some | aveyance: Storm drain int adjacent to stra ewhat protected |
| Describe Existing Site Co North part of conversed to Outfull has som by large ston | large parking exct fall at the Ne crossion k e. | lot now interpersion of slope pank is some | aveyance: Storm drain inc adjacent to stra ewhat protected |

II 1.....



| PROPOSED RETROFT | | |
|--|------------------------|---|
| Purpose of Retrofit: Water Quality Demonstration / Education | Recharge | Channel Protection Flood Control Other: |
| Retrofit Volume Computations | · Target Storage: | Retrofit Volume Computations - Available Storage: |
| | | |
| | | ļ |
| | | İ |
| | t Pond Created | i Wetland Divertention |
| Describe Elements of Proposed | Retrofit, Including Su | urface Area, Maximum Depth of Treatment, and Conveyance |
| Due to proximity e | outfall | to stream, only option is time |
| to treat runoff | in you 7 | parking lot. Landscaped Blands |
| are not large i | nenah to | We for Ty. Lot absears |
| heavily used officer | etal losin | is spaces probably not an |
| option. There to | e under a | around Fracticele on |
| plumeable gar | idment ? | I recommended. |
| SITE CONSTRAINTS | | |
| Adjacent Land Use: | | |
| i Industrial I Transport-R | elated 🗌 Park | Constrained due to |
| Possible Conflicts Due to Adjac | | Yes 🖉 No 🔄 Utilities 🛄 Tree Impacts |
| If Yes, Describe: Only duri | re constructio | UN Structures Property Ownership |
| Conflicts with Existing Utilities | : i Pote: | tential Permitting Factors: |
| None | Dam | m Safety Permits Necessary 🛛 🔲 Probable 🛄 Not Probable |
| Yes Possible | | pacts to Wetlands |
| i Sewer /lone 4 | Floor Floor | odplain Fill 🗍 Probable 🛄 Not Probable |
| Water | | pacts to Forests Probable Not Probable |
| Gas Gable | | pacts to Specimen Trees Probable II Not Probable How many? |
| | | Approx. DBII |
| Electric to Stree | etlights | |
| Overhead Wire | | her factors: |
| Soils: | <u>_</u> | |
| Soil auger test holes: | | Yes No |
| Evidence of poor infiltration (cla | ys, fines): | Yes No Unknown |
| Evidence of shallow bedrock: Evidence of high water table (glo | ving seturation): | Yes No Unknown Yes No Unknown |
| Principle of men water rapic (Ric | | |

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Unique Site ID: <u>LK-R</u>OC



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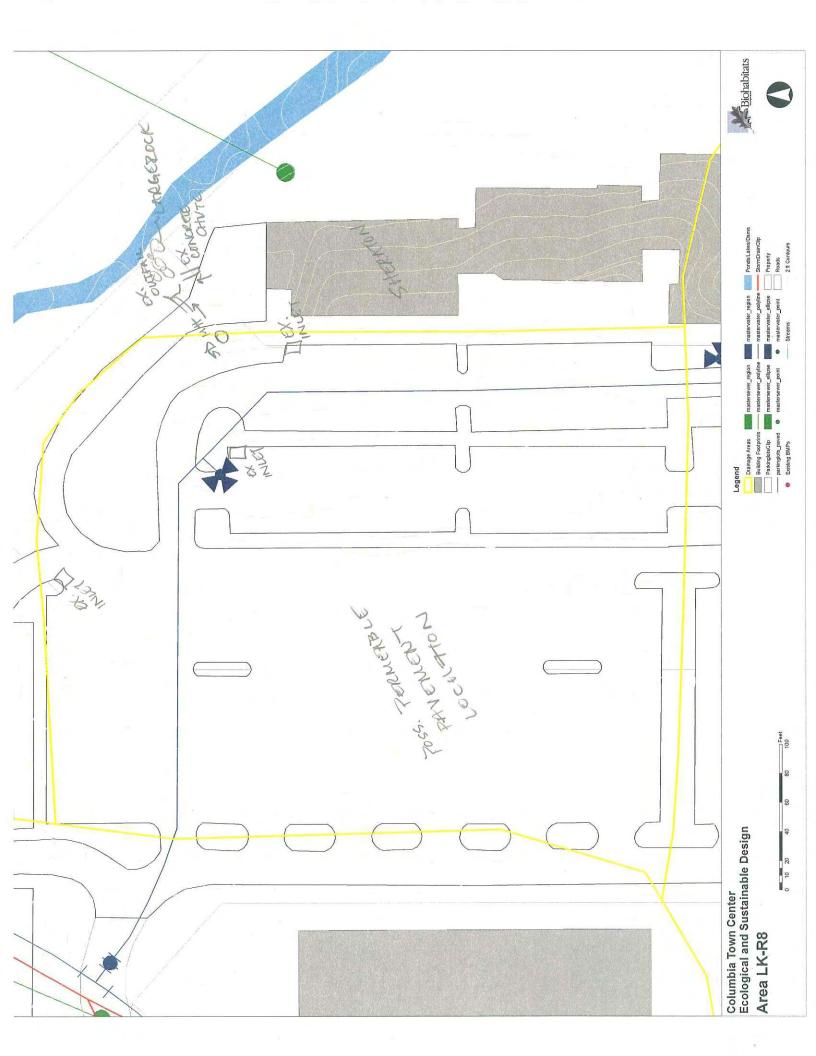
Unique Site ID: <u>UK-R</u>OG

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| OLLOW-UP NEEDED TO COMPLETE FIELD CO | NCEPE | |
| Confirm property ownership | Obtain existing stormwater practice as-built Obtain site as-builts | <u>ijigiousuininen</u> |
| Confirm drainage area Confirm drainage area impervious cover | 🔂 Obtain detailed topography | |
| Confirm volume computations | Obtain utility mapping Confirm storm drain invert elevations | |
| Other: | Contirm soil types | |
| NITIAL FEASIBILITY AND CONSTRUCTION CO | INSIDERATIONS | |
| | | 1 |
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| | | |
| SITE CANDIDATE FOR FURTHER INVESTIGATI IS SITE CANDIDATE FOR EARLY ACTION PRO IF NO, SITE CANDIDATE FOR OTHER RESTORA IF YES, TYPE(S) | IECT(S): YES NO | Maybe Maybe Maybe |

DESIGN OR DELIVERY NOTES



| R | R | Ι |
|---|---|---|

| WATERSHED: LAW SUBWATERSHED: | | : | UNIQUE SITE ID: LK-RO9 | |
|--|--|--|--|--|
| DATE: 4/16/08 | ASSESSED BY: AM BWS | CAMERA ID: | PICTURES: | |
| GPS ID: | LMK ID: | LAT: | LONG: | |
| SITE DESCRIPTION | | | | |
| Name: <u>PARKING</u> B Address: | TWN CLARK RLTX | G 4 KAN LAI | LERONT NORTH | |
| Ownership: If Public, Government Jarísdi | ☐ Public ☐ Priv ction: ☐ Local ☐ Stat | · · · · · · · · · · · · · · · · · · · | Other: | |
| 🔲 Below Outfall 👘 🛄 In C | ive Roadway Culvert Conveyance System r Large Parking Lot | On-Site Hotspot Operat Small Parking Individual Stro | Lot 📋 Small Impervious Area | |
| DRAINAGE AREA TO PRO | POSED RETROFT | | | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ Motes: DA = Parking lo EXten Station, E | t, Clark Bldg, cadway | Drainage Area Ls CRESIDENTIAL C | □ Institutional ac lots) □ Industrial ac lots) □ Transport-Related es □ Park | |
| EXISTING STORMWATER | MANAGEMENT | | | |
| Existing Stormwater Practi If Yes, Describe: | xe: ∐Yes [2]-No | []] Possible | | |
| George dimension me | hours. Facking scharge to out sections have sur ur hole sprod | Into all - So | verance: $append underwhitzad in par condition. p of \leq lept adjaced f end section has fall net have formed.$ | |

Unique Site ID:<u>」人、R</u>O9

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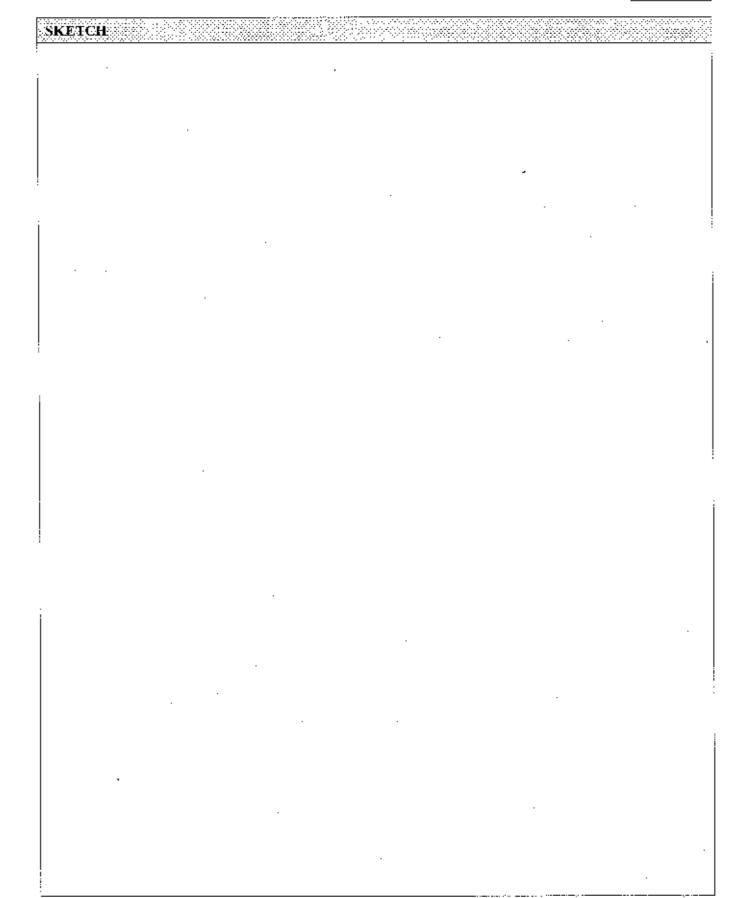
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| PROPOSED RETROFIT | | | |
|--|---------------------|---|--|
| Purpose of Retrofit: | Recharge | Channel Protection Other: | Plood Control |
| Retrofit Volume Computations | - Target Storage: | Retrofit Volume Com | putations - Available Storage: |
| | | | |
| | | | |
| | . * . | i | |
| | | | |
| | et Pond Create | ed Wetland 7 Bioretentic | מי |
| Describe Elements of Proposed | Retrofit, Including | Surface Area, Maximum Dep | th of Treatment, and Conveyance: |
| 2 options: "if spa | ce availab | le, combine w/Lt | -R10 |
| E USE Ch Drec | stern half | of parking let. | to construct stormy |
| 4 D: Dayliah | t sterm | drain system | for use flore the |
| Excavation lills | Lu NEGNIRE | d. Wate bioref. | (or use flow stitter ution of shallow inlet to discharge oded areas |
| lattand. Ricons | truct ent | fall, use drop | inlet to discharge |
| flows to stream | Nevation | Stabilize er | oded areas |
| SITE CONSTRAINTS | | | |
| Adjacent Land Use: | l 🗌 Institution | al Access: | Istraints |
| 🗌 Industrial 👘 🔲 Transport-F | elated [] Park | Constraine | at due to |
| Undeveloped Other: Possible Conflicts Due to Adjac | ent Land Use? | | ilities () Tree Impacts |
| If Yes, Describe: | | | her: |
| Conflicts with Existing Utilities | e Po | otential Permitting Factors: | |
| □ None □ Unknown | . In | am Safety Permits Necessary apacts to Wetlands | Probable Vot Probable Probable Vot Probable |
| Yes Possible | asy o In | pacts to a Stream oodplain Fill | Probable 🗌 Not Probable |
| E Sewer but | NOR IN | pacts to Forests | Probable 🗌 Not Probable |
| ∐ LL∕ Gas | In | pacts to Specimen Trees | Probable Not Probable |
| Cable | | How many? Approx. DBH | access 40 eraded |
| Electric to Stre | | | Saccess to exoded channel may imple GMall Trees |
| Overhead Wird | es O | ther factors: | SMall Thesa |
| Soils: | <u> _</u> | | |
| Soil auger test holes: | ~ \ | Yes Pro | |
| Evidence of poor infiltration (cla Evidence of shallow bedrock: | ys, fines): | Yes No Unknown Yes No Unknown | |
| Evidence of high water table (gle | vino saturation): | Yes No Unknown | |

Unique Site ID: <u>LK-</u>ROG



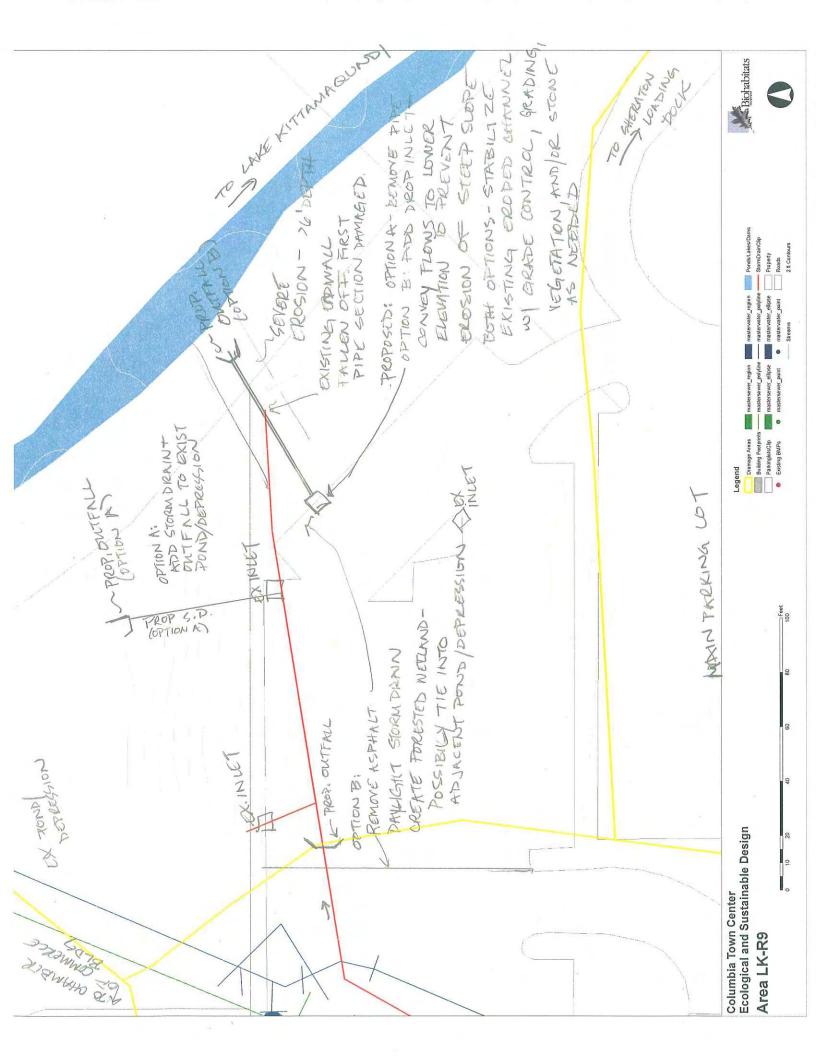


Unique Site ID: <u>LK-L09</u>

RRI

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT Confirm property ownership Obtain existing stormwater practice as-builts Confirm drainage area 💭 Obfain site as-builts Confirm drainage area impervious cover Obtain detailed topography Confirm volume computations Gobtain utility mapping Complete concept sketch Confirm storm drain invert elevations L Confirm soil types Other: INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS Major Constraints: -Loss of parking spaces -Tess. Fisture redevelopment Doth of storm drain Benefit: Storm drain repair ! maessant independent SITE CANDIDATE FOR FURTHER INVESTIGATION: YES: ি ১০ MAYBE IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): No. YES MAYBE. IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): VES NO MAYBE IF YES, TYPE(S):__ Unique Site ID: <u>LK-R09</u>



| WATERSHED: | FRANCE SUBWATERSHED | | UNIQUE SITE ID: LK-R14 |
|--|---|---|--|
| DATE: 4 16 00 | ASSESSED BY: CH/BWS | G. CAMERA ID: | PICTURES: |
| GPS ID: | LMK ID: | LAT: | LONG: |
| SITE DESCRIPTION | | | |
| | OF COMMERCE Sterrett Phre | | |
| Ownership: If Public, Government Jur | | ivate Unknown ate DOT | 1 Other: |
| 🗌 Below Outfall 🔤 🗌 | ion: Above Roadway Culvert In Conveyance System Near Large Parking Lot | On-Sife Hotspot Opera Small Parking Jndividual Stra Underground | z Lot 🔲 Small Impervious Area eet 🔄 Landscape / Hardscape |
| DRAINAGE AREA TO P | ROPOSED RETROFT | | |
| Drainage Area \approx Imperviousness \approx Impervious Area \approx Notes: Dri includes_ parking lef. May i direction of that direction of that $Also, Cytton G iscExisting Storeniwat$ | include One Mail North - storm drain un Known tudes on desaword in | Drainage Area I Residential SFH (< I SFH (> 1 SFH (> 1 Townhou Multi-Far Commercial | $ \begin{array}{c} \square \text{ Institutional} \\ \text{ac lots} \\ \text{ac lots} \\ \end{array} \begin{array}{c} \square \text{ Industrial} \\ \square \text{ Transport-Related} \\ \end{array} $ $ \begin{array}{c} \square \text{ Park} \\ \end{array} $ |
| Existing Stormwater Pra If Yes, Describe: Floodplain are pond-like dep Two inlets exist file Storm drain It is Suspected | actice: Ves INd a behind bliddi ussion. Embauka in pond area, but is from is pstream of Uthat flows ba | Defossible inss has an new is ve no mitfall Ble"pfer w ck up, po | abankanent creating B' heigh + top is no wide exists. Code of inlets redin nd goes into 42" pipe - b <u>out of inlet; and floc</u> inversance: public area. N from Zinlets goes channel before joining |
| Describe Existing Site C | onditions, Including Existing Sit | te Drainage and Co | inveyance: strid area. |
| At the inlet through sh the mainste | , 36" pipe has "l' m + discharges m. | covel, Flor Ho Small | w from Zinlets gols channel befoll joining |
| | | | |
| Existing Head Available | and Points Where Measured: | | |
| NA. | | | |
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Unique Site ID: <u>LK-</u>R40



| PROPOSED RETROFIT | | | |
|---|--------------------|--------------|--|
| Purpose of Retrofit: | Recharge Repair | 9 | Channel Protection Flood Control |
| Retrofit Volume Computations | - Target Storage: | | Retrofit Volume Computations - Available Storage: |
| | | | · · · |
| | et Pond Create | | lland Dioretention |
| | | | ce Arca, Maximum Depth of Treatment, and Conveyance: |
| (1) Divert flows from | arainece | arl | a discubed in LK-R09 into pond. |
| Excavate aroun | d inlet w | 36 L | "pipe inflow to get flows to et to act as riser. Manage te |
| involve che | aile on | 100000 4 | t. To let us viser. Manage |
| SITE CONSTRAINTS | | | ~ |
| Adjacent Land Use: Residential Commercia Industrial Transport-I Undeveloped Other: Possible Conflicts Due to Adja- If Yes, Describe: | Related 🗍 Park | | Access: No Constraints Constraint Access Constrained due to No Constrained due to No Constrained due to Nill have to be Constrained due to Nill have to be Constrained due to No Constrained due to No Constrained due to Nill have to be Constrained due to No Constrained due to No Constrained due to Nill have to be Constrained due to No Constrained due to Space Constrained due to No Constrained due to Space Constrained due to Space Constrained due to Space Constrained due to Structures Constrained due to No Constrained due to No Constrained due to Structures Constrained due to No Constrained due to Constrained due to Constrained due to Constrained due to Constrained due to Constrained due to Co |
| Conflicts with Existing Utilities | | | ll Permitting Factors: Tety Permits Necessary |
| Unknown | ຸ ໂຫ | pacts | to Wetlands Probable Construction of the second sec |
| Sewer | Secture Flo | bodpla | ain Fill Probable Not Probable |
| | | pacts : | to Specimen Trees 🧹 🔲 Probable 🔤 Not Probable |
| Electric | excavate | | Torox. DBH Many shall there by |
| Electric to Stre Overhead Wir Other: | | ther f2 | actors: <u>Leanned to coin</u> acters |
| Soils: | | . | |
| Soil auger test holes: Evidence of poor infiltration (ck | iys, fines): | 🗌 Ye 🗌 Ye | es 🖵 No es 🗌 No 📋 Unknown |
| Evidence of shallow bedrock: | | 🗌 Ye | es 🗌 No 🔄 Unknown |

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Unique Site ID: <u>LK-R1</u>0





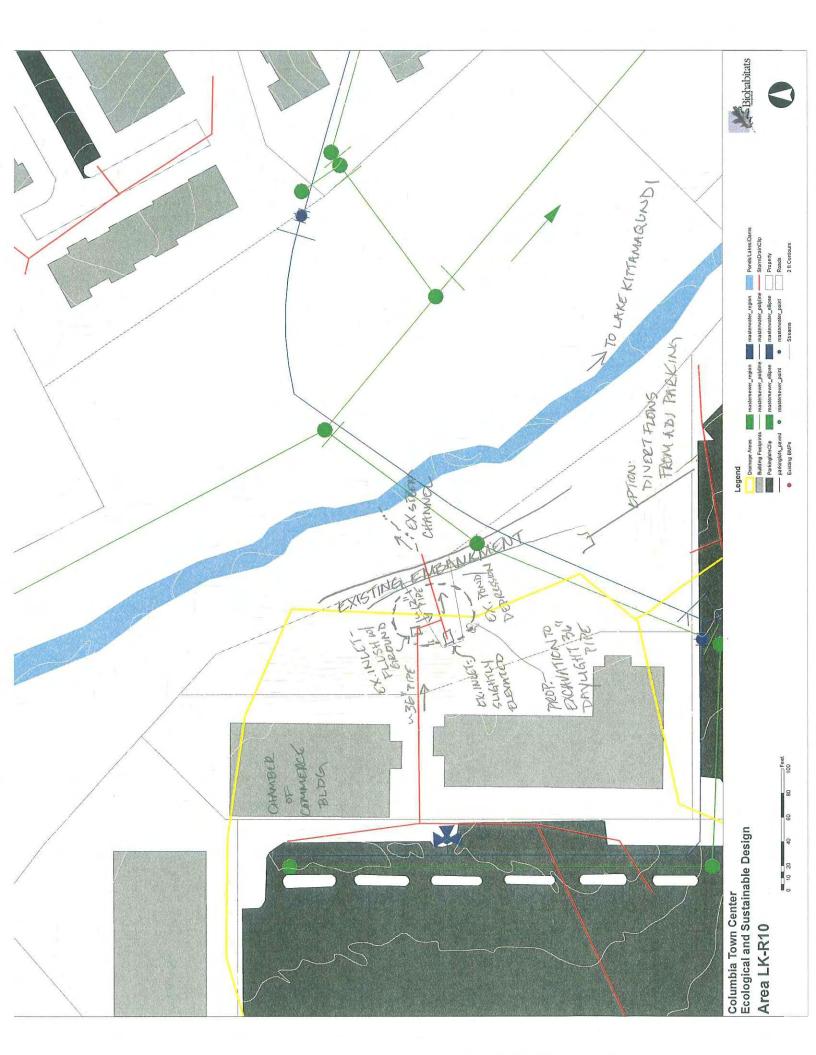
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Page 3 of 4



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| FOLLOW-UP NEEDED TO COMPLETE FIELD CON | NCEPT | |
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| <u> - Anna -</u> | | |
| Confirm property ownership | Chain existing stormwater practice as-be | ilts-Poletermine, |
| Confirm property ownership Confirm drainage area | Obtain site as-builts | Adisioned |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover | Description of the second seco | Halsicned |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations | Obtain site as-builts Obtain detailed topography Obtain utility mapping | Halsicned for SWM |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drain invert elevations | Halsianad for SWM lor is aboned |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations | Obtain site as-builts Obtain detailed topography Obtain utility mapping | Falsigned for SWM (or is aboned Ecd basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Falsicned for SWM (or is aboned sed basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Falsicned for SWM (or is aboned Eed basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Hassicned Falsicned for SWM (or is aboned Eed basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Falsicned For SWM (or is aboned Eed basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Falsicned For SWM (or is aboned sed basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Halsicned Halsicned for SWM (or is aboned Eed basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Halsicned For SWM (or is abored Ecd basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Hasicned For SWM (or is abored Eed basin?) |
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| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Hausined Hausined for is abored Eed busin? |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drait invert elevations Confirm soil types | Hausiched Hausiched for is abored Eed basin? |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch Other: INITIAL FEASIBILITY AND CONSTRUCTION CON | Obtain site as-builts Obtain detailed topography Obtain utility mapping Onfirm storm drain invert elevations Onfirm soil types ISIDERATIONS | Hallianaol for SWM (or is abored sed basin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch Other: | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drain invert elevations Confirm soil types ISIDERATIONS | Hallianaol for SWM (or is abored Eed busin?) |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Complete concept sketch Complete concept sketch Other: INITIAL FEASIBILITY AND CONSTRUCTION CON SITE CANDIDATE FOR FURTHER INVESTIGATIO IS STIE CANDIDATE FOR FURTHER INVESTIGATIO IS STIE CANDIDATE FOR EARLY ACTION PROJE | | MAYBE |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch Other: INITIAL FEASIBILITY AND CONSTRUCTION CON INITIAL FEASIBILITY AND CONSTRUCTION CON SITE CANDIDATE FOR FURTHER INVESTIGATIO IS STIE CANDIDATE FOR FURTHER INVESTIGATIO IS STIE CANDIDATE FOR EARLY ACTION PROJE IF NO, SITE CANDIDATE FOR EARLY ACTION PROJE | | Hallianaol for SWM (or is abored Eed busin?) |
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| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Complete concept sketch Complete concept sketch Other: | | MAYBE |
| Confirm property ownership Confirm drainage area Confirm drainage area Confirm volume computations Complete concept sketch Other: INITIAL FEASIBILITY AND CONSTRUCTION CON INITIAL FEASIBILITY AND CONSTRUCTION CON SITE CANDIDATE FOR FURTHER INVESTIGATIO IS STTE CANDIDATE FOR FURTHER INVESTIGATIO IS STTE CANDIDATE FOR EARLY ACTION PROJE IF NO, SITE CANDIDATE FOR EARLY ACTION PROJE | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm sorm drain invert elevations Confirm soil types ISIDERATIONS ISIDERATIONS ISIDERATIONS N: YES NO ION PROJECT(S): YES NO | MAYBE |

DESIGN OR DELIVERY NOTES





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| , , - | WKQON SUBWATERSHED | n / | UNIQUE SITE ID: LK-R11 |
| DATE: Aji608 | ASSESSED BY:52H BW | CAMERA ID: | PICTURES: |
| GPS 1D: 1 . | LMK ID: | LAT: | LONG: |
| SITE DESCRIPTION | | | |
| Name: <u>C²HAMBER</u> C Address: | <u> A TIMMERCE</u> | ~ | |
| Ownership: lf Public, Government Jurisdi | | vate 🖾 Unknown te 🗌 DOT | Other: |
| 🔲 Below Outfall 🛛 🗍 Ip.(| ove Roadway Culvert Conveyance System or Large Parking Lot <u>SMAU D</u> A | On-Site Hotspot Opera Small Parking Individual Stre Underground | Lot 🔲 Small Impervious Area |
| DRAINAGE AREA TO PRO | POSED RETROFIT | | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ Notes: DA = JanKin | % % % | Drainage Area L Residential SFH (< 1 a SFH (> 1 a Townhous Multi-Far Commercial | Institutional ac lots) Industrial ac lots) Transport-Related ses Park |
| EXISTING STORMWATER | MANAGEMENT | | |
| Existing Stormwater Practi If Yes, Describe: | ce: 🗌 Yes 🛃 Ño | Possible | · · · · · · · · · · · · · · · · · · · |
| Describe Existing Site Cond SMall Pottion of to symple which Headcuit exists | litions, Including Existing Site large parking i jeins concret in Swale. | e Drainage and Con G DT USC L CHANNE | veyance: Marges Via curb curb curb curb curb curb curb curb |
| Existing Mood Appliable on | d Dainte Whare Measured | | |
| Existing Head Available an | u romus where measured: | | |
| | | | |

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| PROPOSED RETROFIT | |
|--|--|
| Purpose of Retrofit: Water Quality Recharge Demonstration / Education Repair | Channel Protection Other: |
| Retrofit Volume Computations - Target Storag | e: Retrofit Volume Computations - Available Storage: |
| | |
| | |
| Proposed Treatment Option: Bxtended Detention Filtering Practice Infiltration | rcated Wetland Bioretention wale Other: |
| Describe Elements of Proposed Reprofit, Includ | ling Surface Area, Maximum Depth of Treatment, and Conveyance: |
| the check dams / berns | s to spread tslow water Stabilized |
| ended area + rise dro | p inlet if needed. Plant |
| W bioretrution -lan | ing Surface Area, Maximum Dopth of Treatment, and Conveyance: 5 to spalad + slow Nater. Stabiliza p inlet if needed. Plant XS |
| | · · · |
| | |
| SITE CONSTRAINTS | |
| Adjacent Land Use: Residential Commercial Institu | tional I No Constraints |
| Industrial | Constrained due to |
| Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: | Yes No Utilities Tree Impacts |
| Conflicts with Existing Utilities: | Potential Permitting Factors: |
| None | Dam Safety Permits Necessary Probable II Not Probable impacts to Wetlands Probable II Not Probable |
| Yes Possible | Impacts to a Stream 🗌 Probable 🕕 Not Probable |
| U Sewer Not on Map Water | Floodplain Fill Probable Not Probable Impacts to Forests Probable Not Probable |
| Gas | Impacts to Specimen Trees 🗌 Probable 🗌 Not Probable |
| Gas Gas Gable Gable Generation Gable Generation Gable Generation Gable G | How many? Approx. DBH |
| | |
| Overhead Wires Other | Other factors: |
| Soils: | |
| 5 Soil auger test holes: | 🗌 Yes 🗹 No |
| | |
| Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation) | ☐ Yes ☐ No ☐ Unknown ☐ Yes ☐ No ☐ Unknown |

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Unique Site ID:<u>//K-</u>R11



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Unique Site ID: <u>LK-</u>RH



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|--------------|----------------|--|---------------------------------------|--|
| DESIGN OR | DELIVERYNOTES | 5.1.2.50.0000.00000000000000000000000000 | 2000 x 10 10 2 X 5 5 5 6 ^A | |
| | | hang period and her and her and her and | un un primer de la Color de | |

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| FOLLOW-UP NEEDED TO COMPLETE FIELD O | ONCEPT |
|---|---|
| Confirm drainage area | Obtain site as-builts |
| Confirm drainage area impervious cover Confirm volume computations | Obtain detailed topography Obtain utility mapping |
| Complete concept sketch | Confirm storm drain invert elevations |
| Other: | Coufirm soil types |
| INITIAL FEASIBILITY AND CONSTRUCTION C | AVASIDEKA1 IQIAS |
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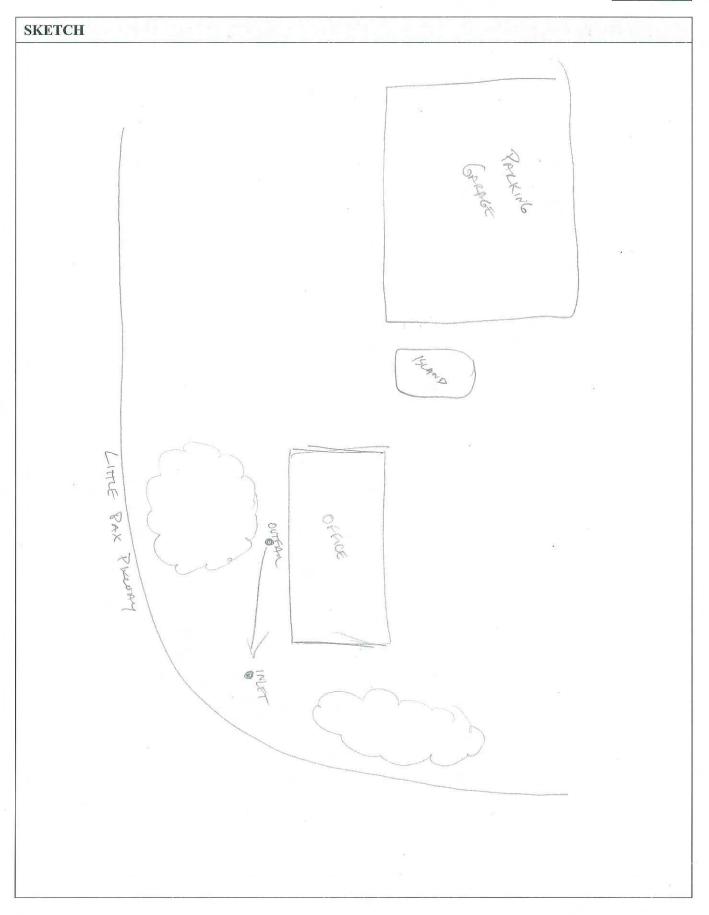
| WATERSHED: SS L | SUBWATERSHED |): | UNIQUE SITE ID: UK-R 12 |
|--|---|---|---------------------------|
| DATE: 4-9-08 | Assessed By: Bws | CAMERA ID: | PICTURES: |
| GPS ID: | LMK ID: | LAT: | LONG: |
| SITE DESCRIPTION | | | 4 |
| Name:Address:0-76 Colli | UMBIA CORPORATE CEN | TER | |
| Ownership: If Public, Government Jurisdie | ction: Dublic Pri | vate 🗌 Unknown te 🗌 DOT [| V Other: 66P |
| Below Outfall | ve Roadway Culvert onveyance System r Large Parking Lot | On-Site Hotspot Operate Small Parking Individual Stre | Lot Small Impervious Area |
| DRAINAGE AREA TO PROP | POSED RETROFIT | | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ | % | Drainage Area La Residential SFH (< 1 a SFH (> 1 a) | ac lots) Institutional |
| Notes: | | Townhous Multi-Fam Commercial | es 🗌 Park |
| EXISTING STORMWATER I | MANAGEMENT | | |
| Existing Stormwater Practic If Yes, Describe: | | | 4 |
| DEPRESSION IN | GREENSPACE W/S | MALL DIAMETE | TRE BUTLET AND RISER |
| STRUCTURE. | WETLAND PLAANTS IN | DEPRESSION. | |
| | | | |
| | | | |
| Describe Existing Site Condi | tions, Including Existing Site | e Drainage and Con | veyance: |
| | | | |
| | | | |
| | | | |
| | | | |
| Existing Head Available and | Points Where Measured: | | |
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| PROPOSED RETROFIT | 2 3 ¹ 1 | |
|---|--|---|
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Pro | otection Flood Control |
| Retrofit Volume Computations - Target Storag | e: Retrofit V | olume Computations - Available Storage: |
| | | |
| | | |
| a a na ana mara | a Angelar Ange | |
| | reated Wetland | Bioretention Other: |
| Describe Elements of Proposed Retrofit, Includ | ling Surface Area, Ma | ximum Depth of Treatment, and Conveyance: |
| UNDERGROUND STURAGE IN PA | TRIKING LOT ISCH | NO, CANTINUE TO VEGETATES |
| SWALE OR BLORGENTIN AL | MD LITTLE PAS | c PARICUNAY. |
| 4. m. | | |
| | | i a |
| A. | | |
| | | |
| SITE CONSTRAINTS | T | |
| Adjacent Land Use: Institute Residential Commercial Institute Industrial Transport-Related Park Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: Rondo Rondo | itional | Access: No Constraints Constrained due to Slope Space Utilities Tree Impacts Structures Property Ownership Other: |
| Conflicts with Existing Utilities: None Unknown Yes Possible Water Gas Electric Electric to Streetlights Overhead Wires Other: | Potential Permitting Dam Safety Permits N Impacts to Wetlands Impacts to a Stream Floodplain Fill Impacts to Forests Impacts to Specimen How many? Approx. DBH Other factors: | Necessary Probable Not Probable Probable Not Probable |
| Solls: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ ☐ Yes ☐ No ☐ ☐ Yes ☐ No ☐ | Unknown Unknown Unknown |







