Greater Edwards Aquifer Alliance

Member Organizations

Alamo, Austin, and Lone Star chapters of the Sierra Club
Bexar Audubon Society
Austin, Bexar and Travis Green Parties
Bexar Grotto
Boerne Together
Bulverde Neighborhood Alliance
Bulverde Neighbors for Clean Water
Cibolo Nature Center
Citizens for the Protection of Cibolo Creek
Comal County Conservation Alliance
Environment Texas
First Universalist Unitarian Church of SA
Friends of Canyon Lake
Friends of Dry Comal Creek
Friends of Government Canyon
Fuerza Unida
Green Society of UTSA
Guadalupe River Road Alliance
Guardians of Lick Creek
Headwaters at Incarnate Word
Helotes Heritage Association
Hill Country Planning Association
Kendall County Well Owners Association
Kinney County Ground Zero
Leon Springs Business Association
Medina County Environmental Action
Native Plant Society of Texas – SA
Northwest Interstate Coalition of Neighborhoods
Preserve Castroville
Preserve Lake Dunlop Association
Preserve Our Hill Country Environment
Riveraid
San Antonio Audubon Society
San Antonio Conservation Society
San Geronimo Valley Alliance
San Marcos Greenbelt Alliance
San Marcos River Foundation
Save Barton Creek Association
Save Our Springs Alliance
Scenic Loop/Boerne Stage Alliance
Securing a Future Environment
SEED Coalition
Signal Hill Alliance
Solar San Antonio
Sisters of the Divine Providence
Texas Cave Management Association
Trinity Edwards Spring Protection Association
Water Aid – Texas State University
Wildlife Rescue & Rehabilitation
Wimberley Valley Watershed Association

PO Box 15618
San Antonio, Texas 78212
(210) 320-6294

October 23, 2025

Monica Reyes
TCEQ, Austin Region
Sent via email to: eapp@tceq.texas.gov

RE: Edwards Aquifer Protection Program 2025 Comments

Dear Ms. Reyes,

The following comments are submitted on behalf of the sixty-two member organizations of the Greater Edwards Aquifer Alliance (GEAA), all of which are united behind a comprehensive plan to protect the Edwards Aquifer, its springs and watersheds, and the Texas Hill Country. The memberships of these organizations represent a large segment of the population that relies on the Edwards Aquifer for their potable water supply, and a broad consensus on how to best protect the aquifer.

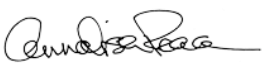
We ask that each member group of our Alliance, all of which have endorsed these recommendations, be listed individually as submitting these comments. Provided here is a list of the member groups that belong to GEAA for inclusion as supporting the comments.

Unprecedented growth in the Texas Hill Country has boosted disposal of sewage effluent to the forefront of issues of concern among our members. Encouraging land application and the beneficial reuse of this effluent enhances efforts to conserve water and more effectively preserves the quality of recharge to our ground and surface waters. We therefore wholeheartedly support the proposed rule-making to allow beneficial reuse to partially substitute for Texas Land Application Permit (TLAP) wastewater disposal area.

We respectfully request that TCEQ conduct a stakeholder process to review current science and discuss potential EAPP rule and guidance document modifications in a collaborative setting. Such a conversation would not only provide an opportunity for stakeholders to efficiently coordinate and reduce duplication of efforts, but also provide TCEQ with the best available research to inform EAPP improvements. We believe that such a stakeholder process is consistent with the TCEQ philosophy to base decisions on sound science, ensure regulations are effective and current, and ensure meaningful public participation in the decision-making process.

Additionally, specific comments on the Edwards Rules are attached for your consideration. We ask that you consider and act on the recommended measures embodied therein, as you go about amending the Edwards Rules. Thank you for your consideration of these comments. If you have any questions, please contact me at your convenience at 210- 320-6294 or Annalisa@AquiferAlliance.org.

Sincerely,



Annalisa Peace,
Executive Director

Permitting Texas Pollutant Discharge Elimination System (TPDES) should be prohibited in the Contributing Zone of the Edwards Aquifer.

In addition to pollution from construction and urban runoff, sewage and wastewater effluent are among the primary pollutants of the Edwards Aquifer. In light of the recent ruling SOS v. TCEQ, in the 459th Judicial District Court of Travis County, Texas[1], we recommend that TCEQ consider a rulemaking process that would require the Agency to adhere to the measures upheld in this ruling and/or align with the prohibition recommended in SB 1709 / HB 3606[2] introduced during the 85th session of the Texas Legislature.

Disposal of wastewater is one of the greatest threats to maintaining water quality in the contributing watersheds to the Edwards Aquifer. Current rules only prevent wastewater discharge within the Recharge Zone. Discharges in the Contributing Zone, even in compliance with current rules, would significantly alter the quality of these oligotrophic surface waters and degrade the aquifer, as demonstrated by recent analysis and a recent report, "Bioassessment of four Hill Country streams threatened by proposed municipal wastewater discharges" by Dr. Ryan S. King and Dr. Jeffrey A. Back of the Center for Reservoir and Aquatic Systems Research, located at Baylor University, Waco, TX[3]. The quality of water in the Contributing Zone directly impacts the quality of discrete recharge in the Recharge Zone. Direct discharge of wastewater should be prohibited not only within the Recharge Zone, but also within the Contributing Zone of the San Antonio and Barton Springs segments of the Edwards Aquifer.

There is widespread scientific consensus and governmental support for prohibiting wastewater discharges into the Edwards Aquifer to prevent degradation. GEAA recommends that TCEQ revise Section 213.6 regarding Wastewater Treatment and Disposal Systems to prohibit TPDES permits from being approved within the Contributing Zone of the Edwards Aquifer. We believe that direct discharge of wastewater into waterways in the contributing zone is a growing problem that needs to be urgently addressed. Effluent discharges pose a risk to human health by introducing anthropogenic pharmaceuticals and other unmonitored chemicals into potable water supplies. Sensitive surface waters within the Contributing Zone cannot withstand the reductions in dissolved oxygen and increases in algae producing constituents that are caused by effluent discharge.

- Emerging contaminants: Current rules for the contributing zone do set minimum levels of effluent treatment for pollution control. However, anthropogenic contaminants only found in sewage effluent, such as unmetabolized pharmaceuticals and personal care products, are not regulated. The effects of allowing these contaminants to accumulate in groundwater, which will be used for drinking water, are unknown and potentially dangerous. Many private well owners, local water supply companies, including San Antonio Water Systems, which serves the entire City of San Antonio, do not pretreat Edwards Aquifer water before distribution and consumption.

- Incorporating PFAS Regulations: In April 2024, the US Environmental Protection Agency (USEPA) announced the final National Primary Drinking Water Regulation (NPDWR) for six Per- and polyfluoroalkyl substances (PFAS). PFAS are manufactured chemicals that have been used in industry and consumer products since the 1940s. Because of their widespread use and persistence in the environment, many PFAS are found in the blood of people, drinking water, waste sites, and animals all over the world. Further, an individual can be exposed to PFAS by touching, drinking, eating, or breathing in materials containing PFAS. Ongoing research has shown that exposure to certain levels of PFAS may lead to health effects such as increased cancer and developmental effects, and reduced ability in one's immune system to fight infections.

