

Analysis of Thresholds for the Requirement of Structural Water Quality Controls

The City of Austin is considering a new Watershed Protection Ordinance (WPO) to regulate development to best protect its creeks, lakes, and other water resources. One key decision is to set a new threshold for when a site development is large and intense enough to warrant an on-site water quality control. This analysis studies this question and offers insight from City of Austin staff experience and the national literature. The topic turns out to be quite complex and multi-sided. The following points are discussed in this review:

- The more restrictive the water quality control threshold, the better the environmental protection.
- The more restrictive the threshold, the greater cost and effort for construction, maintenance, and inspection of water quality controls.
- The City of Austin has long required a relatively protective threshold of 5,000 square feet of impervious cover for water quality controls in Urban watersheds.
- The SOS Ordinance has an 8,000 square foot provision exempting properties platted prior to the 1992 ordinance from water quality controls if they are under this threshold.
- A one-acre site with 5,000 square feet of impervious cover (IC) would have 11% IC over the site; 8,000 square feet would be 18%; and 10,000 square feet would be 23%.
- LCRA and Travis County use a higher 10,000 square foot threshold, although the intensity and configuration of development regulated differs from that of the City of Austin.
- Monies collected by the City to retrofit watershed problems in the urban core are affected by the threshold; the impact of changing the threshold from 5,000 to 10,000 square feet is not known.
- A specific “best number” for the water quality threshold is difficult to identify and depends on the factors held most important.

Background

Urbanization causes changes to the land surface—principally with the construction of impervious surfaces such as roofs, roads, and parking lots—that fundamentally alter natural hydrology. Where rainfall once was intercepted by vegetation and infiltrated into soils, impervious surfaces cause this same rainfall to quickly concentrate and run off the land, carrying pollutants to and eroding downstream waterways. A major countermeasure to this dynamic is to install engineered, water quality (WQ) controls (often called “ponds”) to temporarily store, treat, and slowly release this runoff to reduce its impact. The larger the impervious surface, the more runoff and potential damage that can occur. A very small amount of impervious cover (e.g., one concrete picnic table) is unlikely to have a significant impact. But a large building or parking lot will clearly have a clear negative impact.

This analysis examines where along the continuum of “no impact” to “clear negative impact” Austin should set its regulatory requirements for WQ controls. The object is to use an appropriate threshold that balances concerns for environmental protection; pond inspection and maintenance; and impact on development.

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Existing Code Requirement for WQ Controls

The existing Land Development Code (“code”) threshold for requiring structural water quality controls is 20% impervious cover (IC) calculated on a Net Site Area basis. In other words, when more than 20% of the developable area of a site is proposed to be impervious, a WQ control is required. This standard has been in place since at least the [1986 Comprehensive Watershed Ordinance](#) (CWO). The understanding at the time was that once a certain minimum amount of land cover was converted to IC, a structural WQ control was necessary to mitigate its impacts. At the time, the threshold was believed to be about 20% IC. Sites with less than 20% IC were assumed to have enough natural function to maintain a sufficient level of water quality protection. This assumed that the remaining 80% of the land provided good water quality via infiltration and pollutant uptake. The runoff from the 20% was assumed to be mitigated by the surrounding 80%.

Concerns with the 20% Impervious Cover Threshold for WQ Controls

The 20% IC threshold for WQ controls was a significant advancement in the year 1986: essentially, it replaced an age-old system of providing no controls at all. But since this requirement was instituted, a number of problems have become apparent to warrant changing the threshold to a new standard.

First, for a very large site with less than 20% IC, no water quality controls would be required even though the total amount of impervious cover might be very great. Several examples have been presented during the WPO stakeholder process, including the Canyon Creek Elementary School and the Manor Downs race track sites. Both were permitted with just under 20% IC and thus neither provided on-site water quality controls. Yet both had many acres of impervious cover which contributed increased runoff and pollutants to downstream waterways.

Second, the 20% IC threshold does not have a “lower end” for when not to require a control. So, even for a very small site, any development with more than 20% impervious cover requires a pond. Thus, in practice, a 6,000 square foot commercial site in the Water Supply Rural watershed (which has a 20% IC limit) proposing 1,200 square feet of IC would be required to have a control. The actual impacts of such a small IC footprint are anticipated to be very small. Each such control created would then need to be tracked and inspected by City staff and maintained by the owner.¹

Proposed Water Quality Control Threshold: 5,000 square feet of Impervious Cover

The draft of the Watershed Protection Ordinance (WPO) proposed to City Council by City staff requires that all development sites provide on-site water quality controls if the new and/or redeveloped impervious cover exceeds 5,000 square feet of impervious cover.

