

**ASSESSMENT OF STREET DESIGN AND PARKING LOT GUIDELINES AND FEASIBILITY OF ALLOWING GREEN INFRASTRUCTURE**

NPDES MS4 Community: \_\_\_\_\_

Within Subdivision Regulations, standards for the following are critical for consideration: right of ways; utilities; roadway widths and lengths; cul-de-sacs; curbs; sidewalks; and bus waiting areas.

**Street Standards in Subdivision Regulations**

**Right of Ways**

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
N	Is the minimum right of way width less than 45 feet for a residential street? (For 500 ADT, between 33 and 36 feet?)		See table from Sustainable Neighborhood Road Design Guidebook for MA provided in this workbook at Tab 5 - Reference Tables and Figures.  <i>Good design has not so much to do with the width of the right of way itself, but considerations of context and what makes for efficient and effective use of the right of way. What makes sense for the elements of a right of way on a busy suburban road will likely not make sense for a low volume rural road.</i>	Sent to PB for review	
Y	Are street cross sections provided to show how elements of a right of way might vary given different contexts?		<i>Such drawings can provide a clear understanding about objectives and efficient and effective use of the right of way area in different contexts, bringing together "complete streets" considerations of accommodating different modes of transportation with "green streets" objectives of reducing impervious surface and improving stormwater management.</i>		
N	Do the regulations limit clearing and grubbing within the right-of-way to the minimum necessary?		Developers are encouraged to limit clearing within the right-of-way to the minimum necessary to construct the roadway, drainage, sidewalk, and utilities, and to maintain site lines. Under this approach, it is not required to clear and grub the entire right-of-way.	Sent to PB for review	
Y	Are street trees required for new streets?		<i>In addition to requiring the planting of street trees, it is a good idea to specify that the tree belt can be designed for stormwater management. Tree belts may include bioretention areas or other vegetated stormwater systems. Bioretention areas should utilize noninvasive species (not on any Massachusetts invasive plant list) that can tolerate cycles of drought and inundation.</i>		

**Utilities**

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y	Does the code allow utilities to be placed under the paved section of the ROW?		Utilities (electric, telephone, cable TV, fiber optic, and all other conduits) may be located under the roadway or immediately adjacent to the roadway so as to optimize use of the right of way area for swales and other stormwater management facilities, sidewalks, and street trees.		
Y	Does the code allow utilities to be placed immediately adjacent to the paved section of the ROW?		<i>Often there is concern that such placement of utilities under the road will result in traffic delays and additional costs to utility companies. In the Rhode Island LID Site Planning and Design Guidance for Communities, however, authors from the Harsley Witten Group note that the reality is, "The amount of pavement needed to be removed during such operations can be decreased through better diagnostic tests and trenchless technologies for utility construction and repair." If the idea of putting utilities under the road edge is too great a concern for Departments of Public Works, then the next best strategy is to place utilities directly abutting roadway pavement, within 1 to 2 feet.</i>		