To address this growing issue, the USEPA established legally enforceable levels, called Maximum Contaminant Levels (MCLs), for six PFAS in drinking water: PFOA, PFOS, PFHxS, PFNA, and HFPO-DA as contaminants with individual MCLs, and PFAS mixtures containing at least two or more of PFHxS, PFNA, HFPO-DA, and PFBS using a Hazard Index MCL to account for the combined and co-occurring levels of these PFAS in drinking water. EPA also finalized health-based, non-enforceable Maximum Contaminant Level Goals (MCLGs) for these PFAS. We urge the TCEQ to incorporate these recommended PFAS levels (see Table 1 below) in surface water quality monitoring efforts to ensure the protection of public health across Texas

[1] Cause No. D-1-GN-19-003030; SOS v. TCEQ; in the 459th Judicial District Court of Travis County, Texas

[2] https://aquiferalliance.org/wp-content/uploads/2018/07/NoDischargeBill-FactSheet.pdf

[3] https://www.bartonspringsuniversity.org/uploads/2/1/7/4/21744914/final_report_from_baylor_university_to_sosa_final_10.23.20.pdf

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA	Zero	4.0 parts per trillion (ppt) (also expressed as ng/L)
PFOS	Zero	4.0 ppt
PFHxS	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
HFPO-DA (commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1 (unitless) Hazard Index	1 (unitless) Hazard Index

Table 1: USEPA Final MCLGs and MCLs for six PFAS in Drinking Water

- Rapid, dense residential development over the contributing zone: Three counties in the contributing zone, Comal, Hays, and Kendall, are among the ten fastest growing counties in the USA. Developers are building dense subdivisions and applying for TPDES permits. The growing number of wastewater treatment plants discharging directly into waterways in the Contributing Zone is cause for great concern.

Existing discharge permit procedures should be re-evaluated relative to the 2006 U.S. Fish and Wildlife Service recommendations.

- Recommended water quality for federally listed species in Texas: https://www.researchgate.net/publication/323522633_RECOMMENDED_WATER_QUALITY_FOR_FEDERALLY_LISTED_SPECIES_IN_TEXAS_USFWS_Technical_Report
- Recent (2008–10) Concentrations and Isotopic Compositions of Nitrate and Concentrations of Wastewater Compounds in the Barton Springs Zone, South-Central Texas, and their Potential Relation to Urban Development in the Contributing Zone: https://pubs.usgs.gov/sir/2011/5018/
- WASP Model Analysis of a City of Dripping Springs Proposed Wastewater Treatment Plant Discharge to Onion Creek: https://services.austintexas.gov/edims/document.cfm?id=254063
- An Analytic Water Quality Model of Onion Creek examining Impacts from a Proposed Wastewater Point Source Discharge https://services.austintexas.gov/edims/document.cfm?id=266618

Enhanced Water Quality Protections for TPDES and TLAP Permits on the Edwards Aquifer Contributing Zone

GEAA urges TCEQ to adopt rules for the Edwards Aquifer Contributing Zone. According to recent studies[4], "Currently, Texas Commission on Environmental Quality (TCEQ) regulations on the Edwards Aquifer Contributing Zone are limited, especially when compared with those for the Edwards Aquifer Recharge Zone. The rules are predicated on the premise that no water from the Contributing Zone directly recharges the Edwards Aquifer and that the role of the Contributing Zone is solely to convey surface water to the Edwards Aquifer Recharge Zone where it can then enter the subsurface.

In reality, the Edwards Aquifer is significantly recharged by water infiltrating the Contributing Zone. This infiltrated water is then conveyed to the Edwards Aquifer from the Trinity Aquifer by interformational flow. Recent studies support the supposition that hydraulic communication between the upper Glen Rose Aquifer (i.e., the uppermost unit of the Trinity Aquifer) and the Edwards Aquifer is greater than previously believed. Because of this high level of hydraulic communication, the distinction between the Contributing Zone and the Recharge Zone of the Edwards Aquifer is not great, and in many localities, the Edwards Aquifer Contributing Zone effectively acts to recharge the Edwards Aquifer in a fashion indistinguishable from the Edwards Aquifer Recharge Zone."
Although it would be our preference to prohibit the issuance of TPDES permits in the Edwards Aquifer Contributing Zone, we would find the requirement of the following standards to be acceptable and adequately protective of karst groundwater resources:

[4] Interconnection of the Trinity (Glen Rose) and Edwards Aquifers along the Balcones Fault Zone and Related Topics Karst Conservation Initiative, February 17, 2011, Meeting Proceedings - Austin, Texas, July2011 http://www.bseacd.org/uploads/AquiferScience/Proceedings_Edwards_Trinity_final.pdf

- Implementing stringent effluent treatment, consisting of 5 mg/L Biochemical Oxygen Demand, 5 mg/L Total Suspended Solids, 2 mg/L Ammonia Nitrogen, and 0.001 mg/L Total Phosphorus. The .001 mg/L Total Phosphorus limit is the highest natural phosphorus level in Texas Hill Country pristine streams, which have no excess algae growth.
- Utilizing a "One Water" approach for their wastewater treatment system, and incorporating 100% beneficial reuse (Ch. 210 authorization) of effluent, thereby eliminating the need to discharge effluent into surface waterbodies. In the event an entity is unable to reuse all the wastewater generated, we would recommend that the remaining amounts be land-applied, with the entity purchasing the necessary land and obtaining the requisite TLAP permit from TCEQ.
- Ensuring a licensed Class A wastewater operator is overseeing and managing the day-to-day activities of a TDPES permitted facility over the Edwards Aquifer Contributing Zone.

Additional Recommendations for Texas Land Application Permits

Many of the sewage plants in the region use irrigation/land application for wastewater effluent disposal. The Edwards rules should be strengthened to include specific requirements for wastewater treatment, storage, and irrigation in the following ways:

- Increase storage required for subsurface irrigation systems to be equivalent to what is currently required for surface irrigation systems.
- Require effluent monitoring for total nitrogen and phosphorous
- Require automatic shut-off soil moisture monitoring using tensiometers
- Baseline sampling of adjacent creeks and quarterly sampling after rainfall during irrigation.
- Measure buffers from creek beds rather than stream center to ensure adequate creek protection as stream beds wash out from development.
- Adopt stricter standards for lift stations, similar to City of Austin standards.

Revisions to the Edwards Aquifer Protection Program Technical Guidance Manual, RG-348, Including the Method for Calculating the Removal of Total Suspended Solids

There is a growing national consensus that drainage problems produced by urban development, such as downstream scour and habitat damage as well as flooding, can best be addressed by incorporating low impact development (LID) practices in new development and retrofit projects. The basic goal of LID is to make site runoff conditions after development mimic the pre-development conditions. This is accomplished by using a substantial toolbox of measures, many of which involve promoting infiltration and evapotranspiration in some areas to compensate for the effects of impervious cover in development. However, in the Edwards Aquifer area, this can be very difficult to achieve when many BMPs incorporate liner requirements.

