April 10, 2015 Green Infrastructure Working Group Meeting Notes

Beneficial Reuse of Stormwater

The following largely represents comments that are not reflected in the PowerPoint slides—please refer to the presentation as well (*Presentation links: One slide per page. Six slide per page handout).*

Link to webinar recording: https://attendee.gotowebinar.com/recording/6497123426035423234
Please note this new online option to attend and/or review our meetings! We know that not everyone can attend in person and we are very pleased to be able to offer this webinar format. Please let us know how it works for you. We're still in "beta" mode.

General GIWG information

We want to let everyone know that we have moved the **Stormwater Options for Redevelopment and Infill meeting** from April 24th to **May 15th** (12 - 3 pm) to accommodate the ASLA and CNU conferences. This pushes the **Integration meeting** to **June 5th**. This meeting will facilitate the integration of concepts and comments from of all of the Green Infrastructure Working Group topics:

- Land cover and natural function (February 20)
- Integrate nature into the city (March 13)
- Beneficial use of stormwater (April 10)
- Stormwater options for redevelopment and infill (May 15)
- Integration of Green Infrastructure Elements (June 5)

Beneficial Reuse of Stormwater: Review of objectives

- Recap of WPO Phase 2 work regarding beneficial use of stormwater
- Overview of national models
- Important questions to consider for requirements to retain stormwater on-site

Recap of WPO Phase 2 (Matt Hollon, WPD)

This meeting explores a potential opportunity to tackle several challenging trends facing Austin and the greater region. As we face increases in temperatures, drought, population, and urbanization, we are also seeing decreases in rainfall, surface and groundwater, and natural land cover. But at the same time, practical methods and models to better incorporate natural systems in site design have been implemented in numerous other cities. The good news is that practical solutions already exist for our pressing problems—we just need to connect the dots and act!

Over nine public stakeholder meetings in 2014, the WPO Phase 2 stakeholders came to the conclusion that some beneficial retention and/or re-use on-site should be required for new & re-development. Staff was tasked with reviewing national models to develop a proposal. The following presentation presents an overview of the range of policy options to achieve beneficial use onsite.

(See slide 5 for a brief overview of Austin's current water quality and innovative water management policies)

National Models (Erin Wood, WPD)

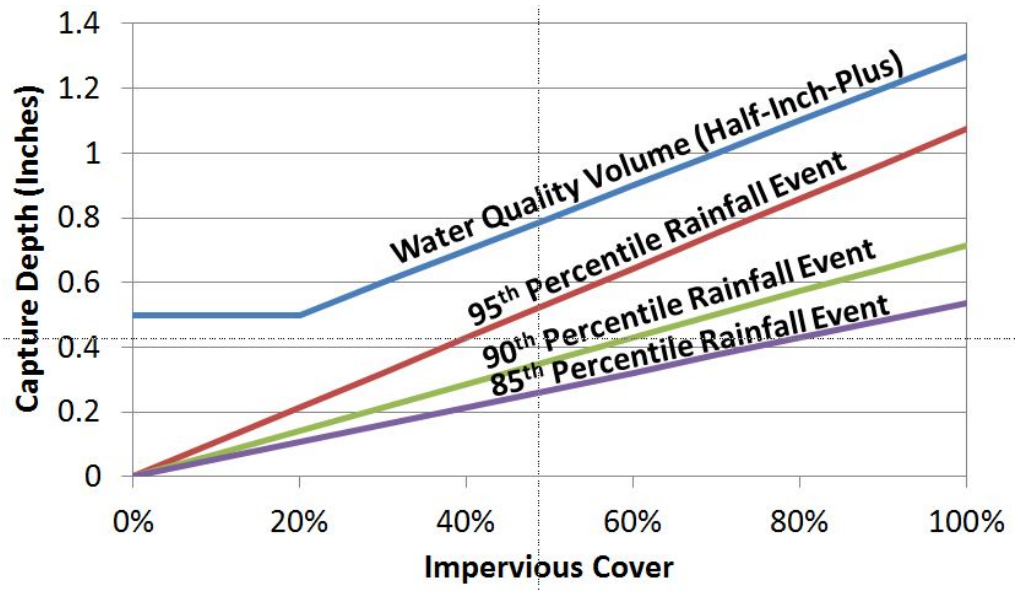
Two basic regulation models emerged from our review of the 18 states and jurisdictions that require on-site beneficial use of stormwater (see this link for more information):