Roadway Widths and Lengths					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y	Is paved roadway <u>width</u> between 18 and 22 feet in low density residential developments with no bicycle lanes present? Low density residential neighborhoods are those with less than 400 average daily trips according to AASHTO, 2001.		Refer to table from Sustainable Neighborhood Road Design Guidebook for MA provided in this workbook at Tab 5 - Reference Tables and Figures.  <i>Many existing standards are based on universal application of guidelines for highways or very large-scale subdivisions planned more than 50 years ago. Revised standards should involve the minimum required pavement width and derive from careful considerations with public works and emergency response officials of traffic volume, on-street parking (where required), and passage of emergency vehicles and school buses.</i>		
N	At higher densities, are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?			Review in Future if necessary	
Y	Are narrower pavement <u>widths</u> allowed on road sections where there are no houses, buildings, intersections, or on-street parking spaces?		Revise local street standards to consider design speed, street type, and traffic volume on arterial and residential roads to allow for more compact roadways and intersections.  <i>If not currently permitted, allow for curb extensions such as pinchpoints, gateways, and chicanes to narrow roadways and utilize street space for pervious pavement or bioretention.</i>		
N	Are reductions in frontage distances allowable where appropriate (i.e. open space developments, around cul-de-sacs, and along outside sideline of curved streets) to increase number of homes		Reduce street length in residential neighborhoods to minimize overall impervious cover creation and land disturbance.	Sent to PB for review	
N	Are developers encouraged to explore alternative street layouts to increase the number of homes per unit length and minimize the		Exploration of alternative street layouts to increase the number of homes per unit length and minimize the length of the roadway is encouraged.	Sent to PB for review	
N	Can permeable paving be used for residential roads, shoulders, and parking lanes?		Where appropriate, use of permeable paving is allowed for road shoulders/parking lanes in residential neighborhoods and for sidewalks as compatible with Americans with Disabilities Act and Massachusetts Architectural Advisory Board design standards.  <i>This approach could involve combining a traditional asphalt surface for the travel lanes and an adjacent porous surface for the shoulder/parking lanes or bike lane area. Snow and ice management for the roadway must avoid sand so as to avoid clogging of the porous shoulder area.</i>	To be reviewed in future	
Y	Do alignments specify: Streets ought to be located in order to protect important natural features, avoiding low areas and steep slopes in particular?		Streets shall be located and designed to minimize: 1. disturbance of the site's natural features and environmentally sensitive areas, including low areas and steep slopes, native vegetation, and trees with a trunk diameter measured at 4.5' DBH (Diameter at Breast Height), breast height of 8 inches or more; 2. cut and fill, thereby reducing disturbance of native soils; 3. unnecessary contouring of the site to preserve natural topography.  <i>Another possible consideration here (though unrelated to MS4 permit): Street lay out along east-west or north-south axes is encouraged. This allows building siting to take advantages of passive solar heat gain and accommodate future solar electric installations on south-facing roofs.</i>		

Cul-de-Sacs					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes ( <i>shown in italics</i> )	Change(s) recommended	Proposed schedule to incorporate changes
Y	Are dead ends discouraged by the regulations? (e.g. by encouraging or requiring connected streets or one-way loop streets)?		<p>A connected road network is of great importance to functioning and efficient road network, reducing response time for public safety officials.</p> <p>Dead-end streets are discouraged. An applicant should make every effort to avoid the creation of dead-end streets and should connect proposed subdivisions to existing dead end streets wherever reasonable and practicable.</p> <p>An applicant may demonstrate that a dead end street is appropriate when they can demonstrate that a future connection to an existing street is not possible or practicable, or when the surrounding property will never need a street connection because of extremely sensitive or <u>permanently protected natural resources</u>.</p>		
Y	Are landscaped/bioretention islands allowed in the center of cul-de-sacs?		<p>All dead-end streets with turnaround islands may be planted with trees and/or other vegetation or left with natural tree growth in lieu of paving the entire area of the island. The maintenance of the inner circle shall be the responsibility of developers, their successors and assigns, or a homeowners' association.</p>	Subject to approval by DPW and PB	
Y	If curbing for cul-de-sacs is required, is it allowed to be perforated or notched to enable the flow of stormwater into the island area?		<p>Where soils are conducive to infiltration (Natural Resource Conservation Service hydrologic soils group A or B), the center island may serve as a stormwater bioretention area with notched or perforated curbing to allow for entry of storm flows. Invisible curbing, where granite curbing forms an at-grade edge with the asphalt, may also be permitted in this situation.</p>	Subject to approval by DPW and PB	
Y	Is minimum required radius for a cul-de-sac set for LID purposes?		<p><i>Sustainable Neighborhood Road Design recommends 50-foot outside radius with vegetated center island.</i></p> <p><i>Massachusetts Fire Code 527 CMR requires 20-foot drive lanes and minimum inside turning radius of 25 feet</i></p>		
Y	Are alternative turnarounds such as hammerhead allowed on short streets in low density residential developments?		<p><i>Hammerheads use less pavement overall than cul-de-sacs. Example below is per Sustainable Neighborhood Road Design:</i></p> <p><i>A hammerhead turnaround having a thirty (30) foot minimum curb radii; forty-five (45) foot minimum center lane radii, a head adequate for three point turn maximum, and a (length to accommodate local firefighting vehicle).</i></p>		
Sidewalks					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes ( <i>shown in italics</i> )	Change(s) recommended	Proposed schedule to incorporate changes
Y	In lower density residential contexts, are sidewalks allowed on just one side of a street? (As opposed to always required on <u>both</u> sides of residential streets.)		<p><i>For low density neighborhoods, consider allowing sidewalks on just one side of street.</i></p> <p><i>See table from Sustainable Neighborhood Road Design Guidebook for MA provided in this workbook at Tab 5 - Reference Tables and Figures.</i></p>		
N	Is permeable paving allowed for sidewalks?		<p>If the site permits infiltration, sidewalks may be constructed of permeable paving materials. If using permeable materials, the developer must work in consultation with the Department of Public Works and an engineer with experience in this field, and materials must be evaluated at regular intervals as they age. Pervious asphalt should be based on specifications such as those found in the University of New Hampshire Stormwater Center Design Specifications for Porous Asphalt Pavements and Infiltration Beds. Sidewalks or pedestrian areas may also be constructed to direct stormwater runoff to a swale or other BMP.</p> <p>Permeable pavements provide increased traction when wet because water does not pool, and the need for sal and plowing is reduced during winter due to low/no black ice development. Compared to traditional paving methods, long-term maintenance costs may be lower in cold climates since permeable pavements resist cracking and buckling in freeze-thaw conditions. Nevertheless, permeable paving requires regular maintenance including: annual inspection of paver blocks for deterioration; periodic replacement of void material (gravel, etc.) if part of the facility; and annual industrial vacuuming of pavements to unclog sand and debris that have accumulated on the surface over time.</p>	To be reviewed in future	
n	Are alternative pedestrian network layouts allowed (rather than placement in ROW)?		<p><i>For certain developments, it may be more sensible for pedestrian circulation to make use of common areas rather than street right of ways.</i></p>		
y	Is sidewalk width standard set for LID purposes?		<p><i>LID standard = 4 feet or less</i></p>		
y	Where curb and gutter streets are required for stormwater drainage, are sidewalks allowed to be disconnected from the stormwater drainage system?		<p><i>Grading of impervious sidewalk surfaces should be done so as to direct stormwater runoff to bioretention areas or other such facilities to eliminate or keep flow out of the municipal storm drain system.</i></p>		

