MEMORANDUM

2010 DEC 10 PM 2:05

TO: District of Columbia Zoning Commission

FROM: Travis Parker, Zoning Review Project Manager

DATE: December 10, 2010

SUBJECT: Hearing Report for ZC #08-06 – Zoning Regulations Review
- Subtitle B: Green Area Ratio Chapter

Zoning Review Process to Date

The Zoning Review has held public working groups by subject area, with up to twenty subject areas to be covered over the course of the process. Each subject area is reviewed in consultation with a public working group that discusses issues identified in the Comprehensive Plan as well as issues arising from the existing Zoning Regulations. Recommended changes are then forwarded to the 24-member appointed Task Force for further review and input. Finally, recommendations for each subject area are made available for public review including a public hearing before the Zoning Commission. Nineteen of the twenty topic areas have gone through the public working group process. After the conclusion of public review for each subject areas, OP is working with the Office of the Attorney General to draft zoning language.

OP is in the process of drafting portions of text based on the proposed reorganization of the code and the conceptual recommendations previously approved by the Zoning Commission. Each section of text will be brought forward and heard at public hearings separately over the course of approximately 6 months. After all sections of text have been heard by the Commission, those separate text sections will be unified into a proposed set of zoning regulations that will be the subject of a final public review process.

Report Content

This report contains the following sections:

I. Review of the background for developing the recommendations
   a. Basics of GAR
   b. Citywide policy and regulations
II. Review of Research
   a. Existing conditions analysis
   b. Sample site studies
   c. Cost & Benefits
III. Description and discussion of major changes to GAR text including:
   a. Applicability
   b. Implementation and Administration
   c. Maintenance and enforcement
IV. Methodology for setting GAR levels in zones
   a. Cost benefit analysis in PDR zones
V. Outline of Subtitle B: Chapter 13 Green Area Ratio (GAR)

ZONING COMMISSION
District of Columbia
CASE NO. ZONING COMMISSION
EXHIBIT NO. District of Columbia
CASE NO.08-06
EXHIBIT NO.87

I. Review of Green Area Ratio

Background
Green Area Ratio (GAR) is an environmental site sustainability metric intended to set standards for landscape and site design that meet goals for stormwater runoff, air quality and urban heat island. The Green Area Ratio is based on achieving environmental performance by allowing a user to select from among optional elements in order to meet an overall GAR score.

Process to Date
This report consolidates information from previous Sustainability Working Group recommendations into proposed text regarding the proposed GAR regulations. Information pertaining to the Green Area Ratio will be found in two major organizational locations of the proposed code: Subtitle B (General Regulations) and Subtitles D through J (the land use subtitles). Subtitle B will contain an explanation of the system of the green area ratio, calculation details, and procedures and administration of the GAR. The individual land use subtitles will each contain zone specific standards and conditions that relate to the GAR.

The basis for these proposed changes arose from the detailed sustainability recommendations issued as a part of the Sustainability Working Group. Recommendations were also posted on OP's Zoning Update website for public review. These recommendations were given conceptual approval by the Zoning Commission at public hearings in 2009 with additional research requested by the Zoning Commission through informal guidance sessions. OP subsequently refined the recommendations into draft text and transmitted the text to the Zoning Commission to be setdown on October 18, 2010. The Zoning Commission responded with questions and guidance to OP on the proposed draft text. This report addresses those questions. Changes to Subtitle B: Chapter 13 Green Area Ratio are shown as red-lined text, attached as Appendix A. Appendix B contains draft definitions and common terms used with Subtitle B: Chapter 13 Green Area Ratio. Appendix C contains the proposed administrative process for the GAR regulation. Appendix D contains cost estimate information for the landscape element options within the GAR requirement. The scoresheet was also updated to reflect these recommended changes and is attached in Appendix E.

Citywide Policies and Regulations
There is a large range of available policy guidance and regulatory language which directly relates to the objectives of the Green Area Ratio. These policies were outlined in full in the setdown report including specific language, but are summarized below.

<u>Local Policies and Regulations</u>

- Comprehensive Plan policies on water conservation, low impact development (LID), sustainable landscaping, erosion prevention, conservation of steep slopes, floodplains, wetlands, and habitat and open space protection
- EPA's stormwater discharges from Municipal Separate Storm Sewer Systems (MS4) permit for significantly expanded reliance on low impact development measures

- WASA/DC Water's Impervious Area Charge implements a fee system based on the amount of impervious surface per property.
- The District Department of the Environment (DDOE)'s RiverSmart voluntary grant program provides incentives for homes and schools to implement reductions in stormwater pollution through landscaping practices that will improve water quality, crate wildlife habitat and manage stormwater runoff
- DDOE's updated stormwater regulations and fees implements a revised stormwater fee for impervious surfaces that are designed to promote green roofs and best management practices by intercepting runoff from rooftops, parking lots and roads, and directing it into vegetative facilities
- DC's Green Building Act promotes and incentivizes green building standards in line with the USGBC's LEED building certification rating system.
- DC's Sediment and Erosion Control Act: Controls stormwater run-off quality and quantity for new development
- DC's Water Pollution Control Act: Water quality standards, protects areas of over 440 square feet of wetlands
- Municipal Code: Title 20, Ch. 31: Flood hazard rules
- DC's Urban Tree Preservation Act of 2002

In addition to the existing adopted policy, the text of the Green Area Ratio has been developed with extensive coordination with the District Department of the Environment. DDOE will provide testimony on the benefits of the implementation of the GAR and its correlation with DDOE policy direction. Generally DDOE's stormwater regulations correlate with many of the benefits associated for stormwater with the GAR, but DDOE's regulations only apply to land disturbances over 5,000 square feet. However, the large majority of lots in the District are smaller than 5,000 square feet. The GAR is aimed at achieving similar stormwater goals. DDOE's stormwater regulations specifically state the volume of runoff which must be captured on a given lot. The GAR in contrast does not set specific qualitative standards for water volume and quality but rather allows for a flexible range of LID implementation with the intention of achieving quantitative standards through the application of qualitative options. While the intent of achieving environmental performance may be similar in both sets of regulations, the regulatory methods and applicability of the standards varies.

II. Review of Research

Existing Conditions Analysis

The GAR existing conditions data were developed using landcover analysis of all land parcels within the District of Columbia. The landcover information was obtained by using aerial photographs with infrared imagery, and layers from OCTO for roads, buildings, sidewalks, water bodies, street trees and wooded areas in order to develop the combined data. The landcover information used to study the existing GAR are not exact proxies for the proposed GAR zoning standards, but rather close equivalents based on available data. This analysis is less detailed than the proposed regulations because of the large scale of data used, and the level of detail that can be accurately captured using aerial photographs. For example, an aerial photograph cannot accurately capture soil depths, particular plant species, or the heights of shrubs. This proxy GAR, along with costs per square foot for implementing GAR BMPs will be used in determining the appropriate GAR requirement per zone. The following baseline information was determined from the initial data analysis of landcover GAR in the District. The available data is based on all parcels within a Ward, including both public and privately owned park lands and other open space not within the public right of ways. The initial analysis of existing GAR conditions has been further expanded in order to prepare necessary data for the implementation of GAR by zone. Summary data findings of existing conditions are available in the following figures and analysis.

Using the existing conditions landcover analysis the average GAR of parcels with a base zone was determined. Approximately two thirds of all parcels or uses have GARs that fall between 0.2 and 0.38 according to the landcover data. While not exact in matching the proposed GAR requirement, the data presents general trends across zones that show the relation of existing green space by zone.

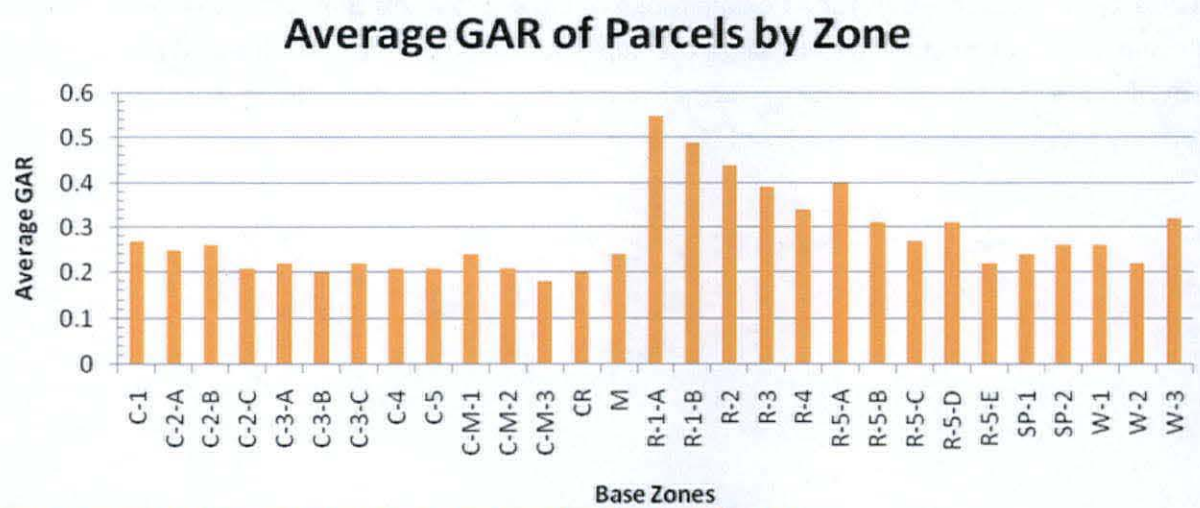


Figure 1: Average GAR by zone for base zones, developed from landcover analysis.

The landcover data was also aggregated by Ward, rather than zone, to determine if there were existing variations in existing green space environmental performance by geographic location. This data was developed from the aerial photography and also included study of minimums and maximum, and standard deviations for each Ward.

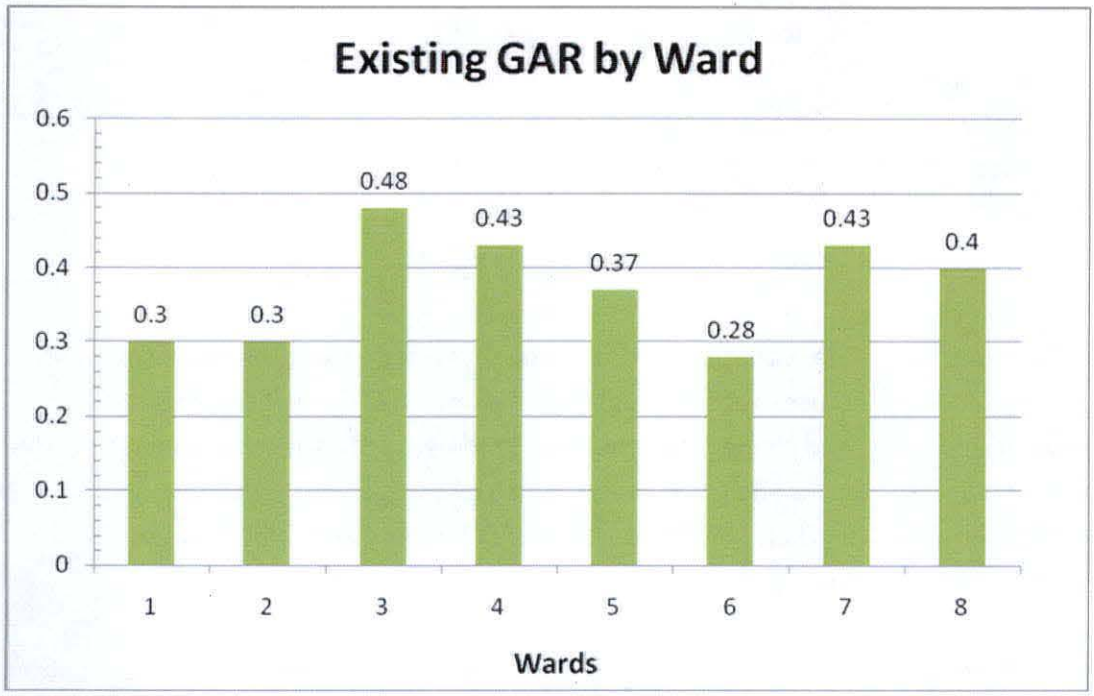


Figure 2: Existing GAR by Ward from Dr. Keeley's landcover analysis.

