

**Position paper and recommendations
for**

Improving Stormwater Management in San Antonio

Spring 2018

**Submitted by the Greater Edwards Aquifer Alliance
Stormwater Focus Group**

Introduction

San Antonio has made great strides in improving stormwater management in the past thirty years. This, and the fact that San Antonio has separate sewer and stormwater systems has enabled San Antonio to be in a better position than many other large urban cities for managing its stormwater. But, like most Texas communities, San Antonio continues to rely primarily on large regional facilities and gray infrastructure to manage its stormwater. This has led to continued flooding caused by new development and diminished water quality due to stream degradation and non-point source pollution. ¹

It may be argued that the continued flooding in San Antonio is due to “Heritage” issues (left from the era when there were few to no rules in place), but there are new flooding situations caused by developments built under the 2001 revised Unified Development Code (UDC) and its subsequent amendments which indicates that the current stormwater rules are not adequate.

What changes are required to:

- 1. Prevent additional flooding from new development and incentivize more sustainable stormwater management measures?*
- 2. Continue to move towards meeting the Master Plan Policies (1997), the Comprehensive Master Plan Framework (2010), SA2020 (2011), SA Tomorrow Comprehensive Plan (2016) and any subsequent stormwater management and water quality goals?*
- 3. Remove all segments of San Antonio’s streams and rivers from the State’s list of impaired water bodies while meeting and exceeding the City’s MS4 permit requirements?*
- 4. Insure that taxpayers are are not picking up any portion of the bill for new development’s stormwater requirements?*

Over the past 4 months, the Greater Edwards Aquifer Alliance has headed a Stormwater Focus group to outline the issues and develop subsequent recommendations for City Council to consider. Listed below are broad recommendations with supporting details to not only improve stormwater management, but to also move the community towards improving water quality in each of the major streams and rivers within San Antonio and its Extraterritorial Jurisdiction (ETJ). Currently, every major steam and river contains segments which do not meet Federal Water Quality Standards as indicated from the Texas Commission on Environmental Quality’s (TCEQ) list of impaired surface water bodies. And some of these impaired segments occur over the Edwards Aquifer Recharge Zone. ²

1. <http://www.watersecuritynetwork.org/enhancing-resilience-in-cities-from-grey-to-green-infrastructure/> and <http://www.govtech.com/em/disaster/With-building-boom-comes-higher-flood-risk.html>
2. https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/14txir/2014_303d.pdf

Executive Summary

Currently, San Antonio has a policy of managing its stormwater to prevent flooding by the following methods:

1. Encouraging developers to pay a fee in-lieu-of versus on site detention so that large stormwater facilities can be constructed to detain stormwater somewhere in the watershed.
2. Increasing stormwater fees that fund practices to meet the MS4 permit requirements for clean water. Currently, street sweeping is a primary practice to meet requirements.
3. Increasing property taxes for construction of flood control projects which include not only regional detention facilities, but additional concreting of channels that were at onetime streams or tributaries leading to our major creeks and rivers.
4. Continuing to issue bonds every 5 years for additional flood control projects.

What have been the results?

1. There are greater periods of low or non-existent flows in tributaries, creeks and rivers while the Edwards Aquifer suffers from more frequent critical periods of low elevation as the natural hydrology on a new development site is altered to prevent stormwater infiltration.
2. Runoff from new development continues to cause flooding of existing properties/structures in their immediate downstream area.
3. More potable SAWS water is required to maintain landscapes as retention of soil moisture is reduced or eliminated by directing all stormwater from impervious areas directly into a drainage system and ultimately into creeks and rivers.
4. Water in every stream and river in the San Antonio area that is currently monitored continues to have segments that are documented as having impaired water quality. That is, water quality does not meet state or federal water quality standards. This situation is exacerbated by the continued concreting of channels/streams where in the past, vegetation and fluvial geomorphology assisted in removing each of the components tested for clean water standards; sediment, heavy metals, bacteria, hydrocarbons, etc. while increasing dissolved oxygen.
5. Tax payers continue to assist in paying for the stormwater management required by new development (even from projects permitted under the current stormwater management rules) through increased taxes, fees, bond interest, health issues, quality of life and reduction in air quality.

