Coastal Low Impact Development (LID) Best Management Practices Inventory

Summary Report






Prepared for Georgia Department of Natural Resources, Coastal Resources Division

Prepared by Marine Extension and Georgia Sea Grant in partnership with Ecological Planning Group, LLC

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Executive Abstract

The *Coastal Low Impact Development (LID) Best Management Practices Inventory* (the Inventory) includes data collection for 277 green infrastructure/low impact development practices in Georgia's eleven coastal counties. Practices range in size and scope yet manage 89.3 million gallons of stormwater runoff annually. It is intended that the Inventory will be a resource for practitioners, educators, and stormwater enthusiasts. The Inventory is foundational to greater understanding of how the science of these systems function in coastal environments.

Acknowledgements

This project is a collaborative effort directed by the Georgia Department of Natural Resources Coastal Resources Division. The Division is sponsoring it as a directed project through a grant award from the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (#NA16NOS4190165).

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This project was a fun collaboration. We would like to recognize the work of the project team members – Jessica Brown, Robert Brown, Mike Baggett, Robert Hulsey, Kelly Hill, Courtney Reich, Stefanie Nagid, and Bill Hodgins. Information and time invested by City and County staff was invaluable to this effort.

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Introduction

Background

There was a 62% increase in population in coastal Georgia from 1970 through 2000 (CQGRD, 2006) and growth and development projections show continued, significant increases in Georgia's coastal populations through 2030. The 2009 introduction of the Coastal Stormwater Supplement (CSS), regional guidance to the Georgia Stormwater Management Manual (GSMM), began to change the standard of stormwater management in Georgia. Prioritization of stormwater green infrastructure (GI) and the availability of low impact design criteria made these strategies available for municipalities to include in planning and design. As the need to consider the impacts of growth in the coastal region continues to increase, so does the need to understand and encourage municipalities to incorporate these strategies into their designs. Almost a decade after the CSS has been introduced, the need to understand more about these practices in coastal Georgia is recognized. Efforts are currently underway to identify and eliminate barriers to implementation, to provide more demonstration projects as examples, and to support the body of knowledge for how green infrastructure and low impact development (LID) practices function in the coastal environment.

Need

Stormwater Low Impact Development (LID) Best Management Practices (BMPs) are a means of accomplishing integrated water management that aims to mimic natural hydrology. It is widely accepted that LID BMPs improve water quality and reduce water quantity through infiltration and evapotranspiration. A 2017 study "Coastal Stormwater Supplement Focus Group Recommendations" found that approximately 90% of surveyed local governments claim familiarity of the CSS, with 55% utilizing its information; however, the number one identified challenge is a lack of training and understanding of CSS compliant structures (i.e. GI/LID practices).

Prior to the completion of that study, Georgia Department of Natural Resources, Coastal Resources Division recognized this barrier and allocated funding to identify GI/LID practices and address the issue by creating a Coastal Low Impact Development Best Management Practices Inventory (the Inventory). The creation of the Inventory was funded by an award from the Office for Coastal Management, NOAA.

Project Team

The project team is made up of The University of Georgia's Marine Extension and Georgia Sea Grant; Ecological Planning Group, LLC; Center for Watershed Protection; and Georgia Department of Natural Resources, Coastal Resources Division.

The team brings a wide range of expertise and services in natural resources planning and design, local government funding, stormwater management, National Pollutant Discharge Elimination System (NPDES) regulatory compliance, and community-engaged research, education, and outreach – that enhance the environmental, social, and economic sustainability of the coastal region. The team's collective knowledge and community engagement led to the success of this project.

Methodology

The objective of this project was to develop an Inventory containing information about LID BMPs installed in Georgia's eleven (11) coastal counties (Chatham, Glynn, Bryan, Liberty, Camden, McIntosh, Effingham, Wayne, Charlton, Brantley, Long), with the goal of utilizing these sites as practical examples and educational resources.

The tasks identified to fulfil this objective include: determining the specific practices to include and scope of information about each practice desired, conducting a survey to gather information about coastal LID BMPs, creating of a GIS database and field collection tool, conducting field assessments and data analysis, and summarizing project findings.

A list of required project information was included in the funding award notice. The required project information is intended to provide an identifier (practice name, physical location, practice type) and a "snapshot" of basic information about the condition and functionality of the practice at the time of assessment. A list of required project information can be found in Appendix I. It is important to note that the majority of the practices/projects were assessed in Summer 2017.