The inclusion of open space parcels in the average data would provide some explanation of the peak GAR in Ward 3 which includes much of Rock Creek Park. Similarly, the high GARs in Wards and 7 and 8 is likely attributable to higher levels of vacant land and a large percent of those Wards being zoned for single-family residential uses. The variation of each zone by Ward was also studied in order to determine if GAR varied by geographic location rather than zone. For each zone, the different existing GAR conditions by Ward were studied. Largely, the data showed that variations by Ward and zone were within the existing standard deviation for each zone district regardless of Ward. As an example, C-3-C is shown below displaying the Wards in which C-3-C zones are located, and the different levels of average GAR score within each Ward.

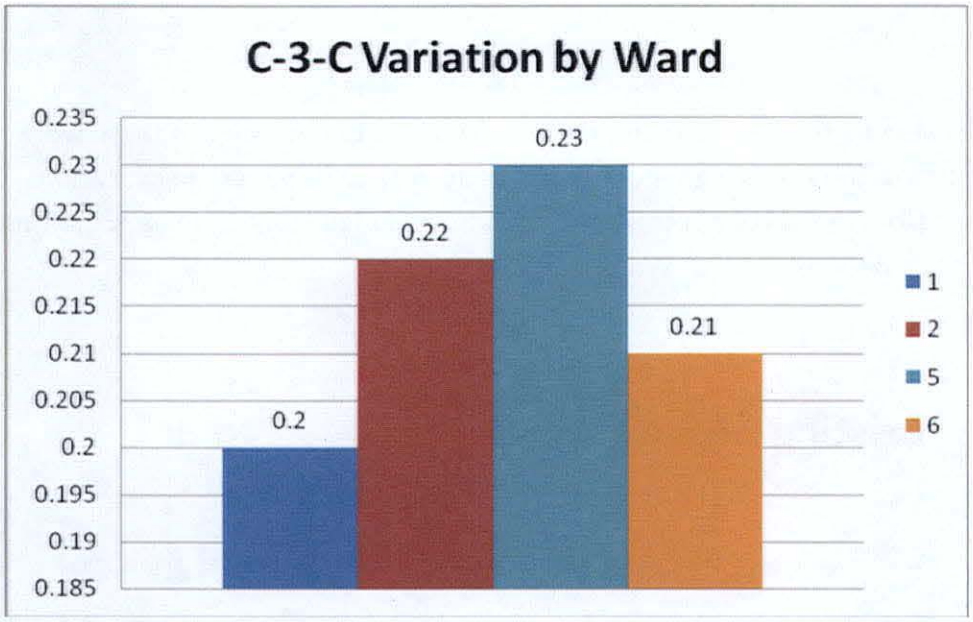


Figure 3: Variation in GAR by Ward for C-3-C zones.

Using the aerial photography data, variation of GAR by land use code from the tax assessor's data was also determined. Land uses with the highest levels of GAR are, not unexpectedly, vacant land, recreational uses, and single family homes. Land uses with the lowest levels of GAR tend to be commercially based uses such as motels, industrial uses, shopping centers and automobile service centers. This likely relates to the overall building and lot coverage associated with different use typologies.

GAR by different lot occupancies was also studied to determine if there was a strong correlation between the amount of open space and the environmental performance of a parcel. In developing the GAR system, it is generally assumed that the environmental performance of a forested or meadow lot not impacted by human intervention would have the highest possible environmental performance, and an entirely asphalt paved lot would have the lowest. Generally the data shows that lower lot occupancy equates to higher existing GAR. This correlates with existing understanding of environmental performance of different building materials. In addition to looking at GAR by lot occupancy generally across all zones, it was also studied within each zone.

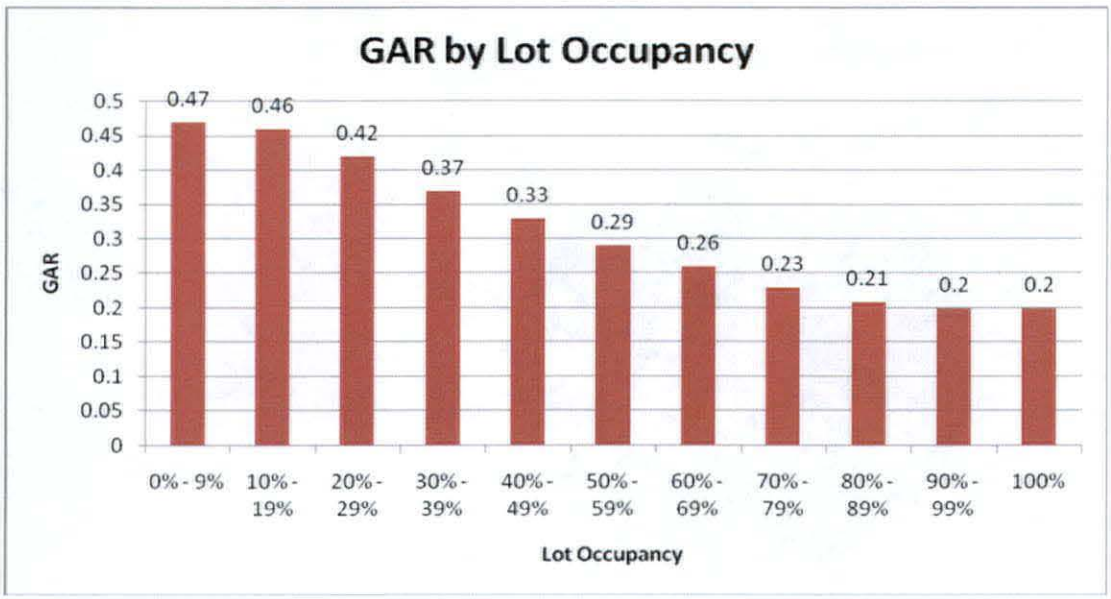


Figure 4: Relation of GAR to Lot Occupancy

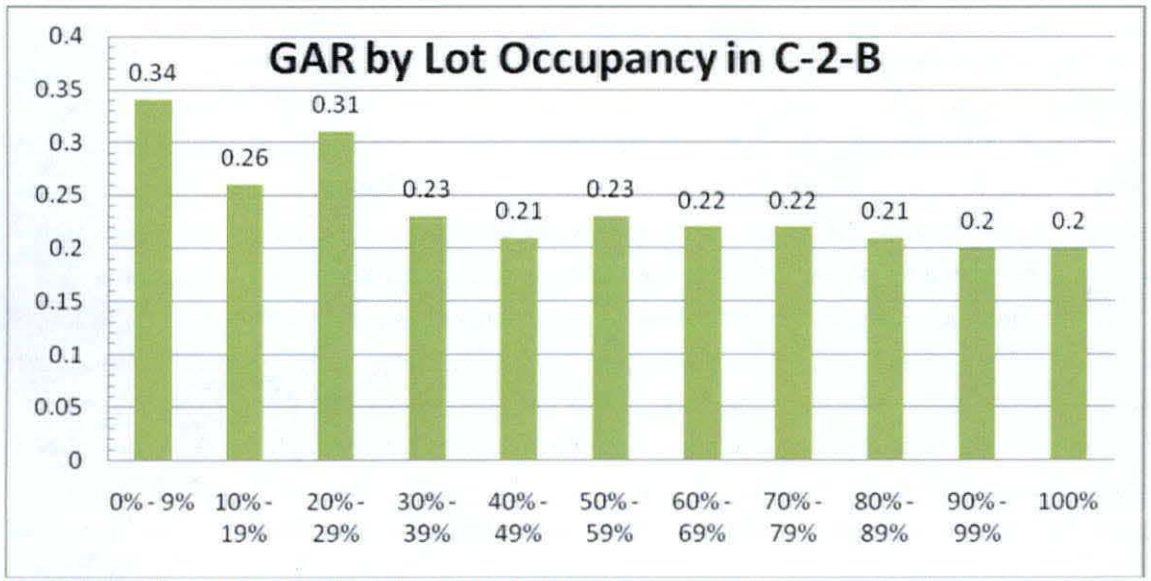


Figure 5: Relation of GAR to Lot Occupancy in the C-2-B Zone

Landcover type from the aerial photography data was also examined for parcels within a given zone. This data enabled a further level of detail within each zone for the types of existing landcovers. Although every zone may not contain every type of landcover, the range of land covered examined are; roof, grass/shrubs; asphalt; concrete; tree canopy over vegetation; tree canopy over roof; tree canopy over concrete; or tree canopy over asphalt. For example, the following chart shows the average landcover in a residential zone.

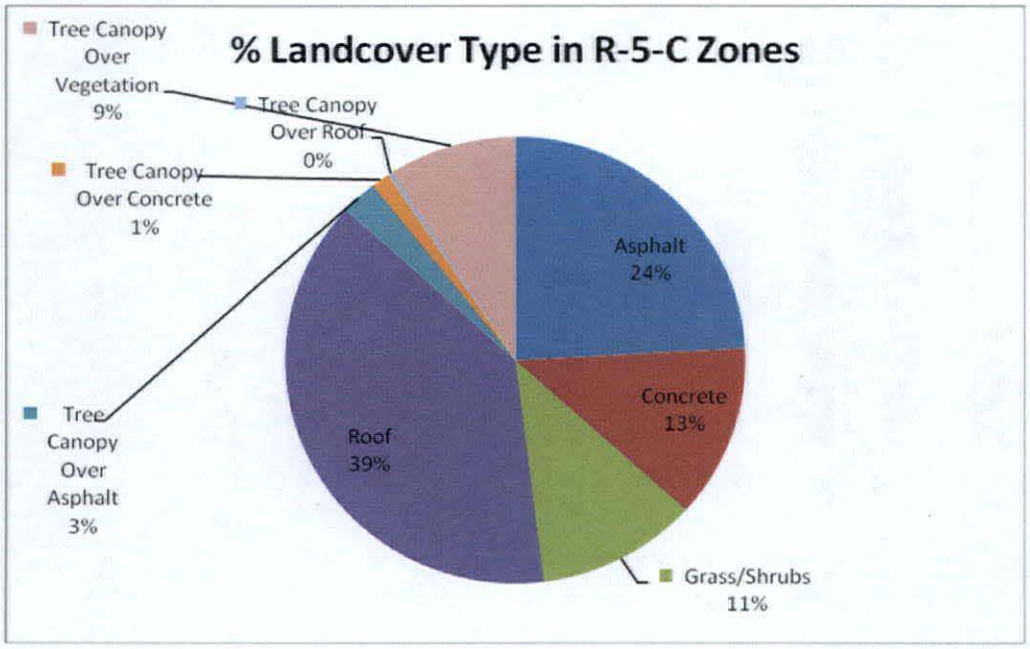


Figure 6. Average landcover typology in R-5-C zones.

After completing an initial analysis of zone data, landcover, lot occupancy and Ward specific information, this data was used to determine any difference between the available data and the proposed GAR regulation. This comparison found that the proposed GAR zoning regulation gives less credit for landcovers or landscape elements without documented environmental performance and more credit for landscape elements with higher environmental performance. This means that there is a variation between the existing landcover analysis and the GAR score which a zoning applicant which achieve with existing conditions on a lot. In order to adjust for this differentiation, sample sites across zones were studied. Using these sample sites, the aerial photographic landcover data was applied to determine existing conditions. This data was developed using a sample site from every zone for which the existing landcover analysis data was run through the GAR scoresheet. In response to this initial analysis, two further forms of study were developed: 1) a study of the variety of sample sites with similar characteristics in a variety of zones across the city, and 2) a study of sample sites within a series of specific zones. The general sample analysis can be found in the below paragraph, while the zone-specific analysis can be found in section IV of this report.

Study 1: General Sample Site Studies

Sample site case studies for the proposed GAR requirement were performed for three main types of sites to test the requirement; 1) 100% lot occupancy buildings downtown, 2) high density multifamily, and 3) small-scale commercial properties. For each of the sample sites, existing landcover analysis from aerial photographs was used to determine existing GAR scores. Then options for increasing the GAR scores were tested to see options for improving on a site by site basis and the potential costs of implementation. One example of each of these sample sites can be seen below.

