
DETERMINING IMPLEMENTATION BARRIERS FOR GREEN INFRASTRUCTURE FOR COASTAL FLOOD CONTROL

Recommendations on How to Incorporate Green Stormwater Infrastructure into City of Biloxi Ordinances

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The Mississippi-Alabama Sea Grant Consortium awarded a grant to Dr. Cris Surbeck, Kristina Alexander, and Liya Abera (together, Project Team) to assess the costs and efficacies of green stormwater infrastructure (GSI) when used on 5-acre or smaller sites in the Northern Gulf of Mexico. Dr. Surbeck is the Chair of the University of Mississippi Department of Civil Engineering Department, Liya Abera is a PhD candidate in Civil Engineering, and Ms. Alexander is an attorney with the Mississippi-Alabama Sea Grant Legal Program.

The Project Team evaluated site plans in Biloxi, Mississippi, and Orange Beach, Alabama, to see how those sites could allow more GSI than what was built or planned. The Stormwater Modeling Report is available here: <http://masglp.olemiss.edu/projects/greeninfrastructure/files/determining-implementation-barriers-for-green-infrastructure-for-coastal-flood-control.pdf>. The Project Team also assessed the life-cycle costs of the GSI options found to be most effective at reducing stormwater runoff on each site. The Life-cycle Costs and Co-benefit Analyses Report is available here: <http://masglp.olemiss.edu/projects/greeninfrastructure/files/mascg-lcca-report.pdf>.

As part of the grant, Ms. Alexander analyzed the ordinances of the two cities and offered ordinance revisions to increase GSI usage in those cities consistent with the costs and efficacies determined in the first part of the project. This is a summary of what was discovered in the assessment of the Biloxi stormwater and land development ordinances. A chart is provided giving more detail and illustrating the concepts discussed herein.

The assessment considers how the City of Biloxi land development and stormwater ordinances address stormwater runoff and where those ordinances could be revised to allow for more GSI. Additionally, some of the recommendations are based on making the ordinances more accessible to stakeholders. The assessment is based on the hydrologic performance and life-cycle cost analyses performed by the Project Team, and also on a review of numerous other cities' ordinances with similar populations and climate. Also, while the project was being conducted, the Project Team met with Rick Stickler and Kristin Greger of the City of Biloxi's stormwater department on multiple occasions, asking for their input on ordinances and practices. The Project Team thanks Mr. Stickler and Ms. Greger for their assistance.

Overall

Biloxi substantially revised its ordinances in 2021, increasing the city's commitment to sustainable development. This revision occurred while the ordinance review was being conducted, and many of the recommendations generated prior to the revisions have been set aside.

While the stormwater and land development ordinances were revised, they still function separately, with few connections between the two. This could be improved. This report suggests several ways to do that. For example, a common feature in land ordinances is the use of landscaped buffers, especially between areas of different zoning. These buffers are an opportunity to require GSI to manage stormwater, such as by requiring a high infiltration rate in those areas.

Additionally, the two ordinances do not always share consistent terms. For example, stormwater ordinances refer to surfaces that can absorb liquid as being pervious, whereas the land development ordinances describe them as porous. A court may find that where the same or similar processes are defined differently, the ordinances are illegally vague or ambiguous.

One recommendation to make the ordinances more useful to stakeholders is to include links or other references to the outside sources and standards mentioned in the ordinances. These links could be provided in an index on the webpage(s) showing the ordinances, meaning the ordinances themselves would not have to be amended and the manuals and standards could be updated as needed. For example, that list could include a link to the Mississippi Department of Environmental Quality Erosion and Sediment Control Manual.

A significant obstacle in this category is the Administrative Manual. More than 30 references to the Administrative Manual were found in the stormwater and land development ordinances, however, no manual has been located. The Project Team asked City of Biloxi staff on more than one occasion where an Administrative Manual could be located, either a physical copy or an online reference, and they did not know. Searches for an online version did not point to the manual. It is difficult for stakeholders when ordinances to set standards that cannot be identified.

Introductory Language in Ordinances

Relevant Section: Sec. 16.5-1

The stormwater and land development ordinances include introductory language regarding their purpose and goals. This is a good place to ensure that the two sections include GSI and also reference each other in a consistent way. Adding language to ensure that, in the event of a perceived conflict, the provision most protective of the environment controls also would help to avoid problems with interpretation.