In addition to the required project information, a list of additional information to be collected when available was also provided. This information was included for practices whenever possible. The information to be collected when available aligns with the required information in the Georgia Low Impact Development Atlas (http://gacoast.uga.edu/outreach/resources-outreach/low-impact-development-atlas/) With the exception of the "approximate size of the BMP" and "maintenance requirements," the other categories within the list of information to be collected when available was unknown for the majority of the sites assessed.

There are many accepted GI/LID practices used for stormwater management. The practices types included in the Inventory were based on those identified in the CSS and in the LID Atlas, and they include: bioswale, bioretention, rain garden, cistern, rain barrel, stormwater wetland, green roof, and permeable pavement. The Inventory also includes an "other" category to capture LID practices identified by local municipalities that were field assessed, but not included in this list. It should also be noted that the focus of practices selected includes those found in civic, public, commercial, and mixed land use types and while rain barrels and rain gardens are included, these practices were only assessed in publicly available locations. Practices at individual private residences were not included. The reasoning for not including these locations was to focus on locations that could be used for educational purposes, recognizing access to private property would be limiting.

All assessments were to be completed within a year; therefore, it was determined by the project team the best means of populating the Inventory was to survey local municipalities. The bulk of the practice sites were initially identified by municipalities and then field-verified. A smaller fraction of practices was identified while the project team

was in the field. It is recognized that in order for the Inventory to be a current and relevant resource, periodic updates will be necessary.

All data collected for the Inventory were collected and stored in a "real-time" geographic information system (GIS) utilizing ESRI's ArcGIS Online and its corresponding Collector application. Ecological Planning Group, LLC created the Inventory data layers. The geographic data and associated content was managed by Ecological Planning Group during the project and is currently managed by the Georgia Department of Natural Resources, Coastal Resources Division. The Georgia Department of Natural Resources, Coastal Resources Division hosts the Inventory. Utilizing an online platform for the Inventory streamlined field data collection and will allow the Inventory to be managed for future, public use.

The bulk of this project's efforts were in the data collection, field assessment, and field verification of the identified practice sites. A total of 277 sites were verified and included in the Inventory, with over 300 site visits completed.

In an effort to be consistent and standardize data collection the project team initially created the "Field Assessment Guidance Document," outlining the assessment protocol. This Guidance document can be found in Appendix II. Each site assessed was given a unique ID code.

All data collected can be found in the Inventory GIS. A collection of photographs was taken at each location to be used for educational purposes. The project team kept field notebooks containing additional information and notes for each verified site. The field notebooks and backup for the photo database are held at Marine Extension and Georgia Sea Grant's Brunswick, Georgia location.

An ArcGIS Online web application and exported attribute table (Excel file) were used to analyze and process statistics and information contained in the Findings section of this report.

Findings

There is a total of 220 GI/LID stormwater best management practices that have been identified and assessed as part of the Inventory in coastal Georgia (11 coastal counties). Excluding sites classified as "Other", approximately 62% of the practices are permeable pavement (137 sites) followed by 20% bioretention (43 sites) and 9% bioswale (20 sites). Stormwater wetlands (4 sites) and green roofs (5 sites) were among the least prevalent. An illustration of practices based on type can be found in Figure 1. One practice type classification of note is "Other." The "Other" classification includes 57 sites – 10 underground detention, 8 infiltration practices (trench or basin), 3 water re-use practices, and 36 identified as non-LID. The 36 non-LID practices were identified by municipalities, but not recognized as LID practices within the Inventory based on practice type/field verification; hence there were 277 identified sites with only 220 recognized as GI/LID practices. Several of the "Other" practices could be considered GI/LID, but access or

ability to view design plans will be required to confirm the design and intention of these practice.

