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MEMORANDUM

To: Jennifer Walls (DNREC); Jennifer Volk (DNREC); Lee Ann Walling (DNREC); Bryan Hall (OSPC); John McDonnell (Town of Greenwood)

From: Eugenia Hart and Kimberly Brewer

Date: March 26, 2012

Subject: Opportunities for Local Code Revisions to Allow Low Impact Development Techniques

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1 Introduction

Delaware has developed a Watershed Implementation Plan (WIP) to accompany and meet the Chesapeake Bay nutrient and sediment total maximum daily loads (TMDLs). The WIP lays out plans for addressing existing pollutant loads to the bay as well as new pollutant loads from future land use changes. Concurrently, Delaware's Department of Natural Resources and Environmental Control (DNREC) has revised the state's Sediment and Stormwater Regulations to provide additional water resource protection, including specifying performance standards that must be met on new construction and development sites.

As new development and redevelopment is proposed in the future, development applicants will need flexibility in site design and multiple tools in order to meet the WIP and sediment/stormwater management requirements. A number of communities have used low impact development (LID) and conservation design that allow both development flexibility and effectiveness in meeting resource protection and community goals. However, there are often unintended barriers to these techniques in local ordinances. These barriers typically include code provisions for setbacks, landscaping, streets, and parking.

Tetra Tech has been asked by DNREC to assist local Delaware municipalities and counties in the Chesapeake Bay watershed with a review of their existing local codes to identify barriers to and opportunities for LID and conservation design techniques. The local jurisdictions that were contacted and were part of this review included Bethel, Blades, Bridgeville, Delmar, Georgetown, Greenwood, Laurel, and Seaford, as well as Kent and Sussex counties.

In the first series of memos for this project, Tetra Tech summarized for each local government the barriers found in its review of local subdivision ordinances, zoning ordinance, sedimentation and erosion control ordinance, onsite wastewater regulations, and street design standards. The codes and ordinances were reviewed based on an Ordinance Review Checklist relating to the following seven goals (*Note: see first series of memos for a copy of the Ordinance Review Checklist and key findings.*):

1. Minimize Effective or Connected Impervious Area
2. Preserve and Enhance the Hydrologic Function of Unpaved Areas

3. Harvest Rainwater
4. Allow and Encourage Multi-Use Stormwater Controls
5. Manage Stormwater to Meet WIP and DNREC Regulations
6. Manage Construction Site Stormwater to Meet WIP and DNREC Regulations
7. Manage Onsite Wastewater Systems to Meet WIP and DNREC Regulations

There were many common barriers identified across the jurisdictions. Local governments reviewed the memos for their respective jurisdictions, and provided corrections and suggestions for revisions, as needed. On the whole, the local governments had only minor revisions and concurred with the barriers identified.

The intent of this memo is to provide example code language that the local governments can consider adopting to address the barriers and opportunities identified. Different approaches and a number of different wording options are provided for each barrier, so local governments can determine which approach or option(s) might be most appropriate for their jurisdiction. Note that these code revisions are not mandatory. They are offered only as examples of how to incorporate language into codes and ordinances to provide more flexibility and effectiveness in meeting resource protection goals and regulations.

2 Optional Example Code Language to Address Common LID Barriers

This section contains a summary of the types of alternative code language provided for each of the seven goal categories listed above. Table 1 lists typical zoning and subdivision code barriers (again by goal category) and specific approaches and example code language to address each barrier. Local governments can use Table 1 to determine which barriers are most important in their jurisdiction and which code revision options are most suitable for their community.

Throughout the example code language, reference is made to a "LID design manual." It is recommended that local governments refer to the *Delaware NEMO Guide to Natural Resource-Based Planning* (Delaware Sea Grant College Program 2005) to further encourage and facilitate the use of LID best management practices (BMPs). The *NEMO Guide to Natural Resource-Based Planning* was developed to provide an overview of LID principles and practices to guide local planning commissions and councils as they make decisions on what to preserve and where to develop. The Guide can be found at the following website: http://nemo.udel.edu/lid.aspx

2.1 Goal #1: Minimize Effective or Connected Impervious Area

The most important code barriers to minimizing impervious area relate to allowing LID BMPs in street and parking areas (e.g., parking medians, grass strips between sidewalk and curb, swales, etc.) and allowing narrow street pavement and travel lane widths. Example code language includes exceptions to pavement width and curb requirements based on the use of LID practices, as well as allowance of permeable paving material (for on-street parking, alleyways, driveways, sidewalks, and portions of off-street parking areas). Example code language is provided to address off-street parking requirements that yield unnecessarily large impervious area (and costs). Finally, some codes limit cluster development to one zoning district only or have no provision for this type of development. Likewise, some codes do not allow conservation or open space design. Tetra Tech found excellent examples of cluster development and conservation design provisions in some of the Delaware community codes, and provided these as examples for other communities to consider.

2.2 GOAL #2: PRESERVE AND ENHANCE THE HYDROLOGIC FUNCTION OF UNPAVED AREAS

In a number of communities, the local regulations currently allow disturbance of riparian areas, erodible soils, steep slopes, areas surrounding wetlands, and areas of high soil infiltration. However, some local codes reviewed have code provisions that encouraged or required protection of these areas to help preserve overall hydrologic function of the development site. Several examples are provided for consideration.

2.3 GOAL #3: HARVEST RAINWATER

Code language governing setbacks and roof design limit rainwater harvest and green roof features. Example code language is provided regarding exceptions to facades and street walls, building setbacks, and rooftop design to allow for rainwater harvesting and green roof systems.

2.4 GOAL #4: ALLOW AND ENCOURAGE MULTI-USE STORMWATER CONTROLS

In most local codes, LID techniques such as bioretention, bioswales, and constructed wetlands are effectively not allowed in required planting strips, landscape, screening, and open space areas, and/or not given credit as a percentage of the development site required to be in open space, landscaping, and other planting areas. Tetra Tech identified many related code barriers that represent significant opportunities for code amendments that would provide more flexibility in site design and for stormwater controls that can meet multiple community uses.