High Density Multi-Family Residential Site: 900 G Street NE

Zone: R-5-D

Existing GAR: 0.18

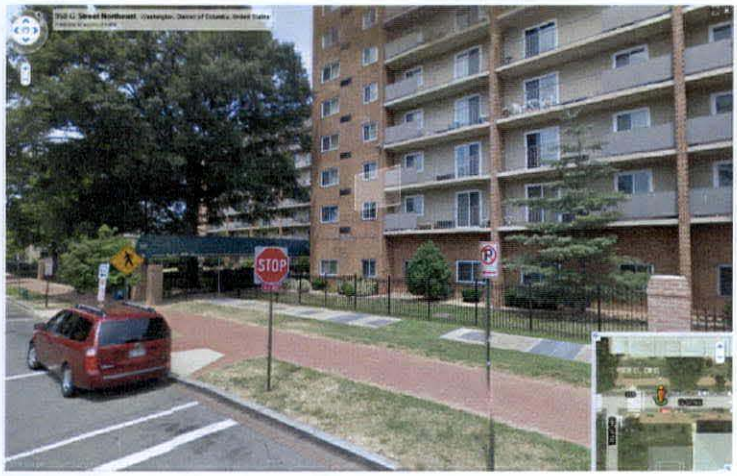


Figure 7: Street level view of 900 G Street NW.

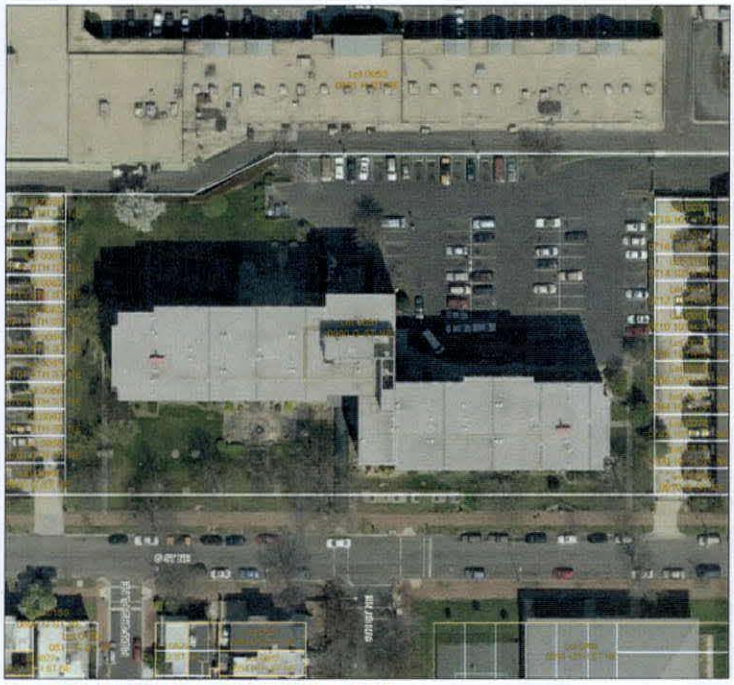


Figure 8: Aerial view of 900 G Street NE

This lot (figures 7 and 8) is characterized by its existing significant open space and green area. Its existing GAR is almost doubled to 0.36 when the paved and asphalt areas are converted to permeable paving and several trees added in the parking or open space areas, for an average cost

of $160,000. The score could again be significantly increased again to 0.488 if green roof is added to over half of the available roof area at a cost of $440,000. If a raingarden or other bioretention facility replaced some of the grassy lawn, at a cost of approximately $105,000 the GAR score could exceed 0.5.

100% Lot Occupancy in Downtown: 800 17th Street NW

Zone: C-4

Existing GAR: 0.30

Figure 9. Street level view of 800 17th Street NW

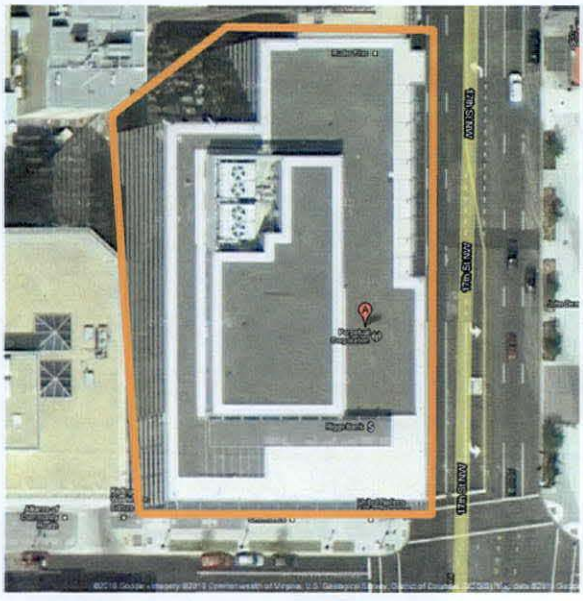


Figure 10. Aerial view of 800 17th Street NW

The primary feature of this development (figures 9 and 10) that achieved the 0.30 GAR score was the extensive (low) green roof which was put in place as a part of the LEED Platinum certification achieved on site. If a more intensive (thicker growing medium) green roof was put in place instead, the property could earn a score of 0.40, at an additional cost of $407,000. If an equivalent area was set aside for renewable energy generation, an additional 0.26 could be added to the GAR score, at a cost of around $420,000.

Small scale Commercial: 1443 Howard Road SE

Zone: C-1

Existing GAR: 0.0

Figure 11: Street level view of 1443 Howard Road SE.

Figure 12: Aerial view of 1443 Howard Road SE.

The low existing GAR score for this site (Figures 11 and 12) is attributable to the complete coverage of the lot by pavement and building. Covering just under half the roof area with an intensive green roof will raise the score to 0.1 and cost around $125,000. In addition, switching over less than half the paved area to permeable paving would achieve the same score and cost approximately $40,000. If the entire pavement area were converted to permeable with a few modest plants and trees in non parking space, the score could raise to 0.26 with an increase in cost of approximately $60,000. If still more of the paved area alone was shifted to other best management practices such as a raingarden, could move the score to 0.27 for an additional $13,000. The combination of permeable paving, raingarden, plants, and green roof would result in a 0.37 score for less than $200,000.

As the individual zones are studied for inclusion in the larger updates to the zoning regulations, these types of analysis will be completed for each zone to aid in the determination of the correct level of the GAR score for a given zone.

Cost & Benefit Analysis

Cost Estimates

At the setdown meeting, the Zoning Commission requested further information on some of the potential costs involved in implementing the GAR requirement. The potential types of costs include costs for the government and costs for property owners to implement different elements of the requirement.

Cost to City to Train Staff

Potential costs for the District government could include time spent training existing employees, hiring new employees with different skills or experience, or creating new certification programs for landscape experts in the District. Conversations with the program administrators of a similar GAR program in Seattle revealed that no new staff was hired in order to address the administration and oversight of their GAR requirement in particular. Each of their current plan reviewers and inspectors were given approximately three hours of training in addition to access to reference resources in order to aid in their implementation of the requirement. Feedback from plan inspectors and site inspectors revealed that while initially extra hours of training and review time accrued, within the first six months of implementation, review times were similar to existing times for reviewing landscape plans. A similar system of four trainings for periods three hours provided over the course of the first year of implementation, and as needed as employee turnover would be appropriate for a District program. The training could be incorporated into current and existing training for site plan reviewers and inspectors as well. It is notable that this regulation is a part of a comprehensive update to the zoning code, and sufficient training will have to be provided to update staff and the general public on the updated regulations, and this training should simply be a necessary portion of that larger effort.

If the District were to take a much more aggressive approach than Seattle and hire a landscape architect or create a certification program for landscape architects in the District, costs would

increase accordingly. If the District were to hire an American Society of Landscape Architect (ASLA) certified landscape architect to review plans most likely submitted by ASLA landscape architects, the City could estimate paying median annual salary of about $65,000 – $73,000 (includes benefits). ASLA reports that as of May 2008, the median annual wages for landscape architects was $58,960. The middle 50 percent earned between $45,840 and $77,610. The lowest 10 percent earned less than $36,520 and the highest 10 percent earned over $97,370 OP does not believe that this is a necessary step given the current expertise available for plan review and site inspections at DDOE.

Cost to Applicant

Costs for an applicant to comply with the GAR will vary depending on site specific conditions and particular landscape elements implemented. Specific cost estimates for landscape elements were based on existing information from best practices with the DC metropolitan region and contracting figures from DDOE and DDOT for work done within the past fiscal year. Cost estimate figures include the costs inherent in removing the existing soil, concrete, asphalt, etc as well as the costs of installing the best management practices. For each landscape element included in the GAR, costs estimate high and low figures were used to estimate overall potential costs. These costs for landscape elements can be found in Appendix D. These cost numbers are reflective of removing the existing conditions, and installing the best management practices, but do not reflect the incremental benefits and savings over time that will be accrued due to their environmental performance or the avoidance of other costs. These figures were tested in both the sample sites included in this report, as well as the methodology for setting GAR section which looked at a series of sample sites in Industrial zones. These analyses as well as consultation with implementation in Seattle found that the costs of implementing the GAR typically came in at less than 1% of total construction costs consistently, and very often less than half a percent of total costs. In addition to these costs, landscape expert fees should also be considered which will vary depending on professional accreditation type and the size of the project.

Benefits

DC property owners are subject to two impervious surface based fees from DDOE and DC Water. Both subject property owners to fees based on the percentage of their property covered in impervious surfaces, though in slightly different ways. Implementation of the GAR requirement would lead to a diminishment of an individual property owner's costs, which are otherwise designed to escalate over time. For DC Water, the initial provision of the regulation in January 2009 had rates of $1.24 per equivalent residential unit (ERU), and at the time of this writing in December 2010 has been increased to $3.45 per ERU, and is expected to increase annually. As the fees escalate over time, it will be an increasing benefit to have a decreased percentage of impervious land and a higher GAR score. In addition to the fees to an individual, the District also is subject to meeting a number of its policy goals and larger federal requirements. These include meeting the requirements of the District's Municipal Separate Storm Sewer Systems (MS4) permit which

requires stormwater quantity and quality performance District-wide through a variety of LID and other initiatives. All the smaller implementation of the GAR on private property is providing incremental steps towards achieving DC's larger goals and permit requirements. If DC does not comply with the MS4 permit, it will be subject to fines of $37,500 per violation per day.

The environmental benefits of LID and other sustainability features are well known, ranging from stormwater quantity and quality to heat island and air quality impacts. These benefits of implementing landscape elements carry varying levels of environmental achievement, depending on the current best management practice. These benefits aid in contributing towards many of the District's policy goals described above. There are a number of available scientific resources, publications and online calculation tools that are available to quantify the specific benefits of implementing a given best practice. For example, the U.S. Department of Agriculture commissioned a study Assessing the Urban Forest Effects and Values which focused on existing tree and land cover in Washington DC. The study appraised the existing tree cover and found that DC's urban forest provided air pollution removal, air temperature reduction, reduced building energy use, improved water quality, reduced noise, as well as social benefits such as human comfort and increased property values. As of 2006, DC's tree canopy was removing 16,200 tons of carbon from the atmosphere annually, and reducing air pollution by 540 tons. On a per tree basis, carbon sequestration can range from 35 lbs/yr for small slow growing trees to 800 lbs/yr for larger trees growing at their maximum rate. Trees planted near residences can have energy saving benefits (from reduced air conditioning demand) of 25 to 43 percent. Casey Trees also provides an online Tree Benefits calculator that enables a user to quantify the benefits of a tree by species, size and location in terms of present value dollars, stormwater, property values, energy, air quality, and carbon dioxide.

Beyond trees, the capabilities to measure the benefits of other LID technologies also exist in the format of existing research or online tools. For example, the Center for Neighborhood Technology provides an online calculator that enables a user to test options for green improvement on a lot and determine their potential benefits and drawbacks. Likewise, though each green roof installation may vary due to location conditions and products, DC GreenWorks a local nonprofit finds that 1,000 square feet of green roof can supply 110 people with oxygen and remove 41 pounds of airborne pollution annually. They can also reduce runoff rates and retain 50-95% of rain water, and reduce noise pollution by 50 decibels. Green roofs can also contribute positively to urban heat islands effects as plants use heat energy from their surroundings to evaporate water, for example one square meter of plant area can evaporate 0.5 liters of water on a hot day. OP is hoping to work DDOE to develop a joint online tool which could aid in the calculation and monitoring of the environmental benefits of these types of best management practices within the District.

