STORM WATER + EROSION CONTROL
TOP PROJECTS

2016 Top Storm Water & Erosion Control Projects

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Storm Water Solutions (SWS) is proud to celebrate the most noteworthy storm water and erosion control projects with the eighth annual installment of its Top Storm Water & Erosion Control Projects awards.

Each year, the SWS editorial staff recognizes new facilities and projects, as well as innovative upgrades and notable storm water and erosion control solutions.

Application & Selection Process

From May to August 2016, SWS encouraged project leaders to submit entries showcasing projects in the design or construction phase within the previous 18 months.

The judges selected 10 winners based on obstacles faced and overcome, and final goals achieved. Although they vary in size and scope, the winning projects shared main objectives: meet population and regulatory demands, address aging infrastructure needs, and implement cost-efficient technologies and best practices.

SWS would like to thank all of the project leaders and representatives who submitted projects and photos, and congratulate the owners, engineers, contractors and designers whose projects are honored in this special feature.

Winner profiles compiled by Bob Crossen, associate editor for SWS. For more information about Top Projects, email swseditor@sgcmail.com.

Blue Island Green Infrastructure Project

When the city of Blue Island, Ill., sought to reduce basement flooding for its residents, Environmental Design Intl. Inc. understood finding the right plots for rain gardens and green infrastructure would be crucial.

At $663,000 and 15,720 sq ft—covering approximately 16 blocks—the project was one of the largest Environmental Design Intl. had done. Searching that area to find the most suitable properties was the most work-intensive part of the project. The lots could not have utilities that would disrupt or delay construction, and properties with basements were eliminated. More space in the ground meant more storage capacity for infiltrated storm water.

The list of potential sites was slimmed down even further. Streets with traffic moving east and west were too narrow and greatly sloped, so the project targeted homes on north- and southbound streets instead.

"Another interesting part of the selection process was that we needed to find parkways that were relatively wide … so that we could maximize the effectiveness of the rain garden," said Carl Bova, engineer for Environmental Design Intl. That same principle was applied to sites with similar characteristics during the sorting process, and those with a greater potential for infiltration were selected.

Safety was also of concern. Rain gardens were strategically placed so as not to impede the vision of drivers on roadways. Bova said they used a 2-ft setback when determining where to place the plants, which were a mixture of local species.

To help prevent homeowners or maintenance workers destroying the flora, the city held informational meetings about the plants' importance. The plants also provided a pleasing aesthetic, and Bova said homeowners have been happy with the results.

In fact, homeowner satisfaction was a priority throughout the construction process.

"We didn't want to become an encumbrance to the homeowners, so as a result, we made sure we kept the 2-ft buffer, the grass strip, that was at about the same grade as the sidewalk, so that if the person should leave the sidewalk, they don't trip and fall," Bova said.

Location: Blue Island, Ill.
Cost: $663,000
Size: 15,720 sq ft
Owner: Metropolitan Water District of Greater Chicago
Designer: Environmental Design Intl. Inc.

Broadway Neighborhood Storm Water Greenway

LA Sanitation's greenway project did more than improve storm water drainage for private and public properties in south Los Angeles—it also improved pedestrian connectivity and storm water capture.

"The water collected by the project is not for direct use. Instead, it infiltrates into the ground and recharges the groundwater aquifer," said Wing Tam, assistant division director for LA Sanitation. "Therefore, the 41 acre-ft per year (13.4 million gal) of storm water collected by this project becomes part of the local water supply. This amount of water will be enough for the daily consumption of 360,000 people."

Reaching that infiltrated water target required use of private property to develop rain gardens and improve storm water capture. LA Sanitation developed an educational plan to get the community involved in the process, including holding community meetings where project managers explained the project's goals.

LA Sanitation used social media and its project website to reach the wider community with photos, videos and regular updates on the work and how construction would impact traffic and pedestrian flow.

Although those living in the project area understood the project goals, few had the authority to approve a rain garden on the property.