2.5 GOAL #5: MANAGE STORMWATER TO MEET WIP AND DNREC REGULATIONS

DNREC's draft Sediment and Stormwater Regulations for post-construction stormwater management apply to developments disturbing more than 5,000 square feet. The regulations include onsite retention/ infiltration performance standards, resource protection and channel protection criteria, and flood mitigation criteria. Development applicants are required to submit a stormwater management plan to show that criteria have been met. The regulations also include requirements for an operations and maintenance plan, and routine maintenance reviews by a certified inspector for the stormwater BMPs. DNREC or its Delegated Agency (such as the County Conservation Districts) will administer the State Sediment and Stormwater Regulations.

Since the DNREC regulations directly affect design and construction of new development projects and redevelopment of existing developed sites, it is advisable that the local municipality or county permits be contingent on proof of approved plans from DNREC or its Delegated Agency. A key gap in the implementation of DNREC's sediment and stormwater regulations is the lack of a code provision designating the party responsible for maintenance and repair of the stormwater BMPs on private property. It is recommended that local jurisdictions consider adopting code language referencing the operations and maintenance plan required by DNREC, and requiring that the plan specify the Property Owners Association or other party responsible for maintenance of the BMPs, as well as the mechanism(s) for funding maintenance and repairs. Local governments could also adopt a requirement that DNREC's performance criteria be met using LID or a combination of LID and conventional stormwater measures. Example language is provided in the Table 1.

Finally, there were no provisions in the local ordinances for offsite mitigation when onsite management does not meet the performance criteria. DNREC is in the final phases of developing an offset tool called the *Nutrient and Sediment Loading Assessment Protocol*. Note that the tool is scheduled to be completed in early 2012 and DNREC will be providing training on how to use the *Nutrient and Sediment Loading Assessment Protocol*. The tool allows developers to determine whether or not a proposed development plan meets the TMDL requirements for a particular watershed or a particular site. This is a useful tool in determining whether or not a proposed development meets the TMDL or will need additional onsite

management or offsite mitigation. Local governments may want to consider requiring developers to use this tool during the planning process before presenting the site plan to the planning and zoning commission for review. Table 1 provides example language requiring use of this tool during development plan review. It also provides optional code provisions for allowing a number of specific offsite mitigation measures that could be used in addition to DNREC's proposed payment-in-lieu program. Adoption and implementation of local off-site mitigation measures should be coordinated with DNREC.

2.6 GOAL #6: MANAGE CONSTRUCTION SITE STORMWATER TO MEET WIP AND DNREC REGULATIONS

DNREC's draft sediment and stormwater regulations require construction site stormwater management controls to be put in place for all construction activities exceeding 5,000 square feet of disturbance. As stated above, it is recommended that local jurisdictions consider adopting code language to clarify roles and responsibilities of the local jurisdiction and DNREC or its Delegated Agency in implementing these requirements.

2.7 GOAL #7: MANAGE ONSITE WASTEWATER SYSTEMS TO MEET WIP AND DNREC REGULATIONS

In unincorporated areas, there are cases where subdivision plans and lots are approved with proposed on-site wastewater treatment and without prior evaluation regarding septic system suitability or feasibility. Where subdivisions are not required to connect to the municipal sewerage system, it is recommended that local governments require an approved site evaluation for an on-site wastewater system prior to final plat approval and/or recordation of the lots.

3 Conclusions

Using LID techniques often requires flexibility in site and stormwater plan design in order to employ the BMP on a proposed development parcel. Review of the local jurisdictions' ordinances revealed some direct barriers to the use of LID techniques, such as specifications and allowances for required screening, landscape and open space areas. Additionally, in some cases, the review of the ordinances identified barriers of omission: by not expressly allowing the LID technique or providing for exemptions, the ordinances generate uncertainty regarding approval and thus unintentionally provide disincentives for some LID practices.

To allow or encourage the use of LID techniques, and thus provide more flexibility in meeting state and local resource protection goals, local jurisdictions can consider amending the text of local subdivision and zoning codes to address existing barriers. Moreover, it is recommended that new ordinance language be adopted that would help clarify the local jurisdictions' and DNREC roles in implementing the state's Sediment and Stormwater Regulations. There are a number of approaches and example code language that can be drawn on from other areas to address the barriers identified. Local governments can use Table 1 to determine which code barriers are most important to address in their jurisdiction and which code revision options are most suitable for their community.

Table 1. Potential Code Revisions to Allow or Encourage LID

GOAL #1: MINIMIZE EFFECTIVE OR CONNECTED IMPERVIOUS AREA

Objective: Minimize impervious area associated with streets.

Objective: Minimize impervious area associated with parking.

Objective: Minimize impervious area associated with driveways and sidewalks.

Objective: Clustering development.

Objective: Incorporate sustainable hydrology practices into urban redevelopment.

Typical Barrier	Optional Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
Overall Effective Impervious Area		
• Where impervious area definitions exist in codes, they are general and include impervious area connected to storm drain system (effective impervious area) as well as impervious area disconnected from storm drain system. This is a disincentive for disconnecting impervious area.	Define or refine impervious area in codes to be effective impervious area only.	"Effective Impervious Area: Amount of the development site that is directly connected to the storm drain system."
Streets		
• The paving width of residential streets is typically required to be greater than 36 feet and travel lanes required to be greater than 12 feet.	Amend zoning ordinance and/or subdivision ordinance provisions for right-of-way and paving widths, to allow exceptions for narrower streets. Encourage LID practices such as curb pullouts with bioretention to allow for passing of larger vehicles and enhanced stormwater management.	"An exception to a requirement of a paving width for 36 feet or more for residential streets may be recommended by the Planning Commission to the Mayor and Town Council on the merits of a particular case upon consideration of the following criteria: type of curbing, building heights, building density, use of low impact development stormwater management practices, and other applicable factors. In no case shall the paving width be less than 24 [22] feet, provided there will be no less than 16 feet of right-of-way." If the use of "curb" for measuring distance is perceived as issue for