Definitions in Stormwater Ordinances

Relevant Sections: 16.5; 23-6-12

GSI can be introduced to Biloxi's ordinances by including relevant terms within definitions. Additionally, the review found that definition sections are a good way to ensure that the land development and stormwater ordinances coordinate as well as clarifying distinctions between similar terms. Suggestions include matching terminology, such as using permeable and impermeable, rather than variations such as porous or impervious.

Additionally, the definition of filtration suggests that aggregate and gravel provide adequate permeability for water to filter through, without clarifying that once compacted, these materials are not permeable and do not provide filtration. Adding "non-compacted" to the definition should eliminate any inconsistency that would approve compacted gravel driveway as providing filtration.

The Project Team recommends adding definitions for the following terms:

- **bioretention**
- **depressed bioretention facility**
- **enforceable maintenance agreement for stormwater facility management, and**
- **detention**
- **filtration**
- **infiltration rate**

- low impact development
- permeable paving material
- retention or detention ponds, and
- stormwater management devices

Stormwater Best Management Practices _____

Relevant Sections: numerous

The stormwater ordinances refer to Best Management Practices in more than 20 different places. The usage suggests there is a universal set of best management practices (BMPs) applicable to all sites, rather than those practices being assigned per site.

Additionally, while the land development ordinances discuss stormwater retention and detention ponds in Sec. 23-6(3)(H)(2)(a), there is no reference in the stormwater ordinances. Consider adding a reference to Sec. 23-6(3)(H)(2)(a) to the end of Sec 16.5-6(1), such as by saying “see also...” Likewise, at the end of Sec. 23-6-2(C)(4), add a reference to Sec. 16.5.

Maintenance of Stormwater Infrastructure _____

Relevant Sections: 16.5-8, 16.5-9

The goal of the ordinances related to maintenance and inspection of stormwater infrastructure is to clarify the roles for the lifetime of stormwater infrastructure. However, these provisions are not clear, such as *performance guarantee*, *maintenance agreement*, *covenant*, and *maintenance easement*. For example, it is not clear whether the maintenance agreement is the same thing as the covenant, as neither are defined. Also, the terms describing the easement are not terms generally associated with that type of legal document and could lead to unanticipated results.

One step to clarifying these provisions is to divide them into three sections:

- a section describing maintenance and inspection during construction to include performance guarantees;
- a section clearly identifying the maintenance and inspection agreements, covenants, and easements that remain in effect after construction is completed, including their specific conditions; and
- a section that describes the roles of the parties for maintenance and inspection for the lifetime of the stormwater infrastructure based on those agreements, covenants, and easements, including enforcement measures.

This would avoid misinterpretations, such as in Sec. 16.5-8(b)(1).b for which a fair reading of the current language is that the City will perform routine maintenance. Additionally, the frequent use of the “owner” when referring to the stormwater management facilities could lead to the misunderstanding that the owner of the facility itself, rather than the property owner where the facility is located, is responsible for lifetime maintenance.

Most concerning are the imprecise terms discussing the easement. For example, Sec. 16.5-8(b)(2).c states that the property owners will sign “the easement document” which is unclear as every other reference is to an “easement,” raising the question as to whether the “easement document” is different than the “easement.” That section next requires the property owners to “execute and record a covenant that runs with the land and binds the property” omitting that the easement must also be recorded. Finally, the language states: “This easement shall exist in perpetuity unless the city agrees upon a discontinuation of the easement.” Putting aside the fact that easements are formally “abandoned” or “extinguished,” rather than “discontinued,” because easements are property rights subject to the statute of frauds as well as being recorded instruments, a simple agreement cannot end an easement. Additionally, the City likely cannot end its interest in real property without following its internal procedure on the record, rather than a simple agreement.

Changes to Land Development Ordinances to Reduce Stormwater Runoff _____

Relevant Sections: Table 23-6-2(D)(2), Sec. 23-6-3(D)(2)(c)

Land development ordinances are a good place for municipalities to acknowledge GSI and to make changes to reduce stormwater runoff. Biloxi recognizes this and has increased its sustainable development mission in the 2021 revisions. However, some other modifications could also reduce runoff.

Parking lots are a challenge for managing runoff as they are large impermeable areas. One way to allow for more water filtration is to reduce the number of parking spaces, primarily at those parking lots that are not used daily. The Project Team recommends reducing number of paved parking places while allowing increased spaces on unpaved, maintained areas at churches and arboretums, botanic gardens, and parks. This allows “event” parking for larger crowds on special days without the loss to water filtration that having impermeable parking for maximum capacity causes.