Bus waiting areas					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
n	Do bus waiting areas require use of permeable paving unless infeasible?		<i>Permeable paving must be used for bus waiting areas in locations where soils are indicated to be in Natural Resource Conservation Service hydrologic soils group A or B.</i>		
Curbs					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
N	Do street standards allow for LID stormwater management approaches (i.e. swales or other such BMPs instead of curb and gutter)? Or are curbs and gutters REQUIRED improvements?		<i>In low or medium density developments where topography, soils, and slope permit, allow conveyance and treatment of stormwater runoff in the street right-of-way via vegetated open channels that incorporate runoff reduction practices such as dry swales, bioretention, biofilters, or vegetated swales, rather than requiring the use of curb and gutter stormwater conveyances.</i>	Sent to PB for review	
y	Where curbs are necessary/required, are perforated curbs that allow runoff into swales or other stormwater BMPs allowed?		<i>Where curbing is needed, think about specifying granite curbing as a way to help keep roads narrow overall. (With asphalt curbing it is hard to plow to the curb since material can be easily damaged. The tendency is to account for this extra width needed in winter months.  If pursuing LID design standards, curbs should either be eliminated or, when deemed necessary to protect the roadway edge, they should be interrupted or invisible. Interrupted curbs are curbs with gaps that allow stormwater to move from the street through to a stormwater management facility, such as planters, swales, rain gardens, or tree filter boxes. Invisible curbs are buried along the street edge so as to allow stormwater to flow over into a stormwater management facility. All LID curb options should be implemented in connection with stormwater management facilities. In shared streets, curbs should either be eliminated or be invisible.</i>		
n	Does the town have criteria for design of roadside swales?		<i>Refer to the design standards presented in the Massachusetts Stormwater Management Handbook: Volume Two.  Potential design considerations / limitations: - Depending on land use and soil type, each grassed swale can treat a relatively small drainage area of a few acres. Large areas should be divided and treated using multiple swales. - Swales are impractical both in areas with steep slopes and with very low slopes. - Soil compaction can reduce infiltration capacity. - Pre-treatment practices may be required in areas with higher potential pollutant loading.</i>	Sent to PB for review	
n	Where curb and gutter systems are installed, are inlets / drains required to have a notice regarding discharge to receiving waters?		<i>Could require that developers install standard signage indicating that waters drain to _____ River, etc.</i>	Sent to PB for review	
Ensuring Soil Permeability					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
			<i>Important note : These suggested standards on ensuring soil permeability might serve better under standards required for a stormwater management permit/and or under the zoning bylaw/ordinance - site plan review for projects that do not trigger stormwater permit requirements. They are included here to underscore the importance of soils in performance of infiltration facilities, but also in ensuring that runoff curve numbers used in calculations remain as accurate as possible post construction.</i>		
n	Is it clear that topsoil removal from the site should not diminish the infiltration characteristics of the site?		<i>Applicants must describe how their project will minimize and limit topsoil removal from the site.</i>	Sent to PB for review	
n	Is it clear that any new soils brought on site should not diminish the infiltration characteristics of the site?		<i>Applicants must describe how they will ensure that any new fill or soils brought to the site will not diminish the infiltration characteristics of the site.</i>	Sent to PB for review	
n	Is there any mention of avoiding compaction of soils by construction vehicles and restoring permeability of soils for infiltration if compacted?		<i>Ensure that all work is planned and executed so as to avoid compaction of topsoil and subsoils, including such best practices as reducing the number of trips required over area of disturbance, laying down soil protective mats for trafficked areas, and avoiding work after rain or snowmelt that soaks soils. For construction equipment, best practices should include using vehicles with low axle loads, reduced tire pressures, and use of flotation tires, doubles, radial tires, and/or large-diameter tires. For areas where such practices are not possible and soils are to be compacted by heavy equipment, subsurface restoration must occur prior to final landscaping activities .</i>	Sent to PB for review	

