Aging infrastructure, a skyrocketing world population and shrinking budgets have, at times, painted an uncertain future for water and wastewater management. Still, innovation continues to propel tens of thousands of noteworthy efforts, and they are flourishing amidst challenges.

From June to August 2011, Water & Wastes Digest (WWD) encouraged project leaders to submit entries showcasing industry-specific projects in design or construction during the past 18 months.

Nominated projects ranged in terms of goal, size and price up to $277 million. The editorial staff selected the winners based on the kinds of obstacles that were faced and overcome by all parties involved with the project, as well as final goals achieved and success met. WWD is proud to highlight these achievements in its annual list of Top Projects.

Thanks to all project leaders and representatives who took the time to submit entries and photos for our awards program, and congratulations to the owners, designers and contractors honored in WWD’s 2011 Top Water & Wastewater Projects.

Winner profiles, compiled by WWD editorial staff member Jeff Zagoudis, are featured on pages 24 to 42.

For more information, contact Water & Wastes Digest at wwdeditor@sgcmail.com.

For more information, write in 1102 on this issue’s Reader Service Card.
Location: Davie, Fla.

Owner: Town of Davie, Fla., Utilities Department

Designer: AECOM

Contractors: Crom Corp.; Dunkelberger Eng. & Testing; Encore Construction Co.; Florida Design Drilling Corp.; Gulf Building; Metro Equipment; Miller Legg; Sinns & Thomas Electrical Contractors Inc.; Triple R Paving; Youngquist Bros. Inc.; Zager Plumbing & Solar Inc.

Cost: $101.9 million

Size: 9.5 mgd

The Town of Davie Water Treatment & Water Reclamation Facility Project – Phase II, Construction Services

The town of Davie, Fla., was established in the early 1900s. At present, the utilities department handles the water and wastewater needs of more than 30,000 residents; by the year 2030, that number is expected to skyrocket past 90,000 customers.

To date, a number of water treatment plants (WTPs) in south Florida have been able to draw freshwater from the Biscayne Aquifer, which covers roughly 4,000 sq miles. Raw water wells connected to this aquifer commonly sit at a depth of 100 to 150 ft.

The South Florida Water Management District, however, recently capped the amount of water that could be extracted from the source. As a result, any new facilities would have to draw brackish water from the Floridan Aquifer at a depth of approximately 1,400 ft. Construction began on the new WTP and water reclamation facility (WRF) in November 2010.

While planning the project and through all phases thus far, sustainability has been a driving force behind decision-making. Each facility, when completed, will employ cutting-edge technology to treat incoming wastewater. Reverse osmosis technology will be used at the WTP, with Aerex providing the system.

The WRF posed an additional challenge, as it needed to be in close proximity to its potential users, which include golf courses and educational institutions. Consequently, the site chosen was fairly small. To minimize the new facility’s footprint in the area, membrane bioreactor technology will drive the treatment process.

When the complex is complete—the expected finish date is in August 2013—it will encompass the WTP and WRF, an administrative building, two odor control facilities and a small “pocket park” open to the public.

“The project presents us with a challenging and professionally satisfying opportunity to provide our valued client with innovative, state-of-the-art, world-class facilities to serve the citizens of the community well into the future,” said Brian Stitt, project manager. “It will also advance the town’s goals of sustainability through water reuse and will conserve valuable water resources in an environmentally sensitive area.”

The project was designed to achieve LEED Silver certification and was built to conserve an estimated 30% of water usage and 21% of energy compared to existing comparable facilities.

The project will also include a small “pocket park” open to the public, which features native plants and water features such as a rain garden and a segment of the new wastewater plant that is exposed to the public to showcase the technology used to treat wastewater.
The Emerald Coast Utilities Authority (ECUA) was called into action after Hurricane Ivan hit Pensacola, Fla., in September 2004. The town was battered by winds in excess of 100 mph and storm surges of 15 ft or more. To make matters worse, the Main Street Water Treatment Plant was one of the casualties, losing power for three days during this critical period. As a result, storm water, storm surge and raw sewage flooded portions of the downtown area.

