



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

**MINUTES OF THE STORMWATER COMMISSION – AD-HOC SUB-COMMITTEE
TO REVIEW UNIVERSITY CITY MUNICIPAL CODE REVISIONS PROPOSED BY THE UNIVERSITY HEIGHTS FLOOD TASK
FORCE
March 19, 2024**

Call to Order. The subcommittee listed above was called to order at 5:15 PM by Eric Karch.

1. **Attendance-Roll Call.** The following Commission members were present either at 7360 Princeton or virtually via zoom: Susan Armstrong, Garry Aronberg, and Eric Karch. City representative Mirela Celaj attended as well. This was a non-quorum meeting, as allowed by our bylaws.

Agenda. To discuss revisions to the proposed code language, and specifically the matrix of eight (8) proposed Green Infrastructure for Stormwater (GISW) techniques presented by the University Heights Association Flood Task Force (version dated 11/10/2023 Impervious Surfaces Draft Bill). This meeting is being held in response to an action item from the 11/14 Ad-Hoc Subcommittee meeting and is a continuation of topics discussed on 11/14/2022, 11/30/2023, 1/18/2024, 1/24/2024, 2/20/2024, and 2/29/2024.

2. **Old Business**

- 2.1 **Flatwork permit**

- 2.1.1 Mirela provided:
 - 2.1.1.1 DRAFT 1-page permit application
 - 2.1.1.2 DRAFT memo to commission explaining the need for flatwork permit
 - 2.1.2 Suggestion to the City is to add on the back of the permit the definitions/examples of Impervious Surfaces (paved driveway, pool, etc); and Green Infrastructure for Stormwater Management (tree, rain garden, french drain, etc).
 - 2.1.3 Required for outside of City right of way. This is different than a GISW permit since rooftops would be impervious but not flatwork, for example. However, a GISW permit should apply to flatwork permit as well.
 - 2.1.4 Good location in ordinance is under <https://ecode360.com/28293615#28293615>

University City, MO / Land Use / Zoning Code

← **ARTICLE V Supplementary Regulations**
 - 2.1.5 City website section on all city permits (as reference)
https://app.mygov.us/pi/citizen/download_forms.php?limit=0&&citiesID=362
 - 2.1.6 On 3/19/2024, Agreed that the same threshold area should be used for both the Flatwork Permit and the GISW Permit.

- 2.2 **Definition of Impervious Area**

- 2.2.1 Suggest that the ordinance just use the term impervious. U City permits and guidelines is the best place to define impervious area.
 - 2.2.2 One possible definition is in the Kirkwood Guidelines for Stormwater Management. Page 1 (Background and Purpose), 1st paragraph, second sentence "Impervious cover or areas are man-made areas that cannot absorb water from rain or snow. Driveways, rooftops, patios, sport courts, tennis courts, and pools, for example, are considered impervious; surfaces such as decks, lawn, or gardens, where the rainwater is allowed to soak into the ground, are not considered impervious. Impervious area increases the amount of rainwater runoff and can



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

cause flooding.”

- 2.2.3 Question to U Heights Flood Task Force. Should a wood deck be considered impervious? Kirkwood does not. It stands to reason that a wood deck with planks butted tightly together (<1/8 inch gap) could act similarly to concrete pavement and would be considered impervious

2.3 Avoiding potential conflict between MSD permit requirements and U City matrix

- 2.3.1 Ordinance should state that the matrix applies when a MSD permit is not required.
- 2.3.2 This helps address the fact that:
 - 2.3.2.1 MSD occasionally does regulate new land disturbance and impervious area < 1 acre in size
 - 2.3.2.2 Techniques being considered in the matrix are not all acceptable to MSD (e.g. dry wells)

2.4 How to make sure a GISW item remains in place in subsequent years? Options include:

- 2.4.1 Tie to occupancy permit
- 2.4.2 Easement area recorded on the legal plat document
- 2.4.3 Annual self-inspection, where property owner submits signed document that the matrix item is still in place and provides a photo as proof.
- 2.4.4 We recommend that City staff develop procedure for this, with preference for annual self-inspection since this has a lower cost burden on City staff. This procedure could also allow for the potential to adjust/change GISWs.

2.5 Storm/Volume on which matrix items will be based

- 2.5.1 Base this on 1.14 inches (1-yr 40 min storm or 2-year 30 min storm). This is consistent with MSD and Missouri Botanical Garden.
- 2.5.2 The goal clarified by the U Heights Flood Task Force at the 11/14/2023 meeting was:
 - 2.5.2.1 Improve U City code which does not currently regulate new impervious area less than 1 acre. Improvement should be as close as you can get to zero increase in stormwater runoff.
- 2.5.3 Differential rainfall runoff – The offsets discussed to date (on 11/30/2023, 1/18/2024, and 1/25/2024) have been based on using a differential rainfall runoff increase. The understanding is that turfgrass itself creates a certain amount of rainfall runoff. A development to change turfgrass to impervious would generate more rainfall runoff. The matrix items would then be sized to handle these differential runoff increases. In doing so, the U Heights goal for no increase would be met.

