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Design-build for water and wastewater infrastructure projects— Benefits of this delivery method lead to its growing popularity

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The Hilton Head PSD system incorporates sustainable principles into the design, maximizing water recovery by using technologically advanced membrane design and low-pressure membranes to reduce power consumption.

States and municipalities investing the \$7 billion allocated for drinking water and wastewater projects under the American Recovery and Reinvestment Act are under pressure to start and finish projects as soon as possible to accelerate job growth. Design-build method of project delivery is a smart choice to repair, improve, and expand water and wastewater treatment facilities across the the progressive form of design-build project delivery provides a mechanism for efficient and rapid translation of concept into construction and stimulates the local economy faster than tradition forms of project delivery.

Traditionally, municipalities have used the design-bid-build approach, which entails two contracts—one with an engineering firm to

design the project, and one with a construction company to build it as designed. Design-build, on the other hand, entails only one contract, between the owner and the design-builder. In addition to quicker project implementation and completion, design-build also allows contracts to be awarded on overall "best value" and provides single-point accountability, typically resulting in fewer change orders, claims, and disputes. The progressive form of Design-build delivery allows municipal owners to advance rapidly through the procurement phase and commence design engineering rapidly without the time and costs associated with development of procurement documents. It also allows the owner to work with one team through the design and into construction, rather than having a baton pass from the procurement consultant to the designer-builder.

Filling the funding gap

The U.S. Environmental Protection Agency (EPA) has estimated that a potential gap between future needs and current spending for wastewater infrastructure of \$150 billion to \$400 billion could occur during the next decade. One approach proposed to bridge this potential gap is to establish a clean water trust fund. In response to a request from Congress, the U.S. Government Accountability Office (GAO) examined stakeholders' views on the issues that would need to be addressed in designing and establishing a clean water trust fund and potential options that could generate about \$10 billion annually in revenue to support such a fund. Stakeholders identified the following three main issues:

- how a trust fund should be

administered and used;

- what type of financial assistance should be provided; and
- what activities should be eligible to receive funding from a trust fund.

While a majority of stakeholders said that a trust fund should be administered through an EPA partnership with the states, they differed in their views on how a trust fund should be used. About one-third of stakeholders responded that a trust fund should be used only to fund the existing Clean Water State Revolving Fund (CWSRF), which is currently funded through federal appropriations primarily, while a few said it should support only a new and separate wastewater program. A few stakeholders supported using a trust fund to support both the CWSRF and a

separate program, while others did not support establishment of a trust fund.

In addition, more than one half of the stakeholders responded that financial assistance should be distributed using a combination of loans and grants to address the needs of different localities. Although a variety of activities could be funded, most stakeholders identified capital projects as the primary activity that should receive funding.

The GAO identified a number of funding options to generate revenue for a clean water trust fund, including a variety of excise taxes on products such as beverages; fertilizers and pesticides; flushable products including soaps, detergents, cooking oils, and toiletries; pharmaceuticals; and water appliances and plumbing fixtures.

Source: GAO

In general, design-build project delivery oftentimes allows projects to be "shovel-ready" within 120 days, provided land and permitting issues are cleared. The design-build approach also allows work beyond engineering to commence rapidly, stimulating manufacturing in a number of sectors, including equipment and materials related to steel, process equipment, electrical equipment, heating and ventilating equipment, instrumentation, building systems (windows, doors, wall systems, locksets), and pipe manufacturing. Water and wastewater facilities' design-build work can positively impact more industry sectors of our economy than almost any other type of work. According to the U.S. Department of Commerce, for every new job added for local water and sewer facilities, an estimated 3.7 jobs are created.

Municipalities considering the progressive form of design-build project delivery should do the following to ensure success:

- verify the statutory and regulatory framework that enables design-build project delivery;
- use a contracting mechanism that fairly balances risks with the party most able to manage and control them;
- establish a positive relationship up-front and realize that changes in scope, schedule, and cost will arise and a process is needed to handle the changes rapidly;
- make sure the owner and the engineering and construction staff of the designer-builder work closely as a team; and
- establish trust and the spirit of collaboration, while creating value, quality, and reliability for the client.