The Edwards Rules do not prohibit the infiltration of stormwater, and 30 TAC Chapter 331 implies that it is appropriate in some situations when it states that "improved sinkholes or caves located in karst topographic areas that inject storm water, flood water, or groundwater may be authorized." A primary question then is "What must be the quality of stormwater for 'injection' (or infiltration) to be authorized?" While obvious, it is nevertheless worthwhile to note that "natural" infiltration to the Edwards Aquifer includes runoff through soil that contains animal droppings and a wide range of other organic matter. Expectations for infiltration purity in developed areas need to be based on a realistic and balanced assessment of significant pollution risk.

Permanent BMP Revisions to Promote LID and Water Conservation

1. Replace impermeable liner requirement with leaky liner that provides sufficient filtering for discharge. Suggested language (from retention/irrigation guidance): Liners should consist of a minimum of 12 inches of biologically active soil with vegetation to remediate stormwater pollution. Any geologic/sensitive features that could allow the water to directly enter the aquifer must be sealed before installing the liner. Rocky soils are acceptable for liners provided that sharp edges in this media do not perforate the liners; however, the coarse material (diameter greater than 0.5 inches) should not account for more than 30% of the soil volume.
2. Require that underdrains be configured to provide internal water storage (IWS) for sand filters and bioretention

(without the impermeable liner shown in that version). Reason – underdrains will likely be required because of low soil permeability, but IWS will increase recharge between events.

3. Eliminate filter fabric separating filtration media from gravel underdrain in bioretention systems and replace with a choker layer consisting of 2 inches of #8 or #89 stone. Reason – Allows plant roots access to the soil below the system to improve survivability in dry weather
4. Allow roof runoff to be used for direct aquifer recharge after sand filtration or biofiltration, if not comingled with other runoff from the site. Reason - Roof runoff is substantially cleaner than runoff associated with paved surfaces, and enhanced recharge would offset groundwater demands associated with new development.

Temporary BMPs

Recent research (Eck et al. 2012) and experiences locally (e.g., City of Austin Water Treatment Plant 4) indicate that substantial improvement in discharge quality at construction sites can be achieved with the use of mulch on disturbed areas. Consequently, we recommend a new section specifically on mulch, which would require that all vegetation removed as part of land clearing activities be chipped/shredded on site and used to cover disturbed areas to the extent feasible.

To reduce soil compaction by construction equipment to enhance infiltration of stormwater, we further recommend that pathways traversed by heavy equipment should be mulched ¾ " before initiating site work.

Compliance Monitoring of Plan-Related Best Management Practices Following Installation.

We have seen frequent examples of inadequate erosion and sedimentation construction controls causing significant pollution events. Off-channel ponds, rock gabions in addition to silt fences, and appropriately limited phasing of clearing and grading all need to be required and strictly enforced to protect the aquifer from construction runoff. Construction staging should also be minimized to allow for immediate revegetation and minimization of pollution risks. These requirements should all be strictly monitored and violations assessed with significant penalties to act as a deterrent to non-compliance.

An investigation into the monitoring of permanent water quality BMPs within the Edwards Aquifer Recharge Zone in Bexar County was initiated after GEAA staff received documentation that scattered BMPs accessible to viewing (not within gated communities) were not being maintained. Issues included:

a. sedimentation within the basin, preventing inflow of stormwater into the basin,
b. stormwater not being collected into the basin, by-passing the structural BMP, and
c. standing water within the basin for more than 48 hours after a rain event

While ongoing inspection for BMP maintenance is completed by San Antonio Water Systems (SAWS) within San Antonio and its ETJ, TCEQ has final responsibility for water quality within the aquifer. Interviews with TCEQ noted that there is no shared database between TCEQ and SAWS, and that TCEQ only takes action after SAWS files a complaint when an entity responsible for a non-compliant basin has not addressed the issue.

While investigating the issue, GEAA staff were repeatedly sent to the Central Registry by TCEQ staff to secure information in regard to non-compliant basins. This effort highlighted that the Central Registry did not contain most of the pertinent data needed to evaluate the BMP, especially when trying to obtain a list of the commercial and residential BMPs. Our efforts highlighted the following:

i. The tracking number (first number in the registry): neither local TCEQ staff nor staff in Austin knew what the tracking number referenced, yet it is the first number given.
ii. Searching and being able to open permits for projects over the recharge zone could only be accessed through all of the permits for a project, no matter the size:
    a) Projects are located by the closest known intersection, even for projects of more than 1,000 acres.
    b) All of the permits for a project are included with no method for sorting. Permits for a large project may have 100's of permits that include those associated with the SWPPP. Therefore, to find a permanent water quality BMP permit, every line item must be reviewed.
    c) Once a permanent water quality BMP is located, there are typically no details available when the link is

opened:

- no specific location within the project for the permitted BMP
- minimum dates for approval, construction initiated, and completion, final inspection, or as-built information
- while there is a link for legal documents, it appears the link does not go anywhere

Finally, after numerous phone interviews with TCEQ staff, it was determined that TCEQ does have an internal system with coordinates and a greater amount of detailed information, but it is simply not available to the public. Therefore, a PIR would be required for each BMP in question at a cost to the requester.

It appears the only actions taken by TCEQ occur when SAWS refers non-compliant sites to TCEQ for greater punitive actions. Therefore, it is our understanding that there is no follow-up by TCEQ to ensure that SAWS and/or BMP owners are completing inspections and required maintenance to ensure BMPs are compliant.

To remedy these deficiencies, we recommend that TCEQ:

a. Separate the permanent water quality BMP plan submittals from the temporary SWPPP
b. Create a database that can be shared between TCEQ and SAWS to ensure that a permit is not issued until SAWS has completed and approved the plan review. Allow access to the basic data to the public (see DSD online permit database)
c. Utilize this database for ongoing compliance monitoring.
d. Codify that TCEQ will revisit/inspect basins on a random basis, ensuring that each basin is inspected within a seven-year period.
e. Include record keeping on BMP maintenance companies to track those with continuing issues/violations

Improving and Facilitating Use of Sustainable Development Stormwater Structural Control Measures within the Edwards Aquifer Recharge Zone

Stormwater management engineering best practices and scientific knowledge about regulated activities with the potential to pollute the Edwards Aquifer and hydrologically connected surface streams have advanced in recent years. For example, GEAA is very interested in discussing EAPP guidance regarding media composition and liner requirements for certain types of stormwater structural control measures. We were awarded a grant for a stormwater retrofit and research project from the City of San Antonio's Proposition 1 Edwards Aquifer Protection Projects within the Urbanized Areas of Bexar County's Recharge and Contributing Zone Program. Included in our funding agreement was pre- and post-construction stormwater monitoring data that will, we hope, be useful to this discussion. GEAA's model project implements a treatment train employing a sediment basin, a biofiltration basin, and natural retention in a park-like setting.