While this turn of events underscored the need for improved facilities, plans already were in the works. Numerous areas of the plant—some of which were part of the original 1970s construction—were not up to the specifications of the Florida Department of Environmental Protection and needed to be addressed.

These requirements, combined with the assurance of more hurricanes down the line, prompted ECUA officials to take action. They quickly came up with a plan to build a modernized, hurricane-resistant wastewater treatment facility outside the city.

Site selection was the first key element to consider. The new plant would need to be built at an elevation beyond the reach of a Category 5 storm surge, and near possible reuse sources for the treated wastewater. Project planners ultimately chose a location just outside of Cantonment, Fla., 15 to 20 miles inland from Pensacola.

WesTech Eng. was brought in as the manufacturer. They installed four OxyStream oxidation ditches, a five-step treatment system for activated sludge. The new facility also features a pair of Clarifier Optimization Package clarifiers. By the time the facility was completed in August 2010, it was officially the largest public works project in the history of Escambia County, Fla.

“As this project provides 100% reuse water for two neighboring industrial facilities at a total design for 23 million gal per day, we believe this project is in a class of its own,” said John Richens, WesTech group leader, process applications. “[We are] proud to be a part of such a monumental project that will make such a huge positive impact to the environment.”

ECUA Central
Wastewater Treatment Plant Project

Location: Pensacola, Fla.
Owner: Emerald Coast Utilities Authority
Designer: Baskerville-Donovan Inc.
Contractor: Brasfield & Gorrie
Cost: $2 million
Size: 22.5 mgd
**Constructed Wetland for CSO Treatment Project**

Washington, Ind., a town of 12,000 in the southwest part of the state, was having serious problems with combined sewer overflow. The situation was so bad that just one-tenth of an inch of rain could produce a backup of gray, dirty, untreated water that ended up in nearby Hawkins Creek. A 2001 survey registered unsafe levels of biochemical oxygen demand, total suspended solids and ammonia.

Initially, the city enclosed the drainage ditches and creeks, which limited the runoff but still did not tackle the issue of water quality. The town conducted another study in 2002 to assess its options and found that proper treatment of runoff would cost almost $40 million. With that number only going up, and a median household income of $34,000, Washington was going to have to find another way.

Talks between town officials, eventual project designer Bernardin, Lochmueller & Associates, and the Indiana Department of Environmental Management resulted in a solution: a constructed wetland. The concept is fairly new—the Washington wetland, when completed, will be only the second of its kind in the U.S.—and the process is quite complex.

Storm water is filtered into a 4-million-gal storage tank and sent over to a treatment plant, while any overflow is carried to the wetland itself, which encompasses 27 acres. How long the overflow stays in the wetland is determined by a SCADA system. Following treatment, the effluent passes through an ultraviolet disinfection system before reaching Hawkins Creek, its final destination.

The new system has a variety of other features to assist with purification, including tools for fine particle removal, an underdrain system to allow dewatering for maintenance purposes, and a recirculation system to control soil moisture. Crews also planted foliage known for its ability to adapt to changes in water level and soil moisture. As a bonus, the wetland will remain saturated even in times of drought thanks to its depth and the natural geology of the area.

“Designing projects that help communities save money and protect the environment is a reward in itself,” said Project Manager Mark Harrison, P.E., LEED AP. “To be recognized for following your passion makes it all the better.”

**Location:** Washington, Ind.
**Owner:** City of Washington, Ind.
**Designer:** Bernardin, Lochmueller & Associates Inc.
**Contractors:** Bowen Eng. Corp.; Koberstein Trucking; Gradex; Daylight Farm Supply; Capitol Electric; Integrity Eng.; MPC Containment Intl. LLC; Whaley Steel
**Cost:** $26.4 million
**Size:** 21-million-gal, 27-acre wetland; 4-million-gal storage tank
By 2008, the sewer system in Fruitland, Md., was more than 40 years old and in need of repair. Both manholes and sewer pipelines had significant wear and tear, with cracks spreading throughout the system. This led to water infiltration to the system, which reduced the capacity of the municipal wastewater treatment plant.

City officials needed to increase the capacity of the plant but also wanted to avoid expanding the plant itself. This meant reducing the volume of infiltration and inflow to the sewers. This proved to be no small feat thanks to the high groundwater table and sandy soil beneath the city. Planners also needed to come up with an approach that would be suitable for the varying field conditions at the sites.

