2014 Top Water & Wastewater Projects

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Infrastructure needs and the limited funds to address them continue to present cities and municipalities with many challenges; however, great work continues to be done.

From May to July 2014, *W&WD* encouraged project leaders to submit entries showcasing industry-specific projects in design or construction during the past 18 months.

Nominated projects differed in terms of goal, size and price, from $55,000 to $10 billion. This year's winners were selected based on the variety of obstacles faced and overcome by all parties involved with the projects, as well as final goals achieved and success met. *W&WD* is proud to highlight these achievements in its annual showcase of Top Projects.

Thanks to all project leaders who took the time to submit entries and photos for our program, and congratulations to the owners, designers and contractors honored in *W&WD*'s 2014 Top Projects.

Winner profiles, compiled by *W&WD* associate editor Amy McIntosh, are featured on pages 24 to 34.

For more information, contact *W&WD* at wwdeditor@sgcmail.com or write in 1103 on this issue's reader service form on page 73.

Hampton Roads Sanitation District Army Base Treatment Plant Improvements Phase III Project

PHOTO: HDR

Location: Norfolk, Va.
Owner: Hampton Roads Sanitation District
Designer: HDR
Contractors: Archer Western Constructors, Berg Electric
Manufacturers: Ovivo, Evoqua, Sanitaire (Xylem), Hydro Intl., Philadelphia Mixers
Cost: $105 million
Size: 18 mgd

HDR led the design for a $105 million improvement project at the Army Base Treatment Plant in Norfolk, Va., for the Hampton Roads Sanitation District (HRSD). The project's goals were threefold: improve nutrient removal, upgrade aging equipment and install a plant-wide distributed control system. The plant received the National Association of Clean Water Agencies' (NACWA) Platinum Award for 27 years of National Pollutant Discharge Elimination System permit compliance. The Army Base Treatment Plant holds the record for the longest time period to qualify for such an award from NACWA.

The improvements include a new preliminary treatment facility with fine screens, raw wastewater influent pumps and grit removal equipment. Additionally, new biological process tanks will house operation of a five-stage nitrification/denitrification process with biological phosphorous removal. These upgrades will help the plant meet an annual average effluent limit of 5 mg/L total nitrogen and 1 mg/L total phosphorous. To account for potential permit changes, the upgrade also will accommodate the future addition of effluent filters to meet a possible limit of 3 mg/L total nitrogen and 0.3 mg/L total phosphorous.

The project began in 2008 and is scheduled for completion in March 2015. Throughout the duration of the project, plant operations continued, continually meeting effluent limits throughout the process. To accommodate additional treatment processes while maintaining plant operations on the congested construction site, HDR and HRSD developed a memorandum of understanding with the neighboring Port Authority to give the team additional land access for construction.

"One important accomplishment is the team's efforts to meet permit through this difficult project," said Bruce Husselbee, P.E., director of engineering for HRSD. "I think the plant staff, HDR and the contractor are to be given credit for accomplishing this achievement."

City of St. Cloud Wastewater Treatment Facility Rehabilitation, Upgrade & Expansion Project

Location: St. Cloud, Minn.
Owner: City of St. Cloud
Designer: Black & Veatch
Contractors: Knutson Construction, Shank Constructors
Manufacturers: Aurora (Pentair), Superior Boiler, Trojan Technologies, Moyno, WesTech, Philadelphia Mixers, Caterpillar/Ziegler, Turblex
Cost: $41 million
Size: 17.9 mgd

Built in 1976, the St. Cloud (Minn.) Wastewater Treatment Facility leases its capacity to five surrounding cities. The aging facility was rehabilitated for mechanical and electrical reliability, increasing its treatment capacity to 17.9 million gal per day. The project also included the addition of a biological nutrient removal (BNR) treatment process for the removal of nitrogen and phosphorous.

The main electrical power feed to the facility was moved to a new building and a 2,000-kW generator was installed. A modified Johannesburg process—which included an anaerobic recycle, a mixed liquor recycle, low-energy vertical mixers and a series of baffles walls—also was included in the upgrade.

To increase capacity, a fourth treatment train was added and existing final classifiers were repurposed as additional oxic volume for the three existing treatment trains. To ensure flexible operations, variable speed mixers and swing zones were included in the BNR process, allowing the facility to run in two different treatment modes.