Some specific improvements to the Texas Commission on Environmental Quality (TCEQ) Edwards Aquifer Protection Program (EAPP) and 30 Texas Administrative Code Chapter 213 (Edwards Rules) and associated guidance documents that would improve the level of protection provided to the aquifer might be enhanced by studying model projects to determine the effectiveness of constructed wetlands and prairies employed as filtration systems.

Technical Guidance Documentation for Stormwater Structural Control Measures (SCM) Should be R eviewed and Updated to Reflect Current Engineering Science.

Design criteria for some SCM may be outdated. For example, TCEQ EAPP biofiltration media requirements include 20% compost, which City of Austin analysis has demonstrated may result in unintended nutrient export, compromising the effectiveness of the SCM. Compost should be defined as humus material of decomposed vegetation without manure or biosolid content.

Clarification of guidance documents regarding infiltration for certain SCM is also needed for consistency, and could occur in an administrative manner, not requiring a rule revision. Additionally, liner requirements for infiltration SCM for some land uses less likely to generate highly contaminated runoff should be reviewed using the best available data to determine if regulatory requirements may be simplified such that additional recharge to the aquifer may be achieved without degrading the quality of recharge by an unacceptable amount.

- Performance comparison of stormwater biofiltration designs: https://repositories.lib.utexas.edu/items/0e2453ae-66f2-4db8-b5ba-c767083bb2e3
- Evaluation of potential for water quality impacts from unlined stormwater basins in the Barton Springs Recharge Zone: https://services.austintexas.gov/edims/document.cfm?id=240241

The Stormwater Best Management Practice Performance Standard Should be Reviewed Relative to the Stated Purpose of 30 TAC 213.1 to Protect the Edwards Aquifer Using the Latest Engineering and Hydrogeologic Data.

Substantial information on stormwater structural control measure performance has been generated by multiple entities, including the City of Austin (see below for examples). Water quality temporal trend analysis for Edwards Aquifer Spring, well, and hydrologically-connected surface water resources has been generated by multiple entities (see below for examples), and indicates degradation over time for some constituents in Barton Springs. The 80% total suspended solids removal standard of the Edwards Rules remains the benchmark used for assessing compliance for critical infrastructure projects like State Highway 45 Southwest. TCEQ, in a collaborative stakeholder process, should compile and review the latest available stormwater structural control measure performance information in comparison to water quality data from Edwards Aquifer springs, wells, and hydrologically-connected surface streams to ensure that existing regulations are effective in protecting the Edwards Aquifer.

- Stormwater Control Measures in Austin, TX: Data Report: https://services.austintexas.gov/edims/document.cfm?id=202219
- Impacts of Stormwater Control Measures on Water Quality in Austin, TX: https://services.austintexas.gov/edims/document.cfm?id=202218
- Stormwater Control Measure Bypass Pollutant Concentrations Based on Storm Runoff Concentrations: https://services.austintexas.gov/edims/document.cfm?id=214826
- Analysis of Water Quality Trends at Barton Springs and surrounding springs in Austin, TX (1995-2015) and an Alternative Framework for Future Analysis https://services.austintexas.gov/edims/document.cfm?id=263435
- An Examination of Stormwater Quality and Quantity in Austin Area Creeks https://services.austintexas.gov/edims/document.cfm?id=283712

Please review existing EAPP Staffing Levels to Ensure Sufficient Staff are Available to Effectively Achieve the Stated Purpose of the Edwards Rules.

Water Pollution Abatement Plans are not consistently verified with proactive inspections in the field, and inspections occur only in response to complaints. However, greenfield developments may occur in areas not visible or accessible to the public, such that no complaints may be generated.

We would ask that TCEQ provide adequate funding for trained and experienced staff, and that monitoring and enforcement of the Edwards rules, where appropriate, be delegated to local agencies that are better equipped to handle these duties. We are aware that TCEQ staff is under special pressure to process Water Pollution Abatement Plans for approval within 60 days rather than the 90-day period provided for in the Edwards Rules. If anything, the rules should increase the 90-day period to provide for a more comprehensive review of WPAPs.

Regulation of Aggregate Production Operations (APOs) Located Over the Edwards Aquifer

The creation of a draft Best Management Practices (BMP) for aggregate production operations impacting the Edwards Aquifer is long overdue. Soliciting public input is appreciated by those of us who are interested in preventing pollution of the Edwards Aquifer from APO's.

TCEQ should also consider incorporating Edwards-specific rules for quarries and rock crushers in the Recharge and Contributing Zones. Where these facilities are located in Edwards Limestone, the underlying aquifer is particularly

vulnerable to contamination, whether or not the quarry actually excavates below the aquifer water level. Without more stringent TCEQ regulations, quarries and rock crushers threaten to degrade the Aquifer and damage the health and water supply of adjacent communities.

TCEQ should provide additional venues for public participation in considering APOs on the Edwards Aquifer Recharge Zone (EARZ) by providing for public meetings, public hearings, and contested case hearing process for water pollution abatement. This could be achieved by changing the Water Pollution Abatement Plan (WPAP) to a Water Pollution Abatement Permit. Since APOs are only required to go through the permit application process for air quality, the public is deprived of the opportunity to pursue concerns regarding vital groundwater resources.

Additionally, GEAA recommends increasing buffer zone requirements around aggregate operations. Buffering impacted residents will provide greater protection from air and water quality impacts. Of special concern are potential impacts to exempt wells that many rural residents rely on as their primary source of water.

Allowing aggregate mining to an estimated depth of only twenty-five feet over the Edwards Aquifer Recharge Zone is an unsafe practice. Mining depth should be raised to at least fifty feet over the Edwards Aquifer to avoid pollution. Edwards Aquifer pollution can potentially occur at any time during the operation of a quarry, as well as at any given time after the quarry pit site is abandoned. The use of a well for mining depth information in the quarry pit area can be unreliable and inaccurate. Currently, determining where the placement of a well should be in relation to the quarry pit is not defined. Aggregate quarries can be very large. For example, two quarries in Medina County were proposed to be one-mile-wide and three miles in length. If wells are to be used to accurately determine the safe depth of quarrying, they must be in proximity to the active mining area. In large quarries, it may be necessary to have multiple monitoring wells to accurately determine the safe depth of mining permitted. Data obtained from these wells should be monitored closely to determine the water level in order to ensure that pollution of the aquifer does not occur due to excessive removal of limestone, especially after periods of heavy rainfall over the underlying quarry pit.

Sensitive features identified in geologic assessment: Currently, TCEQ permits the practice of allowing residue derived from settling ponds during the aggregate processing and allowing this material to be returned to the quarry pit, where it is dumped. This practice should be prohibited on the EARZ. No analysis of this material is currently required, yet it contains potential pollutants, including surfactants. Allowing this material to be placed back into the recharge zone, where it can leach back into the aquifer, not only exposes the Aquifer to pollution, but also creates an impervious cover for the floor of the quarry pit. If TCEQ allows the continued disposal of this grout-like material to be dumped into the quarrying pit, the aggregate company should be required to provide an alternative to make up for the loss of recharge to the aquifer, as is noted when it is determined that a sensitive feature must be sealed.