Another way the land development ordinances could allow for more stormwater runoff is in the description of the curbs. Currently, the provision is directed at protecting landscaping from vehicles. It could be revised to ensure that curbs do not obstruct water from the parking lots to flow into landscaped areas. This should be paired with a requirement that landscaped areas are installed to a grade below the impermeable areas to allow for runoff.

More generally, the language in the land development ordinances uses many terms to describe a surface’s ability to absorb liquids: permeable, impermeable, impervious, porous, semi-pervious, and semi-porous. This does not lead to regulatory clarity. The Project Team recommends using permeable and impermeable throughout stormwater and land development ordinances for consistency, and note that “semi-pervious” and “semi-porous” have no meaning distinct from permeable. If the goal is to establish a standard of absorption for certain areas, it would be better to establish that standard by setting an infiltration rate, rather than using vague terms such as semi-porous.

Additional Recommendations _____

The stormwater ordinances would be more easily used by stakeholders if their form was consistent with the other ordinances. For example, the land development ordinance would identify a section like this: 11-1(A)(1)(a) (hypothetically). Whereas, using the form found in the stormwater ordinances, that section would look like this: 11-1(a)(1).a. The different formats are confusing.

One note regarding the revised ordinances new terminology. Biloxi all but eliminated Low Impact Development in 2021 revisions, using Sustainable Development Features instead. However, Table 23-6-12(C)(4) still uses the term “Low Impact Development.” This would also be a good place to reference GSI.

Topic	Existing Ordinance	Comments	Proposed Modification
Overall			
General: Reference	<p>Administrative Manual is referenced in these sections:</p> <p>Sec. 16.5-3(c), (c)(3), (e)(2) Sec. 16.5-4(a)(2).a Sec. 16.5-6 (intro paragraph), (1) Sec. 16.5-7(2) Sec. 16.5-8(b)(1).c, (b)(2).d Secs. 16.5-9(a), (b) Sec. 16.5-14(a)</p> <p>Sec. 23-2-2(F)(1)(a)(3)(B), (F)(2)(c)(2),(F)(3)(c)(2), (F)(4)(b), (F)(5)(B),</p> <p>Sec. 23-2-3(C)(2), (C)(3), (C)(4),</p> <p>Sec. 23-2-4(H)(4)(a), Sec. 23-3-5(E)(5)(b) Sec. 23-4-3(B)(1)(i)(3), (D)(10)(c)(10)(F)</p> <p>Sec. 23-6-3(C)(2), (C)(3)(b)(1), (G)(5)(d)</p> <p>Sec. 23-7-4(E), (G), (H) Sec. 23-7-5(B)(1), (D) Sec. 23-7-7(C)(4) Sec. 23-7-8(B)(2) Sec. 23-10-2 ¶ 8 (“Administrative Manual”, defined)</p>	<p>Assessment: Multiple references to the Administrative Manual but cannot locate one.</p>	<p>Recommendation: Eliminate all references to the Administrative Manual until one can be found and made available online.</p>
Stormwater			
Citation		<p>Assessment: Citation format using lower-case letters twice, rather than an upper-case and lower-case, makes citations awkward and misleading. It also is inconsistent with how the zoning ordinances are identified.</p> <p>In Definition section could add subsection identifier to each term to make references easier.</p>	<p>Ex: The section below would be cited as Sec. 16.5-8(a)(2).a. If standard code practices were followed it would be Sec. 16.5-8(A)(2)(a), making it less likely the second “a” caused confusion. This is how the land use ordinances are coded.</p> <p>Alternatively, and to make fewer revisions to existing ordinances, the second instance of the lower-case letter could be switched to upper-case and put in parenthesis: Sec. 16.5-8(a)(2)(A).</p> <p>Sec. 16.5-8. - Performance guarantees and maintenance agreements.</p> <p>(a)Stormwater management practice/BMP performance guarantees.</p> <p>(2)Amount of performance guarantee.</p> <p>a. The amount of the performance security</p>