Unique Site ID:___



| | act. |
|---|--|
| OLLOW-UP NEEDED TO COMPLETE FIELD CO | |
| Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drain invert elevations Confirm soil types |
| NITIAL FEASIBILITY AND CONSTRUCTION CO | ONSIDERATIONS |
| | |
| SITE CANDIDATE FOR FURTHER INVESTIGATIONS SITE CANDIDATE FOR EARLY ACTION PROJ F NO, SITE CANDIDATE FOR OTHER RESTORATION IF YES, TYPE(S): | JECT(S): YES NO MAYBE |

Unique Site ID:

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| WATERSHED: $V_{\text{ATTLE}} = \mathcal{P}_{\text{AC}}$ | SUBWATERSHED: | Symptony . | UNIQUE | SITE ID: UK-RI3 |
|--|---|--|----------------------------|---|
| DATE: 23 \mathcal{M}_{hy} 28 Assess. | cd Bγ: ≗∿≶, β∞ | CAMERA ID: | | PICTURES: |
| GPS ID: LMK I | D: | LAT: | | LONG: |
| SITE DESCRIPTION | | | | |
| Name: PARKING STREETME | <u>- 6x47</u> | | | |
| Ownership: If Public, Government Jurisdiction: | Public Priv | | Other: | |
| Proposed Retrofit Location: Storage Existing Pond Above Roadw Below Outfall In Conveyance In Road ROW Near Large Pa Other: | e System | On-Site Hotspot Operat Small Parking Individual Stree Underground | Lot 📋 | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| DRAINAGE AREA TO PROPOSED RI | TROFIT | | | |
| Drainage Area $\approx \frac{76,573}{9,573} \le \frac{91}{10}$ Impervious Area $\approx \frac{91}{69,617}$ Notes: | | Drainage Area La Residential SFH (< 1 a SFH (> 1 a Townhous Multi-Fam | ac lots) ac lots) es | Institutional Industrial Transport-Related Park Undeveloped Other: |
| EXISTING STORMWATER MANAGE | MENT | | | |
| Existing Stormwater Practice: If Yes, Describe: | Yes Mo | Possible | | |
| Describe Existing Site Conditions, Inc PARKING SURFACE 1 | | | - | |
| . PARKING DURAACE I | 2014 <u>6</u> 24 - 124 - 1 794 | - 99 - (4 74 - 74 - 74 - 74 - 74 - 74 - 74 - 7 | , openen v | |
| Existing Head Available and Points W | where Measured: | | | |
| | | | | |

| Retrofit | Reconnaissance | Investigation |
|----------|----------------|---------------|
|----------|----------------|---------------|

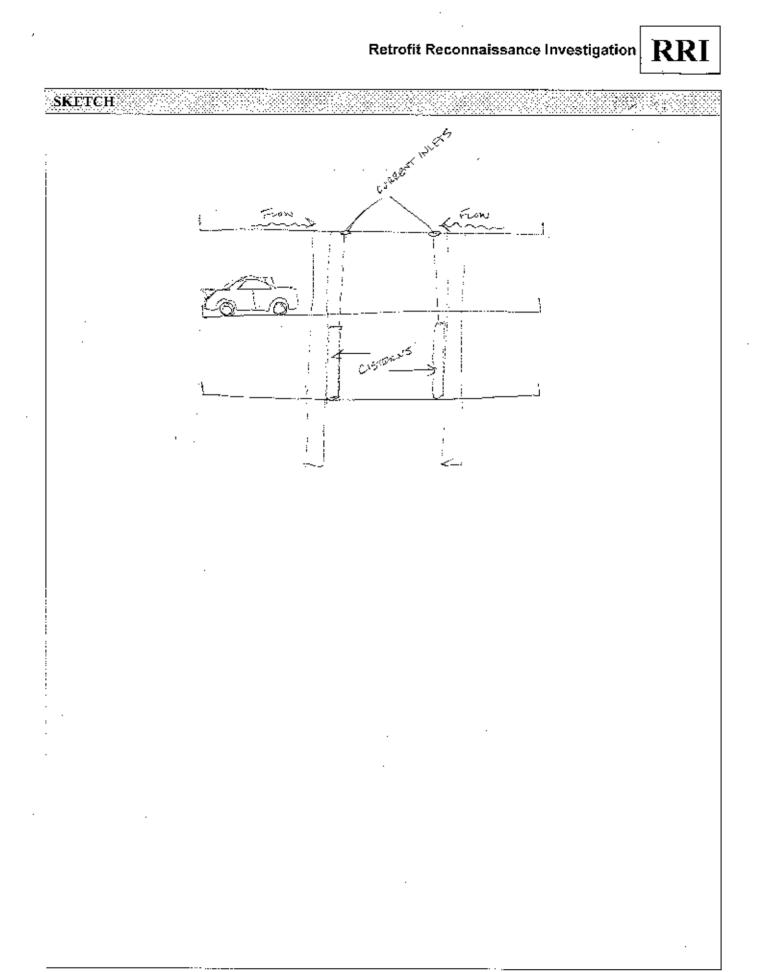
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| PROPOSED RETROFIT | |
|---|---|
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Protection Flood Control Other: |
| Retrofit Volume Computations - Target Storage | : Retrofit Volume Computations - Available Storage: |
| | |
| | eated Wetland Bioretention vale Other: CISTERN |
| Describe Elements of Proposed Retrofit, Includi | ng Surface Area, Maximum Depth of Treatment, and Conveyance: |
| | CISTERIUS ALOUG PARKENS STRUCTURE COLUMNS. EQUIRED FOR AUTO CONTRAINMENTS |
| SITE CONSTRAINTS Adjacent Land Use: Residential Commercial Industrial Transport-Related Industrial Other: Possible Conflicts Due to Adjacent Land Use? | tional Access: Constraints Constrained due to Slope Space Yes No Utilities Tree Impacts |
| If Yes, Describe: | Structures Property Ownership |
| Conflicts with Existing Utilities: None Unknown Yes Possible Sewer Gas Cable Electric Electric to Streetlights Overhead Wires Other | Other: Potential Permitting Factors: Dam Safety Pennits Necessary Impacts to Wetlands Impacts to a Stream Probable Not Probable Impacts to Forests Impacts to Specimen Trees Itow many? Approx. DBH |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | Yes Yes No Yes No Unknown Yes No Unknown |

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| | |
| Confirm property ownership Confirm drainage area Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch | Obtain existing stornwater practice as-builts Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drain invert elevations |
| Other: | Confirm soil types |
| | <u>and and an an and the first of the second</u> |
| | |
| TE CANDIDATE FOR FURTHER INVESTIGATION SITE CANDIDATE FOR EARLY ACTION PROJ NO, SITE CANDIDATE FOR OTHER RESTORA | ECT(8): YES NO MAYBE |

IF YES, TYPE(S):

DESIGN OR DELIVERY NOTES

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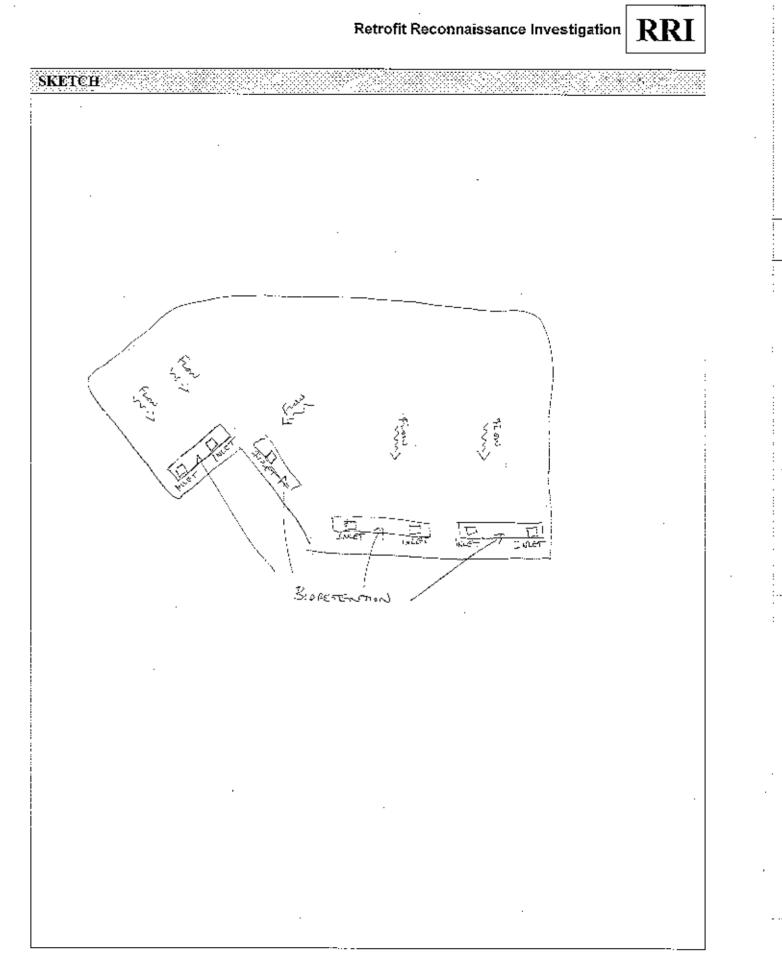
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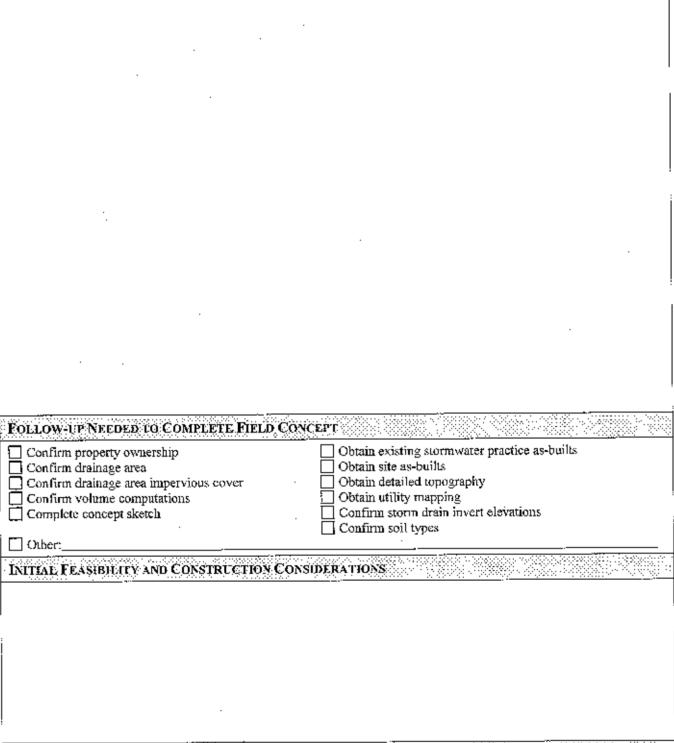
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| WATERSHED: JUNE ? | Aγ | SUBWATERSHED: | KIMANNON | UNIQUE | Sete ID: 上区-展門 |
|--|--------------------------------------|---------------------------------------|---|--------------------------|---|
| DATE: 28 MARY 08 | ASSESS | ED BY: BNS: BM | CAMERA ID: | | PICTURES: |
| GPS ID: | LMK II | D: | LAT: | | LONG: |
| SITE DESCRIPTION | | | | | |
| Name: PARCING ARE Address: Coundra Mu | | | | | |
| Ownership: If Public, Government Jurisdiv | ction: | □ Public ☑ Priv □ Local □ Stat | | Other: | · |
| Below Outfall In C In Road ROW Vea | ove Roadw onveyance r Large Pa | rking Lou | On-Site Hotspot Operat Small Parking I Individual Stree Underground | lot 📋 | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| DRAINAGE AREA TO PROI | | TROFIT | \$728933.C248 | | |
| Drainage Area ≈ <u>443, 039</u> Imperviousness ≈ Impervious Area ≈ <u>364, 3</u> Notes: | <u> <u>B</u>2 60 za</u> | - - - | Drainage Area La Residential SFII (< 1 a SFII (> 1 a Townhouse O'Multi-Fam Commercial | c lots) c lots) es | Institutional Industrial Transport-Related Park Undeveloped Other: |
| EXISTING STORMWATER. | MANAGE | MENT | | | |
| Existing Stormwater Practic If Yes, Describe: | :e: | ∐Yes ⊡îNo | Possible | | |
| Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance: | | | | | |
| Large Panes S. To Storacue | - | | 5m==1 *1284 | 1504NB | SS. CONDECTO |
| Existing Head Available and Points Where Measured: | | | | | |
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| PROPOSED RETROFIT | |
|--|---|
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Protection Flood Control |
| Retrofit Volume Computations - Target Storage | e: Retrofit Volume Computations - Available Storage: |
| | |
| | reated Wetland Bioretention |
| Describe Elements of Proposed Retrofit, Includ | ing Surface Area, Maximum Depth of Treatment, and Conveyance: |
| BIORGENTION ISLANIOS PARALLES | 2 TO CONTOURS LYTTIN PARKING LOTT |
| SITE CONSTRAINTS | |
| Adjacent Land Use: Institution Residential Commercial Institution Industrial Transport-Related Park Undeveloped Other. Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: If Yes, Describe: | tional Access: No Constraints Constrained due to Slope Space Ves No Utilities Tree Impacts Structures Property Ownership Other: |
| Conflicts with Existing Utilities: None Unknown Yes Possible Water Gas Electric Electric to Streetlights Overhead Wires Other: Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): | Potential Permitting Factors: Dam Safety Permits Necessary Impacts to Wetlands Impacts to a Stream Probable Not Probable Impacts to Forests Impacts to Specimen Trees How many? Approx. DBH Yes |
| Evidence of shallow bedrock: Evidence of high water table (gleying, saturation). | 🗌 Yes 🛃 No 🔲 Unknown |

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| SITE CANDIDATE FOR FURTHER INVESTIGATION: | |
|---|----------|
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| I EVANDE FUETNETNETTETNET TENEN BUILDE I BURGEREN ATTENNEN DE DE VERDE DE | |
| T METRIZAN HITIMAR METRIPHEN UNIVERTIGALIMUNT TATA TRADITI A TATA TRADUCTURA AND A TRADUCTURA AND A TRADUCTURA | |
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| 1、1、2、2.2、2、2、1、2、2、2、2、2、2、2、2、2、2、2、2、 | |
| L LA CERE C INDIA CERTAINA DI DI A CITAN DE CIECTICA COLLE DE LA EQUE DE DE LA CIECTA DE LA CERTA DE LA COLLE D | · · · · |
| IS SEE CANDIDATE FOR EARLY ACTION PROJECT(S): | I |
| IS SETE CANDIDATE FOR EARLY ACTION PROJECT(S): | |
| | |
| 【"自己我们就说你,你们这些你的你的?""你们你是你,你是你你的你,你说你们还是你做你吗?""你们这么么?""你们都没是你,你就是你你你?""!"他她说她的声音说道 | |
| \pm Te MAROND A DIMINUTE DAD ANDLED DIRWIND TO TRATICALLY VELACED AND \pm AND \pm AND \pm AND \pm AND \pm AND \pm AND \pm | |
| IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): YES NO | |
| | - 10 L I |
| 上,我们还有这些你,我们还是我说道:"你们是你们你的?"你们还说道:"你们你的你?""你你说你?""你说道:"你们你们你是你不知道你?"你不知道:"你你说道你说 | |
| TRACINE MANY AND A DISCREPANCE AND A TAMANA TANA COMPANY AND A DISCREPANCE AN | |
| 上的人物, 上面发展的第三方面的方面的 是这个人的人们,这些你的意义的意义的,我们就能能能能能能能能能能。""你们就是这个人的,你们就是我们的,我们就是我们能能能能能能能能能能能能能能能能能能能能能能能能能能能能能能能能能能 | |
| 书记,《《【HANNAN》】Y MHAN MAYAAN A CAARAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA | 1 |
| IF YES, TYPE(S) | |

DESIGN OR DELIVERY NOTES

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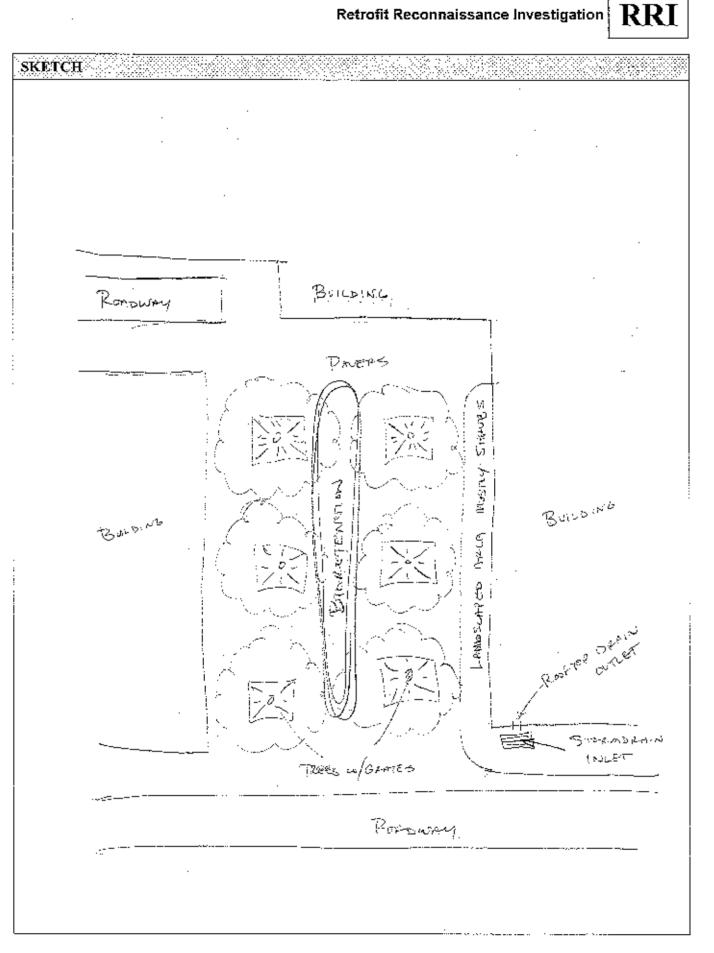
| WATERSHED: LITTLE PA | x SUBWATERSHED | KATAMASUNDI UNQUE | SITE ID: LK-RIS |
|---|--|---|--|
| DATE: 28 May 33 | ASSESSED BY: BKS: BK | CAMERA ID: | PICTURES: |
| GPS ID: | LMK ID: | LAT: | LONG: |
| SITE DESCRIPTION | | | |
| Name: Luxue & TAULAN Address: Columnate Me | | | |
| Ownership: If Public, Government Jurisdie | Tion: Dublic Priv | | |
| 🔲 Below Outfall 🛛 🛄 Jn C | ve Roadway Culvert onveyance System r Large Parking Lot OSED RETROFIT | On-Site Hotspot Operation Small Parking Lot Individual Street Underground | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| Drainage Area ≈ <u>80,668</u> Imperviousness ≈ Impervious Area ≈ <u>61,97</u> Notes: | 77% | Drainage Arca 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 Practic If Yes, Describe: | | Possible | |
| | tions, Including Existing Site | | |
| SUR FRAGE DRAIN NO STORMO. | ÷≮ε From Rotsuavy. Num. | TRADSCARE AND DEVEN | ಎ⊃ ಪಿಲಿಡುವರ ರಿ,ಡಿಕಿನ⊴ರ್ |
| Existing Head Available and | Points Where Measured: | | |

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| PROPOSED RETROFIT | |
|--|---|
| Purpose of Retrofit: Water Quality Recharge Demonstration / Education Repair | Channel Protection Flood Control |
| Retrofit Volume Computations - Target Storage | e: Retrofit Volume Computations - Available Storage: |
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| Proposed Treatment Option: | |
| 🗌 Êxtended Detention 🗌 Wet Pond 🔤 Cr | reated Wetland 🛛 🔁 Bioretention |
| 🗌 Filtering Practice 🔄 Infiltration 🗌 Sv | wale Other: |
| Describe Elements of Proposed Retrofit, Includi | ing Surface Area, Maximum Depth of Treatment, and Conveyance: |
| | |
| BICGETENTION OF UNDE | the factor of $\mathcal{D}_{\mathcal{D}}$ is the set of $\mathcal{D}_{\mathcal{D}}$ is the set of $\mathcal{D}_{\mathcal{D}}$ |
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| SITE CONSTRAINTS | |
| | Access: |
| Adjacent Land Use: | |
| Dindustrial Transport-Related Park | Constrained due to |
| Undeveloped Other: | Slope Space |
| Possible Conflicts Due to Adjacent Land Use? | Yes No Utilities Free Impacts |
| If Yes, Describe: | Structures 🗋 Property Ownership |
| | Other: |
| Conflicts with Existing Utilities: | Potential Permitting Factors: |
| 🗌 None | Dam Safety Permits Necessary Debable Not Probable |
| Unknown | Impacts to Weilands Probable Not Probable Impacts to a Stream Probable Xot Probable |
| Yes Possible | Impacts to a Stream Probable Floodplain Fill Probable |
| !Sewer □ □ □ Water | Impacts to Foresis Probable |
| | Impacts to Specimen Trees |
| | How many? |
| Electric | Approx. DBH |
| Electric to Streetlights | |
| Overhead Wires | Other factors: |
| Other: | |
| Soils: | DY THE |
| Soil auger test holes: | ☐ Yes ☐ No ☐ Yes ☐ No _ Unknown |
| Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: | Yes Yo Unknown Yes Vo Unknown |
| Evidence of high water table (gleying, saturation): | |
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Unique Site ID:___



Unique Site ID:__

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| FOLLOW-UP NEEDED TO COMPLETE FIELD CON | CEPT |
| Confirm property ownership | Obtain existing stormwater practice as-builts Obtain site as-builts |
| Confirm drainage area impervious cover | Obtain detailed topography |
| Confirm volume computations Complete concept sketch | Obtain utility mapping Confirm storm drain invert elevations |
| | Confirm soil types |
| Other: | |
| INITIAL FEASIBILITY AND CONSTRUCTION CONS | IDERATIONS |
| · · · | · · · · · |
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| SITE CANDIDATE FOR FURTHER INVEST | rigation: | NO MAYBE |
|------------------------------------|---------------------------|----------|
| IS SITE CANDIDATE FOR EARLY ACTIO | N PROJECT(S): | NO MAYBE |
| IF NO, SITE CANDIDATE FOR OTHER RE | STORATION PROJECT(S): YES | NO MAYBE |
| IF YES, TYPE(S) | | <u> </u> |
| | | ····· |

DESIGN OR DELIVERY NOTES

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WATERSHED: LITTLE 74X UNIQUE SITE D: LK-RIG SUBWATERSHED: KITSMASUNDI PICTURES: ASSESSED BY: 3N. BWS CAMERA ID: DATE: 23 MAYSE GPS ID: LMK ID: LAT: LONG: SITE DESCRIPTION Name: AMC COLUMBIA 14 CINEMES Address: Columbia Marc Public i V Private Unknown Ownership: State 🗌 dot Other: If Public, Government Jurisdictiou: 🗌 Local **Proposed Retrofit Location:** On-Site Storage Above Roadway Culvert Hotspot Operation 🗹 Individual Rooftop Existing Pond Small Parking Lot Small Impervious Area Below Outfall In Conveyance System Landscape / Hardscape In Road ROW Near Large Parking Lot Individual Street Other: Underground Other: DRAINAGE AREA TO PROPOSED RETROFIT Drainage Area $\approx -\frac{72.419}{56}$ Drainage Area Land Use: 🗍 Institutional Imperviousness ≈ 🔲 Residential Impervious Area≈<u>61.652</u> ≤F \square SFH (< 1 ac lots) 🗍 Industrial \square SFH (> I ac lots) Transport-Related Notes: Townhouses Park 🔲 Multi-Family Undeveloped Other: Commercial EXISTING STORMWATER MANAGEMENT Possible Existing Stormwater Practice: Yes Yes If Yes, Describe: Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance: Suggest DRAINFLE THEM BROWING, PAUL WILLING , AND ROFTOP DIMENT 10 STORM SRAINS

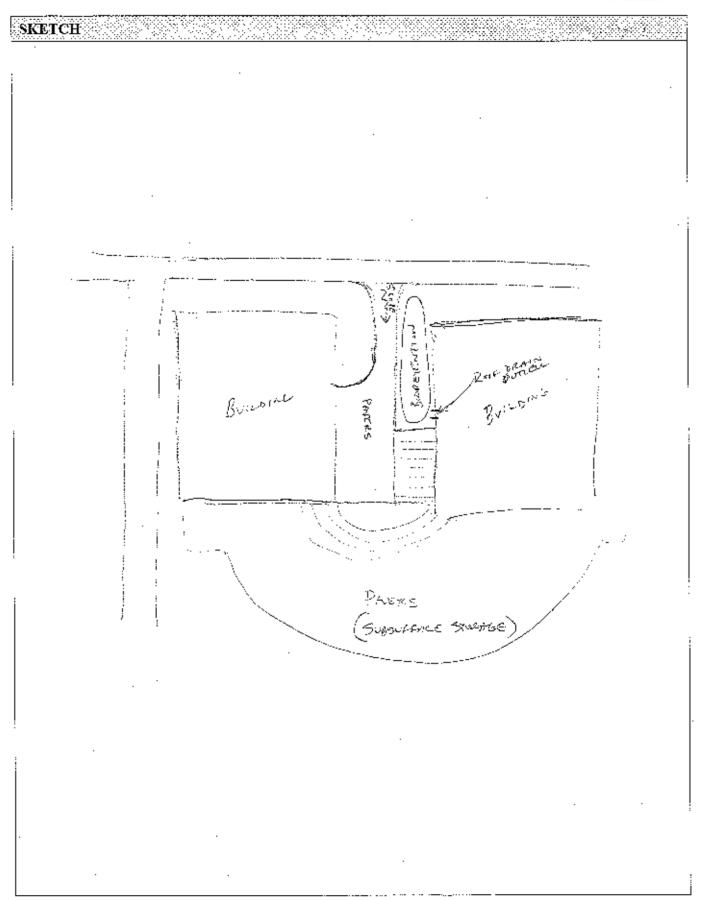
Existing Head Available and Points Where Measured:

Unique Site ID:____

| | · · · · · · · · · · · · · · · · · · · |
|--|--|
| PROPOSED RETROFIT | |
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Protection Flood Control Other: |
| Retrofit Volume Computations - Target Storage | :: Retrofit Volume Computations - Available Storage: |
| · · · | |
| | reated Wetland Bloretention wale Other: |
| Describe Elements of Proposed Retrofit, Includi | ing Surface Area, Maximum Depth of Treatment, and Conveyance: |
| SITE CONSTRAINTS Adjacent Land Use: Residential Commercial Institut Industrial Transport-Related Park Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: | Access: |
| Conflicts with Existing Utilities: None Unknown Yes Possible Sewer Water Gas Cable Electric Electric to Streetlights Overhead Wires Other: Soils: Soil auger test holes: Evidence of poor infiltration (clays, filnes): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | Potential Permitting Factors: Dam Safety Permits Necessary Impacts to Wetlands Impacts to a Stream Probable Not Probable Not Probable Not Probable Not Probable Not Probable Not Probable Not Probable Impacts to Forests Impacts to Specimen Trecs Probable Not Probable How many? Approx. DBH Other factors: Yes No Yes No Unknown Yes |

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| FOLLOW-UP NEEDED TO COMPLETE FIELD (| Concept |
| Confirm property ownership | Obtain existing stormwater practice as-builts Obtain site as-builts |
| Confirm drainage area Confirm drainage area impervious cover | Obtain she as-odifis |
| Confirm volume computations | Obtain utility mapping |

Confirm storm drain invert elevations

Confirm soil types

Confirm volume computa

DESIGN OR DELIVERY NOTES

Other:____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

| SITE CANDIDATE FOR FURTHER INVESTIGATION: | NO MAYBE |
|---|-------------|
| | S NO MAYBE |
| IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): Y | 28 NO MAYBE |
| IF YES, TYPE(S) | |



| WATERSHED: Symphony Stream SUBWATERSHED: | | D: UNIQUE | UNIQUE SITE ID: SS-R/ | | | |
|--|---|--|--|--|--|--|
| DATE: 2/11/08 | ASSESSED BY: JZ/SH | CAMERA ID: Olympus | PICTURES: 1-9 | | | |
| GPS ID: N/A | LMKID: NA | LAT: N/A | LONG: NA | | | |
| SITE DESCRIPTION | CODING STORE | Card Device Addresses | | | | |
| Name: HOWArd County General Hospital Address: Cedar Lane | | | | | | |
| Ownership: If Public, Government Jurisd | | ivate Unknown ate DOT Other:_ | | | | |
| Below Outfall | : ove Roadway Culvert Conveyance System ar Large Parking Lot | On-Site Hotspot Operation Small Parking Lot Individual Street Underground | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: | | | |
| DRAINAGE AREA TO PRO | POSED RETROFIT | | | | | |
| Drainage Area $\approx 15 \text{ acrts}$ Imperviousness $\approx 95\%$ % Impervious Area $\approx 14.25 \text{ acres}$ Notes: D4 is hospital parking lot $R_V = 0.05 \pm 0.009(95) = 0.905$ | | Drainage Area Land Use: Residential SFH (< 1 ac lots) | | | | |
| EXISTING STORMWATER MANAGEMENT | | | | | | |
| Existing Stormwater Pract If Yes, Describe: Square ED w/ Breb Zow How on hice Rises structure - | ay 3 inlets to bred porbraded Niser. F Smaller, larger C Su | o Possible bay Gabion weir (new ossibly clogged! ancelevetion. 2 large | eds maint) | | | |
| Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance: Hospital parking lot drains through Storm drail no to a dry pond. | | | | | | |
| | | | | | | |
| Existing Head Available and Points Where Measured: Roughly G' of storage available in pond. | | | | | | |
| | | | | | | |

Unique Site ID: SJ-R



| PROPOSED RETROFIT | | | |
|--|--|--|--|
| Purpose of Retrofit: A Water Quality Demonstration / Education | Channel P | otection | Flood Control |
| Retrofit Volume Computations - Target Stora $WQ_V = (\frac{1}{12})(0.905)(156c) = 1.1c$ | - | | ns - Available Storage: 100 ' × 150 ') = 1,4 ac - <i>F</i> + ~ |
| | Created Wetland [Swale [| Bioretention Other: | |
| Current practice is a dry detention with a perman out let, and a permane | t pool in to | he brebay. | the |
| SITE CONSTRAINTS | | Constanting of the Constanting o | |
| Adjacent Land Use: Residential Commercial Industrial Transport-Related Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? Yes If Yes, Describe: Yes | | Access: No Constraints Constrained due to Slope Utilities Structures Other: fempe | Space Tree Impacts Property Ownership Wary 1555 & Parking |
| Conflicts with Existing Utilities: None Unknown Yes Possible Sewer Water Gas Cable Electric Electric to Streetlights Overhead Wires Other: | Potential Permitting Dam Safety Permits N Impacts to Wetlands Impacts to a Stream Floodplain Fill Impacts to Forests Impacts to Specimen T How many? Approx. DBH | Factors: ecessary Prob Prob Prob Prob | able 🖾 Not Probable able 🖾 Not Probable |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | 🗌 Yes 🗌 No 🛛 | Unknown Unknown Unknown | |