Recommendations to begin reversing this trend are:

- Develop a regional Green Stormwater Infrastructure (GSI) plan that includes Low Impact Development (LID) and natural channel strategies.
- Revise the Unified Development Code (UDC) for new development and Capitol Improvement projects to insure greater adoption of more sustainable stormwater management practices that will also address water quality including:

- a. Establish the fee-in-lieu as the exception, not the preferred method of compliance, where detention for the 25 yr event is required on site.
 - b. Require and fund position(s) for the drainage review section to have on staff a qualified geofluvial morphologist that has review purview for plans on projects where it is proposed to discharge stormwater into a “natural” drainage feature/stream or river.
 - c. Ensure that all drainage review staff and inspectors are trained and/or certified in LID practices.
 - d. Insure that certified “as built” plans are submitted before final approvals.
- Do not allow alterations to the flood plains (except for those that enhance its ecological functioning) and encourage the creation of wetlands for treating runoff and reuse water to improve water quality.
 - Add debris to Total Maximum Daily Load criteria.
 - Direct regional stormwater and stormwater utility fees so they may also be used for implementing retrofits with LID practices where gray infrastructure is replaced by green infrastructure.
 - Ensure that new flood control and capitol improvement projects have water quality components.
 - Insure that new development designs and fees eliminate the need for tax payers to assist in paying for flood control projects made necessary by increased stormwater flooding due to new construction.

Conclusions

By implementing these next steps to reverse the current trend, San Antonio will also be addressing multiple issues with the same solutions that will provide:

- a) Increased water conservation
- b) Improved water quality
- c) Reduced stormwater runoff with greater flooding mediation capacity
- d) Reduced air pollution
- e) Inceased climate adaption while improving public health, aesthetics and quality of life for all San Antonians

Recommendations

Summary of recommendations:

- Develop a regional Green Stormwater Infrastructure (GSI) plan that includes Low Impact Development (LID) and natural channel strategies.
- Revise the Unified Development Code (UDC) for new development and Capitol Improvement projects to insure greater adoption of more sustainable stormwater management practices that will also address water quality.
- Insure that taxpayers are not paying for flood control projects made necessary by increased stormwater flooding due to new construction.

Recommendations

1. **Develop a regional Green Stormwater Infrastructure (GSI) plan that includes Low Impact Development (LID) strategies and natural channel design practices:**

- a) Locate in the most appropriate places (e.g., where flashy flooding takes place, immediately above impaired water segments and/or on soils that will infiltrate),
- b) Construct in the most efficient manner to:
 - 1) Bundle projects to reduce costs,
 - 2) Utilize spaces allocated for meeting other code requirements such as tree preservation, landscape, landscape buffer, streetscape, sidewalks, detention, open space, etc.;
 - 3) Insure improved water quality from stormwater discharges,
 - 4) Improve aesthetics and environmental impact including air quality, pedestrian comfort, traffic calming, etc.,
 - 5) Accomplish long-term goals such as reducing runoff into monitored streams and rivers by 30% and improve water quality while replacing failing gray infrastructure with green infrastructure to remove all segments from the TCEQ's impaired body list. over the next 15 years.
- c) As these target areas are identified, include incentives for property owners to install retrofit LID practices utilizing Federal grants and other taxed based funding such as the stormwater utility fee.