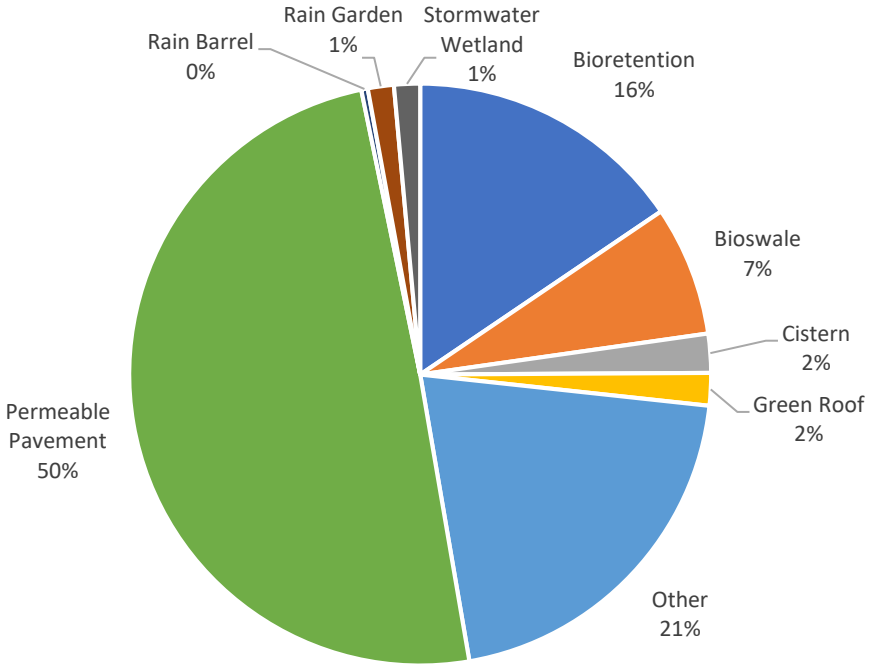

Figure 1. Summary of Practice Type for 277 Sites Included in the Inventory

The most common practice type, permeable pavement, was subdivided by pavement type in the analysis. Permeable Interlocking Concrete Pavers, or PICP, was the overwhelming choice (66%) for pavement type, followed by pervious concrete (28%). A complete breakdown of permeable pavement types can be viewed in Figure 2.

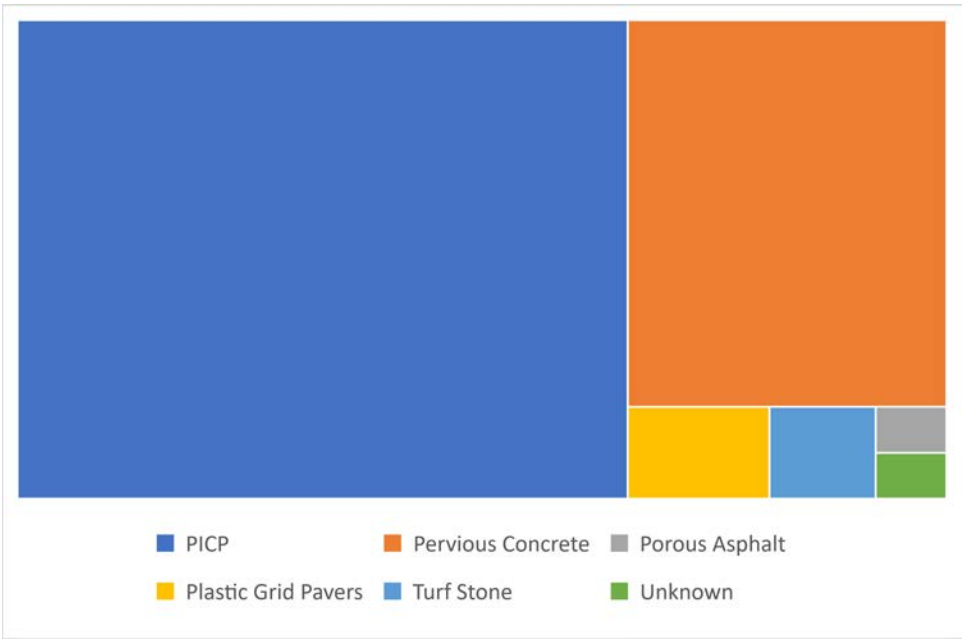

Figure 2. Summary of Permeable Pavement Sites by Pavement Type

Chatham County had the most practices (216 sites) followed by Glynn County with 47 sites and Liberty County with 7 sites. All six counties adjacent to the Atlantic Ocean have at least one (1) verified practice; however, no practices were identified in the five (5) interior coastal counties.

Practices are commonly located at Commercial land use sites (61%). Of the sites verified 36 have restricted access and 83% of them are on privately-owned property.