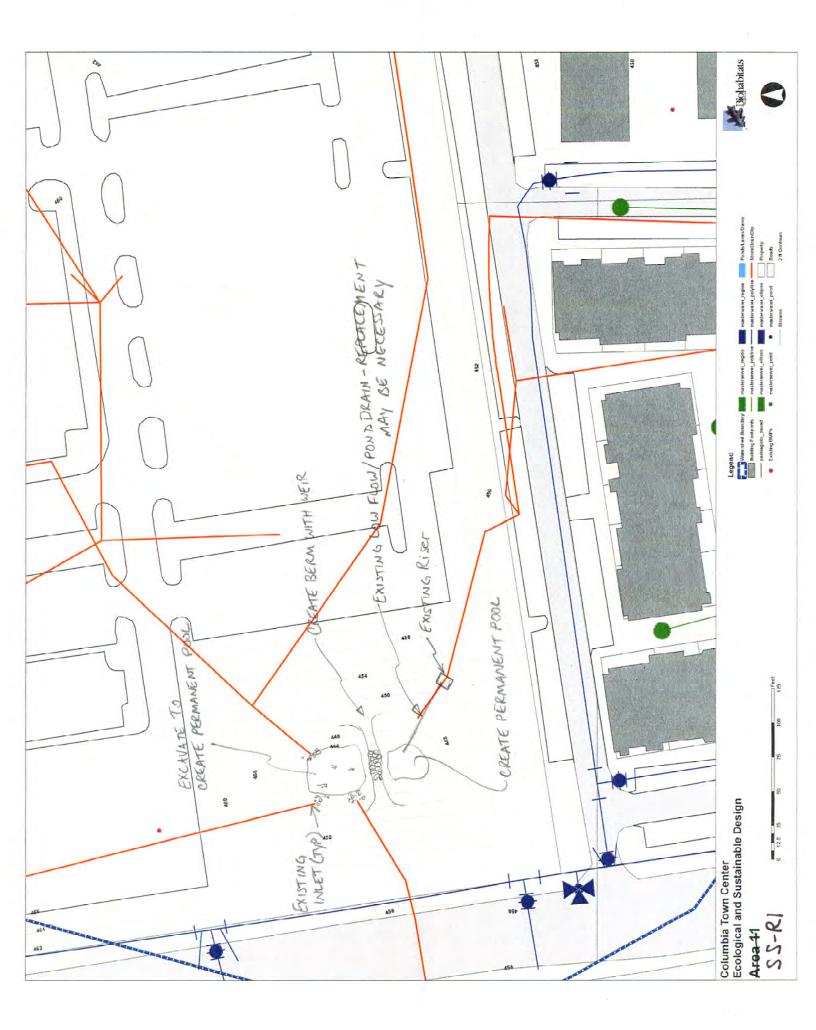
SKETCH

See attached acrial photo Page 3 of 4



| DESIGN OR | DELIVER | Y NOTES |
|------------------|---------|----------------|
|------------------|---------|----------------|

| FOLLOW-UP NEEDED TO COMPLETE FIELD CO | ONCEPT |
|--|---|
| | |
| Confirm property ownership | Obtain existing stormwater practice as-builts Obtain site as-builts |
| Confirm drainage area | |
| Confirm drainage area impervious cover | Obtain detailed topography |
| Confirm volume computations | Obtain utility mapping |
| Complete concept sketch | Confirm storm drain invert elevations |
| | Confirm soil types |
| Other: | |
| INITIAL FEASIBILITY AND CONSTRUCTION CO | INSIDERATIONS |
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| SITE CANDIDATE FOR FURTHER INVESTIGATIO | |
| | |
| IS SITE CANDIDATE FOR EARLY ACTION PROJ | JECT(S): YES NO MAYBE |
| SITE CANDIDATE FOR FURTHER INVESTIGATIO IS SITE CANDIDATE FOR EARLY ACTION PROJ IF NO, SITE CANDIDATE FOR OTHER RESTORAT IF YES, TYPE(S): | JECT(S): YES NO MAYBE |





| SUBWATERSHED ASSESSED BY: JZ/SH LMK ID: N/A Hy General Hospita Hy General Hospita tion: Dublic Pri- tion: Dublic Pri- tion: Local Star ve Roadway Culvert onveyance System T Large Parking Lot COSED RETROFIT DAT = 2.3 ac S = -96 At = 2 = 2.2 | vate 🗌 Unknown | LONG: M/A |
|--|--|--|
| $\frac{1}{4} \frac{General}{Public} \frac{1}{10} \frac{Pri}{Piblic}$ $\frac{1}{10} \frac{Public}{Public} \frac{1}{10} \frac{Pri}{Piblic}$ $\frac{1}{10} \frac{Pri}{Posed Retrof I}$ $\frac{1}{10} \frac{Fi}{Piblic} \frac{1}{10} \frac{Fi}{Piblic}$ $\frac{1}{10} \frac{Fi}{Piblic} \frac{1}{10} \frac{Fi}{Piblic} \frac{1}{10} \frac{Fi}{Piblic}$ | vate Unknown te DOT C On-Site Hotspot Operation Small Parking Lot Individual Street Underground Drainage Area Land Residential SFH (< 1 ac lo | Dther: Individual Rooftop Small Impervious Area Landscape / Hardscape Other: Use: Use: |
| Public Pri- etion: Public Pri- Local Sta | vate Unknown te DOT C On-Site Hotspot Operation Small Parking Lot Individual Street Underground Drainage Area Land Residential SFH (< 1 ac lo | ☐ Individual Rooftop ☐ Small Impervious Arca ☐ Landscape / Hardscape ☐ Other: Use: ☑ Institutional |
| Public Pri- etion: Public Pri- Local Sta | vate Unknown te DOT C On-Site Hotspot Operation Small Parking Lot Individual Street Underground Drainage Area Land Residential SFH (< 1 ac lo | ☐ Individual Rooftop ☐ Small Impervious Arca ☐ Landscape / Hardscape ☐ Other: Use: ☑ Institutional |
| etion: \Box Local \Box Sta ve Roadway Culvert onveyance System r Large Parking Lot OSED RETROFIT $24^{2} = 2.3 \text{ ac}$ | te DOT C On-Site Hotspot Operation Small Parking Lot Individual Street Underground Drainage Area Land Residential SFH (< 1 ac lo | ☐ Individual Rooftop ☐ Small Impervious Arca ☐ Landscape / Hardscape ☐ Other: Use: ☑ Institutional |
| onveyance System Targe Parking Lot OSED RETROFIT $147^2 = 2.3 \text{ ac}$ | Hotspot Operation Small Parking Lot Individual Street Underground Drainage Area Land Residential SFH (< 1 ac lo | Small Impervious Area Landscape / Hardscape Other: Use: Institutional |
| $1f_1^2 = 2.3ac$ | Residential | 🖾 Institutional |
| $\frac{14^2}{5} = 2.3 \text{ ac}$ $\frac{5}{5} = \%$ $\frac{1}{5} = 2.2$ | Residential | 🖾 Institutional |
| 9(95)=0.905 | Townhouses Multi-Family | |
| MANAGEMENT | | |
| | | ver direct |
| tions, Including Existing Site | e Drainage and Convey | ance: |
| | | |
| Points Where Measured: | - | |
| | | |
| | IANAGEMENT e: ∑Yes □No uins to storn dre dry pond. tions, Including Existing Site adjacent to kandsca | a(95) = 0.905 Multi-Family Commercial ANAGEMENT e: XYes No Possible ins to storn drains, which the dry pond. tions, Including Existing Site Drainage and Conveys adjacent to landscaped islands. |



| PROPOSED RETROFIT | | |
|---|--|--|
| Purpose of Retrofit: Ø Water Quality | Channel Pr | rotection Flood Control |
| Retrofit Volume Computations - Target Storag $WQ_{V} = \begin{pmatrix} 1''\\ -12 \end{pmatrix} (0.905) (100,000 \text{ FP})$ | ge: Retrofit V | Volume Computations - Available Storage: |
| = 7,540 ft3 | | |
| -0R - SA = 8% (DA) = 8% (100 Hz) SA = 8000 ft | 2 | |
| | Created Wetland | Bioretention Other: |
| Describe Elements of Proposed Retrofit, Includ | ling Surface Area, Ma | ximum Depth of Treatment, and Conveyance: |
| Convert existing land scape | ed islands to | Dioretennon |
| Convert existing land-scape Create addition bioteten | tion areas. | |
| | | |
| | | |
| | | |
| | | |
| SITE CONSTRAINTS | | |
| Adjacent Land Use: Residential Commercial Institu | | Access: |
| Industrial Transport-Related Park | utional | Constrained due to |
| Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? | Yes No | Slope Space |
| If Yes, Describe: | | Structures Property Ownership |
| Conflicts with Existing Utilities: | Potential Permitting | |
| None | Dam Safety Permits | Necessary 🗌 Probable 🖾 Not Probable |
| Unknown Yes Possible | Impacts to Wetlands Impacts to a Stream | □ Probable ⊠ Not Probable □ Probable ⊠ Not Probable |
| Sewer | Floodplain Fill | 🗌 Probable 🖾 Not Probable |
| Gas | Water Impacts to Forests □ Probable ⊠ Not Probable Gas Impacts to Specimen Trees □ Probable ⊠ Not Probable | |
| Gas Gable Electric Electric to Streetlights | Cable How many? Electric Approx. DBH | |
| Electric Electric Electric to Streetlights | Approx. DBH | |
| Overhead Wires | Other factors: | |
| Soils: | <u> </u> | |
| Soil auger test holes: | Yes ANO | - |
| Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: | ☐ Yes ☐ No ☐ ☐ Yes ☐ No ☐ | Unknown Unknown |
| Evidence of high water table (gleying, saturation) | | Unknown |



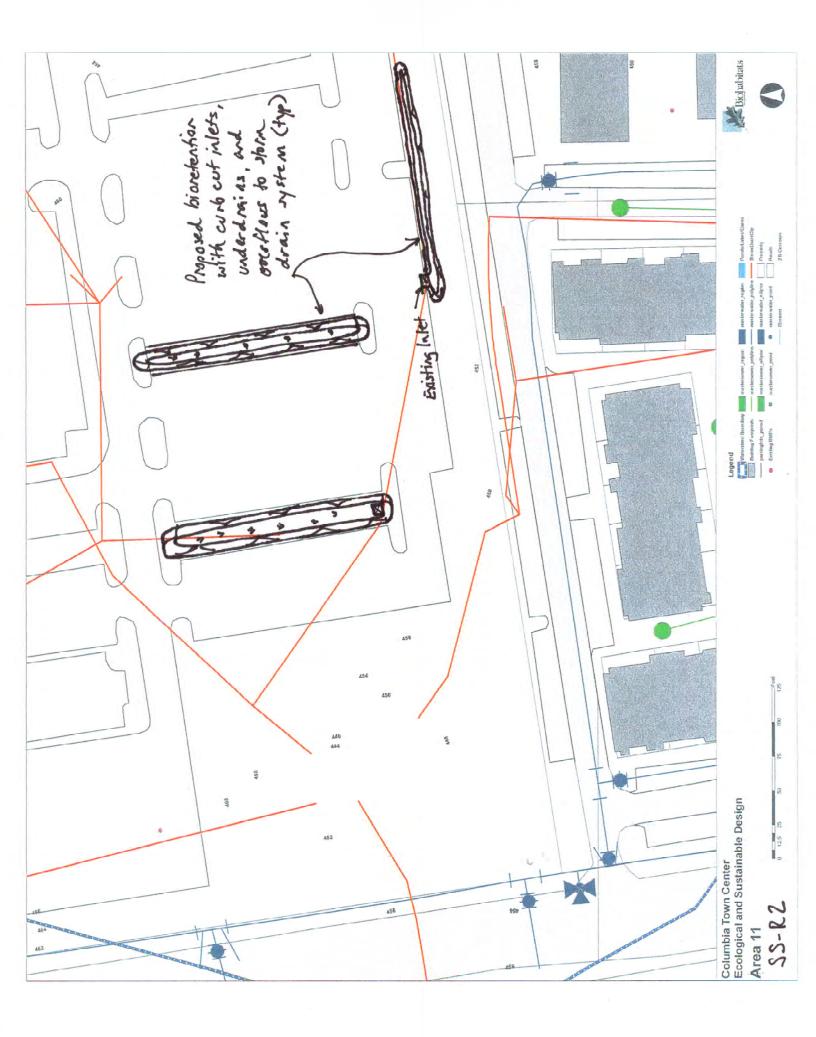
SKETCH

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| 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 Other: | Obtain existing stormwater practice as-builts Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drain invert elevations Confirm soil types |
| INITIAL FEASIBILITY AND CONSTRUCTION C | ONSIDERATIONS |
| Requires reducing width of may result in Poss of parki. | drive aisles in parking lot, and my stalls. |
| | TION: YES NO MAYBE |





| WATERSHED: Symphony | Stream SUBWATERSHE | olige | IE SITE ID: SS-R3 |
|---|---|---|--|
| DATE: 2/11/08 | ASSESSED BY: J2/SI4 | CAMERA ID: Olympus | PICTURES: 18-20 |
| GPS ID: N/A | LMKID: N/A | LAT: NA | LONG: N/A |
| SITE DESCRIPTION | | | |
| Name: Office Comp Address: Cedar Lane | and Hickory Ridge K | 20ad | |
| Ownership: If Public, Government Jurisd | | rivate Unknown tate DOT Other: | |
| Below Outfall | eve Roadway Culvert Conveyance System ar Large Parking Lot | On-Site Hotspot Operation Small Parking Lot Individual Street Underground | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| DRAINAGE AREA TO PRO | PPOSED RETROFIT | | • |
| Drainage Area $\approx 36,000$ Imperviousness $\approx 95\%$ Impervious Area ≈ 34 Notes: | 200712 | Drainage Area Land Use: Residential SFH (< 1 ac lots) | Institutional Industrial Transport-Related Park |
| R _u = 0.05 + 0.039 (EXISTING STORMWATER Existing Stormwater Pract If Yes, Describe: | MANAGEMENT ice: Yes N | , | Undeveloped |
| EXISTING STORMWATER Existing Stormwater Pract If Yes, Describe: | MANAGEMENT ice: Yes N | Commercial | Other: |
| EXISTING STORMWATER Existing Stormwater Practi If Yes, Describe: No practice of downstream | MANAGEMENT ice: Yes N observed, storn dra or underground, | Commercial | Other: |
| EXISTING STORMWATER Existing Stormwater Pract If Yes, Describe: No prachice of downstream of Describe Existing Site Cond | MANAGEMENT ice: Yes N bserved, Storn dra or underground. ditions, Including Existing Si | The Commercial | Conter: |
| EXISTING STORMWATER Existing Stormwater Pract If Yes, Describe: No prachice of downstream of Describe Existing Site Cond | MANAGEMENT ice: Yes N bserved, Storn dra or underground. ditions, Including Existing Si | To A Possible in may lead to a | Conter: |
| EXISTING STORMWATER Existing Stormwater Pract If Yes, Describe: No prachice of downstream of Describe Existing Site Cond | MANAGEMENT ice: Yes N observed, storn dra or underground. ditions, Including Existing Si lot drains to a perimeter of the | The Commercial | Conter: |



| PROPOSED RETROFIT | | |
|---|------------------|---|
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Pro | Detection Flood Control |
| Retrofit Volume Computations - Target Storag | e: Retrofit V | olume Computations - Available Storage: |
| Target $3A = 5\% (DA)$ = 5% (36,000 ft ²) = 1,800 ft ² | Availal | 2 187542 2 187542 |
| Proposed Treatment Option: Extended Detention Filtering Practice Infiltration | | Bioretention Other: |
| Describe Elements of Proposed Retrofit, Includ | - | |
| Create a vegetated filtra area adjacent to the oxi | tion system i | n the grassed |
| area adjacent to the aci | sning storn draw | n inket. Direct |
| rungth From the parking le | of the the p | ractice. |
| Include an underdrain a | and overflow | that consects |
| to the existing storm a | lrain | |
| La contraction of the second | | |
| | | |
| SITE CONSTRAINTS | | A |
| Adjacent Land Use: | tional | Access: |
| Industrial Transport-Related Park | | Constrained due to |
| Possible Conflicts Due to Adjacent Land Use? 🗌 Yes 🕅 No 🔤 Utilities 🔲 Tree Impa | | Utilities Tree Impacts |
| If Yes, Describe: | | Structures Property Ownership Other: Comperant Jossof parking |
| Conflicts with Existing Utilities: Potential Permitting Factors: None Dam Safety Permits Necessary Probable 🖉 Not Probable Unknown Impacts to Wetlands Probable 🖾 Not Probable Yes Possible Impacts to a Stream Probable 🖾 Not Probable Sewer Floodplain Fill Probable 🖄 Not Probable Not Probable Water Impacts to Forests Probable 🖉 Not Probable | | Iecessary Probable Not Probable Probable Not Probable |
| Soils: | | |
| Soil auger test holes: Evidence of poor infiltration (clays, fines): | | Unknown |
| Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | | Unknown Unknown |

Unique Site ID: 55-R3



SKETCH

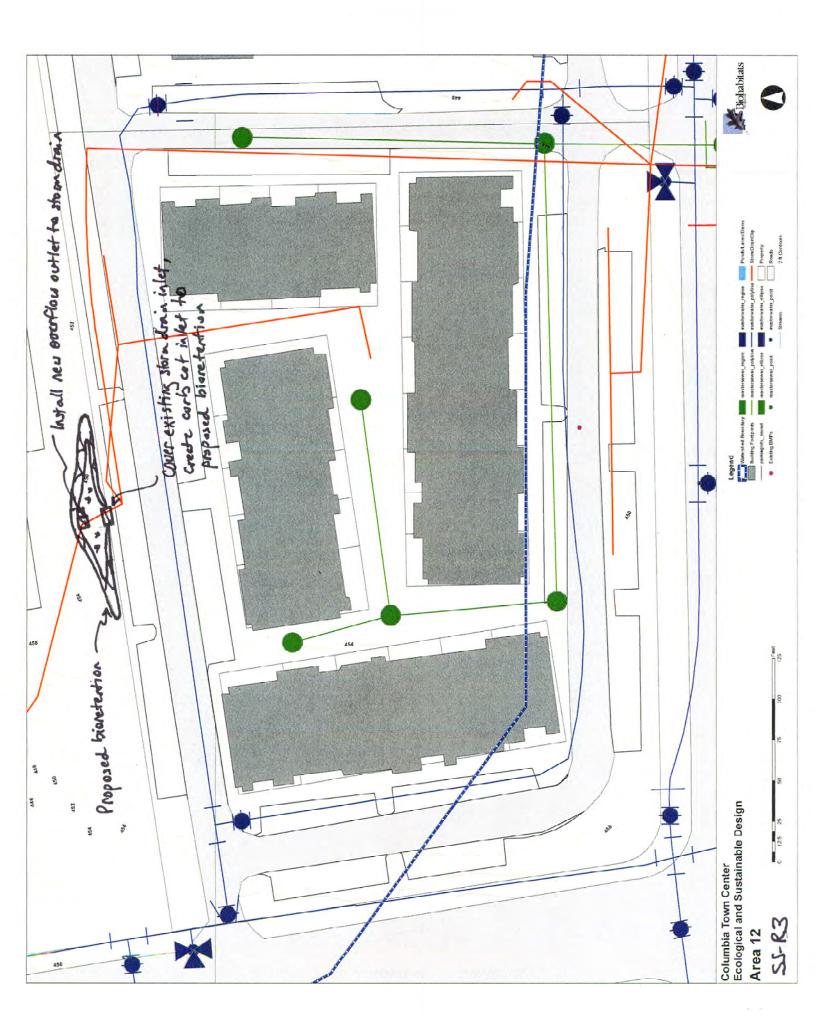
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| DESIGN OR | DELIVERY | NOTES |
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|---|---|
| OLLOW-UP NEEDED TO COMPLETE FIELD CO | ONCEPT |
| Confirm property ownership | Obtain existing stormwater practice as-builts |
|] Confirm drainage area] Confirm drainage area impervious cover | Obtain site as-builts Obtain detailed topography |
| Confirm volume computations | Obtain utility mapping |
| Complete concept sketch | Confirm storm drain invert elevations |
| | Confirm soil types |
| Other: | |
| NITIAL FEASIBILITY AND CONSTRUCTION CO | INSIDERATIONS |
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| ITE CANDIDATE FOR FURTHER INVESTIGATION | |
| SITE CANDIDATE FOR EARLY ACTION PROJ | |
| F NO, SITE CANDIDATE FOR OTHER RESTORA | TION PROJECT(S): YES NO MAYBE |





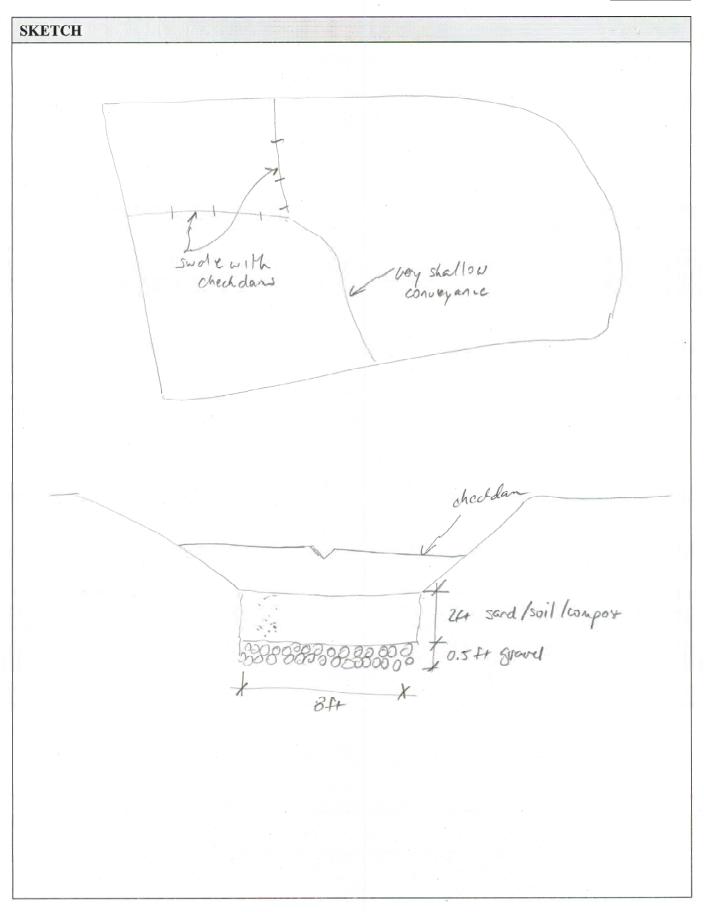
| WATERSHED: Symphony S | FRAM SUBWATERS | SHED: | UNIQUE | SITE ID: SS-R4 |
|---|--|--|-------------------|--|
| DATE: 2/11/08 | ASSESSED BY: JZ/S | H CAMERA ID: 0 | lympus | PICTURES: 21-29 |
| GPS ID: N/A | LMK ID: N/A | LAT: NA | | LONG: N/A |
| SITE DESCRIPTION | | | | |
| Name: Howard Comp Address: Little Pature | nunity College | | | Y |
| Ownership: If Public, Government Jurisdi | ction: Decal | Private Unknown State DOT | Other: | 5 |
| 🗌 Below Outfall 🛛 🖾 In G | ove Roadway Culvert Conveyance System Ir Large Parking Lot | On-Site Hotspot Opera Small Parking Individual Street Underground | Lot |] Individual Rooftop] Small Impervious Area] Landscape / Hardscape] Other: |
| DRAINAGE AREA TO PRO | POSED RETROFIT | | | |
| Drainage Area $\approx 2/9,000$ Imperviousness ≈ 300 Impervious Area $\approx 65,700$ | 0/0 | Drainage Area L ☐ Residential ☐ SFH (< 1 | ac lots) | Institutional Industrial |
| Notes: Ry = 0.05 + 0,009(| 30)=0.32 | ☐ Townhou ☐ Multi-Far ☐ Commercial | ses | Park Undeveloped Other: |
| EXISTING STORMWATER | MANAGEMENT | | 1. 1. Mar | |
| Existing Stormwater Practi If Yes, Describe: | cc: 🗌 Yes [| ⊠ No ☐ Possible | | |
| Describe Existing Site Cond Run off from Lit ending channel Runoff from adjan forming a | itions, Including Existin the Patuxent Par el has Armed mt office blogs severely Croding | kway is dischar kway is dischar and paking lot a channel | ged to Uschage | an open field, an d to same field, |
| Existing Head Available an | d Points Where Measure | ed: | | |
| NA | | | | |
| | | | | |



| PROPOSED RETROFIT | |
|--|---|
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Protection Flood Control |
| Retrofit Volume Computations - Target Storag Target SA - 5% (DA) = 5% (219,000 Fr ²) = $10,950$ Ft ² | ge: Retrofit Volume Computations - Available Storage: * Sufficient space * assume a 15-ft wide swale, legth = $\frac{10,350 \text{ ft}^2}{15 \text{ ft}} = 7.30 \text{ ft}$ |
| Proposed Treatment Option: Extended Detention Filtering Practice Infiltration | Created Wetland Bioretention |
| Replace existing croded char that will conver and the | ling Surface Area, Maximum Depth of Treatment, and Conveyance: Anels with vegetated swales of runoff, Base should consist cring ancdia. Checkolans may be |
| SITE CONSTRAINTS | |
| Adjacent Land Use: Residential Commercial Institut Industrial Transport-Related Park Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: Swales May inferfore with recreational Ge | Constrained due to Slope Space Yes No Utilities Tree Impacts Structures Property Ownership |
| None Unknown Yes Possible Sewer Water Gas Cable Electric Electric to Streetlights Overhead Wires Other: | Potential Permitting Factors: Dam Safety Permits Necessary Impacts to Wetlands Impacts to a Stream Probable Floodplain Fill Impacts to Specimen Trees How many? Approx. DBH |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | Yes No Yes No Yes No Yes No Yes No Yes No Yes No Yes No Yes No Yes No Yes No |

Unique Site ID: <u>SS-RY</u>

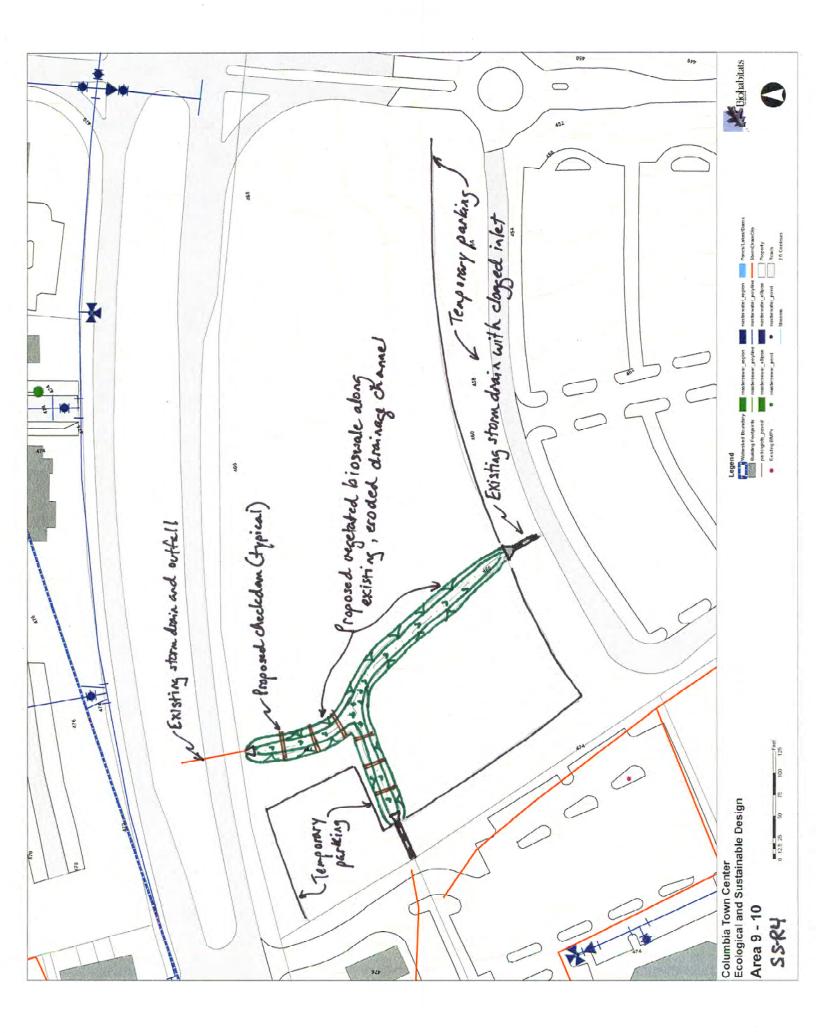






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| Follow-up Needed to Complete Field C | |
| Confirm property ownership Confirm drainage area | Obtain existing stormwater practice as-builts Obtain site as-builts |
| Confirm drainage area impervious cover | Obtain detailed topography |
| Confirm volume computations | Obtain utility mapping |
| Complete concept sketch | Confirm storm drain invert elevations |
| | Confirm soil types |
| Other: | |
| NITIAL FEASIBILITY AND CONSTRUCTION CO | DNSIDERATIONS |
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| SITE CANDIDATE FOR FURTHER INVESTIGATI | |
| S SITE CANDIDATE FOR EARLY ACTION PRO | |
| F NO, SITE CANDIDATE FOR OTHER RESTORA | ATION PROJECT(S): YES NO MAYBE |
| IF YES, TYPE(S): | |





| WATERSHED: Symphony | Stream SUBWATERSHED | UNIQUE | SITE ID: SS-R6 |
|---|--|--|--|
| DATE: 2/11/08 | ASSESSED BY: JZ/S It | CAMERA ID: Olympus | PICTURES: |
| GPS ID: N/A | LMK ID: NA | LAT: N/A | LONG: N/A |
| SITE DESCRIPTION | | | |
| Name: <u>Avalon at</u> J Address: 10310 Hick | imphony Glen apan Long Ridge Road | tment complex | |
| Ownership: If Public, Government Jurisdi | Public Priv | | |
| 🗌 Below Outfall 🗌 In C | ove Roadway Culvert Conveyance System Ir Large Parking Lot | On-Site Hotspot Operation Small Parking Lot Individual Street Underground | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| DRAINAGE AREA TO PRO | | | |
| Drainage Area ≈ 157.0 Imperviousness ≈ 95 Impervious Area ≈ 149.0 Notes: | 00 ft 2 = 3.6 ac | Drainage Area Land Use: Residential SFH (< 1 ac lots) SFH (> 1 ac lots) Townhouses | Institutional Industrial Transport-Related Park |
| | | Multi-Family Commercial | Undeveloped |
| EXISTING STORMWATER | MANAGEMENT | | |
| Existing Stormwater Practi If Yes, Describe: | ce: 🗌 Yes 🕅 No | Possible | |
| Describe Existing Site Cond | itions, Including Existing Site | Drainage and Conveyance: | |
| Roof drain apj | pear to discharge to | sbrmdrain syste | ท |
| | | | |
| Existing Head Available and | d Points Where Measured: | | |
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| PROPOSED RETROFIT | | | |
|---|---|--|-----------------------------------|
| Purpose of Retrofit: Water Quality Demonstration / Education | | hannel Protection | Flood Control |
| Retrofit Volume Computations - Target Storag | e: 1 | Retrofit Volume Con | putations - Available Storage: |
| Aug bldg roof SA = 9,800 ft ² Target SA = 5% (9,800 ft ²) = 490 ft ² per roo | zf | | |
| | reated Wetlar wale | nd 🔀 Bioretenti | on |
| Describe Elements of Proposed Retrofit, Includ | ing Surface | Area, Maximum Dep | oth of Treatment, and Conveyance: |
| Create a bioretentier / ra building to treat runoff. foundation available, Create overflow. | If setle as infil | Wation with | Iding surface |
| SITE CONSTRAINTS | • | | |
| Adjacent Land Use: Residential Commercial Institution Industrial Transport-Related Park Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: If Yes, Describe: | itional | Constraine □ SI ☑ No ☑ ☑ St | nstraints ed due to ope |
| Conflicts with Existing Utilities: None Unknown Yes Possible Base Water Gas Cable Electric Electric to Streetlights Overhead Wires Other: | Dam Safety Impacts to V Impacts to a Floodplain I Impacts to F Impacts to S How m Approx | i Stream Fill | |
| Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | Yes Yes | No No Unknown No Unknown No Unknown | |

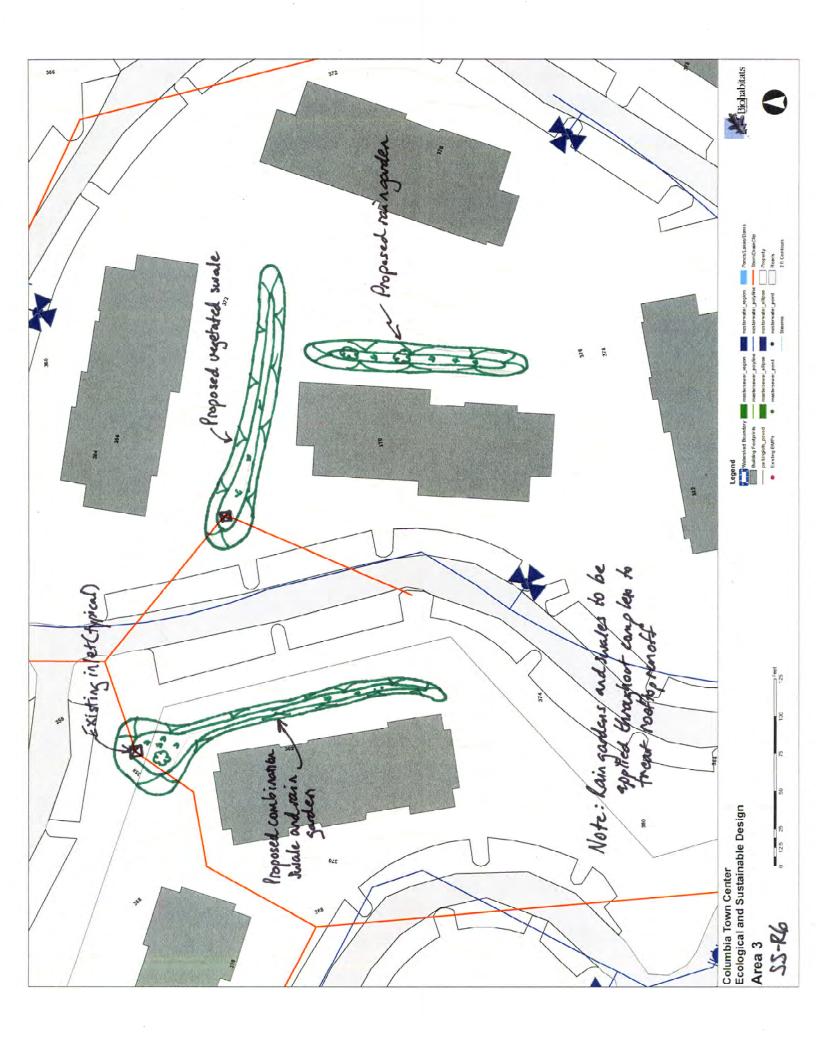


SKETCH



| DESIGN OR | DELIVERY | NOTES |
|-----------|----------|-------|
|-----------|----------|-------|

| FOLLOW-UP NEEDED TO COMPLETE FIELD | CONCEPT |
|---|---|
| | |
| Confirm property ownership | Obtain existing stormwater practice as-builts |
| Confirm drainage area | Obtain site as-builts |
| Confirm drainage area impervious cover | Obtain detailed topography |
| Confirm volume computations | Obtain utility mapping |
| Complete concept sketch | Confirm storm drain invert elevations |
| | Confirm soil types |
| Other: | |
| | |
| INITIAL FEASIBILITY AND CONSTRUCTION C | CONSIDERATIONS |
| INITIAL FEASIBILITY AND CONSTRUCTION C | CONSIDERATIONS |
| INITIAL FEASIBILITY AND CONSTRUCTION C | CONSIDERATIONS |
| INITIAL FEASIBILITY AND CONSTRUCTION C | CONSIDERATIONS |
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| INITIAL FEASIBILITY AND CONSTRUCTION C | CONSIDERATIONS |
| INITIAL FEASIBILITY AND CONSTRUCTION C | CONSIDERATIONS |
| | |
| SITE CANDIDATE FOR FURTHER INVESTIGAT | FION: X YES NO MAYBE |
| INITIAL FEASIBILITY AND CONSTRUCTION C SITE CANDIDATE FOR FURTHER INVESTIGAT IS SITE CANDIDATE FOR EARLY ACTION PRO IF NO, SITE CANDIDATE FOR OTHER RESTOR | FION: X Yes No Maybe OJECT(S): Yes No Maybe |





| | TERSHED: Symphony Fream SUBWATERSHED: | | UNIQUE SITE ID: 55-R7 |
|--|--|--|--|
| DATE: 2/11/03 | Assessed By: J2/JH | CAMERA ID: Olyn | |
| GPS ID: N/A | LMKID: NA | LAT: NA | LONG: N/A |
| SITE DESCRIPTION | | | |
| Name: <u>Liff le Pa</u> Address: | tuxent Parkway | | |
| Ownership: If Public, Government Jurisd | | ivate 🗌 Unknown ate 🗌 DOT 🗌 |] Other: |
| Below Outfall 🛛 In | eve Roadway Culvert Conveyance System Far Large Parking Lot | On-Site Hotspot Operation Small Parking Lo Individual Street | ot Small Impervious Area |
| DRAINAGE AREA TO PRO | PPOSED RETROFIT | | |
| Drainage Area $\approx 150' \times 120$ Imperviousness ≈ 300 Impervious Area ≈ 27 , | $\frac{0' = 90,000}{0} f_1^2$ $\frac{0}{000} f_1^2$ | Drainage Area Lan Residential SFH (< 1 ac SFH (> 1 ac | lots) Institutional |
| Notes: $R_v = 0.05 + 0.009 (30)$ | 0)=0.32 | Townhouses | B Park |
| EXISTING STORMWATER | MANAGEMENT | | |
| | | | |
| | ice: 🗌 Yes 🕅 No | o 🗌 Possible | |
| Existing Stormwater Pract If Yes, Describe: | | | 2V91104* |
| If Yes, Describe: | ditions, Including Existing Site of from Little Pature over grassed area is directed to a | | eyance: flows off ctes into let |
| If Yes, Describe: | | | eyance: flows off ates into let |
| If Yes, Describe: Describe Existing Site Con- Stormwater runof pavement and a channel and Existing Head Available an | | | eyance: flows off ates into let |
| If Yes, Describe: Describe Existing Site Con Stormwater runof pavement and a channel and | ditions, Including Existing Sit # From Little Pature over grassed area is directed to a | | eyance: flows off ates into let |
| If Yes, Describe: Describe Existing Site Con- Stormwater Nunof pavement and a channel and Existing Head Available and | ditions, Including Existing Sit # From Little Pature over grassed area is directed to a | | eyance: flows off ctes into let |
| If Yes, Describe: Describe Existing Site Con- Stormwater Nunof pavement and a channel and Existing Head Available and | ditions, Including Existing Sit # From Little Pature over grassed area is directed to a | | eyance: flows off ctes into let |



| PROPOSED RETROFIT | |
|--|--|
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Protection Flood Control |
| Retrofit Volume Computations - Target Storag | e: Retrofit Volume Computations - Available Storage: |
| Target $SA = 5\%(DA)$ = 5% (90,000ft ²) = 4,500 ft ² | Available JA = 350 ft x 20 ft = 7,000 ft 2 |
| Proposed Treatment Option: Extended Detention Filtering Practice Infiltration | Created Wetland Bioretention wale Other: |
| Describe Elements of Proposed Retrofit, Includ | ling Surface Area, Maximum Depth of Treatment, and Conveyance: |
| Excavate and add filtering Me of swate. Include underdrain if infiltration Raise invert of existing inlet temporary pondum of water | on is infassible. |
| temporary ponding of water | X 3++ 1 94+* |
| Checkdans may be necessary | |
| SITE CONSTRAINTS | |
| Adjacent Land Use: Residential Commercial Institute Industrial Transport-Related Park Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: Park | Access: No Constraints Constrained due to Slope Space Utilities Tree Impacts Structures Property Ownership Other: Traffic C Management |
| Conflicts with Existing Utilities: None Unknown Yes Possible Sewer Water Gas Electric Electric to Streetlights Overhead Wires Other: | Potential Permitting Factors: Dam Safety Permits Necessary Impacts to Wetlands Impacts to a Stream Probable Floodplain Fill Impacts to Specimen Trees How many? Approx. DBH Other factors: |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation) | ☐ Yes ⊠ No ☐ Yes ☐ No ⊠ Unknown ☐ Yes ☐ No ⊠ Unknown : ☐ Yes ☐ No ⊠ Unknown |



