

Success Story of Florida County Self-Performing a \$6-Million Dollar Wastewater Effluent Disposal System Construction Project – Okaloosa County Florida

James P. Kizer, Jr., P.E.^{1*}, Jeff Littrell^{2*}, Joseph Crews, P.E.¹, Jeff Oglesby²

¹Constantine Engineering, Inc., Fort Walton Beach, FL (jkizer@tcgeng.com)

²Okaloosa County Water and Sewer Department, Okaloosa County, FL
(jlittrell@co.okaloosa.fl.us)

ABSTRACT

The Okaloosa County (Florida) Water and Sewer Department (OCWS) is developing the new Arbennie Pritchett Water Reclamation Facility (WRF) to meet the wastewater treatment demands in the rapidly growing service area in the southern portion of the County. The new WRF will have a treatment capacity of 10 million gallons per day (mgd) and will discharge effluent to 200 acres of new constructed Rapid Infiltration Basins (RIBs). The RIBs were constructed using OCWS construction staff and equipment, assisted by design and construction consultants. The original budget for the construction of the RIBs using a traditional design-bid-build process was \$10 million; and using County forces, the actual budget is approaching \$5 million, which includes labor and equipment costs. Before the County could begin to self-perform a project of this magnitude, OCWS had to develop a plan that enabled compliance with Florida statutory requirements for self-performing construction projects greater than \$200,000; to develop strategies to control unanticipated cost increases; institute programs and policies for managing and implementing the purchase and delivery of materials for the project; and ensure that the work flow process adequately allocated risk and potential conflicts with other contracts associated with the design-build project for the new WRF.

KEYWORDS

Alternative Project Delivery, Self-performance, Design-Build, Wastewater Treatment, Procurement, Rapid Infiltration Basins

INTRODUCTION

The Okaloosa County (Florida) Water and Sewer Department (OCWS) is developing the new Arbennie Pritchett Water Reclamation Facility (WRF) to meet the wastewater treatment demands in the rapidly growing Ft. Walton Beach area in the southern portion of this panhandle county. Treatment capacity provided by the new facility will initially be 10 million gallons per day (mgd) and will be readily expandable to 15 mgd to meet future requirements. The new WRF is being constructed to replace the aging 6.5 mgd Garniers Wastewater Treatment Plant (WWTP)

and will discharge effluent to 200 acres of newly constructed Rapid Infiltration Basins (RIBs). The RIBs were constructed using OCWS construction staff and equipment, assisted by design and construction consultants. The original budget for the construction of the RIBs using a traditional design-bid-build process was \$10 million; and using County forces, the actual budget is approaching \$5 million, which includes labor and equipment costs.

The Arbennie Pritchett WRF is being constructed on the site of the existing 654 acre spray field for the Garniers WWTP on Eglin Air Force Base (AFB) property in Okaloosa County, FL. Groundbreaking for the Arbennie Pritchett WRF took place in April 2007 after a 12-year period that included; increasing public interest in replacing the aging and odorous Garniers WWTP; negotiations with the United States Air-Force for leasing of the property for the new facility; Environmental Assessments, Environmental Baseline surveys and property appraisals required by the Federal Government for the out-lease of Air Force Property; and issuance of \$65 million in bonds to fund the total program. During this same period, the Gulf Coast, and Northwest Florida in particular, was ravaged by two successive years of extreme hurricane events. These hurricanes combined with eight other major hurricanes across Florida, caused the construction costs of the program to soar at a rate that exceeded that of inflation due to increases in concrete and structural steel, and a very tight local construction labor market. Additional budget pressures were imposed by the U.S. Air Force at Eglin Air Force Base, the owner of the proposed project property, who after 30 years of allowing the facility to operate with no lease payments, decided to impose “fair market costs” for the property of \$325,000 per year with annual escalation. These financial pressures stressed the County’s Water and Sewer Department’s current rate plan and it was up to the OCWS to develop an innovative approach to implement the project within budget.



Water Reclamation Facility and Rapid Infiltration Basin Site Construction

The OCWS construction and maintenance crews evaluated the situation and stepped forward to take a “hands on” role in constructing the project. At that time, OCWS’s construction experience was limited to construction of large pumping stations and pipelines, projects less than \$300,000 in value. Their resume certainly did not include construction of 200 acres of RIBs, excavation and placing of more 426,000 cubic yards of material and installation of more than 65,000 linear feet of 8-inch through 30-inch diameter ductile iron pipe and 2,250 feet of 48-inch diameter concrete storm drain pipe. The projected costs of these materials and services is currently projected to be about \$5,000,000.