1. Focus on infiltration and baseflow for groundwater recharge and stream health
    - Required to infiltrate amount equal to average annual recharge volume for an undeveloped site
    - Percent of water quality volume to be infiltrated based on Hydrologic Soil Group
    - Can use structural or non-structural controls
2. Focus on keeping stormwater on-site for multiple uses
    - Keep stormwater runoff from leaving the site
    - Can use a combination of infiltration, harvesting, re-use, evaporation, and/or evapotranspiration
    - Retained stormwater can be utilized for multiple purposes, including recharge and baseflow

Given the current drought, the findings of the Water Resource Planning Task Force, and WPO Phase 2 support for the capture, storage, and treatment of rainwater, we propose to focus on the broader approach of keeping stormwater on-site for **any sort of beneficial use** (i.e., not just infiltration and baseflow). In order to implement such a framework, we must first answer several questions to tailor the new regulations to both the Austin context and stakeholder desires.

How much stormwater to retain on-site?

One of most important requirement for a potential framework is how much rainfall to retain onsite—we need stakeholder input to define an appropriate capture depth for Austin. Most of the national models concentrating on beneficial use require retention of a certain percentile of rainfall event, ranging from 80th percentile to 95th percentile. (As an example, in Austin, retention of the 90th percentile rainfall event would mean retention of all rainfall events of one inch or less). Others just require the retention of the full water quality capture volume. (See slide 13 for an explanation of Austin's water quality volume, which is retained and discharged within 48 hours.) The required retention volume is based on the required capture depth, the site area, and the percent impervious cover. The graph below shows the required capture depth on sites of varying levels of impervious cover in Austin, Texas if each of these models was applied to our rainfall patterns and water quality volume requirements.



Data Sources: Roger Glick, Watershed Protection Department; City of Austin Land Development Code; Stormwater Runoff Quality and Quantity from Small Watersheds in Austin, TX: Updated through 2008

How to handle redevelopment and high levels of impervious cover?

Almost all of the national models have alternative standards for redevelopment, pollution hotspots, karst, areas with shallow water table, and other unique site conditions. Furthermore, on high impervious sites, infiltration-based approaches can take up a significant amount of site area (see slides 17 - 21 for a discussion of this issue). Alternate compliance options for redevelopment range from reductions in the required capture volume to payment-in-lieu or partial payment-in-lieu to a complete exemption from the requirements. For example, Washington D.C reduces the capture requirement from the 90th percentile event to the 80th percentile event for "major substantial improvement activity" (remodels), and also permits off-site retention and payment-in-lieu for sites where on-site retention is infeasible. Tennessee and West Virginia present a more novel approach to redevelopment and unique site conditions, allowing a site to reduce its retention requirements by 10% (up to 50%) if the site meets certain requirements (e.g., high density, mixed use, or brownfield development; see slide 22 & 23). Given the rapid rate of redevelopment in Austin, as well as the Imagine Austin goals of density and affordability, how should any potential framework handle redevelopment and high levels of impervious cover?

Are there best practices we would always want to see implemented on-site?

Lastly, are there some practices that we want to see on all sites, regardless of the retention requirement? Instead of innovative or alternative solutions as they are now, these practices could potentially become the standard for all applicable development:

- Disconnected downspouts
- Recessed landscape islands
- Prevent compaction of pervious areas
- Green stormwater controls

(See slides 24 - 29 for more detail on each practice)

Questions from Stakeholders (Full/Large Group)

1. Can you currently use porous pavement in parking lots?

   Response: Yes. You can get water quality credit for the use of porous pavement, but you do not get pervious cover credit for the purposes of calculating percent impervious cover.

2. Is there a potential opportunity to get pervious credit for porous pavement?

   Response: We won't rule anything out—that is part of this CodeNEXT discussion.