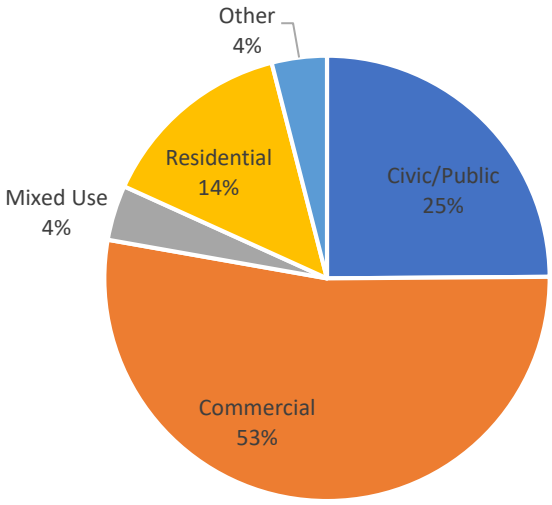

Figure 3. Summary of Land Use

A perceived effectiveness rating was determined for 194 sites. Based on appearance and this visual assessment, three out of every four sites show less than 25% surface area clogging (Good or Excellent ratings). Only 26 sites (13%) received a "poor" rating for perceived effectiveness. A summary of perceived effectiveness by practice type is presented below in Table 1.

Table 1. Perceived Effectiveness by Practice Type

	Excellent	Good	Fair	Poor	Unassessed
Bioretention	16	9	5		13
Bioswale	9	5	1	2	3
Cistern	2				4
Green Roof				1	4
Other	3	3	1	3	47
Permeable Pavement	52	36	18	20	11
Rain Barrel	1				
Rain Garden	3	1			
Stormwater Wetland	3				1
Total	89	54	25	26	83

At the time of assessment, about half of the sites assessed for maintenance only require routine maintenance. The most common maintenance issues identified include locations where multiple maintenance issues were present (18%) and sediment-only (12%). A summary of maintenance issues for the three most common types of GI/LID practices is presented in Table 2.

Table 2. Identified Maintenance Issue for Permeable Pavement, Bioretention, and Bioswales

	Permeable Pavement	Bioretention	Bioswale
Multiple	25	4	4
Other	12	2	1
Routine	59	16	9
Sediment	20	3	1
Structural Damage	2	1	
Trash		1	
Vegetation	7	3	2

Maintenance requirements and associated maintenance costs were generally low. Less than one-third of the sites had a medium or high maintenance requirement rating.

Most notable it was determined that the GI/LID practices identified in the Inventory total 17.6 acres of permeable pavement, 2.5 acres of bioretention, 0.5 acres of green roof, and over 17,500 gallons of cisterns. A summary of areas for all practices is described in Table 3. For permeable pavement, there was 8.62 acres of PICP from 90 sites and 5.92 acres of pervious concrete from 38 sites. Both ranged from a couple hundred square feet to almost an acre. The median site was 2,325 ft2 and 3,365 ft2 for PICP and pervious concrete, respectively. The mean site size was 4,218 ft2 and 6,971 ft2, respectively. These results indicate that many of the permeable pavement sites are rather small and less than a tenth of an acre in size. Assuming a typical ratio of impervious area to practice area of 1:1, the total area treated for most sites is less than 0.2 acres.

Table 3. Summary of Practice Type Areas

Practice Type	**Total Area (ft^2)**	**Total Area (ac)**	**Count**	**Unknown Area**
Bioretention	109,798	2.52	36	7
Bioswale	55,654	1.28	19	1
Green Roof	21,400	0.49	5	0
Permeable Pavement	766,571	17.60	135	2
Rain Garden	5,925	0.14	4	0
Stormwater Wetland	78,575	1.80	4	0
Total	**1,037,923**	**23.83**	**203**	**10**

After the practice areas were calculated, either from the municipality's records, in the field, or through GIS, the area managed by these practices was estimated to calculate annual runoff volume treated by these practices collectively. Using typical sizing equations from

the GSMM and CSS, the assumed impervious area to practice area ratio was 14:1 for bioretention and bioswales and 1:1 ratio for permeable pavement were used to calculate areas treated. If the field notes indicated permeable pavement only received direct rainfall, only the permeable pavement area was calculated as the area treated, and if the field notes indicated inflow was mainly/mostly direct rainfall, a ratio of 0.5:1 was used. Assumptions for the bioretention sizing include 9-in. ponding depth, 2-ft. media depth, and 6-in. gravel storage. Corresponding 25% porosity for the media and 40% porosity for the gravel were also used. Based on these ratios, the area treated by these practices was estimated to be 28.7 acres for permeable pavement and 35.3 acres for bioretention.