SKETCH

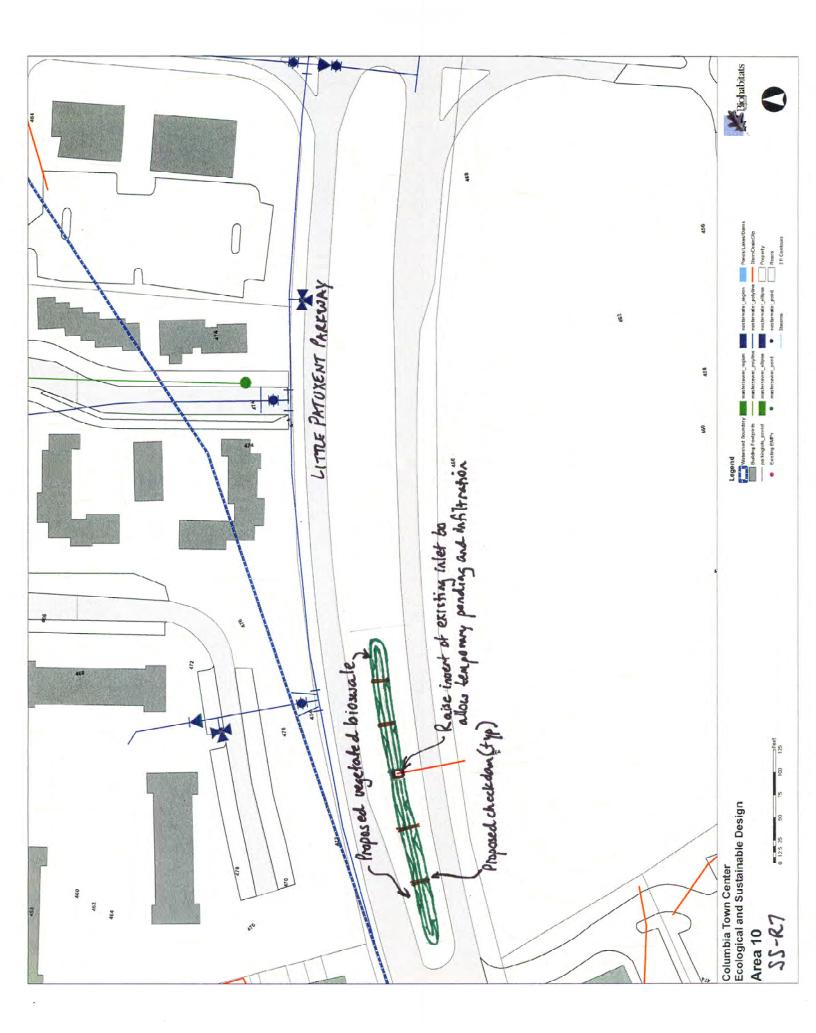
See attached

Unique Site ID: SS-R7



| DESIGN OR | DELIVER | Y NOTES | |
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| FOLLOW-UP NEEDED TO COMPLETE FIELD CON | °FDT | |
|--|--|--------------|
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations | Obtain existing stormwater practi Obtain site as-builts Obtain detailed topography Obtain utility mapping | ce as-builts |
| Complete concept sketch | Confirm storm drain invert elevat | ions |
| Other: | | |
| INITIAL FEASIBILITY AND CONSTRUCTION CONS | IDERATIONS | |
| | | |
| | | |
| SITE CANDIDATE FOR FURTHER INVESTIGATION IS SITE CANDIDATE FOR EARLY ACTION PROJEC IF NO, SITE CANDIDATE FOR OTHER RESTORATION | T(S): YES N | о Мауве |





| ASSESSED BY: JZ/SH | CAMERA ID: OlyApo | |
|---|---|--|
| | CAMERA ID: Olympo | IS PICTURES: 80-85 |
| LMK ID: N/A | LAT: NA | LONG: N/A |
| | | |
| High School peter Road | | |
| | | her: |
| e ove Roadway Culvert Conveyance System ar Large Parking Lot | On-Site Hotspot Operation Small Parking Lot Individual Street Underground | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| POSED RETROFIT | | |
| $f_{1}^{2} = 0.7ac$ $\frac{\%}{100}$ $90f_{1}^{2} = 0.65cc$ | Residential |) Institutional Industrial |
| MANAGEMENT | | |
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| chamels drain rul | noff from a park m drain inlet. | ing |
| | | |
| d Points Where Measured: | | |
| | | |
| | High School acher Road Image Public Processor pove Roadway Culvert conveyance System ar Large Parking Lot POSED RETROFIT $ft^2 = 0.7ac$ $\%$ $20 \pm 7 = 0.65cc$ MANAGEMENT ce: Yes Yes itions, Including Existing Sichards cr arca to a stor | Image: School state Image: School state ction: Image: Dot state Dot in the state DOT in the state ove Roadway Culvert Image: Dot state conveyance System Image: Small Parking Lot in dividual Street Image: Dot state conveyance System Image: Small Parking Lot in dividual Street Image: Dot state conveyance System Image: Dot state r Large Parking Lot Image: Dot state posed RETROFIT Image: Dot state ft 2 = 0.7 ac Image: Dot state go: H+2 = 0.65 cc Image: Dot state go: H+2 = 0.65 cc Image: Dot state image: Dot state Image: Dot state go: H+2 = 0.65 cc Image: Dot state image: Dot state Image: Dot state <td< td=""></td<> |

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| PROPOSED RETROFIT | | |
|--|--|---|
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel Pr | otection Flood Control |
| Retrofit Volume Computations - Target Storag Target SA = 5% (30,200) = 1,500 | | Volume Computations - Available Storage: $V_e SA \approx 150 \text{ ft} \times 15 \text{ ft}$ $\infty 2,250 \text{ ft}^2$ |
| | Created Wetland | Bioretention |
| Convert pawed draining ch SITE CONSTRAINTS Adjacent Land Use: Residential Commercial Industrial Transport-Related Undeveloped Other: | utional | Access: No Constraints Constrained due to Slope Space |
| Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: | 🗌 Yes 🖾 No | 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 Dam Safety Permits I Impacts to Wetlands Impacts to a Stream Floodplain Fill Impacts to Forests Impacts to Specimen How many? Approx. DBH Other factors: | Necessary Probable Not Probable Probable Not Probable |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation) | Yes No | d Unknown d Unknown g Unknown |



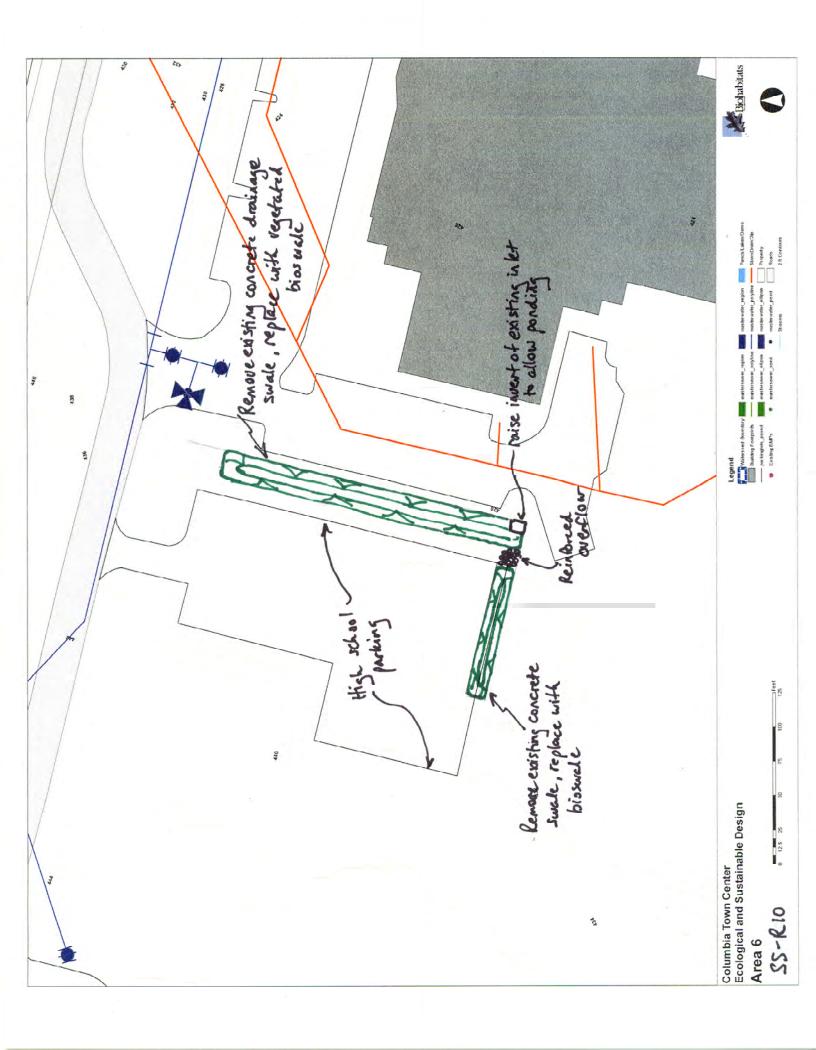
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| DESIGN OR | DELIVER | Y NOTES |
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| OLLOW-UP NEEDED TO COMPLETE FIELD CO | NCEDT |
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| | |
| Confirm property ownership | Obtain existing stormwater practice as-builts |
| Confirm drainage area | Obtain site as-builts |
| Confirm drainage area impervious cover | Obtain detailed topography |
| Confirm volume computations | Obtain utility mapping |
| Complete concept sketch | Confirm storm drain invert elevations |
| _ | Confirm soil types |
| Other: | |
| INITIAL FEASIBILITY AND CONSTRUCTION CON | ISIDEDATIONS |
| ATTAL PERSIBILITY AND CONSTRUCTION CON | |
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| SITE CANDIDATE FOR FURTHER INVESTIGATIO | N: Yes No Maybe |
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| S SITE CANDIDATE FOR EARLY ACTION PROJE | |
| IS SITE CANDIDATE FOR EARLY ACTION PROJE IF NO, SITE CANDIDATE FOR OTHER RESTORAT | |





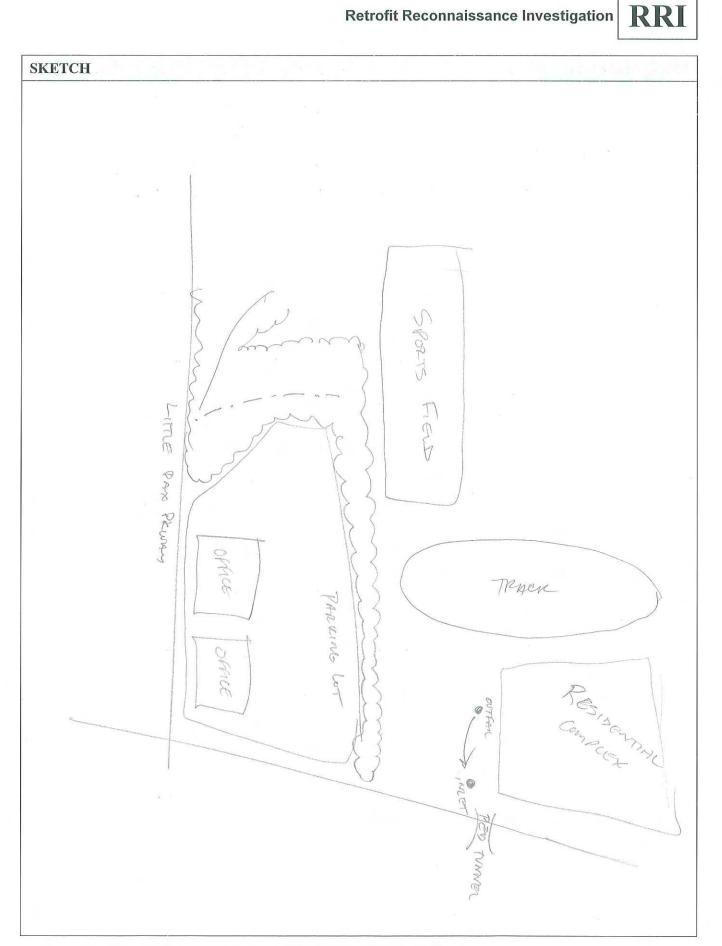
| WATERSHED: SS | SUBWATERSHED | : UN | NQUE SITE ID: RIL, RIZ |
|--|--|---|--|
| DATE: 4-9-08 | ASSESSED BY: BUS | CAMERA ID: | PICTURES: |
| GPS ID: | LMK ID: | LAT: | Long: |
| SITE DESCRIPTION | | | |
| Name:High School | | | |
| Ownership: If Public, Government Jurisdie | Public Prive | | ther: |
| Below Outfall In C In Road ROW Nea Other: | ve Roadway Culvert conveyance System r Large Parking Lot | On-Site Hotspot Operation Small Parking Lot Individual Street | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: |
| DRAINAGE AREA TO PROP | POSED RETROFIT | | 10 |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ | % | Drainage Area Land U Residential SFH (< 1 ac lot SFH (> 1 ac lot | s) Institutional |
| Notes: | | ☐ Townhouses ☐ Multi-Family ☑ Commercial | Park Undeveloped Other: |
| EXISTING STORMWATER I | MANAGEMENT | | |
| Existing Stormwater Practic If Yes, Describe: | e: 🗌 Yes 🔄 No | Possible | |
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| Describe Existing Site Condi | tions, Including Existing Site | Drainage and Conveya | nce: |
| - OVERSCEED PARKING DRAINING TO STORMORATING | | | |
| - STORMSRAIN FROM SCHOOL COMPLEX TO WOODED CHANNEL | | | |
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| Existing Head Available and Points Where Measured: | | | |
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| PROPOSED RETROFIT | | | |
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| Purpose of Retrofit: Water Quality Recharge Demonstration / Education Repair | | | |
| Retrofit Volume Computations - Target Storag | ge: Retrofit Volume Computations - Available Storage: | | |
| | | | |
| | Created Wetland Bioretention wale Other: | | |
| Describe Elements of Proposed Retrofit, Includ | ling Surface Area, Maximum Depth of Treatment, and Conveyance: | | |
| DETENTION AIZEA, | The Residential AREAR NEAR DED. CROSSING | | |
| SITE CONSTRAINTS | | | |
| Adjacent Land Use: Access: Residential Commercial Institutional Industrial Transport-Related Park Undeveloped Other: Slope Space Possible Conflicts Due to Adjacent Land Use? Yes No If Yes, Describe: PARKING Lost Sports FIELD 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 Impacts to Wetlands Probable Impacts to a Stream Probable Floodplain Fill Probable Impacts to Forests Probable Impacts to Specimen Trees Probable How many? | | |
| Solls: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | ☐ Yes No ☐ Yes No ☐ Yes No ☐ Yes No ☐ Yes No ☐ Yes No ☐ Yes No ☐ Yes No ☐ Yes No | | |

Unique Site ID:____



| | Retrofit Reconnaissance Investigation | RRI |
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| DESIGN OR DELIVERY NOTES | | 8 |
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| Follow-up Needed to Complete Field Cond | серт | 14 m |
| Confirm property ownership Confirm drainage area Confirm drainage area impervious cover Confirm volume computations Complete concept sketch Other: | Obtain existing stormwater practice as-builts Obtain site as-builts Obtain detailed topography Obtain utility mapping Confirm storm drain invert elevations Confirm soil types | |
| INITIAL FEASIBILITY AND CONSTRUCTION CONS | IDERATIONS | |
| | | |
| SITE CANDIDATE FOR FURTHER INVESTIGATION IS SITE CANDIDATE FOR EARLY ACTION PROJECT IF NO, SITE CANDIDATE FOR OTHER RESTORATION IF YES, TYPE(S): | T(S): \Box Yes \Box No \Box M | AYBE AYBE AYBE |

Unique Site ID:

Retrofit Reconnaissance Investigation **RRI**



| WATERSHED: | SUBWATERSHED | : | UNIQUE SITE ID: | SS-RIB, RIL |
|--|---|--|------------------|---|
| DATE: 4-9-08 | Assessed By: Bus S | CAMERA ID: | PICTUR | RES: |
| GPS ID: | LMK ID: | LAT: | LONG: | |
| SITE DESCRIPTION | | | | |
| Name: <u>Columbia</u> M Address: | ALL | | | |
| Ownership: If Public, Government Jurisdi | ction: Deblic Privation: Control Public Sta | | Other: | 0 |
| Below Outfall In C | ove Roadway Culvert Conveyance System r Large Parking Lot | On-Site Hotspot Opera Small Parking Individual Stree Underground | Lot 🛛 🗌 Small Im | ll Rooftop pervious Area be / Hardscape |
| | | Duoinago Augo I | and User | |
| Drainage Area ≈ Imperviousness ≈ Impervious Area ≈ | | Drainage Area L Residential SFH (< 1 SFH (> 1 | ic lots) | tutional strial sport-Related |
| Notes: | | Townhous Multi-Fan Commercial | es 🗌 Park | eveloped |
| EXISTING STORMWATER | MANAGEMENT | | | |
| Existing Stormwater Practic If Yes, Describe: | e: Ves 🗌 No | Possible | | |
| OIL AND GRIT | SEPARATOR | | | |
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| Describe Existing Site Cond | itions, Including Existing Site | e Drainage and Con | veyance: | |
| LARGE AVERAS | of Roof AND PARKE | NG DEGINING | to storen Dr | ω , ω |
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| Existing Head Available and | Points Where Measured: | | | |
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Retrofit Reconnaissance Investigation **RRI**



| PROPOSED RETROFIT | | | the second second |
|---|--|------------------------------|-----------------------------------|
| Purpose of Retrofit: Water Quality Demonstration / Education | | Channel Protection Other: | Flood Control |
| Retrofit Volume Computations - Target Storag | je: | Retrofit Volume Co | mputations - Available Storage: |
| | | a. | |
| | reated Wet wale | land Dioreten | tion |
| Describe Elements of Proposed Retrofit, Includ | ling Surfac | e Area, Maximum De | pth of Treatment, and Conveyance: |
| BIOFILTENTION ISLANDS IN RAINGARDENS IN COMMERCIA UNDERGROUND STORAGE IN | ~ Con | now preg | 5 |
| SITE CONSTRAINTS | | | |
| Adjacent Land Use: Institute Residential Commercial Institute Industrial Transport-Related Park Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? If Yes, Describe: If Yes, Describe: | itional | Constrain | onstraints ned due to Glope |
| Conflicts with Existing Utilities: None Unknown Yes Possible Sewer Water Gas Electric Electric to Streetlights Overhead Wires Other: | Dam Safe Impacts t Impacts t Floodplai Impacts t Impacts t How Appr | | |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | Yes Yes | No Unknow | n |



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| Follow-up Needed to Complete Field Co | ONCEPT |
| Confirm property ownership | Obtain existing stormwater practice as-builts |
| Confirm drainage area Confirm drainage area impervious cover | Obtain site as-builts Obtain detailed topography |
| Confirm volume computations | Obtain utility mapping |
| Complete concept sketch | Confirm storm drain invert elevations |
| Other: | Confirm soil types |
| NITIAL FEASIBILITY AND CONSTRUCTION CON | NSIDEDATIONS |
| ATTAL FEASIBILITT AND CONSTRUCTION CON | |
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| SITE CANDIDATE FOR FURTHER INVESTIGATIO | ON: \Box YES \Box NO \Box MAYBE |
| SITE CANDIDATE FOR FURTHER INVESTIGATIO S SITE CANDIDATE FOR EARLY ACTION PROJI | |

Retrofit Reconnaissance Investigation



| WATERSHED: 55 | | SUBWATERSHED: | | UNIQUE | SITE ID: RIS 16 SA | | |
|---|--------|---------------|---|--|-------------------------|--|--|
| DATE: 4-9-08 | Assess | ED BY: BWS | WS CAMERA ID: TIG | | PICTURES: | | |
| GPS ID: JAUR | LMKI | D: | LAT: | | LONG: | | |
| SITE DESCRIPTION | | | | | | | |
| Name: <u>Hickory</u> R.DG. Address: | E Tan | VHOMES | | | | | |
| Ownership: Public Private Unknown If Public, Government Jurisdiction: Local State DOT Other: | | | | | | | |
| Below Outfall In Conveyance System Small Parking Lot Sm In Road ROW Near Large Parking Lot Individual Street La | | | | Individual Rooftop Small Impervious Area Landscape / Hardscape Other: | | | |
| DRAINAGE AREA TO PROP | | ETROFIT | | | | | |
| Drainage Area ≈% Imperviousness ≈% Impervious Area ≈% Notes: | | | Drainage Area Land Use: Residential Institutional SFH (< 1 ac lots) | | | | |
| | | | Townhous | | Park Undeveloped Other: | | |
| EXISTING STORMWATER | MANAGE | MENT | | - | | | |
| Existing Stormwater Practice: If Yes, Describe: | | | | | | | |
| Describe Existing Site Cond | | | | veyance: | | | |
| · ROOFTOP AND PH | | | HIN | | | | |
| - MAMY ROUFTUP | DISCOM | NECTED | | | | | |
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| Existing Head Available and Points Where Measured: | | | | | | | |
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Retrofit Reconnaissance Investigation



| PROPOSED RETROFIT | а л | |
|--|---|---|
| Purpose of Retrofit: Water Quality Demonstration / Education | Channel P | Protection |
| Retrofit Volume Computations - Target Storag | ge: Retrofit | Volume Computations - Available Storage: |
| | | |
| | Created Wetland wale | Bioretention Other: |
| Describe Elements of Proposed Retrofit, Includ | ling Surface Area, M | aximum Depth of Treatment, and Conveyance: |
| - SANS FILTER IN PARKING - FIGINBARRELS For RESI | DENCE | |
| SITE CONSTRAINTS | | |
| Adjacent Land Use: | Itional | Access: No Constraints Constrained due to Slope Space Utilities Tree Impacts Structures Property Ownership Other: |
| Conflicts with Existing Utilities: None Unknown Yes Possible Water Gas Electric Electric to Streetlights Overhead Wires Other: | Potential Permittin Dam Safety Permits Impacts to Wetlands Impacts to a Stream Floodplain Fill Impacts to Forests Impacts to Specimer How many? Approx. DBH | Necessary Probable Not Probable Not Probable Not Probable Not Probable Not Probable |
| Soils: Soil auger test holes: Evidence of poor infiltration (clays, fines): Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): | ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No : ☐ Yes ☐ No | Unknown Unknown Unknown |

Unique Site ID:_____

| | Retrofit Reconnaissance Investigation | RRI |
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| OLLOW-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 |
| NITIAL FEASIBILITY AND CONSTRUCTION C | CONSIDERATIONS |
| | |
| | |
| SITE CANDIDATE FOR FURTHER INVESTIGAT S SITE CANDIDATE FOR EARLY ACTION PRO F NO, SITE CANDIDATE FOR OTHER RESTOR IF YES, TYPE(S): | OJECT(S): YES NO MAYBE |

Unique Site ID:____

Retrofit Reconnaissance Investigation RRI

| WATERSHED: LANTSE P. | XX SUBWATI | ERSHED: | Kethem Age NOL | UNIQUE | STE ID: 55- 817 |
|---|---|----------------|--|----------------------------|--|
| DATE: 28 19 84 08 | ASSESSED BY: BM | 845 | CAMERA ID: | | PICTURES: |
| GPS ID: | LMKID: | | LAT: | | LONG: |
| SITE DESCRIPTION | | | | | |
| Name: PARKING AREA Address: Consumption Ma | | | | | |
| Ownership: If Public, Government Jurisdi | Etion: Decal | Priva State | | Other: | |
| ☐ Below Outfall ☐ In C ☐ In Road ROW ☑ Nea ☐ Other: | we Roadway Culvert onveyance System r Large Parking Lot | | On-Sitc Hotspot Operat Small Parking Individual Stre Uoderground | Lot 🗄 |] Individual Rooftop] Small Impervious Arca] Landscape / Hardscape] Other: |
| Drainage Area $\approx \frac{B15}{10}\frac{47^{\circ}}{10}$ Imperviousness $\approx \frac{1}{10}$ Impervious Area $\approx \frac{57B_{12}}{10}$ Notes: | 9 <i>3F</i> 7/_% 5/2 \$F | | Drainage Area L: Residential SFH (< 1 a SFH (> 1 a Townhous Multi-Fam | ac lots) ac lots) es | ☐ Institutional ☐ Industrial ☐ Transport-Related ☐ Park ☐ Undeveloped |
| EXISTING STORMWATER | Management | | | | Other: |
| Existing Slormwater Practic If Yes, Describe: | :e: 🛄 Yes | ₩ No | Possible Possible | | |
| Describe Existing Site Cond | itions, Including Exis | ting Site | Drainage and Con | veyance: | |
| Larce Phen Su | FFMC: VAXERING | 0.04 1 | 3M/LL 130.400 | 5 . | |
| Existing Head Available and | l Points Where Meas | ured: | | | |
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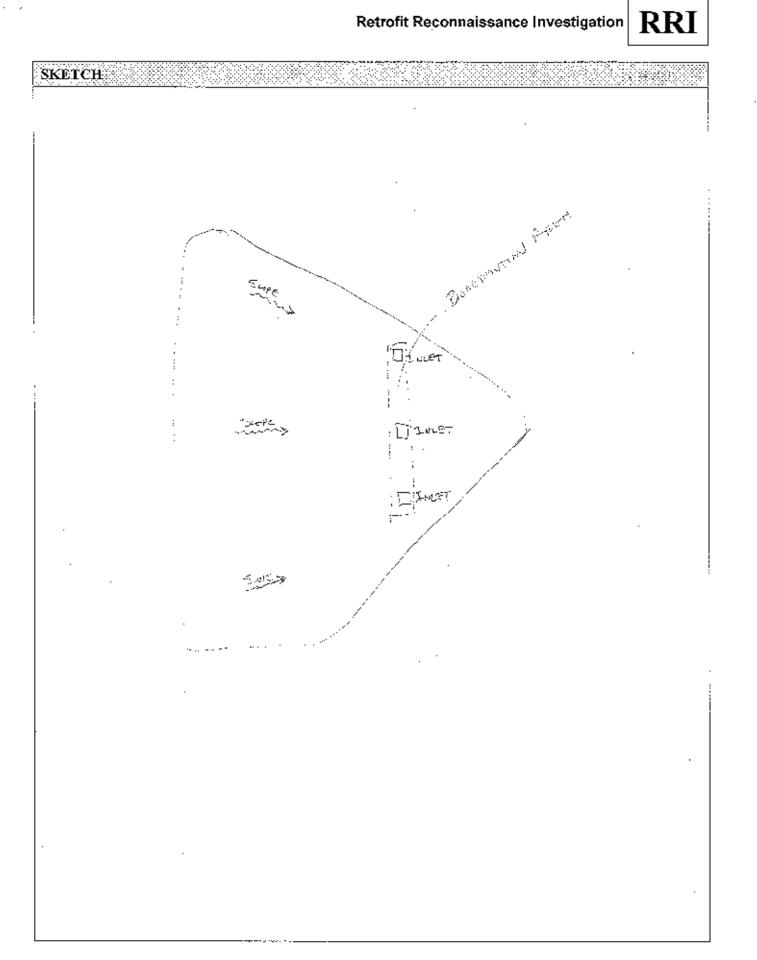
Retrofit Reconnaissance Investigation RRI

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| PROPOSED RETROFIT | | |
| Purpose of Retrofit: Water Quality Recharge Demonstration / Education Repair | Channel Protection Flood Control | |
| Retrofit Volume Computations - Target Storage | e: Retrofit Volume Computations - Available Storage: | |
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| Proposed Treatment Option: | | |
| Extended Detention Wet Pond Cr | reated Wetland 🔲 Bioretention | |
| Filtering Practice Infiltration Sv | wale Other: | |
| Describe Elements of Proposed Retrofit, Includi | ling Surface Area, Maximum Depth of Treatment, and Conveya | ace: |
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| MARKINEL CONTINE DIORETENTION | N FRIERS WICHIN THE PARLING LOAT. | |
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| SITE CONSTRAINTS | | |
| Adjacent Land Use: | Access: | |
| 🗌 🛄 Residential 🔤 Commercial 🔤 Institu | | |
| Industrial Iransport-Related Park | Constrained due to | |
| Undeveloped Other: Possible Conflicts Due to Adjacent Land Use? | Yes No Utilities Tree Impacts | |
| If Yes, Describe: | Structures Properly Owners | hip |
| | Other | _ |
| Conflicts with Existing Utilities: | Potential Permitting Factors: | |
| None | Dam Safety Permits Necessary Drobable | |
| 🗌 Unknown | Impacts to Wetlands 🗍 Probable 🖓 Not Probable | |
| Yes Possible | Impacts to a Stream 🔲 Probable 🔄 Not Probable | |
| Sewer | Floodplain Fill Drobable Not Probable | |
| | Impacts to Specimen Trees | |
| Gas Gas | Impacts to Specimen Trees Probable Not Probable | |
| | Approx. DBII | |
| Electric to Streetlights | | |
| Overhead Wircs | Other factors: | _ |
| Other: | i | _ |
| Soils: | | |
| Soil auger test holes: | Yes X No | |
| Evidence of poor infiltration (clays, fines): | Yes No Unknown | |
| Evidence of shallow bedrock: Evidence of high water table (gleying, saturation): |): Yes Yoo Unknown): Yes Voo Unknown | |
| Framence of might water lable (greying, saturation). | V Clies Callon Clementown | |





DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT. Confirm property ownership Obtain existing stormwater practice as-builts Confirm drainage area Obtain site as-builts Confirm drainage area impervious cover Obtain detailed topography Confirm volume computations Obtain utility mapping. Complete concept sketch Confirm storm drain invert elevations Confirm soil types Other: INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS SITE CANDIDATE FOR FURTHER INVESTIGATION: YES" NO MAYBE YES MAYBE IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): No IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): VIS. MAYBE NO. IF YES, TYPE(S):

Unique Site ID:

Appendix D: Unified Stream Assessment Field Forms

Stream Crossing SC

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|----------------|------------------------------|-----------------|---------------------------------------|---------------|----------|------------------------------------|--|--------------|--------------------------------------|----------------------|--|
| WATERSHED | /SUBSHED: 🗋 | <u>>umpt</u> | <u>vernu</u> | | | | DAT | ге: <u>2</u> | <u>1 12 1 08</u> | 3 Asse | SSED BY: SN/BS |
| SURVEY REA | сн ID: | 0 (| d'1 | Cime: | ÷ | AM/PM | Рно | ото ID | : (Camera-I | Pic #) | /# |
| SITE ID: (Cond | dition-#) SC- | 6 | LAT | 0 | • | " LONG | 0 | , | | LMK | GPS (Unit ID) |
| | | | | <u> </u> | | | | | ···· | | |
| TYPE: 🗌 Roa | d Crossing | Railroad | Crossing | Mann | nade f | Dam 🗌 Beay | er Da | m 🗖 (| Geological Fo | rmation N | Other: Path Xing |
| | | Tturn oud | · · · · · · · · · · · · · · · · · · · | BARREL | | MATERIAL: | ···· · · · · · · · · · · · · · · · · · | | | 1 | |
| | SHAPE: | Botton | | Single | э. | Concrete | | L . | IMENT: | Barrel dia | IONS: (if variable, sketch) |
| | \square Box 1 | Ellipti | | Double | | | | <i>e</i> . | w-aligned flow-aligned | 1 | () |
| FOR ROAD/ | Circular | | | Triple | | ☐ Metal ☐ Other: ₩ | | | not know | | Height:(ft) |
| RAILROAD | X Other: | | [| Other: | | M Omer. Mr | | | HOU KHOW | | |
| CROSSINGS | CONDITION: | (Evidence | of) | | | | | CULVI | ERT SLOPE: | Culvert le | ength:(ft) |
| ONLY | Cracking/ch | inning/co | arrosion | | stream | scour hole | | 🗌 Flat | | | Width: <u>//(ft)</u> |
| | Sediment d | | | | | inkment | | 🗌 Slig | $(2^{\circ}-5^{\circ})$ | | |
| | ∇ Other (<i>desc</i> | - | | by hor | | | | 🗌 Obv | /ious (>5°) | Roadway | elevation:(ft) |
| | 77 | | and blacks | VED | LEAD | <u>/(</u> | | | | | |
| POTENTIAL R | RESTORATION | CANDID | ATE | Fish bar | rier rei | noval 🗌 Cul | vert re | pair/rep | lacement | Upstream s | torage retrofit |
| 🗌 no | | | | Local str | eam r | | | | | | |
| IS SC ACTING | AS GRADE C | ONTROL | <u> </u> | <u>] No [</u> | Ye | s 🗌 Unk | nown | | | <u></u> | |
| | EXTENT OF H | | | KAGE: | r | | · · · · · | BLO | CKAGE SEV | E RITY: (circ | rle #) |
| | Total | | Partial | | | A structure such | as a da | am or | A total fish bloc | kage on a | A temporary barrier such as a |
| If yes for | / []' Temporary | | Unknown | | | road culvert on a | 3rd or | ter or | tributary that w | ould isolate a | beaver dam or a blockage at |
| fish barrier | CAUSE: | | | | - | greater stream b upstream moven | | the . | significant read or partial block | | the very head of a stream with very little viable fish habitat |
| Jish Gurrier | 📋 Drop too hi | igh W | 'ater Drop |): (| in) | anadromous fish | | 1 | interfere with th | | above it; natural barriers such |
| | Flow too sh | | | | in) | passage device | present | . | anadromous fis | ih. | às waterfalls. |
| | Other: b | oulde | us lund | er brid | co - | 5 | | 4 | (3 | 1 | 2 1 |
| NOTES/SKET | | | | () | ſ | | | | No. | <i>)</i> | |
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| | | | | | | | | | Desc | | |
| | | | | | | | | | KEPC | INTED TO AU | THORITIES YES NO |

| 2 | tre | 31 | 17 | Cros | sing |
|---|-----|----|----|------|------|
|---|-----|----|----|------|------|

| | | | | | Stre | am Cros | ssing k | SC |
|------------------------------------|--|--|---|---------------------------------------|--|---|--|--|
| WATERSHEE | SUBSHED: Sumphos | nu | | DA | TE: 2/ 12/08 | Asse | SSED BY: 8 | N/BS |
| SURVEY REA | | Фіме:: | _AM/PM | | ото ID: (Camera-Pi | × | /# | of the state of th |
| SITE ID: (Cor | ndition-#) SC- $\overline{2(8)}$ LAT | • • • | ' LONG | ° | '' L | мк | GPS (U | nit ID) |
| | | | | | | | | |
| TYPE: 🗌 Ro | | | | er Da | am 🔲 Geological For | mation | Other: | |
| For Road/ Railroad Crossings | SHAPE: Arch Bottomless Box Elliptical Circular Other: | # BARRELS: Single Double Triple Other: | MATERIAL: Concrete | | ALIGNMENT: Flow-aligned Not flow-aligned Do not know | | | (ft) |
| ONLY | CONDITION: (Evidence of) Cracking/chipping/corrosic Sediment deposition Other (describe): | on 🗌 Downstream | m scour hole bankment | | CULVERT SLOPE: \Box Flat \Box Slight (2° – 5°) \Box Obvious (>5°) | Culvert length: Width: Roadway elevation: | | (ft) (ft) |
| | | | | | · · · · · · · · · · · · · · · · · · · | 1 | | |
| POTENTIAL | RESTORATION CANDIDATE | | repair 🗌 Othe | | epair/replacement | Upstream st | orage retrofit | |
| IS SC ACTIN | G AS GRADE CONTROL | | es 🗌 Unkı | nowr | 1 | | | |
| lf yes for fish barrier | CAUSE: Drop too high Water D Flow too shallow Water D Other: (1000) | wn Yrop: (in) | A structure such a road culvert on a greater stream blo upstream moveme anadromous fish; passage device pl | 3rd or ocking ent of no fisi | der or tributary that wou the significant reach or partial blockag h interfere with the t. anadromous fish | age on a Ild isolate a of stream, e that may migration of | A temporary ba beaver dam or the very head o very little viable above it; natura às waterfalls. | a blockage at f a stream with fish habitat |
| NOTES/SKET | | | 5 |) | 4 3 | | 2 | 1 |
| NUTES/SKET | CH: | | | | • | | | |
| | | | | | REPOR | TED TO AUT | HORITIES 🗌 | Yes 🗌 No |

| • | | | | | С | | | | • | |
|---|-------|-------|--------|-------------|-------|------|---------|----------|--------|-----|
| | 21 P. | 100 | ٤ | 3- 3 | | 1775 | <u></u> | <u> </u> | e y mi | 6 P |
| 2 | 11 | 1.1.1 | ۰. | 11 | - Ŀ . | 44.4 | ~ | | 2 E | 13. |
| | | | | | | | | | | |

| | | | | | | SC |
|--|---|--|--|---|--|--|
| | | | | Sire | am Cros | ising NC |
| WATERSHED | /SUBSHED: SUMOHOMU | | DATE: 2 | 801 SI 1 | ASSE | SSED BY: SH/BS |
| SURVEY REA | | AM/PM | |): (Camera-Pic | | /# |
| SITE ID: (Con | dition-#) SC- 🖰 (G) LAT ' | '' Long | • • | '' LN | ик | GPS (Unit ID) |
| TYPE: 🗍 Roa | ad Crossing 🔲 Railroad Crossing 📋 Manmade I | Dam 🗌 Beave | er Dam | Geological Form | nation 🗍 | Other: |
| For Road/ Railroad Crossings Only | SHAPE: # BARRELS: Arch Bottomless Box Elliptical Other: Other: Condition: (Evidence of) Cracking/chipping/corrosion Downstream Sediment deposition Saling emba Other (Evidence of) Cracking/chipping/corrosion Downstream Other (Evidence of) Other (Evidence of) Other (Evidence of) Other (Evidence of) Other (Evidence of) | MATERIAL: Concrete Metal Other: | ALIG Fla Do CULV Fla Sli | NMENT: ow-aligned of flow-aligned o not know | DIMENSI Barrel dia Culvert le | IONS: (if variable, sketch) meter: <u>48</u> (ft) Height:(ft) |
| | | | I | | | ···· |
| POTENTIAL I | RESTORATION CANDIDATE Kish barrier ret | | | placement 🔲 U | Jpstream st | orage retrofit |
| IS SC ACTING | G AS GRADE CONTROL 🗌 No 🕅 Ye | s 🗌 Unki | nown | | | |
| | EXTENT OF PHYSICAL BLOCKAGE: | | BLO | CKAGE SEVER | ITY: (circ | le #) |
| lf yes for fish barrier | Total Partial Temporary Unknown CAUSE: Drop too high Water Drop: (in) Flow too shallow Water Depth: Other: (in) | A structure such a road culvert on a greater stream blo upstream moveme anadromous fish; passage device p | 3rd order or ocking the ent of no fish resent. | A total fish blockay tributary that woul significant reach o or partial blockage interfere with the r anadromous fish. | d isolate a f stream, e that may | 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 às waterfalls. |
| NOTES/SKET | CH: | | | + | | 2 1 |
| | | | | | | |
| | | | | | | |
| | | | | REPORT | FED TO AUT | THORITIES 🗌 YES 🗌 NO |
| | | | | | | |

| | | | | | | | | Stre | am Cros | sing SC | (|
|---|---------------|-----------------|--------------|------------------------------|--|---------------------------------------|------------------------|--|--|---|------------------------------|
| WATERSHED | SUBSHED: | Sum | nen | | | DA | TE: L | 112/08 | ASSE | SSED BY: SH/BS | ()) |
| SURVEY REA | CH ID: | | | GIME: : | _AM/PM | | | : (Camera-Pio | ····· | /# | |
| SITE ID: (Con | dition-#) SC | <u>- 9 (w</u>) | LAT | o I | '' Long_ | o | , | " Ll | мк | GPS (Unit ID) | |
| | | | | | | | | | | · • • · · · · · · · · · · · · · · · · · | |
| TYPE: Roa | ad Crossing [| Railroad | Crossir | ng 🗌 Manmade | Dam 🗌 Beav | er Da | am 🔲 | Geological For | mation 🕅 | Other: Culvert? | , |
| For ROAD/ Arch Bottomless Single For ROAD/ Box Elliptical Double RAILROAD Other: Other: Other: CROSSINGS CONDITION: (Evidence of) Other: Other: | | | | Double Double | MATERIAL: Concrete Metai Other: | | ∑ Flo ☐ Not ☐ Do | NMENT: w-aligned t flow-aligned not know | DIMENSIONS: (if variable, ska Barrel diameter: <u>36</u> Height: | | <i>ch)</i> _(ft) _(ft) |
| ONLY | NLY | | | | | im scour hole bankment | | CULVERT SLOPE: Flat Slight $(2^{\circ} - 5^{\circ})$ Obvious $(>5^{\circ})$ | | Width: | _(ft) _(ft) |
| | | escribe): | <u>0 mil</u> | 90100 | | | | | Roudinay | | (11) |
| POTENTIAL I | | | | Fish barrier re | N 1 | | • • | lacement [] t lObu | • | torage retrofit | |
| IS SC ACTING | G AS GRADE | CONTROL | · | | es 🕅 Unk | nowi | | J r | | | |
| | EXTENT O | | | CKAGE: | | | BLO | CKAGE SEVEF | RITY: (circ | le #) | |
| lf yes for fish barrier | Flow too | ry 🗍 | | vn op: (in) :pth: (in) | A structure such road culvert on a greater stream bl upstream movem anadromous fish; passage device p | 3rd oi ocking ient of no fis | der or 1 the h | A total fish blocka tributary that wou significant reach a or partial blockag interfere with the anadromous fish. | ld isolate a of stream, e that may migration of | A temporary barrier such beaver dam or a blockag the very head of a stream very little viable fish habit above it, natural barriers às waterfalls. | ie at n with tat |
| | Other: | | | | 5 | | 4 | 3 | | 2 1 | |
| Notes/Sketch: Not sure of purpose, could be to protect utility line stakes or sewer Nog, remove + replace w/ oppropriate open channel str. | | | | | | | | | | | |
| | | • | | | | | | | | | |
| | | | | | | | | REPOR | TED TO AU | THORITIES 🗌 YES 🗌 |] No |

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| | DISUBSHED: Sympher | 1 1 | | | 112108 | <u> </u> | ssed by: 5 | N/BS |
|----------------------------|---|--|---|----------------------------------|--|--|---|---|
| SURVEY REA | 1.0 / 1 | <u></u> | | HOTO ID | : (Camera-Pi | | /# CPS // | |
| SILLID: (Co | ndition-#) SC- $[O(12)]$ LAT | | ' LONG' | | " L | MK | GPS (U | nit ID) |
| TYPE: 🗍 Ro | ad Crossing 🔲 Railroad Crossi | ing 🔲 Manmade | Dam 🔲 Beaver I | Dam 🔲 | Geological For | mation 🕅 | Other: UM | Marmi |
| For Road/ Railroad | SHAPE: Arch Bottomless Box Elliptical Circular Other: | # BARRELS: Single Double Triple Other: | MATERIAL: | ALIGNMENT: | | DIMENSI Barrel dia | ONS: (if varia meter: Height: | ible, sketch) |
| CROSSINGS ONLY | CONDITION: (Evidence of) Cracking/chipping/corrosio Sediment deposition Other (describe): | n scour hole pankment | scour hole \Box Flat \Box Slight (2° – 5°) | | | Ivert length: Width: adway elevation: | | |
| POTENTIAL | RESTORATION CANDIDATE | Fish barrier r | emoval 🗌 Culvert repair 🔲 Other: | repair/rep | blacement 🗌 | Upstream st | orage retrofit | |
| IS SC ACTIN | G AS GRADE CONTROL | | es 🗌 Unknow | vn | | | | |
| | EXTENT OF PHYSICAL BLC | | | BLO | CKAGE SEVE | RITY: (circi | le #) | |
| lf yes for fish barrier | Flow too shallow Water D | rop: (in) epth: (in) | A structure such as a road culvert on a 3rd greater stream blocki upstream movement anadromous fish; no passage device prese | order or ng the of fish | A total fish block tributary that wou significant reach or partial blockag interfere with the anadromous fish | uld isolate a of stream, je that may migration of | A temporary ba beaver dam or the very head of very little viable above it; natura as waterfalls. | a blockage a of a stream w a fish habitat |
| NOTES/SKE | Dither: too long p | 1 pres | 5 | 4 | 3 | | 2 | 1 |
| | - un pristrean | L piped U | nder devel | abmen | t | | | |
| | | | | | | | | |

| Severe | Bank | Erosion | |
|--------|------|---------|--|

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|--|--|---|--|--|--|--|
| WATERSHED/SUBS | HED: Sumphy | YILL STREAM | m | | | CSSED BY: SH/BS |
| SURVEY REACH: | š | TIME: <u>9</u> : ¹ | <u>5</u> am/pm | PHOTO ID (CAME | | |
| SITE ID: (Condition- | | | | <u>2'29"</u> I | | GPS: (Unit ID) |
| ER/ | | | | <u>''</u> 'I | | |
| | | | | | 1. 7 | |
| PROCESS: | Currently unknown Bed scour Bank failure | LOCATION DIMENSIONS | Meander bend 50 GPS) LT_ <u>15</u> f | | ftBot | alley wall [] Other: tom widthft |
| Aggrading | Slope failure | Bank Ht | LT <u>b/r</u> f | t and/or RT | ft Top | widthft |
| Sed. deposition | Channelized | <u> </u> | | | | tted Widthft |
| LAND OWNERSHIP | Private 🗌 Publi | c 🗌 Unknown | LAND COVER | : 🛛 Forest 🗌 Fi | eld/Ag 🗌 Dev | veloped: |
| | ORATION CANDIDATI | Other: | : / | Bank stabilization | л£. | |
| | | | , | | | |
| EXISTING RIPARIA | AN WIDTH: 6 | ^∑≤25 ft | 25 - 50 ft | □ 50-75ft □ 75- | 100ft |)0ft |
| EROSION SEVERITY(circle#) Channelized= 1 | Active downcutting; tall bar of the stream eroding at a f contributing significant amo stream; obvious threat to p infrastructure. | ast rate; erosion ount of sediment to | Pat downcutting evic widening, banks acti moderate rate; no th infrastructure | vely eroding at a | failure/erosion; like | table; isolated areas of bank sly caused by a pipe outfall, local parian vegetation or adjacent use. |
| | 5 | | 4) 3 | | 2 | 1 |
| ACCESS: | Good access: Open area ownership, sufficient room materials, easy stream cha heavy equipment using exi trails. | to stockpile nnel access for sting roads or | | Access requires tree landscaped areas. Il or distant from stream. | other sensitive are stockpile areas avail distance from strea equipment require | |
| | 5 | <u></u> | 4 3 | 1 | 2 | 1 |
| NOTES/CROSS SEC | CTION SKETCH: | | مقترین | | | |
| | | · · · · · · · · · · · · · · · · · · · | and the second sec | NII WAANNA DOOR AM AMAGAMA AMAGAMA AMAGAMA AMAGAMA AMAGAMA AMAGAMA AMAGAMA AMAGAMA AMAGAMA AMAGAMA AMAGAMA AMA | | |
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| | | | | 1 | Dura | |
| | | | | ; | KEPORTED TO | authorities 🗌 Yes 🗌 No |

| | | | | S | evere Bank Er | osion ER |
|--|--|--|--|---|---|--|
| WATERSHED/SUBS | HED: Sum oh | omy Snee | Ertm | DATE: 2/12 | <u>/ 68</u> Asses | SSED BY: SN BS |
| SURVEY REACH: | COU! | THE Q . 4 | S ANT/PNT | PHOTO ID (CAM | FRA-PIC #)· | 1# 1.1 |
| SITE ID: (Condition- | #) START LAT 3 | 9 0 12 1 57 " | ' LONG 76 05 | 2:27" | LMK | GPS: (Unit ID) |
| ER- <u>]</u> | END LAT | 0 1 11 | LONG | 1 11 | LMK | - |
| PROCESS: | Currently unknown Bed scour Bank failure Bank scour Slope failure Channelized Private Publi DRATION CANDIDATI | BANK OF COL LOCATION: [DIMENSIONS: Length (if no G Bank Ht Bank Angle C Unknown C Unknown C Grade | NCERN: \Box LT A Meander bend BPS LT <u>45</u> f C_{ACU} T LT <u>3</u> f LAND COVER control 101 a 101 a Yes (Descri | RT Both (<i>l</i> Straight section t and/or RT (and/or RT 2 and/or RT Forest F Bank stabilization be): | ooking downstream | ley wail [] Other: om widthft widthft eloped: |
| EXISTING RIPARL | N WIDTH: | ∐ ≤25 ft | 🗌 25 - 50 ft | □ 50-75ft □ 75 | -100ft 🖸 >100 |)ft |
| EROSION SEVERITY(circle#) Channelized= 1 | Active downcutting; tall bar of the stream eroding at a contributing significant and stream; obvious threat to p infrastructure. | ast rate; erosion ount of sediment to | Pat downcutting evid widening, banks acti moderate rate; no th infrastructure | vely eroding at a reat to property or | failure/erosion; likely | ble; isolated areas of bank / caused by a pipe outfall, local rian vegetation or adjacent use. |
| ACCESS: | Good access: Open area ownership, sufficient room materials, easy stream cha heavy equipment using exi trails. | to stockpile innel access for | Fair access: Forest adjacent to stream, removal or impact to Stockpile areas sma | ed or developed area Access requires tree | other sensitive areas stockpile areas avai | ust cross wetland, steep slope or s to access stream. Minimal lable and/or located a great n section. Specialized heavy |
| NOTES/CROSS SEC | CTION SKETCH: | | | | | |
| | | | urder c Z'he | ut stream, | trying to | straighter |
| | | | | | Reported to a | uthorities 🗌 Yes 🦳 No |

| Severe Ba | nK ⊟ | rosion |
|-----------|------|--------|
|-----------|------|--------|

| WATERSHED/SUBS | HED: Sumahe | MU STR | EArm | DATE: <u>21</u> 12 | / CB Asses | SED BY: SN/BS |
|----------------------|--|---------------------|--|---|---------------------------------------|---|
| SURVEY REACH: | SR-101 | THME: 10: (| <u>03 am/pm</u> | PHOTO ID (CAME | RA-PIC #): | /# 7 |
| SITE ID: (Condition- | *) START LAT 3 | 9 0 12 . 56. | LONG 76 0 5 | 2: <u>28</u> " I | .MK | GPS: (Unit ID) |
| ER- <u>_</u> | END LAT_ | | LONG° | | .MK | |
| | | | | | | |
| PROCESS: | Currently unknown | BANK OF CO | NGERN: LT | RT Both (lot Straight section [| oking downstream, |) |
| Downcutting | Bed scour | | | Stratght section [| | icy wall <u>i</u> Outer, |
| Widening | Bank failure | DIMENSIONS | | and/on BT 20 | ft Botto | om widthft |
| Headcutting | Bank scour | Bank Ht | | t and/or RT <u>20</u> t and/or RT <u>(</u> | n Bond . ft Top v | widthft |
| Aggrading | Slope failure | | | ° and/or RT | | ed Widthft |
| Sed. deposition | Channelized | | | | | |
| LAND OWNERSHIP | Private Publi | c 📋 Unknown | LAND COVER | Forest Fi | eld/Ag 🗌 Deve | loped: |
| | | · | | | · · · · · · · · · · · · · · · · · · · | |
| POTENTIAL REST(| DRATION CANDIDATI | E: Grade | | Bank stabilization | ÷ | |
| | ERTY/INFRASTRUCT | | Yes (Descri | he). | | |
| | | | | | | |
| EXISTING RIPARIA | AN WIDTH: | | ☐ 25 - 50 ft | □ 50-75ft 🗔 75- | 100ft | ft |
| EROSION | Active downcutting; tall bar of the stream eroding at a t | | Pat downcutting evic | | Grade and width stat | ole; isolated areas of bank |
| SEVERITY(circle#) | contributing significant amo | ount of sediment to | widening, banks acti moderate rate; no th | | failure/erosion; likely | caused by a pipe outfall, local |
| Channelized= 1 | stream; obvious threat to p infrastructure. | roperty or | infrastructure | | scour, impaired npar | ian vegetation or adjacent use. |
| | 5 | | 4 3 | | 2 Difficult popper Mi | 1 Ist cross wetland, steep slope or |
| ACCESS: | Good access: Open area ownership, sufficient room | to stockpile | | ed or developed area Access requires tree | other sensitive areas | to access stream. Minimal |
| | materials, easy stream cha heavy equipment using exi | | removal or impact to | landscaped areas. | | able and/or located a great n section. Specialized heavy |
| | trails. | | | Il or distant from stream. | equipment required. | 1 |
| NOTES/CROSS SEC | L | | + į. | | 2 | |
| NULES/CRUSS SEA | TION SKETCA. | | | | | |
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| | | | | | REPORTED TO AT | J THORITIES 🗌 YES 🛄 NO |
| 1 | | | | | LUI ONTED TO AC | |

10724 LPP - address of buildingsevere Bank Erosion ER

| WATERSHED/SUBS | HED: Sumoine | WKA | | DATE: 2/12 | <u>/OB</u> Asses | SSED BY: SH/RS |
|------------------------------|--|--|--|----------------------------|---|--|
| SURVEY REACH: | SR 01 | | AM/PM | PHOTO ID (CAME | RA-PIC#): | /# |
| SITE ID: (Condition-) | *) START LAT | <u> </u> | 'LONG° | <u>tt</u> | MK | GPS: (Unit ID) |
| ER- <u>4</u> | | | | | MK | |
| | | | | | | |
| PROCESS: | Currently unknown | LOCATION: | Meander bend | RT Both (lot | oking downstream] Steep slope/val | n) - CWB CWA Ney wall 🗌 Other: |
| Widening | Bank failure | DIMENSIONS | - | and/an DT | ft Pott | om width ft |
| Headcutting | Bank scour | Bank Ht | | t and/or RT t and/or RT | | widthft |
| Aggrading | Slope failure | | | | | ted Widthft |
| Sed. deposition | Channelized | | -1. | ° and/or RT | | ······································ |
| LAND OWNERSHIP | Private 🗌 Publi | c 🗌 Unknown | LAND COVER | : Forest Field | eld/Ag 🗹 Deve | eloped: |
| POTENTIAL RESTO | DRATION CANDIDATI | E: 🗹 Grade | - | Bank stabilization | | |
| THREAT TO PROP | erty/Infrastruct | | Yes (Descri | • | | |
| EXISTING RIPARLA | N WIDTH: | <u> </u> | 🗌 25 - 50 ft | 50-75ft 15- | 100ft 🔲 >10 | Oft |
| EROSION SEVERITY(circle#) | Active downcutting; tall bar of the stream eroding at a contributing significant amo stream; obvious threat to p infrastructure. | ast rate; erosion ount of sediment to | Pat downcutting evid widening, banks acti moderate rate; no th infrastructure | vely eroding at a | failure/erosion; likel | able; isolated areas of bank y caused by a pipe outfall, local irian vegetation or adjacent use. |
| Channelized= 1 | 5 | | 4 3 | | 2 | 1 |
| ACCESS: | Good access: Open area ownership, sufficient room materials, easy stream cha heavy equipment using exi trails. | to stockpile innel access for | adjacent to stream. / removal or impact to | | other sensitive area stockpile areas ava | ust cross wetland, steep slope or is to access stream. Minimal ilable and/or located a great m section. Specialized heavy |
| | 5 | | 4 3 | | 2 | 1 |
| NOTES/CROSS SEC | ction Sketch: NOT Stre | am, from | n eurbeit | t RT Ban | k from p | arking lot |
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| | | | | | | |
| | | | | | REPORTED TO A | uthorities 🗌 Yes 🗌 No |

t, M

| Severe | Bank | Erosion |
|--------|------|---------|
| 000010 | | |

| WATERSHED/SUBS | HED: Sympho | M | | DATE: 2/ 12 | <u>_/_08</u> Ass | ESSED BY: SH/BS |
|--|---|---|--|---|--|---|
| SURVEY REACH: | | TIME: | _:AM/PM | PHOTO ID (CAM | ERA-PIC #): | ····· |
| SITE ID: (Condition- | #) START LAT | <u> </u> | | · · · · · · · · · · · · · · · · · · · | | GPS: (Unit ID) |
| ER | END LAT | <u> </u> | '' LONG° | <u> </u> | LMK | |
| PROCESS: | Currently unknown Bed scour Bank failure Bank scour Slope failure | LOCATION DIMENSIC Length (if) Bank Ht | N: D Meander bend DNS: 20 GPS) LT <u>40</u> LT <u>5</u> 6 | RT Both (/a Straight section / ft and/or RT ft and/or RT _° and/or RT | ft Bo | m) valley wall [] Other: ttom width <u>55</u> ft p width <u>15</u> ft etted Widthft |
| Sed. deposition | Channelized | | | | | |
| LAND OWNERSHI | ?:□Private ☑ Publi | c 🗌 Unkno | wn LAND COVE | R: [Y Forest] F | ieid/Ag [] De | eveloped: |
| 🗌 No | ORATION CANDIDAT ERTY/INFRASTRUCT AN WIDTH: | URE: 🗌 No | Yes (Desc | Bank stabilization | | 00ft |
| EROSION SEVERITY(circle#) Channelized= 1 | Active downcutting; tall bar of the stream eroding at a contributing significant am stream; obvious threat to p infrastructure. | fast rate; erosior ount of sediment | to widening, banks ac moderate rate; no infrastructure | vident, active stream stively eroding at a threat to property or 3 | failure/erosion; lik | stable; isolated areas of bank lefy caused by a pipe outfall, local parian vegetation or adjacent use. 1 |
| ACCESS: | Good access: Open area ownership, sufficient room materials, easy stream cha heavy equipment using ex trails. | to stockpile annel access for | Fair access: Fore adjacent to stream removal or impact | sted or developed area . Access requires tree to landscaped areas. all or distant from stream. | other sensitive an stockpile areas av | Must cross wetland, steep slope or eas to access stream. Minimal vailable and/or located a great eam section. Specialized heavy ed. |
| NOTES/CROSS SE | CTION SKETCH- | <u></u> | 4 | | <u></u> | |
| | | | | | | |
| | | | | | Reported to | AUTHORITIES 🗌 YES 🗌 NO |

| Severe | Bank | Erosion |
|--------|------|---------|
| 0010.0 | | |

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| WATERSHED/SUBS | HED: Sympho | WM | | DATE: <u>2/12</u> | <u>/ 08</u> Asse | SSED BY: SW/BS |
|--|--|--|--|---|--|--|
| SURVEY REACH: | 0 1 | FIME::_ | AM/PM | Рното ID (Сами | ERA-PIC #): | /# |
| SITE ID: (Condition- | ⁽⁴⁾ START LAT | 0 1 11 | LONG° | <u> </u> | | GPS: (Unit ID) |
| ER | END LAT_ | <u> </u> | LONG° | tt | _MK | |
| PROCESS: | Currently unknown Bed scour Bank failure Bank scour Slope failure Channelized | LOCATION: [DIMENSIONS: Length (if no G Bank Ht Bank Angle |] Meander bend : : <i>PS</i>) LT <u>400</u> f LT <u>4-5</u> f LT | RT Both (lo Straight section t and/or RT and/or RT " and/or RT " and/or RT " Straight section " | ft Bot 5ft Top ° Wet | |
| | | | ······ | | | |
| POTENTIAL RESTO | DRATION CANDIDATI | E: 🗌 Grade | | Bank stabilization | | |
| THREAT TO PROP | ERTY/INFRASTRUCT | | Yes (Descri | be): | | |
| EXISTING RIPARIA | AN WIDTH: | | 25 - 50 ft | ∑ 50-75ft □ 75- | 100ft 🗌 >10 | 0ft |
| EROSION SEVERITY(circle#) Channelized= 1 | Active downcutting; tall bar of the stream eroding at a contributing significant amo stream; obvious threat to p infrastructure. | ast rate; erosion ount of sediment to | Pat downcutting evid widening, banks acti moderate rate; no th infrastructure | ively eroding at a | failure/erosion; like | able; isolated areas of bank ly caused by a pipe outfall, local arian vegetation or adjacent use. |
| | 5 | | 4 3 | transferd | 2 | 1 |
| ACCESS: | Good access: Open area ownership, sufficient room materials, easy stream cha heavy equipment using exi trails. 5 | to stockpile nnel access for | adjacent to stream. removal or impact to Stockpile areas sma | ed or developed area Access requires tree b landscaped areas. ill-or distant from stream. | other sensitive are stockpile areas ava | Aust cross wetland, steep slope or as to access stream. Minimal ailable and/or located a great am section. Specialized heavy d. 1 |
| NOTES/CROSS SEC | CTION SKETCH: | | | | | |
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| | | | | | Reported to A | authorities 🗌 Yes 🗌 No |

| | | | | Se | evere B | ank Erosion ER |
|------------------------------|---|--|--|--|--|---|
| WATERSHED/SUBS | HED: Symphi | 7AAL 1 | | DATE: 2. / 12 | ./68 | ASSESSED BY: SM/AS |
| SURVEY REACH: | SR-2 | Тіме::_ | AM/PM | РНОТО ІД (САМІ | | the second second |
| SITE ID: (Condition- | | | | · · · · · · · · · · · · · · · · · · · | LMK | |
| ER- 7 | END LAT | | LONG ° | | LMK | |
| | | | | | | |
| Downcutting | Currently unknown | | Meander bend | RT Both (<i>lc</i>) Straight section | | wnstream) slope/valley wall 🗌 Other: |
| Widening | Bank failure | | | t and/or RT | ft | Bottom width <u> </u> ft |
| Headcutting | Bank scour | Bank Ht | LT I() f | t and/or RT | ft | Top width 20 ft |
| Aggrading | Slope failure | | | ° and/or RT | 0 | Wetted Widthft |
| Sed. deposition | Channelized | | | | | ······································ |
| LAND OWNERSHIP | Private 🗹 Publi | c 🗌 Unknown | LAND COVER | : 🗹 Forest 🗌 Fi | ield/Ag | |
| No No | DRATION CANDIDATI | Other | : | Bank stabilization | - | |
| THREAT TO PROP | erty/Infrastruct | URE: 🗌 No | Yes (Descri | be): | | |
| EXISTING RIPARLA | ······ | | □ 25 - 50 ft | ☑ 50-75ft | ·100ft | □>100ft |
| EROSION SEVERITY(circle#) | Active downcutting; tall bar of the stream eroding at a t contributing significant and stream; obvious threat to p | ast rate; erosion ount of sediment to | Pat downcutting evic widening, banks acti moderate rate; no th infrastructure | vely eroding at a | failure/en | d width stable; isolated areas of bank osion; likely caused by a pipe outfall, local paired riparian vegetation or adjacent use. |
| Channelized= 1 | infrastructure. | | 4 3 | | 2 | 1 |
| ACCESS: | Good access: Open area ownership, sufficient room materials, easy stream cha heavy equipment using exi trails. | in public to stockpile nnel access for | Fair access: Forest adjacent to stream. | ed or developed area Access requires tree I andscaped areas. Il or distant from stream. | Difficult other sen stockpile distance equipme | access. Must cross wetland, steep slope or isitive areas to access stream. Minimal areas available and/or located a great from stream section. Specialized heavy nt required. |
| | 5 | 2 | 4 3 | } | 2 | <u> </u> |
| NOTES/CROSS SEC | tion sketch: the avgled | oulvert | amed at | bank | | |
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| | | | | | Report | TED TO AUTHORITIES 🗌 YES 🗌 NO |

| Severe | Bank | Erosion |
|--------|------------|---------|
| 00000 | La caritic | |

| WATERSHED/SUBS | hed: <u>Sympho</u> | Yhu | | DATE: <u>2/ 12</u> | / GP Asses | SSED BY: SN/BS |
|-----------------------|---|-------------------|---|--|------------------------|--|
| SURVEY REACH: | 0 1 | THME::_ | AM/PM | РНОТО ID (CAME | RA-PIC #): | /# |
| SITE ID: (Condition-1 |) START LAT | <u> </u> | LONG° | | <u>.mk A</u> | GPS: (Unit ID) |
| <u>er-</u> 8 | END LAT_ | ····· | LONG° | <u>'</u> '' I | .MK <u>5</u> | |
| | | Durr on Cor | | RT Both (lo | oking downstrage | •} |
| | Currently unknown | LOCATION: | Meander bend | \square Straight section [| Steep slope/va | lley wall 🗌 Other: |
| Downcutting | Bed scour | DIMENSIONS: | Ň | | | |
| Widening | Bank scour | | | t and/or RT | ft Bott | om widthft |
| | Slope failure | Bank Ht | | t and/or RT | ft Top | widthft |
| Sed. deposition | Channelized | Bank Angle | $LT \gamma O$ | ° and/or RT | Wet | ted Widthft |
| | Private 🙀 Publi | c Unknown | LAND COVER | : 🗌 Forest 🗌 Fi | eld/Ag 🗌 Dev | eloped: |
| | | | | | | · · · · · · · · · · · · · · · · · · · |
| POTENTIAL RESTO | DRATION CANDIDATI | E: Grade | control | Bank stabilization | | |
| No | | Other: | | · | | |
| THREAT TO PROP | ERTY/INFRASTRUCT | URE: 🗌 No | Yes (Descri | be): | | |
| EXISTING RIPARIA | an Width: | [] ≤25 ft | □ 25 - 50 ft | □ 50-75ft 175- | 100ft 🗌 >10 | Oft |
| EROSION | Active downcutting; tall bar | | Pat downcutting evic | | Grade and width st | able; isolated areas of bank |
| SEVERITY(circle#) | of the stream eroding at a contributing significant am | | widening, banks act moderate rate; no th | | failure/erosion; likel | y caused by a pipe outfall, local |
| or r: | stream; obvious threat to p | roperty or | infrastructure | icat to property of | scour, impaired ripa | rian vegetation or adjacent use. |
| Channelized= 1 | 5 | | 4 3 | | 2 | 1 |
| ACCESS: | Good access: Open area ownership, sufficient room | | Fair access: Forest | ed or developed area | other sensitive area | lust cross wetland, steep slope or as to access stream. Minimal |
| | materials, easy stream cha | annel access for | removal or impact to | Access requires tree andscaped areas. | stockpile areas ava | ilable and/or located a great m section. Specialized heavy |
| | heavy equipment using ex trails. | | | all or distant from stream. | equipment required | l |
| | 5 | | 4 1 | 3 | 2 | 1 |
| NOTES/CROSS SEC | CTION SKETCH: | | | | | |
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| | | | | | Preopres to 4 | UTHORITIES 🗌 YES 🗍 NO |
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Severe Bank Erosion