- 2. Revise the UDC to insure that there is increased effectiveness of the code and its implementation with greater adoption of more sustainable stormwater management practices by:**
- a) Requiring on-site detention for a minimum of the 25 year event³ that includes a water quality component.
 - b) Increasing fees so that sustainable practices that can address both water quality and stormwater runoff will be an economically feasible option or at a minimum the total stormwater management costs are paid by the development.
 - c) Continuing to collect the fee in-lieu-of (FILO) for regional facilities that will address larger events.
 - d) Including a safety factor into the calculations which are based on impervious cover to insure specific site anomalies are addressed and to protect the integrity of receiving bodies of water, ie. streams and floodplains. (justification is explained under supporting information on pages 5 and 6 in this document).
 - e) Requiring that the engineer of record submit and sign off on the “as built” plans and provide a surety bond for a minimum of one year.
 - f) Insuring that all transportation and capitol improvement (TCI) projects have Green Stormwater Infrastructure components that will also address water quality.
 - g) Requiring and providing funding to have qualified staff in the stormwater review and capitol improvement projects management staff to properly review and implement LID and natural channel designs.
 - i. TCI project managers and Stormwater review and inspection staff receive certification of continued education for implementation and inspection of GSI components including natural channel design.
 - ii. Create and fund a new staff position within TCI for a fluvial geomorphologist to review all private and TCI flood control projects, projects that requires a modification to a floodplain and or may impact a “natural” drainage system.
 - h) Eliminating staff implementation practices that dilute the effectiveness of stormwater control such as variances and alternative methods of compliance including raising a downstream bridge versus on-site compliance or paying a FILO.
 - i) Insuring that regional facilities’ are placed out of the floodplain and include Green Stormwater Infrastructure components to improve water quality, enhance aesthetics, provide multi-use and assist the city to meet its MS4 permit requirements. This may require new tree planting and other restoration practices.
 - j) Giving policy direction to TCI staff to:
 - i. Prioritize water quality,

3. <https://pubs.usgs.gov/wri/wri98-4044/pdf/98-4044.pdf>

- ii. De-prioritize the removal or approval to remove properties from floodplains or areas prone to flooding so that they may be developed as a means to increase tax revenues,
 - iii. Understand the concept that open spaces that flood and floodplains should be maintained to maximize their flood control and water quality benefits and are to be given tax relief to pay for the ecosystem services that they provide,
 - iv. Understand that disconnecting stormwater drainage systems and increasing green infrastructure to allow for more infiltration will save tax dollars, improve flood control measures and assist the city to meet water and air quality requirements.^{4,5}
- k) Directing regional stormwater fees to also be used for implementing retrofits with LID practices where gray infrastructure is replaced by green to the extent possible.
 - l) Codifying stormwater rebates and tax credits to commercial properties for implementing GSI practices especially when impervious areas are replaced or covered by LID practices.
 - m) Codifying that City tree planting programs shall situate/engineer plantings where they will provide stormwater management, reduce runoff, increase water infiltration, remove pollutants and provide long term soil moisture for plant growth.
 - n) Insuring that MPO and TXDOT projects incorporate LID practices in their projects within city limits and the ETJ. This is especially pertinent as TXDOT now has its own MS4 permit.
 - o) Directing staff to insure that maintenance practices along creeks and rivers follow ecological guidelines and that “in-the-field” operation and maintenance staff receive training to reduce negative impacts to streams and eliminate stream bank erosion.
 - p) Requiring reuse water to receive an additional treatment such as provided by constructed wetlands before it is discharged directly into streams and rivers to reduce or eliminate its nutrient load.
 - q) Insuring that a Total Maximum Daily Load for trash is included in watershed studies and plans, that such identified impaired river and stream segments are included on the 303(d) listing and strategies for new developments and capitol improvement projects are implemented to insure that future debris does not leave the site by stormwater runoff.

3. Structure funding for new flood control projects to provide sufficient transparency to insure taxpayers are not paying to mitigate new flooding or increased flooding caused by new developments.

4. <https://www.epa.gov/green-infrastructure/green-infrastructure-cost-benefit-resources>

5. <http://ccap.org/resource/the-value-of-green-infrastructure-for-urban-climate-adaptation/>

Background and Supporting Information:

1. The two documented projects that have created flooding under the 2001 and current UDC are Worham Oaks in the ETJ and The Preserve at Castle Hills within the city limits (outside the mandatory detention areas). This has occurred even though the projects met current codes as the drainage reports and plans were approved by City staff. There are many other similar anecdotal examples and the possible causes that stormwater engineers and others have noted include:
 - a) Hydrological formulas used to meet drainage standards are not sufficiently accurate, as it is *impossible* for a model to include small details of every site's specific conditions. This causes an unintentional misapplication of the local accepted standards relating to impervious cover; this error is exacerbated on larger projects. A safety factor should be included in calculations even as it pertains to on-site detention.
 - b) City staff has adopted and codified a preference for "Payment in Lieu of" for regional detention or to have the developer construct enhancements of existing grey infrastructure somewhere downstream which does not address either runoff from the project on to immediate properties or water quality.
 - c) To date, there has been limited use of the LID incentives offered in the UDC. It has been stated by developers and their engineers, that current stormwater fees are not of adequate consequence to promote voluntary incorporation of LID as an alternative that might induce the developer to utilize more of his property versus paying a FILO for detention off site. LID practices address and resolve multiple problems that the city faces; therefore, LID needs to be the city's preference for stormwater management. Research has shown that runoff and pollution export from a traditionally designed residential development can be more than twice- that of one designed with LID components.⁶