2.6 Matrix Item #1 – Plant native plants, such as grass and herbaceous vegetation

- 2.6.1 Decided to base this on 1.14 inches (1-yr 40 min storm or 2-year 30 min storm).

2.1 Matrix Item #2 – Amended soil ~~Direct new impervious surface runoff to permeable areas on the property~~

- 2.1.1 Decided to base this on Kirkwood’s design guidance, which correlates well to Garry’s calculations. This is a 1:1 ratio assuming a 12-inch deep amended soil.

2.2 Matrix Item #3 – install tree cover

(BELOW IS ACCUMULATED FROM PREVIOUS MEETINGS)

- 2.2.1 Decided to account for two different tree sizes: overstory (biggest trees) and understory (smaller trees). 1 mature overstory tree (e.g. oak) can be used to offset 500 SF of new



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

impervious area. 1 mature understory tree (e.g. dogwood or eastern redbud) can be used to offset 100 SF of new impervious area. Require using only trees native to Missouri. Yield to City Forester to provide further guidance to City staff for administering the matrix.

2.2.2 Decided how to implement item #3:

2.2.2.1 Require U City Arborist approval of the developer's tree planting plan. This would help address the following possible complications. Planting trees too close together would compromise the tree's health. Planting trees too close to a house or utility (e.g. power line or sanitary lateral) should be avoided.

2.3 Matrix Item 4 – Install permeable pavement

2.3.1 Decided to defer to Kirkwood manual on permeable pavers (page 31)

2.3.2 100 SF of new impervious requires 40 SF of 6-inch deep permeable pavement, for example.

2.4 Matrix Item 5 – Aerate lawns

2.4.1 Deleted this due to maintenance difficulties.

2.5 Matrix Item 5 – Green roof

2.5.1 Discussed that offset should be same as item #1 since it is essentially creating a native planting area. This is appropriate for a sloped roof

2.5.2 Should there be a different offset for a flat roof ?

2.5.3 Evapotranspiration - this benefit is real, but should not be used as a design parameter since evapotranspiration benefit is on the year, but the ordinance is attempting to deal with a single storm event.

2.5.4 Discussed re-visit the offset to go from a runoff coefficient of 0.95 (impervious area) to a runoff coefficient of 0.1 (natives)

2.5.5 Discussed an offset of 1:1. Susan indicated that the offset should be closer to 5:1, and she will provide a citation at the net meeting. An EPA document from Kansas City was reviewed (see 2.12 References), but it does not provide detailed stormwater volume estimates or design rainfalls.

2.5.6 Mirela indicated that Brentwood does not include a green roof in their guideline.

2.5.7 Discussed that an engineered design will likely be required for a green roof due to structural considerations and the City's requirement for International Building Cod (IBC) design.

2.6 Matrix Item 6 – Rain barrel / rain cisterns

2.6.1 100 SF of new impervious area requires (1) 55-gallon rain barrel. This is because the differential runoff for converting 100 SF of grass to impervious is 49 gallons.

2.6.2 MO Botanical Gardens shows that the rain barrel needs to be 73 gallons for 100 SF. However, this does not account for the fact that grass has runoff. Once that grass was removed to build the impervious area, the change is just the differential. Our recommended offset (100 SF : 20 gallons of barrel) are based on the differential.

2.6.3 State that these features must be emptied between rain events to be functional.

2.6.4 On 3/19/2024, discussed that the original U Heights Flood Task Force #s are different than our current recommended offset. U Hts instead suggested an offset of 1 SF : 0.6 gallons, and may have come from Bob Criss. Our calcs show 1 SF : 0.2 gallons and are based on a design rain storm of 1.14 inches in 50 minutes. We discussed that the design rain storm should be consistent throughout all matrix items. The implication of using 1 SF : 0.6 gallons for item 6 is a three-fold increase, and could necessitate tripling the size of the other matrix items. Garry will inquire with Bob Criss and report back to the group.



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

2.7 Matrix Item 7 – Install Infiltration basins such as rain gardens and bioswales

- 2.7.1 Decided to defer to the MO Botanical Garden rule of thumb (5:1), which respects Garry's calculations based on differential runoff, with some accommodation of sloped ground and berm. This ratio of 5 impervious area : 1 rain garden ponding area is based on a 6 inch deep rain garden. Require applicant to demonstrate adequate ponding area for depths that vary from 6 inches.