Upgrading the almost-40-year-old facility came with its share of challenges. The conditions of many areas of the site were unknown, so a number of contingency plans were in place. Additionally the installation of new equipment—the BNR process, new clarifiers and ultraviolet disinfection—proved to be more difficult because of the lack of elevation differences on site.

The team was able to maintain existing treatment quality and capacity throughout the four-year project. Ten pages of the project's specifications outlined the facility's operations and the sequence of work. The team installed the new, fourth treatment train first, so that each existing train could be rehabilitated and upgraded one at a time. The project was completed in April 2014.

To complete the project, the city was required to gain financial and political support from the five neighboring cities. A group of stakeholders known as the St. Cloud Area Wastewater Advisory Commission—created in the early stages of the project—helped select the consultant to develop the facility's plan and directed the creation of guidelines outlining responsibility for project and ongoing operation and maintenance costs.

"The staff in the St. Cloud Public Utilities Department were directly involved in the planning, design, construction oversight and optimization of the facility to ensure efficient and effective operation," said Patrick Shea, public services director for the city of St. Cloud. "Large investment in a facility like this is not possible without ratepayers, city leaders and community support. The investment helps illustrate the strong environmental stewardship of the city of St. Cloud."

Bozeman, Mont., Water Reclamation Facility Improvements Project

PHOTO: SCOTT DOBRY PICTURES / HDR

Location: Bozeman, Mont.
Owner: City of Bozeman
Designer: HDR
Contractors: Williams Brothers Construction, McAlvain Construction, Morrison Maierle Inc.
Manufacturers: ABS Sulzer, Trojan Technologies, Huber, Peerless (Grundfos), Wilo Emu, Sanitaire (Xylem), Philadelphia Mixers, WesTech
Cost: $52,539,687
Size: 8.5 mgd

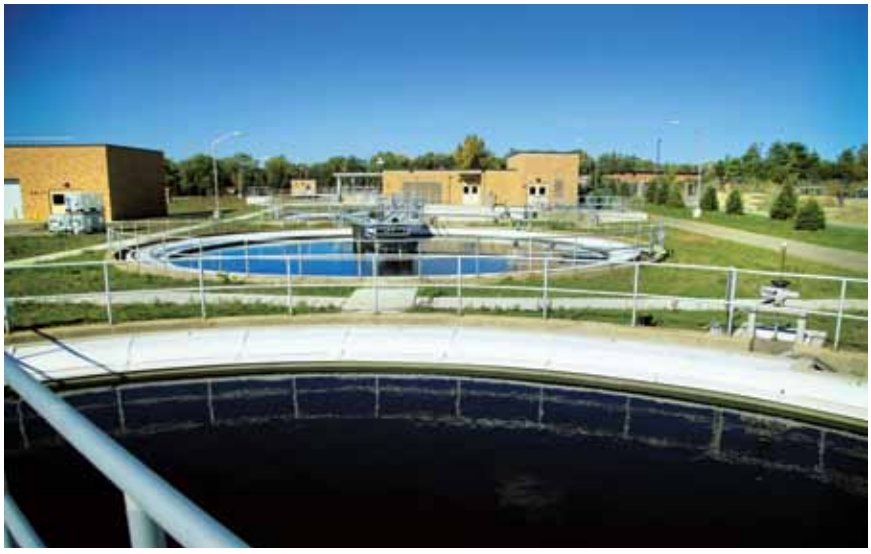
In order to keep up with rapid population growth by increasing plant capacity, and to meet revised discharge limits, the city of Bozeman, Mont., embarked on an upgrade of its wastewater treatment plant.

The upgrade of the Bozeman Water Reclamation Facility (WRF)—the largest public works project in the city's history—was completed in September 2014. During the four-year design and construction phase, the plant was able to operate and successfully meet its discharge permit.

The plant's effluent accounts for 33% of the total summer flow to the nearby East Gallatin River, which experiences low flow in the summer and has elevated background nutrient concentrations. The Montana Department of Environmental Quality was prepared to develop the total maximum daily loads for nitrogen and phosphorous, and the Bozeman WRF was likely to receive strict discharge limits because of the plant's significant contribution to the river. Because of this, the city decided to upgrade the plant's existing processes to meet the potential new limits while design of the other facility improvements was in progress.

