SUSTAINABILITY STARS DESCRIPTION AND CONTRACTOR

Awards Winners Board Booklet



The West Houston Association Sustainability Stars Program recognizes qualified applicants for investigating, investing in, implementing, inspiring, and innovating in sustainable development in Greater West Houston. The goal of the Sustainability Stars Program is to gather insights into sustainable infrastructure so that WHA's members and the public recognize the value and challenges associated with sustainable infrastructure and development practices.

Here are the winners display boards and project overviews.





2017

Winners



Bridgeland Purple Pipe and Water Reuse System Cypress, Texas

West Houston Association Sustainability Stars Program Application



Bridgeland Purple Pipe and Water Reuse System

Project Owner: Howard Hughes Corp. on behalf of Harris County WCID 157 The integration of sustainable infrastructure was a major consideration when planning the Bridgeland development, an 11,400-acre master-planned community in Northwest Harris County. The developer, Howard Hughes Corp., aimed to create a community that seamlessly blended natural features

Nith forward-thinking water reuse program

Project Engineer: BGE, Inc.

Sustainability Star: Integration Star

Project Type: Residential Community and Infrastructure 3,000 acres of gre

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with modern facilities and amenities while being environmentally conscious.

BGE helped the developer achieve this goal by incorporating more than 3,000 acres of lakes, trails, and parks into the design. The development's vast areas of greenspace are supported by an innovative and forward-thinking water reuse and purple pipe system that reduces the community's overall demand for treated, potable (drinking) water.



Tine Pouple Pipe and Mate

The purple pipe system takes advantage of two sources of non-potable water that the vast majority of other developments do not utilize. First, Bridgeland's wastewater treatment plant was designed to treat water to Type I effluent standards, water that is clean enough to discharge into public lakes. Second, Bridgeland has rights to a certain volume of water in the adjacent Cypress Creek. These two sources of water are pumped into Bridgeland's interconnected lake system to keep it at a steady level.

When planning the reuse system's lakes, BGE engineers took into account historical weather data to project water loss due to evaporation, estimated irrigation for various seasons of the year, and estimated rainfall that will make its way into the lakes through the community's storm sewers.

Water is pumped from the interconnected lakes into the purple pipe system to irrigate common green areas, such as parks, esplanades, and a disc golf course.

Top: Purple pipes are installed in a trench in the Bridgeland development. The pipes will carry non-potable water to irrigate common green spaces, saving millions of gallons of potable (drinking) water.

Bottom: A worker tightens a bolt linking two segments of purple pipes together.



West Houston Association Sustainability Stars Program Application: Bridgeland Water Reuse System

Benefits

Bridgeland's purple pipe system dramatically reduces the development's need for potable water, making the community more sustainable. If the purple pipe system had not been implemented, Bridgeland would need to use hundreds of millions of gallons of drinking water annually for irrigation. Last year, 437.5 million gallons of non-potable water were pumped through the purple pipe system, with 58.5 million gallons coming from treated wastewater and the remaining 379 million from the adjacent Cypress Creek and stormwater that runs into Bridgeland's amenity lakes. The purple pipe system completely eliminates the need to use more expensive, potable water to irrigate the greenspace.

The purple pipe system uses stormwater, Cypress Creek, and treated effluent to fill its system of interconnected lakes. Water is then pumped from the lakes into the purple pipe system to irrigate common green areas.



West Houston Association Sustainability Stars Program Application: Bridgeland Water Reuse System



Setting aside its environmental benefits, Bridgeland's water reuse and purple pipe system have cost savings benefits. The development's treated wastewater, water rights from Cypress Creek, and stormwater runoff provide sustainable sources of water. Drinking water, meanwhile, is purchased from the local water authority for \$2.45 per 1,000 gallons of water. If Bridgeland did not have a purple pipe system, it would need to spend more than \$1 million annually on irrigation.