Presented herein is the successful story of how OCWS mitigated unanticipated cost increases, regulatory and statutory requirements to self-perform a \$5 million dollar construction project, and the details to managing and implementing the construction of 200 acres of RIBs. The innovations in team work required by the owner, consultants, and purchasing staff to successfully procure and construct the project are discussed. Challenges that the team met and overcame also will be discussed.

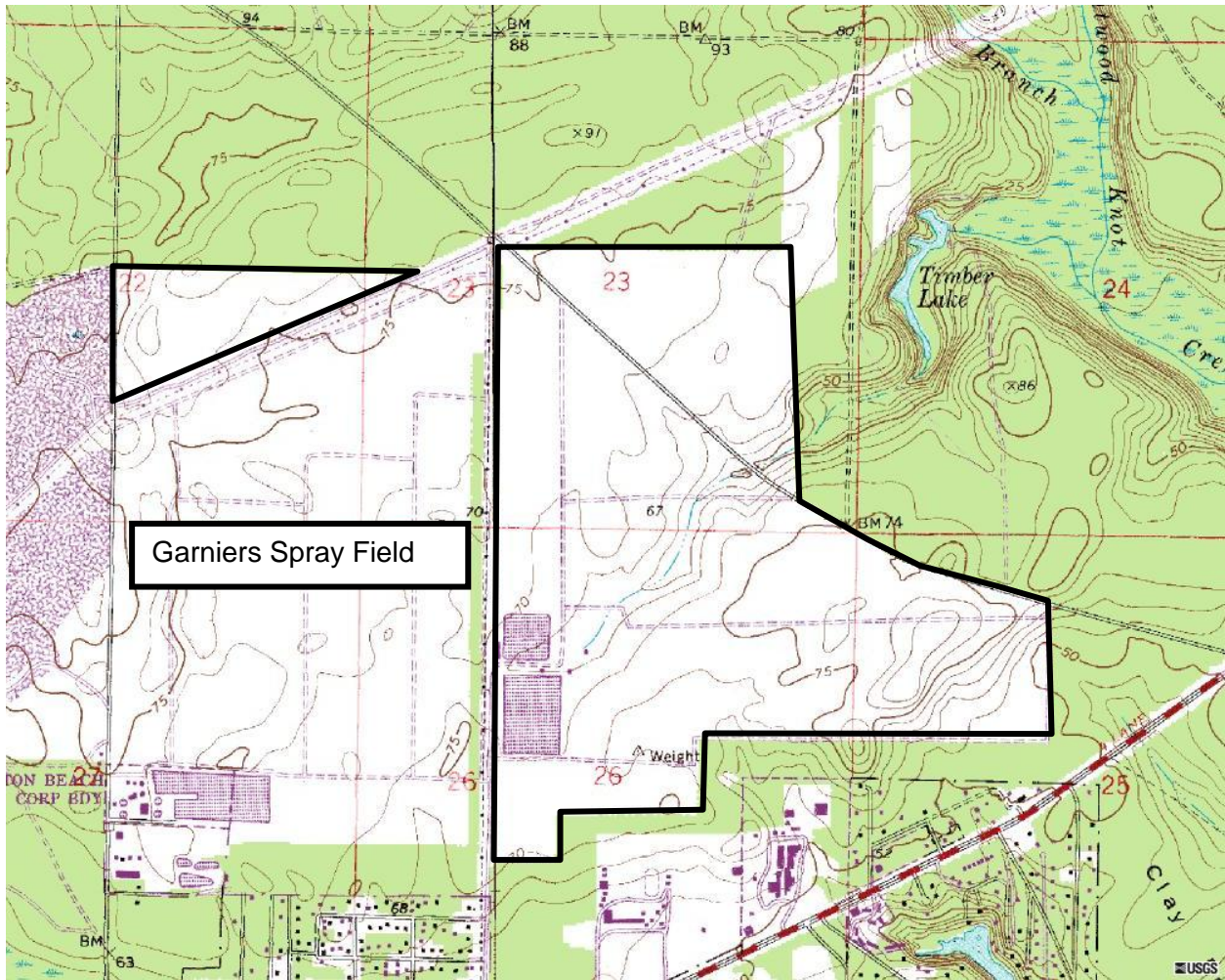
PROJECT BACKGROUND

Okaloosa County, formed by an act of the Florida Legislature in 1915, is located in the center of a 100 mile long strip of white sand beaches in Northwest Florida. The County is bordered on the west by Santa Rosa County, Florida, on the north by Covington County, Alabama, on the east by Walton County, Florida and on the south by the Gulf of Mexico. The northern half of Okaloosa County is largely agricultural, and with the exception of the coastal area, the entire central and southern portions of the County comprise Eglin AFB. Eglin AFB is one of the world’s largest military installations. Established in 1935 Eglin covers 725 square miles in Walton, Okaloosa and Santa Rosa Counties. It includes three major airfields: Eglin Main, Hurlburt, and Duke Field in Okaloosa County.

Okaloosa County is governed by a five member Board of Commissioners elected at large to serve staggered four (4) year terms. A County Administrator hired by the Commission executes policies established by the Commission and oversees all County departments. OCWS is a department of the County and operate as a separate enterprise. The OCWS is financed from the revenues of the system and no general tax revenues are provided to the System at this time. The management structure for the OCWS consists of a Department Director who reports to the County Administrator and is responsible for the management and operation of the system. OCWS was established in March, 1966 when the County assumed ownership and began consolidating several privately-owned water and sewer systems in unincorporated areas outside Fort Walton Beach. Presently, OCWS provides water and sewer services to unincorporated areas of central and southern Okaloosa County and has four major water and sewer services areas; the Garniers Service Area in the south being the largest. The number of sewer customers has increased from 705 units in 1966 to over 33,200 units in 2006.

The Garniers service area is located in Southern Okaloosa County and is bounded by Eglin AFB on the North and East, Fort Walton Beach on the South and West and also the Gulf of Mexico on the South. The Garniers WWTP, originally constructed in 1971 to replace several package plants, provides wastewater service to the Garniers service area. Several expansions and