III. Changes to draft GAR Text

Applicability

Applicability to Flats

At the setdown meeting questions were raised about whether the requirement should apply to flats (two unit buildings) or single family homes with accessory apartments. The Zoning Commission raised the concern that this requirement may be perceived as being too onerous on one or two unit properties that may not have the necessary expertise to comply with the requirement. In response, the Office of Planning prepared an examination of the area and lots on which the GAR would apply and looked at the number of single family homes and the number of flats. The data represent only those accessory apartments that are registered with the District. Single family homes make up approximately 93,700 households in DC according to the Office of Tax and Revenue, while condos and flats make up 47,900 and 7,900 respectively. This combined land area makes up approximately 20% of the District's total land area, but varies by zone. While the exclusion of flats from the GAR requirement would not cover a large percentage of the District's land area, it would provide a large number of homes with exemptions from the requirement.

The Green Area Ratio Setdown Report outlined three reasons for not initially requiring that one-family dwellings meet the proposed GAR standards:

- Implementing this standard would impose an undue financial and logistical burden upon homeowners.
- Properties with one-family dwellings typically maintain higher standards of landscaping and retain more green area.
- The sheer number of one-family dwellings would put a significant stain on the pilot program.

The same can be said of flats. A majority of requests for flat conversions come from the owner-occupants of an existing one-family dwelling. Modifying the interior space in these dwellings to accommodate two-families or to create an accessory basement apartment does not result in significant changes to the existing landscaping or the loss of open space. There are also no external requirements for these uses, such as an additional parking on-site, that would necessitate changes in the site character. The design characteristics of new flats constructed to moderate-scale of two- or three-stories in a row, semi-detached and detached configurations are generally indistinguishable from the neighboring one-family dwellings. There are also a large number of individual flats or flat conversions in nearly every neighborhood that would have to be identified and brought into conformance. Based on these observations it would be appropriate to also exempt rowhouses and flats from the GAR requirements. Therefore, the Office of Planning recommends changing the GAR requirement to apply to all zones except the R-1 to R-4 zones (zones in proposed Subtitle D).

Below is a map that shows the proposed applicability of the GAR based on the exclusion of federal lands, single family homes and flats.

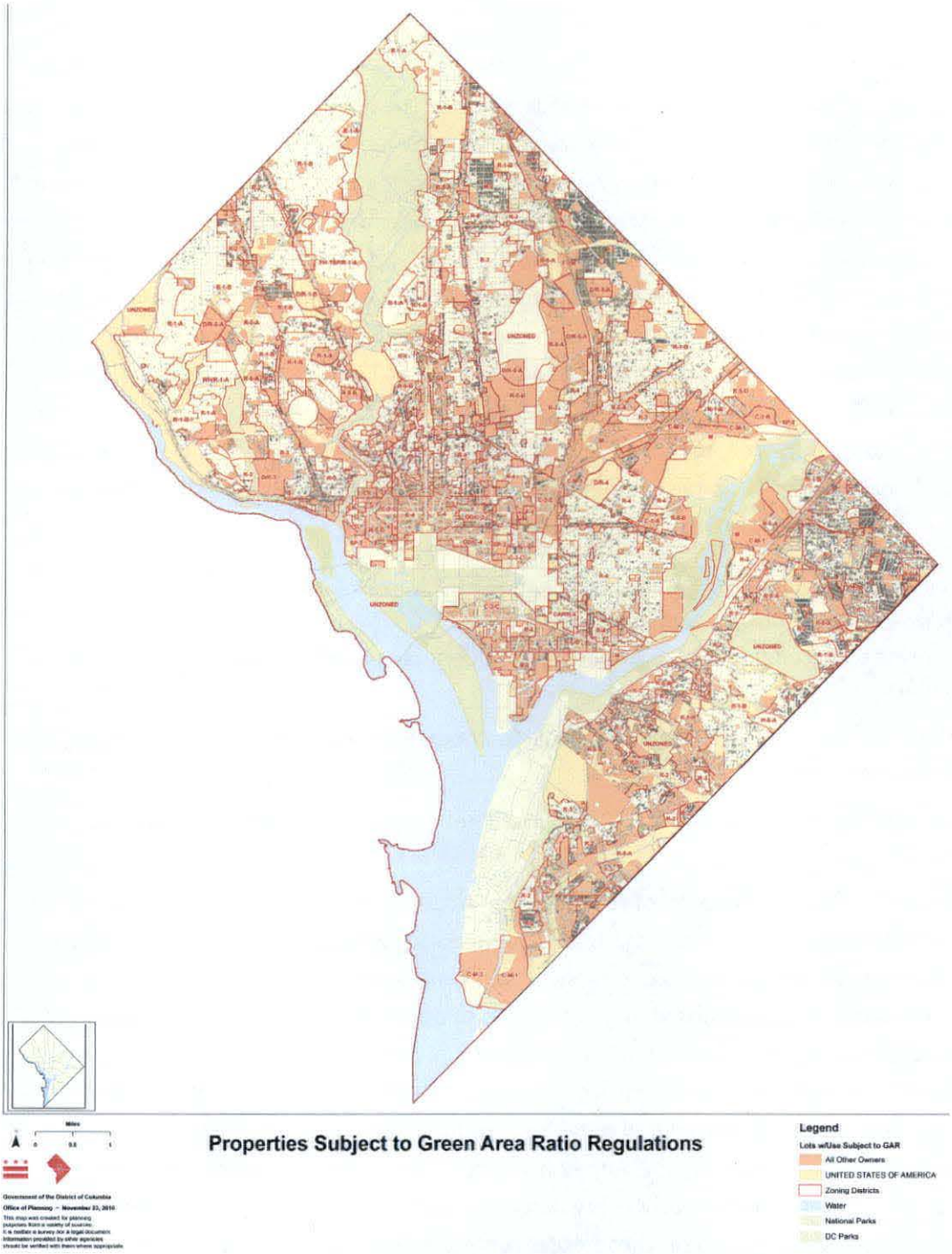


Figure 13. Properties subject to GAR requirements in zones, excluding the highlighted federal properties.

Applicability to Public Space

At the setdown meeting, the Zoning Commission raised questions about whether the GAR requirement could be met by implementing landscape elements in public space when they could

not fit on a lot. OP investigated the legality of allowing compliance in public spaces and found no legal restrictions on this type of implementation, as long as the regulation is clearly and explicitly worded. OP discussed the option with DDOE and found favorable support for off-site applicability of the requirement. Placing LID in public space and expanding the existing tree canopy in both public and private space fit into DDOE and the District's larger policies and goals. Allowing compliance with the GAR in public space would add a necessary layer of complication however, as all GAR implementation in public areas would have to meet public space regulations in addition to those of the GAR. DDOT is in the process of developing a stormwater management plan for the public spaces that fall in their purview, so this would be an additional set of public space guidance that would need to be navigated by property owners. Discussions with DDOT have brought up concerns about the difficulties of using public space for compliance of a regulation of private land, such as if a cistern were put in public space and later a sidewalk needed to be expanded, there could be a conflict of interests. Due to these factors OP recommends not allowing compliance with the GAR using public space at this time.

Further discussions on the topic of allowing the GAR in public space also brought up the concept of allowing off site compliance with the GAR. This is a topic which will require much further study into feasibility for implementation, and therefore OP is not recommending in favor or against off site implementation of the GAR at this time.

Applicability to Renovations

OP has conducted further discussions with DDOE about continuity between the terms of their respective regulations. This process led to a discussion of the standard concerning the cost associated with a substantial or major renovation. The proposed GAR regulations had recommended a standard of renovations over 100% of the assessed value threshold for the applicability of GAR . This standard was based on the existing standard established in the current code in the DD overlay which requires application on all new buildings and renovations that exceed 100% of the cost of the assessed value of the building. DDOE's stormwater regulations have a substantial renovation standard of 50% of the assessed value. OP surveyed the following regulations for references to standards of substantial renovation: Zoning, Building Code, the Green Building Act, the floodplain regulations, DDOE's stormwater regulations, and the Anacostia Waterfront Environmental Standards Act of 2008. Below are examples of current regulations.

Title 11: Zoning

- The current Title 11 (zoning) lays out that nonconforming structures cannot continue as nonconforming if more than 75% of the cost of the entire structure (§2001.4). This is one of the only sections of the code pertaining to the level of new construction by cost in the code that is a trigger for further requirements.

> 2001.4 If a nonconforming structure is destroyed by fire, collapse, explosion, or act of God to an extent of more than seventy-five percent (75%) of the cost of

reconstructing the entire structure, the nonconforming structure shall not be restored or reconstructed except in conformity with all provisions of this title, except as provided otherwise in §§ 2001.5 through 2001.10.

- The DD overlay (Chapter 17) requires application on all new buildings and renovations that exceed 100% of the cost of the assessed value of the building. This has been in place for some time and is a known and used standard in the existing code.

1700.5 The requirements and incentives of this chapter apply to all new buildings and to all other buildings where any additions, alterations, or repairs within any twelve-month (12) period exceed one hundred percent (100%) of the assessed value of the building as set forth in the records of the Office of Tax and Revenue as of the date of the building permit application; provided:
(a) The cost basis for alterations or additions to an existing building shall be the amount indicated by the applicant on the application for a building permit;
(b) The assessed value of the building shall be the value set forth in records of the Office of Tax and Revenue as of the date of the building permit application; and
(c) In the case of an addition, the requirements and incentives of this chapter apply only to the addition.

DCRA's DCMR 12J Existing Building Code

- DCRA follows the following standard of existing buildings, defining "substantial improvement" as exceeding 50% of the market value of the structure before improvements or repairs begin.
- The Green Building Act references this provision in the existing building code as the current version of the building code "(40) "Substantial improvement" has the same meaning as in section 202 of Title 12J of the District of Columbia Municipal Regulations (12J DCMR § 202)."

SECTION EX-202 GENERAL DEFINITIONS:
Substantial Improvement. For the purpose of determining compliance with the flood provisions of this code, any repair, alteration, addition, or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained substantial damage, any repairs are considered substantial improvement regardless of the actual repair work performed. The term does not, however, include either:
1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the code official and that are the minimum necessary to assure safe living conditions; or
2. Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure

NCRC and AWC Reorganization Act of 2008

- Subtitle B of the NCRC and AWC Reorganization Act of 2008, which is the environmental standards subtitle, also known as the Anacostia Waterfront Environmental Standards Act of 2008, like the GBA, puts a number of requirements on new construction or substantial

improvement. Section 452 (7) defines substantial improvement as having "the same meaning as set forth in Section 2(40) of the Green Building Act."

DDOE's Floodplain Regulations

- In the updated floodplain regulations, Section 3105 puts certain requirements on new construction and substantial improvements of residential and non-residential properties.
- The substantial improvements are defined in Section 3199 of the regulations as follows, which is very similar in content to DCMR Section 12J.

> Section 3199 "Any repair, reconstruction, rehabilitation, addition, or improvement of a building or structure, the cost of which equals or exceeds fifty percent (50%) of the market value of the structure before the start of construction. If the structure has sustained substantial damage, any repairs are considered substantial improvement regardless of the actual repair work performed. The term does not, however, include either:
>
> 1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the code official and which are the minimum necessary to assure safe living conditions; or
> 2. Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure."

DDOE's Stormwater Regulations

- DDOE's draft stormwater regulations stipulate application when "alterations and repairs of existing buildings in which the estimated cost equals or exceeds fifty percent (50%) of the assessed value of the property before alterations and repairs are started"

> Title 21, Chapter 5: 526.2 Before conducting Level 3 alterations and repairs of existing buildings in which the estimated cost equals or exceeds fifty percent (50%) of the assessed value of the property before alterations and repairs are started, and which have downspouts connected to a sewer, a person shall obtain a stormwater management permit to treat, control, and manage runoff from the site.

After discussions with DDOE about current standards and their intentions towards updating the draft stormwater regulations, OP continues to recommend a 100% cost of renovation standard for applicability to renovations. The decision was based on the policy and recommended actions from discussions with DDOE and DC Water. While several other regulations refer to 50% cost as a substantial renovation, these standards are often applied to a lower threshold of compliance for those regulations. Rather than intentionally make a new regulation more complicated by having separate standards for renovations and new construction OP recommends using a higher threshold for renovation, with a single standard for both.

Implementation and Administration

The Zoning Commission requested further information about the administration and department-specific government responsibilities that would be associated with implementing the requirement. The Office of Planning conducted discussions with the District Department of the Environment and the Department of Consumer and Regulatory Affairs to help determine responsibilities regarding

the administration of the GAR. These two agencies are expected to be the primary administrative agencies for the GAR requirement.