A major problem with the present regulations is that there is no requirement for any land reclamation and/or revegetation upon quarry abandonment. There is also no provision for maintenance of any berms or other pollution controls that were installed by the quarry operator. Furthermore, the technical guidance on BMP for quarrying operations should not solely apply to the EARZ, but should be utilized in other karst aquifers, particularly in areas where both the Contributing Zone of the Edwards Aquifer overlaps the recharge zone of other aquifers. Given that recent studies identify communication between the Trinity and the Edwards karst aquifer systems, it does not seem to be prudent that this manual should apply only to the Edwards Aquifer.

Pollution of the Edwards Aquifer or other karst aquifers can still occur if aggregate companies are not closely monitored regularly. Violators should be subjected to substantial, strictly enforced fines and cleanup costs. The TCEQ (January 2012) guidance document *RG-500, Best Management Practices for Quarry Operations – Complying with the Edwards Aquifer Rule,* should be used to determine the appropriate bottom elevation of the quarry to minimize impact to the Edwards Aquifer. In this document, Section 2.1 requires a "High water levels for purposes of setting quarry bottom elevation, and that the water level in a 12-month period with rainfall total at or above the 90th percentile." Section 2.1 defines how to calculate the separation from Groundwater in the Recharge Zone. In addition, there needs to be a 25-foot buffer from the quarry bottom to the top of the groundwater table. RG-500 indicates how to calculate the actual permitted quarry bottom

Additional Comments

As detailed in our 2005 comments and supported by the Scientific Consensus paper, our recommendations include requiring adequate buffer zones to protect streams, springs and recharge features, limits to impervious cover on the Edwards Recharge and Contributing zones, expanding the pollution reduction standards to include toxic metals, organic chemicals and nutrients, and other measures and strategies that we believe will be adequately protective of our water quality.

The Optional Water Quality Measures (appendices A and B of RG-348, EAPP Technical Guidance Manual) are not adequate to protect Endangered Species and allow unnecessary pollution of the Edwards Aquifer. The optional measures, among other deficiencies, fail to limit impervious cover, only monitor for one constituent (Total Suspended Solids), allow for increases in pollutant loads from developed properties, and allow for sealing of sensitive recharge features rather than preservation and setbacks.

There is widespread scientific consensus that limiting impervious cover in both the recharge and contributing zones is necessary to maintain water quality in the Edwards Aquifer.[5] Scientists agree that engineered controls, even when perfectly maintained, cannot replace impervious cover limits. TCEQ should recognize this sound science by implementing impervious cover limits of no more than 10% in the recharge zone and 15% in the contributing zone. Where engineered water quality controls are used, these should be inspected frequently, with significant fines assessed for malfunctioning facilities. In general, the penalties for violations of the Edwards Rules seem low in relation to the severity of the violations and should be increased to act as a preventative deterrent.

Additionally, since non-point source pollution from stormwater runoff and flooding are concerns in the development of the Edwards Aquifer Recharge and Contributing zones, we believe that TCEQ should require stormwater management to be permitted. Currently there is no venue for the public to contest stormwater management plans that could have significant negative impacts on the health and safety surface and groundwater supplies. Requiring stormwater plans for new developments to be permitted would provide the public with notification of applications for stormwater management that they could then review, comment on, and, if necessary, contest.

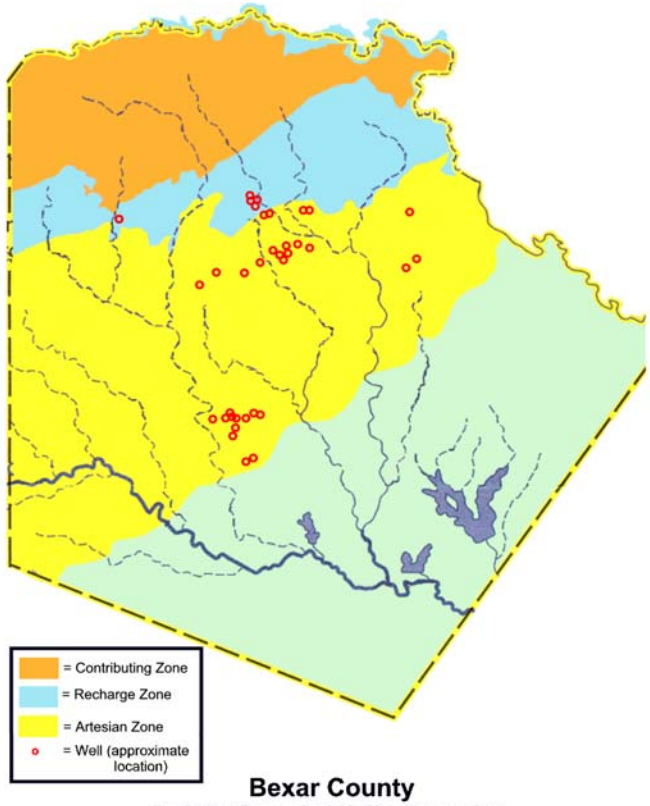
The Greater Edwards Aquifer Alliance and the many groups that join us ask that you act now to adopt these recommendations into the TCEQ Edwards Aquifer Protection Program.

[5] See *Protecting the Edwards Aquifer: A Scientific Consensus*, signed by 39 scientists, planners, and engineers in 1997, https://aquiferalliance.org/Library/LibraryFiles/Resources/Scientific_consensus1.pdf

Evidence of Contamination

Even though the Texas Commission on Environmental Quality has failed to conduct any adequate survey of water quality in the Edwards Aquifer, sample measurements by other entities from wells and springs flowing from the Edwards Aquifer provide clear evidence that water in the aquifer has been contaminated by human activities:

1. Chlorinated solvents[1] have been detected in several Bexar County wells in the Edwards Aquifer, at locations indicated on the map below.



Bexar County
Public Supply Wells Found to Contain Chlorinated Solvents
1982 - 1996

Edwards Aquifer water supply wells have been shut in to protect drinking water supplies. In the San Antonio segment of the aquifer wells, these wells have been closed down because of toxic organic chemical contamination:[2]

- Castle Hill well owned by Bexar Metropolitan Water Supply;
- The Jones-Maltsberger well owned by the San Antonio Water System;
- The Bitters Road and Highway 281 well owned by Bexar Metropolitan Water Supply; and
- A city well in Uvalde.

In addition to these wells, which have been closed because of high concentrations of toxic organic chemicals, the San Antonio Water System operates a well on a reduced pumping schedule because of contamination; a private water supply well

[1] Trichloroethylene, tetrachloroethylene, 1, 2 dichloroethylene, 1,1,2,2 tetrachloroethane, vinyl chloride, dichlorobenzene, dichloroethane, chlorobenzene, trichloroethane, 1,1,1 trichloroethane, 1,1,2 trichloroethane, methylene chloride, dichloromethane. Source: George Rice, hydrologist, personal communication, March 2004.