HDR assisted the city with the implementation of a retrofit of the existing aeration basins to incorporate a phased nitrification/denitrification process for improved nitrogen removal. This five-stage Bardenpho biological nutrient removal process enabled the city to meet the more restrictive nitrogen discharge requirements of their new permit. The process also has the ability to provide chemical precipitation for future phosphorous removal.

"We are producing some of the best effluent quality in the state of Montana, and that's very good for the small trout stream we discharge to and for the whole watershed," said Herb Bartle, superintendent of the Bozeman Public Works WRF. "The overall quality of the equipment and the process itself allows us to continually produce excellent effluent."



Village of Deerfield, Ill., Water Reclamation Facility Modifications Project

Location: Deerfield, Ill.
Owner: Village of Deerfield
Designer: Strand Associates Inc.
Contractor: Joseph J. Henderson & Son Inc.
Manufacturers: KSB, Envirex (Evoqua), Centrisys, Kaeser, Ovivo, Trojan Technologies
Cost: $29.45 million
Size: 30 gpm

The Deerfield (Ill.) Water Reclamation Facility had a history of wet weather flow issues. With an average daily flow of 3.5 million gal per day (mgd), the plant could reach more than 27 mgd during wet weather events.

Not equipped to handle such elevated flow, the plant could only pass up to 8 mgd through activated sludge treatment due to the limited capacity of the intermediate screw pumps. The rest of the flow would be sent to excess flow clarifiers, followed by an excess flow storage pond. Neither of these storage options could be completely emptied, thus significantly limiting the storage capabilities of the plant.

The team designed and built a new treatment plant on top of an existing and operating facility, while continuing to meet permit requirements. Designed to address the wet weather capacity issues while simplifying the treatment process, the upgrade included the removal of primary clarifiers, trickling filters and anaerobic digestion. Ultraviolet disinfection replaced chlorination and dechlorination chemicals, while a centrifuge replaced sludge drying beds. A new influent pump station was built and a final clarifier and additional aeration tank were installed.

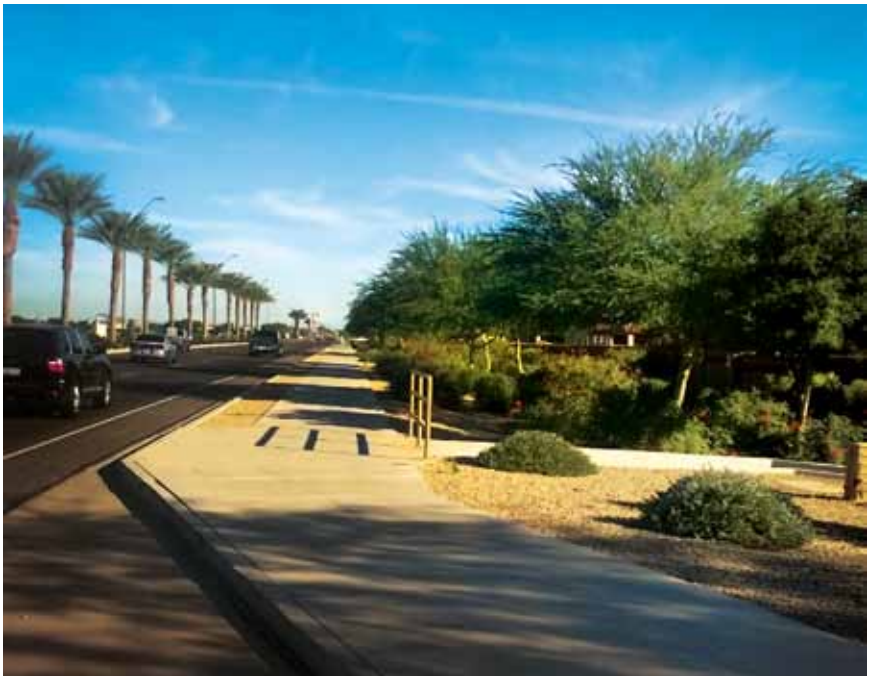
Construction was carefully planned, allowing the facility to remain operational throughout the project. The additional aeration tank was built and one-third of the tankage was modified, as two-thirds of the existing tankage handled the treatment process. This was coordinated with construction of the new pumping station, modifications to influent sewers on both sides of a nearby river, and demolition of a trickling filter and clarifier to allow installation of a major pipe.