modifications to the WWTP have been implemented over the past 37 years and the existing capacity of the WWTP is 6.5 mgd. The WWTP discharges treated effluent nearly three miles through parallel 20 inch diameter force mains to the spray irrigation effluent disposal field located on Eglin AFB. The spray irrigation field, originally constructed in 1972, now has 540 acres under irrigation and the total area included in the lease with Eglin AFB is 676 acres. The portions of the property that are not irrigated include 136 acres of buffer zones, holding pond area, field and access road areas, and a small harvesting equipment storage area. Two effluent holding ponds are provided for a total storage volume of 25.6 million gallons.



Garniers Spray Field Property

As the Garniers WWTP has aged, development in its immediate vicinity has intensified and residents have become more sensitive to odors, noise, the presence of chlorine, sludge hauling, and the normal activities associated with the operation and maintenance of a WWTP. Public concerns about the presence of Ocean City Elementary School immediately adjacent to the WWTP led the County to assess its long term future. Additionally, because of its wide range of activities, the uniqueness of its various facilities, its vast size and favorable location, Eglin AFB has an important role in the defense programs of the United States. In fact, on September 8, 2005, the Base Closure and Realignment Commission (BRAC) submitted their final

recommendations for closure and realignment of military installations to the President of the United States. The final report recommends a realignment plan for Eglin AFB that will result in the net gain of about 6,000 military and civilian positions. These personnel are needed to support the new operations that will be located at Eglin AFB that include the Army's 7th Special Forces Group, the Joint Strike Force Integrated Training Center (F-35), and the Defense Threat Reduction Agency to name a few. Eglin AFB will continue to grow and the future of Eglin AFB and its role as a pivotal component of the United States military defense training and development infrastructure is secure.

In 1998, OCWS and the Okaloosa County Board of County Commissioners (BCC) began the process of evaluating the continued use of the Garniers WWTP and determined that the WWTP should be decommissioned and a new facility constructed in a different location. The BCC and OCWS came to the conclusion after evaluating the existing facility's age and condition of the existing processes and equipment, public concerns regarding odors and the proximity of the WWTP to the elementary school, operational performance, and the limited ability to expand the capacity of the existing WWTP to meet the growth and expansion in the service area, including that of Eglin AFB. Very soon afterward, it became evident that there was limited public or private property available in the Garniers Service Area to locate a new facility. After evaluating several potential sites, OCWS and the BCC determined that the best plan for a new WRF site would be to construct a new treatment facility on leased property from Eglin AFB.