Houston communities that did not originally include a purple pipe and water reuse system are now facing challenges as they try to implement them retroactively. These neighborhoods want to implement purple pipe systems because of the rising cost of potable water and increasing regulation of groundwater usage. However, they must design a system that circumvents existing

If not for the purple pipe system, Bridgeland would spend more than \$1 million on potable water for irrigation.

infrastructure and disturbs landscaping, which increases costs. The decision to design Bridgeland to include the water reuse system from the start was forwardthinking and economically sensible.

Additionally, the sustainability of the community has become a selling point to potential home buyers. Now more than ever, Texans want to live in communities that are environmentally friendly. By including a purple pipe system in Bridgeland's design, BGE is responding to residents' sense of environmental responsibility and stewardship.

Future Expansion

The water reuse system is operational in Bridgeland, but there are also plans for expansion in the near future. BGE and Howard Hughes Corp. are developing plans for an additional pump station to the lake system and another wastewater treatment plant that treats wastewater to Type I standards and expanding the purple pipe system. Currently, only about a quarter of the 11,400-acre development is complete and occupied by residents. As the development expands, so will the water reuse and purple pipe system.

West Houston Association Sustainability Stars Program Application: Bridgeland Water Reuse System



JERSEY MEADOWS DETENTION BASIN

PROJECT OVERVIEW

Local Permitting Entities:

- Harris County Flood Control District
- Harris County
- City of Jersey Village

Project Type: Public Infrastructure

Sustainability Stars:



Flood Damage Reduction Benefits:

- 4,000 structures will have reduced or eliminated damages from 1% annual chance, 24-hour event
- Base flood elevation reduced by up to 0.35 feet

INVESTIGATION

Project team used Harris County Flood Control District (District) design guidance and tools to evaluate potential environmental impacts in the project area and to identify water quality enhancement alternatives. Team used the District's Watershed Environmental Baseline (WEB) Data Summary Tool (DST), a GIS-based tool that reviews multiple environmental resource databases, such as the National Wetland Inventory, cultural resource surveys, hazardous materials, to identify potential impacts and to identify water quality enhancement design alternatives based on the project's location within District-defined water quality opportunity regions.



Project Cost: \$7 million

Site Size: 43 acres

Detention Volume: 400 acre-feet

Project Owner: Harris County Flood Control District

Civil Engineer:

R. G. Miller Engineers, Inc.

Contractors:

- Serco Construction Group, Ltd.
- Apache Ecological Services, Inc.
- Landscape Professionals of Texas

Sustainability Features:

- Watershed Environmental Baseline (WEB) Used for Planning
- Evaluated Water Quality Improvement Options
 Utilized Permanent Pool (Wet Bottom) Detention Design
 Integrated Stormwater Quality Treatment
 Mitigated Unavoidable Impacts with Onsite Replacement of Habitat and Aquatic Resources
 Planted Trees
 Constructed Trails (City of Jersey Village)

Project team determined the project was located in a "Moderate" opportunity region (yellow area in the figure below). After an evaluation of alternatives a wet bottom detention basin with water quality treatment wetlands was selected as the preferred water quality enhancement design alternative.





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INVESTMENT

The project team designed the wet bottom basin with stormwater quality treatment wetlands to filter and absorb stormwater pollutants. Mitigation wetlands (separate from the treatment wetlands) were designed to replace existing non-jurisdictional wetlands impacted by construction. A tree planting plan was developed as both a park amenity for the City of Jersey Village and to the promote areas of reforestation. These facilities reduce the frequency of cyclic maintenance, like mowing, providing habitat and aquatic resource values to the watershed and community, and promoting additional evapotranspiration and infiltration of stormwater runoff compared to a traditionally designed dry bottom detention basin planted with just turfgrass.



INTEGRATION

Construction of the Jersey Meadows Stormwater Detention Basin project was completed in 2014. The project received an award from the **Houston Area Urban Forestry Council** as the **2014 Project of Year** because of the extensive tree planting that was completed.