According to initial agreement by OP, DCRA, and DDOE, review of the GAR requirements will be similar to current requirements where DCRA manages the overall approval process and DDOE provides technical expertise in site plan review. An outline of the proposed administrative process is attached to this report in Appendix C. Generally, applicants will go to DCRA for the GAR requirements similar to any other zoning requirement. If they must meet the GAR they will submit their required forms to DCRA which will forward them to DDOE for review, prior to granting building permits and certificates of occupancy.

As a part of the larger series of overall updates from the Zoning Review process, OP anticipates training on all the zoning code updates. The training around GAR should be included in the larger updates training and education process. GAR training in particular should target existing plan reviewers at DCRA as well as DDOE's stormwater plan reviewers and inspectors. OP also anticipates producing I materials to aid the general public and the development community about the GAR requirement, as well as methods and options for meeting their requirement. OP will work with DDOE to provide access and support for applicants to have the necessary detailed information available in order to implement the GAR. In addition, OP is in discussions with DDOE about incorporating the GAR requirement into an online stormwater implementation tool to aid property owners in meeting their stormwater requirements. Once completed, this online platform is anticipated to provide the feasibility of different options for a particular property's sustainability implementation.

Maintenance & Enforcement

The Zoning Commission requested further detailed information at the setdown meeting about maintenance of the implemented GAR elements. Areas of interest centered on who would maintain data on GAR implementation and long term timelines of implementation. Because there is not an equivalent requirement to GAR currently in place, DCRA does not currently have established procedures for maintaining and tracking the submitted landscape maintenance plans. However, OP and DDOE are jointly in the process of applying for a grant from the EPA which could help to establish, monitor and report on the achieved results of this requirement. Whether the grant funding is received or not, a system would be established by working in conjunction with DCRA that is similar to the Office of Zoning's Compliance Review complaint based system. As the GAR would be a zoning requirement, like any zoning requirement, the property owner is responsible for maintaining zoning compliance. The maintenance section of the proposed text outlines that implemented GAR elements may be replaced over time with other GAR landscape elements, so long as the equivalent GAR score is maintained.

Similar to other zoning requirements, enforcement of the GAR will be a complaint based system due to available resources. In discussions with the city of Seattle, their enforcement system is similarly based on complaints and then inspections, rather than a proactive system of inspection. In speaking with DDOE they have a separate system of stormwater inspectors (eight full time employees) who could be made available for GAR enforcement and compliance.

IV. Methodology for Establishing GAR in Zones

In response to initial analysis of existing GAR conditions, two further forms of study were developed to develop data to be used to set GAR levels in those zones: 1) a variety of sample sites of similar characteristics in a variety of zones across the city, and 2) sample sites within a series of specific zones. Study 1 analysis is discussed above in section II Review of Research. Study 2 is discussed below.

The first example of this methodology is in the first draft land use subtitle report for Production, Distribution, and Repair (PDR) zones. This analysis was completed in order to test a methodology for determining how to set GAR within for a zone. In order to develop this analysis, OP developed a range of high and low cost estimates for the landscape element options for the GAR. These estimate figures can be found in Appendix D.

OP examined CM and M zones throughout the city to recommend GAR score requirements for proposed PDR zones. To determine the recommended levels, OP examined the following information:

- Existing ground cover
- Existing building footprints
- Construction cost averages for industrial uses
- Cost estimates for GAR elements

Using existing building footprint and ground cover analysis of CM and M zones, OP calculated the average existing GAR score by zone. This was done by determining the land area as a whole within each zone occupied by building, pavement, trees, vegetation, or other. This information was then used to approximate an average GAR score for the entire zone using proposed multipliers from the general GAR chapter. Approximate existing average GAR scores for existing PDR zones are:

Zone	Average GAR
C-M-1	0.156
C-M-2	0.092
C-M-3	0.036
M	0.172
Average for all PDR	0.137

This information provides a starting point for setting a proposed GAR score. For example, if the GAR score was set in the PDR zones at 0.1, it could be assumed that over half of the PDR zoned

properties in the city would meet the requirement under existing conditions with no further improvements needed. After determining the existing landcover and analysis was performed for a variety of typical sample sites within each of the PDR zones.

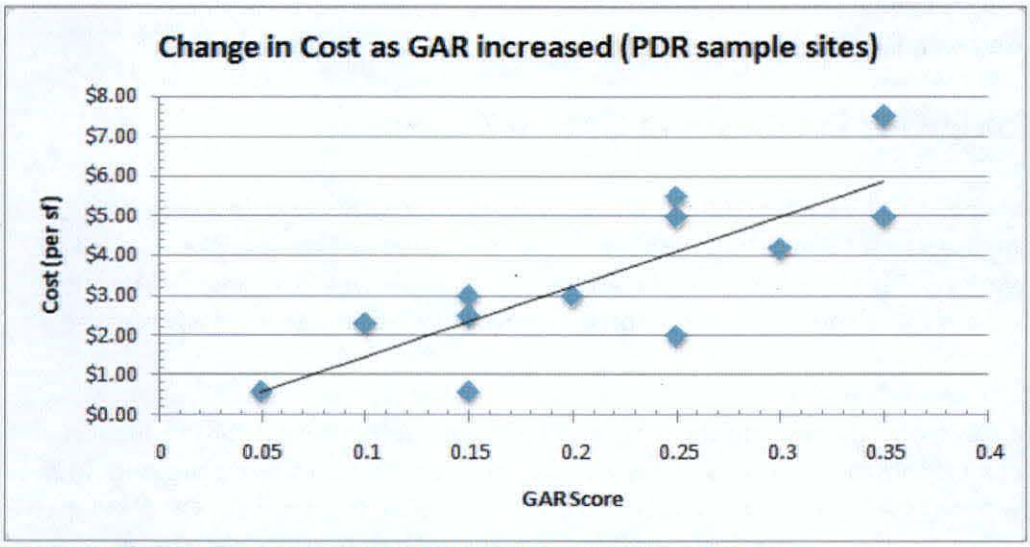


Figure 14: Change in costs per square foot as higher GAR requirements are met.

Using estimated costs of providing GAR elements (Appendix D), the costs associated with meeting different GAR scores on properties starting with a 0.0 score were examined. The chart above (Figure 14) depicts projected average costs for various case studies in PDR zones. The chart shows GAR scores along the X axis and average cost per square foot of lot area to raise a property from 0.0 to the projected score along the Y axis. The resulting linear value shows a projected average cost of $1.50 per square foot of lot area to raise each 0.1 FAR up to 0.3. Above 0.3 in PDR zones, the costs rise faster because more expensive measures are required since many of the properties in these zones are either fully paved or fully built out. In addition, the analysis has shown that scores above 0.3 may be difficult or impossible to achieve on lots with 100% lot occupancy.

Since there are very few properties with an existing score of 0.0, the average cost to achieve the GAR requirement starting from 0.0 is assumed to be at the highest end of the range of cost to property owners. Based on all of this information and an industrial construction cost estimate of $200 per square foot of gross floor area, a possible GAR requirement was tested in the PDR zones of 0.1, 0.2, and 0.3 for potential costs. All three resulted in a range of cost for compliance that was below 1% of construction costs.

The table below shows these calculations for a GAR requirement in PDR zones of 0.2:

	C-M-1	C-M-2	C-M-3	M

Proposed GAR requirement	0.2	0.2	0.2	0.2
Average existing GAR	0.156	0.092	0.036	0.172
Average additional GAR required	0.044	0.108	0.164	0.028
Projected cost for average additional GAR	$0.66/sf of lot area	$1.62/sf of lot area	$2.46/sf of lot area	$0.42/sf of lot area
Allowed FAR	3.0	4.5	6.0	6.0
Construction cost based on full FAR build out at $200/sf of GFA	$600/sf of lot area	$900/sf of lot area	$1200/sf of lot area	$1200/sf of lot area
Cost Range (per sf of lot area)	$0-$3	$0-$3	$0-$3	$0-$3
Cost Range as percentage of construction cost	0 - 0.5%	0 - 0.33%	0 - 0.25%	0 - 0.25%

Because a score of 0.1 is below the average existing score in PDR zones and 0.4 represents a score that can difficult or impossible to achieve on lots with 100% lot occupancy, the GAR score requirement in PDR zones should fall between 0.2 and 0.3. Since this is a new program and the analysis is based on estimated costs, OP recommends a starting requirement for PDR zones of 0.2. This would represent an improvement for most existing PDR properties without imposing any undue burden on new development or redevelopment. After the program has been in place for a time and developers are familiar with the process, there will be future opportunities to consider a higher requirement.

V. Outline of Subtitle B – Chapter 13 Green Area Ratio

At the setdown meeting the Zoning Commission asked for further details on several of the specific details of the terminology and standards used in the proposed text. These changes are detailed on a section by section basis below.

Sections 1300 and 1301 - Introduction to GAR Regulations

- § 1301 provides background information about the proposed system of Green Area Ratio in order to add clarity for users.

Section 1302 – Applicability of Green Area Ratio

- § 1302 provides an explanation of rules for when the Green Area Ratio must be met.
- § 1302 contains an explanation of conditions and situations when the GAR applies.
- § 1302.1 establishes the assessed value threshold at which the GAR must be applied to 100% assessed value renovations of existing buildings or structures.

- § 1302.1 states that the GAR applies to all development which requires a Certificate of Occupancy. This provision ensures that single dwelling unit residences are not required to meet the standards of the GAR. This decision is based on three considerations: , first that an undue financial and logistical burden not be placed on homeowners, secondly, recognition that these dwelling typically already have a higher landscaped or green area on their lots, and thirdly, that the program can be efficiently administered. Including one dwelling unit residences in the requirement would be logistically complicated before the program has been piloted because single dwelling unit homes occupy a majority of the parcels in DC.
- § 1302.2 On the basis of research in the above report and the request of the Zoning Commission, this section now excludes Certificates of Occupancy for flats and accessory apartments from the GAR requirement as well.

Section 1303 – Calculation of Green Area Ratio

- § 1303 provides an explanation of how the GAR is calculated.
- § 1303 contains an explanation of elements included in the calculation, applicable landscape elements, how to measure elements included in the GAR, and the formula used to calculate the GAR.
- §§ 1303.1 -1303.6 have no proposed changes to the draft text.
- § 1303.1 This section remains unchanged.
- § 1303.2 This section remains unchanged.
- § 1303.3 This section remains unchanged.
- § 1303.4 is used to ensure that the GAR score is not achieved by merely paving an entire site with permeable pavement, but rather that a higher environmental and aesthetic value is achieved through the GAR requirement. This section remains unchanged.
- § 1303.5 shows how landscape elements may be counted where they overlap, such as groundcover under a tree, and when overlapping landscape elements can be counted for additional GAR credits. This is allowed in order to provide credit for the stormwater retention abilities of differing surface types (impervious, or pervious by depth.) This section remains unchanged.
- § 1303.6 explains that there are further requirements for each landscape element to be considered eligible which are found in 1304. This section remains unchanged.
- § 1303.7 shows how trees are to be measured for the purposes of meeting the GAR requirements. The regulations use this equivalency table to enable standardization of credits for landscape elements of different species which may vary incrementally in size. Providing equivalent square footage to be used for certain size plants and trees allows for standardization of calculations in the GAR scoresheet.
- § 1303.7 In an expansion from the previous version of the text, five rather than three variations of square footage that may be used for different sized trees are used in order to give a higher multiplier in the landscape elements chart in order to capture the higher environmental performance that is achieved from a larger tree. This expansion of categories of tree sizes led to shifting in the numbers of both trunk diameter and equivalent square footages. This equivalency is based on a calculation based on

standard arborist procedures of approximately one inch of trunk for every two feet of canopy diameter.

- § 1303.8 provides the detailed steps for measuring landscape elements of the GAR, including references to more detailed information about particular landscape elements. This section remains unchanged.
- § 1303.9 provides a table of optional landscape elements that may be included, and the environmental performance multipliers used in calculating GAR. In order to reflect the updated tree area equivalencies, these numbers were changes in the multiplier chart.
- § 1303.9 In addition, the specifications for the depths of intensive and extensive roofs were changed to reflect existing definitions from the updates to the sustainability updates to the building code, from which the previous definitions differed. In response to the deeper depths laid out by the definitions, the multipliers were adjusted to reflect the higher environmental performance achieved.
- § 1303.9 also includes the inclusion of area set aside for renewable energy generation, based on commentary and discussion from the Zoning Commission, to ensure that the provision of the GAR does not exclude other worthy sustainability measures.