The design of the new facility addressed the wet weather flow problem by increasing the amount of flow to the aeration tanks and allowing for the complete removal of water from the clarifiers and storage pond.

Additionally, the facility's administration building achieved LEED Silver certification, including using the plant's effluent for heating and cooling. The grounds are also home to nine rain gardens and bioswales, low-maintenance grasses and native plants.

"Construction was a collaborative effort whose success depended on all parties. Coordination and teamwork were evident," said Barbara K. Little, P.E., director of public works and engineering for the village of Deerfield. "Weekly construction meetings were held with the general contractor, engineer and village personnel. Mutual respect was evident at every meeting, even in difficult times. All team members are extremely proud of the work we were able to accomplish for Deerfield and the region."

City of Goodyear, Ariz., Vadose Injection Project



Location: Goodyear, Ariz.
Owner: City of Goodyear
Designer: Brown and Caldwell
Cost: $3.4 million
Size: 8,300 acre-ft per year

Located in the arid southwest, Goodyear, Ariz.'s 157th Ave. Water Reclamation Facility aims to maximize its water supply to ensure sustainable water resource management. By creating injection wells in the unsaturated zone between the surface of the earth and the water table—known as the vadose zone—the city is generating 3,500 acre-ft per year of reclaimed water, with the goal of reaching 8,300 acre-ft per year at build out, with a total of 15 injection wells.

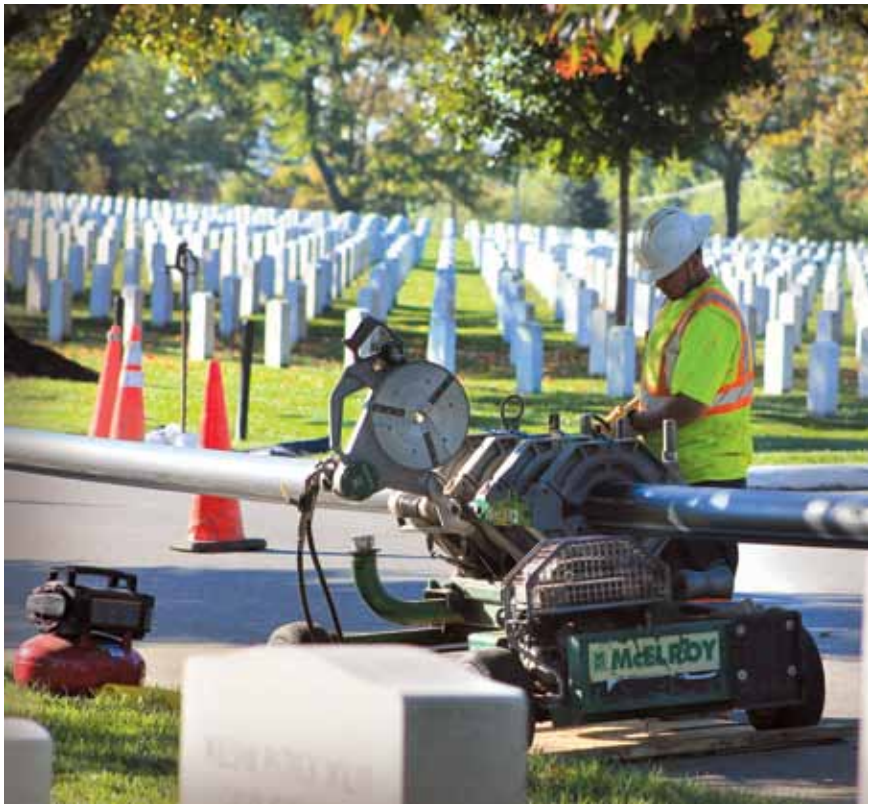
The vadose injection project is intended to recharge and replenish the aquifer that is the source of the city's water supply, as well as store water underground for future use in times of drought or other water shortages. The city will be able to bank long-term groundwater storage credits to generate income or to use instead of alternative, more expensive water supplies.

The wells will minimize the need for secondary non-potable reclaimed water infrastructure by instead implementing permitted recovery wells, served within the city's potable water supply system. Recharged water also will help the city meet groundwater replenishment obligations under the state's current laws.