Ultimately, they decided on a two-phase project. The first phase would focus on manhole rehabilitation, while the second would rehabilitate the pipelines. The order of work for each phase was determined by the potential for inflow and infiltration at a given site.

In Phase I, workers prioritized manholes based on age, depth, location and condition. Initially, each manhole was grouted to help seal up any cracks. From there, SpectraShield of the Carolinas installed a three-layer polyurea lining beneath each manhole.

Once manhole rehabilitation was complete, efforts switched to fixing the pipelines. Fruitland’s sewer system features 10,800 ft of pipes ranging in width from 8 to 18 in. The first step was adding cured-in-place pipe lining throughout, utilizing either a water, steam or ultraviolet light cure. In total, the city patched up 122 manhole covers. In addition to large cracks, there were a number of lateral-to-mains connections that had sprung a leak.

“We are extremely proud of this infiltration and inflow project and the positive impact that it has had on the city of Fruitland’s wastewater treatment plant capacity,” said Amanda Pollack, P.E., of George, Miles & Buhr.

**Fruitland Infiltration & Inflow Removal Project**

*Location: Fruitland, Md.*

*Owner: City of Fruitland, Md.*

*Designer: George, Miles & Buhr LLC*

*Contractors: Manhole Rehabilitation; SpectraShield of the Carolinas; AM-Liner East Inc.*

*Cost: $900,000*

*Size: 10,800 ft of pipeline; 122 manholes*
Location: Costa Mesa, Calif.
Owner: Mesa Consolidated Water District
Designer: Carollo
Contractor: MWH Constructors; Brutoco Eng. & Construction
Cost: $16.9 million
Size: 8.6 mgd

Colored Water Treatment Facility Technology Replacement & Expansion Project

Situated in southern California, the town of Costa Mesa has always had an issue with naturally occurring organic materials (NOMs) in its groundwater, giving it a tea-colored appearance. The offending tint is due to an ancient, submerged redwood forest located hundreds of feet below the surface, within the aquifer Mesa Water uses.

While the water remains safe to drink, the district’s existing Colored Water Treatment Facility (CWTF) has been unable to remove all NOMs. This has forced the district to import some of its water from outside sources. A new water treatment facility will increase the district’s ability to produce its own water, saving money in the process.

In January 2011, Mesa Water began the process of building a new CWTF, which first meant demolishing the current plant. With that step done, construction could begin on the new facility, complete with a state-of-the-art nanofiltration system manufactured by Biwater-AEWT. This approach makes use of membrane technology to weed out any undesirable foreign materials.

A degasifier system, provided by Jacobs Air Water Systems, is also in the plans for removal of methane and hydrogen sulfide gases, while an onboard chemical scrubber will prevent any gaseous odor from escaping into the surrounding community.

Project planners have given themselves a tight deadline for completion: The expected finish date is mid-July 2012. The construction site is fairly small, which presents its own set of challenges. In addition to the treatment facility itself, Carollo and Mesa Water are designing a 3,400-sq-ft landscaped area around it. Visitors will be able to see mature redwoods and other native plant species along numerous footpaths, complete with a gazebo.

“The facility has always produced soft, high-quality water,” said Fred R. Bockmiller, Jr., P.E., Mesa Water Board president. “The CWTF Improvements Project expands capacity, reduces energy cost and will help the district achieve its goal of being 100% locally reliable by 2012.”
Lake Waco is a primary water source for the citizens of Waco, Texas, a growing college town. The watershed surrounding the lake has the highest concentration of dairy farms anywhere in the state, which means high nutrient loadings and algae growth. When the algae bloom, they release the organic compound geosmin, which gives the water an unpleasant taste and odor.

Prior to 2005, potable water from the lake flowed into two separate water treatment plants (WTPs): One had a 42-million-gal-per-day (mgd) capacity, and the other held 24 mgd. City officials found the existing facilities were not able to correct the geosmin problem, making the water virtually undrinkable at points throughout the year.