The 5,000 square foot threshold was selected for three reasons:

¹ A counterargument would be that collectively many of such small sites will add up to result in a negative watershed impact. But most of these small projects are isolated, infill projects. The vast majority of development is done in larger units and subject to WQ control requirements with any of the systems evaluated by this present analysis (20% IC vs. 5,000 sq. ft vs. 10,000 sq. ft. thresholds). The main point is that there are a small number of projects that have very low IC and do not necessarily warrant a water quality control.

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- 1) The City of Austin already uses this threshold for the urban core. Code section 25-8-211(C) states that “water quality controls are required in accordance with the Environmental Criteria Manual” (ECM). Section 1.9.2.A of the ECM states: “For all levels of impervious cover, projects in the Urban Watersheds must provide water quality controls when the cumulative total of both new and redeveloped impervious cover exceeds 5000 SF.”
- 2) 5,000 square feet is the threshold beyond which a Site Plan is required for site development. The Site Plan process offers a systematic means of evaluating development elements, including grading, drainage, and water quality controls. Projects with less than 5,000 square feet of impervious cover are assumed to be less intense and less complex and do not warrant a full Site Plan review. This is a logical place to include water quality controls.
- 3) Many other national entities have also selected the 5,000 square foot of impervious cover threshold, including:
 - a. US Environmental Protection Agency (EPA)
 - b. Maryland state
 - c. San Francisco
 - d. Washington DC
 - e. Philadelphia

Other entities have selected lower (e.g., Seattle at 2,000 and Portland at 500 square feet) or others (e.g., Chicago at 7,500 higher). The 5,000 standard appears to place Austin in the range of pro-active water quality protection.

Prior to the recommendation of 5,000 square feet, City staff recommended an 8,000 square foot threshold. This was based on an SOS Ordinance provision that allows properties platted prior to the 1992 Ordinance to build up to 8,000 total square feet of impervious cover before they are required to build on-site controls. This works out to 18% impervious for a one-acre site. But later it was recognized that a 5,000 square foot threshold was already required for the Urban watersheds and thus this standard was then recommended for the Watershed Protection Ordinance draft for Council approval.

Potential Threshold: 10,000 square feet of Impervious Cover

Travis County currently has a 10,000 square foot threshold. Some WPO stakeholders recommend that the City of Austin adopt the County standard because they believe that the 5,000 threshold is too strict and to keep the two measures consistent. The Lower Colorado River Authority (LCRA) also uses a 10,000 square foot threshold for the requirement of water quality controls. (The County adopted this threshold when they used LCRA’s Highland Lakes Ordinance to regulate development in the western portion of Travis County. It uses City of Austin regulations in the eastern portion. But the 10,000 square foot standard is applied to the entire County area beyond Austin and other cities’ ETJs.)

A one-acre site with 10,000 square feet of impervious cover would be 23% impervious over the site.

Based on interviews with the staff involved in both the Travis County and LCRA regulations, one major reason the 10,000 square foot threshold was considered adequate was that the size of the lots in these areas is relatively large. Most developments are in rural settings and have on-site wastewater disposal (“septic”) systems and water wells, both of which require increased lot sizes according to state and

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county standards. The overall impervious cover levels of the average developed site therefore remains relatively low and a substantial amount of remaining pervious cover remains to help mitigate the impacts of the impervious cover. Additionally, both the County and LCRA apply their water quality regulations to all development, including individual single-family homes, such that any proposed development in excess of the 10,000 threshold would be required to install on-site WQ controls. So both wanted to set the threshold high enough to avoid having to individually regulating most single-family homes.

Implications of Using a 10,000 square foot Threshold for the City of Austin

The case for requiring controls at a lower (e.g., 5,000) or higher (e.g., 10,000) level are complex and depend on the area of interest examined. Here are some of the major points:

- *Environmental Protection.* The lower the threshold, the more environmentally protective. Uncontrolled impervious cover generates runoff which can create problems downstream.
- *Resources for Water Quality Protection Retrofits.* In the Urban watersheds, the code offers small developments an option to pay into a fund rather than provide on-site water quality controls. This relieves the design challenges of locating the pond on site and provides revenue to fund the numerous projects needed to correct historic watershed problems created by uncontrolled development. The current WQ control threshold in the Urban watersheds is 5,000 square feet of impervious cover. If this is raised (e.g., to 10,000) a portion of this revenue will be lost. (The magnitude of this loss is still be evaluated at the time of this writing.)
- *WQ Control Maintenance & Inspection.* The lower the threshold, the more small ponds that will be required. Each is required to be maintained by the property owner (or, in some cases, the City of Austin) and inspected by City of Austin staff. This requires cost and resources.
- *Development.* Ponds cost money to build and take space on developed sites. Smaller sites often present more challenges in terms of finding appropriate locations for these controls. In the Urban watersheds, small projects with small ponds may qualify to pay a payment in lieu of on-site construction, but this still is a cost.²
- *Development Review and Inspection.* Where ponds are required for small subdivisions and commercial projects, they require a significant effort to review and oversee. Effectively, there is no difference between the time it takes to review a large vs. a very small site. If the overall benefit of providing the WQ control is negligible, then freeing up this time and effort would enable these resources to be more productively used.
- *Community Perception.* Occupants of neighboring properties are often concerned about the drainage impacts of new developments. Provision of a water quality pond (or at least a payment to a fund to provide such protections) demonstrates the City's commitment to addressing the impacts of developments on area creeks and waterways and that the burden of the negative environmental impacts will be borne by the new development.