The project's proximity to sensitive environmental sites has been the greatest challenge thus far. It is located near two Comprehensive Environmental Response, Compensation, and Liability Act sites—the Phoenix Goodyear Airport (PGA) North and PGA South—and one State Water Quality Assurance Revolving Fund (WQARF) site. PGA North is 2 miles northeast of the site, PGA South is 1.25 miles east of the site, and the Western Avenue WQARF is 2 miles southeast.

Working with the U.S. Environmental Protection Agency and the Arizona Department of Environmental Quality, the city strategically chose well locations to ensure rising water levels associated with the project do not impact the groundwater remediation activities at these sites.

"The city of Goodyear is committed to creating a sustainable environment for our citizens," said Georgia Lord, mayor of the city of Goodyear. "The vadose injection project allows us to replenish our water supply as well as improve the quality. It also gives us the opportunity to partner with the Superfund regulatory agencies and the responsible parties to enhance the clean-up efforts. It's a win-win for our community."



Arlington National Cemetery Water Main Replacement Program

Location: Arlington, Va.
Owner: U.S. Army
Designer: U.S. Army Corps of Engineers Norfolk District
Contractors: Murphy Pipeline Contractors
Manufacturers: TT Technologies , ISCO Industries
Cost: $7.6 million
Size: 38,500 ft of pipe

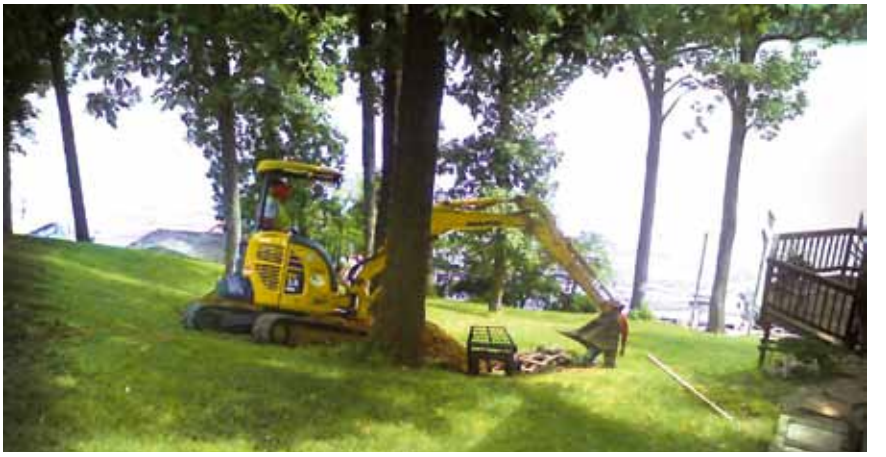
Founded in 1864, Arlington National Cemetery in Arlington, Va., is a military cemetery spanning 624 acres across the Potomac River from the nation's capital. More than 60 years ago, 38,500 ft of cast iron water main were installed underground to support fire suppression and potable water needs at the cemetery.

In July 2014, the U.S. Army Corps of Engineers completed the replacement of the existing 6-in.-diameter cast iron water main with 6-in.-diameter high-density polyethylene (HDPE) pipe.

The cemetery hosts an average of 25 to 30 funerals per day, as well as up to four million tourists and visitors each year. There were no plans to close the cemetery to burials or visitors throughout the construction process, so crews worked in five phases to replace the pipe. Out of respect, the crews stopped work and shut down equipment during funeral processions and services.

Pre-chlorinated pipe bursting was used to reduce the impact of construction to both the environment and the cemetery activity. The contractors fused 300- to 600-ft lengths of HDPE pipe away from cemetery operations, bacteriologically disinfected each section, and installed the new main. The existing main was pipe burst, a post-chlorination and flushing of the main was performed, and the new line was connected into the distribution system. The new pipe has a 100-plus year design life.

"The project progressed without incident and is a true testimony to the pre-chlorinated pipe bursting technology and the team atmosphere to replace the extensive water main system with little to no impact on the cemetery and its daily activity," said Andy Mayer, president of Murphy Pipeline Contractors. "Teamwork was vital to ensure a successful project. The Norfolk District U.S. Army Corps of Engineers and Arlington National Cemetery personnel showed great resolve in working with our crews to properly plan, adapt and execute the project."



