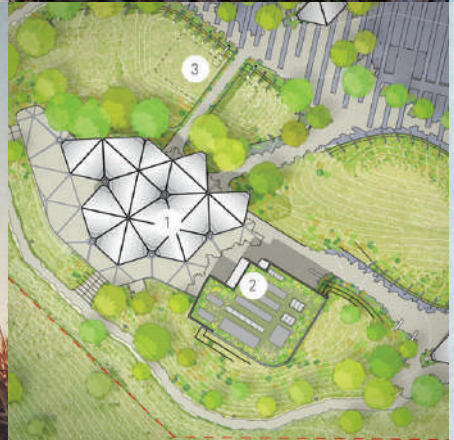


ONE WATER

IN
THE **Texas Hill Country**



CONNECTING COMMUNITIES WITH PROJECTS AND PROFESSIONALS



Dear Hill Country Leader:

Water is the lifeblood of our region. Thirteen Texas rivers have their headwaters in the Hill Country, and for centuries the residents and stewards of these lands have recognized the critical importance of protecting water quantity and quality for future generations.

We all see the Hill Country growing at an incredible pace. Business-as-usual development practices place increasing pressure on our water supplies. The dramatic swings in weather and water availability only compound that pressure. As water resources are squeezed, our ability to access affordable water for domestic, irrigation, business and recreational purposes could be severely impacted—ultimately harming our economy, property values and natural ecosystems.

We can no longer afford to turn a blind eye toward threats to the long-term resilience of our water. There is a growing practice of integrated water management known as One Water that offers a way for us to grow as a region while protecting and respecting water resources at the same time. One Water strategies include 1) the use and reuse of water to expand water supplies; 2) the collection, treatment and management of water close to its source; and 3) the pursuit of all opportunities to minimize our overall water footprint.

This guidebook is intended to connect Hill Country communities facing growth and increased demands for water with water professionals experienced with One Water strategies, planning, implementation, design and construction. We interviewed engineers, architects, planners and landscape designers to gain insight into the realities of One Water projects, and within these pages feature 14 selected professionals along with an example project each completed in Texas.

Finding and connecting with consultants who can be trusted with a community’s most precious resource—its water—is a serious undertaking, and we hope this guidebook gives you a good place to start. Our organizations are committed to help you along the way as well.

Thank you to our partners who made this book possible—The Cynthia and George Mitchell Foundation, The Pisces Foundation, The JPB Foundation through The Funders Network, Texas Living Waters Project, Faust Law and WaterPR—without whom this project would not have been possible.

Sincerely,

Katherine Romans

Katherine Romans
Hill Country Alliance

Jennifer Walker

Jennifer Walker
National Wildlife Federation



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One Water Explained

WHAT IS ONE WATER?

One Water is a term that refers to an integrated approach to planning and implementation in order to manage finite water resources for long-term resilience and reliability. One Water considers all water resources as a potential water supply—rainwater, drinking water, stormwater and wastewater—and seeks to minimize our overall demand for water resources. By using a One Water planning approach, water resources can be used together, efficiently and effectively, for the benefit of the community and the environment.

In the Texas Hill Country, One Water planning can be applied at many different scales—from the individual building site (a home, business, public building or agricultural enterprise) all the way up to a city or regional plan. As an example, New Braunfels Utility is in the process of approving its first “One Water Roadmap” which covers its entire service area. At the municipal level, a One Water approach would use forward-thinking engineering, thoughtful water-management decisions, and community engagement to maximize resilience and benefits for the whole community.

Think about all the water that moves through your community. There may be creeks, water flowing through supply pipelines, wastewater piped away to a treatment system, stormwater infrastructure and drainage ditches, and water supplies we don’t often consider, like air conditioning condensate, which can be considerable in a large structure. Within the One Water framework, all of these waters should be considered holistically to maximize environmental, economic and community benefits.

“While One Water is a relatively new term, it refers to an efficient and conservative approach to water management older than Texas. It’s about making every drop count, being smart about how we design and build in a water-limited region, and ensuring that water is here for people and the environment—today and for generations to come.”

Katherine Romans | Hill Country Alliance

One Hill Country Water. Many New Demands.

Water is a finite and fragile resource. For thousands of years, Native Americans, European settlers, and modern-day Texans have been drawn to the Hill Country and its shaded swimming holes, meandering creeks, and clear spring-fed rivers. More than any other time in history, the carrying capacity of our region—its ability to support people, livestock, wildlife and crops without long-term environmental degradation—is being pushed to its limit.

With increases in human consumption and demand, our available fresh water will not be enough to sustain the incredible growth we are seeing in our region if we don’t change the way we think about it and use it. Thankfully, we can do more with less. If we plan well and put good practices in place, there will be sufficient freshwater for human, ecological and all life purposes. One Water is the right kind of thinking for the future of our region—for the future of Texas and the planet.



ONE WATER VERSUS TRADITIONAL WATER MANAGEMENT

Traditional development, guided by our regulatory framework, separates water into siloed systems—drinking water, wastewater and stormwater. Municipal government is often structured in the same silos. This reflects an outdated infrastructure model where miles and miles of expensive pipelines run through our rocky Hill Country ground to deliver fresh water for drinking and other uses, and then doing the same in reverse to remove the “waste” water. This method is expensive from all perspectives: development, infrastructure timing, raw water demands, and environmental costs.

In the Hill Country, traditional water management approaches are also giving rise to an increase in applications to discharge treated wastewater into creeks, causing potentially dangerous water quality issues for downstream neighbors’ drinking and swimming water.

Likewise, managing stormwater by channelizing creeks into concrete culverts rather than naturally meandering greenways causes long-term environmental degradation, increases flash flood peaks, and removes the potential community amenity of a healthy and beautiful waterway. More frequent and extreme weather events in our region are exacerbating these problems.

In order to manage water resources and water needs collectively, municipal departments can create new ways of working together to manage water as interconnected and interdependent operations. Stakeholders—including developers, residents, community leaders, urban planners, water managers and engineers—can plan together with the goal of utilizing water as thoughtfully and efficiently as possible to benefit their community.



At the heart of One Water is the critical importance of stakeholder input.

Key differences between traditional and integrated urban water management

Source: Based on Pinkham (1999), adapted by ICLEI (2011).

Aspect of Urban Water Management	Traditional Approach	One Water Approach
Overall approach	Integration is by accident. Water supply, wastewater and stormwater may be managed by the same agency as a matter of historical coincidence, but physically the three systems are separated.	Physical and institutional integration is by design. Linkages are made between water supply, wastewater and stormwater, as well as other areas of urban development, through highly coordinated management.
Collaboration with stakeholders	Collaboration = public relations. Other agencies and the public are approached when approval of a preselected solution is required.	Collaboration = engagement. Other agencies and the public collaborate to identify effective solutions.
Choice of infrastructure	Infrastructure is made of concrete, metal or plastic.	Infrastructure can also be green, including soils, vegetation and other natural systems.
Management of stormwater	Stormwater is a nuisance that is conveyed away from urban areas as rapidly as possible.	Stormwater is a resource that can be harvested as a water supply source and retained to support aquifers, waterways and biodiversity.
Management of human waste	Human waste is collected, treated and disposed of into the environment.	Human waste is a resource and can be used productively for energy generation and nutrient recycling.
Management of water demand	Increased water demand is met through investment in new supply sources and infrastructure.	Options to reduce demand, including harvesting rainwater and reclaiming wastewater, are given priority over other sources.
Choice of technological solutions	Complexity is neglected, and standard engineering solutions are employed to deal with individual components of the water cycle.	Diverse solutions, both technological and ecological, and new management strategies are explored that encourage coordinated decisions between water management, urban design and landscape architecture.