As water infrastructure investment continues to be a significant priority, funding for clean-water and wastewater projects must be invested wisely. The progressive form of design-build project delivery is an effective way of implementing the much needed water projects in an efficient manner.

Design-build market growth

A four-year analysis of the Water Design-Build Council's member firms found that the sales value for the design-build method of project delivery for the nation's water and wastewater infrastructure projects increased nearly 80 percent in 2008 to reach \$2.2 billion, representing 89 new projects. Geographically, projects in Florida, Arizona, Nevada, and New Mexico represented 73 percent of all sales in 2008.

From 2005 to 2008, Water Design-Build Council members reported design-build revenue of \$6.4 billion and a total of nearly 349 projects across the United States. On average, 82 percent of member projects were design-build, while 15 percent were construction management at risk, and 3 percent were design-build-operate.

Other key findings from the analysis include the following:

- average design-build contract duration from 2005 to 2008 was 1.8 years;
- median value of new projects was \$3.3 million;
- projects in Arizona, California, Florida, and Texas accounted for 65 percent of the design-build market sales since 2005; and
- the number of water and wastewater projects was nearly equal, at 47 percent and 42 percent, respectively.

AECOM, Brown & Caldwell, Black & Veatch, Carollo Engineers, CDM, CH2M HILL, The Haskell Company, HDR, MWH, and Veolia Water S&T participated in the report.

For information about how municipalities can benefit from the design-build approach, visit the Water Design-Build Council online at www.waterdesignbuild.org.

Design-build in action

To date, the design-build approach has brought significant value to the many communities that have utilized it, including the following:

Cape Coral, Fla.—Working with MWH, the city of Cape Coral implemented a \$500 million utility expansion project (UEP). The project included design and construction of water, wastewater, and irrigation pressure mains, as well as gravity sewer systems and community sewer pumping stations. In completing the project, the team produced more than 750 drawings during the 10-month design phase. The overall expansion included design and construction of more than 700 miles of utility piping with more than 240 miles of reconstructed residential roadways. In addition, the project required the provision of more than 200 miles of gravity sewer, 34 wastewater pump stations, 175 miles of potable water pipelines, and 190 miles of reclaimed water pipelines, providing more than 4,500 water, sewer, and reclaimed water services to customers. Upon expected completion of the UEP in 2011, the project will consist of more than 830 miles of underground pipeline. In 2004, the city launched a subsequent seven-year, \$440 million facility expansion program with MWH that includes further expansion of water, sewer, and irrigation collection, distribution, transmission, and treatment systems.

Hilton Head Island, S.C.—The Hilton Head Public Service District (PSD) enlisted the help of AECOM to build a new source of potable water to combat the effects of saltwater intrusion into its groundwater source. The community, which experienced a boom in population growth from both seasonal tourism and year-round residents, was forced to close or reduce pumping from five

of its 11 wells because of saltwater intrusion caused by over-pumping in recent years, and was in danger of losing two more. AECOM worked with PSD to tap a new groundwater source and build a reverse osmosis water treatment plant to

remove salt and other minerals found in the water. The system incorporates sustainable principles into the design, maximizing water recovery by using technologically advanced membrane design and low-pressure membranes to reduce power consumption. PSD now also has three sources of water for crucial drought response.

Santa Fe, N.M.—When the city of Santa Fe and its engineering consultant, CDM, completed the planning and initial concept design for a sustainable source of water, they elected to deliver the project using the design-build form of project delivery. The city selected CH2M HILL to implement this critical infrastructure project. The project, which broke ground in September 2008, will include a diversion structure on the Rio Grande River, two pumping stations, pipelines, and a water treatment plant. When completed, the \$216 million Buckman Direct Diversion Project will divert water from the Rio Grande River and transfer that water to a plant for treatment and then to customers, providing an additional 8,730 acre-feet of surface water per year. Further, construction of the project is expected to inject \$287.2 million in net economic benefits to the regional economy through the completion of construction in 2011, and will generate and sustain more than 500 jobs per year during the same period.

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