Beginning in 1999, OCWS initiated negotiations with the Air Force to convert 20 acres of the existing 670 acre spray field site on Eglin AFB to a site for a new state-of-the-art 10 mgd WRF; and to convert another 200 acres of the existing spray field into RIBs for effluent disposal. The existing 670 acre effluent spray field property is generally the southern boundary of the AFB and is adjacent to county owned and private property. The site is in an area of the base that is commonly referred to as "wastewater alley". It received this name because the City of Fort Walton Beach WWTP and effluent spray irrigation system and the Eglin AFB WWTP and spray irrigation system are located in the same vicinity. This property has been utilized by the County for wastewater disposal for more than 30 years and Eglin appreciates the "buffer" or anti-encroachment value that the wastewater disposal systems provide for this portion of the base. The OCWS plan would return more than 415 acres of the existing 670 acre spray field to Eglin AFB; and the proposed treatment and disposal system will only require 255 acres for the 10 mgd capacity of the WRF.

The program to construct the new Arbennie Pritchett WRF, as it has been named, consists of the following major components:

- Construction of the new 10 mgd Arbennie Pritchett WRF at the existing Garniers effluent spray field site on Eglin AFB
- Construction of the new 10 mgd, 200 acre RIB system at the existing Garniers effluent spray field site on Eglin AFB
- Construction of a new 15 to 25 mgd pumping station at the Garniers WWTP.

- Construction of piping modifications at the Garniers WWTP to facilitate the 2 existing 20-inch diameter effluent pipelines to be converted into raw wastewater pipelines to convey wastewater from the new pumping station to the new WWTP.
- Construction of piping modifications at the existing Garniers effluent spray field site to tie the 2 existing 20-inch diameter effluent pipelines into the new 10 mgd WWTP.
- Demolition and decommissioning of the existing Garniers WWTP.
- Miscellaneous collection and transmission system improvements to optimize the operation of the new raw wastewater conveyance system.



Garniers Spray Field, Arbennie Pritchett WRF and RIB Construction Site

By the end of 2003, the County and OCWS had spent more than 4 years negotiating with the Air Force on the conversion of the existing spray field to the new WRF and RIB site. Environmental impact documents had been prepared, as well as investigations and site surveys to evaluate the potential for unexploded ordnance that might be buried on the site. A draft lease agreement with the Air Force had been negotiated with an annual lease payment for the property. Closure of the negotiations seemed eminent.

With the implementation of the new WRF program on the horizon, the County evaluated several project delivery approaches for each of the individual program components. Finally, the County chose to implement the construction of the new 10 mgd WRF using the design-build (D-B) project delivery approach. Using this approach, the County expected to secure substantial

benefits for its customers, including timely and efficient scheduling, optimal risk allocation, competitive design selection, and innovation, clear assignment of performance responsibilities to a single contracting entity, and long-term WWTP reliability and life-cycle cost savings. Construction of the new 200 acre RIBs and the new 25 mgd Garniers Re-Pumping Station would be performed using the traditional design-bid-build project delivery approach. This delivery approach was chosen because the scope of these projects were well defined, the costs, timing, and scheduling of the projects would be easily controlled, and the allocation of optimal risk would be easily assessed.

The County contracted with Constantine Engineering, Inc. of Fort Walton Beach to serve as the Program Manager and with PolyEngineering of Dothan, AL, to begin design of the new RIBs and HDR, Inc. was contracted to serve as the Design Criteria Professional for the new WRF. It seemed that the program to construct a new WRF was moving forward swiftly. Then in August of 2004, Hurricane Ivan struck the Florida panhandle near Pensacola. Hurricane Ivan was the strongest of the four hurricanes to strike Florida in the 2004 Atlantic Hurricane season. The first three hurricanes in the 2004 season, Charley, Frances, and Jeanne impacted the Florida peninsula. The efforts to cleanup and rebuild needed infrastructure in the County significantly impacted the progress of the new WRF program. The following 2005 hurricane season was the most active season for major hurricanes in recorded history. Four storms, Dennis, Katrina, Rita, and Wilma directly impacted Florida. Other hurricanes that year had broader regional impacts to the Gulf Coast. The collective effect of the 2004 and 2005 hurricane seasons had a profound influence on the construction industry in the Gulf Coast, and specifically in Florida. Okaloosa County was faced with re-evaluating the impacts to its original cost estimate used for project financing. Key concerns centered on costs for concrete, structural steel, as well as the skilled labor market. By the start of 2006, all indications were that the costs for constructing the WRF and disposal system were quickly increasing.