While water quality was an issue, the city also wanted to expand its capacity for water treatment. City officials decided a dissolved-air flotation (DAF) plant was the answer to both questions. The first step was getting regulatory approval for the idea. This led to a series of five pilot studies, which gained the desired endorsement and also increased the load rating from the standard 6 gal per minute (gpm) per square foot to 12 gpm per square foot; the increase resulted in approximately $10 million in construction cost savings.

In 2005, work began on Texas’s first DAF plant. The building was sited directly adjacent to Lake Waco for quicker algae removal. To prevent stray odor from escaping, the design team covered the DAF cells, supplied by Leopold. Trapped air then was blown directly into the lake to reduce the algae infestation and improve fishing.

The design team wanted to make the new plant as inconspicuous as possible, which led them to build 75% of the buildings underground, including the ozone facilities and balancing basins. The DAF plant was completed in June 2011.

The original WTPs were kept intact, with new biological filters installed to help remove organic carbon after ozonation. Residents have noticed a marked difference in water quality, as evidenced by blind taste tests conducted by a local newspaper.

“This project has been a great win for everybody,” said Brain Fuerst of CH2M Hill. “The water quality improvement has been incredible. Water quality has gone from a source of woe to a source of pride for the city of Waco.”
Gwinnett County, located in north central Georgia near Atlanta, found itself needing to replace six aging wastewater treatment plants to increase capacity. A new building (or buildings) by itself was not enough, as the county Department of Water Resources (DWR) also was looking to update the processes used to treat the incoming water.

Rather than restoring each of the facilities, the DWR has decided to expand and update the Yellow River Water Reclamation Facility (WRF), moving its holding capacity from 14.5 million to 22 million gal per day. Development began in February 2006 and is ongoing, with completion expected at the end of 2012.

Taking this approach, the DWR essentially will consolidate the six existing buildings into one state-of-the-art facility. Besides increasing capacity, it will decrease operating costs and the amount of pollution discharged into the Yellow River basin.

Even a brand-new facility, however, is only as good as its upkeep. For that reason, DWR is utilizing a computerized maintenance management system to keep the plant running in tip-top shape. The operation and maintenance staff will be able to use the new system, which will link to the county’s asset management system, to generate and track work orders for routine and corrective maintenance.

Concerns for the environment, both natural and man-made, are of top priority to all involved. In the spirit of being a good neighbor, the Yellow River WRF will employ enhanced odor control measures to keep the surrounding area pleasant.

The hope for the new operations center is that it can achieve Leadership in Energy and Environmental Design (LEED) Silver certification. It would be the first LEED certification for the DWR, which it would use to establish itself as a model for future facilities and facility improvements.

“The Yellow River project is being designed and constructed through an alternative project delivery approach that is providing excellent value to the owner, ahead of schedule and under budget,” said Jim Grum, project manager. “Our integrated project team is excited to have our project chosen as one of the 2011 WWD Top Projects.”
The E.M. Johnson Water Treatment Plant (WTP) in Wake County, N.C., serves Raleigh and six neighboring cities in the eastern part of the county. Faced with continued population growth in the area, Raleigh officials wanted a new facility to supplement the 86-million-gallon-per-day capacity of the Johnson WTP, thereby accommodating local growth through projected 2018 totals. They also hoped to make the drinking water system less vulnerable to extended drought conditions.

Construction began on the 55-acre site of the Dempsey E. Benton WTP in April 2007. The design team from Arcadis G&M formed a close partnership with Archer Western Contractors, which kept the entire process running smoothly. As construction went along, the city expressed an interest in achieving Leadership in Energy and Environmental Design (LEED) Silver certification for its new plant; Archer and Arcadis were quick to respond.

They brought in ITT Water & Wastewater USA (now Xylem) to provide WEDECO ozone and low-pressure/high-intensity ultraviolet (UV) disinfection systems for the new facility. The design team is awaiting state acceptance of UV credits for the method as a viable pathogen control. In the interim, the plant will use a chemical process to treat incoming potable water.

The design team placed a high priority on safety throughout the entire construction process, even as safety codes changed between the project’s beginning and end stages. Planners specifically referenced an effective safety program during the request-for-proposal process. In the end, contractors did not experience a single lost-time injury in the 524,000 man-hours required to finish the job.