MULTIPLE BENEFITS OF ONE WATER

One Water can help us achieve the highly prized triple bottom line—benefits for our communities, economy and environment. Whereas traditional approaches to water management might only consider the immediate capital and maintenance costs associated with a project, a One Water approach considers harder-to-quantify benefits, such as the creation of a new park feature, reduction in future water demand and customers’ costs, or quality of life improvements.

COMMUNITY	ECONOMY	ENVIRONMENT
At the heart of One Water is the value of stakeholder input and honoring community values. This public-centric approach often delivers surprising and positive results, as well as public engagement and enjoyment of a project that might otherwise be non-visible. For example, the restoration of a creek that runs through a community can yield stormwater management benefits and create a new public park or green space, thus delivering multiple benefits to the community.	One Water approaches often represent a cost savings over traditional water infrastructure. Green stormwater infrastructure may cost less to construct, operate and maintain than a traditionally engineered approach. On-site wastewater reuse avoids construction and energy costs of extending traditional wastewater infrastructure and reduces demand for potable water. And on-site stormwater management can be used to create public amenities, like parks, trails and green spaces.	Healthy waterways and clean aquifers are core values in Hill Country communities, as well as a conservation ethic when it comes to the use of limited natural resources. One Water strategies offer multiple uses for the same water supply through treatment and reuse, or purposeful management. Reusing water within its watershed has many benefits, but care should be taken to not cut off flows needed downstream by other communities, including aquatic and wildlife habitats. Protecting water quality maximizes return on investment by avoiding costs for future treatment plants, remediation of polluted waterways, and recovery of impaired species.

FIVE KEYS TO IMPLEMENTING ONE WATER IN THE HILL COUNTRY

In creating this resource, we interviewed local decision makers, engineers, water professionals and consultants to understand the hurdles to using a One Water approach in the Hill Country. Small municipalities can face unique challenges in implementing innovative One Water strategies. Often infrastructure investment is done in an emergency setting, where the cheapest and fastest solution is the only one considered.

Similarly, some engineers and developers may have a “we’ve always done it this way” mentality, which makes it difficult to consider more innovative approaches. Water resource professionals identified five key considerations for the successful implementation of a One Water approach—planning, communication, education, evaluation and inter-departmental coordination. These are expanded below using insights from interviewees whose experience adds value and veracity.

1. Planning

Invest in planning that defines the community’s goals, such as access to open space, water conservation and environmental health. Engage with the end-users and beneficiaries of water infrastructure investments to inform both long-term planning, as well as individual projects. One Water principles can be most easily incorporated when prioritized in the initial stages of a project, especially site location.

2. Communication

When seeking a professional consultant, be clear about your goals for a project and the risks your community has identified. Tell the consultant you want to know a range of options that will achieve your community goals, as well as the permitting requirements.

3. Community Education

Fear of the unknown and concerns about new methods and consultants can impact public support for innovative projects. Prioritize educating stakeholders about the benefits of a project to determine if the strategies are a good fit for the needs of your community. Engage with community members early and often.

4. Evaluation

One Water projects may bring longer term savings in operations, maintenance, environmental benefits and avoidance of future costs for environmental impairment. Be sure to communicate that you want to be presented with all the benefits of a One Water design and not just an upfront capital cost comparison. Find ways to quantify the secondary and tertiary benefits of a project, including public recreation use and environmental benefits.

5. Interdepartmental Coordination

Identify silos and barriers early in planning a project and determine how they will be navigated. City charters may govern where department funds can be spent, or operational protocols may not be clear as to which department will maintain a particular asset that serves multiple purposes.



One Water Projects and Professionals

ONE WATER FOCUS AREAS, STRATEGIES AND PROJECTS

In this section we have highlighted six focus areas to demonstrate how a number of water-centric projects use an assortment of strategies to meet specific goals—all part of the interdependent approach we refer to as One Water.

We have organized the focus areas, strategies and projects in the table on the next page to highlight a mix of recent One Water projects in the Texas Hill Country. In the pages that follow, you will find a more detailed overview to the projects—the challenges and successes—an introduction to the water resource professionals who championed One Water approaches in a diversity of public and private developments.

The list of professionals in these pages is by no means complete or exhaustive, but it provides a solid starting place to explore One Water in action in the Hill Country by acknowledging these engineers, architects, planners and landscape designers with real experience in out of box thinking.

We want to stress the importance in seeking and hiring professionals with innovative ideas, proven experience, and the ability to spend time identifying and implementing your community’s values into every aspect of your project. Engineers, landscape architects, community groups, concerned citizens, elected leaders and staff—all have roles to play in tackling our region’s water resource challenges.

It is important to note that the authors did not independently verify all the statements made about the projects or firms. As you interview consultants, always feel empowered to ask for further examples of work, references of prior clients that could be contacted, and even opportunities to visit and observe some of their projects in person.

Part Three of this booklet provides further information on the firms and professional contacts, as well as areas of experience that should be part of your inquiry when interviewing a consultant.



Hill Country Focus on One Water Strategies

Source: Adapted from the US Water Alliance *One Water Roadmap: The Essential Management of Life’s Essential Resource* (2016).

Focus Areas	Strategies	Example Projects
 Reliable and Resilient Water Utilities	<ul style="list-style-type: none">• Diversifying and stretching water supplies• Utilizing green infrastructure to manage flooding and revitalize neighborhoods• Transforming wastewater into a resource• Forging new business models	<ul style="list-style-type: none">• Aquifer Storage & Recovery, New Braunfels• Brooks Campus Redevelopment, San Antonio• Integrated Stormwater Management Ordinance, Boerne
 Thriving Cities	<ul style="list-style-type: none">• Integrated planning across the water cycle• Utilizing on-site water systems• Deploying advanced technologies to improve decision making• Adopting a “dig once” approach• Managing water to foster climate resilience	<ul style="list-style-type: none">• Integrated Water Resources Plan, Austin• Blue Hole Primary School, Wimberley• Twin Oaks Library Rainwater Harvesting System, Austin
 Competitive Business and Industry	<ul style="list-style-type: none">• Fully integrating water stewardship into company strategy• Deploying water efficiency, stormwater management and water reuse at industrial facilities• Developing upstream and downstream partnerships in priority watersheds	<ul style="list-style-type: none">• Red’s Car Detail Shop, Dripping Springs• Altstadt Brewery, Fredericksburg• Camp Eagle, Rocksprings
 Sustainable Agricultural Systems	<ul style="list-style-type: none">• Creating partnerships among upstream and downstream communities• Using on-farm strategies to reduce water consumption and manage nutrients• Using watershed-scale planning and monitoring	<ul style="list-style-type: none">• Shield Ranch Master Plan, Bee Cave
 Social and Economic Inclusion	<ul style="list-style-type: none">• Fostering community resilience in the face of a changing climate• Building a water safety net• Leveraging water investments to generate community benefits• Enhancing community capacity to engage in water planning and governance	<ul style="list-style-type: none">• Cypress Creek Watershed Protection Plan, Wimberley
 Healthy Waterways	<ul style="list-style-type: none">• Maximizing natural infrastructure to ensure healthy ecosystems• Managing groundwater for the future• Protecting watersheds to protect water• Utilizing citizen science for planning, ecosystem monitoring and watershed restoration	<ul style="list-style-type: none">• Blue Hole Park, Wimberley• Confluence Park, San Antonio• Eliza Springs Daylighting, Austin