Hurricane Dennis 2005



Hurricane Ivan 2004

Equally important was the sky rocketing increase in property values that occurred during the 12 months that followed the 2005 hurricane season. This was important because the Air Force decided to renegotiate the lease of the property which required new cost appraisals for the 255 acre WRF and RIB site. These negotiations stopped the progress of the design of the RIBs and the development of the design/build documents for the new WRF. In September 2006 a final lease with the Air Force was executed for the construction of the new WRF Program. The new lease agreement was only the second lease negotiated under the enhanced use lease program. The annual cost of the lease had increased nearly 75 percent, and included an annual inflation factor of 2 percent over the 30 year life of the lease.

OCWS had established a rate plan to fund the project and by the close of 2005, it seemed that the costs of the program had increased to a critical point of possibly impacting the implementation of the program. However, OCWS realized that any changes to the program could impact the negotiations with the Air Force for the property which could cause a setback of several years. OCWS was determined to move forward with the original program and began to evaluate alternatives to reduce costs while maintaining the core goals of the WRF Program. In July of 2006, more than \$65,000,000 in water revenue bonds was sold to fund the program. The financial pressures imposed by the escalating construction costs and the higher lease payments required in the property lease stressed the County's Water and Sewer Department's rate plan to fund the program and it was up to the OCWS to develop an innovative approach to implement the project within budget.

The OCWS construction and maintenance crews evaluated the situation and stepped forward to take a "hands on" role in constructing the RIBs portion of the project, as well as all of the modifications and connections to the existing pipelines. At that time, OCWS's construction experience was limited to construction of large pumping stations and pipelines, projects less than \$300,000 in value. Their resume certainly did not include construction of 200 acres of RIBs with an estimated cost to be about \$10,000,000.



OCWS Construction Crews Placing RIB Piping

In late September, 2006, OCWS proposed to the BCC that they be authorized to self-perform the construction of the 200 acres of RIBs, as well as all of the modifications and connections to the existing pipelines. Before the BCC could give OCWS this authorization, however, specific statutory regulations need to be met.

STATUTORY REQUIREMENTS

The state of Florida has specific requirements that must be met before a government entity such as Okaloosa County can self-perform a public works project valued at greater than \$200,000. Specifically, these requirements are included in Chapter 255, Public Property and Publicly Owned Buildings, Florida State Statutes (F.S), Section 255.20, Local bids and contracts for public construction works; specification of state-produced lumber. F.S. 255.20 states that before the project can be constructed using the County's forces, the BCC must hold a public meeting to discuss the project. Specifically, the statute states that a County government may "self-perform" public works projects valued at greater than \$200,000 ... "When the governing board of the local government, after public notice, conducts a public meeting under s. 286.011 and finds by a majority vote of the governing board that it is in the public's best interest to perform the project using its own services, employees, and equipment." The BCC must evaluate the benefits of the County self-performing this work with their own forces as compared to contracting the work to a private contractor and then vote to approve or deny the County constructing the project using its own forces.

On December 5, 2006, the BCC held the required public meeting to discuss OCWS's proposal to construct the 200 acre RIB Effluent Disposal Project for the Arbennie Pritchett WRF using OCWS staff and equipment, as supplemented in accordance with County Ordinances and State Statutes. During this public meeting, OCWS identified that self-performing the project was in the County's best interest and provides the following benefits to the County:

- OCWS estimates that self-performing the project could reduce the project costs by \$3 million to \$4 million dollars over contracting with an outside construction company.
- OCWS has reviewed the construction requirements for the project and has determined that they have the necessary qualifications, labor, and available time to complete the project.
- Self-performing the project will not require an increase in the current number of full-time staff, and that any additional increase in staffing will be by temporary contract employees if required.
- The construction will not increase the cost to the customers but will help to maintain the existing rate structure and costs.
- This implementation method may allow OCWS to invest in some equipment items that will have residual value and benefit to the County after this project is completed.
- There will be no significant impact on local economic development or small or minority business owners

- Since this is a project to construct new wastewater facilities there will be no significant impact on state or local tax revenues.
- OCWS will be better positioned to control the sequencing of activities to coordinate with other construction activities associated with the construction of the new Arbennie Pritchett WRF.
- OCWS can control the construction schedule and quality of the construction.