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STONEBROOK ESTATES

PROJECT OVERVIEW

Local Permitting Entity: Harris County / Harris County Water Control Improvement District No. 119

Project Type: Residential Community (Single Family, Multifamily) & Infrastructure (Street/ Bridge, Wet Utility, Storm/Drainage)

Sustainability Stars:







(Civil infrastructure and lots completed; homes under construction) (approx. 52% complete as of June 2017)



Stonebrook Estates, a 51.4-acre single-family residential,

Project Cost: \$11.4 million Site Size: 51.4 acres

Development Size: 135 lots (2 lot sizes offered: one 70 ft. wide by 125 ft. deep and the other 80 ft. wide by 130 ft. deep)

Project Owner: Terra Visions, LLC, Randy Jones, Managing Member

Project Engineer: R. G. Miller Engineers, Inc., Angela Howes, P.E.

Additional Engineer (LID component): Aguirre & Fields, LP., Steve Albert, P.E.

Sustainability Features: LID/GI (Vegetated Bioswales, Linear Detention, Biofiltration Systems, Natural Drainage System) low-impact development, is located near Tomball, Texas. The 135 lot development consists of 80 completed homes, with an average sales price over \$500,000. Stonebrook was developed with LID/GI amenities in mind and a hybrid stormwater management system, which uses natural drainage systems coupled with traditional storm sewers to adequately direct stormwater around and away from the homes. The hybrid drainage system received 12 inches of rain during the 2016 Tax Day Flood, equivalent to the 100year event, and performed as designed with no flooded structures in the development.

Figure 1: Natural drainage systems alter site runoff and can reduce the amount of detention required **NARRATIVE**



Adopted in 2011, Harris County's Low Impact Development and Green Infrastructure (LID/GI) <u>Design</u> <u>Criteria</u> provides a detailed policy framework that allows developers to obtain development permits when using LID/GI in unincorporated areas of the county.

Stonebrook Estates was one of the first LID projects in Harris County. Terra Visions, LLC chose to employ the LID techniques as an integral part of the community's

Image Credit: M. Bloom

Low-Impact Development (LID) is a term used to describe a land planning, and engineering design approach to manage stormwater runoff as part of green infrastructure. LID emphasizes conservation and use of on-site natural features to protect water quality.

<u>Green Infrastructure</u> (GI) is an approach to water management that protects, restores, or mimics the natural water cycle. overall amenity, rather than using a detention pond alone, at the far side of the development approach. Using LID/GI, Terra Visions' engineers designed and had constructed the entire site's drainage system for nearly half of the typical cost of a traditional storm sewer system and preserved developable land.

"The idea was to be different. We chose to use the facility as landscaping and give it a look that's not a typical ditch." — RANDY JONES, PRINCIPAL, TERRA VISIONS, LLC.

Stonebrook Estates' entry is intended to serve as a gateway to the homes. A key feature of Stonebrook Estates' LID/GI approach is a bio-swale, creating the

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welcoming green space at the entrance to the development.

The LID/GI amenities provide homeowners with increased green space, a trail system and a water feature that naturally guides stormwater to two 50foot-wide detention channels that filter the flows to an interior detention basin. The basin then releases the water at a rate and quality that is safe for the surrounding environment.

INNOVATIVE WATER-MANAGEMENT FEATURES

Natural Drainage System. Stonebrook's • natural drainage system mimics the natural flow of water across a green landscape. It directs stormwater into linear and lake-style detention basin. Then stormwater is slowly released to nearby watersheds.



- **Engineered Soils.** The first inch of stormwater Х runoff from the development is directed through engineered soil filters (biofiltration) that remove pollutants from the stormwater and ensures that the community complies with local postconstruction stormwater quality management regulations.
- Curb Cuts and False-back Inlets. Х

Stonebrook's roadways are cross-sloped and use "false-back inlets" along the curbs to drain stormwater into bio-swales, rather than traditional storm sewer pipes.