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in <i>Italics</i> )	Change(s) recommended	Proposed schedule to incorporate changes
	Are the following practices allowable when appropriate site				
y	Green roofs		<i>Green roofs are particularly appropriate for structures with a wide roof area, and typically are installed on flat or low angle rooftops. Design and maintenance considerations are described in more detail in PVPC's Green Infrastructure Fact Sheet on "Green Roofs." See: <a href="http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets">http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets</a></i>		
y	Infiltration practices such as rain gardens, curb extensions, planter gardens, porous and pervious pavements, and other designs to manage stormwater using landscaping and structured or augmented soils		<i>Rain gardens, also referred to as bioretention areas, use soil, plants and microbes to treat stormwater before it is infiltrated or discharged, and function effectively on small sites or on large sites divided into multiple small drainages. Common applications include parking lot islands, median strips, and traffic islands. Limitations, design considerations, and maintenance requirements are described in more detail in PVPC's Green Infrastructure Fact Sheets on "Bioretention Areas," "Green Streets," and "Tree Box Filters." See: <a href="http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets">http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets</a></i>  <i>Porous/pervious paving is appropriate for pedestrian-only areas and for low- to medium-volume, low-speed areas such as overflow parking areas, residential driveways, alleys, and parking stalls. If the underlying soils have a permeability of less than 0.3" per hour, use of an underdrain will be required. Permeable paving is not ideal for high traffic/high speed areas because it generally has lower load-bearing capacity than conventional pavement. Design and maintenance requirements are described in more detail in PVPC's Green Infrastructure Fact Sheet on "Porous Asphalt." See: <a href="http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets">http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets</a></i>		
			<i>Encourage both preservation of existing stands of trees and mature trees on site as well as plans that incorporate trees into stormwater management practices. This can be done through specific requirements and through a system of credits. Calculating stormwater benefits of certain species based on size can be done through the National Tree Benefit Calculator. See calculator at: <a href="http://www.treebenefits.com/calculator/">http://www.treebenefits.com/calculator/</a></i>		
			<i>Allow for bioretention areas or other vegetated stormwater facilities within treebelt areas and to count toward other required landscaping features, including site, parking or perimeter screening. This creates areas that function on several levels, including aesthetics and stormwater management.</i>		
y	Water harvesting devices such as rain barrels and cisterns, and the use of stormwater for non-potable uses		<i>Cisterns and rain barrels are used to store rooftop runoff for later use for landscaping and other non-potable uses such as car washing. Water stored in cisterns is even used in some cases for toilet flushing and/or irrigation of planters within buildings. Cisterns and rain barrels can be used in most commercial and residential properties where rooftop runoff is directed to a gutter and downspout. Design and maintenance requirements are described in more detail in PVPC's Green Infrastructure Fact Sheet on "Rain Water Management." See: <a href="http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets">http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets</a></i>		
	If no, please describe impediments: _____				
n	If yes, are there developer incentives for utilizing green infrastructure practices?		<i>The use of green infrastructure practices can be encouraged by offering incentives such as stormwater utility fee discounts or credits, waived or reduced permit fees, recognition programs for successful green infrastructure sites, and/or exemptions from portions of the local stormwater permitting requirements. For additional ideas on types of incentives and implementation, please refer to the EPA's Encouraging Low Impact Development Fact Sheet: <a href="https://www.epa.gov/sites/default/files/2015-09/documents/bbfs7encouraging.pdf">https://www.epa.gov/sites/default/files/2015-09/documents/bbfs7encouraging.pdf</a></i>	Sent to PB for review	