“We are extremely pleased that our customer, the Dempsey E. Benton WTP, has been named a 2011 Top Projects winner,” said Karl Buscher, managing director of ITT Water & Wastewater (Xylem). “The management of the plant remains on the cutting edge of water treatment technology, and the accomplished treatment plant along with its team is an excellent choice for the award.”

Location: Raleigh, N.C.
Owner: City of Raleigh, N.C.
Designer: Arcadis G&M of North Carolina
Contractors: Archer Western Contractors; Walsh Group Chicago
Cost: $97.5 million
Size: 20 mgd
As the city of Stuart, Fla., grew over the decades from a small town to a large riverfront community, the wastewater treatment facility (WWTF) never really kept pace. Homes and businesses kept getting built closer to the plant until there was no more room for expansion.

City officials knew they had to do something but were unsure how to proceed. Moving the entire facility would have been one option, but they quickly realized that would be an expensive proposition. There also were concerns about the air quality in and around the facility that relocation would not solve.

The problem persisted for several decades with no clear solution in sight. Then in 2010, the city came upon an answer: Instead of moving the WWTF, it would “hide” the plant from the community, integrating it with the surrounding neighborhood. Work began on a series of projects in May 2010 that would work toward this ultimate goal.

To achieve the goal of integrating the WWTF with its environment, the design team needed to be sure the facility served the community’s needs. For that reason, the WWTF underwent a complete transformation into a water reclamation facility (WRF). As a WRF, the new service could make a direct contribution to the community by providing a high-quality water source.

Once the change was made, the next challenge was creating aesthetic unity with the plant’s neighbors—namely the county courthouse and a sports complex. The design team at Culpepper & Terpening opted to enclose the entire WRF in a decorative precast wall system and install solar lighting and additional landscaping. To conceal the equipment from higher elevations, such as the courthouse next door, designers used 3-D laser scanning to determine roof styles, elevations and colors.

“The city of Stuart is extremely proud to be recognized by Water & Wastes Digest for the city’s WRF,” said David Peters, assistant director for the city of Stuart Department of Public Works. “Faced with the unique challenges of a WRF located in a downtown setting, the city and its consultants have successfully ‘hidden’ the WRF by creating structural features and landscape enhancements that blend the facility with a natural inner-city setting.”
The Municipal Utility District (MUD) No. 25 of Ft. Bend County, Texas, wanted to improve its water conservation efforts in the area. Before starting Phase I of its wastewater effluent reuse program in March 2007, most of the potable water in the district was going to two sources: the Houstonian Golf Club and the Orchard Lakes Home Owners Assn. Both organizations were using the water for landscaping, specifically amenity ponds, and for irrigation purposes.

The district wanted to ensure that all of its customers were getting the most use possible from the potable water. It began work, therefore, on a two-phase project to correct the situation, with the ultimate goal of eliminating the use of groundwater or potable water in amenity ponds. MUD No. 25 also hoped to significantly reduce the amount of potable water used in landscape irrigation.

The first phase involved redirecting the wastewater treatment plant’s effluent from nearby Oyster Creek to the golf course and the homeowners association. Getting both users to agree to the switch proved difficult at first, but the district worked to educate them on the benefits of using treated effluent both for themselves and the community.

Once the two major users were on board, the design team could concentrate on everyone else. Phase II of the program, which is ongoing, saw the district implementing the treated effluent solution for other area businesses and organizations using potable water for landscaping and irrigation.

While the district achieved its practical goals, the environment reaped benefits as well. MUD No. 25 points out that every gallon of treated effluent used is one less gallon of groundwater pumped into a plant, treated chemically and put back into nature.

“Our company, constituents, and the local and regional environment enjoy great benefits as a result of implementing the reuse program,” said C. Nicole Cempa, director of risk management and regulatory compliance for MUD No. 25. “We take great pride in being on the forefront of such a worthwhile endeavor.”

Location: Sugar Land, Texas
Owner: Ft. Bend County, Texas, Municipal Utility District No. 25
Designer: Camp Dresser McKee
Contractor: JTR Contractors Inc.
Cost: $1.9 million
Size: 1.5 miles of pipe