Focus Area: Reliable and Resilient Water Utilities

STRATEGY	Diversifying and stretching water supplies
PROJECT	Aquifer Storage and Recovery, New Braunfels
PROFESSIONAL	Stephanie Moore, INTERA

New Braunfels Water Utility is building a full-scale Aquifer Storage and Recovery (ASR) well field to enhance the resilience of their water supply. ASR projects store excess water in an aquifer to be retrieved for use during times of shortage, especially during summer peaks when demand is highest.

INTERA led the evaluation of the hydrogeology and identification of potential sites for recharge injection into the saline portion of the Edwards Aquifer and the Middle and Lower Trinity aquifers. Once land was secured, INTERA provided the analysis and oversight for all the monitor well drilling activities, including a pilot well. Full project buildout will provide long-term supply during drought of record, allow for better utilization of existing water rights, minimize construction of new facilities, and minimize environmental impacts.

New Braunfels Utilities will store water underground during times of excess rainfall, then retrieve the water in times of drought.



Reliable and Resilient Water Utilities (continued)

STRATEGY	Utilizing green infrastructure to manage flooding and revitalize neighborhoods
PROJECT	Brooks Campus Redevelopment, San Antonio
PROFESSIONAL	Kim Patak, Freese and Nichols

Formerly a 1,200-acre military base in south San Antonio, Brooks Campus is being redeveloped into a vibrant residential and commercial mixed-use community. Redevelopment provides a number of opportunities to improve water quality. Kim Patak with Freese and Nichols developed a low impact development (LID) guidance document for the property.

The property is bounded to the west by the San Antonio River and to the east by Salado Creek, both of which are classified by the Texas Commission on Environmental Quality as having impaired water quality. The proximity to these impaired water bodies is a call to action to implement forward-thinking development practices that will improve the quality and quantity of stormwater runoff from the development, thus having no negative influence on water quality in the creek and river—and perhaps having a positive one.

As land parcels undergo the transition from their former use to new uses, stormwater runoff previously drained by concrete storm drains, culverts and open channels leading to regional detention structures are being re-engineered. Brooks Campus is using green infrastructure practices that will slow and treat stormwater on-site and mitigate erosion on receiving streams. Further, the green infrastructure will become an aesthetic and recreational amenity for the redevelopment.

Developers often cite the challenges involved in trying to understand, select, design and realistically estimate the value of using LID as the biggest impediment to implementation. The project team of Brooks Development Authority, San Antonio River Authority, and Freese and Nichols developed the LID Guidance document to remove that impediment by identifying the best locations and low impact development practices for the entire Brooks Campus Redevelopment.

Low impact development design using green infrastructure at Brooks redevelopment would reduce erosion and pollution in receiving streams, while creating natural spaces within the development.



STRATEGY	Utilizing green infrastructure
PROJECT	Integrated Stormwater Management Ordinance, Boerne
PROFESSIONAL	Troy Dorman, Halff and Associates

The City of Boerne recently developed an integrated stormwater management code to meet community goals and concerns. The population of this historic and iconic Hill Country town has doubled in size in the last ten years, resulting in growing community concern about the impacts of new development. Citizen groups encouraged city leaders to implement a proactive plan to guide growth in a way that is both fiscally and environmentally sustainable.

City leadership and staff, working with Troy Dorman of Halff, updated the city’s stormwater regulations to achieve better flood protection and water quality outcomes, while preserving Cibolo Creek and its riparian areas and tributaries for future generations. The process was an outgrowth of the City’s 2018 Comprehensive Master Plan, also developed by Halff, that identified local waterways as a core feature of the city’s fabric. Working through a stakeholder process, the city achieved consensus on a Low Impact Development (LID) ordinance that met the desired goals.

The new city regulations incorporated a citywide water quality standard, comprehensive water quality and detention, a higher standard for flood protection, setting aside stream buffers and enhanced local floodplains to protect future development areas. The new code also incentivizes trails and active recreation within the protected stream buffers to provide community benefits.

By protecting its abundant natural amenities, Boerne seeks to preserve a charming small-town ambiance, enhance parks and trail systems, and encourage growth that is compatible with a history of 100-plus years of life along Cibolo Creek. Halff continues to provide planning and engineering services to implement the integrated stormwater management ordinance, including master drainage planning, capital improvement planning, water quality design, and development review assistance.

The City of Boerne’s new integrated stormwater management ordinance prioritizes water quality and green infrastructure.



Focus Area: Thriving Cities

STRATEGY	Integrated planning across the water cycle
PROJECT	Integrated Water Resources Plan, Austin
PROFESSIONAL	Dan Rodrigo, CDM Smith

Water Forward is a 100-year water plan developed by Austin Water in response to severe drought (2008–2016), concerns about changing climate, and the need to provide sustainable solutions for long-term population growth in the Austin region.

Dan Rodrigo of CDM Smith facilitated creation of the plan using multi-disciplinary teams that forecasted water and wastewater needs, assessed environmental goals and regulatory commitments, conceptualized alternatives, and used advanced decision support tools to help Austin and its stakeholders understand risk and see trade-offs.

Consistent with One Water practices, Water Forward incorporates the following principles: 1) viewing water, wastewater and stormwater as important resources to be managed holistically; 2) accounting for future uncertainties to increase reliability and resiliency; 3) protecting and enhancing the natural environment; 4) reflecting community values and social needs; and 5) using an adaptive approach for implementation of actions and projects.

The plan included recommended actions and projects to implement the principles adopted by stakeholders to achieve the plan goals. By using technology, ordinances, incentives, infrastructure improvements and continued stakeholder engagement, Austin’s Water Forward plan has received national attention as a model of water planning.

Investing in long-term water planning that prioritizes stakeholder collaboration is key to a water-secure future.



STRATEGY	Utilizing on-site water systems
PROJECT	Blue Hole Primary School, Wimberley
PROFESSIONALS	Tom Curran, Doucet & Associates Ted Davison, O’Connell Robertson David Venhuizen, Venhuizen Engineering

Wimberley’s Blue Hole Primary School is the first One Water School in Texas. Ted Davison of O’Connell Robertson led the architectural design of the school, a 90,600 square foot structure, to reflect the One Water concept and the importance of water to the natural beauty of the surrounding Texas Hill Country. The nature-themed campus is a model for future schools in the area as the region adapts to water challenges and develops innovative ways to benefit the community and environment.