The BCC approved the OCWS proposal to self perform the RIB construction at their December 5, 2006 meeting.

PROJECT DELIVERY PLANNING

OCWS, the Program Manager, and the Design Engineer evaluated the scope of work required for OCWS to self-perform the work. Specifically, an implementation plan needed to be developed that addressed:

- Project management procedures
- Coordination with other OCWS departments to maintain operation of the existing spray field disposal system
- Risk allocation and safety
- Policies for managing the purchase, delivery, storage, and protection of materials for the project
- Scheduling and controlling the work activities
- Heavy equipment needs and determination of the procurement of leased or purchased equipment
- Staffing requirements and the need to temporary trade staff
- Quality control assurance
- Coordination with the design/build contractor for the WRF
- Cost control
- Compliance with regulatory and statutory requirements

The first step in the process was to establish a project management team to oversee the work activities of the project. OCWS identified Jeff Oglesby, OCWS Construction/Maintenance Crew Manager as the overall Project Manager for the County, and Jebb Chesser, EIT, OCWS Engineer as the Project Manager. James Kizer, PE, Constantine Engineering, Inc., was the Program Manager, and Dave Marshall, Constantine Engineering, served as the Construction Manager and the licensed contractor overseeing the project. Robert Mauzy, OCWS Wastewater System Manager coordinated with the management team on issues associated with the operation of the existing facilities. With this senior project management team in place, the remainder of the project issues were addressed.

Routine project management meetings were scheduled as well as weekly meetings with construction and engineering supervisors, specific roles and responsibilities were identified. The County's Safety and Risk Management Plan was reviewed and evaluated for use with the work

activities anticipated in the construction of the RIBs. The County Risk Manager was consulted and it was determined that changes to the Safety and Risk Management Plan were not required. Also reviewed were the County and OCWS's policies for managing and implementing the purchase, delivery, storage, and protection of materials for the project.

The purchase of materials was likely one of the most limiting processes in the implementation of the project. Government entities are usually required to solicit competitive bids for nearly all materials and services, and OCWS is no different. Bid packages were developed for the purchase of pipe, valves, fittings, concrete, manholes, and other materials. The County's standard procedures were used to solicit bids for these items. Mark Griffin, OCWS Procurement Specialist was responsible for coordinating the procurement process with the County's Purchasing Department. Unfortunately, OCWS could not deviate from the County's standard procurement procedures, and instead worked diligently to ensure that material orders were complete, and made in a timely period so that materials arrived on site when needed. Once the materials were delivered, they were inventoried and stored in a secure site that was totally separate from other storage locations maintained by OCWS and the County. This procedure was essential to ensuring that materials for the RIB project were not comingled with other materials which could have resulted in critical items not be available when needed, thus adversely affecting the construction sequence. OCWS identified a single person to coordinate the receipt, unloading, storage, and inventory management of more than 65,000 feet of 8- through 30-inch diameter pipe, 2,000 fittings and valves, 5,000 gasket sets, and other materials for the project.



OCWS Material Storage Yard

The project management team evaluated the County's existing equipment determined that the existing OCWS equipment would not provided the productivity needed to meet the scheduling requirements of the project; and that additional equipment needed to be leased. Additional evaluations were performed to analysis the optimum equipment requirements considering both

schedule, labor force, and costs. Finally, the team decided to issue other bid packages for the procurement of leased equipment to supplement the fleet of OCWS equipment that was available for the project. The additional equipment that was leased included an excavator, two D6 dozers, and four articulating 25-yard off-road dump trucks.



OCWS Construction Crews Excavating RIB Site

The team also evaluated the labor requirements for constructing the project and determined that the existing OCWS Construction Team of 9 would be sufficient to complete the project. Headed by OCWS Construction Crew Supervisor Harold Godwin, and Foreman Chuck Vanderford, the team consisted of two Heavy Equipment Operators and six Utility Technicians and Operators. OCWS was fortunate that each their Construction Team members held a CDL license and was available to operate the heavy equipment. During the height of the excavation and fill activities, OCWS was operating three excavators, two dozers, and the four articulating off-road dump trucks. The team developed an effective schedule that allowed the construction of the project using the existing OCWS construction staff, and, as needed, supplemented it with other existing OCWS staff.