Annual runoff treated was based on the assumption that GI/LID practices were sized for the water quality event depth and that they treat 90% annual runoff. A runoff coefficient of 0.95 was applied to the 47.96 inches of annual rainfall to estimate runoff from an entirely impervious watershed. Annual precipitation data is from the NOAA weather station located at the Savannah International Airport, Station USW00003822. For green roofs and bioswales, the runoff reduction factor in the GSMM for each (0.6 and 0.5) were multiplied by 90% to estimate annual volume treated. Stormwater wetlands were not included in the calculation because the GSMM assigns a runoff reduction credit of 0 to these practices. Cisterns were also not included in the calculation because the usage for each system is unknown. A summary of each practice and the estimated area treated, and annual runoff volume treated is identified in Table 4. Overall, it was identified that the GI/LID practices in the Inventory treat an area greater than 84 acres and treat over 89 million gallons of stormwater runoff annually.

Table 4. Summary of Area Treated and Annual Runoff Treated by GI/LID

Practice Type	Area Treated (ac)	Treatment % of Annual Runoff	Annual Volume Treated (MG/Yr)
Bioretention	35.29	90%	42.24
Rain Garden	2.04	90%	2.43
Permeable Pavement	28.65	90%	33.58
Green Roof	0.49	54%	0.35
Bioswale	17.89	45%	10.71
Total	**84.36**		**89.31**

Summaries by County

The primary objective of this project was to identify GI/LID practices in eleven (11) of Georgia's coastal counties; however, no practices were identified for Effingham, Wayne, Charlton, Brantley, or Long counties.

Bryan

Bryan County has four (4) verified sites including two bioretention, one bioswale, and one permeable pavement practice. All of these practices are located at the Richmond Hill City Center (520 Cedar Street). Three out of four practices have "excellent" effectiveness ratings and require only routine maintenance at the time of assessment.

Camden

There is one practice, permeable pavement, verified in Camden County. This practice is permeable pavers at the Cumberland Island National Seashore Museum in St. Marys. St. Marys is in the process of adding additional permeable pavement and bioretention in their downtown as part of an Georgia DNR-EPD 319(h) nonpoint source implementation grant.

Chatham

In Chatham County, there are 216 verified sites – 114 permeable pavement, 25 bioretention, and 17 bioswales. All five (5) green roofs included in the Inventory are located in Chatham County. Over half of the practices in Chatham County have less than 25% surface area clogging and 30% have an "excellent" perceived functionality rating. The majority of practices located within Chatham County are within the City of Savannah followed by Unincorporated Chatham County.

Glynn

There are 47 sites verified in Glynn County. The Glynn County sites are predominately Bioretention (15 sites) and permeable pavement (16 sites). Additionally, three of the four rain gardens included in the Inventory are in Glynn County.

Liberty

There are seven (7) sites verified in Liberty County, and they are all located in the City of Hinesville. Four of the seven are permeable pavement and have either "good" or "excellent" classifications for perceived functionality.

McIntosh

There are two sites (one cistern and one permeable pavement site) in McIntosh County. Both sites are public and accessible.

Recommendations and Future Use

Over the course of the project, the project team identified the following recommendations for future use:

- **Establish a periodic Inventory update.** A periodic update, every 3-5 years, would ensure current and relevant data are being used. Updates would also allow simple comparisons for individual practices over the lifetime of the practice.
- **Maintenance Guidance.** The majority of sites classified well for "Overall Effectiveness and Perceived Functionality." Less than 26% of the practices received a "poor" rating. While it was discovered that much of the maintenance needs identified are routine, guidance for maintenance, particularly for permeable pavement and bioretention is needed.
- **Additional Monitoring.** Inventory assessments were a visual-based evaluation of perceived effectiveness. Additional monitoring (i.e. infiltration rates, removal efficiency, dewatering time) to provide data to support functionality and actual effectiveness of practices located in coastal environments is needed. The Inventory will provide physical locations of practices that can potentially be monitored or assessed over time.
- **Encourage locating practices in other Land Use types.** 61% of sites were found in "Commercial" land development. Site selection may be driven by NPDES regulations yet encouraging implementation in other land types may increase accessibility.
- **Online Availability.** There appears to be a correlation between population densities and practices. Since populations are projected to increase in the Coastal region it is assumed the number of practices will, too. Therefore, making the Inventory available in an online format and capacity will be beneficial to practitioners. Based on feedback in meetings and presentations the opportunity to utilize the practice specific, data-driven summaries (Appendix IV) is attractive to coastal municipalities. If these data are available practitioners may be more willing to share data to be included in "information to be collected if available."
- **Photograph Collection.** One of the greatest outcomes of this project is the collection of photographs obtained during site assessments. Photos should be used for educational purposes to illustrate lessons learned and showcase proper examples in the coastal environment.
- **Motivations for types of Permeable Pavement.** Pervious concrete and permeable interlocking concrete pavers (PICP) appear to be popular permeable pavement choices in coastal Georgia. Further information is necessary to identify if this is market-driven (availability), functionality-driven, aesthetics, or other motivation.
- **Educational Demonstration Projects.** Now that GI/LID practices have been identified in the coastal region, there is a need for demonstration projects to better understand how to plan for, design, construct/implement, and maintain GI/LID practices. Less than 17% of the practices verified in the Inventory are located on public property.

References

Source: Georgia Coast 2030: Population Projections for the 10-County Coastal Region (Center for Quality Growth and Regional Development at the Georgia Institute of Technology, 2006)

Appendices

I. Project Information
II. Field Assessment Guidance Document
III. Coastal LID Best Management Practices Map
IV. Data-driven Practice Summary Sheets

Appendix I – Project Information (Required and to be Collected when available) - copied from RFP Document

Required Information:

- Project Name (or name of business where located)
- Address to include:
    - Street (or street names of closest intersection if no physical address)
    - City and Zip
    - County
- LID Practice Type listed as:
    - Bioswale
    - Bioretention/Rain Garden
    - Cistern/Rain Barrel
    - Storm water Wetlands
    - Green Roof
    - Permeable Pavement
    - Other (include description)
- Latitude/Longitude in Decimal Degrees (location can be obtained from Google Earth)
- Land Use Type listed as:
    - Civic/Public
    - Commercial
    - Mixed Use
    - Residential
    - Other (include description)
- Management/Contact Information (include name, email and phone number)
- Narrative Summary of Practice (include brief one line description in spreadsheet and longer narrative in Technical Report)
- Date of Installation
- Appearance of BMP and overall effectiveness (include additional comments in Technical Report):
    - Excellent
    - Good
    - Fair
    - Poor
- Photographs (Certify photos are not copyrighted or otherwise protected and freely available to DNR to use for not-for-profit educational purposes)

Information to Be Collected When Available:

- Cost of installation
- Approximate size of BMP (in square footage or gallons where applicable)
- Name of designer
- Name of installer
- Reason for installation (water quality, water quantity or flooding, etc.)

- Maintenance requirements (include specific maintenance plans/requirements and additional comments in technical report):
    - High
    - Medium
    - Low
- Maintenance costs (include specific cost information in technical report):
    - High
    - Medium
    - Low
- Any cost comparisons to traditional infrastructure proposed at site (Y/N)? (include details in technical report)
- Any issues or lessons learned since installation(Y/N)? (include details in technical report)
- Website linked to more information

The Land Use Type (ownership) category should focus on these ownership types:

1. Civic/Public (county, local municipality, state, federal)
2. Managed on behalf of public entity (i.e. land trust)
3. Commercial/Industrial (strip malls or larger commercial sites)
4. Large scale residential or mixed use (community amenities in large developments, BMPs in apartment or large condo complexes, etc. -***not*** individual single family home installations)

Appendix II – Field Assessment Guidance Document

The following is a framework for site-specific practice characteristics collected as part of the Low Impact Development Best Management Practices Inventory. The purpose of this document is to assist the project team in the collection of consistent field data.