<https://www.missouribotanicalgarden.org/sustainability/sustainability/sustainability/sustainable-solutions-for-you/rainscaping-guide/design-and-build-a-rain-garden/determine-rain-garden-size-and-depth>

2.8 Matrix Item 8 – French Drain ~~Detention basin~~

- 2.8.1 Discussed that for the size of development that is being targeted by the ordinance/matrix, a detention basin is effectively the same as a rain garden.
- 2.8.2 Decided to replace item 8 with French Drains
- 2.8.2.1 They are listed in Kirkwood's design guidance as the similar Dry Wells (page 15)
- 2.8.2.2 They are included in the USGBC LEED manual
<https://www.usgbc.org/credits/homes/v2008/ssc4>
- 2.8.2.3 City (Mirela) says that a French Drain was one of the most popular BMPs used in Crestwood to mitigate new impervious area
- 2.8.3 Design basis – decided to use the same volume as rain garden, but divide by 0.4 (accounts for void spaces between gravel), which yields an offset of 12:1.
- 2.8.4 Require that the surface is grass - consistent with Kirkwood, and U Heights will likely prefer it.

2.9 Ordinance location for GISW matrix is Chapter 405 Subdivision and Land Development Regulations

- 2.9.1 City (Mirela) suggests the best location is to add it to Code Chapter 405.510.
- 2.9.1.1 City (Mirela) provided "Section 405.510 Revised Ucity code 2-29-2024.docx"
- 2.9.1.2 Suggested item c (in red) is a good location to call for the new ordinance. The group discussed that the wording suggested by Mirela is different than what we've been discussed. Agreed that it needs to be reworded and needs work to call for threshold limit of impervious and new matrix.
- 2.9.1.3 On 3/19/2024, we revisited this. We agreed that a version of the matrix table should be included in the ordinance, but possibly without the references column. The reason is that the links in the reference column might not stand the test of time. The full matrix, with references should be included with the GISW permit application, and the references could more easily be periodically updated by DPW. Eric offered to draft the ordinance for review by the group based on our discussions.
- 2.9.2 Discussion about trigger threshold for new impervious. Previous discussions have been based on 100 SF. City (Mirela) suggested that this might be too low and maybe 200 SF would be more appropriate. Group decided to list 100 SF for initial draft.
- 2.9.2.1 On 3/20/2024, we revisited this discussion. Agreed that the same threshold area should be used for both the Flatwork Permit and the GISW Permit. Discussed that the Brentwood trigger is 200 SF and the Kirkwood trigger is 1,000 SF. Agreed to state that the trigger in U City is 100 SF and allow further discussion outside the Stormwater Commission between the City Council, City DPW, City Legal, and the U Heights Flood Task Force. This trigger is tied to the workload of City staff.



Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

2.10 Status of Matrix Review

2.10.1 See item 2.11 for remaining work.

2.11 Subjects raised, but not yet fully addressed

2.11.1 Need to develop ordinance language for Flatwork permit and GISW permit

2.11.2 Matrix Item 3 - Should credit be given to a pre-existing tree?

2.11.3 Matrix Item 5 – finalize sizing determination needed for green roof

2.11.4 Matrix Item 7

2.11.4.1 Should the basin be sized for the actual drainage area that it receives? In other words, consider an example where the basin receives not only 100 SF of new impervious area, but also 50 SF of grass. The basin should be sized to accommodate all of this drainage or the basin will become overwhelmed, which could lead to increased maintenance or even premature failure of the basin.

2.11.4.2 Should there be a requirement that the developer demonstrate the watershed area draining to the selected location for the basin, and that the required area and depth can be achieved at this location?

2.12 References

The following are a list of references reviewed.

2.12.1 City of Kirkwood, MO – Stormwater Management Guidance; Green Infrastructure Techniques for Stormwater Management (January 2022)

<https://www.kirkwoodmo.org/home/showpublisheddocument/7847/637854587558070000>

2.12.2 Local communities listed in the HR Green report to City (Feb 8, 2023): Town & Country/Olivette/etc

2.12.3 Dubuque, IA - Bee Branch Watershed Flood Mitigation Project

2.12.4 Tulsa, OK – From Harm's Way; Flood Mitigation in Tulsa, OK (1993)

2.12.5 Springfield MO on Fasnicht Creek Stormwater Improvement Project

2.12.6 City of Brentwood "Brentwood Practices for Stormwater Control"

<https://www.brentwoodmo.org/DocumentCenter/View/28005/Stormwater-Control-Best-Management-Practices>

2.12.7 EPA 430-S-18-001 Estimating the Environmental Effects of Green Roofs: A Case Study in Kansas City, Missouri (August, 2018).

https://www.epa.gov/sites/default/files/2018-09/documents/greenroofs_casestudy_kansascity.pdf

2.12.8

3 Next meeting – Business was not completed.

4 Adjournment. Adjourned at 6:00 PM.

Minutes Preparation. The minutes were prepared by Eric Karch.

U:\UniversityCity\Minutes\20240319_StrmWtrCommMin_AdHOC_DRAFT.docx