Typical Barrier	Optional Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
	Or Adopt standard LID standard street drawings as part of the local Design and Construction Standards for Water, Sewer, and Streets. This potentially has the advantage of not requiring any amendment to the municipal or county code.	implementation of LID streets, amend to specify "curb or street edge." "Where a portion of a project or public improvement has been designed specifically as an LID stormwater management feature, the [County/Town Manager or designee] shall have the authority to waive the dimensional requirements of this section to enable the installation of LID stormwater management measures." Or Adoption and use of standard LID street drawings as part of street construction standards.
• Curb bumpouts and curb extensions are not expressly allowed near intersections or mid-block for traffic calming and bioretention stormwater management opportunities.	Amend zoning ordinance and/or subdivision ordinance provisions regarding curb and street dimensional and material requirements. Or Adopt standard LID standard street and curb drawings that include curb bump outs and curb extensions as part of the local Design and Construction Standards for Water, Sewer, and Streets.	If the use of "curb" for measuring distance is perceived as issue for implementation of LID streets, amend to specify "curb or street edge." "Where a portion of a project or public improvement has been designed specifically as an LID stormwater management feature, the [County/Town Manager or designee] shall have the authority to waive the dimensional requirements of this section to enable the installation of LID stormwater management measures." "…or with materials and sizes necessary to support specifically designed LID drainage functions [consistent with the LID Manual/specifications]." Or Adoption and use of standard LID street drawings as part of street construction standards.
• Landscaping maintenance and street grass strip planting height requirement can prohibit bioretention, swale, and other LID BMP opportunities. For example: "No planting or landscaping in excess of 2 ½ [or 3] feet shall be permitted within [15] [25] feet of the intersection of the right of way lines of two or more intersecting streets. Or "It is unlawful for the owner or tenant of any property	Amend code to allow LID BMPs at intersections and along right-of-way areas as a part of an approved stormwater management plan as long as sight visibility and public safety are maintained. And Amend code to allow Certified Backyard Habitat/Community Habitat as long as sight visibility and public	"Where a portion of a project or public improvement has been designed specifically as an LID stormwater management feature or Certified Backyard Habitat/Community Habitat, the [County/Town Manager or designee] shall have the authority to waive the dimensional and height requirements of this section to enable the installation of LID stormwater management measures, as long as the sight visibility and public safety are maintained."

Typical Barrier	Optional Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
to permit or maintain the growth of any grass more than 8 inches in height."	safety are maintained.	
• Current standards require the use of concrete and bituminous surface for on-street parking and alleyways.	Amend zoning ordinance and/or subdivision ordinance provisions and the local Design and Construction Standards for Streets regarding paving material requirements for on-street parking and alleyways.	"The use of permeable parking surfaces including [approved materials] shall be permitted [at the discretion of the official] [upon demonstration that performance standards are met] [in accordance with the standards of the LID design manual.]"
Parking		
• Current zoning establishes high minimum parking space requirements.	Amend zoning ordinance dimensional requirements regarding parking to establish lower minimum parking requirements and a maximum parking requirement where transit services are available.	See example language Town of Chapel Hill, NC Unified Development Ordinance § 5.9.1 Minimum and Maximum Off-Street Parking Requirements for Town Center and Non Town Center Zoning Districts. Access the Town's minimum and maximum parking requirements at http://chapelhill.granicus.com/MetaViewer.php?view_id=&clip_id=834&meta_id=49693 Note: The maximum and minimum limits in the above ordinance could be lowered somewhat to further reduce effective impervious area.
• Current zoning requires overly large parking stalls and drive aisles.	Amend zoning ordinance requirements regarding parking stall and drive aisle dimensions	Revise table with dimensional parking requirements to require a minimum stall width of 9 feet, a minimum stall length of 15 feet, and a minimum drive aisle of 22 feet.
• Standards prohibit the use of pervious paving materials in parking areas.	Amend zoning ordinance and/or subdivision ordinance provisions regarding parking material requirements	"Permeable paving shall be [may be] used in twenty percent of the off-street parking area, or in the low-traffic portion of the parking area, whichever is greatest." "The use of permeable parking surfaces including [approved materials] shall be permitted [at the discretion of the official] [upon demonstration that performance standards are met] [in accordance with the standards of the LID design manual.]" "Permeable surfaces such as [list approved] are encouraged in low traffic

Typical Barrier	Optional Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
		areas and in required parking areas for open space uses [parks, recreation areas]."
Driveways/Sidewalks		
• All sidewalks are required to be surfaced with concrete material.		"Variations from standard sidewalk materials and patterns may be allowed pursuant to approval by [officer/board] where permeable materials are used in conjunction with an LID stormwater management feature." "The use of permeable surfaces including [approved materials] shall be permitted [at the discretion of the official] [upon demonstration that performance standards are met] [in accordance with the standards of the LID design manual.]"
• In most cases, driveways are required to be surfaced with concrete materials.		"Variations from standard driveway materials and patterns may be allowed pursuant to approval by [officer/board] where permeable materials are used in conjunction with an LID stormwater management feature." "The use of permeable surfaces including [approved materials] shall be permitted [at the discretion of the official] [upon demonstration that performance standards are met] [in accordance with the standards of the LID design manual.]"
Clustering Development		
• Some local codes limit cluster development to one zoning district only or have no provision for cluster development that allows lots and setbacks to be smaller in	Amend zoning ordinance, as needed, to provide for cluster development options.	See Sussex County, DE Zoning Ordinance for good example language as noted below: Zoning Ordinance Article IV Agricultural Residential Districts, § 115-25 Specifies a cluster development option for lots using on-site septic system. Note that lots on central sewer are allowed to be significantly