David Venhuizen contributed to the overall technical approach and vision for a rainwater harvesting system to supply toilet flush water and to the design and permitting to reuse the “waste” water for on-site irrigation. Tom Curran of Doucet & Associates designed the green stormwater infrastructure and tied the rainwater systems to the stormwater management plan.

Robust community collaboration and multiple strategies resulted in reducing the school’s impact on local water resources by 90 percent. Wimberley ISD, Wimberley Valley Watershed Association, other stakeholders worked with the professional consultants to prioritize water as a resource in designing the school. The school’s One Water design acknowledges the importance of protecting Wimberley’s sensitive water resources, such as Jacob’s Well, Blue Hole and the Trinity Aquifer.



Multiple on-site water management strategies at the Blue Hole Primary School provide a real-life science lesson for the students while significantly reducing infrastructure and utility costs.

One Water strategies on-site include:

- Rainwater and AC condensate collection to flush toilets and provide irrigation for landscape and school gardens.
- Green stormwater infrastructure, including rain gardens containing native plants, permeable pavers, and other stormwater mitigation strategies to slow down runoff, recharge groundwater, and reduce nonpoint source pollution.
- On-site treatment and reuse system that will allow grey water and black water produced by the school to be beneficially reused through a subsurface drip irrigation system.
- Educational features include clear pipes and signage installed into the architecture of the school to create an immersive educational experience.

STRATEGY	Employing advanced technology to improve decision making
PROJECT	Twin Oaks Library Rainwater Harvesting System, Austin
PROFESSIONAL	Marty Christman, Geosyntec

At the Twin Oaks Library in Austin, Marty Christman of Geosyntec, in collaboration with city engineers, designed and installed an internet-enabled, real-time, green infrastructure system. The goal of the project was to improve water conservation for the on-site landscape irrigation system, improve the stormwater capture efficiency through the rainwater harvesting system, and reduce stormwater runoff from the library site.

Geosyntec designed the system so that harvested rainwater feeds an on-site, automatic irrigation system during dry weather. Conversely, in advance of forecasted rain events, the system automatically drains the cisterns to make space to capture the forecasted runoff volume. Controlling the cisterns based on the weather forecasts enables the system to capture more rainwater while limiting the volume of runoff and pollutants discharging from the site.



An automated rainwater harvesting system empties in advance of rain forecasts to manage heavy runoff volumes and irrigates the public green space during dry periods.

Focus Area: Competitive Business and Industry

STRATEGY	Fully integrating water stewardship into company strategy
PROJECT	Red’s Car Detail Shop, Dripping Springs
PROFESSIONAL	Joel Bock, Sunland Group

Early in the planning stages, the owner/developer of a car detail shop near Dripping Springs hired Sunland Group to lead the way using One Water principles to conserve and reuse water on-site, as well as expand the water supply.

Typically, an auto detail shop is a very water intense business, but Joel Bock found a number of ways to integrate water conservation and reuse in the design of this 5,000 square foot, five-bay, car detail shop.



This artist’s rendering shows how rainwater harvesting and green infrastructure were incorporated into the site design.

Sunland’s team designed a rainwater harvesting system with split plumbing to supply the car detailing machines, steam-cleaning systems, and toilet flush water for bathrooms with water-efficient fixtures.

The rainwater tank was sized to also accommodate landscape irrigation. During the calculations for the water balance of the system, Sunland found the tank to have more than two months of capacity based on normal business operations. The tank can be refilled with a two-inch rain event, which happens nearly every month of the year in this part of Hays County.

The site features green infrastructure in the form of a water quality pond that treats runoff from the site’s impervious cover and irrigates the perimeter landscape area. The land planning phase of the project was an important time for decisions by the owner and engineer to consider options and utilize the One Water principles to the maximum effect.

Competitive Business and Industry (continued)

STRATEGY	Deploying water efficiency, stormwater management and water reuse
PROJECTS	<ul style="list-style-type: none">Altstadt Brewery, FredericksburgCamp Eagle, Rocksprings
PROFESSIONAL	David Price, Texas Onsite

David Price of Texas Onsite designed a wastewater plant for the Altstadt Brewery in Fredericksburg that treats all the domestic and commercial wastewater from several restaurants on the site.

The wastewater is highly treated on-site, then distributed locally via drip irrigation on the grounds and in adjacent grass pastures for harvesting and grazing. This reuse keeps treated water out of area surface waters and reduces the volume of groundwater pumping needed for irrigation purposes.

On-site treatment and reuse is also employed in a system that separates out the brew process grain waste for land application, thus further reducing the carbon footprint from the business operation.

Camp Eagle in Rocksprings is located in one of the State’s most pristine river headwater regions. As an outdoor adventure camp for youth, families and groups, it was important to be water efficient and to carefully treat and reuse wastewater. Texas Onsite was hired to retrofit a wastewater discharge system designed by another firm into a zero-discharge system at a capacity of 38,000 gallons per day. A new program for treatment, reuse for irrigation and land application was developed and permitted to keep wastewater out of the creeks and rivers and protect downstream users, as well as sensitive ecosystems from being degraded.



TOP: At Camp Eagle an on-site wastewater irrigation system was substituted for a discharge system keeping pollution out of local waterways.

LEFT: Altstadt Brewery uses a zero discharge wastewater system.

Focus Area: Sustainable Agriculture Systems

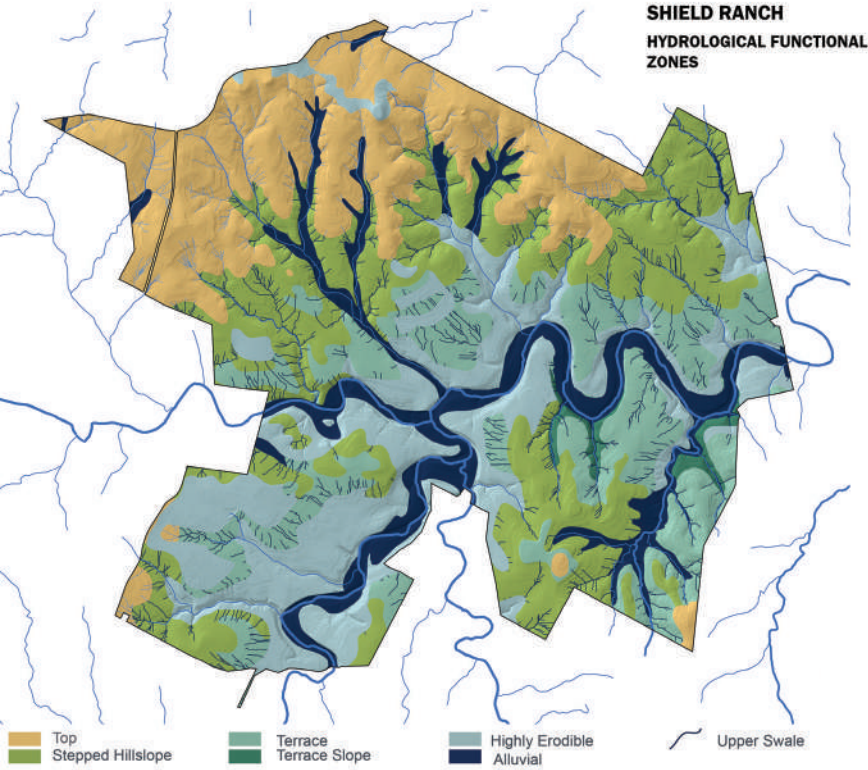
STRATEGIES	<ul style="list-style-type: none">• Creating partnerships among upstream and downstream communities• Using watershed-scale planning and monitoring
PROJECT	Shield Ranch Master Plan, Bee Cave
PROFESSIONALS	Erin English and Claudia Browne, Biohabitats

Ranch owners can extend their legacy of stewardship by protecting and enhancing on-site and downstream ecology through master planning that incorporates water management considerations. For the Master Plan at the Shield Ranch, a 6,800-acre ranch west of Austin, Biohabitats evaluated and integrated water resource considerations through all phases of the project, including collection and review of existing information and data, inventory and analysis of opportunities and constraints, and collaboration on appropriate water management strategies for the site.