Topic	Existing Ordinance	Comments	Proposed Modification
Stormwater			
Best Management Practices	<p>All references to BMP Sec. 16.5-4(a)(2)(b), (a)(4)(d)(3), (a)(5)(b) Sec. 16.5-5. (all but (e)) Sec. 16.5-6(2).b, c, and d. Sec. 16.5-7(1) Sec. 16.5-8(a)(1), (a)(2).b, (a)(3), (a)(4).b, (a)(5).a.2, (a)(5).b. Sec. 16.5-8(b)(1).a.3, (b)(1).b, (b)(2).d, (b)(2).e. Secs. 16.5-9(a), (b), (b)(1).a.3, (b)(1).b.3, (b)(1).b.4, (b)(2).c.3, (c). Sec. 16.5-14 (all). Sec. 16.5-18(2)(e).</p>	<p>Assessment: The references suggest there is such a thing as a universal BMP.</p>	<p>Definition added to clarify BMPs are site-specific.</p>
General Purposes	<p>Sec. 16.5-3(c)(3). Nonstructural practices, such as pervious pavers and green roofs ... in the Administrative Manual, will be used on the site that reduce:</p> <ol style="list-style-type: none"> a. The generation of stormwater from the site; b. The size and cost of stormwater storage; and c. The pollutants generated at the site. <p>Use of porous: Sec. 23-5-4(A)(1) only.</p>	<p>Assessment: Improve how ordinances relate to each other.</p> <p>Match terminology with zoning: pervious used here, porous used in zoning.</p> <p>Include links to outside sources.</p>	<p>Revise: Sec. 16.5-1 (c) General purpose and intent. The purpose of this chapter is to protect and safeguard the public health, safety, and general welfare of the citizens and landowners of Biloxi through the establishment of minimum stormwater management requirements and flood damage prevention controls. These requirements are to be read consistently with the Land Development Ordinances, and the language leading to more effective stormwater runoff reduction shall control.</p> <p>Revise: Sec. 16.5-3(c)(3) Nonstructural practices, such as permeable pavers and raingardens, consistent with those found in Table 23-6-12(B), will be used on the site to reduce:</p> <ol style="list-style-type: none"> a. The generation of stormwater from the site; b. The size and cost of stormwater storage; and c. The pollutants generated at the site. <p>Revise: Sec. 16.5-6: Unless judged by the city to be exempt or granted a waiver, the following performance criteria shall be addressed in the site's SWPPP, as further detailed in the Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas (https://www.mdeq.ms.gov/wpcontent/uploads/2017/05/Vol_ume_1-1.pdf)</p> <p>(1) All site designs shall establish stormwater management practices to control the peak flow rates of stormwater discharge associated with a 100-year, 24-hour design storm, or as otherwise specified in Sec. 16.5-27(a) whichever is more severe, and reduce the generation of stormwater. These practices should use permeable materials to absorb and reduce stormwater runoff from impermeable surfaces to maximize the treatment of both water quality and quantity to the extent practicable. (See also Sec. 23-6.12, Sustainable Design).</p>

Topic	Existing Ordinance	Comments	Proposed Modification
Stormwater			
<p>Definitions</p>	<p>Sec. 16.5-5 BMP selection is site specific, dependent upon site conditions and proposed activities, thus each project's MDEQ- or city-approved SWPPP will identify appropriate pre-construction, construction and post-construction BMPs that will be subject to ongoing inspections by the city.</p>	<p>Assessment: Definitions are needed</p> <ul style="list-style-type: none"> • bioretention • enforceable maintenance agreement for stormwater facility management • infiltration rate (?) • low impact development (especially if Administrative Manual cannot be located) • permeable paving material (also referencing porous, in case they don't remove references in zoning) • retention or detention ponds • stormwater management devices <p>Clarify that aggregate driveways do not provide filtration</p>	<p>Add definitions:</p> <p><i>Best Management Practices</i> depend on the site conditions and proposed activities and are identified within an approved stormwater pollution prevention plan.</p> <p><i>Depressed Bioretention Facility:</i> A grassy depression with a high infiltration rate, designed to capture runoff from 100-year 24-hour storms, preferably planted with native plants and trees is an effective, sustainable method to control stormwater runoff. The depressed bioretention facility need not be conduit to natural waterways, but can act as a natural detention facility.</p> <p><i>Detention</i> shall mean the collection and temporary storage of stormwater in such a manner as to limit the post-development peak discharge to pre-development peak discharge rates, with subsequent gradual release of the stormwater. <i>See also Retention.</i></p> <p><i>Enforceable Maintenance Agreement</i> shall refer to a legally-enforceable agreement in the form of a covenant assigning the perpetual maintenance and repair obligations for a property's stormwater facility management facility and includes all easements needed to allow reasonable access to the site by the City of Biloxi.</p> <p><i>Filtration</i> shall mean the selective removal of suspended matter from stormwater by passing the water through natural or artificial devices or through at least two feet of suitable fine textured granular media such as porous soil, uniformly graded sand, and/or non-compacted gravel or other natural or artificial non-compacted permeable aggregate, which may be used in conjunction with filter fabric and/or underdrain pipe.</p> <p><i>Green stormwater infrastructure:</i> Systems and practices that use or mimic natural processes to achieve infiltration, evapotranspiration or use of stormwater in ways that limit runoff and protect water quality. <i>See also, Sustainable Design, Sec. 23-6.12.</i></p> <p><i>Hydraulic Conductivity:</i> the property of soil to allow water movement through it.</p> <p><i>Impermeable:</i> Surface that is highly resistant to the absorption of fluids.</p>