3. What is the point of using a rain garden instead of a sand filter if it is less space-efficient?

   Response: The sand filter discharges the water in 48 hours. This helps remove pollutants and mitigated downstream channel erosion, but does little to promote infiltration into the soil capable of maintaining creek baseflow. If this water was infiltrated on-site instead of discharged, the landscaped area could receive it, thereby reducing the use of potable water for irrigation. Most sites have 10 - 30% landscaping, and onsite infiltration would help support those plants with less need for potable irrigation water. Rain gardens also present a chance to "double dip" on required landscape area and water quality controls.

   Response from audience: Rain gardens are also cheaper than sand filters, and getting even cheaper to maintain and build as we get better and more experienced at making them. In addition, rain gardens offer multiple ecological and aesthetic benefits that are not provided by sand filters.

4. Is there a requirement for the re-use of air conditioning condensate?

   Response: That is a great idea, but it isn't really a part of this discussion of stormwater regulations.

5. What about maintenance requirements? Won't rain gardens degrade over time??

   Response: Yes, like any stormwater control, rain gardens require maintenance. But the maintenance is fairly straightforward, and doesn't require heavy equipment or specialized personnel (like a wet pond or sand filter). They do need more frequent maintenance and cleaning, however. This represents a shift from a specialized system to a low-key system with more frequent maintenance.

   Link to Rain Garden page:

   austintexas.gov/department/rain-gardens-keeping-water-land

   Link to Green Stormwater Infrastructure Maintenance Manual:
   www.austintexas.gov/sites/default/files/files/Watershed/stormwater/GSI_Maintenance_Manual_web.pdf

6. The design criteria make you oversize rain gardens in case of failure or lack of maintenance. As we get better at maintaining them, could we perhaps adjust the criteria to reduce their size?

   Response: Rain gardens are not required to be oversized for potential failure or lack of maintenance. (This was discussed as part of the Watershed Protection Ordinance, Phase 2, for privately maintained rain gardens for single-family residential subdivisions, but no action has been taken on this possibility at the

present time.) We will continue to review rain garden and other water quality control sizing as we gain more experience in using them.

7. Can you explain the cost comparison for the CVS example (see slide 29)?

   Response: The conventional design was actually more expensive than the rain garden design because it needs more and larger pipes to get the water to the sand filter. The rain garden design also uses much less structural concrete. The landscaping costs in the rain garden scenario were larger than the sand filter, but these costs did not outweigh the savings.

8. Do we have figures on how landscaping will help with carbon sequestration and air quality?

   Response: We do not have those at our fingertips, but Sue Barnett in Development Services does (Sue.Barnett@austintexas.gov).

9. Can you provide us with the data source for your calculations for rainfall event percentiles in Austin?

   Response: Rainfall event percentiles were based on rainfall data collected at Mueller and the rain gauge at Waller Creek from 1942 to 2012. The data used daily (24-hour) increments and did not screen out small events. We will post the data on our website in the near future.

10. What is the definition of rainfall event used by your group?

    Response: There are several ways to define a rainfall event, but we use a 24 hour increment.

11. I am concerned about the trends towards changing weather patterns with climate change. Shouldn't we use a more recent record?

    Response: Yes, that is a good suggestion. For right now, we are still trying to select an appropriate approach before we get into that level of detail.

12. Will there be a requirement for more retention in areas of town with flooding problems?

    Response: We are going to address that exact question in our Stormwater Options for Redevelopment and Infill meeting on May 15th. (Note: retention of all or a portion of the water quality volume can be helpful for small flood events (e.g., the 2-year storm), but generally has a very minimal effect on larger ones (e.g., the 25- and 100-year events).)

13. What about the use of greywater and potable uses?

    Response: Those are great options and we don't want to exclude them, but this effort is mostly focused on stormwater.

14. I don't think we are well served if we don't specify the beneficial uses we want to achieve. We must be clearer about which uses we prioritize, because some are in conflict. And there are impediments to rainwater harvesting that exist in current law and practice.