[2] Geary Schindel, Edwards Aquifer Authority, personal communication, August 8, 2005.

has been fitted with expensive activated carbon filtering devices to remove contamination, wells which exhibit nitrate concentrations above the drinking water standards. The San Antonio Water System closed the Braun Station well in 1984 because of a pathogenic outbreak of cryptosporidia.[3]

2. Diethyl phthalate at 120 ug/l was measured in the October 7 1981 sample from Barton Springs. This chemical is a plasticizer in polyvinyl chloride, an industrial solvent, a wetting agent, and a component of insecticides.[4]
3. Tetrachloroethylene (PCE) was measured in 7 of 10 samples collected from Barton Springs between February 1989 and February 1991. Tetrachloroethylene is a man-made compound. The source has never been identified.[5]
4. Wells in the City of Sunset Valley have experience significant problems with siltation and sediment. In July 1993, 1.5 feet of accumulated sediment were removed from the water storage tank, 8 months following the previous cleaning.[6]
5. Total suspended solids concentrations in wells as high as 18,000 mg/l have been reported in wells in the Barton Springs Edwards Aquifer along the Sunset Valley Fault.[7]
6. Samples from a well near the intersection of Barton Creek and Loop 360 were measured with concentration of lead from 20 to 40 ug/l and zinc from 100 to 260 ug/l[8] Hauwert and Vickers[9] reported the presence of lead in 14 and arsenic in 7 Barton Springs Edwards Aquifer wells. Samples from three wells exhibited arsenic concentrations higher than the drinking water standard of 0.01 mg/l.
7. Petroleum hydrocarbons have been measured in 12 wells and springs in the Barton Springs Zone. Total organic halogens have been measured in two wells.[10] These chemicals are largely of human origin and rarely occur naturally in

---

[3] Ibid.

[4] Andrews, F. L., Schertz, T. L., Slade, R. M., and Rawson, Jack. *Effects of Storm-water Runoff on Water Quality of the Edwards Aquifer near Austin, Texas.* U. S. Geological Survey Water-Resources Investigation Report 84-4124, 1984.

[5] Buszka, P. M. and R. M. Slade. Determination of the Sources of Organic Compounds in Ground-Water Discharges of Barton Springs, Austin, Texas. 10 April 1991.

[6] Nico Hauwert, Geologist. Personal Communication, June 1994.

[7] Hauwert, N. M. and S. Vickers. *Barton Springs/Edwards Aquifer Hydrogeology and Groundwater Quality*, prepared for the Texas Water development Board by the Barton Springs/Edwards Aquifer Conservation District, September, 1994.

[8] Andrews, F. L., Schertz, T. L., Slade, R. M., and Rawson, Jack. *Effects of Storm-water Runoff on Water Quality of the Edwards Aquifer near Austin, Texas.* U. S. Geological Survey Water-Resources Investigation Report 84-4124, 1984.

[9] Hauwert, N. M. and S. Vickers. *Barton Springs/Edwards Aquifer Hydrogeology and Groundwater Quality*, prepared for the Texas Water Development Board by the Barton Springs/Edwards Aquifer Conservation District, September, 1994.

[10] Ibid.

groundwater. Their presence indicates degradation of the aquifer. Furthermore, the occurrence of these chemicals in some wells and springs is associated with elevated concentrations of pesticides, nitrate, lead, or arsenic, indicating contamination from a broad range of sources.

8. The City of Austin has documented statistically significant trends in the degradation of Barton Springs water for the following parameters: conductivity, dissolved oxygen, organic carbon, sulfate and turbidity.[11]

9. Other data has long been available and relied upon, for example, by Fish and Wildlife scientists. In one biological opinion[12] the scientists explained that

> *"Major highway, subdivision, and other construction projects along Barton Creek increased during the early 1980's and 1990's. While high turbidity has been observed in Barton Springs Pool following major storm events since the early 1980's, the duration and frequency of sediment discharges from Barton Springs increased substantially during the 1990's."*

10. Sediments collected from Barton Springs on April 20, 1995 contained polycyclic aromatic hydrocarbons at levels up to 6.5 times those shown to be toxic to Hyallela azteca.[13] Data in Tables 7-12 of the Biological Opinion show exceedances of EPA probable effects levels (i.e. effects to aquatic organisms) for twenty different metals, pesticides and poly-aromatic hydrocarbons occurring at Barton Springs Pool and Barton Creek.

11. Atrazine has been detected in Barton Creek and Barton Springs Pool. A study by the United States Geological Survey (2000) showed atrazine in the pool after a rain. Peak detected levels were 0.56 ug/l in Barton Springs, 0.80 ug/l in Williamson Creek, and 0.44 ug/l in Barton Creek. One year later, in May of 2001, the USGS again sampled soluble pesticides in Barton Springs and Barton Creek following a rain. This time, USGS detected a peak concentration of 3.19 ug/l atrazine at Upper Barton Springs. The Texas State drinking water standard for atrazine is 3 ug/l.

Evidence Demonstrating the Need to Limit Imperviousness

Impervious areas include rooftops, sidewalks, concrete-lined drainage channels, parking lots, residential streets, and roadways—any man-made feature that prevents water from going directly into the soil. The effect of imperviousness on stream degradation has been widely researched and well-documented:

---

[11] City of Austin, *Update of Barton Springs Water Quality Data Analysis – Austin, Texas*, February 2005.

[12] 62 Fed. Reg. 23385.

[13] City of Austin, unpublished data, 1994; Ingersoll et al., in press.

> *". . Scientific evidence . . . relates imperviousness to specific changes in the hydrology, habitat structure, water quality and biodiversity of aquatic systems. This research, conducted in many geographic areas, concentrating on many different variables, and employing widely different methods, has yielded a surprisingly similar conclusion: stream degradations occurs at relatively low levels of imperviousness (~10%). Most importantly, imperviousness is one of the few variables that can be explicitly quantified, managed and controlled at each stage of land development."*[14]

In 1997 thirty-nine scientists, planners, and engineers in the Edwards Aquifer region produced and signed *Protecting the Edwards Aquifer: A Scientific Consensus.*[15] The consensus of virtually every independent scientist familiar with the Edwards Aquifer was that it is not feasible to prevent aquifer contamination without limiting the amount of impervious cover in both the recharge and contributing zones. Furthermore, these scientists specifically agreed that engineered controls, even when perfectly maintained, cannot replace impervious area limits.

This conclusion has been recently reaffirmed in *Regional Water Quality Protection Plan for the Barton Springs Segment of the Edwards Aquifer and Its Contributing Zone*:[16]

> *"Based on the evaluations of the scientific studies presented, the consulting team determined that the approximate quantity of impervious cover which can occur while remaining protective of water quality in the Planning Region is in the range of ten to fifteen percent (10% to 15%), on a gross site area basis."*

The USGS documented the relationship between urbanization and water quality degradation in streams throughout the Austin area. Nine of the 18 study sites were along streams in the Barton Springs segment and its contributing zone. The study demonstrated statistically significant increases in constituent concentrations with increasing impervious cover.[17]

a) Storm Runoff Pollution

With higher impervious cover, more pollutants are generated and carried into storm runoff. Figure 1 shows estimated pollution increases in storm runoff as impervious cover increases due to development. These relationships are based on data from storm runoff monitoring in Central Texas and are consistent with results from many similar studies around the United States. The figures show that with even modest levels of imperviousness, pollutant loads increase by 5 to 12 times that of an undeveloped site.