"Our biggest worry has been that most residents in the community are renters," Tam said. "Not being property owners, they were not in a position to accept the remodeling of their front yard and in many cases, reaching the property owners was a challenge. Therefore, we ended up with only 20 houses participating out of the 240 houses that our staff visited."

Despite the difficulties of getting property owners on board, LA Sanitation landscaped 19 residential rain gardens, four parkway swales and eight dry wells. Additionally, it constructed a 531,000-gal infiltration gallery, all of which contributes to 41 acre-ft of annual infiltration.

Location: Los Angeles
Cost: $4.6 million
Size: 223 acres of tributary area
Owner: LA Sanitation–City of Los Angeles
Designer: LA Sanitation–City of Los Angeles
Contractor: Mike Prlich & Sons Inc.

Matilija Creek Erosion Control Project

A grouted stone highway embankment posed danger to traffic as erosion undercut the stone, creating a void under a travel lane. Caltrans District 7 quickly learned that keeping drivers safe on State Route 33 also meant protecting the Southern California steelhead trout.

"The grouted stone revetment will be removed from the top down, removing the waste materials away from the stream rather than working in the stream corridor, which further reduces the potential impacts to the stream area," said Ben Willardson, director of water resources for CWE, the firm tasked with designing the $3.23 million project.

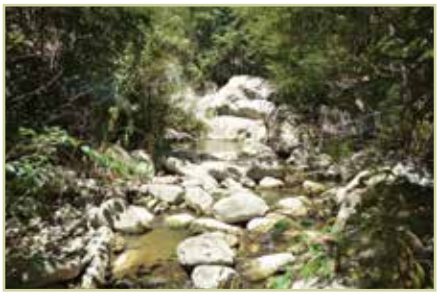
The nearby North Fork Matilija Creek's step-pool geomorphology is an important aspect of the steelhead trout habitat. Of particular importance was the creek's sediment transport, which CWE aimed to disturb as little as possible.

"Analysis showed that the design would preserve sediment transport conditions for flows up to the two-year flow, allow transport of sediments during larger events, and, at the same time, provide resting areas for fish migration during extreme events," Willardson said.

Those analyses worked in conjunction with a fish management plan, which included a pump, dam and discharge system for flow bypass.

"Sediment control for the construction of the project involves a setback from the stream with standard erosion control practices, such as silt fencing to prevent movement toward the stream," Willardson said.

Widening of the floodplain also increased the space for fish to find shelter. The channel cross-section capacity had to be large enough to move the sediment while also providing shelter in the overbank. Those fish resting places also had to have flow velocities of almost 25 ft per second during large events. Additionally, fish had to be relocated, which posed additional challenges to the work.



Location: Ventura County, Calif.
Cost: $3.23 million
Size: 6,050 sq ft
Owner: California Department of Transportation District 7
Designer: CWE

Chautauqua Green Infrastructure Improvements

The New York State Department of Environmental Conservation determined that Chautauqua Lake posed serious health risks to humans due to nutrient pollution and algal blooms. It required phosphorus loads from developed land into the lake be reduced by 46%.

Recognizing the problem, the Chautauqua Institution introduced three green infrastructure practices—stream stabilization, constructed wetlands and stream daylighting—to treat and capture water on its property. Scott Rybarczyk, project engineer for Wendel, the project designer, said the stream stabilization visibly reduced sediment and nutrient flows into the lake while the artificial wetlands constructed on a nearby golf course cut down on phosphorus loads. Stream daylighting was a more taxing problem.

"Daylighting is tricky in that flat grades are needed for bioswales," Rybarczyk said. "The general slope of the existing park is over 5%, so grading was required to provide flat grades for these green infrastructure elements. Similarly, the team had to make sure not to have too steep a slope, because that could erode some of the planting areas."

The daylighting served to filter runoff with the help of the bioswales. After some deliberation, another element to address the volume of water to be treated was added.