**Development Policies in Subdivision Regulations**

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in <i>italics</i> )	Change(s) recommended	Proposed schedule to incorporate changes
n	Does the preliminary plan processes promote an LID approach?		<p><i>At the outset, encourage developers to undertake a Low Impact Development (LID) approach in their projects by requiring an LID plan for preliminary subdivision applications. The City/Town could help by providing a developer with a standard site analysis checklist that will help during the early stages of the project to maximize design and functionality of LID strategies and stormwater management practices. As part of this analysis and reporting, the applicant could identify proposed LID strategies and stormwater BMPs. Use of PVPC checklist could be part of this early review. See:</i></p> <p><a href="https://thinkblueconnecticutriver.org/wp-content/uploads/2020/12/10-LID-Checklist-for-Preapplication-Meeting-PVPC-Model.docx">https://thinkblueconnecticutriver.org/wp-content/uploads/2020/12/10-LID-Checklist-for-Preapplication-Meeting-PVPC-Model.docx</a></p>		
			<p><i>Important note: It is best to include this early review element as part of stormwater management permit requirements for larger projects and site plan review requirements for smaller projects, but good to reinforce that process in Subdivision Regulations.</i></p>		
			<p><i>Under Preliminary Plan/General: To the fullest extent reasonable and practicable, all subdivisions shall be designed and constructed to incorporate the most recent LID and stormwater management design standards, best practices, policies and design elements.</i></p> <p><i>To include in Preliminary Plan Contents (some of these elements go beyond the PVPC LID checklist, but are worthwhile considerations for this stage of subdivision review):</i>  <i>Location and limits of soil types consistent with the soils classification maps prepared by the Natural Resources Conservation Service.</i>  <i>Areas where the depth of natural soil to bedrock is four (4) feet or less.</i>  <i>The extent of any Interim Wellhead Protection Areas and Recharge Areas.</i>  <i>Delineation of slopes of twenty-five percent (25%) or greater.</i>  <i>Areas delineated as "BioMap Core Habitat" or "Supporting Natural Landscape" on the Massachusetts BioMap Project developed by the Massachusetts Natural Heritage &amp; Endangered Species Program.</i></p>		
n	Is the definitive plan process coordinated with the stormwater management and erosion and sediment control permit process requirements?		<p><i>Define a process that combines submissions for stormwater management permits with Definitive Plans to avoid duplication.</i></p> <p><i>Possibly state: An Application for a Stormwater Management and Erosion and Sediment Control Permit, in accordance with Section ___ of the _____, along with all required plans and supporting information and documentation, must be included as part of the submission for a Definitive Subdivision Plan. No work shall commence on the construction of a Definitive Subdivision Plan until a Stormwater Management and Erosion and Sediment Control Permit has been approved and issued.</i></p>	Sent to PB for review	
y	Is there a section within the subdivision regulations that addresses drainage?		<p><i>Consider removing specific stormwater management language from subdivision regulations and referring out to standards in the stormwater management ordinance/bylaw and regulations is recommended. It is best not to describe requirements in subdivision regulations to avoid conflict and inconsistencies as standards are updated from time to time.</i></p>		
n	Do the site development standards explicitly permit LID stormwater management approaches?		<p><i>Review any additional standards carefully to ensure they enable LID stormwater management approaches and do not present barriers to such development strategies.</i></p>	Sent to PB for review	