Topic	Existing Ordinance	Comments	Proposed Modification
Stormwater			
Definitions (cont.)			<p><i>Infiltration Rate:</i> the rate at which water passes through a type soil.</p> <p><i>Low impact development:</i> Systems and practices such as green stormwater infrastructure that use or mimic natural processes that result in the infiltration, evapotranspiration or use of stormwater in order to limit runoff and protect water quality. See also, <i>Green Stormwater Infrastructure</i>, or Sustainable Design Sec. 23-6.12.</p> <p><i>Retention</i> shall mean the collection and temporary storage of stormwater in such a manner as to provide treatment through physical, chemical, or biological processes, with subsequent gradual release of the stormwater by percolation through soil or by evapotranspiration. See also, <i>Detention</i>.</p>
Terminology	<p>Sec. 16.5-6: Site designs ... should seek to utilize pervious areas for stormwater treatment and to infiltrate stormwater runoff from driveways, sidewalks, rooftops, parking lots, and landscaped areas to maximize to the extent practicable treatment for both water quality and quantity.</p> <p>Sec. 23-6-3(D)(4) Incentives (a)(3) Permeable parking surfacing is used for 20 percent or more of the total vehicular use area.</p>	<p>Assessment: Improve how ordinances relate to each other.</p> <p>Match terminology with zoning, avoiding porous, using permeable.</p> <p>Shorten for clarity Sec. 16.5-6.</p> <p>Add preferred stormwater maintenance facility of depressed bioretention facility.</p>	<p>Revise:</p> <p>Sec. 16.5-6:</p> <p>(1) ... These practices should use permeable materials to absorb and reduce stormwater runoff from impermeable surfaces to maximize the treatment of both water quality and quantity to the extent practicable. (See also Sec. 23-6.12, Sustainable Design).</p> <p>(3) To the extent practicable, sites should reduce stormwater runoff via a depressed bioretention facility with a high infiltration rate, preferably planted with native plants and trees.</p> <p>(4) Ditches shall capture runoff from 100-year 24-hour storms to act as natural detention facilities. They do not need to act as a conduit to natural waterways.</p>

Topic	Existing Ordinance	Comments	Proposed Modification
Stormwater			
Responsibility for Post Construction Maintenance		<p>Assessment: different terms are used in Sec. 16.5-8 without clearly defining those terms: performance guarantee, maintenance agreement, covenant, maintenance easement. Vagueness and ambiguity are the death knell of laws.</p> <p>Ex. Is the “enforceable maintenance agreement” the same thing as the “covenant”? Need for these two documents to be clearly identified.</p> <p>Assessment:</p> <p>Sec. 16.5-8(b)(1) misidentified as being “general” when it defines what must be included in a Maintenance Agreement</p> <p>Assessment: Sec. 16.5-8(b)(2).c misidentified as the term of a maintenance agreement</p>	<p>Change: Divide into sections New Sec. 16.5-8 Performance guarantees to include what is required to be promised during the construction phase (using language from Sec. 16.5-8(1)).</p> <p>New Sec. 16.5-9 Maintenance Agreements and Maintenance Easements to define what responsibilities exist after construction is complete, using language from existing Sec. 16.5-8(2) (with revisions shown herein).</p> <p>New Sec. 16.5-10 Lifetime Maintenance of Project Using portions of existing Sec. 16.5-9 (with revisions shown herein)</p> <p>If not going to restructure then make the following change starting with: Change Sec. 16.5-8(b)(1) Maintenance Agreements</p> <p>Sec. 16.5-8(b)(2).c Term of Maintenance Easement</p>
	<p>Sec. 16.5-8(b)(1).b The maintenance agreement will include any and all maintenance easements required to access and inspect the stormwater treatment practices and to perform routine maintenance as necessary.</p>	<p>Assessment: This suggests that routine maintenance will be performed by the City.</p> <p>Assessment: Reference to a covenant is confusing as it is not described or defined.</p>	<p>Revise: Sec. 16.5-8(b)(1).b. The Enforceable Maintenance Agreement specifying the parties responsible for the lifetime maintenance of stormwater facilities will include all maintenance easements required for the city to access and inspect the stormwater treatment practices and to perform routine maintenance as necessary at the expense of the property owner in perpetuity, and shall function as a legally binding covenant specifying the parties responsible for the proper maintenance of the BMPs. The Enforceable Maintenance Agreement shall be secured prior to issuance of any permits for land disturbance activities.</p>
	<p>Sec. 16.5-8(b)(2).c</p>	<p>Assessment: Section (2).c’s language could be clearer that there are two documents both of which have to be filed and recorded, and both of which run with the land: the easement and the covenant. And that the owners of the land sign the covenant.</p>	<p>Sec. 16.5-8(b)(2).c Term of Maintenance Easement The property owners with a recorded interest in the property shall execute and record the easement and a covenant that runs with the land.</p>