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|------------------------------|--|--|---|---|---------------------|---|
| WATERSHED/SUBS | HED: Symph | | | DATE: 2112 | | SSED BY: SN/BS |
| SURVEY REACH: | 0 1 | TIME::_ | AM/PM | PHOTO ID (CAME | | /# |
| SITE ID: (Condition- | | <u> </u> | LONG | ' <u>'' I</u> | .MK | GPS: (Unit ID) |
| ER-9(11) | END LAT_ | •••••••••••••••••••••••••••••••••••••• | LONG | <u>'</u> ''' I | .MK | |
| | | DANK OF CO | | RT Doth (lo | okina downstream | 1) |
| | Currently unknown | LOCATION: | Meander bend | Straight section [| Steep slope/va | lley wall 🔲 Other: |
| Downcutting | Bed scour Bank failure | DIMENSIONS | | - | | |
| Headcutting | Bank scour | Length (if no G | <i>FPS</i>) LT1 | ft and/or RT | ft Bott | om widthft |
| | Slope failure | Bank Ht | LT1 | ft and/or RT <u>47</u> | ft Top | widthft |
| Sed. deposition | | Bank Angle | LT | ° and/or RT <u>WM</u> | Ment Wet | ted Widthft |
| | Private 🗌 Publi | c 🗌 Unknown | LAND COVER | k: 🗌 Forest 🛛 Fi | eld/Ag 🗌 Dev | eloped: |
| | <u> </u> | | | <i></i> | | |
| POTENTIAL RESTO | DRATION CANDIDAT | | | Bank stabilization | | |
| □ No | | Other | | http:// | · A | |
| THREAT TO PROP | ERTY/INFRASTRUCT | | 1 | ĺ | Q. | |
| EXISTING RIPARIA | N WIDTH: | [ֻֻלַ] ≤25 ft | □ 25 - 50 ft | □ 50-75ft □ 75- | 100ft □>10 | Oft |
| EROSION SEVERITY(circle#) | Active downcutting; tall ban of the stream eroding at a | fast rate; erosion | Pat downcutting evi widening, banks act | dent, active stream ively eroding at a | | able; isolated areas of bank y caused by a pipe outfall, local |
| SETERIT (Country) | contributing significant am stream; obvious threat to p | | moderate rate; no th infrastructure | | | arian vegetation or adjacent use. |
| Channelized= 1 | infrastructure. 5 | | 4 | | 2 | 1 |
| ACCESS: | Good access: Open area | | | ted or developed area | Difficult access. M | fust cross wetland, steep slope or as to access strearn. Minimal |
| | ownership, sufficient room materials, easy stream cha | annel access for | adjacent to stream. removal or impact to | Access requires tree o landscaped areas. | stockpile areas ava | ilable and/or located a great |
| | heavy equipment using ex trails. | isting roads or | | all or distant from stream. | equipment required | m section. Specialized heavy I. |
| | 5 | | 4 | 3 | 2 | 1 |
| NOTES/CROSS SEC | CTION SKETCH: | | | | | |
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| | | | | | REPORTED TO A | AUTHORITIES 🗍 YES 🗌 NO |
| | | | | | | |

| Severe | Bank | Erosion |
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| 000000 | Dann | Lui O Orori |

×.

| WATERSHED/SUBS | HED: Samah | en la | | DATE: <u>2112</u> | <u>801</u> | Assessed by: <u>SN/BS</u> |
|----------------------|--|---|---|--|-----------------------------|---|
| SURVEY REACH: | | TIME:: | AM/PM | Рното ID (Сам | ERA-PIC #) | : /# |
| SITE ID: (Condition- | [#]) START LAT | 0 1 11 | LONG° | 1 11 | LMK | GPS: (Unit ID) |
| ER-10(12) | END LAT_ | | LONG ° | | LMK | |
| | | ····· | | · · · · · · · · · · · · · · · · · · · | | |
| PROCESS: | Currently unknown | BANK OF COL | NCERN: LT | RT Both (l | ooking down | stream) |
| Downcutting | Bed scour | | | Straight section | $[\underline{X}]$ Steep sid | ope/valley wall 🗌 Other: |
| Widening | Bank failure | DIMENSIONS | | | 27 | D |
| Headcutting | Bank scour | Length <i>(if no</i> G | <i>PS</i>) LT: | ft and/or RT | π | |
| Aggrading | Slope failure | | | ft and/or RT <u>8</u> | | Top widthft |
| Sed. deposition | Channelized | 1 | | ° and/or RT | | Wetted Widthft |
| LAND OWNERSHI | •: 🗌 Private 🗌 Publi | ic 🗌 Unknown | LAND COVER | k: 🚺 Forest 🔲 F | ield/Ag | Developed: |
| | | | | | | |
| 🗌 No | DRATION CANDIDAT | [⊅ Other: | Mare ch | Bank stabilization | | |
| THREAT TO PROP | ERTY/INFRASTRUCT | URE: 🗌 No | A Yes (Descr | ibe):∕∕∕∕∖,≀<~{\$(& | a top o | rt slope |
| EXISTING RIPARIA | N WIDTH: | <u> </u> | 25 - 50 ft | □ 50-75ft □ 75 | -100ft] | ⊠_>100ft ⁸ |
| EROSION | Active downcutting; tall bas of the stream eroding at a | | Pat downcutting evi | | Grade and | width stable; isolated areas of bank |
| SEVERITY(circle#) | contributing significant am | ount of sediment to | widening, banks act moderate rate; no ti | | failure/erosi | on; likely caused by a pipe outfall, local |
| Channelized= 1 | stream; obvious threat to p infrastructure. | property or | infrastructure | ······································ | scour, impa | ired riparian vegetation or adjacent use. |
| | 5 | | 4 3 | <u> </u> | 2 | 1 |
| ACCESS: | Good access: Open area ownership, sufficient room | in public to stockpile | | ed or developed area | | cess. Must cross wetland, steep slope o live areas to access stream. Minimal |
| | materials, easy stream cha | annel access for | removal or impact t | Access requires tree blandscaped areas. | | eas available and/or located a great on stream section. Specialized heavy |
| | heavy equipment using ex trails. | isting roads of | Stockpile areas sm | all or distant from stream. | equipment | |
| | 5 | Z | 4 | 3 /) | 2 | 1 |
| NOTES/CROSS SEC | | 1 | . () | an still | ţ | |
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| | | | | | | d to authorities 🗋 Yes 🗍 N |

| Severe Bank Erosio |
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| | HED: Dymph | emy | | DATE: 2/12 | 108 | ASSESSED BY: SH/B |
|----------------------|---|---|---|---------------------------------------|-------------------------|---|
| SURVEY REACH: | 0 / | Тіме::_ | AM/PM | PHOTO ID (CAM | ERA-PIC #) | : /# |
| SITE ID: (Condition- | *) START LAT | <u> </u> | LONG° | 1 11 | LMK | GPS: (Unit ID) |
| ER- <u> (1</u> 3) | END LAT_ | | LONG | t t! | LMK | <u>.</u> |
| | | | | | | |
| PROCESS: | Currently unknown | BANK OF COL | VCERN: X/LT | RT Both (<i>la</i> | ooking down | ustream) |
| Downcutting | Bed scour | | | Straight section | | ope/valley wall 🗌 Other: |
| Widening | Bank failure | DIMENSIONS | | | a | Dette an and 141 |
| Headcutting | Bank scour | | <i>PS</i>) LT_ <u>_</u> f | t and/or RT | π | Bottom widthf |
| Aggrading | Slope failure | Bank Ht | | | | Top widthf |
| Sed. deposition | Channelized | Bank Angle | | | | Wetted Width |
| LAND OWNERSHIP | Private 🗆 Publi | ic 🗌 Unknown | LAND COVER | Forest F | ield/Ag | Developed: Nalk |
| | | - | | | | |
| POTENTIAL RESTO | DRATION CANDIDAT | E: Grade | | ∃ (Bank stabilizatior | 1 | |
| | ERTY/INFRASTRUCT | | | be): Charles | | |
| | 0 | * | □ 25 - 50 ft | • 4 <i>2</i> 7 | <u> いろく</u> -100ft 【 | ⊴ |
| EXISTING RIPARIA | | ······································ | 25 - 50 ft | | | |
| EROSION | Active downcutting; tall ba of the stream eroding at a | nks on both sides fast rate: erosion | Pat downcutting evid | | Grade and | width stable; isolated areas of ba |
| SEVERITY(circle#) | contributing significant am | ount of sediment to | widening, banks action moderate rate; no the | | failure/eros | ion; likely caused by a pipe outfall lired riparian vegetation or adjace |
| Channelized= 1 | stream; obvious threat to p infrastructure. | soperty or | infrastructure | | Soout, impr | |
| | 5 | | 4 3 | | 2 | cess. Must cross wetland, steep |
| ACCESS: | Good access: Open area ownership, sufficient room | | Fair access: Foreste adjacent to stream. / | ed or developed area | other sensi | tive areas to access stream. Mini |
| | materials, easy stream chi heavy equipment using ex | | removal or impact to | landscaped areas. | | reas available and/or located a groom stream section. Specialized h |
| | trails. | | | Il or distant from stream. | equipment | |
| | 5 | | - 3 |)/ | 2 | |
| NOTES/CROSS SEC | CTION SKETCH: | | | | | |
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| | | | | · · · · · · · · · · · · · · · · · · · | | D TO AUTHORITIES 🗌 YES |

| Storm Water Outfalls | | | | | | |
|--|--|--|--|--|--|--|
| WATERSHED/SUBSHEI | : Suruphan | , STREAM | DATE: $\frac{2}{12}$ $\frac{12}{29}$ Assessed by: SH/BS | | | |
| SURVEY REACH ID: | | ME: 9:32-AM/PM | PHOTO ID: (Camera-Pic #) / /# 2. | | | |
| SITE ID (Condition-#): O | | | ong 76 • 52 · 31 | | | |
| | | | | | | |
| BANK: LT RT Head FLOW: None Trickle | TYPE: | MATERIAL: Concrete Metal PVC/Plastic Brick Other: | SHAPE: Single DIMENSIONS: SUBMERGED: Circular Double 24 X No Elliptical Triple Diameter: 10 Image: Partially Other: Fully | | | |
| Moderaté ' Substantial Other: | Open channel | Concrete Earthen | Parabolic Width (Top):(in) NOT APDESCABLE Other: " (Bottom):(in) | | | |
| CONDITION: None Chip/Cracked Peeling Paint Corrosion Other: | ODOR: NO Gas ⁴ Sewage Rancid/Sour Sulfide Other: | DEPOSITS/STAINS: None Oily Flow Line Paint Other: | VEGGIE DENSITY: PIPE BENTHIC GROWTH: None None Brown Orange Normal Other: Other: Other: Good Odors Other: Suds Algae Other: Other: | | | |
| 0.11121 | ITY: 🖸 Non | e Slight Cloudiness e Sewage (toilet paper astic bags) Dumpir | etc.) Petroleum (oil sheen) Other: g (bulk) Excessive Sedimentation | | | |
| POTENTIAL RESTORA | TION CANDIDATI | E 🔲 Discharge investigati | on Stream daylighting Local stream repair/outfall stabilization Other: | | | |
| <i>If yes for daylighting:</i> Length of vegetative cove | er from outfall: | ft Type of exi | sting vegetation:Slope:° | | | |
| If yes for stormwater: Is stormwater currently co □ Yes ☑ No □ Not | | Land Use d Area availa | escription: Wards, MMC Sone, alla | | | |
| SEVERITY: con (circle #) stre | npared to the amount of am; discharge appears nificant impact downstre | f discharge is significant normal flow in receiving to be having a | discharge; flow mostly clear and odorless. If the arge has a color and/or odor, the amount of arge is very small compared to the stream's base ind any impact appears to be minor / localized. | | | |
| SKETCH/NOTES: | - onitall at | start, 1 ots of t | evosion on banks, banging back + forth | | | |
| | | | Reported to authorities: \Box yes \Box no | | | |
| <u> </u> | | | KEI OKTED TO AUTHORITES TES _ M | | | |

| Storm Water Outfalls | | | | | | |
|---|---|--|--|---|--|--|
| WATERSHED/SUBSHED: SUMphony DATE: 2/12/08 ASSESSED BY: SW/BS | | | | | | |
| SURVEY REACH ID: ^{<} | | dere. | PHOTO ID: (Camera-Pic #) | /# | | |
| SITE ID (Condition-#): C | DT- <u>2</u> LA | r' '' L | ONG' LI | MK GPS: (Unit ID) | | |
| BANK: LT RT Head FLOW: None Trickle Moderate | TYPE: | MATERIAL: Concrete Metal PVC/Plastic Brick Other: | A Circular Double | IENSIONS: SUBMERGED: Ineter: Image: Constraint of the second sec | | |
| U Substantial | Dpen channel | Concrete Earthen | Parabolic Width (To | | | |
| CONDITION: None Chip/Cracked Peeling Paint Corrosion Other: | ODOR: NO Gas Sewage Rancid/Sour Sulfide Other: | DEPOSITS/STAINS: None Oily Flow Line Paint Other: | None Normal Inhibited Pool Excessive | L QUALITY: X No pool ood Odors Colors Oils ids Algae Floatables | | |
| FOR COLOR: Image: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: Image: Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: Image: Slight Cloudiness Cloudy Opaque OTHER Excess Trash (paper/plastic bags) Image: Dumping (bulk) Excessive Sedimentation CONCERNS: Image: Needs Regular Maintenance Image: Bank Erosion Other: | | | | | | |
| POTENTIAL RESTORA | TION CANDIDATE | Discharge investigati | | al stream repair/outfall stabilization | | |
| <i>If yes for daylighting:</i> Length of vegetative cov | er from outfall: | <u>ft</u> Type of exi | sting vegetation: $\frac{9/05}{2}$ | Slope:o | | |
| If yes for stormwater: Is stormwater currently c □ Yes No □ Not | controlled? investigated | Land Use de Area availat | | sid | | |
| SEVERITY: con (circle #) str | avy discharge with a dist ong smell. The amount o mpared to the amount of eam; discharge appears nificant impact downstre: 5 | f discharge is significant normal flow in receiving to be having a | discharge; flow mostly clear and odorless. I arge has a color and/or odor, the amount of arge is very small compared to the stream's I nd any impact appears to be minor / localize | discharge; staining; or appearance | | |
| SKETCH/NOTES: | ر | | | <u> </u> | | |
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| | ······································ | | REPORT | TED TO AUTHORITIES: YES NO | | |

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| Storm Water Outfalls | | | | | | |
|---|---|--|--|--|--|--|
| WATERSHED/SUBSHED | · Sympho | MU | DATE: 2/12/08 | Assessed by: SH/BS | | |
| SURVEY REACH ID: | | ME: | PHOTO ID: (Camera-Pic #) | /# | | |
| SITE ID (Condition-#): OT LAT' ''' LONG' ''' LMK GPS: (Unit ID) | | | | | | |
| BANK: LT RT Head FLOW: | TYPE: | MATERIAL: Concrete Meta PVC/Plastic Brick | Circular 🔲 Double | MENSIONS: SUBMERGED: Image: Strain of the straight o | | |
| None Trickle | Open , channel | Concrete Earther | Trapezoid Depth: | (in) Top): (in) NOT APPENCABLE | | |
| CONDITION: None Chip/Cracked Peeling Paint Corrosion Other: | ODOR: NO Gas Sewage Rancid/Sour Sulfide Other: | DEPOSITS/STAINS: None Oily Flow Line Paint Other: | None H Normal C Inhibited POO Excessive C Other: S | E BENTHIC GROWTH: None Brown Orange Green Other: DL QUALITY: No pool Good Odors Colors Oils Suds Algae Floatables Other: | | |
| FOR COLOR: Clear Brown Grey Yellow Green Orange Red Other: FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation CONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization | | | | | | |
| If yes for stormwater: | Ino Istorm water retrofit Other: If yes for daylighting: If yes for daylighting: Slope: Length of vegetative cover from outfall: ft Type of existing vegetation: If yes for stormwater: Is stormwater currently controlled? Land Use description: | | | | | |
| SEVERITY: (circle #) stro | pared to the amount of am; discharge appears ificant impact downstre | f discharge is significant normal flow in receiving to be having a | Il discharge; flow mostly clear and odorless harge has a color and/or odor, the amount of harge is very small compared to the stream's and any impact appears to be minor / localiz | f discharge; staining; or appearance of causing any erosion problems. | | |
| SKETCH/NOTES: | 5 | A ARNA IN | which is L' tall - \$0 | $\frac{2}{1}$ | | |
| | w nound | | | RTED TO AUTHORITIES: 2 YES 2 NO | | |
| | | | KEFON | | | |

| | | | | : Stor | rm Water Outfa | |
|---|---|---|--|--|--|--|
| | | | | 0.01 | nn veator oure | |
| WATERSHED/SUBSHED | WATERSHED/SUBSHED: Sumsham Stream | | | | ASSESSED B | v: SN/BS |
| SURVEY REACH ID: | t 1 (i) " | ME::AM/P | м Рното | D ID: (Camera-Pi | ic #) /# | |
| SITE ID (Condition-#): O | Г- <u></u> ЦА | tTTTTTTT | '' LONG | <u> </u> | '' LMK | GPS: (Unit ID) |
| BANK: LT RT Head FLOW: None Trickle | TYPE: | MATERIAL: | | cular 🔲 Double ptical 🔲 Triple | DIMENSIONS: Diameter: 24 | SUBMERGED: |
| Moderate Substantial Other: | Open / channel | Concrete E | Earthen Tra: | abolic W | Vidth (Top):(i | in) n) NOT APDECABLE in) |
| CONDITION: None Chip/Cracked Peeling Paint Corrosion Other: | ODOR: No Gas Sewage Rancid/Sour Sulfide Other: | DEPOSITS/STAIN | vs: VEGG X-Nor I Nor I Inh I Exc I Oth | rmal ibited sessive | | rs □Colors □Oils |
| | TY: 🗌 Non | e Slight Cloudin e Sewage (toile astic bags) I | ness 🗌 Cloud | ly Dpaque Petroleum | Orange ☐ Red [(oil sheen) [Sedimentation JAMM [JJUII] | Other: |
| POTENTIAL RESTORAT | TION CANDIDATI | E X Discharge inv | | | Local stream re | pair/outfall stabilization |
| If yes for daylighting: Length of vegetative cove If yes for stormwater: Is-stormwater currently co Yes No No Not | ntrolled? | Lanc | e of existing vege I Use description: available: | | Slc | ope:° |
| SEVERITY: strong (circle #) strong | | of discharge is significant i normal flow in receiving to be having a | discharge has a c discharge is very | low mostly clear and o olor and/or odor, the a small compared to the ict appears to be minor 3 | mount of discha stream's base of cau | I does not have dry weather arge; staining; or appearance ising any erosion problems. 1 |
| SKETCH/NOTES: H | <u>`</u> | in other | 4 Ve.' | | L a | 1 |
| | | | | | | |
| | | | | | R eported to Aute | IORITIES: 🗌 YES 🗌 NO |

| | | 4.* | | | | | | |
|------------------------------------|---|-----------------------------|---------------------------------------|--|---|--|---|--|
| | | | | S | torm Water (| Dutfalls | OT | |
| WATERSHED/SUBSH | ED: Symphi | Mu | DAT | re: <u>2 / 17 /(</u> | Assess | SED BY: SI | N/BS | |
| SURVEY REACH ID: | | ME::AM/PM | Рно | O TO ID: (Camera | -Pic #) | /# | p | |
| SITE ID (Condition-#): | от- <u>S</u> La | .T1 | " LONG_ | <u> </u> | _" LMK_ | GF | PS: (Unit ID) | |
| | | . | Crit | | e DIMENSI | ON6. | SUBMERGED: | |
| BANK: MLT RT Head | TYPE: | MATERIAL: | SHA Metal 🗹 (| APE: 🗌 Single Circular 🔲 Doul | | 7 7 | No No | |
| FLOW: | ─ | PVC/Plastic | | Elliptical Triple Diameter: | | | Partially | |
| None Trickl | e | Other: | | Other: | | ····· | Fully | |
| | D Open | 🗌 Concrete 🔲 Ea | rihen | Frapezoid Parabolic | Depth: | <u>(in)</u> | NOT APPENCABLE | |
| Other: | channel | Other: | | Other: | Width (Top): " (Bottom): | (in) (in) | | |
| CONDITION: Mone Chip/Cracked | ODOR: ☑ NO □Gas □ Scwage | DEPOSITS/STAINS | ⊡/ĭ | GGIE DENSITY: None Normal | | THIC GROW | TH: None | |
| Peeling Paint | Rancid/Sour | Flow Line | | nhibited | POOL QUA | POOL QUALITY: No pool | | |
| Corrosion | U Sulfide | Other: | | Excessive Other: | | Good Odors Olors Oils Suds Algae Floatables Other: | | |
| | | | | | | | | |
| FOR COL | DR: | ır 🔄 Brown 🗔 G | rev TY | ellow Green | 🗌 Orange 🔲 | Red 🗌 Othe | r; | |
| FLOWING TURI | BIDITY: 🔽 Non | e 🔄 Slight Cloudine | | oudy 🗌 Opaqu | e | ana ang in | | |
| | ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation | | | | | | | |
| | eeds Regular Mainte | | ank Erosion | Other: | | ** | | |
| | | | · · · · · · · · · · · · · · · · · · · | | | | | |
| POTENTIAL RESTO | RATION CANDIDAT | E [] Discharge inves | | Stream daylighting Other: | g 📋 Local stre | am repair/out | fall stabilization | |
| If yes for daylighting | <u>;</u> ; | | | | | | | |
| Length of vegetative c | over from outfall: | ft Type | of existing v | egetation: | | Slope: | o | |
| If yes for stormwate | | | | | | | | |
| Is stormwater currently | y controlled? | | - | on: | | | | |
| | | | available: | | | | | |
| SEVEDITV. | Heavy discharge with a dis strong smell. The amount compared to the amount o | of discharge is significant | discharge has | ge; flow mostly clear a a color and/or odor, th | ne amount of | | t have dry weather hing; or appearance | |
| (circle #) | stream; discharge appears | s to be having a | discharge is v flow and any i | ery small compared to mpact appears to be n | the stream's base ninor / localized. | | erosion problems. | |
| | significant impact downstr 5 | | 4 | 3 | | 2 | 1 | |
| SKETCH/NOTES: | | | | · · · · · · · · · · · · · · · · · · · | | | | |
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| | | | | | | | | |
| | | · | | , | REPORTED TO | O AUTHORITIE | S: YES NO | |

| OT NATERSHEDSLESSING: Supplicity: SUP NATERSHEDSLESSING: Supplicity: SUP THE SUP | \ \ | | | | | | |
|---|--|--|---|---|--|------------------------------------|--|
| SLRVEY REACH ID: TMR: AM/PM PHOTO ID: (Canenu-Fue ID) //4 STE ID (Conductor-Fue ID) IAT | | | | Sto | rm Water Outfalls | ΟΤ | |
| SLRVEY REACH ID: TMR: AM/PM PHOTO ID: (Camera-Fie fb) /# STE ID (Condution-F): OT- God LAT "LONG " IMK GPS: (Unit ID) BKA: TYPE: MATERIAL: Concrete Metal Circular Duble Dimensions: SUBMERGED: Motor Trickle Concrete Metal Circular Duble No Partially Moderatic Open Concrete Earthen Trapcoid Depty: (in) No Tritule No Other: Ohter: Other: Other: Other: Interstore Interstore Interstore Interstore No Interstore Interst | WATERSHED/SUBSHED: Sumphony DATE: 2/12/08 ASSESSED BY: SN/RS | | | | | | |
| SITE DC community C1 01 Difference Difference Backin: Type: Sight P: Sight P: Sight P: Difference Backin: Chorecree Mail P: Sight P: Difference Double No Prov: Pixel Other: Double Difference Difference Difference Partially Moderate Other: Other: Other: Double: Double: None Provide Difference Partially Other: Obox: SNone Difference Width (Top): Im None Provide Difference Point Finon None Difference Difference Point Difference Differenc | SURVEY REACH ID: | <u> </u> | G/ | PHOTO ID: (Camera-P | | 8 | |
| BARE DATE Metal Official probability DT_TCT Head Creater Double Diameter No Moderale Direct Other: Double Diameter Diameter <tddiameter< td=""> Diameter <tddiamete< td=""><td>SITE ID (Condition-#): O</td><td>T- 6 (10) LA</td><td>.T''T'T</td><td>LONG'</td><td>" LMK G</td><td>PS: (Unit ID)</td></tddiamete<></tddiameter<> | SITE ID (Condition-#): O | T- 6 (10) LA | .T''T'T | LONG' | " LMK G | PS: (Unit ID) | |
| BARE DATE Metal Official probability DT_TCT Head Creater Double Diameter No Moderale Direct Other: Double Diameter Diameter <tddiameter< td=""> Diameter <tddiamete< td=""><td></td><td>· · · · · · · · · · · · · · · · · · ·</td><td></td><td></td><td>Durman</td><td>SUBMEDCED:</td></tddiamete<></tddiameter<> | | · · · · · · · · · · · · · · · · · · · | | | Durman | SUBMEDCED: | |
| Substantial Open Concrete Earthen Inpubblic Depting Inpubblic Inpublic Inpublic <td>LT RT Head</td> <td>Closed</td> <td>Concrete Meta</td> <td>l 🗹 Circular 🗌 Double C 🗌 Elliptical 🔲 Triple</td> <td></td> <td>☐ No ☐ Partially</td> | LT RT Head | Closed | Concrete Meta | l 🗹 Circular 🗌 Double C 🗌 Elliptical 🔲 Triple | | ☐ No ☐ Partially | |
| None Gas Oding Oding Green Gr | Substantial | | — — | n 🗌 Parabolic | Width (Top): <u>(in)</u> " (Bottom): <u>(in)</u> | \geq | |
| FLOWING TURBIDITY: None Slight Cloudiness Cloudy Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Diccess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation ONCERNS: Needs Regular Maintenance Bank Erosion Other: POTENTIAL RESTORATION CANDIDATE Discharge investigation Stream daylighting Local stream repair/outfall stabilization In o Storm water retrofit Other: Slope: ° If yes for daylighting: Land Use description: Slope: ° Is stormwater: Is stormwater: Storm state currently controlled? Land Use description: Outfall does not have dy weather discharge is significant on it neceving stream, discharge appears to be having a significant may strang appears to be having a significant may a significant image do the amount of discharge is significant may impect appears to be minor / localized. Outfall does not have dy weather discharge appears to be having a significant image do the amount of moment low in receving stream, discharge appears to be having a significant image do papears to | None Chip/Cracked Peeling Paint Corrosion | Gas Sewage Rancid/Sour Sulfide | None Oily ☐ Flow Line ☐ Paint | None Normal Inhibited Excessive | Brown Orange Other: POOL QUALITY: Good Odors Suds Algae | ☐ Green No pool Colors ☐Oils | |
| □ no □ Storm water retrofit □ Other: If yes for daylighting: | FLOWING TURBID ONLY FLOAT/ OTHER Exc | FLOWING TURBIDITY: None Slight Cloudiness Opaque ONLY FLOATABLES: None Sewage (toilet paper, etc.) Petroleum (oil sheen) Other: OTHER Excess Trash (paper/plastic bags) Dumping (bulk) Excessive Sedimentation | | | | | |
| □ no □ Storm water retrofit □ Other: If yes for daylighting: | | | | | | · · · · | |
| If yes for daylighting: | | TION CANDIDAT | | | Local stream repair/ou | tfall stabilization | |
| Length of vegetative cover from outfall: ft Type of existing vegetation: Slope: o If yes for stormwater: Is stormwater currently controlled? Land Use description: | | | Storm water retrofit | Other: | | | |
| Is stormwater currently controlled? Land Use description: Yes No Not investigated 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 discharge appears to be having a significant impact downstream. 5 4 3 2 1 SKETCH/NOTES: Spillway to Channel broken the emotion of the stream's date of the stream's da | | er from outfall: | ft Type of e | kisting vegetation: | Slope: | 0 | |
| SEVERITY: 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, now mostly clear and obtices in 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 Skettch/Notes: Spillway 10 Channel Worken, t. 200 upg Wattened to the stream's base flow and any impact appears to be minor / localized. Skettch/Notes: | Is stormwater currently c | | | | | | |
| | SEVERITY: cor (circle #) stre | ong smell. The amount npared to the amount o eam; discharge appears | of discharge is significant f normal flow in receiving s to be having a | harge has a color and/or odor, the a harge is very small compared to the | amount of discharge; sta | ining; or appearance | |
| | Support/Norma- | 5 | 4 | | 2 ender orth | 1 | |
| | SKETCH/NOTES: | spillway 10 | i Vunnel D'OK | m. t to why | ur van vol he het. | | |
| | | | • | • | | | |
| | | | | | REPORTED TO AUTHORITI | ES: YES NO | |

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| | | <i></i> | | | |
|---|---|-----------------------------------|---|---|--|
| | | | Stor | m Water Outfall | , OT |
| WATERSHED/SUBSHE | D: Sumphon | nu | DATE: 21 12/08 | Assessed by: | SHBS |
| SURVEY REACH ID: | | ME: | PHOTO ID: (Camera-Pi | ic #) /# | |
| SITE ID (Condition-#): | DT-12(20) LA | T' | 'LONG'' | ' LMK | GPS: (Unit ID) |
| | | | | DIMENSIONS: | Submerged: |
| BANK: / | Туре: | MATERIAL: | SHAPE: Single | 2 A | No No |
| FLOW: | Closed | PVC/Plastic HBri | ick 🖞 Elliptical 🗌 Triple | Diameter: DU(i | |
| 🔲 None 🕅 Trickle | , bibe | Other: | Other: | | Fully |
| Moderate Substantial | Dpen | Concrete 🗌 Earth | | Depth: (in) | |
| Other: | channel | Other: | | Vidth (Top): <u>(in)</u> " (Bottom): <u>(in)</u> | |
| CONDITION: | | DEPOSITS/STAINS: | VEGGIE DENSITY: | PIPE BENTHIC G | |
| None | ODOR: NO | None | None | Brown Ora | nge 🗌 Green |
| Chip/Cracked | | Oily | Normal Inhibited | Other: | <u>}</u> |
| Peeling Paint Corrosion | Rancid/Sour | Paint Paint | | POOL QUALITY: Good Odors | \ - |
| Other: | Other: | Other: | Other: | Suds Algae | |
| | | - | | Other: | |
| FOR COLO | R: | r 🔲 Brown 🗌 Grey | y Yellow Green |] Orange [] Red [| Other: |
| 1 1.111 (1.112) | DITY: Non | | | (oil sheen) | Other: |
| | rables: 🛛 🖾 Non cess Trash (paper/pl | | <u>r </u> | Sedimentation | Other. |
| | eds Regular Mainter | e 7 (- 7 | k Erosion Other: | | |
| | | | | × | |
| POTENTIAL RESTOR | ATION CANDIDAT | | gation Stream daylighting | Local stream repa | ir/outfall stabilization |
| If yes for daylighting. | • | Storm water retrof | it Other: | | |
| Length of vegetative co | | ft Type of | existing vegetation: | Slope | e:° |
| | | | | | |
| If yes for stormwater. Is stormwater currently | | Land Us | se description: | | |
| | | Area ava | | | |
| O C IIIIIII | leavy discharge with a dis | ef die ekonen in nigerifieent 👘 🔍 | Small discharge; flow mostly clear and | | oes not have dry weather |
| SEVERILY: 0 | ompared to the amount o tream; discharge appears | f normal flow in receiving | lischarge has a color and/or odor, the a lischarge is very small compared to the | e stream's base | e; staining; or appearance of any erosion problems. |
| | ignificant impact downstre | | low and any impact appears to be mind | or / localized. | |
| Current (Norma- | 5 20-55 - 5 | 44 2. a.S. kana (| 3 | 2 | <u>l</u> |
| SKETCH/NOTES: | WOS DING (| ann sa | w whole ; | eddur - | 1 |
| | | | | | |
| | | | | | |
| | | | | · · · | |
| | | | | | · · · · |
| | | | | _ | |
| | | | · · · | KEPORTED TO AUTHO | RITIES: YES NO |

| | | | | | Storm | Water Outfa | |
|--|---|--|----------------------------|--|--------------------------------------|---|--|
| WATERSHED/SUBSH | ED: Stars | shanu | | DATE: 2/] | 7. /08 | ASSESSED B | Y: SH/BS |
| SURVEY REACH ID: | | | M/PM | Рното ID: (Са | | | - 1 |
| | | | | · · · · · | | | GPS: (Unit ID) |
| SITE ID (Condition-#): | $OT-\underline{O}(\mathcal{L})$ | LAT''_ | " Lo | ONG° | 1 <u>11</u> | LMK | Grs: (Unit ID) |
| BANK: LT RT Head FLOW: None Trickl | Closed | MATERIAL: Concrete PVC/Plastic | Metal c □Brick | | Double | DIMENSIONS: Diameter: | SUBMERGED: |
| Moderate Substantial Other: | Dpen channel | Concrete [| Earthen | Trapezoid Parabolic Other: | | th (Top):(i | in) NOT APPESCABLE in) |
| CONDITION: | ODOR: Gas Sewage Rancid/S | None | AINS: | VEGGIE DENS | | Brown C C | GROWTH: None Drange Green |
| Corrosion | Sulfide | Image: Source of the second se | | Excessive Other: | | POOL QUALITY Good Odo Suds Alg Other: | • |
| FLOWING TURI ONLY FLOA OTHER E | FLOWING TURBIDITY: Image: None Slight Cloudiness Image: Cloudy Opaque ONLY FLOATABLES: Image: None Sewage (toilet paper, etc.) Image: Petroleum (oil sheen) Image: Other: OTHER Image: Excess Trash (paper/plastic bags) Image: Dumping (bulk) Image: Excessive Sedimentation | | | | | | |
| POTENTIAL RESTO | | DATE Discharge | - | on 🗌 Stream dayli 🔲 Other: | ighting 🗌 | Local stream rej | pair/outfall stabilization |
| If yes for daylighting Length of vegetative c | | l:ft _] | Type of exis | ting vegetation: | | Slo | ope:° |
| If yes for stormwater Is stormwater currently Yes No | controlled? | | and Use de trea availab | scription: | | | |
| Severity: (circle #) | strong smell. The am compared to the amo | n a distinct color and/or a wount of discharge is signific pount of normal flow in receiv pears to be having a wnstream. | ing discha | discharge; flow mostly rge has a color and/or rge is very small compa id any impact appears | odor, the amoun ared to the strea | nt of discha am's base calized. | Il does not have dry weather arge; staining; or appearance ising any erosion problems. |
| . <u></u> | | 5 | 4 | 3 | | 2 | 1 |
| SKETCH/NOTES: | | | | | | | |
| | | | | | RE | PORTED TO AUTI | iorities: 🛄 yes 🛄 no |

| | | • | | | U | tility Im | pacts UT |
|--|--|--|---|-----------------------------|--|---|--|
| WATERSHED/SUBSH | ED: Symphony | DATE: Z | _/ <u>/Z_/08</u> | ASSESSEI | BY: 5 | N/BS | · · |
| SURVEY REACH ID: | | Тіме:: | AM/PM | Рното ID: (<i>C</i> | amera-Pic | #) | . /# |
| SITE ID: (Condition-#) | UT- <u>3(52</u> -7) LAT_ | <u> </u> | '' LONG | <u> </u> | " LMK: | | GPS: (Unit ID) |
| TYPE: | MATERIAL: Concrete Corrugated metal | LOCATION: | 🗌 Yes | LIAL FISH BARR | IER: | Diamete | IMENSIONS: or: <u>4 in</u> exposed: <u>7 ft</u> |
| Exposed manhole | Smooth metal D PVC Other: | Above stream | m Condi | ective covering bro | t failure oken | - | corrosion/cracking hole cover absent |
| EVIDENCE OF COLOR Inone Clear Dark Brown Lt Brown Yellowish Greenish Other: DISCHARGE: ODOR Inone Sewage Oily Sulfide Chlorine Other: DEPOSITS Inone Tampons/Toilet Paper Lime Surface oils Stains Other: POTENTIAL RESTORATION CANDIDATE Structural repairs Pipe testing Citizen hotlines Dry weather sampling Ino If ish barrier removal Other: Cave | | | | | | | |
| If yes to fish barrier, W | /ater Drop: (ir | | | | | | |
| SEVERITY: (Circle #) | Section of pipe undermined by collapse in the near future; a p the bed or suspended above the section along the edge of the s the entire side of the pipe is ex manhole stack that is located i stream channel and there is ex failure. | ipe running across he stream; a long stream where nearly posed; or a n the center of the | partially exposed immediate threat undermined and b immediate future. is that the pipe ma | that the pipe will be | pipe is stabl stream but o exposed; th concrete an fish moveme | e; the pipe is only a small e pipe is exp d it is not ca ent; a manho and does not | d pipe, stream bank near the s across the bottom of the portion of the top of the pipe losed but is reinforced with using a blockage to upstream ble stack that is at the edge of t extend very far out into the |
| Leaking= 5 | 5 | | 4 | 3 | (2) | | 1 |
| NOTES: | | | | Rei | PORTED TO I | LOCAL AU | THORITIES 🗌 Yes 🛄 No |