Before construction began, the management team and OCWS engineering staff reviewed the design drawings and evaluated the labor requirements for setting and controlling the grade for the excavation and placement of fill during the RIB construction. While OCWS was prepared to commit 3 of their 6 engineering staff to the project, they determined that this was not sufficient to meet the scheduling needs of the construction crews. They evaluated alternatives to enhance their productivity and determined that utilization of global positioning system equipment (GPS) mounted to key excavation equipment would significantly improve their ability to set grades for excavation and fill activities. OCWS selected the GPS equipment by Topcon Positioning Systems, Inc. to control horizontal and vertical grades for the excavation and placement of the earthwork for the RIB construction, and for the installation of the RIB piping. Before the GPS equipment could be utilized, OCWS engineering staff had the existing 2-dimensional design drawings converted into a 3-dimensional model of the existing and proposed grades for the

project. The 3-dimensional model of the proposed grades was used to set and control the excavation activities; while the 3-dimensional model of the existing was used to monitor and balance the quantities of excavation and fill.

GPS equipment was initially installed on one leased excavator (5 yard bucket) and on a leased D6 Dozier. The excavator GPS did not provide machine control, but rather showed the horizontal location of the equipment and indicated an elevation of the excavation. Therefore, the GPS equipment assisted the excavator operator to control grade, but would not automatically control the excavator to set grade. Conversely, the dozier GPS provided true machine control of the equipment. The dozier operator simply set the direction and speed of travel for the dozier, and the GPS equipment would control the blade height and attitude based on the 3-dimensional model that had been programmed into the equipment.



D6 Dozier Equipped With Global Positioning System Antennae

OCWS later determined that the excavator operator could maintain the grade excavation equally as well without the GPS system; and that a second dozier equipped with GPS machine control would significantly improve their productivity. Some of the 18 RIBs some required excavation and others required significant fill. OCWS relocated the excavator GPS system to a second D6 dozier which allowed them to dedicate one machine controlled dozier to set the final grade of the excavation work and the other to set the grade for the fill work.

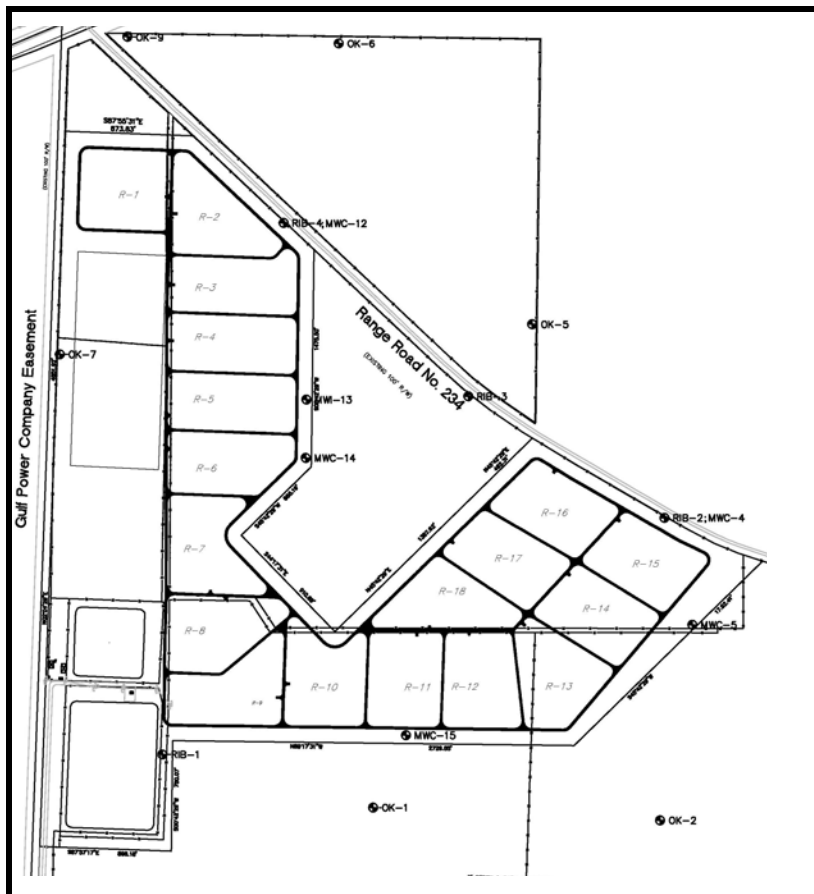
A base unit was maintained throughout the duration of the project, and this unit was set up every morning and taken down every night. A rover GPS unit was used to perform spot elevations of the RIB construction and it was used to set and control the construction of the 10-inch to 30-inch diameter RIB piping, including horizontal and vertical grade control.