Section 1304 - Landscape Element Conditions and Standards for Green Area Ratio

- This section provides an explanation of conditions of eligibility for landscape elements, and standards of application.
- § 1304 provides specific details and conditions that landscape elements must meet in order to count towards the GAR requirements.
- § 1304.2 This section remains unchanged.
- § 1304.3 establishes the definition of landscape elements that may be considered bioretention facilities, i.e. rain gardens. This section was updated to include Baysavers a locally based LID best management practice.
- § 1304.4 This section remains unchanged.
- § 1304.5 establishes how vegetated or 'green' walls may be used towards meeting GAR requirements. This section was updated to provide further clarity about how to measure areas to be included when implementing a vegetated wall.
- § 1304.6 This section remains unchanged.
- § 1304.7 This section remains unchanged.
- § 1304.8 establishes enhanced tree growth systems, some examples of which include structural soils and other methodologies of promoting tree root growth and overall tree health. This section was updated to stress that soils should be neither contaminated nor compacted according to federal regulations.
- § 1304.9 This section remains unchanged.
- § 1304.10 This section remains unchanged.
- § 1304.11 This section remains unchanged.

Section 1305 - Submittal Requirements for Green Area Ratio

- This section provides an explanation of the submittal requirements needed to meet the GAR.
- §1305.1 This section remains unchanged.
- §1305.2 This section remains unchanged.
- §1305.3 This section remains unchanged.
- Old § 1305.4 required a worksheet to demonstrate how the particular square footages for the proposed landscape elements on a property are determined. This section was deleted due to ongoing confusion about a submittal that was intended to add clarity. In response, the submittal requirement was removed.
- New § 1305.4 establishes the specific elements that must be included in the submitted landscape plan in order for the plans to be properly reviewed for GAR compliance. This section remains unchanged.
- New § 1305.5 establishes that a landscape maintenance plan is required and identifies the elements which must be included in the submitted landscape maintenance plan. This section remains unchanged.
- § 1305.6 explains changes to landscape or maintenance plans that require a plan revision and approval. This section remains unchanged.
- § 1305.7 establishes the timing requirements of meeting GAR requirements and that landscape elements must be installed before a Certificate of Occupancy is issued. This section remains unchanged.
- § 1305.8 requires signed verification by a certified landscape expert that the landscaping was installed according to the approved building permit. This section remains unchanged.
- § 1305.9 describes that a temporary Certificates of Occupancy may be issued under a series of conditions that prohibit installation of the required GAR elements. This section remains unchanged.
- § 1305.10 This section remains unchanged.

Section 1306 - Special Exceptions for Green Area Ratio

- This section provides an explanation of exceptions from the GAR.
- § 1306 contains conditions and requirements under which a property may be eligible for a special exception from the GAR requirement.
- § 1306.1 provides the exception for historic preservation was included in order to enhance and preserve the historic and cultural resources of the District. This section was edited to change the word "addition" to "renovation."
- § 1306.2 was added after the setdown meeting to provide an exception for where other sustainability measures are implemented. This exception is intended to not penalize property owners whom are taking other measures towards implementing sustainability measures on their property that aid the District's larger goals. Examples of these sustainability measures might include geothermal heating and cooling systems, cisterns, or solar panels.

Section 1307 – Maintenance Requirements for Green Area Ratio

- This section provides an explanation of maintenance requirements for the GAR.
- § 1307.1 The maintenance section of the proposed text outlines that implemented GAR elements may be replaced over time with other GAR landscape elements, so long as the equivalent GAR score is maintained.

Appendix A: Draft GAR Chapter Text

CHAPTER 13 GREEN AREA RATIO

1300 INTRODUCTION TO GREEN AREA RATIO

1300.1 *Green Area Ratio* (GAR) is the ratio of the weighted value of landscape elements to land area. The GAR score relates to an increase in the quantity and quality of environmental performance of the urban landscape.

1300.2 *Green Area Ratio* sets integrated environmental requirements for landscape elements and site design that contribute to the reduction of stormwater runoff, the improvement of air quality, and the mitigation of the urban heat island effect.

1300.3 The purposes of the *green area ratio* regulations are to:

(a) Implement a value-based system of requirements for environmental site design that provides flexibility in meeting environmental performance standards.

(b) Promote attractive and environmentally functional landscapes.

1300.4 The purpose of this chapter is to:

(a) Provide general guidance about the regulation of *green area ratio* requirements;

(b) Define the applicability of *green area ratio*;

(c) Set forth the formula for calculating the Green Area Ration and define its component parts;

(d) Identify those landscape elements that are included in the *green area ratio,* explain how their area is measured, and set forth eligibility requirements;

(e) Establish multipliers for each eligible landscape element;

(f) Indicate what plans and certifications must accompany an application submitted to demonstrate proof of *Green Area Ratio* compliance; and

(g) Establish maintenance requirements for the landscape elements that are counted toward a property's *green area ratio* requirement.

Appendix A: Draft GAR Chapter Text

1301 RELATIONSHIP TO LANDUSE SUBTITLES

1301.1 The *green area ratio* regulations of this chapter apply to all zones in all land use subtitles. Each land use subtitle also includes development standards tables containing *green area ratio* standards specific to zones within that subtitle.

1302 APPLICABILITY OF GREEN AREA RATIO STANDARDS

1302.1 The *Green Area Ratio* applies to all new buildings requiring a Certificate of Occupancy and to all existing buildings requiring a Certificate of Occupancy where any additions, alteration, or repairs within any twelve month (12) period exceed one hundred percent (100%) of the assessed value of the building as set forth in the records of the Office of Tax and Revenue as of the date of the building permit application; provided:

(a) The cost basis for alterations or additions to an existing building shall be the amount indicated by the applicant on the application for a building permit; and

(b) The assessed value of the building shall be the value set forth in records of the Office of Tax and Revenue as of the date of the building permit application.

1302.2 The *Green Area Ratio* does not apply to Certificates of Occupancy issued for the following purposes:

(a) Two dwelling units; and

(b) Two sleeping units; and

~~(b)~~(c) Accessory dwelling units.

1303 CALCULATION OF GREEN AREA RATIO

1303.1 The *Green Area Ratio* shall be calculated using the following formula:

$$GAR = \frac{(\text{area of landscape element 1} \times \text{multiplier}) + (\text{area of landscape element 2} \times \text{multiplier}) + \ldots}{\text{Lot area}}$$

1303.2 For the purposes of this formula and the remainder of this section:

(a) The term "landscape element" refers to one of the elements listed in the left hand column in Table B § 1303.9, and will be hereafter referred to as "landscape element" or "element;"

(b) The term "multiplier" refers the number listed in the right hand column of Table B § 1303.9 that corresponds to a "landscape element"; and

(c) The term "area of landscape element" means the square feet of a landscape element, unless the element is a tree or large shrub, in which case "area of landscape area" refers to the element's equivalent square footage as indicated in B § 1303.7.

1303.3 The process for calculating a property's GAR under the formula is as follows:

(a) The area of each landscape element is multiplied by its corresponding multiplier;

(b) The resulting numbers for all landscape elements are added together;

(c) The resulting point total is then divided by the total land area of the lot;

(d) The product of the equation equals the property's GAR.

1303.4 The total points for all *permeable paving* and *enhanced tree growth* credits may not count for more than one third (1/3) of the *Green Area Ratio* score for a lot.

1303.5 If multiple landscape elements occupy the same area, for example groundcover under a tree, the full square footage or equivalent square footage of each element may be counted.

1303.6 A landscape element must meet the eligibility requirements of B § 1304.

1303.7 Equivalent square feet of tree and large shrubs are identified in the table below.

GREEN AREA RATIO LANDSCAPE ELEMENTS	EQUIVALENT SQUARE FOOTAGE
Plants at least 2 feet tall at maturity	9 square feet per plant
Tree canopy for trees 2.5 inches (2.5 in.) to ~~8~~ six inches (6 in.) in diameter	~~100~~ 50 square feet per tree
Tree canopy for trees ~~8~~ six inches (~~8~~ 6 in.) to ~~24~~ twelve inches (~~24~~12 in.) in diameter	~~350~~ 250 square feet per tree
Tree canopy for trees twelve inches (12 in.) to eighteen inches (18 in.) in diameter	600 square feet per tree
Tree canopy for trees- eighteen inches (18 in.) to twenty four inches (24 in.) in diameter	1300 square feet per tree
Tree canopy for trees larger than ~~24~~ twenty four inches (24 in.) in diameter ~~or larger~~	~~450~~ 2000 square feet per tree

Appendix A: Draft GAR Chapter Text

1303.8 Landscape elements of the GAR shall be measured in the following ways:

(a) All trees shall be measured for diameter at a height four feet- six inches (4 ft. 6 in.) above grade when planted. Use the square footage equivalent based on diameter in the table in § 1303.5.

(b) For *vegetated walls*, use the vertical square footage of the portion of the wall covered by vegetation.

(c) For all other elements other than trees, large shrubs, perennials, and vegetated walls, square footage is determined by the area of a horizontal plane that is over the element.

Appendix A: Draft GAR Chapter Text

1303.9 Eligible landscape elements are identified in the table below:

GREEN AREA RATIO LANDSCAPE ELEMENTS	MULTIPLIER
Landscaped area (select one of the following for each area)	
Landscaped areas with a soil depth of less than 24 inches	0.3
Landscaped areas with a soil depth of 24 inches or more	0.6
Bioretention facilities	0.4
Plantings	
Ground covers, or other plants less than 2 feet tall at maturity	0.52
Plants at least 2 feet tall at maturity	0.3
Tree canopy for all trees ~~2.5~~two and one half inches (2.5 in.) to ~~8~~six inches (86 in.) in diameter	0.45
Tree canopy for new trees ~~8~~six inches (6 in.) in diameter or larger	0.56
Tree canopy for preservation of existing trees ~~8~~six inches (~~8~~6 in.) to 24 inches (24 in.) in diameter	0.7
Tree canopy for preservation of existing trees 24 inches (24 in.) diameter or larger	0.8
~~Green~~ Vegetated wall, plantings on a vertical surface	0.6
Vegetated roofs	
Extensive vegetated roof over at least 2 inches but less than ~~4~~8 inches of growth medium	0.36
Intensive vegetated roof over at least ~~4~~8 inches of growth medium	0.48
Water features (using at least 50% recycled water)	0.2
Permeable paving	
Permeable paving over at least 6 inches and less than 2 feet of soil or gravel	0.4
Permeable paving over at least 2 feet of soil or gravel	0.5
Enhanced tree growth systems	0.4
Renewable energy generation (area of)~~Renewable energy generation~~	0.5
Bonuses	

Native plant species	0.1
Landscaping in food cultivation	0.1
Harvested stormwater irrigation	0.1

1304 LANDSCAPE ELEMENT ELIGIBILITY CONDITIONS FOR GREEN AREA RATIO

1304.1 No landscape element may be counted towards a property's GAR unless it meets the applicable eligibility condition stated in this section.

1304.2 Plantings over the specified soil depths shall meet the required conditions listed in the Table of Landscape Elements and Multipliers in B §1303.2.

1304.3 *Bioretention facilities* shall be landscaped areas that receive rainwater from surrounding areas and use plants and soils to slow, filter, and infiltrate stormwater runoff. *Bioretention facilities* include but are not limited to rain or rainwater gardens, bioretention planters, Baysavers, or linear cells or swales. These do not include structures made of cement or concrete alone~~only structures~~.

1304.4 Trees shall meet the following conditions:

(a) All trees shall be at least two and one half (2.5) inches in diameter measured at a height four feet- six inches (4'6") above grade when planted and shall be replaced if damaged or killed by any cause.

(b) All trees shall meet the American Standard for Nursery stock, as set forth by the American Nursery and Landscape Association.

1304.5 *Vegetated walls* shall meet the following conditions:

(a) The maximum calculated vertical dimension shall not exceed thirty (30) feet unless the vegetated wall features a built-in growth medium;

(b) The area calculated for the vegetated wall features shall be fully covered within a period of two (2) to five (5) years from planning;

~~(b)~~(c) The area calculated is the ground coverage area, not the total plant growth area;

~~(c)~~(d) The walls shall be at least five (5) feet from a side or rear lot line; and

~~(d)~~(e) Where stormwater harvesting for irrigation is proposed, vegetated walls shall contain a connection to the proposed irrigation system.