Topic	Existing Ordinance	Comments	Proposed Modification
Stormwater			
	<p>Sec. 16.5-8(b)(2).c The owners with a record interest in the property shall sign the easement document, and execute and record a covenant that runs with the land and binds the property. This easement shall exist in perpetuity unless the city agrees upon a discontinuation of the easement.</p>	<p>Assessment: Covenant not clearly distinguished from maintenance agreement and maintenance easement, nor its terms defined.</p> <p>Rather than create a third document, make maintenance agreement an enforceable covenant filed with the property.</p> <p>Assessment: Easements are a formal property right that cannot disappear because one party “agrees” to do so. Need to add language more appropriate to how easements are described legally.</p>	<p>c. Term of documents to ensure lifetime maintenance of stormwater facilities.</p> <p>The owners with a record interest in the property shall sign the easement document, and execute and record the Enforceable Maintenance Agreement that runs with the land and binds the property. This easement shall exist in perpetuity unless the city formally extinguishes the easement by filing the appropriate documentation revoking the easement and dissolving the Enforceable Maintenance Agreement. The city shall provide written notice to the party that owns the property at the time of filing the documents extinguishing the easement.</p>
	<p>Sec. 16.5-9</p>	<p>Assessment: Not clear that “owner” means owner of the property, especially problematic in HOA situations.</p>	<p>Revise Sec. 16.5-9– Inspection and Maintenance:</p> <p>(a) It is the property owner’s responsibility to ensure that required pre-construction and construction BMPs are installed, function properly and are adequately maintained to protect the city’s stormwater management system.</p> <p>(b) To ensure the proper installation, maintenance and operation of temporary and permanent BMPs by the property owner, ...</p> <p>(b)(2) Post-construction.</p> <p>a. Post-construction, the property owner shall perform or cause to be performed ...</p> <p>(c) To rectify deficiencies indicated by stormwater management BMP inspections, the community development director, in cooperation with the city engineer, shall:</p> <p>(1) Notify the property owner by certified letter and also at the time the deficiencies are discovered notify orally the property owner, agent, and/or the person doing the work of the deficiencies, including a timeframe for repairs.</p>
	<p>Sec. 16.5-8(b)(2).c</p>	<p>Assessment: Section (2).c’s language could be clearer that there are two documents both of which have to be filed and recorded, and both of which run with the land: the easement and the covenant. And that the owners of the land sign the covenant.</p>	<p>Sec. 16.5-8(b)(2).c Term of Maintenance Easement The property owners with a recorded interest in the property shall execute and record the easement and a covenant that runs with the land.</p>
Design Storm	<p>Sec. 16.5-27: 100-year, 24-hour</p>		