    Response: Our reasoning for not specifying which beneficial uses to stress is that we want to give some flexibility to the design community. All of the goals are laudable and some sites may be well suited to achieve some goals, whereas they are not well suited to achieve others. Prioritization is something that we are coming to you as the stakeholders for—we wanted it to be discussed amongst the group. As for impediments to rainwater harvesting, we (City staff) understand the community concern and are working with the community to reduce these as much as possible.

15. Will you consider changing the 24-hour drawdown time requirement for flood detention to allow more retention of water on-site?

Response: Let's put that in the parking lot for now and bring it back up during the Stormwater Options for Redevelopment and Infill meeting on May 15th. This question relates more to whether detention credit is given to water quality controls than beneficial use. The vast majority of annual rainfall—90% to 95%—is handled in water quality controls rather than flood controls, which handle the remaining 5 or 10% (and during conditions which soils are entirely saturated and most rain storage systems completely full).

Comments from Stakeholders (Large Group)

16. Mandatory requirement for irrigation-only meters. By metering and billing separately, consumers will become more conscious of their irrigation water usage. Furthermore, the separate meters could potentially ease the transition to limits/requirements in the future.
17. No potable water should be used for outdoor irrigation. There should be a flat-out ban. How can we potentially achieve that goal in stages? Use alternative sources (stormwater, graywater, etc.).
18. Move to regionally-appropriate landscape template to meet non-potable irrigation goals.
19. The use of solely non-potable for irrigation is laudable, but it needs to be phased in. Separate metering will help, but lots of education is also needed to make sure people don't lose their investment in landscaping. The landscaping and irrigation industry should be pulled into this discussion.
20. Best practices – use as much auxiliary water as possible on-site (and as much as legal).
21. Goal should be to get the landscape irrigation to non-potable – that should be the driver for how much we retain on-site.
22. Need to be prepared for future, mandatory water restrictions in the case of a continued drought.
23. AWU staff: Potable irrigation is still needed as a backup in case it doesn't rain for long periods. We can't afford to lose all of our landscaping and trees.
24. Redevelopment is happening in places that can afford to meet all the city requirements – they don't need special exceptions or breaks from stormwater requirements to make their projects work.
25. City should present costs on maintenance of sand filters vs. rain gardens.
26. Maintenance of a rain garden would happen ordinarily at a commercial development as part of landscaping maintenance – there shouldn't be any additional cost.
27. Concerns about using infiltration as a stormwater quality measure over the Edwards Aquifer (karst).
28. Reviewers should be allowed to make decisions considering the intent of policy, rather than following the exact letter of the law (i.e., try something innovative and monitor for 5 years).
29. How much to retain on site? Use the engineering methodology based on Curve Numbers to model runoff retention of the existing site to determine capture volume. Sites with slower draining Type D soils logically have to hold less because it's based on CN. This can help to promote innovation and diversity of outcomes.
30. What is the point of diminishing returns? Where is the tipping point where these regulations negatively impact affordability?
31. How to handle redevelopment/high levels of IC? California and Arlington County (VA) allow off-site planting of trees. San Francisco – trash load reduction plans.
32. Amount of allowed impervious cover should be specific to the watershed and based on how much the watershed can support.

33. Look to Nashville, TN as a model for visual stream surveys and impairment inventories.
34. Look at ecological areas to make plants as water-efficient as possible.
35. Can install landscape areas/bioswales in existing parking lots to disconnect impervious cover.
36. Determine amount of trees required and don't remove any trees – anything under 19" is not currently protected for single-family residential. Should require more trees to be planted in subdivisions than the current two to three trees.
37. Have the tree requirements based on function and not just aesthetics.
38. Like to see more porous pavement on-site.
39. Must clearly define open space on site.
40. Key considerations – plant selection, what works in rain garden, and how that affects availability from local nurseries.
41. Potential for city to establish urban tree farms? Talk to growers about future plant needs.
42. Need certified maintenance crews for rain gardens.
43. Exceptions for existing trees in rain gardens/recessed islands so they don't drown.
44. How much to retain on site? To answer that, we need to define what we want to achieve. Water quality vs flood control vs ecosystem function might yield different answers. May need to look at that question from two different levels – water quality and infiltration provided on-site but flood might need a regional approach. We must understand how sites fit together and might help solve some problems – how much to retain on site might be different depending on how they fit into larger picture.
45. Rain gardens may take up more space than sand filters, but they have more benefits as well. Rain garden infiltration increases over time as soil/plants get established. They will become more functional over time, and they have many other benefits beyond just water quality.
46. Need to promote uses of stormwater that close loops – circular systems vs. linear (more benefits, synergies).
47. Application of beneficial use requirement to residential development could be a much bigger challenge. With the current reliance on end-of-pipe treatment (e.g., no credit for on-lot controls), won't get much infiltration at all unless the controls have a much bigger footprint than we see in current practice.