ADDED VALUE

Terra Visions LLC describes the LID features as an essential part of the community's sense of place. The developer attributes the success to the community's complete blend: a private street—a gated community, and well landscaped with LID components right outside your front door.

BENEFITS

 Low-impact development principles present the opportunity to fulfill market demand for communities that are environmentally friendly. Natural drainage systems create linear green spaces that can anchor trails and water features that are desired by homeowners. Green Infrastructure is a key component of a well-rounded community desirable to homebuyers.

R.G. Miller Engineers estimated that the natural drainage system reduced the site detention requirement by 24 percent. Stonebrook's natural drainage system was tested during the Tax Day Flood of April 2016, when the community received 12 inches of rainfall in a 24-hour period (an amount equal to the area's 100-year rainfall). Stonebrook's performed drainage system better than anticipated, with the stormwater staying in the system and not flowing into the streets or yards. The natural drainage system captured and directed the rainfall and runoff correctly, and the linear and lake -like detention basin successfully released the design flow to the nearby channels and bayous.

 Natural drainage systems can CUT drainage facilities costs. By changing the site's runoff characteristics, natural drainage systems can reduce detention requirements, while reducing drainage costs because swales generally cost less than sewer pipes.

Green Infrastructure can mitigate risk Х and avoid losses. Stonebrook Estates has already survived several floods. The Green Infrastructure in this community is effective and has protected its homeowners.

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2018

Winners





2018

Winners





Project Overview

Sustainability Stars Awarded: Investigation, Investment, Integration & Innovation Project Type: Residential Community & Infrastructure Local Permitting Entity: Texas Commission on Environmental Quality, City of Fulshear Project Cost: Confidential Site Size: 45 Acres (immediate project) 3,200 Acres (Entire Community) Project Owner: Fort Bend County MUD 169, Johnson Development Corporation Project Engineers: BGE, Inc. (Engineer) & SWA Group (Landscape Architect)

SUSTAINABILITY FEATURES: 3-PART WATER TRANSECT Designed as a 45-acre wetland treatment basin, the Polishing Pond is the start of a three-part water management transect where community effluent is captured and treated, sent to an extensive naturalized system of bioremediating polishing lakes, and then slowly discharged into a meandering three-mile long creek restoration.





Along the journey, thoughtful site design promotes reduced water use by plant selection and designated no irrigation zones, improved water quality through use of linear bioswales the wetlands, re-purposing and for landscape wastewater ot re-establishing irrigation, and equilibrium through stream fluvial geomorphology principles.

Water Treatment Process

CROSS CREEK

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STAR REVIEW

INVESTMENT STAR



Polishing Pond

The Polishing Pond is particularly innovative in its engineering

INTEGRATION STAR



COMMUNITY CONNECTIONS

To provide broad resident access, community connector trails

approach. Effluent being discharged from the site ultimately drains into Oyster Creek, one of the Texas Commission on Environmental Quality's historically listed impaired streams. As such, any discharge should essentially be devoid of biologically impaired pollutants and high concentrations of oxygen. Standard treatment practices typically utilize mechanical treatment systems to process and clean community effluent. These systems incorporate several concrete basins and various pieces of equipment that require enormous power supplies and large impervious footprints with few external benefits. pass by the eastern edge and meandering nature trails seamlessly thread between and around varied habitats. Boardwalk and overlook crossings have also been added for additional mid-basin access and are complimented by educational signs. In addition to biological treatment, the signage focuses on site accommodations for neo-tropical migrants and community birding opportunities.



LAF Case Study

Shortly after construction, students from Texas A&M became interested in the treatment process and did a case study on the project for the Landscape Architectural Foundation. Field samples were taken and lab tests were run. The data supported water quality goals by showing reductions in the concentrations of nitrogen, phosphorous, potassium, calcium, magnesium, sodium, zinc, copper and manganese.