Typical Barrier	Optional Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
size to encourage open space preservation.		smaller. Article XVI Residential Planned Community District Although not explicitly stated, cluster development is allowed in this District through flexibility on lots sizes, minimum yard requirements, etc. Article XXV Supplementary Regulations, § 115-194.3 ES-1 Environmentally Sensitive Development District Cluster development is also allowed in residential zoning districts. Significantly smaller lots are allowed in Districts using central water and sewer (7,500 sq. ft. v ½ acre). Note: Environmentally Sensitive Development District shall include all lands designated as "Environmentally Sensitive Developing Area" in the Comprehensive Plan.
• Some local zoning codes do not allow Conservation or Open Space Design as an option.	Amend zoning ordinance, as needed, to provide for open space design options.	A number of Delaware communities have good example language for Open Space Design overlays, including Town of Laurel: Subdivision Ordinance Article 4, § 4 (Major Subdivision Requirements) encourages open space design. Subdivision Ordinance Article 6 Conservation and Open Space Standards § 6.1requires all subdivisions and land development to minimize impacts to slopes exceeding 15 percent and to wetlands, streams, swales, and riparian buffers. § 6.2 For major subdivisions and land development projects, wetlands, floodplain areas, slopes of 15 percent or more are considered primary conservation areas and subtracted from the Total Tract Area to yield an Adjusted Tract Area. A minimum of 30 percent of the adjusted tract area shall be set aside for passive or active recreation (considering woodlands, significant natural features, etc.).

GOAL #2: PRESERVE AND ENHANCE THE HYDROLOGIC FUNCTION OF UNPAVED AREAS

Objective: Minimize building footprint/envelope area.

Objective: Preserve topsoil structure.

Objective: Preserve sensitive wetlands.

Objective: Preserve sensitive soils.

Objective: Preserve sensitive stream buffers.

Typical Barrier	OPTIONAL Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
Topsoil Structure & Building Footprint		
• Subdivision ordinances typically do not minimize building footprint disturbance of topsoil.	Amend Subdivision Ordinance to include Conservation and Open Space Standards.	See Example Language Town of Laurel, DE Open Space Design above. Example language from the Town of Bethel, DE Codes: Draft Subdivision and Land Development Project Ordinance Article 4, § 4 (3) Design Process for Major Subdivisions requires a limit of disturbance line of a minimum of 50 feet to protect existing vegetation. Houses and other buildings shall be located a minimum of 100 feet from wetlands, watercourses, and floodplain areas. Draft Subdivision and Land Development Project Ordinance Article 6, § 6 (C) (4) Healthy woodlands exceeding ½ acre shall be preserved and designated as Conservation and Open Space to the maximum extent possible. Bethel Zoning Ordinance § 5D Any residential lot shall be covered with no more than 40 percent impervious surfaces. Any commercial lot shall be covered with no more than 60 percent impervious surfaces.
Wetlands		
• Site designs are not required to minimize impacts to the hydrologic functions of wetlands.	Amend Subdivision Ordinance to include Conservation and Open Space Standards to address wetland functions.	Example Language Town of Bethel, DE Code: Draft Subdivision and Land Development Project Ordinance Article 4, § 4 (3) Design Process for Major Subdivisions requires a limit of disturbance line of a minimum of 50 feet to protect existing vegetation.

Typical Barrier	OPTIONAL Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
		Houses and other buildings shall be located a minimum of 100 feet from wetlands, watercourses, and floodplain areas. Example Language Kent Co., DE Subdivision and Land Development Ordinance 187, Article XII, § 187-77 (C) No portions of wetlands areas shall be filled, developed, cleared of vegetation unless granted permission from the Corps of Engineers (D) No buildings, structures, impervious surface, fill, or obstructions to drainage or land disturbance shall be situated nearer than 25 feet to a delineated wetland.
Stream Buffers		
• Stream buffers are not encouraged or required in many codes.	Amend Subdivision Ordinance to encourage or require stream buffer protection within 60 to 100 feet on each side of the stream.	Example Code Language Town of Bethel, DE Codes: Draft Subdivision and Land Development Project Ordinance Article 4, § 4 (3) Design Process for Major Subdivisions requires that houses and other buildings shall be located a minimum of 100 feet from wetlands, watercourses, and floodplain areas. Example Language Kent County, DE Subdivision and Land Development Ordinance 187, Article XII, § 187-78 (B) 100 feet buffers are required from tidal stream, marsh, and non-tidal fresh water body, lake, pond or blue-line stream [perennial stream]. 50 feet buffers for non-blue-line streams [intermittent and ephemeral streams], creeks, and ditches. Subdivision and Land Development Ordinance 187, Article XI, § 187-78 (C) For projects located within a promulgated TMDL basin, the property owner or applicant shall be responsible for the preservation or reestablishment of riparian buffers to facilitate the reduction of nutrients and other pollutants to the level necessary to ensure compliance with

Typical Barrier	OPTIONAL Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
		TMDL reductions. Subdivision and Land Development Ordinance 187, Article XI, § 187-78 (A)-(C). No buildings, structures, or paved surfaces (with a few exceptions) shall be permitted within the required buffer area. Note: A number of methods could be used to measure the distance of the buffer, e.g., the mean high water line, the centerline of the stream, etc. DNREC prefers the mean-high-water-line technique. The state of Delaware cannot require buffers, but local governments do have the authority to require stream buffers.

GOAL #3: HAVEST RAINWATER

Objective: Allow rainwater harvesting through plumbing code provisions.

Objective: Allow the use of downspout disconnection/redirection, rain barrels, and above-and below-ground cisterns for rainwater harvesting.