PHOTOS: GRW ENG.

Twin Lakes Low-Pressure Sewer System Project

Location: White & Carroll counties, Ind.
Owner: Twin Lakes Regional Sewer District
Designer: Reynolds Inc., Clyde E. Williams & Associates, RheinBach Eng., GRW Eng.
Contractors: Reynolds Inc., HRP Construction, Rothenberger Construction
Manufacturers: Environment One Corp., Gorman-Rupp
Cost: $63.5 million
Size: 2,838 acres; 100-plus miles of shoreline

In 2000, the Twin Lakes Regional Sewer District (TLRSD) set out to clean up Lake Freeman and Lake Shaffer, reservoirs of the Tippecanoe River in north-central Indiana. Failing septic systems were contaminating the lakes with *E. coli*, so the TLRSD was looking for an environmentally sound sewer alternative to improve public health and safety.

Because of the rural area's rough terrain of water tables and bedrock, along with small towns and isolated homes, the TLRSD could not afford a traditional gravity system. Engineers instead opted for a $63 million low-pressure sewer system, which was not only less expensive than a gravity system, but also required shallow trenching and thus caused less environmental damage.

What resulted was the largest grinder pump-driven low-pressure sewer system in the Western Hemisphere. The TLRSD replaced deteriorating septic systems in 14 areas with this system to improve water quality. More than 180 miles of high-density polyethylene pipe cross the lakes eight times and the Tippecanoe River three times.

The project was completed in December 2013. Currently, 5,071 grinder pumps are in the system, servicing approximately 8,000 residential and commercial customers, with an expected flow capacity of 1.285 million gal per day delivered to four separate wastewater treatment plants in the area.

"The mere scale of the project is further indication of grinder pump-driven pressure sewers not being the alternative, but being the appropriate technology solution for more environmentally conscious communities moving forward," said Eric Lacoppola, president of Environment One Corp.

City of Wilsonville Wastewater Treatment Plant & Improvements Project

Originally built in the early 1970s, the wastewater treatment plant in Wilsonville, Ore., was home to aging infrastructure and numerous odor complaints. The 2.25-million-gal-per-day (mgd) plant was in need of increased capacity, upgraded infrastructure and biosolids handling for regulatory compliance, improved odor control, and maximized plant space for future expansion.

As the first wastewater design-build-operate (DBO) project in the state of Oregon, the $44-million project included permitting, design, construction and commissioning. Additionally, CH2M Hill, the DBO delivery firm, will handle long-term operations, operations and maintenance (O&M), repair, and replacement of the upgraded plant. The 15-year operations contract includes an annual O&M fee of approximately $2 million per year.

Located in a residential neighborhood surrounded by trees, the site's tight footprint was a challenge for the construction crew. This, combined with the need to keep the plant fully operational throughout construction, proved difficult as most of the equipment was being repurposed or removed. Because of these issues, careful sequencing of construction was required. In addition, the trees presented environmental challenges, and buffer zones were created to protect the environmentally sensitive areas near the construction site.

Ultimately, plant capacity was expanded to 4 mgd and infrastructure modifications included improvements to the headworks, aeration basins, clarifiers, biosolids processing, and filtration and disinfection. The plant now is capable of producing Class A biosolids on site and it employs redundant equipment so the facility can operate with one major piece of equipment or process unit out of service. Functional and hydraulic equipment from the existing plant was repurposed to be used in the upgraded facility both during and after construction.

"This was an excellent project completed on schedule and within budget. The new facility resolves longstanding community complaints concerning odor from the plant, improves water quality and increases capacity to facilitate future growth for the city," said Eric Mende, project manager for the city of Wilsonville. "The teamwork approach and cooperative attitude amongst all of the project participants—the city, owner's representative, CH2M Hill and all of its subcontractors—created a true partnership, of which we are all proud."