2. Portions of most monitored streams and rivers within the San Antonio and its ETJ have impaired water quality. This is partially due to "Heritage" issues/developments, but many practices that exacerbate degraded water quality continue, such as:
 - a) Stormwater from roofs and gutters are discharged onto parking areas where it picks up additional pollutants before entering into a stormdrain or "improved" channel that flows directly to a stream or river.

6. <https://doi.org/10.1016/j.jenvman.2007.03.026>

- b) Stormwater requirements are calculated by the impact on first 2,000 ft and/or on “capacity” in the receiving water body or channel. This does not consider the integrity and ecological functioning of that receiving drainage system. Without additional considerations in hydrological models for ecological function, there will continue to be increases in the degradation of receiving water bodies especially within 100year flood plains. This continued degradation will exacerbate future flooding conditions and continue to decrease water quality.⁷
 - c) Note: This will be an even greater problem as the city develops to the south where there is not rock to prevent additional scouring and downcutting, compared to the north side of the city. More stream and river “blow outs” can be expected, causing a need for additional funding for repairs.⁷
 - d) Commercial landscape maintenance operations and residential owners “blow” their organic material into city streets, which ends up in streams and rivers causing water quality degradation.
 - e) While reuse water plays an important role for replacing artesian well water to maintain low flows in streams and rivers, it does contain a higher level of nutrients such as nitrogen and phosphorus. Even though it meets EPA water quality standards, these elevated levels exacerbate issues for meeting water quality goals. This is especially noted in the River Walk and Brackenridge Park area where there has been an increase in turbidity and algae growth since the switch to reuse water. It is therefore recommended that constructed wetlands be used to filter the additional nutrients, remove the sewage treatment odor, and create wildlife habitat. In addition, wetlands are proven to provide a buffer to moderate flooding in urban areas.⁸
 - f) Flood control projects continue to include the use of concrete in channels without incorporating best management practices to reduce litter or address its negative impact on water quality.
3. Taxpayers continue to pay an increasing amount to manage stormwater through property taxes, utility fees and the issuance of bonds. It is difficult to separate precisely the source of funding for construction of a project with its multiple phases and/or the cause or need for specific flood control projects. But, as it has been noted, new development continues to cause an increase in runoff and new incidences of downstream flooding.

7. https://www3.epa.gov/npdes/pubs/usw_b.pdf

8. <https://www2.monroecounty.gov/files/health/EnvQual/eh-WMWetlandsforCitizens.pdf>

Conclusions

In the words of one reporter, “Impervious cover is expanding every day, especially in San Antonio, one of the fastest-growing large cities in the U.S. The region’s population is expected to increase by 1.1 million over the next 25 years. Part of Flash Flood Alley, the area sits in the path of intense storms, exposing more people to flooding hazards and destruction.”⁹

Meeting these challenges will require a new perspective on the way San Antonio manages stormwater. We must begin using multidisciplinary approaches that will address more than one quality of life issue.

Fortunately, San Antonio already has the beginning of a Green Stormwater Infrastructure/LID plan and the UDC already has enabling ordinances for LID along with guidelines and design specification. Together with new political direction, the City will be able to implement the use of green stormwater infrastructure and other more sustainable measures to facilitate the next steps needed to create a more sustainable and resilient San Antonio for the future.

And by implementing these next steps, San Antonio will also be addressing multiple issues with the same solutions that will provide:

- f) Increased water conservation
- g) Improved water quality
- h) Reduced stormwater runoff with greater flooding mediation capacity
- i) Reduced air pollution
- j) Increased climate adaption while improving public health, aesthetics and quality of life for all San Antonians

9. <http://www.govtech.com/em/disaster/With-building-boom-comes-higher-flood-risk.html>