Immersive Experience

The success of the project is best defined not by numbers, but by experience. Early morning or late evening walks through the site reveal darting birds, animal choruses at the edges, striking tree silhouettes, and footsteps treading lightly through nature. A site where function is high but emotional connectivity creates enduring respect for sense of place.

Ecological Oasis

While carefully crafted for engineering purposes, the ecological framework has become an ecological oasis for residents and wildlife. Native naturalized plantings have been extended beyond the aquatic shelves to create varied habitat zones and recreational opportunities. Originally dry, designers recognized an unique ecological opportunity and planted numerous Bald Cypress within the dry basin banks. As effluentfrom new homes reached the site, water levels rose to static levels and submerged trees to create iconic Cypress trees in standing water.

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QUEENSTON MANOR APARTMENT HOMES

Project Overview

SUSTAINABILITY STARS AWARDED:

INSPIRATION STAR, INTEGRATION STAR, INVESTIGATION STAR, & INVESTMENT STAR

PROJECT TYPE: LID

LOCAL PERMITTING ENTITY: HARRIS COUNTY



PROJECT COST (LID FEATURES): \$799,500 SITE SIZE: 7.4 ACRES PROJECT OWNER: ACADEMY DEVELOPMENT PROJECT ENGINEERS: EHRA ENGINEERING SUSTAINABILITY FEATURES: USE OF MULTIPLE LID TECHNIQUES YIELD REDUCTION IN THE OVERALL DETENTION STORAGE REQUIREMENT AND VALUABLE ACREAGE TO BE REGAINED FOR DEVELOPMENT USING BEAUTIFIED SWALES THROUGHT THE COMMUNITY.

Special Terms Defined:

LID: Low-Impact Development is a term used to describe a land planning and engineering design approach to manage stormwater runoff within green infrastructure. LID mimics natural pre-development drainage flows by slowing stormwater runoff.

Benefits & Added Value

The Queenston Manor LID solution is



designed to look just like any other apartment project. The areas between apartment buildings would have been grass-filled open space even without LID. All residents likely see is an attractive lawn. That was exactly the goal behind the placement of the stormwater raingardens and the plant and grass choices withn them. The same goes for the cisterns beneath the property's parking spaces. Queenston Manor is an example of ordinary looks but exceptional stormwater engineering.

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STAR REVIEW

INVESTIGATION STAR

EHRA's Engineers, Planners, and Hydrologists developed a LID solution to literally save the project after industry detention standards wouldn't do. By analyzing the storage capacities and release rates of the LID features, it was determined tvhat raingardens positioned between apartment buildings, pervious pavement parking areas, and a final end-of-system raingarden to further slow stormwater runoff would adequately serve the site. The LID solution allowed for 2 additional buildings (48 more apartment units) and associated parking to be put on site.

INTEGRATION STAR

The LID elements included 4 rain gardens, 11 permeable paver parking areaswith underground cisterns, and 3 outfall locations, all connected with maximum 6" diameter PVC pipes.

INSPIRATION STAR

EHRA Engineering participated in the Houston-GalvestonAreaCouncil(H-GAC) "Designing for Impact" program consisting of a lecture, site tours, and a printed guide to LID techniques and projects in the Greater Houston area. H-GAC recognized that Queenston Manor's LID solution included innovative adaptations of established LID practices tailored to Houston's

INVESTMENT STAR

EHRA's LID solution was modeled using EPA-SWMM software and included a system of 54 drainage nodes and links, and 3 outfalls into the adjacent HCFCD channel.





West Houston Association Sustainability Stars

BRIDGELAND CREEK PARKWAY SECTIONS 788

Project Overview

SUSTAINABILITY STARS AWARDED: ★ INVESTIGATION STAR PROJECT TYPE: Residential Community and Infrastructure LOCAL PERMMITTING ENTITY: Harris County, City of Houston, TxDOT PROJECT COST: \$5.5 million SITE SIZE: 24 Acres PROJECT OWNER: Bridgeland Development LP PROJECT ENGINEERS: HR Green, Inc.