"It was determined that a forebay, an artificial pool of water in front of a larger body of water, and three bioswales, landscape elements designed to remove silt and pollution from the surface runoff water, would maximize the water quality volume treated," Rybarczyk said.

The design of the wetland took the golf course operations into consideration and avoided problems with a nearby state highway.

Despite the difficulties, the project saw a considerable difference in the quality of Chautauqua Lake, and private citizens neighboring the property already have committed to building rain gardens to further help the watershed.

Location: Chautauqua, N.Y.
Cost: $166,500
Size: 16,500 ft
Owner: Chautauqua Institution
Designer: Wendel

Expo Rail Operations & Maintenance Facility

Designing a way to optimize rail operations and fleet maintenance for the Expo Light Rail Transit Line was a tall order. The scale of the rail line, which connects downtown Los Angeles to Santa Monica, posed challenges when it came to the sustainability elements the Los Angeles County Metropolitan Transportation Authority (LACMTA) sought to include.

"At the outset, the project goals explored every sustainable aspect possible and made this project into a prime example for future projects in our expanding transportation network," said Timothy Lindholm, executive officer of capital projects for LACMTA.

That research paid off. Through development of an urban runoff mitigation plan—as required by Santa Monica city regulations—the project achieved LEED credits SS 6.1, SS 6.2, WE1 and RP 1.3. It also reduced interior potable water usage by 44% and potable water use for irrigation by 53%. With limited space for irrigation, excess rainwater was used to wash vehicles.

Pervious surfaces on the property infiltrate rainwater to a 400,000-gal cistern, reducing runoff to the municipal separate storm sewer.

"The design team collaborated together to implement these sustainability measures and achieve LEED Gold," Lindholm said.

The sustainable nature of the project also served the rail facility well as California entered a historic drought. However, Lindholm said the drought was not considered when designing the project.

"The design team, including W2 Design, explored reusing the storm water at a time when there was no indication of a drought or mandated water savings," Lindholm said. "Metro is very pleased with the storm water system. As we enter the next rainwater cycle, we anticipate a significant water savings."

Location: Santa Monica, Calif.
Cost: $99 million
Size: 360,000 sq ft
Owner: Los Angeles County Metropolitan Transportation Authority
Designer: Maintenance Design Group, W2 Design Inc.
Contractor: Kiewit Building Group, Wahaso

New Orleans Levee Wave Overtopping Protection

When looking for a way to protect the New Orleans Levee, one team found the answer 5,000 ft above sea level. Task Force Hope, a U.S. Army Corps of Engineers (ACE) office in New Orleans established after Hurricane Katrina, contracted Colorado State University (CSU) to create a facility in which it could test several turf reinforcement mat materials under major storm conditions.

The facility needed to be capable of simulating full-scale wave overtopping tests with maximum average overtopping discharges between 200 and 300 liters per second per meter, depending on wave period, according to Dr. Christopher Thornton, director of the engineering research center and hydraulics laboratory at CSU.

The facility is a fixed-in-place machine with two side-by-side 1.8-meter-wide channels supporting four 10-ton removable trays configured similarly to field levee conditions. The simulator can hold 31 cu meters of water and simulate a wave with a volume of 17 cu meters per meter. Waves were measured with five bed-mounted pressure sensors and three "surfboard" platforms to flow thickness. Those platforms, along with two pilot tube meters, also measured velocity of the waves for several types of vegetation.

"Most testing lasted at least six hours and the wave intensity increases as the test proceeds. Every hour they stop and take survey measurements to document how the slope is reacting to the waves," Thornton said.

Ultimately, Bermuda grass sod was found to be the best option. It is free of bahia grass, torpedo grass and Florida betony.

The sod was machine cut with a total thickness between 1.75 and 2 in. The turfgrass required a soil thickness between 0.75 and 1 in., excluding top growth and thatch.