² ECM section 1.6.4 lists projects "strongly considered" to be eligible include commercial sites smaller than one acre in size and single-family residential sites smaller than two acres in size, with some exceptions. Exceptions include sites within 500 feet of Lady Bird Lake or adjacent to an open channel stream.

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City of Austin vs. LCRA/Travis County Development Patterns

The City of Austin does not require WQ controls to be built on individual single-family residential lots. Thus a building permit will not trigger a pond. The City only requires ponds to be provided in the subdivision and site plan process. LCRA and Travis County require on-site controls whenever the respective impervious cover threshold is exceeded. As mentioned above, this was one rationale for setting the WQ control threshold to a relatively higher 10,000 square foot level.

Single-family residential lots in the City of Austin are typically small and developed to 30 to 45% impervious cover. In the LCRA and Travis County jurisdictions outside the City's ETJ, lots are much larger and impervious cover levels lower. The higher the impervious cover level, the more "hydraulically connected" the drainage system, meaning that runoff water is more likely to speed off the site without a chance to infiltrate and be mitigated by soils and vegetation. The original 20% impervious cover threshold for WQ controls was based on this concept. Today, research has shown that watershed impacts begin even lower. Thus, there is some concern with having 30 to 45% impervious cover allowed for single-family residential subdivisions without WQ controls.

Conclusion

There is no objective "right number" threshold for the provision of water quality controls. The more restrictive the water quality control threshold, the better the environmental protection. But the more restrictive the threshold, the greater cost and effort for construction, maintenance, and inspection of water quality controls. At some point along the continuum, the added effort and complexity in requiring controls on smaller and smaller amounts of impervious cover will not yield a proportionate benefit to the environment or the community. Portland, Oregon, for example, has apparently expressed some reservations that setting their threshold at 500 square feet may be discouraging developers from building smaller projects (Cost Analysis of Proposed District of Columbia Stormwater Regulations, 2010).

The choice of which threshold to use is an element that is instrumental in helping balance the equation between environmental protection and not overly restricting development. The staff selection of 5,000 square feet was selected in part to lessen the impact of going from gross site area to net site area. As this threshold is applied, it will have the most significant impact on projects with smaller lots and infill projects. As discussed earlier, and illustrated in the table below, a one acre lot utilizing a threshold of 10,000 square feet allows 23% impervious cover without a water quality control, a threshold of 8,000 square feet allows 18% impervious cover without a threshold, and a 5,000 threshold allows 11% impervious cover without a threshold on the same size lot. As the lot size decreases, the percent impervious cover allowed without a control increases in each scenario. Given that measurable watershed degradation has been documented to occur at impervious covers below 20%, staff recommends a 5,000 square foot threshold. If this threshold is increased, staff recommends a limit no higher than 8,000 square feet.

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Percent Impervious Cover (IC) on 1 Acre of Land with Varying Levels of Impervious Cover

IC sq. ft.	Pct. IC
2,000	5%
5,000	11%
8,000	18%
8,712	20%
10,000	23%

Additional Information

§25-4-174 Lot Size	Min. COA subdivided lot size in ETJ = 5,750 ft ² (0.13 acres)
§25-8-64 IC Assumed per Lot	Lot < 10,000 ft ² assumed to have 2,500 ft ² IC (0.06 acres)
§25-2-58 SF-4A Lot Size	3,600 ft ² (0.08 acres)
§25-2-779(M) SF-4A Max. IC	65% IC; → 3,600 ft ² x 65% IC = 2,340 ft ² IC (0.05 acres)
§25-5-3 Small Projects	IC ≤ 5,000 ft ² or construction site ≤ 10,000 ft ²
ECM 1.9.2 Urban WQ Threshold	5,000 ft ² IC (0.11 acres)
§25-8-516(A)(2) SOS Exemption	8,000 ft ² IC (0.18 acres)
LCRA WQ Threshold	10,000 ft ² IC (0.23 acres)
Travis County WQ Threshold	10,000 ft ² IC (taken from LCRA)