Shield Ranch is managed by a family with a strong land ethic and a commitment to conservation and stewardship. Examples of their efforts include placing 95 percent of the ranch under conservation easements and providing a nature immersion camp for urban kids who might not otherwise get to experience the Hill Country landscape. To

help continue this legacy of stewardship, the Shield-Ayers-Bowen family and Shield Ranch staff sought a master plan to guide the realization of their vision for a natural and cultural landscape that could be enjoyed by the family and shared with the public for generations to come. To facilitate this process and ensure informed decision-making, Biohabitats developed hydrologic functional zones and a suitability analysis based on eco-hydrologic sensitivity to assist in siting low-impact development elements.

Hydrologic analysis in the Master Plan allows the owners of Shield Ranch to incorporate water resource considerations into all decision-making through the long term.



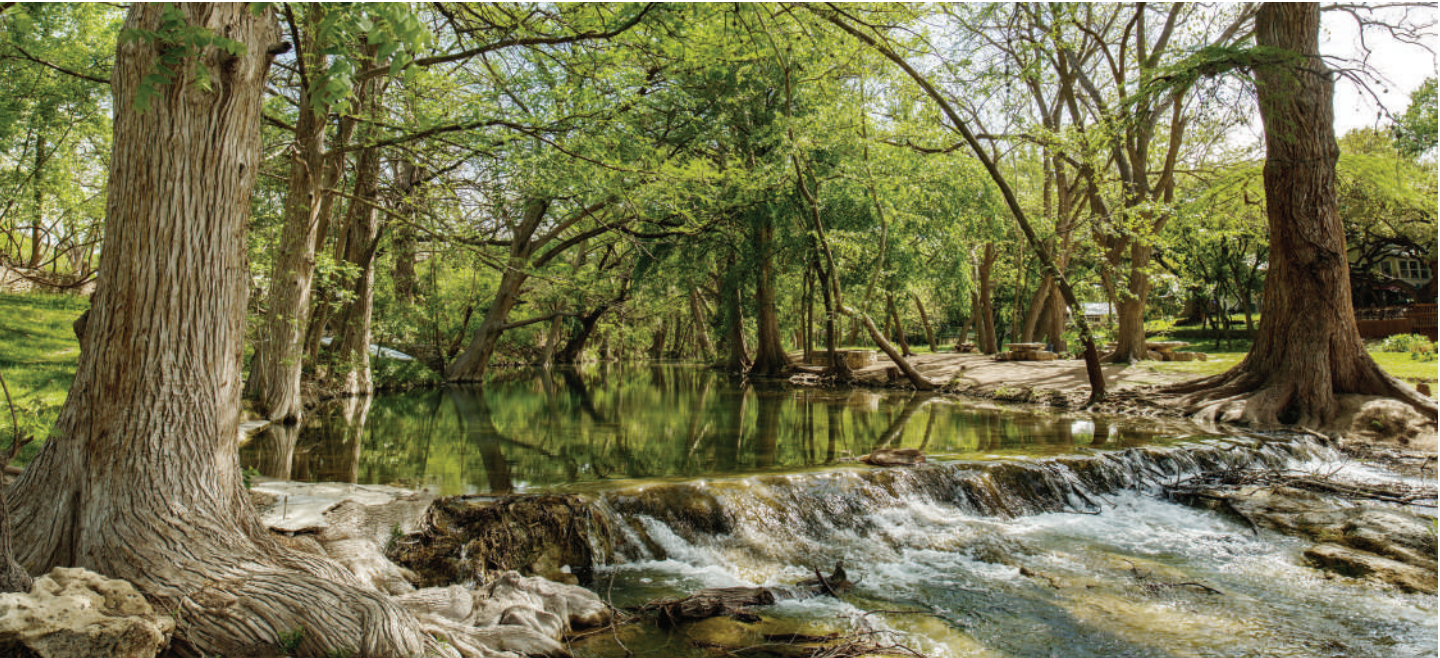
Focus Area: Social and Economic Inclusion

STRATEGY	Enhancing community capacity to engage in water planning and governance
PROJECT	Cypress Creek Watershed Protection Plan, Wimberley
PROFESSIONAL	Tom Hegemier, Doucet & Associates

The Cypress Creek Watershed Protection Plan (WPP) is a proactive plan that addresses potential, future nonpoint source pollution and proper management of source groundwater. Tom Hegemier of Doucet & Associates led the design and implementation of green infrastructure and low impact development components of the WPP. The plan incorporates groundwater and surface water components, spans multi-agency jurisdictions, and is comprehensive in its approach for maintaining balance between natural resource management and economic development.

Elements of the plan include the design and construction of multiple stormwater treatment measures, watershed ordinance upgrades, water quality monitoring, education and outreach, and an extensive stakeholder process. The plan is supported by grants from Texas Commission on Environmental Quality for non-point source pollution management. The ultimate goal of the Cypress Creek Watershed Protection Plan is to ensure the long-term integrity and sustainability of the Cypress Creek watershed are preserved, and that water quality standards are maintained for present and future generations.

Preserving the beauty and water quality of Cypress Creek is of highest importance to the economic and ecosystem health of the community.



Focus Area: Healthy Waterways

STRATEGY	Maximizing natural infrastructure for healthy ecosystems
PROJECT	Blue Hole Park, Wimberley
PROFESSIONAL	Rebecca Leonard and Steven Spears, Lionheart Places

The spring-fed waters of Wimberley’s Blue Hole have been an invaluable resource for wildlife and residents of the Texas Hill Country for centuries. In 2005, after a century of overuse and neglect, the City of Wimberley purchased the Blue Hole and its surrounding 126 acres to protect the beloved swimming hole.

Rebecca Leonard and Steven Spears led the design team which focused on balancing uses, restoring native landscapes, protecting delicate ecosystems, and preserving precious water resources. Revenue from the improved recreational facilities pays for maintenance of the park and investment in other park facilities. This national award-winning project set a new standard for environmental stewardship through community-based design and celebrating water as a treasured Hill Country resource.