---

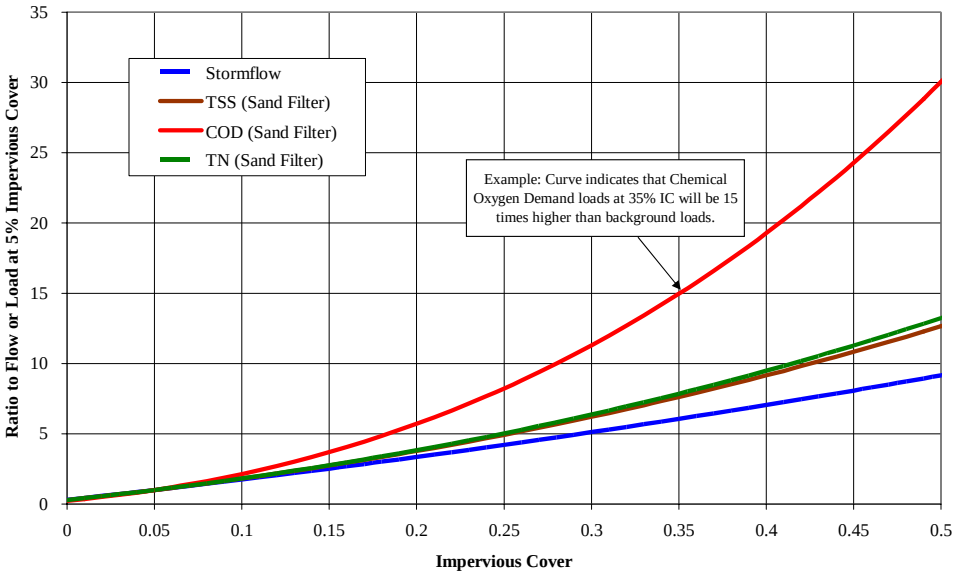
[14] Schuler, Thomas. *The Importance of Imperviousness*, Watershed Protection Techniques, 1(3): 100-111.

[15] A copy of this document and a list of the signers are attached.

[16] June, 2005. http://www.waterqualityplan.org/index.php?BODY=finaldraft.

[17] Veenhuis, J.E., and Slade, R.M., 1990, *Relation Between Urbanization and Water Quality of Streams in the Austin Area, Texas*, USGS Water Resources Investigations Report 90-4107.

Figure 1. Increasing Stormflow and Pollutant Loads with Increasing Impervious Cover

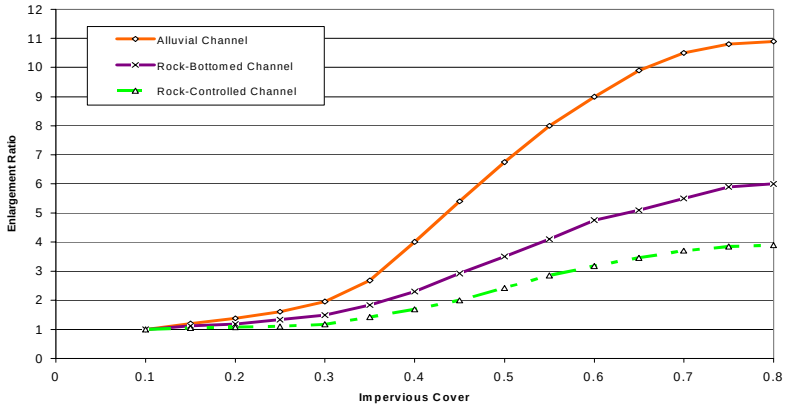


b) Stream Bank Erosion

With larger impervious areas, more water reaches waterways faster and with greater erosive force. The resulting scour widens and deepens channels, abrades aquatic and streamside vegetation, and creates shifting sediment bars. An estimated 80% of the total suspended solids pollution generated from urbanization comes from channel banks downstream from the developed watershed. Engineered water quality controls treating runoff from a developed area do nothing to remove this additional sediment pollution.

Sediments and adsorbed pollutants introduced by this runoff suffocate and contaminate stream ecosystems, and eliminate the natural pool and riffle sequences critical to fish and wildlife. Enlarging channels destroy tree root support and eventually these large trees fall and die. Figure 2 illustrates the effect of impervious cover on the size of stream channels.

Figure 2. Stream Enlargement Ratio versus Impervious Cover



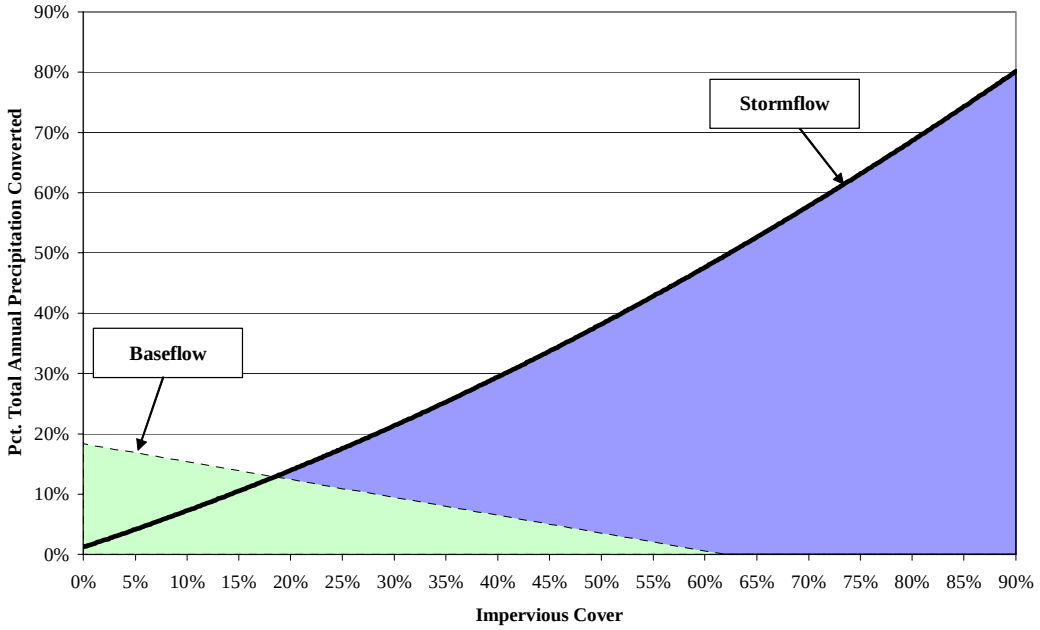
Source: Raymond Chan & Associates, Technical Procedures for the Watershed Erosion Assessments, September, 1997.

c) Decreased Base Flow in Streams Decreases Aquifer Recharge

Baseflow is defined as water in creeks and rivers between storm runoff events. It provides most of the Edwards Aquifer recharge in the Barton Springs Zone and likely in the San Antonio Edwards as well. Baseflow loss translates directly, therefore, into a reduction in available aquifer water. The loss of baseflow also radically alters the natural character of the stream and eliminates the viability of wetlands and aquatic habitat.