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
• Continuous facades with uniform setback are required, so planter boxes cannot be installed at the bottom of drains or along a façade.	Amend language to provide an allowance for exceptions to maximum setback and continuous façade extension requirements to incorporate LID or features specifically intended to manage, store or treat rainwater. Develop design guidance that recognizes and encourages LID features and rainwater harvesting in design	"Exceptions to maximum façade indentations, required street wall continuity, or building walls may be made [by the appropriate authority/officer] as specifically necessary to accommodate rainwater harvesting or LID stormwater management features integrated with the building design." "The dimensional standards for building setbacks and associated yards may be varied [by the reviewer/officer] to incorporate LID stormwater management features or rain water harvesting systems which are integrally designed with the building and landscape plan." "The dimensional standards for building setbacks and associated yards may be varied [by the reviewer/officer] to incorporate LID stormwater

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
		management features or rain water harvesting systems which are integrally designed with the building and landscape plan." "LID stormwater management areas may deviate from the required width if approved in conjunction with a stormwater management plan, and if the [board or officer] determines that the screening function is substantially equivalent to the required minimum."
• Requirements for pitched roofs limit rainwater harvesting and green roof features.	Allow deviations to accommodate rainwater harvesting or green roof features. Create a standard for flat or green roofs within the ordinance.	"a roof may be flat if such flat roof is hidden by a raised parapet or terraces providing amenities to the occupants, such as an atrium or balcony, or to accommodate rainwater harvesting or green roof features."
	Roof design standards should explicitly recognize that rainwater harvesting and/or green roofs need to be part of the design treatment, in the same way that mechanical equipment often is.	"Roofs should be designed to enclose mechanical equipment and to be used for recreational, retail or restaurant uses, and to incorporate rainwater harvesting and green roof features."
• Current design standards maximize heat and light reflection which can be detrimental to rooftop vegetation	Revise architectural standards for roofs and parapets to minimize heat and light reflection.	"Parapet walls enclosing roofs shall have appropriate coloring to minimize light and heat reflection on the roof-top vegetation."

GOAL #4: ALLOW AND ENCOURAGE MULTI-USE STORMWATER CONTROLS

Objective: Allow and encourage stormwater controls as multiple use in open space areas.

Objective: Allow and encourage stormwater controls as multiple use in landscaped areas.

Typical Barrier	OPTIONAL Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
Landscaped Areas		
• Purpose statements for landscaping regulations do not include LID and stormwater management as an explicit intent or purpose of the regulations.	The purpose statement for landscaping standards should explicitly encourage the use of landscaping as a multi-function stormwater, habitat and aesthetic enhancement.	"Landscaping and stormwater management plans should be designed as, or incorporate, LID features that enhance the site's hydrologic function, aesthetics and habitat quality." "Setback areas that are to be used for stormwater management will need to be designed for both stormwater discharge and screen requirements. Such on-site stormwater management practices help reduce the impact on the Town sewer system."
• Landscaped strips required at parking perimeters that do not allow LID features to "count," or that require the use of edge areas suited to stormwater management for evergreens, berms, etc. that are not compatible with LID.	Develop provisions for landscaped strips to (1) be allowed to vary in width where necessary to act as LID stormwater management features, (2) incorporate multi-function landscape and LID principles, and (3) discourage the use of turfgrass. Or Explicitly allow LID as a landscaping feature in required strips and refer to in LID design manual.	"The use of 'green wall' features in conjunction with required walls or fences is encouraged." "Planting plans for required landscaped strips shall minimize the use of turfgrass and hardscape except in areas of high foot traffic." "The dimensional standards for landscaped strips and walls may be varied to accommodate LID stormwater features designed in conjunction with an overall landscaping and stormwater management plan for the site." "The ground plane shall be vegetated with potted plants, vines, shrubs, LID stormwater management features such as planter boxes or green walls, or groundcover. The use of turfgrass is discouraged except where an area is specifically designed for regular pedestrian use and foot traffic." "The use of turfgrass is discouraged except in areas specifically designed for regular use for active or passive recreation activities that require a flat, maintained, vegetated surface, such as but not limited to playing fields, picnic areas, gathering spaces, and active parks." "To encourage multi-function landscaping and discourage monoculture, areas …shall be suitably landscaped with a mixture of shrubs, trees and ground cover, which are encouraged to incorporate xeriscaping and to

Typical Barrier	OPTIONAL Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
		function as LID stormwater management areas." "Planter boxes, LID planters, rainwater harvesting systems, or a green wall treatment, may be substituted for the required landscaping. Such substitute landscaping shall be subject to the approval of the City Manager [and may be drawn from the LID Design Manual]."
• Dimensional standards or planting requirements (such as mandatory treatment of landscaping as berms, or use of turf) limit or exclude use of LID features. "Screen parking areas with landscaped berms."	See above	See options above
• Standard dimensional requirements for width and depth prohibit changes necessary to bring in or infiltrate water, or size plants correctly. For example planting strips are required along those portions of the perimeter of the lot or premises adjoining street highways and public places except where driveways and sidewalks are located. The planting strip are typically required to have a depth of not less than 6 feet along streets, and much deeper along highways.	See above	"The use of turfgrass is discouraged except in areas specifically designed for regular use for active or passive recreation activities that require a flat, maintained, vegetated surface, such as but not limited to playing fields, picnic areas, gathering spaces, and active parks." "The dimensional standards for landscaped strips and walls may be varied to accommodate LID stormwater features designed in conjunction with an overall landscaping and stormwater management plan for the site." "In order to accommodate LID BMPs, required setbacks, sideyards, and rear yards may be reduced by up to 25 percent. The reductions may not compromise public safety such as the site distance triangles as defined by this Zoning Ordinance."
• Landscape LID features are not included in the definition of landscape areas, or counted toward required landscaping. This is a structural disincentive to LID.	Explicitly allow bioretention, swales, constructed wetlands and other LID landscape features to count as landscape area of the development site.	"The following are illustrative of the types of open space areas that may be deemed to serve as buffering and preservation of natural features to count toward satisfaction of the passive open space requirements of this section: - Riparian forest buffers - Landscape buffers Add:

Typical Barrier	OPTIONAL Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
		- Stormwater detention ponds when suitably designed to emulate natural features - Bioretention areas, bioswales, constructed wetlands, and other landscape LID stormwater BMPs "Required Plant Reduction and Substitution. In order to accommodate LID BMPs the number of planted trees may be reduced in buffer yards by 10 percent, 50 percent of the required trees may be 1.5 inches in caliper, and all shrubs may be 24 inches in height." "Encroachments. Water quality BMPs may encroach into required buffer yard as long as the encroachment does not disturb existing vegetation. Minor understory may be disturbed in order to accommodate water quality structures. Trees and shrubs shall be placed to maximize screening where the encroachment takes place. If encroachment runs parallel to the buffer, the width of the buffer shall be increased by the amount of the encroachment."
• Landscape "points" and required areas are weighted towards turfgrass, street trees, or other features in a way that discourages the use of LID or where LID does not "count." This is a structural incentive for vegetated/treed strips, which favors vegetated/treed strips strongly over any form of LID.	LID could be incentivized through amendments to this section and street tree guidance that create additional points/incentives for incorporation of LID features and native, xeriscape or multi-function landscaping. Revise points or other landscape requirement system and calculations to allow or incentivize the use of LID landscape features as part of overall landscaping plans and requirements. In cases where a certain size tree is required per square foot of area, a waiver provision can be introduced; however, the waiver most likely will need to be designed in such a way that a tree requirement cannot be	"Each one square foot of vegetated parkway area with street trees provided shall satisfy 1.5 square feet of the front and street side yard vegetated area requirements, or [2.0 or more] square feet for vegetated parkway areas designed and planted as LID stormwater management features." "For each 100 square feet or portion thereof required front and street side yards, or 16 square feet of area designed and planted as LID bioretention areas, with each single planting area to be a minimum of 6 square feet." "Required Plant Reduction and Substitution. In order to accommodate LID BMPs the number of planted trees may be reduced in buffer yards by 10 percent, 50 percent of the required trees may be 1.5 inches in caliper, and all shrubs may be 24 inches in height." "Encroachments. Water quality BMPs may encroach into required buffer yard as long as the encroachment does not disturb existing vegetation. Minor understory may be disturbed in order to accommodate water quality structures. Trees and shrubs shall be placed to maximize screening where the encroachment takes place. If encroachment runs

Typical Barrier	OPTIONAL Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
	avoided entirely.	parallel to the buffer, the width of the buffer shall be increased by the amount of the encroachment."
• Streetscape and street tree planting requirements often preclude the use of LID stormwater management features.	Allow for deviations to street planting plans where the spacing must be varied to accommodate LID drainage features, or the use of trees and planter boxes for LID.	"…in which case trees shall be spaced [X] feet apart, or where planting areas have been designed to incorporate LID stormwater management features, in which case trees shall be spaced as required and approved [by appropriate manager/officer] in conjunction with an approved stormwater management plan." "If the required buffer is designed as an LID stormwater management area, the dimensional requirements of this section, including the requirement for shade trees, may be varied in conjunction with an approved stormwater management plan so long as [effective or equivalent] screening and shading are provided." "Required Plant Reduction and Substitution. In order to accommodate LID BMPs the number of planted trees may be reduced in buffer yards by 10 percent, 50 percent of the required trees may be 1.5 inches in caliper, and all shrubs may be 24 inches in height." "Encroachments. Water quality BMPs may encroach into required buffer yard as long as the encroachment does not disturb existing vegetation. Minor understory may be disturbed in order to accommodate water quality structures. Trees and shrubs shall be placed to maximize screening where the encroachment takes place. If encroachment runs parallel to the buffer, the width of the buffer shall be increased by the amount of the encroachment."
• Often tree grates are required that conflict with the use of planter boxes or other LID feature.	Where standards exist for tree grates, provide deviation language if trees are planted as part of an LID feature or stormwater management plan.	"Tree grates shall not be required if trees are planted in a landscaped parkway or designed as an LID stormwater management feature."
• Curbs or grading measures are required that preclude the use of	Amend landscaping standards to ensure that islands are not required	Add language to state "Grading and edge treatments of landscaping areas shall allow stormwater inflow where areas are designed as LID

Typical Barrier	OPTIONAL Approach	OPTIONAL Example Language (TO ADDRESS BARRIERS)
parking or landscaped areas for LID.	where a landscaped strip has been designed as an LID stormwater management feature.	stormwater management features. In such cases, where adequate screening is provided, berming and curbs shall not be required." Add language stating "Wheel stops or breaks in the barrier curb may be provided in order to allow for drainage into peripheral green areas designed to accommodate the stormwater discharge directed to them." "Landscaped areas shall be enclosed by at least [X] length of full-height curb or equivalent barrier, which may include LID stormwater retention areas with suitable demarcation and wheel stops or other protection, between driveways."
Open Space Areas		
• Structural LID techniques such as constructed wetlands, swales, and bioretention areas are not allowed to be constructed in a development's designated open space, or receive "credit" as required open space.	Where these BMPs can be designed to support landscape and open space functions, flexibility should be provided in locating these BMPs where they can be most effective in managing water quality, drainage, and flooding impacts. Explicitly provide credit to LID features by adding them to the definition of "open space."	In definition of open space, add such language such as "An area of land and/or water (excluding yards) not improved by buildings, structures, streets, roads, or parking areas, or containing only such improvements as are complimentary, necessary, or appropriate for the use or enjoyment of the open area, conservation of natural resources, or to incorporate LID stormwater management features, as required and approved [by appropriate manager/officer] in conjunction with an approved stormwater management plan."
• Natural open space areas are not required to be maintained in a natural condition.	Add language requiring that required natural area be recorded the register of deeds and provide guidance on any allowed future disturbance in these areas.	"Undisturbed natural open space area is required for all development unless mitigated offsite or through a payment in lieu of a natural open space area dedication. The percentage of the natural open space area required depends on a project's built upon [or effective impervious] area as described in Section X of this ordinance. For natural areas that have remained undisturbed, the location of this area shall be recorded at the register of deeds office as "undisturbed natural area." For natural areas that have been disturbed and revegetated, the location of this area shall be recorded at the register of deeds office as "revegetated natural area." The future disturbance of these areas is prohibited except for greenway trails with unlimited public access, private trails provided they are composed of pervious materials and comply with the stream buffer requirements, the [town or county] utility lines and channelwork/maintenance activities by the [town or county] stormwater

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		department. Other utility work may be allowed in the natural areas provided it will not result in the loss of natural area as approved by the [town or county]."

GOAL #5: MANAGE STORMWATER TO MEET WATERSHED IMPLEMENTATION PLAN & DNREC STORMWATER REGULATIONS

Objective: Meet DNREC stormwater regulations.