Healthy Waterways (continued)

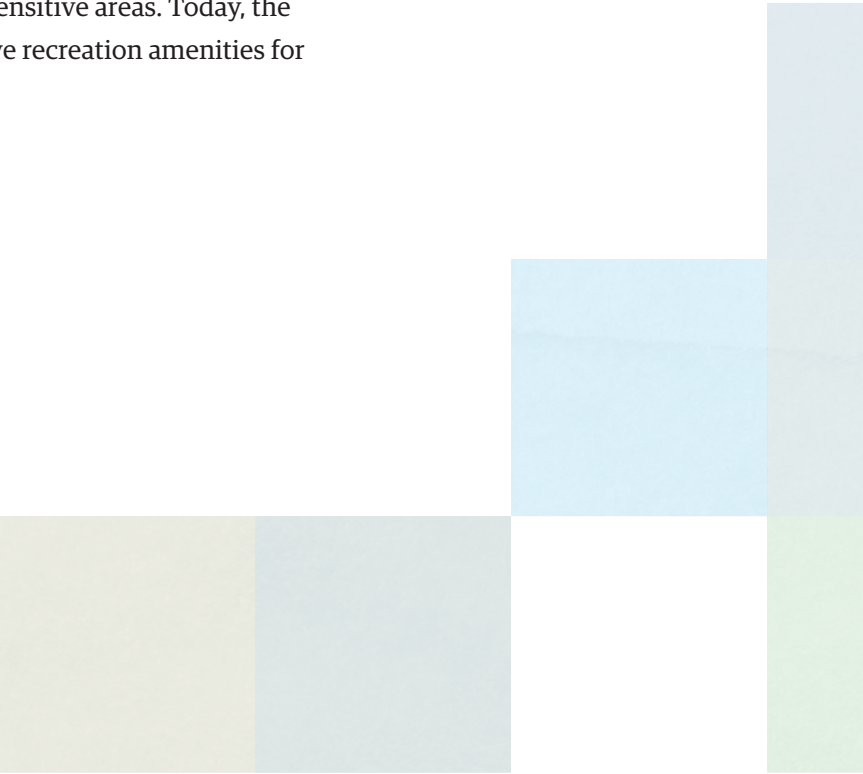
One Water considerations included:

- Reducing stormwater runoff through ten rain gardens and bioswales
- Using drought-tolerant turf and well water for recreation field irrigation saving an estimated 600,000 gallons of potable water every month
- Collecting rainwater in a 5,100-gallon cistern
- Carefully selecting restorative soils and riparian plants for resiliency against flash floods

The Park design incorporated all the aspects that were essential to the experience—the savanna, dense tree canopy and rope swings—as well as enhancing damaged landscapes that were “loved to death” such as the cypress grove, streambanks, natural rock outcroppings and the wetlands.

The Cypress Creek streambank was stabilized by amending soils and adding native vegetation cover. Four designated limestone-slab, creek-access points were created to allow users to climb in and out of the water without damaging tree roots or causing erosion of the streambank. Despite the addition of a significant new park program, the design protects and enhances the site’s ecologically sensitive areas. Today, the park offers a new and improved swimming hole and active recreation amenities for thousands of annual visitors.

Blue Hole Park balances the needs of the community while preserving and restoring the historic Blue Hole and surrounding ecosystems.



STRATEGY	Maximizing natural infrastructure for healthy ecosystems
PROJECT	Confluence Park, San Antonio
PROFESSIONAL	Heather Gale Holdridge, Lake Flato

Confluence Park is a living laboratory that allows visitors to gain a greater understanding of the ecotypes of the South Texas region and the function of the San Antonio River watershed.

Heather Holdridge led the sustainability systems integration of the park as part of the Lake Flato design team. Constructed of concrete petals designed thoughtfully to sit lightly upon the land, the main pavilion forms a geometry that collects and funnels rainwater into a site-wide water catchment system. The pavilions throughout the park provide shade and shelter, simultaneously engaging visitors to visualize the cycle of water at Confluence Park and how it relates directly to the San Antonio rivershed.

The multi-purpose Estella Avery Education Center, featuring a green roof that provides thermal mass for passive heating and cooling, serves as a classroom space that opens to the pavilion. Rainwater collected through the site-wide water catchment system serves as the primary source of water throughout the park, and the entire site is powered by a photovoltaic array providing 100 percent of on-site energy on a yearly basis.



Confluence Park demonstrates how public spaces can educate the public on natural and efficient water management design.

STRATEGY	Maximizing natural infrastructure for healthy ecosystems
PROJECT	Eliza Springs Daylighting, Austin
PROFESSIONAL	Lauren Ross, Glenrose Engineering

The Eliza Springs Daylighting project enhanced the endangered Barton Springs Salamander habitat by creating a stream-like surface flowpath for the crystal clear spring water, replacing a bypass that piped the spring water underground and out of sight. The stream is now an educational feature of the Barton Springs/Zilker Park area, educating visitors on spring flow and salamander habitat.

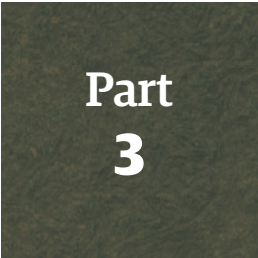
Glenrose Engineering developed the design criteria for the new stream path based on an analysis of historical Eliza Springs flow rates, historical flows in Barton Creek, historical pool flooding events, and biological data. Established velocity and other measures were used to achieve optimal water dissolved oxygen concentrations which are critical to salamander habitat.



Allowing Eliza Springs to flow freely as a creek towards the main pool provides visitors a close-up view of the crystal-clear salamander habitat, inherently educating the public on why protecting the aquifer recharge from pollution is so critical.



Contacts and Resources



ONE WATER PROFESSIONALS

The firms and professionals listed below represent a variety of experts “pushing the envelope” in their work to approach development from an integrated planning, or One Water, approach in the Hill Country. Contact information is current at the time of this publication but may change with time. The listings are in alphabetical order by firm.

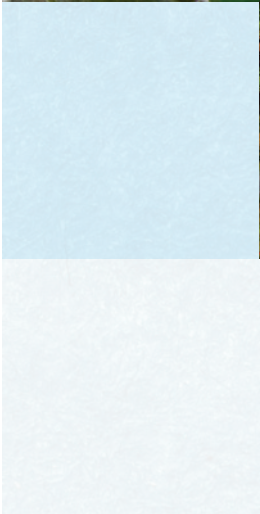
We will do our best to keep an updated version of this resource on our websites, HillCountryAlliance.org and TexasLivingWaters.org. Inclusion in this guidebook does not constitute an endorsement from the Hill Country Alliance or the National Wildlife Federation.

Required Experience

The following list of experience areas represents the type of expertise needed for a solid One Water approach in planning, design and development. All professional contacts listed in this section have experience in many of these areas. When interviewing consultants for a One Water project, we highly recommend inquiry on these experience areas.