Location: Wilsonville, Ore.
Owner: City of Wilsonville
Designer: CH2M Hill
Contractors: Wildish Building Co., Power City Electric, University Mechanical Contractors
Manufacturers: Sanitaire (Xylem), Sharpe Mixers, WesTech, Evoqua, Ozonia, Therma-Flite, EDI, Biorem Technologies, David P. Wilson Co., Flygt (Xylem), Wemco (Weir), Fairbanks Morse (Pentair), Seepex, Columbia Hydronics
Cost: $44 million
Size: 4 mgd

Colorado Springs Utilities Southern Delivery System Program

Location: Pueblo & El Paso counties, Colo.
Owner: Colorado Springs Utilities
Designers: Carollo Engineers, CDM Smith, CH2M Hill, Dewberry, Matrix Design Group
Contractors: Archer Western Construction LLC, ASI/HCP Constructors, Garney Companies Inc., Layne Heavy Civil Inc., McCarthy Building Companies, Western States Reclamation Inc., Wildcat Construction Co. Inc.
Manufacturer: Northwest Pipe Co.
Cost: $841 million (Phase 1)
Size: 50 miles of pipe, three pump stations, one 50-mgd treatment plant

To protect the water supply of Colorado's Pueblo and El Paso counties, the Southern Delivery System Program is working to provide water to communities in the area. When complete, the two-phase project will deliver Arkansas River water stored in the Pueblo Reservoir to the partner communities of Colorado Springs, Colo.; the city of Fountain, Colo.; Security Water District; and Pueblo West Metropolitan District.

In addition to providing a redundant method of water delivery for Colorado Springs' western slope water supply, it also maximizes the investment of the existing water infrastructure and offers future drought protection.

Phase 1 of the project included construction and installation of a reservoir connection at the North Outlet Works of Pueblo Dam, 50 miles of 66-in.-diameter underground pipeline, three pump stations, a 50-million-gal-per-day water treatment plant and a finished-water pump station.

Phase 2 will see the construction of two additional reservoirs and other system improvements.

The geography of the region has presented a number of challenges throughout construction. The South Pipeline 1 section of the system faced steep elevation; the pipeline had to travel under an active railroad line, then upward through a 90-ft-high bluff on the side of the railroad. Additionally, the variability of geological conditions of the Greenhorn Limestone formation also made construction difficult. A trenchless crossing was constructed, consisting of a 308-ft-long, 10-ft-diameter tunnel, dug at a slight angle into the bluff, connected to a 90-ft vertical riser shaft.

Construction of South Pipeline 2 required relocation of residents in the area. Six homes were purchased and the owners relocated, and five homes were removed. The Southern Delivery System team sent outreach information to more than 1,000 homeowners and employed two facilitators to assist property owners with concerns

"I'm proud of the value we are bringing to our rate payers. In 2016, we will turn on a water delivery system that will ensure our community has water for decades," said John Fredell, program director for the Southern Delivery System. "We've also faced complex technical challenges and innovated to meet those challenges, saving more than $147 million in the process."

San Antonio River Authority & Texas Landfill Management Martinez II Recycling Facility Project

Location: North Converse, Texas
Owner: Texas Landfill Management LLC
Designer: Texas Landfill Management LLC
Contractor: Texas Landfill Management LLC
Manufacturers: John Deere, Peterson Pacific Corp., McCloskey Brothers, SCARAB Intl., Liebherr USA
Size: 10 acres
Cost: $3.1 million

A public-private partnership between the San Antonio River Authority (SARA) and Texas Landfill Management LLC has resulted in a 10-acre recycling facility adjacent to the site of the Martinez II Wastewater Treatment Plant in Bexar County.

The new recycling facility will provide composting as a sustainable alternative to landfill disposal for the treatment and beneficial reuse of biosolids and other recycled compostable materials such as clean wood, brush, yard trimmings and food waste.

Formerly home to a biosolids land application operation, the 52-acre site is ideal for this type of facility. Its proximity to the wastewater treatment plant and sanitary landfill is convenient for biosolids transport, and the high-density clay soil is suitable for a storm water retention pond and groundwater protection.

The team's biggest challenge has been preparing and receiving approval for a permit amendment from the state of Texas, as well as the Conditional Letter of Map Revision from the Federal Emergency Management Agency. The project is currently in the construction phase and is expected to be fully operational in early 2015.

"This a very positive project that will provide the San Antonio River Authority with a long-term, sustainable alternative to our current biosolids landfilling disposal method," said Jim Doersam, senior engineer for SARA. "The new facility will recycle SARA's biosolids into beneficial end products, including compost and fertilizer, which are badly needed in our drought-prone area of the country."