Special Terms Defined:

Low-Impact Development is a term used to describe a land planning, and engineering design approach to manage stormwater runoff as part of green infrastructure.

LID emphasizes conservation and use of on-site natural features to protect water quality. Green initiative is a term used to describe any initiative that will create a cleaner and healthier environment.

SWA Group (Landscape Architect) SUSTAINABILITY FEATURES:

- Bio-Retention & Engineered Soil
- False inlets
- Vegetated Filter Strips
- Vegetated Swale

CONCEPTUAL LAYOUT

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STAR REVIEW

INVESTIGATION STAR

With a goal to enhance the community's natural environment within the Cypress Creek Watershed, Bridgeland Development LP chose to explore "green initiatives," in the design for two sections of Bridgeland Creek Parkway through Prairieland Village.

Bridgeland Development LP partnered with HR Green to develop low-impact and stormwater quality alternatives to be incorporated into the design for Bridgeland Creek Parkway.

INVESTMENT STAR

The Bridgeland Creek Parkway project implements sustainable stormwater management concepts throughout the project area to provide the desired level of storm water conveyance and flooding protection within the street system.

The implementation of the "green initiative" design concepts, consisting of 18 bioswales and approximately 88,000 cubic feet of storm water storage, in conjunction with the neighborhood roadways with false inlets and minimal storm sewer, results in the preservation and enhancement of the Prairieland Village characteristics.

HR Green developed multiple concepts to be evaluated, and the final alternative used false inlets that have an orifice directing flow into bio-swales, allowing for infiltration and sediment control prior to entering the bio-cell areas.

Benefits & Added Value

The project embraces a sustainable and low impact design philosophy by implementing a sustainable stormwater conveyance and flood protection system with bio-swales. When compared with a conventional stormwater conveyance system, this "green initiative" system recognizes

multiple benefits:

- Reduces modeled peak flows
- Reduces stormwater pollutants
- Increases stormwater infiltration and recharge
- Lowers construction estimates (10%)
- Preserves the community's natural characteristics

GULF COAST MUHLY MUHLENBERGIA CAPILLARIS - IS A 1½-3 FT., PERENNIAL GRASS WIT LARGE, AIRY, MUCH-BRANCHED SEED HEAD UP TO HALF AS LONG AS THE ENTIRE PLAN SPIKELTS ARE PURPLE. IN THE FALL THE PLANT TAKES ON A FEATHERY, DEEP PINK HU

INDIAN BLANKET GAULARDIA PULCHELLA - FIREWHEEL OR INDIAN BLANKET GROWS 1-2 FT. TALL. THE WELL-KNOWN FLOWER HEADS ARE 1-2 IN ACROSS WITH A RED CENTER AND A VELLOW OUTER BAND. OCCASSIONALLY THE THREE-CLEFT RAYS ARE SOLID ORANGE OR YELLOW. THE DISK FLOWERS IN THE CENTER ARE BROWNISH RED

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BIORETENTION PLANTS

COREOPSIS COREOPSIS LANCEOLATE - GROWS IN SMALL CLUMPS BUT FORMS

COREOPSIS COREOPSIS LANCEOLATE - GROWS IN SMALL CLUMPS BUT FORMS EXTENSIVE COLONIES, IT IS 1-2% FEET TALL AND HAS LEAVES 3-4 INCHES LONG. TH YELLOW, DAISY LIKE FLOWERS OCCUR SINGLY ATOP LONG, STALKS.

Plant Material

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WHA hopes that you will reach out to us so we can recognize you as an early adopter of these practices.Visit our webpage below to submit an application before the August 1st deadline!

https://westhouston.org/sustainability-stars/