"The hold system depends on making sure the vegetation and T-Recs create an interlocking system that protects the levee. After the sod is installed, the contractors also have to irrigate the sod to ensure that it grows," said Mike Jotzke, technical services manager for East Coast Erosion Blankets.

Location: New Orleans
Cost: $7.8 million
Size: 900,000 ft
Owner: U.S. Army Corps of Engineers
Designer: U.S. Army Corps of Engineers
Contractor: Circle Construction LLC, Phylway Construction LLC, Shavers-Whittle Construction LLC

Tracer Channel Restoration

Low flow in the flat-bottomed Tracer Channel in Fort Worth, Texas, impaired maintenance operations because it was constantly muddy. Mowing equipment regularly got stuck, and ruts from tractor treads created standing pools of water in which mosquitoes bred.

Development of pasture land catalyzed the issue. As natural land was turned into housing developments and commercial structures, maintenance crews could not keep up with the growth, and storm water infrastructure fell into disrepair.

"Significant amounts of sediment had built up in the channel bottom, substantially blocking the storm drain outfalls into the channel," said Steve Eubanks, storm water capital projects engineer for the city of Fort Worth. "There were several areas of black erosion on the north side of the channel due to roof drains and parking lot runoff, exposing some of the drainage pipes."

City staff removed sediment and used turf-reinforcement mats to stabilize the slope of the channel. The installation of a low-flow channel also directed water to the pilot channel, where standing water is contained and better controlled. At key locations where runoff discharged down the banks of the channel, the city implemented erosion protection.

"The slopes and flood banks are staying dry and stable for the vegetation crew to use their mowers on them," Eubanks said. "The tractors are able to pass over the structures because pipes were extended and concrete aprons were installed."

Restoration of the channel was not without its difficulties, as 2015 was the wettest year on record for Fort Worth. Construction crews lost 48 days to rainy weather.

"The road for the trucks would become saturated with water from rain, seepage and overflow from the temporary pilot channel," Eubanks said. "It was difficult to get the finished surface done, planted and tracked, and to get the erosion blankets installed before it was washed down by rainfall and the flow of the channel."

Despite the weather, the city never closed the channel during reconstruction, nor did it dam it to stop flow. The implemented measures have been successful.

Location: Fort Worth, Texas
Cost: $302,639.82
Size: 78,408 sq ft
Owner: City of Fort Worth
Designer: Fort Worth Storm Water Field Operations
Contractor: Fort Worth Transportation and Public Works Department, Forth Worth Storm Water Field Operations

University of Kentucky FEMA Flood Mitigation Project

The Wolf Creek Watershed on the University of Kentucky campus was overwhelmed by increased storm water runoff after years of development. A nearby highway often was overtopped during major storm events, posing a traffic hazard.

With a Federal Emergency Management Agency Hazard Mitigation Grant, the institution hired Bell Eng. to develop a plan to reduce flooding, detain water for reintroduction to the watershed and improve water quality. Doing so required coordination between a family housing unit, a childcare center and the university's football stadium, which was undergoing renovations.

"We knew from the conceptualization of the project that having all parties involved throughout the design and construction would be crucial to the project's success," said Keith Ingram, project manager for UK Capital Project Management Group.

To ensure the project went smoothly, all parties held monthly meetings where they were given updates and had questions answered. The meetings gave stakeholders agency over the process and helped them understand their neighbors' circumstances.

The project aimed to reduce the peak flow for the 100-year flood event by 44%, which was a challenge given the limited surface area for detention. In total, six detention basins hold 8.3 acre-ft of detained water, which increased detention from 14.9 to 21.7 acre-ft in the project area.

"One of the stipulations of the grant was that paved parking areas could only be constructed to replace paved areas being removed by construction of new surface collection basins," Ingram said. The team had to relocate and build an addition to the existing 900-space parking lot adjacent to the stadium.

"The combined lots accommodated [more than] 1,200 parking spaces and approximately 5 acre-ft of underground detention," said Robert L. Pickerill, project manager for Bell Eng.