Topic	Existing Ordinance	Comments	Proposed Modification
Land Development			
Parking Spaces	<p>Table 23-6-2(D)(2): Minimum Number of Off-Street Parking Spaces. (Public and Institutional Use Classification; Community Services use category)</p> <p>Place of worship: 1 per 8 seats in principal assembly area.</p> <p>Arboretum, botanical garden, park:</p> <p>1 per 250 sf + 1 per 4 persons of maximum outdoor facility capacity</p>	<p>Assessment: Reduce number of paved parking places while allowing increased spaces on unpaved, maintained areas at churches and arboretum, botanic gardens, and parks.</p> <p>Unclear what maximum outdoor facility capacity they are talking about at parks. If they are stadiums, it should be phrased in terms of seating, not how many people will fit in a ballfield.</p>	<p>Table 23-6-2(D)(2)</p> <p>Places of worship: 1 per 10 seats in the principal assembly area may be paved; an additional parking place per two seats may be created in sodded, maintained areas.</p> <p>Arboretum or Botanical Garden: 1 per 250 sf + 1 per 6 persons of maximum outdoor facility capacity; an additional parking place per 2 persons may be created in sodded, maintained areas.</p> <p>Park (Private or Public): 1 per 250 sf + 1 per 6 persons of maximum outdoor facility capacity; an additional parking place per 2 persons may be created in sodded, maintained areas.</p>
Landscaping	<p>Sec. 23-6-3(B) Purpose and Intent of Landscaping...</p> <p>(4) Reducing stormwater runoff and the costs associated therewith</p> <p>Sec. 23-6-3(E)(2) all development shall provide a perimeter landscape buffer to separate it from a different existing use on abutting land, or from vacant abutting land in a different zoning district.</p>	<p>Assessment: New point system under Sustainable Development needs to be tried.</p>	<p>No change based on new ordinances.</p>
Curbs	<p>Sec. 23-6-3(D)(2)(c)</p> <p>All planting areas shall be protected from vehicle damage by the installation of curbing, wheel stops, or other comparable methods. This standard shall not prohibit the use of planting areas as on-site stormwater management devices.</p>	<p>Assessment: Change to clarify that curbing will not obstruct water flow to landscaped areas.</p>	<p>Revise: Sec. 23-6-3(D)(2)(c) to include at the end:</p> <p>... Protective curbing around landscaped areas will leave openings for the flow of water onto unpaved areas. Landscaped areas and perimeter areas shall be so graded as to receive a reasonable portion of the rainfall from the surrounding pavement.</p>
Description of landscaping in connection with stormwater runoff reduction	<p>Sec. 23-6(3)(H)(1-2)</p>		<p>Revise: Sec. 23-6(3)(B)(3) Mitigating against erosion and sedimentation caused by stormwater runoff and other flooding events</p> <p>Add: Sec. 23-6(3)(C)(6) Berms (e) In no case shall a berm that increases stormwater runoff from a site be allowed without prior approval of green stormwater infrastructure to install offset any increase in stormwater runoff.</p>

Topic	Existing Ordinance	Comments	Proposed Modification
Land Development			
<p>Permeable Definition;</p> <p>Percentage of Impermeable Surface</p>	<p>Uses “porous paving material” in places</p> <p>Sec. 23-5.4(A) - Maximum Impervious Surface Area (1) Increase for Use of Porous Paving Material</p> <p>The maximum impervious surface area standard in Table 23-5-2, Intensity and Dimensional Standards, may be increased by five percentage points (e.g., from 60 to 65 percent) for any lot on which at least 50 percent of the nonstructural impervious surface area (e.g., driveways, sidewalks, parking areas, and patios) is paved with porous paving material.</p> <p>Sec. 23-5-3 (F) - Impervious Surface Area (as a percentage of lot area) shall be determined by dividing the total horizontal area of impervious surfaces located or proposed on a lot by the total horizontal land area within the boundaries of the lot, then multiplying by 100.</p> <p>Sec. 23-6-2(C)(4) The use of pervious or semi-pervious parking area surfacing materials—including, but not limited to, grass, mulch, “grass-crete,” or recycled materials such as glass, rubber, used asphalt, brick, block, and concrete—may be approved for up to 25 percent of the required off-street parking and loading areas on a site, provided such areas are properly maintained.</p>	<p>Assessment: Inconsistent use of permeable, impermeable, impervious, porous. Also “semi-pervious” and “semi-porous” have no meaning distinct from pervious or porous.</p> <p>Exs. Permeable is term used in Table 23-6-12(B); sustainable development options, zoning code uses impermeable and impervious; Sec. 23-5-3(F) uses impervious; Sec. 23-5-4(A)(1) uses porous; Sec. 23-6-2(C)(4); uses “pervious” and “semi-pervious”; Sec. 23-6-2(C)(4) – Alternative Materials uses porous/semi-porous. <i>But see</i> Sec. 23-5-4(A) - Maximum Impermeable Surface Area.</p> <p>Assessment: Need reference to this within stormwater ordinances.</p> <p>Add reference to Sec. 23-6-12 in Sec. 16-5.6(1).</p>	<p>Revise: Table 23-3-2(B): Impermeable surface area, max. (% of lot area): 40</p> <p>Table 23-3-2(D): Impermeable surface area, max. (% of lot area): 40</p> <p>Sec. 23-5-3(F) - Impermeable Surface Area Impermeable surface area (as a percentage of lot area) shall be determined by dividing the total horizontal area of impermeable surfaces located or proposed on a lot by the total horizontal land area within the boundaries of the lot, then multiplying by 100.</p> <p>Sec. 23-5-4(A)(1) Increase for use of permeable paving material</p> <p>The maximum impermeable surface area standard in Table 23-5-2, Intensity and Dimensional Standards, may be increased by five percentage points (e.g., from 60 to 65 percent) for any lot on which at least 50 percent of the nonstructural impermeable surface area (e.g., driveways, sidewalks, parking areas, and patios) is paved with permeable paving material.</p> <p>Sec. 23-6-2(C)(4): Alternative Materials</p> <p>The use of permeable parking area surfacing materials—including, but not limited to, grass, mulch, “grass-crete,” or recycled materials such as glass, rubber, used asphalt, brick, block, and concrete—may be approved for up to 25 percent of the required off-street parking and loading areas on a site, provided such areas are properly maintained to retain permeability. Where possible, such materials should be used in areas proximate to and in combination with on-site stormwater control devices. (See Stormwater Management Ordinance 16.5)</p> <p>Revise: Sec. 23-6-3(D)(4) Incentives (a)(3) Permeable parking surfacing is used for 20 percent or more of the total vehicular use area.</p>