| M | lsc | ella | ane | ou | S |
|---|-----|------|-----|----|---|

| | | Miscella | necus MI | | |
|--|----------------------|---------------------------------|----------------------|--|--|
| WATERSHED/SUBSHED: Sumphing | DATE: <u>2/12/08</u> | ASSESSED BY: SHAS | | | |
| SURVEY REACH ID: | TIME:AM/PM | РНОТО ID: (Camera-Pic #) | /# | | |
| SITE ID: (Condition-#) MI- <u>4(K</u>) 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' rprop, to protect an outfact from curb cut HC-3) 75 located directly ds, 3' tall | | | | | |
| | | REPORTED TO LOCAL AU | THORITIES 🗌 Yes 🔲 No | | |

| WATERSHED/SUBSHED: Sumphony | DATE: <u>2/12/08</u> | ASSESSED BY: SHARS | |
|---|-------------------------------|---|------------------|
| SURVEY REACH ID: | TIME:AM/PM | РНОТО ID: (<i>Camera-Pic</i> #) | /# |
| SITE ID: (Condition-#) MI- <u>5(HC-4)</u> LAT | ''' Long°_ | ' LMK: | GPS: (Unit ID) |
| | | | |
| POTENTIAL RESTORATION CANDIDATE | torm water retrofit 🛛 Stream | restoration 🔲 Riparian Manageme | ent |
| | Discharge Prevention 🗌 Other: | | |
| DESCRIBE: 1'told, 25' us HC 6 1 | shich is BPS | | , |
| | | | |
| | | | |
| | | REPORTED TO LOCAL AU | THORITIES Ves No |

| WATERSHED/SUBSHED: Sumphonu | DATE: <u>2/12/08</u> | Assessed by: SN/BS | | | |
|---|-------------------------------|---------------------------------|----------------------|--|--|
| SURVEY REACH ID: U C | TIME::AM/PM | РНОТО ID: (Camera-Pic #) | /# | | |
| SITE ID: (Condition-#) MI-(@(MC-5) LAT° | ''' Long°_ | ' LMK: | GPS: (Unit ID) | | |
| | | | | | |
| POTENTIAL RESTORATION CANDIDATE | | estoration 📋 Riparian Manageme | nt | | |
| | Discharge Prevention 🗌 Other: | | | | |
| DESCRIBE: 2' tall, held by log, Hocaled 25' us 6, | | | | | |
| | | | | | |
| | | R EPORTED TO LOCAL AU | THORITIES 🗌 Yes 📋 No | | |

| 5 8 | _ |
|--------------|---|
| Miscellaneou | S |

| | | Miscella | neous MI | | | |
|--|------------------|---------------------------------|----------------|--|--|--|
| WATERSHED/SUBSHED: Symphomy | DATE: 2 / 12 /08 | Assessed by: SA/BS | | | | |
| SURVEY REACH ID: | TIME:AM/PM | Рното 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: Debrus Other: Debrus Other of the stream Discharge Describe: Much woody debrus in stream Discharge Describe: Much woody debrus in stream Discharge | | | | | |

| WATERSHED/SUBSHED: SUM | phony DATE: | 2/12/03 | ASSESSED BY: | SH/BS | |
|-----------------------------|-----------------|---------------------|--------------|----------------|-----------------------|
| SURVEY REACH ID: | | :AM/PM | Рното ID: (C | amera-Pic #) | /# |
| SITE ID: (Condition-#) MI-2 |) LAT'' | '' LONG° | TT | LMK: | GPS: (Unit ID) |
| | | | | | |
| POTENTIAL RESTORATION CAN | | | | | |
| 🗋 no | Discharge I | Prevention 🕅 Other: | atoms too | bleeking | stream c |
| DESCRIBE: Cansing | , Phish blackag | C, eres ion on | RThank | - 5' by | 15 |
| | t (1 | | | 4 | |
| | | | | | |
| | | | | | |
| | | | REPOR | TED TO LOCAL A | UTHORITIES 🗌 Yes 📋 No |

| WATERSHED/SUBSHED: SUMPHONY | DATE: 2/12/08 | Assessed by: SH/BS | |
|--|-----------------------------|---------------------------------|------------------|
| SURVEY REACH ID: | TIME::AM/PM | РНОТО 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 Manageme | ent |
| no | Discharge Prevention Other: | | |
| DESCRIBE: head cut 2' | | | |
| | | | |
| | | | |
| | | REPORTED TO LOCAL AU | THORITIES Ves No |

| | | Miscella | neous MI |
|---------------------------------------|---------------------------------|---------------------------------|--|
| WATERSHED/SUBSHED: SUMMPNONY | DATE: <u>2/ 17/08</u> | Assessed by: SN/BS | |
| SURVEY REACH ID: | Тіме:ам/рм | РНОТО ID: (Camera-Pic #) | /# |
| SITE ID: (Condition-#) MI-7(HC-6) LAT | °t LONG° | ' LMK: | GPS: (Unit ID) |
| | | | ······································ |
| POTENTIAL RESTORATION CANDIDATE | Storm water retrofit 🛛 🗌 Stream | restoration 🔲 Riparian Manageme | ent |
| 🗌 no | Discharge Prevention 🗌 Other: | | |
| DESCRIBE: 3' tall | | | |
| | | | |
| | | | |
| | | R EPORTED TO LOCAL AU | THORITIES Yes No |

| WATERSHED/SUBSHED: | DATE:// | ASSESSED BY: | |
|--|--------------------------------|---------------------------------|-------------------|
| SURVEY REACH ID: | TIME:AM/PM | Рното ID: (Camera-Pic #) | /# |
| SITE ID: (Condition-#) MI- <u>8(1-</u>) LAT | °' LONG°_ | ' LMK: | GPS: (Unit ID) |
| | | notonation [] Dinarian Managam | |
| POTENTIAL RESTORATION CANDIDATE S | Discharge Prevention [] Other: | | ent |
| | | | |
| DESCRIBE: | | | 4 |
| | | | |
| | | | 1 |
| | | | |
| | | REPORTED TO LOCAL AU | UTHORITIES Yes No |

| WATERSHED/SUBSHED: Symptony | DATE: 2 / 12 / 08 | Assessed by: SH/BS | |
|---------------------------------------|---|---------------------------------|----------------------|
| SURVEY REACH ID: | TIME:AM/PM | Рното ID: (Camera-Pic #) | /# |
| SITE ID: (Condition-#) MI-9 (K-8) LAT | ⁰ ' Long°_ | ''' LMK: | GPS: (Unit ID) |
| POTENTIAL RESTORATION CANDIDATE S | torm water retrofit 🛛 Stream Discharge Prevention 🗍 Other: | restoration 🗌 Riparian Manageme | ent |
| DESCRIBE: Headout -4' tall, t | ree holding | | |
| | | R EPORTED TO LOCAL AU | THORITIES 🗌 Yes 📋 No |

Miscellaneous MI

| WATERSHED/SUBSE | HED: Slamphony | DATE: 2 / 12 / 08 | Assessed by: SH/BS | |
|-----------------------|---------------------------------------|--------------------------------|---------------------------------|-----------------------|
| SURVEY REACH ID | | TIME::AM/PM | РНОТО ID: (Camera-Pic #) | /# |
| SITE ID: (Condition-# |) MI-10(HC-9) LAT | [•] ' LONG° | ' LMK: | GPS: (Unit ID) |
| | | | | |
| POTENTIAL RESTO | RATION CANDIDATE | torm water retrofit 🛛 🗌 Stream | restoration 🔲 Riparian Manageme | ent |
| 🗖 no | | Discharge Prevention 🗌 Other: | | |
| DESCRIBE: 3' | all headcut, sma | ll 80-cm boulders | holding | |
| | · · · · · · · · · · · · · · · · · · · | | - | |
| | | | | |
| | | | REPORTED TO LOCAL AL | JTHORITIES 🗍 Yes 🗍 No |
| | | | | |

| WATERSHED/SUBSHED: Sumptiony | DATE: <u>2/12/08</u> | ASSESSED BY: SH/BS | · · · |
|---|--|---------------------------------|---------------------------------------|
| SURVEY REACH ID: | TIME:AM/PM | Рното ID: (Camera-Pic #) | /# |
| SITE ID: (Condition-#) MI-11(HC-10)LAT° | ' Long°_ | ''' LMK: | GPS: (Unit ID) |
| | ······································ | | · · · · · · · · · · · · · · · · · · · |
| POTENTIAL RESTORATION CANDIDATE 🔲 St | torm water retrofit 🛛 🗌 Stream | restoration 🛛 Riparian Manageme | ent |
| | Discharge Prevention 🗌 Other: | | |
| DESCRIBE: 2' tall headcut, held | by tree | | τ. |
| · · · · · · · · · · · · · · · · · · · | Q | | |
| | | | |
| | | | |
| | | REPORTED TO LOCAL AU | THORITIES 🗌 Yes 🗌 No |

| WATERSHED/SUBSHED: SUMMONU | DATE: <u>2 / 12 / 08</u> | Assessed by: SH/BS | |
|--|-------------------------------|---------------------------------|--------------------|
| SURVEY REACH ID: | TIME::AM/PM | Рното ID: (Camera-Pic #) | /# |
| SITE ID: (Condition-#) MI-12 (HE-11) LAT | '' Long°_ | ''' LMK: | GPS: (Unit ID) |
| | Discharge Prevention 🗌 Other: | restoration 🔲 Riparian Manageme | ent |
| DESCRIBE: 3' tall headcut 3 | end of spillway | REPORTED TO LOCAL AL | JTHORITIES TYES NO |

| | | Miscella | aneous \mathbb{N} |
|--|------------------------------|--------------------------|---------------------|
| WATERSHED/SUBSHED: Symphomy | DATE: 2/12/08 | ASSESSED BY: SHBS | |
| SURVEY REACH ID: | TIME:AM/PM | PHOTO ID: (Camera-Pic #) | /# |
| SITE ID: (Condition-#) MI-13(M-12) LAT | LONG | ' LMK: | GPS: (Unit ID) |
| | Discharge Prevention Other: | ······ | |
| DESCRIBE: - Stream from road | where joins SC-12 st | ream 2° tall, held | by log |
| | | | |
| | · | REPORTED TO LOCAL A | UTHORITIES Yes |

| WATERSHED/SUBSHED: | DATE:// | ASSESSED BY: | |
|-----------------------------------|---|--|------------------|
| SURVEY REACH ID: | TIME::AM/PM | Р НОТ О ID: (<i>Camera-Pic</i> #) | /# |
| SITE ID: (Condition-#) MI LAT | '' LONG°_ | ' LMK: | GPS: (Unit ID) |
| POTENTIAL RESTORATION CANDIDATE S | torm water retrofit 🛛 Stream Discharge Prevention 🗌 Other: | restoration 🔲 Riparian Manageme | ent |
| DESCRIBE: | | | • |
| | | | |
| | | | |
| | | REPORTED TO LOCAL AU | THORITIES Yes No |

| WATERSHED/SUBSHED: | | DATE: | | As | SSESSED BY: | | |
|---------------------------|-----|-------|------------------------------|----|-------------|-----------------|-----------------------|
| SURVEY REACH ID: | | TIME: | _:AM/PM | PI | HOTO ID: (C | Camera-Pic #) | /# |
| SITE ID: (Condition-#) MI | LAT |)t | '' Long | 0 | · · · · · | LMK: | GPS: (Unit ID) |
| POTENTIAL RESTORATION CAN | | | etrofit 🗌 Streeter Determine | | oration 🔲 R | iparian Managem | ient |
| DESCRIBE: | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | REPOR | RTED TO LOCAL A | UTHORITIES 🗌 Yes 📋 No |

| | | | | | | | | Impacte | d Bu | ffer | IB |
|--|------------|-------------------------------------|---------------------------------|---------------------------------------|---|------------------------------------|--------------------------|--|------------------|------------------------------------|--|
| WATERSHED/SUBSHED: | Sump | hemu | | | | DATE | : 21 | 12/08 | Ass | ESSED I | 9 : SH/BS |
| SURVEY REACH: | <u> </u> | đ | TIME: | _: | AM/PM | 1 | | (Camera-Pic | | 1 | (# |
| SITE ID: (Condition-#) | Start L | лт° | _''' I | LONG | o | | 11 | LMK | | GPS: | (Unit ID) |
| B - <u>4</u> | END L | AT° | _''' I | ONG | | · · · · | 11 | LMK | | | |
| IMPACTED BANK: | | ADEQUATE: | Lack of Recently Golf Cou | planted | I 🖾 Ot | bo narrow her: | 119RN | (idespread inv | asive p | lants | |
| (Facing downstream) LT Banl | 3 100 | | |] | | | * | NILI | | | |
| RT Banl | | | |] | | ~ <u>X</u> | <u>(;))</u> | <u>Ewy</u> | <u> </u> | | |
| DOMINANT LAND COVER: LT Ban RT Ban | | | |] | Fall grass | |] | | Other | | |
| INVASIVE PLANTS: | None 🗌 | | | artial co | | <u> </u> | | | 🗌 unk | nown | |
| STREAM SHADE PROVID | ED? 🗌 Noi | ne Part | ial 🗌 |] Full | WET | lands P | RESEN | T?⊠No | □ Y | es 🔲 l | Jnknown |
| POTENTIAL RESTORATIO | ON CANDIDA | TE _ Activ | | ion 🗌 C | freenway | design | 🗌 Nati | ural regenerati | on 🕅 | Invasivo | es removal |
| RESTORABLE AREA Length (ft): $721'$ Width (ft): $80'$ | c RT | REFOREST POTENTIAN (Circle #) | | where the not appoint of the specific | ed area on p ne riparian a ear to be us purpose; pl ailable for p | area does ed for any enty of | public prese purpo | cted area on eithe c or private land tr ently used for a sp pse; available area ing adequate | nat is ecific | land whe encroach feature si | l area on private re road; building iment or other ignificantly limits area for planting |
| | | | | (| 5) | | 4 | 3 | 2 | | 1 |
| POTENTIAL CONFLICTS | | | over 🗌 Se | idesprea | d invasiv nal impa | e plants ets (deer, | Deaver | otențial contarr) 🕅 Other: | inatio AT | 1 ∐ L | ack of sun |
| NOTES: | | | | | | | | | | | |
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| Impacted | Buffer |
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| | IB |] |
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| WATERSHED/SUBSHED: OLMAP | MM4_ | | | DATE: <u>2</u> | 1 <u>12108</u> As | sessed by: SH/BS |
|---|------------------------------------|----------------------|--|---------------------------------------|---|---|
| SURVEY REACH: | 0 | TIME: | :AM/PM | Рното ID: | (Camera-Pic #) | /# |
| | AT0 | _''' L | ONG° | 1 11 | LMK | GPS: (Unit ID) |
| IB END L | AT° | _''' L | ONG° | t tt | LMK | |
| IMPACTED BANK: REASON IN LT Int | ADEQUATE: | X Lack of | | oo narrow 🕅 ' | Widespread invasive | plants |
| | Institutional | Golf Cour | | Other Public | mok nos a cr | |
| (Facing downstream) LT Bank 🛛 🗌 RT Bank 🔹 🔀 | | | | Д: П. Ф | ocids, open sp shility line, over | meach |
| DOMINANT Paved | Bare groun | d Turf/law | | Shrub/scrub | Trees Other | |
| LAND COVER: LT Bank | | | , Ē | | | |
| RT Bank | | | Å | | | |
| INVASIVE PLANTS: None | 🗌 Rare | | artial coverage | Extensi | ve coverage 🗌 un | known |
| STREAM SHADE PROVIDED? | ne APar | tial 🗌 | Full WET | LANDS PRESE | | Yes 🔲 Unknown |
| POTENTIAL RESTORATION CANDIDA | | | on □Greenway レ/ 040. Spec | | tural regeneration D | Invasives removal |
| RESTORABLE AREA | | | Impacted area on p | oublic land Imp | acted area on either | Impacted area on private |
| LT BANK RT Length (ft): $200'$ Width (ft): $200'$ | REFOREST POTENTIA (Circle #) | | where the riparian not appear to be us specific purpose; p area available for p | sed for any pres | lic or private land that is sently used for a specific pose; available area for ting adequate | land where road; building encroachment or other feature significantly limits available area for planting |
| Width (ft): $2 \sqrt{10^2}$ | | | 5 | <u>(4)</u> | 3 | 2 1 |
| POTENTIAL CONFLICTS WITH REFOR | RESTATION | □ Wia cover □ Sev | despread invasiv ere animal impa | e plants 🛛 🗍 F cts (deer, beave | otential contamination \mathbf{X} Other: $\mathcal{U}_{\mathcal{T}}_{\mathcal{T}_{\mathcal{T}_{\mathcal{T}_{\mathcal{T}_{\mathcal{T}_{\mathcal{T}}}}}}}}}}$ | on 🗌 Lack of sun hy lire |
| NOTES: | | | | | | |
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| | | | | | | Channel Modi | fication CM | | |
|---|--------------|--|--------------|----------------|---|---|---|--|--|
| WATERSHED/S | SUBSHED: | Sumphony | | | DATE: 2/1 | 2 108 | ASSESSED BY: SH/BS | | |
| SURVEY REAC | н ID: 🖒 | 2-8-0 | TIME: | Рното І | D: (Camera-Pic #) | /# | | | |
| SITE ID: (Cond | ition-#) | START LAT° | | LONG | it | LMK | GPS: (Unit ID) | | |
| CM | | END LAT° | TT | LONG | 0 1 11 | LMK | | | |
| | | | | | | | | | |
| TYPE: The Channelization Bank armoring concrete channel Floodplain encroachment Other: | | | | | | | | | |
| MATERIAL: Does channel have perennial flow? bc. of | | | | 🗹 Yes 🗌 No | DIMENSIONS: | 2 (ft) | | | |
| | -, | Is there evidence | of sedimen | t deposition? | Yes 🕅 No | Yes X No Height 4 | | | |
| Rip Rap Metal | Earthen | Is vegetation grov | ving in cha | nnel? | Yes X No | Top Width: | $\frac{\mathcal{U}}{\mathcal{L}} (ft) $ | | |
| Other: | | Is channel connec | ted to floor | iplain? | Ves No | Length: | (ft) | | |
| | | · · · · · · · · · · · · · · · · · · · | | | | ··· I.································· | | | |
| BASE FLOW C Depth of flow | `Lof | (in) | i | | ADJACENT STREAM CORRIDOR Available width $LT_{(27)}$ (ft) $RT_{(27)}$ (ft) | | | | |
| Defined low fl | ow channe | l? 🗋 Yes 🖾 No | | | Utilities Present? Fill in floodplain? | | | | |
| % of channel b | ottom _/Ç | <u>)</u> % | | | Yes No | | | | |
| POTENTIAL R | ESTORATIO | ON CANDIDATE |] Structural | repair 🔲 B | ise flow channel cr | eation 🗌 Natural | channel design 🔲 Can't tell | | |
| no no | | Ē |] De-chann | elization 🔲 Fi | sh barrier removal | 🗌 Bioengi | neering | | |
| CHANNEL- IZATION SEVERITY: | channel wher | n of concrete stream (>500 e water is very shallow (<1 natural sediments present | i A moder | | but channel stabilized and atural stream channel. | | | | |
| (Circle #) | | 5 | 4 | | | 2 | (1) | | |
| NOTES: US | of dam | n on HCC pro | perty | | | | """ nored | | |
| | | | | | | | | | |
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| Frash and Debri | S |
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|--|--|--------------------|--------------------|--|--|--|
| WATERSHED/SUE | SHED: SLANDHONN | | DATE: 2 / | 2/08 As | SSESSED BY: SHAS | |
| SURVEY REACH I | | Е: АМ/РМ | Рното ID: (Ca | umera-Pic #) | /# | |
| SITE ID: (Condition | 1-#) TR LAT° | ''' LON | G | _'' LMK | - GPS: (Unit ID) | |
| TYPE: Industrial Commercial Residential | MATERIAL: Appliances Automotive Other: | — | SOURCE: | LOCATION: Stream Riparian Area Lt bank Rt bank | LAND OWNERSHIP: A Public Unknown Private AMOUNT (# Pickup truck loads): | |
| POTENTIAL REST | $\begin{array}{c} \text{FORATION CANDIDATE} \\ \hline \square \text{ Ot} \end{array}$ | | am adoption segmen | t 🗌 Removal/preve | ntion of dumping | |
| If yes for trash or debris removal | | eavy equipment 🛐 T | | P | UMPSTER WITHIN 100 FT:] Yes [] No [] Unknown | |
| CLEAN-UP POTENTIAL: (Circle #) | 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. | | | | | |
| NOTES: | near middle sch | 1000 | <u>.</u> | . 2 | I | |
| | | | | REPORTED TO | AUTHORITIES VES NO | |

Trash and Debris

TR

| WATERSHED/SUB | SHED: Sundhornu | | DATE: <u>2</u> / 10 | DATE: 2/12/08 ASSESSED BY: SH/BS | | | | |
|--|---|---|--|----------------------------------|--|--|--|--|
| SURVEY REACH] | AL | 1E::AM/PM | PHOTO ID: (Ca | mera-Pic #) | /# | | | |
| SITE ID: (Condition | -#) TR- <u>2</u> Lat <u>°</u> | ' Lone | G | '' LMK | GPS: (Unit ID) | | | |
| Type: Industrial Commercial | MATERIAL: Plastic Paper Tires Constru | I | SOURCE: | LOCATION: | | | | |
| Residential | Appliances Yard W Automotive Other: | aste | ☐ Illegal dump ☐ Local outfall | Lt bank Rt bank | AMOUNT (# Pickup truck loads): | | | |
| POTENTIAL REST | FORATION CANDIDATE St | ream cleanup 🗌 Stre | am adoption segment | t 🔽 Removal/pr | evention of dumping | | | |
| 🔲 no | 0 | ther: | | | | | | |
| If yes for trash or | EQUIPMENT NEEDED : H | DUMPSTER WITHIN 100 FT: | | | | | | |
| debris removal | WHO CAN DO IT: Volunteers Local Gov Hazmat Team Other Yes No Unknown | | | | | | | |
| CLEAN-UP POTENTIAL: (Circle #) | 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, o with easy access. Trash a long period of time but few days, possibly with a s | may have been dumped o it could be cleaned up i | ver area, where ac | t of trash or debris scattered over a large cess is very difficult. Or presence of drums f hazardous materials | | | |
| . , | 5 | 4 | 3 | 2 | 1 | | | |
| NOTES: Use HC-3 Cops, tires, all the way to LPP, chains, while, rope, plastic etc. | | | | | | | | |
| | | | | | | | | |
| | | | | Reportei | D TO AUTHORITIES YES NO | | | |

Trash and Debris

TR

| WATERSHED/SUB | shed: Symphomy | 2/08 | Assessed by: SH/BS | | | | | | | |
|--|--|--|---|--|--|--|--|--|--|--|
| SURVEY REACH I | | 1 Рното ID: (Can | nera-Pic #) | /# | | | | | | |
| SITE ID: (Condition | SITE ID: (Condition-#) TR-340 LAT' ''LONG' ''LONG' GPS: (Unit 1D) | | | | | | | | | |
| TYPE: Industrial Commercial Residential | MATERIAL: Image: Paper Image: Metal Image: Plastic Image: Paper Image: Metal Image: Tires Image: Construction Image: Medical Image: Appliances Image: Yard Waste Image: Medical Image: Automotive Image: Other: Image: Medical | SOURCE: Unknown Flooding Illegal dump Local outfall | LOCATION: Stream Riparian Are Lt bank Rt bank | a LAND OWNERSHIP: Public Unknown Private AMOUNT (# Pickup truck loads): 2 | | | | | | |
| POTENTIAL REST | POTENTIAL RESTORATION CANDIDATE Stream cleanup Stream adoption segment Removal/prevention of dumping | | | | | | | | | |
| If yes for trash or debris removal | EQUIPMENT NEEDED : Heavy equipment WHO CAN DO IT: Volunteers | | | DUMPSTER WITHIN 100 FT: | | | | | | |
| CLEAN-UP POTENTIAL: | A small amount of trash (i.e., less with easy access. Trash | or bulk items, in a small are may have been dumped ov it it could be cleaned up in small backhoe. | er area, where acc | t of trash or debris scattered over a large cess is very difficult. Or presence of drums I hazardous materials | | | | | | |
| (Circle #) | 5 4 | (3) | 2 | 1 | | | | | | |
| NOTES: Grave | n powerling -up to LPP, | | | | | | | | | |
| | | | Reported | TO AUTHORITIES YES NO | | | | | | |

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Trash and Debris

TR

| WATERSHED/SUB | shed: Symphomy | | DATE: 2/17 | DATE: $2/12/08$ Assessed by: SH/BS | | | |
|--|--|-------------------------|---|---|--|--|--|
| SURVEY REACH I | | ME: :AM/PM | РНОТО ID: (Cal | PHOTO ID: (<i>Camera-Pic #</i>) /# | | | |
| SITE ID: (Condition | <i>1-#</i>) TR- <u></u> LAT <u>°</u> | ' Lon | G | '' LMK | GPS: (Unit ID) | | |
| Type: Industrial Commercial Residential | MATERIAL: Plastic Paper Tires Constr Appliances Yard W Automotive Other: | | SOURCE: Unknown Flooding Illegal dump Local outfall | LOCATION: | Ca LAND OWNERSHIP: | | |
| POTENTIAL REST | FORATION CANDIDATE $\bigwedge_{i=1}^{i}$ S | tream cleanup 🔲 Stre | am adoption segment | Removal/pro | evention of dumping | | |
| If yes for trash or debris removal | <u> </u> | Heavy equipment 🔲 T | <u> </u> | · · · | DUMPSTER WITHIN 100 FT: | | |
| CLEAN-UP POTENTIAL: (Circle #) | A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access | with easy access. Trash | or bulk items, in a small ar may have been dumped o t it could be cleaned up ir small backhoe. | ver area, where ac | t of trash or debris scattered over a large cess is very difficult. Or presence of drums f hazardous materials | | |
| | 5 | 4 | (3) | 2 | 1 | | |
| NOTES: | have worthy lobertra | go Atence, | place Woody | debris in | n thatplain | | |
| | | | | | | | |
| | | | | REPORTEI | TO AUTHORITIES YES NO | | |

| Stream | Cros | sind |
|--------|------|------|
| | | |

ng SC

| | | | | | Chilop |
|-----------------------|---|--|--|----------------------|---|
| | SUBSHED: Sumphony Stream | | DATE: <u>2/12/08</u> | | |
| SURVEY REA | | | ното ID: (Camera-Pi | | /# |
| SITE ID: (Con | dition-#) SC LAT 39 ° 12 ' 5 | <u>4 " Long /4.</u> | <u>° 32 ' 26 "</u> L | MK | GPS (Unit ID) |
| TYPE: X Roa | ad Crossing 🔲 Railroad Crossing 🔲 Manmade | Dam 🗌 Beaver | Dam Ceological For | mation $\Box \Omega$ | ther: |
| | SHAPE: #BARRELS: | MATERIAL: | ALIGNMENT: | 1 | NS: (if variable, sketch) |
| | SHAPE: π DARKELS. | Concrete | Flow-aligned | Barrel diame | 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - |
| | Box Elliptical Double | Metal | Not flow-aligned | | eight:(ft) |
| FOR ROAD/ Railroad | Circular Triple | Other: | Do not know | | U () |
| CROSSINGS | | | CULVERT SLOPE: | Culvert leng | gth: <u>35 (ft</u>) |
| ONLY | CONDITION: (<i>Evidence of</i>) | n agour hale | Flat | w | idth:(ft) |
| | Cracking/chipping/corrosion Downstrear | | Slight $(2^\circ - 5^\circ)$ | | 11 |
| | Other (<i>describe</i>): | | \Box Obvious (>5°) | Roadway el | evation:(ft) |
| | | ····· | | ······ | |
| POTENTIAL] | . — | 1 | t repair/replacement | Upstream stor | age retrofit |
| D no | | - / 1 | ton samal cano | No War | , 2 |
| IS SC ACTIN | G AS GRADE CONTROL 🛛 🗋 No 🕅 Y | es 🔲 Unkno | own | <i>k</i> , <i>b</i> | |
| | EXTENT OF PHYSICAL BLOCKAGE: | | BLOCKAGE SEVE | RITY: (circle | #) |
| | Total Partial | A structure such as | a dam or A total fish block | áge on a A | temporary barrier such as a |
| If yes for | Temporary Unknown | road culvert on a 3r | | | eaver dam or a blockage at he very head of a stream with |
| fish barrier | CAUSE: | greater stream block | t of or partial blocka | ge that may v | ery little viable fish habitat |
| 0 | Drop too high Water Drop: (in) | anadromous fish; no passage device pre | | 0 | bove it; natural barriers such s waterfalls. |
| | [™] ⊠ Flow too shallow Water Depth: (in) | | | | |
| Nome/Sup | | 5 | 4 3 | 2 | I |
| NOTES/SKEI | -another incoving pipe from | or 2 P. | as end this | notion s | port |
| | - another incontra Dife "an | fel ~ ~ | of the second seco | | , |
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| | | | REPO | RTED TO AUTH | IORITIES 🗌 YES 🗌 NO |



| | (orrest) | | | DATE: 7 | 1 12/08 | ACCT | ssed by: SH | 10.0 |
|--|--|---|--|--|---|--|--|---------|
| WATERSHED | | <u>онсяли</u> Ф тіме: : | AM/PM | | <u>-//015</u>): (Camera-Pia | 1 | /# 36 | 32257 |
| SURVEY REA | | 1 | AM/PM "LONG_ | • • | 1 | <u>мк</u> | GPS (Unit | |
| SITE ID: (Con | annon-#) 3C-<u>-</u> | LAT' | LONG | | | <u></u> | 01 0 (0/m | |
| | d Crossing 🔲 Railroa | d Crossing 🔲 Manmade | Dam 🗌 Beav | er Dam | Geological For | nation 🔲 | Other: | |
| FOR ROAD/ RAILROAD CROSSINGS ONLY | SHAPE: Arch Botto Box Ellip Circular Other: Other: Condition: (Evidence Cracking/chipping/ Sediment deposition Other (describe): Other | # BARRELS: mless Single Double Triple Other: corrosion Downstreation Failing em | MATERIAL: | . ☐ Flo ☑ No □ Do - 2 St CULV □ Fla ☑ Sli | NMENT: w-aligned t flow-aligned not know $reaM \leq convers$ ERT SLOPE: t ght ($2^{\circ} - 5^{\circ}$) vious (>5°) | Barrel dia L Culvert le | Height: | |
| POTENTIAL I | RESTORATION CANDI | DATE X Fish barrier: | removal 🗌 Culv 1 repair 🔲 Oth | | placement 🔲 1 | Upstream st | orage retrofit | |
| | G AS GRADE CONTRO | | - | inown | | | | |
| 10 DC ACHIN | EXTENT OF PHYSIC | 7 | | | CKAGE SEVEI | RITY: (circ | le #) | · |
| If yes for fish barrier | X Total Temporary CAUSE: Drop too high Flow too shallow | A structure such road culvert on a greater stream b upstream moven anadromous fish passage device | as a dam or 3rd order or locking the nent of ; no fish present. | tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. beaver dam or the very head very little viable above it; natur as waterfalls. | | A temporary barrie beaver dam or a b the very head of a very little viable fis above it; natural b as waterfalls. | lockage at stream with h habitat | |
| | Other: | | 5 | | 4 (3.) | | 2 1 | |
| NOTES/SKET | ch: -Cle | -crosses UPP an up | | | | | | |
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| | | | | | Repor | RTED TO AU | THORITHES 🗌 Y | es 🗌 No |

| | | | | | | | | | | ** | |
|--|--|----------|--|---|-------|---|--|--|-----------------------------------|---|---|
| | | | | | | | Stre | am Cros | ssing | SC | |
| WATERSHED | /SUBSHED: Sumó | nanu | | | DA | те: 2 | 112 /08 | ASSE | SSED BY: | SN/BS | |
| SURVEY REA | | | `IME:: | _AM/PM | | | : (Camera-Pi | | /# | 1 10 194 200 | _ |
| SITE ID: (Con | dition-#) SC- <u>3</u> | LAT | 0 1 | ' LONG | 0 | t | | MK | GPS | (Unit ID) | |
| | ad Crossing 🗍 Railroad | Crossing | Manmade | Dam 🗌 Beav | er Dø | am 🗍 | Geological For | mation | Other: | | |
| FOR ROAD/ RAILROAD | SHAPE: Arch Bottor Box Ellipt Circular Other: | nless [| BARRELS: Single Double Triple Other: | MATERIAL: Concrete Metal Other: | | ALIGI | NMENT: w-aligned t flow-aligned not know | DIMENS Barrel dia | IONS: (if v ameter: Height: | pariable, sketch) <u>19</u> (ft) (ft) |) |
| CROSSINGS Only | CROSSINGS CONDITION: (Evidence of) ONLY Cracking/chipping/corrosion Downstrear Sediment deposition Failing emb Other (describe): Other (describe): | | | | | Fla | ERT SLOPE: t ght $(2^{\circ} - 5^{\circ})$ vious $(>5^{\circ})$ | Culvert length: <u>50</u> (ft) Width:(ft) Roadway elevation:(ft) | |) | |
| POTENTIAL I | RESTORATION CANDIN | |] Fish barrier re] Local stream r | emoval 🗌 Culv repair 🔲 Othe | | epair/rep | placement | Upstream si | torage retr | əfit | |
| IS SC ACTING | G AS GRADE CONTROL | |]No 🕅 Ye | es 🗌 Unk | nowr | 1 | | | | | |
| EXTENT OF PHYSICAL BLOCKAGE: Total Partial Temporary Unknown If yes for fish barrier CAUSE: Drop too high Water Drop: Flow too shallow Water Depth: (in) | | | A structure such road culvert on a greater stream bl upstream movem anadromous fish; passage device p | a 3rd order or locking the significant reach of stream, nent of r, no fish present. tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish. beaver dam or i the very head o very little viable above it; natura as waterfalls. | | ry barrier such as a n or a blockage at ad of a stream with iable fish habitat atural barriers such lls. | h | | | | |
| NOTES/SKET | Other: | ····· | | 5 | | 4 | 3 | | 2 | <u>l</u> | |
| | orand new c | ulvert, | , no H2O | us, come | ir. | a CH 10A | n us of | culvert | بر | • | |
| | | | | | | | | | | | |
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REPORTED TO AUTHORITIES YES NO