REQUIRED DATA:

- Unique Site ID Code: Initials + 3-digit code, starting at "001" (these data should also be documented in a field notebook, along with any supporting written data).
    - i.e., RAB001, RAB002, RAB003, …
- Project Name: Typically filled in, but describe as name of site/building/business present. Add address or street name for common businesses/establishments
- Street Address
- City
- Zip Code
- County: Dropdown selection
- LID Practice: Dropdown selection
    - If multiple practice types are present at one site (e.g., bioretention AND permeable pavement), fill in a new point for each type, but add letter to ID Code
        - i.e., RAB003a, RAB003b
    - If one practice type is present as multiple separate sections (e.g., multiple sections of permeable pavement in parking stalls across a site OR separate bioretention cells), one enter one point for the site, but make a note of the multiple sections in the "Narrative Summary."
- Land Use Type: Dropdown selection
    - Civic/Public – Any city, county, or publicly-owned property
    - Commercial – businesses (most are in this category)
    - Mixed Use
    - Residential
    - Other – Make a note in "Narrative Summary" if this is selected
- Ownership/Accessibility: Dropdown selection
    - Public – Any city, county, or publicly-owned property
    - Private – Commercial sites, residential sites, businesses (most are in this category)
    - Public Restricted – cannot access because behind gate or on secure site
    - Private Restricted – cannot access because behind gate or on secure site
- Perceived Functionality/Effectiveness of BMP: Dropdown selection
        - This box covers appearance and how the project team thinks the BMP will perform. Is the water getting to the BMP, once there will it infiltrate and store/treat the intended volume (is there suspected bypass), and does the outlet appear to discharge the water appropriately? The project team has been looking at the following major things:
            - 1. Surface condition/infiltration capacity – Level of clogging/sediment accumulation, signs of water staining or excessive ponding duration (wetland plants).
            - 2. Inlet/Outlet condition – does the water get there, does it get out, or are there signs of bypass or water short-circuiting?

- 3. Presence of Erosion
- 4. Structural Issues – smeared or raveling pervious concrete, settled pavers, drains or overflow structures damaged or allowing inadvertent bypass, breached overflow berm
- 5. Vegetation (if present) – appearance
- 6. Look at the BMP as well as the drainage area. Is the drainage area stable?

  - Excellent – pristine, issues above very minor (represent <10% of surface area), healthy vegetation (if present)
  - Good – a few issues above, but nothing major (10-25% of surface area)
  - Fair – moderate clogging, but still seems to work, 25-50% of surface area affected by issues above
  - Poor – severe clogging, major structural issues, severe erosion, >50% of the area affected by issues above. Also if permeable pavers appear to be just bricks

- Maintenance Issues: Dropdown selection
  - If there is maintenance needs/issues, how would you classify them?
  - Routine – no maintenance issues that requires immediate attention
  - Vegetation
  - Sediment
  - Structural Damage
  - Trash
  - Multiple – Make a note in "Narrative Summary" if this is selected
  - Other – Make a note in "Narrative Summary" if this is selected
- Field Observations (Subjective Field Notes)
  - This is where you write any issues associated with the practice. **Note: This field will not be shared on the LID database.
  - Typical Information Entered:
    - Permeable Pavement Type: PICP, PC, or PA
    - PICP: what is the material in joints – sand, pea gravel, gravel, none
    - Signs of erosion, berm failure, surface clogging level, smeared pervious concrete, settled permeable paver blocks, permeable pavement sealed with asphalt sealer, permeable pavers are just bricks
    - Add details if available – level of clogging, maintenance conditions
- Narrative Summary (Objective Field Notes)
  - This field will be shared on the LID database.
  - Typical Information Entered:
    - Are BMPs in series, flows from one to another?
    - Permeable pavement: number of parking stalls, enter dimensions if across parking lot in field book, and if you want area to be reexamined in GIS make note in field book.
    - Dimensions: provide this here for bioretention (length, width, ponding depth, general shape), if underdrain is accessible, what is the depth to the underdrain?
    - Where is the BMP located – parking stalls only, driving lanes, adjacent to parking lot, center of parking lot.
    - What is the inflow – direct rainfall only, some runon, a lot of runon

        - Where does the flow go – is there an underdrain, grate inlet or berm for overflow
            - Add dimensions of overflow structure or underdrain diameter/number
        - Type of vegetation (turf, shrubs, perennials, trees, mulch).
    - For some of these sites, this field is pre-loaded with information (typically Savannah sites), so delete irrelevant data from here, but keep ID and Project #. Data here might give some information for other boxes.
- Field Collection Status: Dropdown selection
    - Completed – turns dot to "green"
    - Local Employee Needed – access issue
    - Complex Site Needs Reassessment – not sure how to classify/rate specific fields
    - Other – Make a note in "Narrative Summary" if this is selected
- Overall Collection Status: Dropdown selection
    - In Progress – Once it is started
    - Completed – Once everything is done
- Date of Installation – Use January 1st if only the year is known.
- Contact Name Associated with Management Ownership
    - For Savannah BMPs (most common), we listed "City of Savannah (Roger Raines)"
    - For other municipalities, you can list city/municipality and a contact name from there if available in parentheses.