Areas of experience

- Aquifer storage and recovery
- Building systems design, includes dual plumbing, condensate recapture and water efficient fixtures
- Climate appropriate and low water use native landscaping
- Development and use of grey water
- Floodplain restoration
- Impervious cover alternatives, such as pervious pavement and green roofs
- Indirect and direct potable reuse
- Nature-based solutions for flood mitigation
- Permitting green infrastructure
- Rainwater harvesting for potable and non-potable use
- Securing funding for green infrastructure projects
- Stakeholder engagement
- Water-supply planning



Biohabitats
Biohabitats.com



Contact

Erin English, PE, LEED AP	Claudia Browne
eenglish@biohabitats.com	cbrowne@biohabitats.com
505-819-0158	303.477.0660

Example project

Shield Ranch Master Plan, page 22

Firm Description

Biohabitats, Inc. is a national ecological consulting firm with more than 35 years of experience focused on ecological restoration, conservation planning and regenerative design. Biohabitats has purposefully built an interdisciplinary team of ecologists, biologists, soil scientists, natural resource planners, geomorphologists, landscape architects and engineers. Our team integrates nature-based solutions into a broad range of water resource projects at multiple scales, including wastewater treatment and reuse, stormwater green infrastructure, rainwater harvesting, watershed restoration and high performance building systems. Our services include ecological assessments, planning, engineering analysis, design, permitting, construction and adaptive management.

CDM Smith
CDMsmith.com



Contact:

Dan Rodrigo, One Water Practice Leader
water@cdmsmith.com
213-457-2149

Example Project

Integrated Water Resources Plan, page 17

Firm Description

CDM Smith is a global environmental and infrastructure consulting, engineering and construction firm that has long been an advocate of the One Water approach for the integrated management of water, wastewater and stormwater.

Our plans involve multidisciplinary teams that forecast water and wastewater needs, assess environmental goals and regulatory commitments, conceptualize alternatives, and use advanced decision support computer tools to help clients and communities understand risk and see trade-offs.

Furthermore, our plans have led to successful implementation of projects and programs such as potable reuse, brackish desalination, aquifer storage and recovery, stormwater capture and enhanced water conservation. All of these have provided multiple benefits such as increased utility service reliability that supports economic prosperity, improved watershed health, enhanced resiliency against a changing climate, and greater cost-effectiveness.

Doucet & Associates
DoucetEngineers.com



Contact

Tom Curran, PE
tcurran@doucetengineers.com
Tom Hegemier, PE, D.WRE, CFM
thegemier@doucetengineers.com
512-583-2600

Example Projects

Blue Hole Primary School, page 18
Cypress Creek WPP, page 23

Firm Description

Formed in 1992, Doucet & Associates provides water resource planning, water quality planning, floodplain modeling and mapping, stream restoration, surveying and land development services. We have completed hundreds of projects across Central Texas to enhance water quality, protect water supplies, promote nature-based solutions, and protect the public and infrastructure. Doucet was the lead civil engineer on the Wimberley One Water School—designing or coordinating all site plan improvements including stormwater, rainwater harvesting and water quality measures.

Freese and Nichols
Freese.com



Contact

Kim Patak, PE, CFM, ENV SP
kkp@freese.com
512-617-3138

Example Project

Brooks Campus Redevelopment Low Impact Development Guidance, page 15

Firm Description

Freese and Nichols (FNI) offers innovative approaches, practical results and outstanding service. We bring a wide range of national expertise to projects of all varieties, and we work with communities of all sizes that share a common interest in responsible resource management.

For more than 125 years, FNI has innovated many areas of our industry, including the design and permitting of the first operational direct potable reuse project in North America. With offices in Austin, San Marcos and San Antonio, we have dozens of employees who live and volunteer in the Hill Country. In addition to design services, FNI offers Decision Support Analysis and Public Engagement, to help facilitate a transparent and open process and to ensure data-driven decision-making.

Geosyntec Consultants
Geosyntec.com



Contact

Marty Christman
mchristman@geosyntec.com
512-354-3278

Example Project

Twin Oaks Library Rainwater Harvesting System, page 19

Firm Description

Geosyntec is a specialized consulting and engineering firm that works with private and public-sector clients to address new ventures and complex problems involving the environment, natural resources and civil infrastructure.

Geosyntec is known for its innovative work in stormwater management, stream restoration, green infrastructure, and erosion and sediment control. Our personnel have helped shape the state of these practices nationally over the past three decades via joint project work with civil engineering faculty at academic institutions, as well as continuous involvement in original research, development and application of techniques and technologies. As a result, Geosyntec is recognized for frequently facilitating the transfer of technologies from academia to commercial and public use and likewise, transferring practical findings back to research efforts.

Glenrose Engineering, Inc.
Glenrose.com



Contact

Lauren Ross, PhD, PE
lauren@glenrose.com
512-431-7988

Example Project

Eliza Springs Daylighting, page 27

Firm Description

Established in 1987, Glenrose Engineering is a woman-owned consulting business in Austin. We solve environmental problems using innovative design based on sound scientific principles. Project areas include storm runoff treatment design, stream and riparian restoration, permit and litigation support, monitoring system design, site remediation, and more.

Our clients include industries, municipalities, government agencies, sovereign tribal nations, land developers, attorneys and environmental organizations. We've worked on projects in Texas, California, New Orleans post-Katrina, Canada, Mexico and Scotland.

Halff and Associates
Halff.com



Contact

Troy Dorman, Ph.D, PE
tdorman@halff.com
210-704-1381

Example project

Integrated Stormwater Management Ordinance, page 16

Firm Description

Halff is an employee-owned, multidiscipline professional services firm. For more than 70 years, Halff has provided innovative solutions for clients and communities throughout the United States, offering full-service planning, engineering, architecture, landscape architecture, environmental, energy, right of way, visualization and surveying services. Halff has 26 offices in Texas, Oklahoma, Louisiana, Arkansas and Florida. The firm is ranked No. 106 in Engineering News-Record magazine's list of the top 500 design firms in the United States.

INTERA
Intera.com



Contact:

Stephanie Moore, PG
smoore@intera.com
505-235-9561

Example Project

New Braunfels Utilities Aquifer Storage and Recovery, page 14

Firm Description

INTERA is a geosciences and engineering consulting firm established in 1974. Since the late 1990s, INTERA's quantitative geoscience and engineering skills have been focused on water resource planning, development and management. INTERA's water resource solutions result from developing and applying state-of-the-art data acquisition and modeling technology. These tools are applied to evaluate regional groundwater availability, reliability of water supplies, well-field design and optimization, ASR, salt-water intrusion, safe yield analysis, flood control, capture zone delineation, and conjunctive surface water-groundwater use. Through these services, INTERA brings a focus on accurately determining the availability of water resources and finding ways to sustainably use and effectively manage these resources.

Lake|Flato Architects LAKE | FLATO
LakeFlato.com

Contact
Heather Gale Holdridge, EIT, Associate AIA, LEED Fellow
hholdridge@lakeflato.com
210-679-2312

Example Project
Confluence Park, page 26

Firm Description
Since its founding in San Antonio in 1984, Lake|Flato has designed buildings that respond to the culture and climate of each unique place. Lake|Flato creates buildings that are tactile, modern, environmentally responsible, artful and crafted. Our facilities shape collaborative working environments and catalyze users to think creatively, work with peers in interdisciplinary ways, and share this created content with their community and the world.

Lake|Flato has received wide critical acclaim. We were recognized by ARCHITECT Magazine as the top firm overall in the 2019 ARCHITECT 50. The American Institute of Architects honored us with its prestigious Firm of the Year Award in 2004, and the firm earned a Texas Medal of Arts in 2009. *Fast Company* recently named us one of the “Ten Most Innovative Architecture Firms in the World”, and the LOCUS Foundation honored Lake|Flato with a Global Award for Sustainable Architecture, recognizing our architectural approach to addressing the needs of society.