Figure 3 shows how baseflow drops and storm runoff increases as imperviousness increases. Impervious surfaces covering about 30% of a site reduce baseflow volumes by one half. At 60% imperviousness, virtually 100% of the baseflow is eliminated. Even if we were to eliminate 100% of the pollutant loads in storm runoff, development still diminishes baseflow volumes, which in turn diminishes the amount of aquifer water available.

Figure 3. Percent of Precipitation Converted to Stormflow and Baseflow versus Impervious Cover



Developers and their engineers have consistently argued that impervious cover limits are unnecessary because engineer water quality controls can protect the Aquifer. This perspective is reflected in the existing TCEQ Edwards Aquifer protection regulations which require some water quality treatment but do nothing to limit imperviousness.

This perspective, however, fails to recognize the clear scientific information and experience that engineered systems cannot replace the water quality benefits of undeveloped land, open space, park areas, and low impervious cover development for two significant reasons.

One reason is that the treatment systems required by TCEQ do not address all of the water quality problems that are generated by development. These systems do not, for

example, eliminate the sediment load created by increased stream bank erosion downstream from the control. These systems also do not replace clear and clean base flow in the streams between the storm runoff events, which provides most of the aquifer recharge.

The second reason that these treatment systems do not eliminate the need for impervious cover restrictions is that they degrade and fail. Where the natural landscape that remains on a low-imperviousness development remains day after day and year after year to provide high-quality and sustaining aquifer recharge, engineered systems fail routinely. Many of the engineering designs are based on faulty assumptions. They are often not constructed to the engineered specifications. Once constructed, they are rarely maintained. A survey of constructed engineered systems built to comply with the existing TCEQ Edwards rules would demonstrate inadequacies in the vast majority.

The Need for Preserving Natural Soil and Vegetation Surrounding Known Cave Openings, Solution Features, Springs, Wetlands, and Streams.

Buffers serve three important functions to protect Edwards Aquifer recharge:

1. Buffers separate development and associated pollution from entry-ways into the aquifer. This physical separation improves the likelihood that entry-ways into the aquifer will remain open and continue to provide aquifer recharge. This physical separation also provides a safety zone in which to capture and contain hazardous spills and accidental releases of toxic chemicals.
2. Buffers filter runoff, removing sediment, nutrients, pesticides, heavy metals, or toxic organic chemicals before water enters the aquifer where these filtering processes do not occur.
3. Buffers provide an area where runoff can soak into the soil and migrate to karst openings within the aquifer.

Evidence Regarding Inadequacy of TCEQ Storm Runoff Pollution Reduction Standards

Allen White, a U. S. Fish and Wildlife contaminants expert, offered these comments on the TCEQ storm runoff pollution reduction standard requiring removal of only 80% of the increase in total suspended solids (TSS):

> *"Emphasis on TSS removal is based on the assumption that TSS is an adequate surrogate for all other contaminants of concern that may be in run-off from all land uses covered by this document/initiative. TSS may not be an adequate surrogate for certain toxic pollutants of concern (soluble pesticides, nutrients or heavy metals)."*[18]

[18] Email from Robert Pine to Michael Barrett (January 31, 2005), provided by U. S. Fish and Wildlife Service to SOS Alliance pursuant to Freedom of Information Act request.

Even with the TCEQ-required reduction in total suspended solids, other chemicals remain in urban storm runoff at higher than natural levels. These elevated chemical concentrations are damaging to human health and to the diversity of species in the natural world.

Evidence Regarding Inadequate Enforcement of Existing TCEQ Edwards Protections

A fundamental flaw of the Edwards Rules is that they depend on self-reporting, rather than relying on independent review by TCEQ. On the rare occasion when independent scrutiny is brought to bear on the regulatory process, noncompliance is revealed.

For example, in November of 2003, Cunningham-Allen, Inc. submitted a Water Pollution Abatement Plan (WPAP) to TCEQ for the construction of a Lowe's Home Improvement Warehouse in the recharge zone, along the border between the City of Austin and City of Sunset Valley. The document contained the seal and signature of professional engineer Elias G. Haddad. Within the WPAP was a Geologic Assessment signed by David Hill, P.E. and John E. Cook from Professional Service Industries, Inc. The report said the following:

> *"The purpose of this report is to . . . identify the location and extent of significant recharge features present in the development area.*
>
> *The purpose of the site investigation was to delineate features with recharge potential that may warrant special protection or consideration.*
>
> *[F]ield observations indicate that no obvious recharge features are onsite.*
>
> *The . . . lack of recharge features onsite . . . .*
>
> *No recharge features were found on the subject site.*
>
> *No recharge features were found onsite.*
>
> *No recharge features were found on the subject site."*

Based on this submission, Executive Director Margaret Hoffman issued a letter approving the WPAP on February 18, 2004 containing the following language:

> *"According to the geologic assessment included with the application, no geologic features exist on the site. . . [B]ased on the engineer's concurrence of compliance, the planning materials for construction of the proposed project and pollution abatement measures are hereby approved . . . ."*

However, in subsequent litigation, when an independent engineer was able to obtain entry to the site during construction, she observed and photographed an obvious recharge feature through which virtually 100% of storm runoff was draining from most of the site. Water on the site contained an oil-product spilled from an onsite fuel storage tank as well as high levels of sediment and nitrogen—all being delivered directly into the Aquifer.

Before the court, Lowe's disputed the existence of this now photographed and documented recharge feature. But the court issued a temporary injunction, ordering Lowe's to divert storm water runoff "from flowing into aquifer recharge features[,] remove fuel tanks [and] remove . . . water contaminated by hydrocarbons . . . ."

Similarly, when SOS Alliance filed suit to challenge a development along Little Barton Creek in the Village of Bee Cave, SOS Alliance site visits pursuant to the litigation revealed numerous violations of the TCEQ WPAP requirements. As a result the developer was penalized by TCEQ, something that was unlikely to have occurred if the violations had not been independently investigated by SOS Alliance.

Evidence Regarding Inadequate Funding of TCEQ Edwards Protection Program

TCEQ regulations apply to the Edwards Aquifer recharge and contributing zones in all or portions of Medina, Bexar, Comal, Kinney, Uvalde, Hays, Travis and Williamson Counties. The total area to which they apply is more than 3,500 square miles. More than 200 Water Pollution Abatement Plan applications in each of the last several years have been submitted to the San Antonio district office for review.

Implementation of the Edwards protection program is the responsibility of TCEQ district offices in Austin and San Antonio. Total TCEQ expenditures to protect the entire Edwards Aquifer region were $585,058 in 2004. By comparison, the expenditures of the City of Austin watershed protection department, covering a much smaller portion of Texas, amount to more than $5 million per year.