Objective: Replicate the predevelopment hydrology of the site, to the extent practicable.

Objective: Maintain water quality functions of the watershed.

Objective: Minimize channel erosion impacts.

Objective: Minimize flooding impacts.

Objective: Inspect BMPs to ensure proper construction and design.

Objective: Long-term maintenance.

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
DNREC Standards for Post-Construction Control of Stormwater		
• DNREC's Sediment and Stormwater Regulations for post-construction stormwater management apply to developments disturbing more than 5,000 square feet. The regulations include on-site retention/infiltration performance standards, resource protection and channel protection criteria, and	Adopt code language referencing DNREC's Sediment and Stormwater Regulations and prerequisite requirements preliminary plan approval, grading permit approval, and building permit approval.	Add language such as "Sediment Control and Stormwater Management The provisions and requirements contained in the Delaware Sediment and Stormwater Regulations and supporting Technical Document, as shall be amended from time to time, shall be the basis for implementing sediment control and stormwater management for new construction, development, and redevelopment activity. The Department of Natural Resources and Environmental Control (DNREC) or its Delegated Agency will administer the provisions and requirements of the Sediment

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
flood mitigation criteria, with requirements for a stormwater management plan to show that criteria have been met. They also include requirements for an operations and maintenance plan and routine maintenance reviews. • DNREC or its Delegated Agency will administer the State Sediment and Stormwater Regulations. • Since the DNREC regulations directly affect design and construction of new development projects and redevelopment of existing developed sites, permitting by the local municipality or county should be contingent on proof of approved plans from DNREC or its Delegated Agency.		and Stormwater Regulations. DNREC will require a project application meeting with permit applicants to review sediment and stormwater requirement. The [Town] [County] or designee shall require attendance by permit applicants at such meeting as a prerequisite to preliminary site plan approval. No grading or building permit shall be issued by [Town] [County] unless a Sediment and Stormwater Management Plan has been approved by DNREC or its Delegated Agency as meeting all the requirements of the Delaware Sediment and Stormwater Regulations and supporting Technical Document."
• A key gap in implementation of DNREC's sediment and stormwater regulations is the lack of a code provision designating the party responsible for maintenance and repair of the stormwater BMPs on private property.	Adopt code language referencing the operations and maintenance plan required by DNREC, and requiring that the plan specify the Property Owners Association or other party responsible for maintenance of the BMPs and the mechanism(s) for funding maintenance and repairs.	Continuing the Sediment and Stormwater section, add language such as "Maintenance The owner of each BMP installed pursuant to this ordinance and the DNREC Sediment and Stormwater Regulations shall maintain and operate it so as to preserve and continue the function for which the BMP was designed. For all BMPs that have been constructed on privately owned property and not within the public easement, prior to the issuance of an Occupancy Permit for any building within a permitted development served by a BMP, the applicant or owner of the BMP shall establish an Operations and Maintenance Plan as required by the DNREC Sediment and Stormwater Regulations and approved by DNREC or its Delegated Agency. In addition to DNREC minimum plan requirements, for the purposes of this ordinance, the Operations and Maintenance Plan shall specify the mechanism for funding maintenance and repairs, as well as the Property Owners Association or other party responsible for

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
		maintenance of the BMP. The Property Owners Association or similar legal entity shall have the power to compel contributions from residents of a development to cover their proportionate shares of the costs associated with BMP maintenance. At the discretion of the [Town] [County] Manager or designee, certificates of occupancy may be withheld pending receipt of an approved Operations and Maintenance plan. The Operations and Maintenance Plan shall be referenced on the final plat and shall be recorded by the applicant or owner with the [County] Register of Deeds upon final plat approval in order to acknowledge the duty of the owner and all subsequent owners of the property to maintain the BMP in accordance with the terms of the Plan."
• Local governments could require the use of LID.	In local code stormwater management provisions, require that DNREC's performance criteria be met using LID or a combination of LID and conventional stormwater measures.	Continuing the Sediment and Stormwater section, add language such as "Low Impact Development The DNREC Sediment and Stormwater Regulations, Post Construction Stormwater Management Performance Criteria shall be achieved using LID site planning and techniques or a combination of LID and conventional storm water management practices. The goal of LID is to develop site design techniques, strategies, and BMPs to store, infiltrate, evaporate, retain, and detain runoff on the site to more closely replicate pre-development runoff characteristics and to better mimic the natural and unique hydrology of the site thereby limiting the increase in pollutant loads caused by development. The selection of these strategies and techniques for compliance with the Performance Criteria is discretionary and shall be detailed in a stormwater management plan submitted during the preliminary plan review process. Specific requirements regarding the design, installation and maintenance of LID structures and a discussion of LID site planning is contained in the LID Design Manual."
• Local governments could require the use of the *Nutrient and Sediment Loading Assessment Protocol* tool.	Amend development review procedures to include the use of the *Nutrient and Sediment Loading Assessment Protocol* calculation tool.	Add language such as The Sediment and Stormwater Management Plan submittal shall include *Nutrient and Sediment Loading Assessment Protocol* tool output along with sketch plans for the proposed development site. [X] contains detailed information concerning the submission of the requirements for the *Nutrient and Sediment Loading Assessment Protocol.*