IF AVAILABLE (*Categories in bold are ones that the project team has been filling out in the field, some are just "unknown"*):
**Note: Practices that have an asterisk (*) are characteristic that have not currently been listing/including due to a lack of data in the field. These characteristics may be added to from the office once all data have been collected. These should not prevent completion of the field-data assessment, because the project team recognizes that these data may not be available.
April 2017: For "designer name", "installer name", "installation cost", and "website link" characteristics have not been available for most to date.
"Contact phone number" and "email" have not been listed to date, because contact name has been general (City/County Engineer, …).

- *Contact Phone Number
- *Contact E-mail
- *Installation Cost
- **Approximate Area of BMP (sqft) – Important to get while in field**
    - Sometimes this is already listed. If so, estimate to see if it is within a close range.
    - Use wheel, tape measure, or pacing to estimate size. Count parking stalls.
        - We can try to fill in through GIS later too, but there is tree cover that obstructs view or outdated ortho when zoomed in
- **Approximate Volume of BMP (gal) – Important to get while in field**
    - Typical for bioretention or practice with storage. Estimate ponding depth and multiply by area.
        - Conversion 1 cubic foot = 7.48 gallons.
- *Designer Name
- *Installer Name

- **Reason for Installation: Dropdown selection**
    - **This information might have been already provided with initial points, but if not, Unknown can be selected in the field**
    - Water Quality
    - Water Quantity or Flooding
    - Both
    - Other
    - **Unknown**
- **Maintenance Requirements: Dropdown selection**
    - **This is based on <u>perceived maintenance needs</u> for the site**
    - **High** – major undertaking, likely needing replacement
    - **Medium** – substantial effort of vegetation replanting or clogging seems to be extreme
    - **Low** – very simple maintenance needs, some pruning/replanting of vegetation, regenerative air vac truck to address sediment.
    - **Unknown**
- **Maintenance Cost: Dropdown selection**
    - **This is based on <u>perceived cost to conduct needed maintenance</u> for the site**
    - **High** – very expensive, corresponding to replacement
    - **Medium** – special equipment needed
    - **Low** – low cost for addressing vegetation or use of regenerative air vac truck.
    - **Unknown**
- **Maintenance Notes**
    - **This has a shorter character limit so write in what the main maintenance need.**
        - **i.e., Vac truck, replacement, pruning, new vegetation, structural defects, none at this time/routine**
- **Cost Comp to Traditional?: Dropdown selection**
    - **This information might have been already provided with initial points, but if not, Unknown can be selected in the field**
    - Yes
    - No
    - **Unknown**
- **Issues or Lessons Learned?: Dropdown selection**
    - **This information might have been already provided with initial points, but if not, Unknown can be selected in the field**
    - Yes
    - No
    - **Unknown**
- *Website Link

Photo Notes

- For PICP, take a straight-down shot of the pavers with a few joints to show style and joint material
- Take photos of each section of permeable pavement/bioretention cells if there are multiple present.

- Take photos of underdrains, inlets, and overflow structures if present
- Take a good photo of the BMP only, and one that includes some of the drainage area too

Field Book Notes

- List ID Code, Site Name, Address
- Enter anything related to dimensions, number of parking stalls, conditions of sediment, permeable pavement type
- Add sketch if necessary.
- Note if Area is needed to be redone from GIS
- Add any additional comments/notes that cannot be collected in the App.

Appendix III– Coastal LID Best Management Practices Map

Coastal Georgia Low Impact Development Inventory

Jenkins
Screven
Candler
Bulloch
Effingham
Evans
Bryan
Chatham
Tattnall
Liberty
Long
Wayne
McIntosh
Brantley
Glynn
Charlton
Camden

Inset Map 1 1:60,000

See Inset Map 1

See Inset Map 2

Inset Map 2 1:60,000

1:250,000

Legend

Low Impact Development Practice Type

- Bioretention
- Rain Garden
- Bioswale
- Cistern
- Rain Barrel
- Green Roof
- Other
- Permeable Pavement
- Stormwater Wetland

N

Appendix IV– Data-driven Practice Summary Sheets