Topic	Existing Ordinance	Comments	Proposed Modification
Land Development			
Stormwater Pond/ Bioretention	<p>Sec. 23-6-3(H) These provisions are intended to encourage stormwater retention or detention ponds to be located and configured as an open space amenity. (if a utility it has to be screened)</p> <p>(b) Land area occupied by stormwater management devices, including retention or detention ponds shall be counted towards the open space set-aside requirement (See Sec. 23-6-6)</p>	<p>Assessment: No reference to stormwater retention /detention ponds in stormwater ordinances.</p>	<p>Add: as the last sentence of Sec. 16.5-6(1)</p> <p>Designs shall be consistent with the provisions of Sec. 23-6-3(H) and use green stormwater infrastructure as retention or detention ponds and depressed bioretention facilities to the extent practical.</p> <p>Add: Sec. 23-6-3(H)(1) These provisions are intended to encourage stormwater retention or detention ponds and bioretention facilities to be located and configured as an open space amenity.</p>
Buffer	<p>Sec. 23-6-3(E) – too complicated to explain. 10-20’ wide; different opacities, some 20’ tall.</p> <p>(E)(7) sidewalks are allowed in buffers, but minimized. Otherwise not supposed to have any impermeable surfaces....Landowner responsible to replant required vegetation in buffer.</p>	<p>Assessment: need to improve ability of buffers to serve as stormwater management tools.</p>	<p>Add:</p> <p>Table 23-6-3(E)(3): Buffer Types: 5. Where practicable, buffers of at least 100 square feet, shall include a raingarden or other green stormwater infrastructure sized to hold stormwater runoff from between 5 and 10 percent of the impervious area draining to it, with native plants planted in a sand/soil matrix soil bed with a mulch cover layer.</p>
Green Stormwater Infrastructure	<p>Table 23-6-12(C)(4): Menu of Sustainable Features</p> <p>Use of Low Impact Development (LID) techniques instead of retention or detention ponds for stormwater management.</p>	<p>Assessment: Biloxi all but eliminated Low Impact Development in 2021 revisions. Uses “Sustainable Development Features” except in this provision.</p>	<p>Revision to Resource Conservation:</p> <p>Use of Green Stormwater Infrastructure techniques instead of retention or detention ponds for stormwater management</p> <p>Add: Table 23-6-12(C)(4): Menu of Sustainable Features:</p> <p><i>Depressed Bioretention Facility:</i> A grassy depression with a high infiltration rate, designed to capture runoff from 100-year 24-hour storms, preferably planted with native plants and trees is an effective, sustainable method to control stormwater runoff. The depressed bioretention facility need not be conduit to natural waterways, but can act as a natural detention facility.</p>