Comments from Breakout Groups

Questions Asked:

How much stormwater to retain on-site?

How to handle redevelopment and high levels of impervious cover?

Are there best practices we would always want to see implemented on-site?

Identify and discuss key considerations if more stormwater is integrated on-site.

- *For example: maintenance, inspections, plant selection, retention time, existing trees, soils.*

Group 1 comments

General and Key Considerations

48. A source control approach must include multiple sites; each site has different capabilities.
49. Similarly, rainwater harvesting is more cost effective if it is shared over a few properties. How best could we integrate a whole neighborhood or a few properties? Medium-scale collaboration is a tough nut to crack.
50. Natural ecosystems don't separate water quality and flooding. We need multilayered systems, and to think broadly about controls. Site retention may be used for smaller storms, but regional flood control may be needed for larger events.
51. We are finding that when you start retaining on-site, soil biology improves. The soil gets deeper, and this will enhance the infiltration capacity and functionality.
52. Retention controls should be integrated with the landscape AND adjacent properties. They can provide walkways across properties, connect green infrastructure between properties, and they will be more functional that way.
53. Concern that this "free water" is just going to encourage the overuse of potable water or the use of thirsty landscapes. Need to curb potable use at the same time.
54. Barriers to this effort
    a) Property rights
    b) Development community
    c) Texas encourages economic growth at the expense of everything else
    d) Disconnected actors – individual actors have not incentive to take the impact of their property into account
55. Perhaps we could build a less restrictive system if we worked on a regional scale, but this is very hard to accomplish. How can we get large swaths of public opens space/stormwater control (a la Mueller) using private development and private property?
56. Mueller is not any denser than Hyde Park. New Urbanist creed may not provide Imagine Austin goals (e.g., prosperity for everyone). Compact and connected is not the main goal—it is one of many.
57. The devil is in the details for efforts like this. By many measures, Mueller is not very walkable.
58. Big challenge is the transition steps from the status quo to what we ultimately want to achieve. For a while, we need to plan for both. Example: Why would we worry about ROW expansions removing rain gardens if we have the goal of promoting multi-modal transportation? Conflict between current and future system.
59. Tradeoffs with affordability. How might this effort impact life cycle costs, up-front costs.
60. Well, we should also consider the multiple benefits of these systems. Can close loops and combine uses for a marginal increase in costs.
61. Also must consider total costs to the city, not just costs to the developer. Infill may be cheaper for the private sector, but it may necessitate sewer system upgrades.

How much to retain on-site

62. How much to retain on-site should depend entirely on the goal. It should be robust to handle some larger rain events.

63. It should be the appropriate level to irrigate the landscaping, i.e., small, frequent storms. We must set a performance goal and see what level of capture that necessitates.

Redevelopment

64. We need to "rewind the video" and connect sites with green infrastructure.
65. Like the Tennessee and West Virginia incentive model for redevelopment, but it needs to be implemented carefully.
66. Concerns with the TN/WV model. Less retention for higher density is potentially in conflict. Higher density could increase stormwater runoff.
67. Don't want to institutionalize legacy stormwater problems. Need to take away the opportunity to do piecemeal remodels without redeveloping. Some incentive may be appropriate.
68. Problem: To support redevelopment of a site, a developer needs to see a return on their investment. That return comes from more rooftops, which will just exacerbate the stormwater problem. Must consider unintended consequences of any potential regulation.