1304.6 *Vegetated roofs* shall meet the following conditions:

(a) Designs for vegetated roofs must include plans to provide supplemental water for a minimum of two (2) growing seasons;

(b) Where stormwater harvesting for irrigation is proposed, vegetated roofs shall contain a connection to the proposed irrigation system;

(c) The vegetation on a vegetated roof is not additionally eligible for groundcover value towards GAR requirements.

1304.7 Water features shall meet the following conditions:

(a) Water features must use harvested rainwater for at least fifty percent (50%) of the annual flow.

(b) The water features must be under water for at least six (6) months out of twelve (12).

1304.8 Enhanced tree growth systems shall meet the following conditions:

(a) ~~be~~ Be at least twenty-four (24) inches deep, under pavement, and adjacent to planting areas.

~~(c)~~(b) Made up of soils that are not considered contaminated or compacted according to federal SUPERFUND legislation.

~~1304.8~~1304.9 Native plant species shall meet the following conditions:

(a) The plants are listed in the U.S. Fish and Wildlife Service's Native Plants for Wildlife Conservation Landscaping: Chesapeake Bay Watershed guide; or

(b) The Applicant provides two references in current publications showing that the plant is native to the region; and

(c) The plant is not listed on the U.S. Fish and Wildlife Service's list of Plant Invaders of Mid-Atlantic Natural Areas.

~~1304.9~~1304.10 Food cultivation shall meet the following conditions:

(a) All food cultivation areas must be easily accessible to at least one occupant of the building;

(b) All food cultivation areas must have a source of water that can reach all portions of the food cultivation area.

(c) The cultivation of animals for food is not eligible for GAR credits.

~~1304.10~~1304.11 Harvesting stormwater for irrigation shall meet the following conditions:

(a) If the irrigation type is spray, applicants shall follow treatment standards set forth in the current District Department of Environment's Stormwater Management Guidebook.

(b) If the irrigation type is drip, no additional treatment of stormwater is required.

1305 SUBMITTAL REQUIREMENTS FOR GREEN AREA RATIO

1305.1 This section lists the submittal requirements for demonstrating compliance with a *Green Area Ratio* requirement.

1305.2 For the purposes of this section, the term Certified Landscape Expert means a person who is a:

(a) State of Virginia certified landscape architect;

(b) State of Maryland certified landscape architect;

(c) International Society of Arboriculture Certified Arborist;

(d) Maryland's certified Professional Horticulturist; or

(e) Landscape Contractors Association MD-DC-VA, Certified Landscape Technician.

(f) Certified U.S. Green Building Council professional

1305.3 Applicants shall submit a *Green Area Ratio* score sheet with the GAR calculated for the given lot at the time of building permit application.

~~1305.4 Applicants shall provide the *Green Area Ratio* worksheet showing how the GAR was calculated for the given lot.~~

~~1305.5~~1305.4 Applicants shall provide a landscape plan prepared by a Certified Landscape Expert that includes the following information:

(a) *Green Area Ratio* elements called out by category and area, which may be provided as a part of the landscape plan or as a separate document;

(b) Lot dimension and size;

(c) Location and areas of all landscape elements with dimensions;

(d) Location, size, and species of all plants used to meet requirements;

(e) Both common and botanical names of all plant material;

(f) Identification of all existing trees that are to be preserved, with their location, trunk diameter at four feet- six inches (4'6") above grade, canopy radius, and species;

(g) Plans indicating how preserved trees and other plants will be protected during demolition and construction;

(h) Location and dimensions of wheel stops, curbs, or other devices to protect landscaping for landscaped areas adjacent to driveways;

(i) A schematic irrigation and drainage plan and the size and depth of all plant containers for rooftop or container landscaping or areas to be irrigated with rainwater;

(j) Location and size of any trees to be removed;

(k) Specifications for soil improvement; and

(l) Signature of the certified landscape expert who prepared the plans together as verification that plantings and other landscape elements meet the requirements of the this Chapter.

~~1305.6~~1305.5 Applicants shall provide a landscape maintenance plan prepared and signed by a Certified Landscape Expert that describes how the plantings with be cared for and maintained including:

(a) Soil preparation;

(b) Use of compost;

(c) Plant replacement;

(d) Irrigation;

(e) Weed and pest control;

(f) Control of noxious or invasive species, and;

(g) Care and maintenance of water and *hardscape features*.

~~1305.7~~1305.6 The following modifications or substitutions to the landscape elements of an approved landscape plan require a plan revision and approval:

(a) Number of trees, shrubs, or groundcovers;

(b) Location of required plantings or landscape features;

(c) Substitution of species; or

(d) Revisions of any feature than could decrease planting area or lower the *Green Area Ratio* score.

~~1305.8~~1305.7 Except as provided below, approved landscape elements shall be installed in accordance with the approved plan prior to the issuance of the Certificate of Occupancy.

~~1305.9~~1305.8 Prior to the issuance of the certificate of occupancy, a landscape checklist must be signed by a Certified Landscape Expert, verifying that that landscaping was installed according to the building permit approved by DCRA.

~~1305.10~~1305.9 The Zoning Administrator may grant a temporary certificate of occupancy when installation of the required landscaping is not currently possible due to weather, season or site construction subject to the condition that landscaping must be installed within four (4) months after the date the temporary certificate is issued.

~~1305.11~~1305.10 The temporary certificate of occupancy may be extended up to two times by four (4) month periods by the Zoning Administrator based on the same conditions of § 1305.10.

1306 SPECIAL EXCEPTIONS FOR GREEN AREA RATIO

1306.1 The Board of Zoning Adjustment may grant, by special exception, a full or partial reduction in the GAR required for an ~~addition~~ renovation to a *historic resource* if, in addition to meeting the general requirements of [§3104], the applicant demonstrates that providing the required GAR is impractical as a result of the nature or location of the *historic resource*.

1306.2 The Board of Zoning Adjustment may grant, by special exception, a full or partial reduction in the GAR required for new construction or renovation if, in addition to meeting the general requirements of [§3104], the applicant demonstrates that providing the GAR is impractical as a result of equivalent sustainability measures already being implemented on the property. The criteria for equivalency should be based on the following items;

(a) Sustainability measures that achieve the intent of the GAR through methods not available through the GAR requirement.

1307 MAINTENANCE REQUIREMENTS FOR GREEN AREA RATIO

1307.1 All plantings and landscape elements used to calculation a property's GAR must be maintained for the life of the project. If, for any reason, the installed landscape fall below the minimum required GAR score, new eligible landscape elements shall be added to compensate and result in the required ratio. These elements are not required to be the same as the submitted plans, so long as the GAR achieved is equivalent.

Appendix A: Draft GAR Chapter Text

Draft Green Area Ratio Definitions

Landscape elements: Optional element used to implement the Green Area Ratio. These elements include stormwater and Low-impact-development best management practices for green infrastructure.

LID - low impact development

BMP *– best management practice*

Bioretention facilities are landscaped areas that receive rainwater from surrounding areas and uses plants and soils to slow, filter, and infiltrate stormwater runoff. *Bioretention facilities* include but are not limited to rain or rainwater gardens, bioretention planters, Baysavers, or linear cells or swales. Examples include but are not limited to bioretention planters, linear cells, swales, or rain gardens. These do not include structures made of cement or concrete alone.

Vegetated roofs are horizontal or near-horizontal (less than 30% grade) surfaces on top of a building or structure covered with vegetation and a growing medium. *Vegetated roofs* are intended to promote water or energy conservation by using plants and soils to slow, filter, and infiltrate stormwater runoff. *Vegetated roofs* may be intensive or extensive but are not limited to modular or layered growth systems.

Extensive vegetative roof A low profile roof with a growing medium less than 8 inches in depth, composed of plants that can thrive in a rooftop environment with limited water, shallow roots and sparse nutrients.

Intensive vegetative roof A high profile roof with a growing medium 8 inches or more in depth that can support a wide range of vegetables, shrubs and small trees.

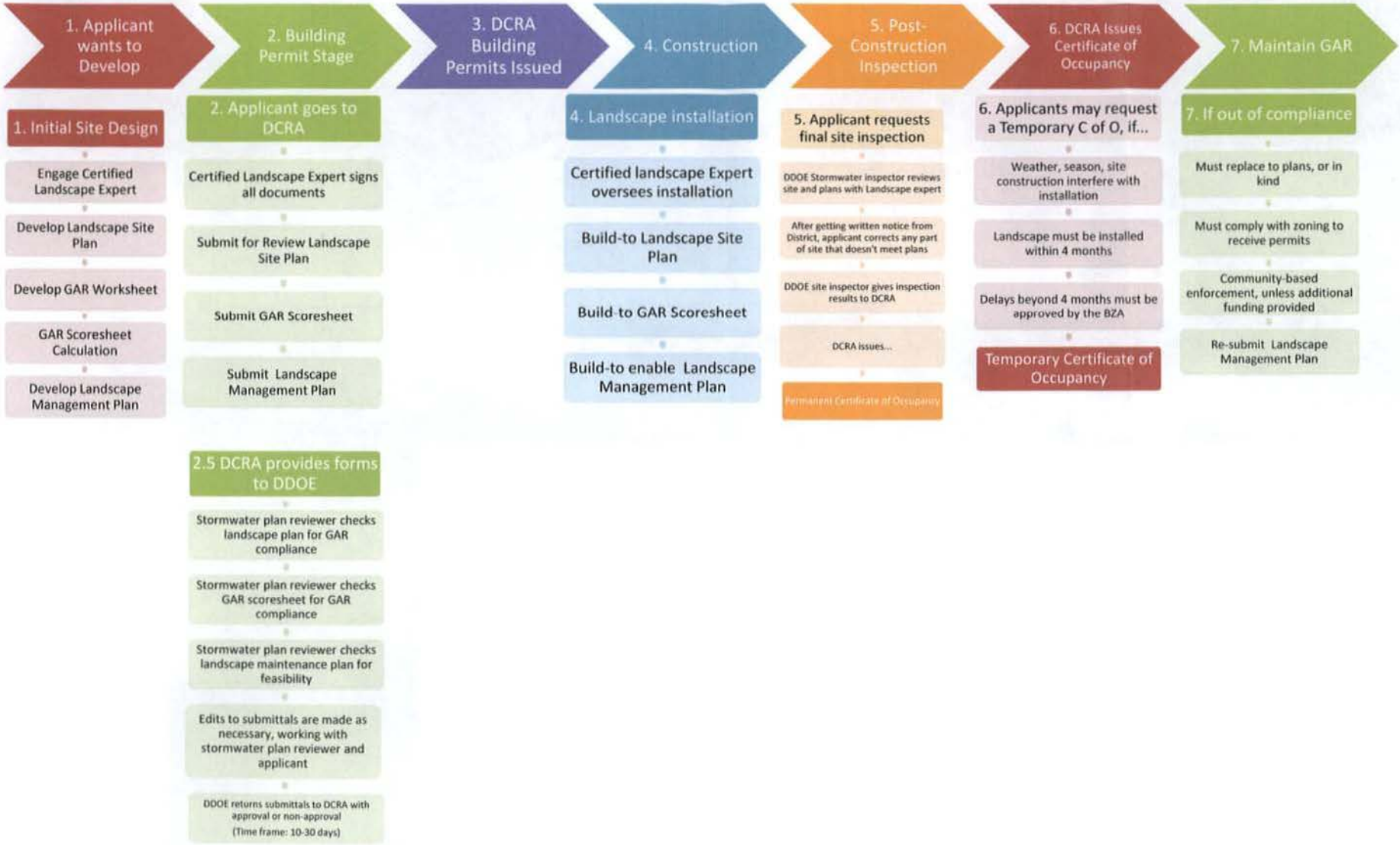
Vegetated walls are vertical or near-vertical surfaces covered with vegetation and in some cases a growing medium. *Vegetated* walls may include but are not limited to walls or screens with climbing vines, espalier trees or modular planting systems.

Water features include both water and may include plants. Examples include but are not limited to fountains, waterspouts, informal or formal ponds, bogs or container water gardens.