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
Offsite Mitigation		
• At times it is difficult to meet full stormwater criteria requirements onsite, particularly in urban areas where proposed developments have high impervious area. Cost-effective and equitable alternatives can be provided through partial off-site mitigation and payment-in-lieu.	DNREC is in the process of developing an offset and fee-in-lieu program and regulations to address mitigation. Under the Chesapeake Bay TMDL, localities are required to offset nutrients and sediment from any future growth. Local governments may wish to consider providing additional off-site options for building BMPs offsite, buy downs, and banking/trading of credits. Adoption and implementation of such local off-site mitigation programs should be coordinated with DNREC.	Continuing the Sediment and Stormwater section, add language such as "Mitigation Purpose. The purpose of this mitigation is to reduce the cost of complying with the total phosphorus removal criteria for development and redevelopment with greater than 24 percent built-upon area while ensuring the reduction of pollution loads and achievement of the ordinance objectives. Description. In addition to the DNREC payment-in-lieu mitigation option, there are two [Town/County] total phosphorus mitigation options available to development and redevelopment greater than 24 percent built upon area, including off-site mitigation and a buy down option. Both off-site and buy-down mitigation will result in the construction of retrofit BMPs in the same named [watershed or river basin]. Criteria for Off-Site Mitigation. The owner or designee of a proposed development site that will include greater than or equal to 24 percent built upon area shall construct a BMP retrofit project designed to achieve an equivalent or greater net mass removal of total phosphorus as would be achieve by meeting the total phosphorus removal criteria from the proposed site. Off-site mitigation is allowed only for total phosphorus removal above [X] percent. Onsite BMPs shall be constructed to achieve [X] percent of total phosphorus from the project site. The criteria for approval of off-site total phosphorus mitigation area. BMPs must be constructed in accordance with [reference design standards and/or manual]; b. BMPs must be inspected and found to be incompliance; c. Following inspections, BMPs may be installed and credits obtained for pounds of total phosphorus removed that can be applied to future projects. These credits may be accumulated or "banked". D. All off-site mitigation BMPs shall be subject to the maintenance requirements herein. Criteria for Total Phosphorus Buy Down. The owner or designee of a proposed development site that will include greater than or equal to 24 percent built upon area may buy down the total phosphorus removal requirement on site to no less than [X] percent. On site BMPs must be installed to remove the remaining total phosphorus load. The money shall be used by the City to construct BMP retrofit projects designed to achieve an equivalent or net mass removal of total phosphorus as would

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
		be achieved if the total phosphorus load reduction requirement was met on the proposed site. The criteria for the buy down option are [add]. All BMPs constructed by the City as part of this mitigation option shall be maintained by the jurisdiction into perpetuity. Lots Less than One Acre. Development and redevelopment on a lot less than one acre in size is allowed by right to forego meeting the requirements of this article provided the City is paid a mitigation fee according to rates set forth in the administrative manual and provided such development and redevelopment are not part of a larger common plan of development or sale. Transit station areas and distressed business districts. Development and redevelopment projects within transit station areas designated by the planning director or distressed business districts designated by the economic development director are allowed by right to forego meeting the requirements for this article except [add minimum requirements] provided one of the following three measures are implemented on the site: Pay the city a mitigation fee according to rates set forth in the administrative manual; [add other provisions].”

GOAL #6: MANAGE CONSTRUCTION SITE STORMWATER TO MEET WATERSHED IMPROVEMENT PLAN & DNREC REGULATIONS

Objective: Meet DNREC stormwater regulations.

Objective: Minimize erosion and sedimentation and delivery of nonpoint source pollutants during construction activities.

Objective: Inspect BMPs ensure proper construction and design.

Objective: Maintain BMPs.

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
DNREC Standards		
• DNREC's Sediment and Stormwater Regulations for construction activity apply to developments or construction disturbing more than 5,000 square feet. The regulations include turbidity performance standards, requirements for sediment and stormwater management plans, land disturbance and site stabilization criteria, required weekly inspections, and maintenance agreements. • DNREC or its Delegated Agency will administer the State Sediment and Stormwater Regulations. Since the DNREC regulations directly affect design and construction of new development projects and redevelopment of existing developed sites, permitting by the local municipality or county should be contingent on proof of approved plans from DNREC or its Delegated Agency.	Adopt code language referencing DNREC's Sediment and Stormwater Regulations and prerequisite requirements preliminary plan approval, grading permit approval, and building permit approval.	Add language such as "Sediment Control and Stormwater Management The provisions and requirements contained in the Delaware Sediment and Stormwater Regulations and supporting Technical Document, as shall be amended from time to time, shall be the basis for implementing sediment control and stormwater management for new construction, development, and redevelopment activity. The Department of Natural Resources and Environmental Control (DNREC) or its Delegated Agency will administer the provisions and requirements of the Sediment and Stormwater Regulations. DNREC will require a project application meeting with permit applicants to review sediment and stormwater requirement. The [Town/County or designee] shall require attendance by permit applicants at such meeting as a prerequisite to preliminary site plan approval. No grading or building permit shall be issued by [Town] [County] unless a Sediment and Stormwater Management Plan has been approved by DNREC or its Delegated Agency as meeting all the requirements of the Delaware Sediment and Stormwater Regulations and supporting Technical Document."

GOAL #7: MANAGE ONSITE WASTEWATER SYSTEMS TO MEET WATERSHED IMPROVEMENT PLAN & DNREC REGULATIONS

Typical Barrier	OPTIONAL Approach	OPTIONAL Example language (TO ADDRESS BARRIERS)
In unincorporated areas, there are cases where subdivision plans and lots are approved with proposed on-site wastewater treatment and without prior evaluation regarding septic system suitability or feasibility.	Require an approved site evaluation for an on-site wastewater system prior to final plat approval and/or recordation of the lots.	Example Code Language Kent County, DE Subdivision and Land Development Ordinance 187, Article X, § 187-53 (D) Sanitary sewerage facilities (4) Individual residential on-site sewerage disposal systems permitted as per Table X-2 must comply with all applicable requirements of the Kent County Department of Public Works and the Delaware Department of Natural Resources and Environmental Control. (5) Individual residential on-site sewage disposal systems sited in a watershed with an established total maximum daily load (TMDL) shall be designed and installed in accordance with nutrient load reductions prescribed in the TMDL or they shall use the best available technologies in order to achieve the required nutrient reduction targets set for a particular watershed. (6) Subdivisions outside the growth zone utilizing individual on-site sewage treatment and disposal must submit a system master plan with individual site evaluations for each lot. Subdivisions which follow the low density guidelines under Table X-2 are exempt from this requirement. Site evaluations shall be performed by a certified soil scientist and shall be an addition to the soil feasibility study requirements of DNREC. Said master plan shall be submitted prior to recordation and must be recorded in conjunction with the record plan."