Best Practices

69. Regulations should apply to Single Family development (or at least new subdivisions). It is most of the land area of the city. It would be affordable in Single Family because of the low impervious cover.
70. Integrate maintenance into design and establish a maintenance protocol as a part of the design. Also need to get away from designs that need a lot of maintenance and heavy equipment.

Group 2 comments

71. This approach seems too good to be true—can rain gardens really take up such a small footprint and save money at the same time?
72. Redevelopment should have the same requirements as greenfields—they are making enough money to comply.
73. Concern about potential weakening of impervious cover standards as part of CodeNEXT.
74. How far are we from saying "no more irrigation with potable water?"

    Response from AWU representative: That is a part of the Water Resource Planning Task Force discussion for the Integrated Water Resource Plan. See this link for upcoming meetings.
75. Should have separate meters for automatic irrigation systems
    a) Current requirement for large commercial sites
    b) Ensures better billing and easier maintenance
76. Should be able to show through modeling that 100% of landscape irrigation can be provided with stormwater for highly impervious sites.
77. We shouldn't even be talking about using potable water for irrigating commercial sites (i.e., we should already be requiring non-potable for those sites). Residential will be a different discussion.
78. There is currently a lot of overwatering and poorly maintained irrigation.
79. Request for data on maintenance costs for sand filter vs. rain garden.

80. Need further discussion and evaluation of cost/benefit of the requirements for reduced pressure zone (RPZ) devices for rainwater harvesting systems.

Group 3 comments

General

81. How can we incorporate hydrologic functioning goals into a form-based code? It seems that there is a fundamental conflict with how they are written and writing code for hydrologic function.
82. We need to make sure our values are incorporated into [CodeNEXT consultant] Opticos' code language.

How much to retain on-site

83. Use curve numbers of existing site, and then they have to keep it on-site if they can't infiltrate it. Rainwater harvesting, grey re-use, sequester, "use in column," toilet flushing, cooling.
84. Supports having a menu of alternative ways to reach retention requirement.

Redevelopment

85. Payment-in-lieu as an option.
86. Offsite tree planting as an option.
87. Must emphasize education. Could educate redevelopers as a part of the MS4 process.
88. Any offsite mitigation should occur within the same watershed.
89. Use Nashville impairment inventories as a model—see EPA document "Post-Construction Performance Standards & Water Quality-Based Requirements" (link).
90. Redevelopment should have to incorporate landscape strips into highly impervious areas, e.g., driveways, parking lots, etc.
91. Must be flexible to accommodate existing trees. If there is an existing tree in an existing low spot, we don't want to drown the tree by building a rain garden there. The solution would be to enlarge the open space around the tree, and then add a low spot with a berm downslope of the tree. This area can serve as an infiltration area, while also protecting the tree.
92. The city should develop an online database of suitable plant systems based on the soils/geologies found throughout Austin. You would go online, click on your site's location, and this would give you a list of suitable plants. This could also be combined with a biofiltration rebate program.
93. Need better site design. Look at existing patterns on the site, identify "ponding" locations for rain gardens.
94. There are innovative ways to create disconnected impervious cover that will work for redeveloped sites.
95. There should be a minimum rainwater collection requirement of 25% of the retention volume.
    a) Challenge: this could potentially add a lot of costs to small businesses. Rainwater harvesting should be on the menu, but it should not be mandatory.
    b) Disconnecting impervious cover could be much less expensive.

Best practices

96. Retain as much auxiliary water (non-potable) on-site as possible to use in place of potable.
97. Planting strips/disconnect impervious cover.
98. Determine number of trees required on a site. Rank species based on function/ecological value/infiltration rate.
99. Permeable pavement.
100. Ecologically group plants.

Key considerations

101. Challenge of measuring the catchment area of a skyscraper (vertical walls).
102. Incorporating existing trees at grade.
103. Plant selection and local availability: we need to mandate the use of an appropriate plant list, but there also needs to be coordination with the growers/nurseries so there is sufficient supply.
104. Rain garden rebates.
105. Opportunities to avoid extensive maintenance for rain gardens:
    a) Use beggars lice and bermuda grass for rain gardens
    b) Mandatory plant list for passive maintenance