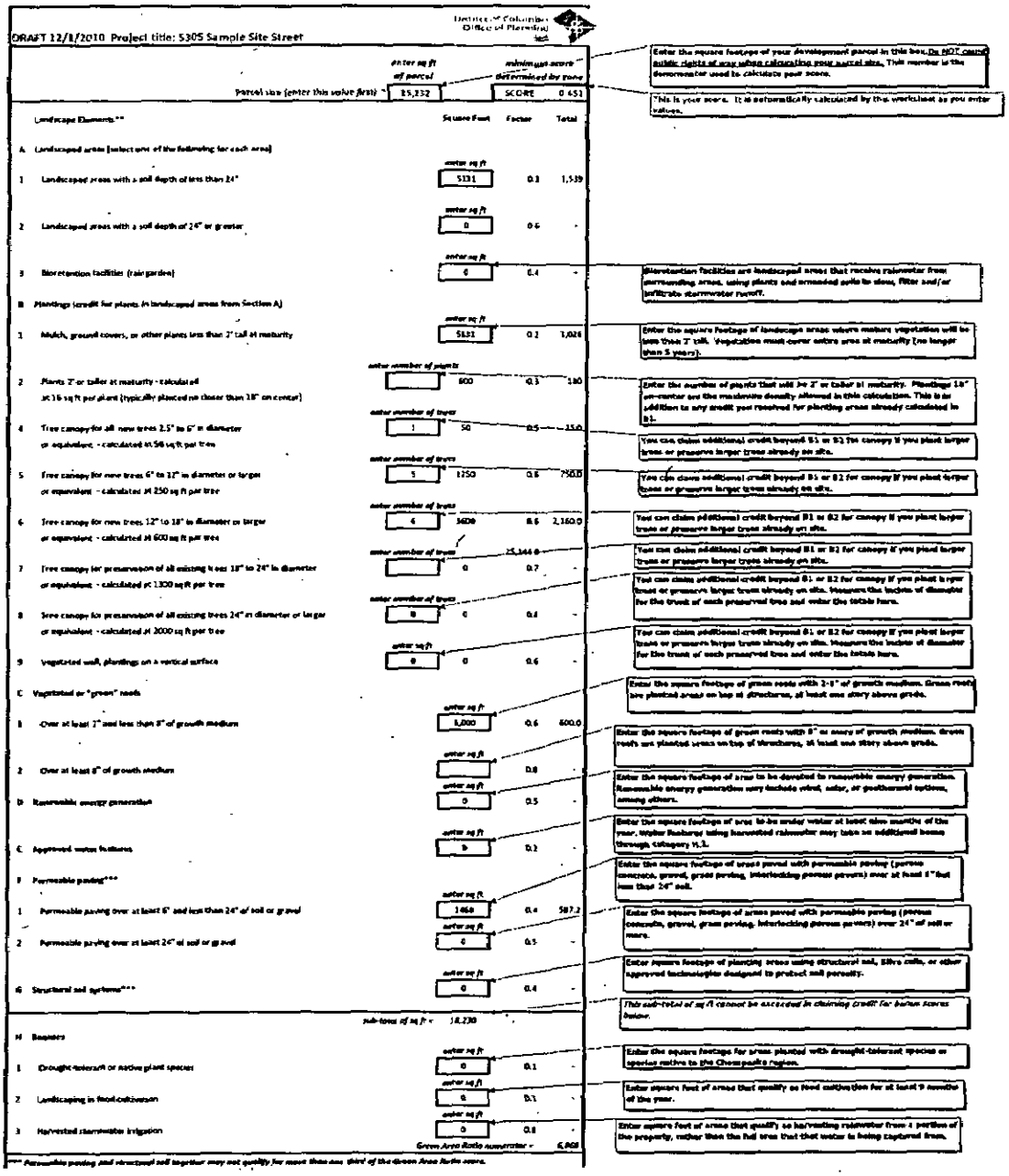
Permeable paving is surfaces that allow water infiltration through paving material while providing a stable, load-bearing surface. Examples include pervious concrete, porous asphalt, perforated brick pavers, mechanically-reinforced grass, but not including grass or gravel.

Enhanced tree growth is a mix of soil and stone engineered to provide a stable, load-bearing surface while allowing penetrable space for tree root growth. This definition may apply to technologies that are functionally equivalent to structural soils and provide the same space for tree root growth.

Food cultivation areas are used for the growing of vegetables, fruits, grains, and other edible plants by residents or occupants of a building. Allowed plant types include annual fruits and vegetables, fruit-producing perennials, shrubs or trees, herbs and nut-bearing plants. *Food cultivation* of animals is not eligible for GAR credit.


1. Applicant wants to Develop
2. Building Permit Stage
3. DCRA Building Permits Issued
4. Construction
5. Post-Construction Inspection
6. DCRA Issues Certificate of Occupancy
7. Maintain GAR
1. Initial Site Design
Engage Certified Landscape Expert
Develop Landscape Site Plan
Develop GAR Worksheet
GAR Scoresheet Calculation
Develop Landscape Management Plan
2. Applicant goes to DCRA
Certified Landscape Expert signs all documents
Submit for Review Landscape Site Plan
Submit GAR Scoresheet
Submit Landscape Management Plan
2.5 DCRA provides forms to DDOE
Stormwater plan reviewer checks landscape plan for GAR compliance
Stormwater plan reviewer checks GAR scoresheet for GAR compliance
Stormwater plan reviewer checks landscape maintenance plan for feasibility
Edits to submittals are made as necessary, working with stormwater plan reviewer and applicant
DDOE returns submittals to DCRA with approval or non-approval
(Time frame: 10-30 days)
4. Landscape installation
Certified landscape Expert oversees installation
Build-to Landscape Site Plan
Build-to GAR Scoresheet
Build-to enable Landscape Management Plan
5. Applicant requests final site inspection
DDOE Stormwater inspector reviews site and plans with Landscape expert
After getting written notice from District, applicant corrects any part of site that doesn't meet plans
DDOE site inspector gives inspection results to DCRA
DCRA issues...
Permanent Certificate of Occupancy
6. Applicants may request a Temporary C of O, if...
Weather, season, site construction interfere with installation
Landscape must be installed within 4 months
Delays beyond 4 months must be approved by the BZA
Temporary Certificate of Occupancy
7. If out of compliance
Must replace to plans, or in kind
Must comply with zoning to receive permits
Community-based enforcement, unless additional funding provided
Re-submit Landscape Management Plan

Cost to Implement	Min	Max
Asphalt with Bio-Infiltration	$13.00	$15.00
Grass/Shrubs (asphalt to)	$1.60	$13.00
Tree Canopy Over Asphalt	$0.57	$1.14
Tree Canopy Over Vegetation	$2.17	$14.14
Unvegetated Permeable Pavement (ashpalt to)	$3.00	$11.00
Vegetated Permeable Pavement (asphalt to)	$3.00	$11.00
Green roof - extensive	$10.00	$25.00
Green roof - intensive	$25.00	$40.00
Roof with Bio-Infiltration	$13.00	$15.00
Tree Canopy over Roof	$0.57	$1.14
Concrete with Bioinfiltration	$13.00	$15.00
Grass/Shrubs (concrete to)	$2.60	$15.00
Tree Canopy Over Concrete	$0.57	$1.14
Tree Canopy Over Vegetation (concrete to)	$3.17	$13.00
Unvegetated Permeable Pavement (concrete to)	$4.00	$13.00
Vegetated Permeable Pavement (concrete to)	$4.00	$13.00
Renewable Energy	$26.00	$75.00
Vegetated façade	$24.00	$39.00



DRAFT 12/1/2010 Project title: 5305 Sample Site Street

District of Columbia Office of Planning

	enter sq ft of parcel	minimum score * determined by zone
Parcel size (enter this value first)	15,232	SCORE 0.451

Enter the square footage of your development parcel in this box. Do NOT count public rights of way when calculating your parcel size. This number is the denominator used to calculate your score.

This is your score. It is automatically calculated by this worksheet as you enter values.

Landscape Elements**		Square Feet	Factor	Total
A	Landscaped areas (select one of the following for each area)			
1	Landscaped areas with a soil depth of less than 24"	enter sq ft 5131	0.3	1,539
2	Landscaped areas with a soil depth of 24" or greater	enter sq ft 0	0.6	-
3	Bioretention facilities (rain gardens)	enter sq ft 0	0.4	-
B	Plantings (credit for plants in landscaped areas from Section A)			
1	Mulch, ground covers, or other plants less than 2' tall at maturity	enter sq ft 5131	0.2	1,026
2	Plants 2' or taller at maturity - calculated at 16 sq ft per plant (typically placed no closer than 18" on center)	enter number of plants 600	0.3	180
4	Tree canopy for all new trees 2.5" to 6" in diameter or equivalent - calculated at 56 sq ft per tree	enter number of trees 1 50	0.5	25.0
5	Tree canopy for new trees 6" to 12" in diameter or larger or equivalent - calculated at 250 sq ft per tree	enter number of trees 5 1250	0.6	750.0
6	Tree canopy for new trees 12" to 18" in diameter or larger or equivalent - calculated at 600 sq ft per tree	enter number of trees 6 3600	0.6	2,160.0
7	Tree canopy for preservation of all existing trees 18" to 24" in diameter or equivalent - calculated at 1300 sq ft per tree	enter number of trees 0	25,344.0 0.7	-
8	Tree canopy for preservation of all existing trees 24" in diameter or larger or equivalent - calculated at 2000 sq ft per tree	enter number of trees 0 0	0.8	-
9	Vegetated wall, plantings on a vertical surface	enter sq ft 0	0	0.6 -
C	Vegetated or "green" roofs			
1	Over at least 2" and less than 8" of growth medium	enter sq ft 1,000	0.6	600.0
2	Over at least 8" of growth medium	enter sq ft	0.8	-
D	Renewable energy generation	enter sq ft 0	0.5	-
E	Approved water features	enter sq ft 0	0.2	-
F	Permeable paving***			
1	Permeable paving over at least 6" and less than 24" of soil or gravel	enter sq ft 1468	0.4	587.2
2	Permeable paving over at least 24" of soil or gravel	enter sq ft 0	0.5	-
G	Structural soil systems***	enter sq ft 0	0.4	-
		sub-total of sq ft =	11,230	
H	Bonuses			
1	Drought-tolerant or native plant species	enter sq ft 0	0.1	-
2	Landscaping in food cultivation	enter sq ft 0	0.1	-
3	Harvested stormwater irrigation	enter sq ft 0	0.8	-
		Green Area Ratio numerator =		6,868

*** Permeable paving and structural soil together may not qualify for more than one third of the Green Area Ratio score.

Bioretention facilities are landscaped areas that receive rainwater from surrounding areas, using plants and amended soils to store, filter and/or infiltrate stormwater runoff.

Enter the square footage of landscape areas where mature vegetation will be less than 2' tall. Vegetation must cover entire area at maturity (no longer than 3 years).

Enter the number of plants that will be 2' or taller at maturity. Plantings 18" on-center are the moderate density allowed in this calculation. This is in addition to any credit you received for planting areas already calculated in B1.

You can claim additional credit beyond B1 or B2 for canopy if you plant larger trees or preserve larger trees already on site.

You can claim additional credit beyond B1 or B2 for canopy if you plant larger trees or preserve larger trees already on site.

You can claim additional credit beyond B1 or B2 for canopy if you plant larger trees or preserve larger trees already on site.

You can claim additional credit beyond B1 or B2 for canopy if you plant larger trees or preserve larger trees already on site. Measure the inches of diameter for the trunk of each preserved tree and enter the totals here.

You can claim additional credit beyond B1 or B2 for canopy if you plant larger trees or preserve larger trees already on site. Measure the inches of diameter for the trunk of each preserved tree and enter the totals here.

Enter the square footage of green roofs with 2-8" of growth medium. Green roofs are planted areas on top of structures, at least one story above grade.

Enter the square footage of green roofs with 8" or more of growth medium. Green roofs are planted areas on top of structures, at least one story above grade.

Enter the square footage of area to be devoted to renewable energy generation. Renewable energy generation may include wind, solar, or geothermal options, among others.

Enter the square footage of area to be under water at least nine months of the year. Water features using harvested rainwater may take an additional bonus through category H.3.

Enter the square footage of areas paved with permeable paving (porous concrete, gravel, grass paving, interlocking porous pavers) over at least 6" but less than 24" soil.

Enter the square footage of areas paved with permeable paving (porous concrete, gravel, grass paving, interlocking porous pavers) over 24" of soil or more.

Enter square footage of planting areas using structural soil, silva cells, or other approved technologies designed to protect soil porosity.

This sub-total of sq ft cannot be exceeded in claiming credit for bonus scores below.

Enter the square footage for areas planted with drought-tolerant species or species native to the Chesapeake region.

Enter square feet of areas that qualify as food cultivation for at least 9 months of the year.

Enter square feet of areas that qualify as harvesting rainwater from a portion of the property, rather than the full area that that water is being captured from.