Jeb Chesser, Project Engineer stated that “The GPS equipment was the key to doubling our productivity...I just can’t see us completing the project on time and with the same quality without the GPS equipment...as build’s were developed as the project progressed...”

The Program Manager worked with the project team to develop a CPM schedule for the project that accounted for material deliveries, lease equipment rentals, labor and productivity. The schedule was used to monitor and control the work activities for the project. Special consideration was given to ensuring that sufficient spray field acreage was available to dispose of effluent from the existing WWTP during construction. Several pipe re-routings were performed to allow areas of the existing spray field to be isolated from other areas to facilitate the construction of the RIBs and disposal of effluent. Quality control and assurance was monitored by the staff from the Program Manger, the design engineer, and by Randall Ward, OCWS Construction Inspector.

CONSTRUCTION OF THE RAPID INFILTRATION BASINS

PolyEngineering, completed the design of the RIBs in mid-2006. As shown below, the project consists of the construction of 18 RIBs that ranged in size between 6.5 and 8 acres. OCWS placed material and equipment orders for the RIB construction in January 2007 and construction of the RIBs began on March 20, 2007.



Site Layout for the Arbennie Pritchett WRF Rapid Infiltration Basin Project

The RIBs were originally planned to be constructed using a phased approach to minimize the impact of reducing the acreage available for disposal to the existing spray field. However, as construction progressed, the importance of phasing the construction was determined to be less

important than originally conceived. More of the spray field was taken out of service with little to no adverse impact on the performance of the system. Therefore, OCWS decided to focus on completing the excavation and placement of more than 426,000 cubic yards of material ahead of the construction of the more than 65,000 linear feet of 8-inch through 30-inch diameter ductile iron pipe and 2,250 feet of 48-inch diameter concrete storm drain pipe. Revising the schedule of activities to reflect the proposed work flow would allow completion of the earthwork portion of the project more quickly and the return of the leased equipment in less time. This would further reduce the costs of the project.

Earthwork construction activities began in July 2007 and excavation and fill activities were completed in December 2007. Major transmission pipeline construction occurred throughout the project since the pipelines were installed within the RIB berms. Construction of the interior RIB piping began after the earthwork for 2 or 3 RIBs had been completed. RIB piping construction was completed in March 2008. Other miscellaneous construction activities were completed in June 2008. The original project schedule was to complete the RIBs by August 2008. Therefore, OCWS completed the project about 2 months ahead of schedule.



Completed Rapid Infiltration Basins

The estimated costs for constructing the 200 acres of RIBs using the traditional design-bid-build project delivery method was about \$10,000,000. Changes that occurred during the project were estimated to increase the project costs to about \$11,000,000. OCWS completed the project ahead of schedule at a cost of about \$5,000,000. This amount includes \$3,000,000 in materials, \$713,000 in leased equipment costs, 932,000 in OCWS burdened labor costs, and \$400,000 in rental costs associated with OCWS owned equipment. While not an exact value, it is obvious that the resultant savings exceed the original estimate of \$3,000,000 to \$4,000,000.

LESSONS LEARNED

Following the County's decision to proceed with the Self-Performance project delivery approach, there were several lessons learned, including:

- Statutory requirements exist that constrain government entities from self-performing major construction projects and should be thoroughly investigated before embarking on a project using this type of delivery approach.
- Self-performing major construction projects can allow for significant cost savings; however there is a real transfer of risk and liability to the entity performing the work that should be considered.
- Effective planning of the project to establish material needs and delivery times are essential components to maintaining the project schedule and controlling project costs.
- A management team of qualified and experienced individuals should be established early in the project to review the construction requirements and to assess whether the existing staff is qualified to perform the work and whether a sufficient labor force is available to complete the project.
- The management team also must assess the construction equipment needs and develop strategies for overcoming any shortfalls.
- Self-performing the work allows the Owner more easily control potential adverse impacts associated with changes in scope.
- Owners retain control over the construction schedule and quality of the construction; which may or may not be a positive aspect and is dependent on the qualifications and dedication of the staff.



Completed Rapid Infiltration Basins

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