Location: Lexington, Ky.
Cost: $6 million
Size: 240 acres
Owner: University of Kentucky
Designer: Bell Eng.
Contractor: Bluegrass Contracting

Upper Whites Branch Stream Restoration

To prepare the Upper Whites Branch Stream in Fort Worth, Texas for development, Peloton Land Solutions had to eliminate a 50-year-old stock pond and ephemeral stream.

"The pond was almost a complete mystery with regard to design and construction standards, embankment, composition, and foundation," said Tim Whitefield, project engineer for Peloton Land Solutions. "Aside from some trees on the embankments, it appeared to be in good condition but the unknowns were too great to risk leaving it in place."

If the pond's dam were to breach, two major highways would be overtopped by the water and nearby residences would have succumbed to flooding. To prevent such a disaster, the project team chose to bring the stream channel back to its natural form—all the way down to the limestone formations. The design team took careful effort to make the formations look like those naturally occurring in the environment, while also serving as grade control for the project area.

"I had taken pictures of a nearby natural stream that had down-cut into fractured limestone, creating natural drop structures of its own," Whitefield said. "When the initial dirt work on the site started uncovering lots of limestone boulders, it just made sense that they should stay on the site and serve in the same role as the limestone from the nearby stream."

Native plants clustered in hydrozones reduce long-term water usage, as well. State and federal agencies have used the area owned by Hillwood Properties as a training ground.

"The decision by Hillwood to restore 2,500 ln ft of White Branch within Bluestem Park offered us a unique opportunity to provide an educational open space to the community that simultaneously deals with drainage in a natural and ecologically responsible manner," said Russell Laughlin, executive vice president of Hillwood Properties.

Location: Fort Worth, Texas
Cost: $2.25 million
Size: 2,500 ln ft
Owner: Hillwood Properties
Designer: Peloton Land Solutions Inc.
Contractor: SWA, Conaster Construction, Nan Faith Arnold, Guaranteed Hydromulch, Alliance Landscape

Webb Bridge Park Water Quality Improvements

Lake Windward, the largest lake in Alpharetta, Ga., was a financial liability for the city. It required constant upkeep and regular dredging to remove sediment, which was negatively impacting the environment and recreational use of a private lake.

Following an inquiry from the lake owner, the city established a team to study the area. The team conducted field assessments, measured water quality and performed hydrologic and hydraulic analyses. The city ultimately restored 350 ln ft of a local stream, installed three bioretention ponds, updated three parking lots and repaired aging storm water infrastructure.

"The success of these projects has shown that it is not as difficult to retrofit water quality measures into dated infrastructure as once thought," said Pam Bush, civil engineer for the city.

While attractive to the eye, the in-stream features and grading provided several management functions. Both sides of the stream reach incorporated a bankfull bench and the banks were tied back into the existing grade at a 2-to-1 slope. Rock J-hooks, step pools and riffles were constructed, and a geo-lift structure stabilized the banks while re-establishing vegetation.

Community involvement became an important facet of the project.

"[Residents] are fully invested in their local government and the future of the city," said Jill Bazinet, senior storm water engineer for the city. "The surrounding residents have always been involved in the park, but the environmental concerns downstream at Lake Windward helped prioritize this project."

Those living downstream from the project have noted improvements on their properties, particularly a reduction in erosion. The project's success extended beyond its practical use.

"Because of the park's location, it is an ideal spot for school children to learn about water quality sampling and protection of our natural resources," said Terry Porter, environmental programs coordinator for the city of Alpharetta.

Location: Alpharetta, Ga.
Cost: $900,000
Size: 95-acre park, 350 ln ft of stream restoration, 1.3 acres of bioretention
Owner: City of Alpharetta
Designer: Manhard, Woolpert
Contractor: River Works Inc., Blount Construction Co. Inc., Tri Scapes Inc.