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| | | | | | | | | | Stre | am Cros | esing | SC |
|--|--|------------------------|--|---|---------|--|-------|---|---|-------------------------------------|---|--|
| WATERSHED | SUBSHED: | Sumpt | rona | | | | DA | te: _2 | 112 108 | ASSE | SSED BY | : SH/BS |
| SURVEY REA | | 0 1 | <u>d</u> | TIME: : | AN | 1/PM | Рн | ото ID | : (Camera-Pi | | /# | |
| SITE ID: (Con | dition-#) SC- | 4 | LAT | 0 1 | 1 | ' LONG | 0 | 1 | " L | МК | GP | S (Unit ID) |
| | | | | | | | | | ······································ | | - <u> </u> | |
| TYPE: 🕅 Roa | d Crossing |] Railroad | l Crossir | ig 🗌 Manma | de Dan | n 🔲 Beav | er Da | um 🔲 (| Geological For | mation | Other: | |
| FOR ROAD/ RAILROAD CROSSINGS ONLY | SHAPE: Arch Box Circular Other: CONDITION Cracking/c Sediment Other (de. | Botton Ellipti | nless ical e of) orrosion | # BARRELS: | Eam sco | IATERIAL: Concrete Metal Other: | | ALIGN ALIGN Flo Do CULV Flat Slig | WMENT: w-aligned t flow-aligned not know ERT SLOPE: | DIMENSI Barrel dia Culvert le | IONS: (<i>if</i> ameter: Height: ength: Width: | variable, sketch) <u>48</u> (ft) (ft) <u>100</u> (ft) (ft) (ft) |
| | | | | · | | Personal | | | | | | |
| POTENTIAL F | RESTORATION | N CANDIE | DATE | | | | | epair/rep | lacement 🗌 | Upstream st | torage ret | rofit |
| no | | | | Local strea | | ir 🗌 Oth | er: | | | | | |
| IS SC ACTINO | G AS GRADE (| CONTROL | 1 | No 🗌 | Yes | Unk | nowi | | | | | |
| | EXTENT OF | | | CKAGE: | | | | BLO | CKAGE SEVE | RITY: (circ | le #) | |
| Image: Total Image: Partial Image: Temporary Unknown If yes for Image: Cause: Image: fish barrier Image: Drop too high Image: Cause: Image: Drop too high Image: Cause: Image: Drop too high Image: Cause: Image: Cause: Image: Cause: Image: Cause: | | roa gra up an | ad culvert on a eater stream bl stream movem adromous fish; | e such as a dam or int on a 3rd order or eam blocking the movement of us fish; no fish levice present. A total fish block ributary that wo significant reach or partial blockag interfere with the anadromous fish | | Id isolate a of stream, ge that maybeaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such | | | | | | |
| | Other: | | | | | 5 | | 4 | 3 | | 2 | 1 |
| NOTES/SKET | - plunge | . pool (| | ved ds, n | 000 | | | | to sualle | | ure. d | 5 |

REPORTED TO AUTHORITIES YES NO

| | | | | Stream | m Crossing SC | |
|---|---|--|--|--|---|--|
| WATERSHED | SUBSHED: SUMA | heny | | DATE: 2/12/08 | ASSESSED BY: SN/BS | |
| SURVEY REA | | TIME:: | _AM/PM | Рното ID: (Camera-Pic # | | |
| SITE ID: (Cor | adition-#) SC- <u>5</u> | LAT'' | LONG | <u> </u> | K GPS (Unit ID) | |
| TYPE: 🗌 Ro | ad Crossing 🔲 Railroad | Crossing 🗌 Manmade | Dam 🗌 Beav | er Dam 🔲 Geological Forma | ution 🕅 Other: Path Wossing | |
| For Road/ Railroad Crossings | SHAPE: Arch Botton Box Ellipt Circular Other: | ical Double | MATERIAL: | Flow-aligned Flow-aligned Not flow-aligned Do not know | DIMENSIONS: (<i>if variable, sketch)</i> Barrel diameter: <u>48</u> (ft) Height:(ft) Culvert length: <u>40</u> (ft) | |
| ONLY | CONDITION: (Evidence Cracking/chipping/c Sediment deposition Other (describe): | orrosion 🗌 Downstream | n scour hole pankment | scour hole \Box Flat Width: | | |
| POTENTIAL | RESTORATION CANDI | DATE 🔲 Fish barrier re | emoval 🗖 Cut | ert repair/replacement 🔲 Up | stream storage retrafit | |
| | | Local stream | | | stream storage redont | |
| IS SC ACTIN | G AS GRADE CONTROI | _ <u> </u> | es 🔲 Unk | nown | | |
| | EXTENT OF PHYSIC. | | | BLOCKAGE SEVERI | ΓΥ: (circle #) | |
| If yes for fish barrier CAUSE: Drop too high Water Drop: Flow too shallow Water Depth: Other: | | road culvert on a greater stream blupstream movem anadromous fish; | A structure such as a dam or oad culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish 5 5 4 3 4 4 4 5 4 4 5 4 4 5 4 4 5 4 4 5 4 4 5 4 4 5 4 4 4 5 4 5 4 4 5 4 4 5 4 4 5 4 5 4 4 4 5 4 5 4 5 4 4 3 5 4 5 4 | | | |
| NOTES/SKET | CH: | | | - | 2I | |
| | causing aggrad | ion 115 callse | 2 small | | ed to authorities 🗌 Yes 🗍 No | |

Appendix E: Field Assessments Photo Log



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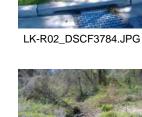
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Stormwater Retrofit Opportunities



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Page E-3

Stormwater Retrofit Opportunities











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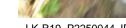
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Stormwater Retrofit Opportunities





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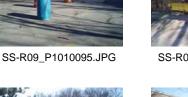
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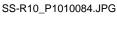














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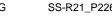




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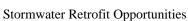






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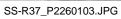
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Page E-11



Stormwater Retrofit Opportunities







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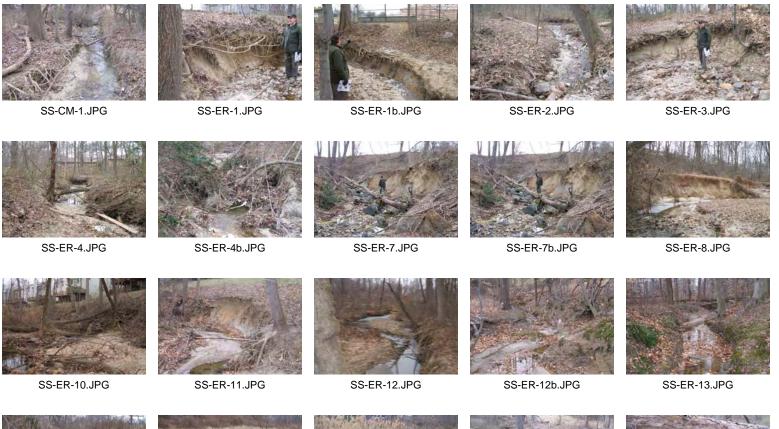
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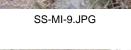






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Stream Impacts



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Appendix F: Stormwater Retrofit Opportunities

| | Table | F-1: Symphony Stream and Lake Kittamaqundi Watersheds Stor | rmwater Retrofit Oppor | tunities | | | | |
|--|--|--|---|--------------------------|--|--|----------------|---|
| 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 Stor | mwater Retrofit Oppor | tunities | | | | |
|---|--|---|----------------------------------|--------------------------|--|--|----------------|---|
| 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 | 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 Stor | rmwater Retrofit Oppor | tunities | | | | |
|--|---|---|--|--------------------------|--|--|----------------|---|
| 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 Stor | mwater Retrofit Oppor | tunities | | | | |
|---|---|---|-------------------------------|--------------------------|--|--|----------------|---|
| 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 | | | | | | | | | | | | ater Retr | ofit Ra | nking D | ata | | | | | | |
|----------------|--|----------------------------------|--|-------------|-------|--|-------------|-------|----------|-------|----------|--------|-----------|---------|----------------------|------------------------|-------|--------|-------|---|--------|-------|
| | | | Water | Quality, TP |) | Water Q | uality, TSS | | Recha | rge | Water Qu | antity | | I | Feasibility | | | Visibi | lity | (| Cost | |
| Total Score | Location | Type of Treatment | Normalized Annu TP Load Remove (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 | ОК | 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 | ОК | 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 | ОК | 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 |

| | | |] | Fable G-1 | : Sym | phony Stream a | and Lake | Kitta | maqundi | Wate | rsheds St | ormwa | ater Retr | ofit Ra | nking D | ata | | | | | | |
|----------------|--|---|--|------------------|-------|--|------------|-------|----------|-------|-----------|--------|-----------|---------|----------------------|------------------------|-------|--------|-------|---|--------|-------|
| | | | Water (| Quality, TP |) | Water Qu | ality, TSS | | Recha | rge | Water Qu | antity | |] | Feasibility | | | Visibi | lity | (| Cost | |
| Total Score | Location | Type of Treatment | Normalized Annua 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 | ОК | 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 | ОК | 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 |

| | | | Ta | able G-1 | : Sym | phony Stream a | and Lake | Kitta | maqundi | Wate | rsheds St | ormw | ater Retr | ofit Ra | nking D | ata | | | | | | r |
|----------------|---|---|---|------------|-------|--|------------|-------|----------|-------|-----------|--------|-----------|---------|----------------------|------------------------|-------|--------|-------|---|--------|-------|
| | | | Water Q | uality, TP |) | Water Qu | ality, TSS | | Recha | rge | Water Qu | antity | | I | Feasibility | | | Visibi | lity | C | ost | |
| Total Score | Location | Type of Treatment | 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 | ОК | 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 | ОК | 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 | ОК | Possible | Low | 0 | Low | 0 | \$128,000.00 | Medium | 8 |

| | | | Ta | ble G-1 | : Sym | phony Stream a | nd Lake | Kitta | maqundi | Wate | rsheds St | tormw | ater Retr | ofit Ra | nking D | ata | | | | | | |
|----------------|---|----------------------|---|------------|-------|--|------------|-------|----------|-------|-----------|---------|-----------|---------|----------------------|------------------------|-------|--------|-------|---|--------|-------|
| | | | Water Qu | uality, TP | | Water Qu | ality, TSS | | Recha | rge | Water Q | uantity | | I | Feasibility | | | Visibi | lity | С | lost | |
| Total Score | Location | Type of Treatment | 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 | e Kittamaqundi Water | sheds Riparian | Corridor Res | toration Oppo | rtunities | | | | |
|---|---|--|---|------------------------------|---|----------------------------------|--|--|---|---------------|--|
| | | | | | | Spe | cific Opportu | nities | | | Planning Level Design |
| Location | Existing Conditions | Description of Restoration Opportunity | Restoration Opportunity | Total Reach Length (feet) | Floodplain Reconnection (square feet) | Riparian Buffer (square feet) | Stream Restoration (linear feet) | Bank Stabilization (linear feet) | Regenerative Stormwater Conveyance (linear feet) | Priority | and Construction Cost Estimate (2007 dollars) |
| 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.

| 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) | Box 1A: The Simple Method Pollutant Loading Calculation | | | | | | | | | | |
|---|---|--------|--|--|--|--|--|--|--|--|--|
| L=Annual pollutant loading (lbs/year)P=Rainfall depth over the desired time interval (inches)Pj=Fraction of rainfall events that produce runoffRv=Runoff coefficient, which expresses the fraction of rainfall which is conver 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) | | | Pollutant Loading, $L = [(P)(Pj)(Rv)/12]$ (C) (A) (2.72) | | | | | | | | |
| 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 conver 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) | Where: | | | | | | | | | | |
| Pj=Fraction of rainfall events that produce runoffRv=Runoff coefficient, which expresses the fraction of rainfall which is conver 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) | L | = | Annual pollutant loading (lbs/year) | | | | | | | | |
| Rv=Runoff coefficient, which expresses the fraction of rainfall which is conver 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) | Р | = | Rainfall depth over the desired time interval (inches) | | | | | | | | |
| Rv=Runoff coefficient, which expresses the fraction of rainfall which is conver 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) | Pj | = | Fraction of rainfall events that produce runoff | | | | | | | | |
| C = Flow-weighted mean concentration of the pollutant in urban runoff (mg/l) A = Area (acres) | - | = | Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff = $0.05 + 0.009$ (I) | | | | | | | | |
| A = Area (acres) | Ι | = | Imperviousness (i.e., $I = 75$ if site is 75% impervious) | | | | | | | | |
| | С | = | Flow-weighted mean concentration of the pollutant in urban runoff (mg/l) | | | | | | | | |
| | А | = | Area (acres) | | | | | | | | |
| 12 and 2.72 are unit conversion factors | 12 and | d 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) | | | | | | | |
| Ι | = | Imperviousness (i.e., $I = 75$ if site is 75% impervious) | | | | | | | |
| С | = | Flow-weighted mean concentration of the pollutant in urban runoff (mg/l) | | | | | | | |
| А | = | Area (acres) | | | | | | | |
| 8.16 is a regional constant and unit conversion factor | | | | | | | | | |
| | U | | | | | | | | |

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 Loa | ding for the Symphony Stream Watershed |
|---|--|
| Annual TP Loading, $L_{TP} = (Rv) (C) (A) (8.16)$ | Annual TSS Loading, $L_{TSS} = (Rv) (C) (A) (8.16)$ |
| Where: | 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 | 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: | Therefore: |
| Annual TP loading = (0.29) (0.27 mg/L) (728 acres) (8.16) | Annual TSS loading = (0.29) (58 mg/L) (728 acres) (8.16) |
| Annual TP loading = 465 lbs/year | Annual TSS loading = 99,919 lbs/year |

| Box 1D: Current TP and TSS Annual Load | ding for the Lake Kittamaqundi Watershed |
|--|---|
| Annual TP Loading, $L_{TP} = (Rv) (C) (A) (8.16)$ | Annual TSS Loading, $L_{TSS} = (Rv) (C) (A) (8.16)$ |
| 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 | 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 postretrofit 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: | 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: | 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 | |

| 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: . 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: | 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: | 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 | | |

1. Refers to stormwater treatment option in Schueler, et al., 2007, that is used to determined pollutant removal efficiency.

Uses the median pollutant removal efficiency identified for the stormwater treatment option in Schueler, et al., 2007.
 Assumes pollutant reduction benefit is based on runoff reduction; assumes potential runoff reduction 10%.

| Table 3 | : Potential Ann | ual TP Lo | ad Reductions | Associated wi | th Stormwate | r Retrofits in the Sy | mphony Stream V | Vatershed | |
|--|--|-----------------------|-----------------------|---------------------------|---|---|--|---|---|
| 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 | 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 | 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: . 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 Annu | ial TP Loa | ad Reductions A | ssociated wit | th Stormwater | Retrofits in the Lal | ke Kittamaqundi V | 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 Annu | ial TP Loa | ad Reductions A | Associated wit | h Stormwater | r Retrofits in the Lal | ke Kittamaqundi V | 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 |

1. Refers to stormwater treatment option in Schueler, et al., 2007, that is used to determined pollutant removal efficiency.

Uses the median pollutant removal efficiency identified for the stormwater treatment option in Schueler, et al., 2007.
 Assumes pollutant reduction benefit is based on runoff reduction; assumes potential runoff reduction 10%.

Summary

| Table 5: Annual TP Loading Under Various Scenarios in the Symphony Stream and Lake Kittamaqundi Watersheds | | | | | | | | | |
|--|--------------|--------------|--|--|--|--|--|--|--|
| Symphony Stream Lake Kittamaqundi Watershed 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 | | | | | | | |

The results of this modeling effort are summarized in Tables 5 and 6.

| Table 6: Annual TSS Loading Under Various Scenarios in the Symphony Stream andLake 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 |

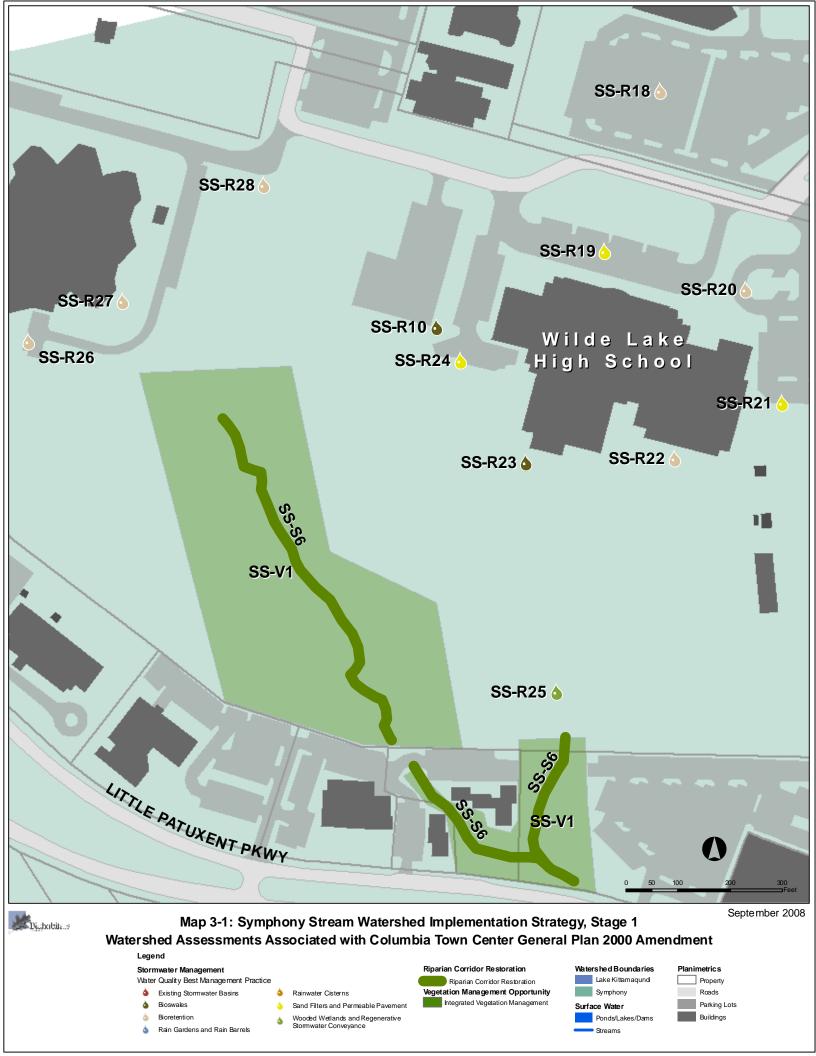
References and Resources

Pitt, R., A. Maestre, and R. Morquecho. 2004. The National Stormwater Quality Database (NSQD), Version 1.1. University of Alabama. Tuscaloosa, AL

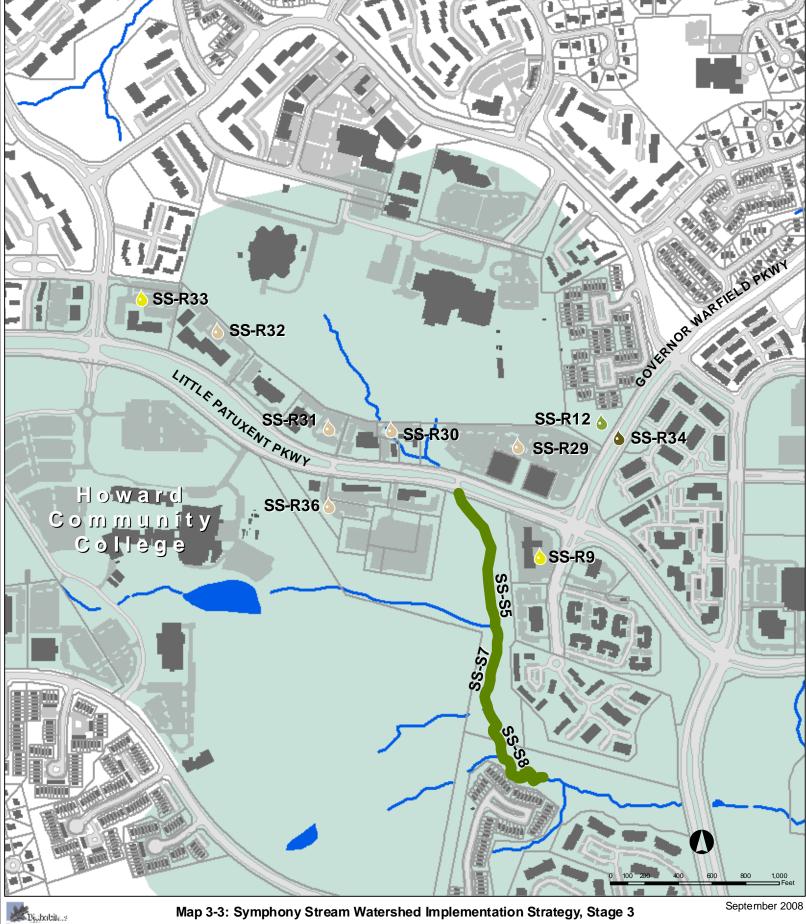
Schueler, T. 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban Best Management Practices. Department of Environmental Programs. Metropolitan Washington Council of Governments. Washington, D.C.

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







Map 3-3: Symphony Stream Watershed Implementation Strategy, Stage 3 Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Bioswales Δ.

Bioretention

Stormwater Management

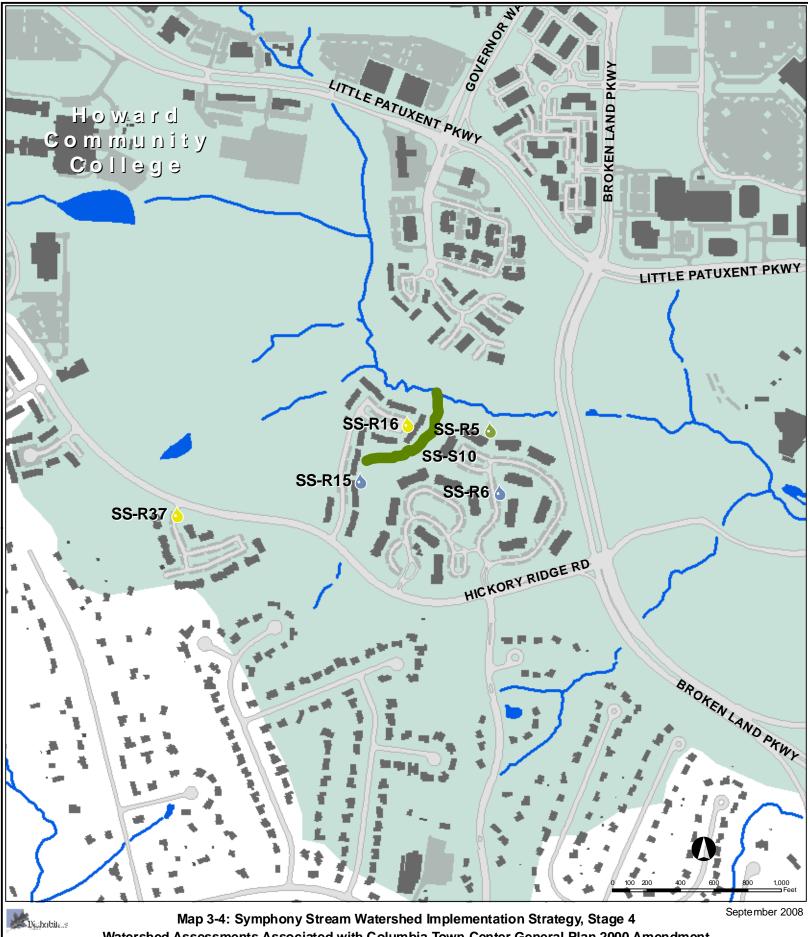
Water Quality Best Management Practice Existing Stormwater Basins ۵

ain Gardens and Rain Barrels

- Rainwater Cisterns
 - Sand Filters and Permeable Pavement ۵
 - Wooded Wetlands and Regenerative Stormwater Conveyance ۵

Riparian Corridor Restoration Riparian Corridor Restoration Vegetation Management Opportunity Integrated Vegetation Management

| Watershed Boundaries | Planimetric s |
|----------------------|---------------|
| Lake Kittamaqundi | Property |
| Symphony | Roads |
| Surface Water | Parking Lots |
| Ponds/Lakes/Dams | Buildings |
| | |



Map 3-4: Symphony Stream Watershed Implementation Strategy, Stage 4 Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management

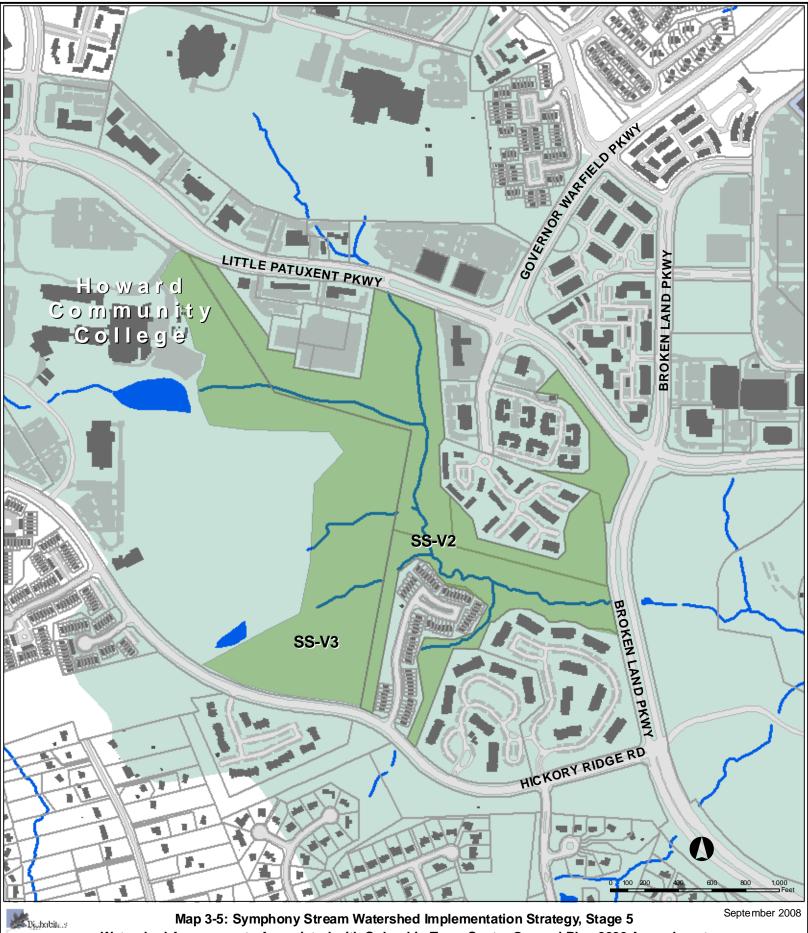
- Water Quality Best Management Practice Existing Stormwater Basins ۵
 - Rainwater Cisterns
- Bioswales Δ.
- Bioretention ain Gardens and Rain Barrels
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance ۵

Riparian Corridor Restoration Riparian Corridor Restoration Vegetation Management Opportunity Integrated Vegetation Management









Map 3-5: Symphony Stream Watershed Implementation Strategy, Stage 5 Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

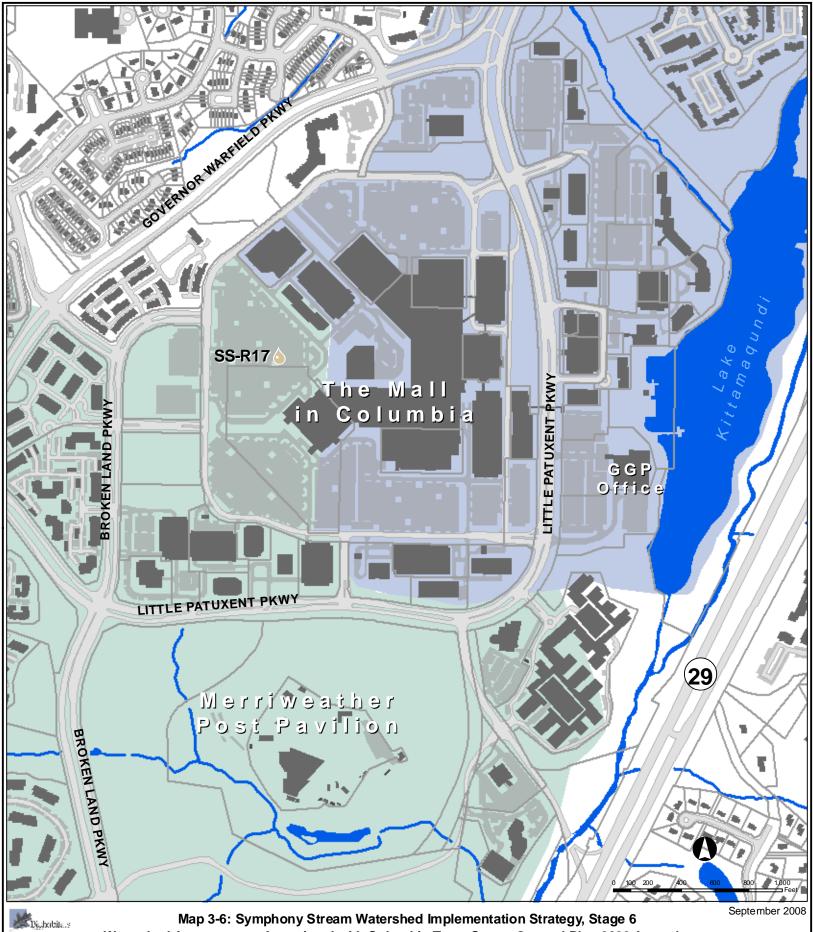
Stormwater Management

- Water Quality Best Management Practice Existing Stormwater Basins ۵
 - Rainwater Cisterns
- Bioswales ۵
- Bioretention
- ain Gardens and Rain Barrels
- Sand Filters and Permeable Pavement ۵
- Wooded Wetlands and Regenerative Stormwater Conveyance ۵

Riparian Corridor Restoration Riparian Corridor Restoration Vegetation Management Opportunity Integrated Vegetation Management

Watershed Boundaries Lake Kittamaqundi Symphony Surface Water Ponds/Lakes/Dams Streams





Map 3-6: Symphony Stream Watershed Implementation Strategy, Stage 6 Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Δ.

Stormwater Management Water Quality Best Management Practice

Bioswales ۵

Bioretention

Existing Stormwater Basins ۵

Rain Gardens and Rain Barrels

- Rainwater Cisterns
 - Sand Filters and Permeable Pavement
 - Wooded Wetlands and Regenerative Stormwater Conveyance ۵

Riparian Corridor Restoration Riparian Corridor Restoration Vegetation Management Opportunity Integrated Vegetation Management

Watershed Boundaries Lake Kittamaqundi Symphony Surface Water Ponds/Lakes/Dams Streams





Map 3-7: Lake Kittamaqundi Watershed Implementation Strategy, Stage 1 Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

Stormwater Management

Bioswales ۵

- Water Quality Best Management Practice Existing Stormwater Basins ۵
 - Rainwater Cisterns Sand Filters and Permeable Pavement
 - ۵
- Bioretention ain Gardens and Rain Barrels
- Wooded Wetlands and Regenerative Stormwater Conveyance ۵

Riparian Corridor Restoration Riparian Corridor Restoration Vegetation Management Opportunity Integrated Vegetation Management





Watershed Boundaries Surface Water





Map 3-8: Lake Kittamaqundi Watershed Implementation Strategy, Stage 2 Watershed Assessments Associated with Columbia Town Center General Plan 2000 Amendment

Legend

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Stormwater Management

- Water Quality Best Management Practice ۵ Existing Stormwater Basins
 - Rainwater Cisterns Sand Filters and Permeable Pavement
 - Bioswales
- Bioretention ۵. ain Gardens and Rain Barrels
- ۵
- Wooded Wetlands and Regenerative Stormwater Conveyance ۵

Riparian Corridor Restoration Riparian Corridor Restoration Vegetation Management Opportunity Integrated Vegetation Management





Watershed Boundaries Planimetric s





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 ۵ Existing Stormwater Basins
 - Rainwater Cisterns

۵

- ۵ Bioswales
- Bioretention ۵.
- ain Gardens and Rain Barrels
- Sand Filters and Permeable Pavement
- Wooded Wetlands and Regenerative Stormwater Conveyance ۵

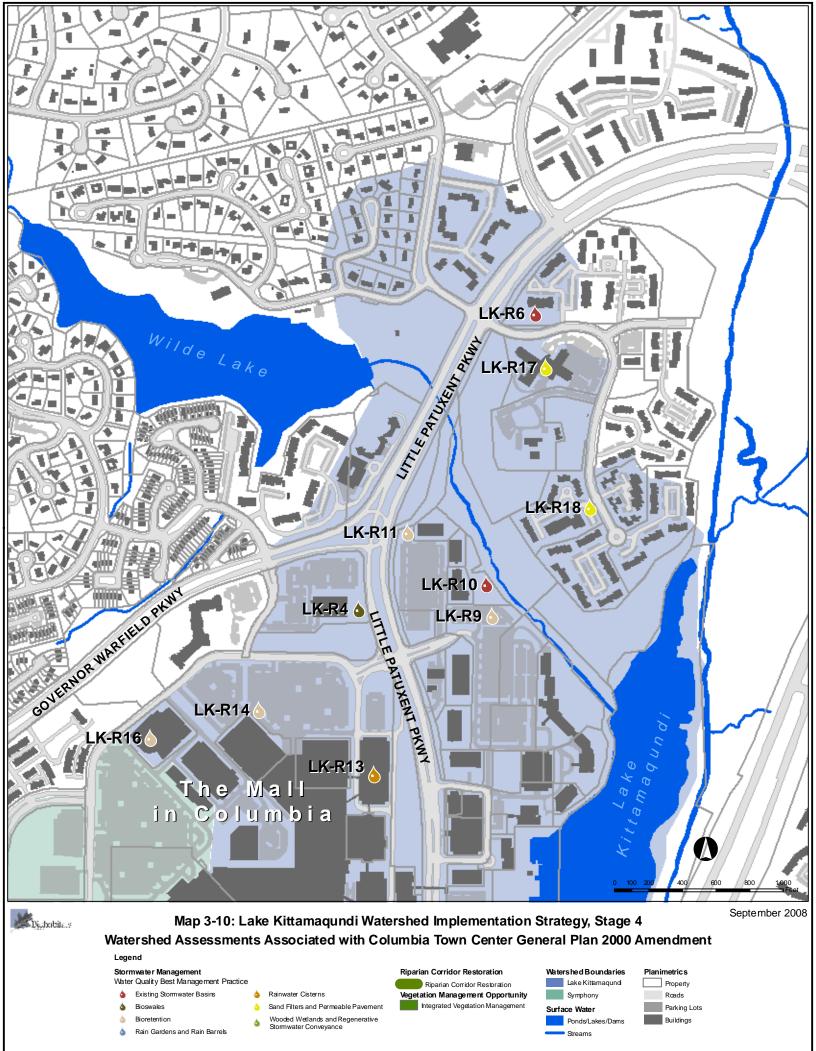
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September 2008

Streams







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