Lionheart LIONHEART
LionheartPlaces.com

Contact
Rebecca Leonard, FAICP, PLA, CNU-A
rebecca@lionheartplaces.com
512-520-4488

Example Project
Blue Hole Park, page 24

Firm Description
Founded by Rebecca Leonard, Lionheart’s team brings decades of experience in urban, suburban and rural environments, stretching from Houston to the Texas Hill Country. We believe in delivering excellence from the initial vision through plan to implementation. Simply put, Lionheart is committed to seeing clients fully realize their vision.

Lionheart’s process creates a framework for all implementation activities, ensuring that they are advancing the project to completion, while confirming they are justifiable in the marketplace, financeable by a variety of sources, and feasible and supportable by the stakeholders. We monitor comprehensive risk and alert clients to potential pitfalls to help our clients stay courageous through implementation.

O’Connell Robertson O’CONNELLROBERTSON
OconnellRobertson.com

Contact
Ted Davison, HFDP, LEED AP
tdavison@oconnellrobertson.com
512-478-7286

Example Project
Blue Hole Primary School, page 18

Firm Description
O’Connell Robertson is a full-service architecture and engineering design firm whose mission-driven approach creates environments that enrich the lives of the people they serve. The firm was established in 1950 and has completed more than one thousand projects ranging from small renovations to new multi-million-dollar facilities. With architects, engineers and interior designers in-house, O’Connell Robertson offers a single-source solution. Our diverse expertise and broad range of capabilities enable us to see projects from different perspectives and offer new approaches to solving difficult problems.

Sunland Group Sunland GROUP
Sunlandgrp.com

Contact
Joel Bock, PE
jbock@sunlandgrp.com
512-494-0208

Example Project
Red’s Car Detail Shop, page 20

Firm Description
2020 marked the 35th anniversary for Sunland Group, Inc., a woman-owned, multidisciplinary firm offering innovative solutions nationwide from our Austin, Texas headquarters.

Founded in 1985 as Sunland Engineering Company, the firm changed its name to Sunland Group, Inc. to encompass its growing range of offered services, including architecture, civil engineering, land planning, program and project management, construction management, digital consulting and technology services.

During the firm’s 35+ year history, Sunland has completed more than 400 major projects with a total construction value of more than \$15 billion.

Texas OnSite TexasOnsite.com

Contact
David Price, PE
dprice@texasonsite.com
512-698-7676

Example Project
Altstadt Brewery & Camp Eagle, page 21

Firm Description
Our firm specializes in all types of water quality projects, including wastewater treatment and management, stormwater runoff and preventing anything harmful from discharging into surface or groundwater. We design, permit and install these water infrastructure projects and have been doing so for more than 30 years.

Venhuizen Water Works David Venhuizen, P.E.
Venhuizen-ww.com

Contact
David Venhuizen, PE
waterguy@venhuizen-ww.com
512-442-4047

Example Project
Blue Hole Primary School, page 18

Firm Description
David Venhuizen is a professional engineer and licensed irrigator who has been practicing in the water resources field for more than three decades. Throughout that time, Mr. Venhuizen has championed and practiced innovative strategies aimed at enhancing the sustainability of our water resources. These include rainwater harvesting as a broad-scale, development-wide water supply strategy and the “decentralized concept” of wastewater management, aimed largely at managing these flows as a water resource to be husbanded, rather than as if they were a nuisance to be made to *go away*, and low-impact development (LID) stormwater management practices.

Further, Mr. Venhuizen asserts that, to approach sustainable water, a fundamental transformation of our water resources infrastructure model is required to design water management into the form and function of development as if it were a central function, rather than merely appending it on as if an afterthought.



ADDITIONAL ONE WATER RESOURCES

Momentum has been building around integrated water resource management across the country. If you or your community are interested in learning more, the resources below reflect just some of the organizations, reports and research initiatives that explore the use of One Water to enhance water resilience.

US Water Alliance One Water Hub

uswateralliance.org/one-water

Ensuring One Water Delivers for Healthy Waterways: A Framework for Incorporating Healthy Waterways into One Water Plans and Projects

National Wildlife Federation, Pacific Institute, Meadows Center for Water and the Environment

texaslivingwaters.org/deeper-dive/healthywaterways/

One Water for Texas Webinar Series

Texas Living Waters and Cynthia and George Mitchell Foundation

texaslivingwaters.org/conference-materials-and-presentations/one-water-webinars/

Blueprint for One Water

Water Research Foundation, Brown & Caldwell

savepaloaltosgroundwater.org/files/Blueprint-for-One-Water.pdf

Advancing One Water in Texas

Cynthia and George Mitchell Foundation

bit.ly/CGMFOneWater

Watershed Stewardship for the Edwards Aquifer Region: A Low Impact Development Manual

Greater Edwards Aquifer Alliance

aquiferalliance.net/Library/GEAAPublications/GEAA_Manual.pdf

The University Texas at El Paso, Center for Inland Desalination Systems, One Water Research

utep.edu/engineering/cids/Research/Current-Research.html

Water Reuse Practice Guide

William J. Worthen Foundation

collaborativedesign.org/water-reuse-practice-guide

San Antonio River Authority

sariverauthority.org/public-services/low-impact-development

POTENTIAL FUNDING SOURCES FOR ONE WATER PROJECTS

Investment in water infrastructure can be an incredibly expensive undertaking. The resources below reflect some of the innovative funding mechanisms that cities, counties, school districts, water districts and other governmental entities can tap to fund One Water approaches to water management.

Always ask your engineering, design and construction teams if they can help in finding grants, low-interest loans or other funding mechanisms. It is worth noting that while a more innovative approach to water management may present additional up-front costs, often these approaches can yield significant cost savings over the life of the project—through water conservation, decreased demand on traditional water supplies, and/or savings on long-term operations and maintenance.

The Texas Water Development Board provides low-cost funding for water infrastructure projects. One Water projects may be available for funding through the State Water Implementation Fund for Texas (for projects in the State Water Plan), the Drinking Water State Revolving Fund, or the Clean Water State Revolving Fund. Many One Water projects are eligible for Green Project Reserve opportunities which can include principal forgiveness. Hill Country communities can also research the Flood Infrastructure Funds for facilitating their water management plans.

Larger engineering firms can often assist with evaluating, applying for and managing grant funds for municipalities and other government entities.

Texas Water Development Board Financial Assistance Programs

twdb.texas.gov/financial/programs/index.asp

Green Project Reserve Guidance (Drinking Water State Revolving Fund and Clean Water State Revolving Fund)

twdb.texas.gov/financial/programs/green/index.asp

Texas Water Development Board Flood Information Clearinghouse — One Stop Shop for Flood Mitigation Funding Opportunities for Texas Communities

texasfloodclearinghouse.org





Hill Country Alliance
1322 W. Highway 290, Suite D
Dripping Springs, TX 78620
512-894-2214
HillCountryAlliance.org



National Wildlife Federation
South Central Regional Center
505 East Huntland Drive, Suite 485
Austin, TX 78752
512-610-7776
TexasLivingWaters.org