# C-43 West Basin Storage Reservoir Water Quality Feasibility Study
# Public Meeting Minutes

***December 2, 2020 10:00 AM – 12:00 PM***
***Webinar***

## Meeting Welcome

- Drew Bartlett, Executive Director of the South Florida Water Management District (SFWMD), stated that almost two years ago, the Governor challenged SFWMD and the Florida Department of Environmental Protection (DEP) to come up with a water quality treatment component for the C-43 West Basin Storage Reservoir. We embarked on this Feasibility Study to ensure we can provide treatment for the reservoir. He stated that he appreciates SFWMD staff and the J-Tech team for all their work to pull this Study together. He also thanked each of the Working Group members for their perseverance in crafting these recommendations. In addition, he thanked the public for their feedback and engagement. The Feasibility Study is the first step in this process and SFWMD will continue moving forward with the other steps. Drew stated that he is looking forward to the team presenting the Feasibility Study today.
- Georgia Vince, J-Tech, welcomed everyone to the final public meeting on the Feasibility Study. She provided information on how to ask questions throughout the presentation using Zoom. She also explained that Menti, a live polling program, will be used at the end of the presentation to obtain input from Zoom participants.
- Georgia covered the meeting goals and objectives. The focus of today's meeting is on the Final Feasibility Study and recommendations, Water Quality Alternative Treatment Technology (WQATT) pilot study, and next steps.
- Georgia introduced the Working Group members from SFWMD, DEP, Hendry County, Lee County, City of Cape Coral, City of Sanibel, and Lehigh Acres Municipal Services Improvement District. Georgia also introduced the J-Tech consultant team members from Jacobs Engineering, Tetra Tech, and Wetland Solutions.

## Study Background

- In January 2019, Governor DeSantis signed an Executive Order to provide greater protection for Florida's environment and water quality. This order included this C-43 West Basin Storage Reservoir Water Quality Feasibility Study.
- Georgia noted that the primary objective for this Study is to identify opportunities to provide additional treatment and improve water quality leaving the C-43 West Basin Storage Reservoir (WBSR). The study will evaluate pre-treatment, in-reservoir treatment, and post storage treatment options. These options must be cost-

effective, technically feasible, scalable, and compatible with the objectives of the C-43 WBSR.

- Georgia reviewed several of the Study constraints including that the Study cannot affect the congressionally approved C-43 WBSR project purposes, infrastructure, construction schedule, or operation. In addition, project lands have not been specifically identified for the Study. This evaluation will be done during the next phase of the project.
- Georgia stated that that the C-43 WBSR and the selected treatment component(s) are not identified to achieve compliance with the Caloosahatchee River and Estuary Total Maximum Daily Loads (TMDLS). Instead they are to improve water quality of flows returned back to the Caloosahatchee River.
- Georgia presented the project schedule. The project began in July 2019, and the Final Feasibility Study was completed in October.
- Georgia stated that the C-43 WBSR is a component of the Comprehensive Everglades Restoration Plan (CERP). The project is funded by annual Florida legislative appropriations, and the U.S. Army Corps of Engineers will credit eligible project costs. The reservoir is currently under construction with a construction completion target of December 2023.
- The purpose of the C-43 WBSR is to capture excess basin runoff and Lake Okeechobee releases to store water to improve the quantity, timing, and distribution of discharges to the Caloosahatchee Estuary. Another purpose of the project is to maintain water supply for existing users.
- Georgia provided an overview of the location of the C-43 WBSR including its location in relation to the C-43 Canal, Lake Okeechobee, Ortona and Franklin Locks, and Townsend Canal. This is a 10,500-acre project that will provide above-ground storage.
- Flows from the river will be directed through the Townsend Canal and into the reservoir. When the river and estuary call for it, water that is stored will be discharged through the Townsend Canal and back into the river and estuary.

## Water Quality Treatment Technologies

- Marcy Frick, J-Tech, provided details about the treatment technologies the consultant team studied for the project. The search for the appropriate treatment technologies focused on three primary water quality parameters including nitrogen, phosphorus, and total suspended solids (TSS). Nitrogen and phosphorus are nutrients that drive algae growth, and TSS include algae and organic matter. Nitrogen exists in multiple forms, which vary in their availability to algae, including organic nitrogen and inorganic nitrogen that includes ammonia and nitrate. Phosphorus occurs in dissolved and particulate forms, which have different mechanisms of treatment.
- Marcy stated that this project faces area and operational constraints, so the consultant team considered the spectrum of natural and conventional treatment

systems for pre-treatment, in-reservoir treatment, or post-treatment. Natural systems use the same chemical and biological processes for treatment as conventional systems. Conventional systems build tank-based treatment reactors of concrete and steel and move water and compounds using electricity and chemicals, while natural systems are typically land-based and rely upon gravity flow and natural plant, soil, and microbes to provide the media and biological habitat that sustain these processes at natural rates. As a result, fewer staff are required to operate, and maintenance and monitoring processes are significantly reduced. Fewer residuals are also produced, so this often means lower long-term unit operational costs per pound of nutrient removed for natural systems.

- Marcy mentioned that the Information Collection Summary Report for this project was available on April 3rd. The consultant team summarized the attributes of 38 chemical, physical, and biological technologies. These technologies were from the DEP Technology Library, Working Group member experience, case studies, vendor submittals, and public input from past public meetings. As part of the Information Collection Summary Report, the consultant team eliminated 13 technologies from further evaluation that were not applicable to the C-43 WBSR and/or did not have enough information available for the study. The remaining 25 technologies were carried over for further evaluation in the Feasibility Study. The Information Collection Summary Report and Final Feasibility Study are posted to the Study website.
- Marcy reviewed the key attributes that were used to describe the different technologies. These included whether Florida case studies were available and whether data were suitable for analysis, nutrient removal data and the extent it could be used to scale up to treat large flows associated with the reservoir, general land requirements and whether its features were compatible with the reservoir system and location, if treatment residuals are produced and how they can be managed, energy requirements, implementation schedule, operations and maintenance (O&M) requirements, general costs (construction, O&M, and cost benefit), and regulatory constraints with the provision that the technology cannot harm the environment.
- Chris Keller, Wetland Solutions, covered three technologies that were evaluated further. The first, constructed treatment wetlands, are large created marshes designed to naturally improve water quality. They are commonly used in south Florida, and they may be referred to as Stormwater Treatment Areas (STAs in south Florida) or filter marshes (for regional projects). These wetlands reduce nutrient concentrations by consuming nitrogen and phosphorus for the growth of wetland plants and as an energy source for microbial processes and communities that live in the wetlands. Many successful applications of this technology exist in Florida and around the world. We have very robust operational data sets from large-scale systems in this region (south Florida). The general removal efficiencies range from 20–40% for total nitrogen (TN), 75–90% for total phosphorus (TP), and over 90% for

suspended algal solids. Constraints for this technology are that treatment wetlands generally require large land areas and have correspondingly large capital costs for land acquisition and construction, but they typically have lower O&M costs than the conventional technologies. Most of the annual costs are associated with supplying electricity to operate the pump stations needed to route water to and from the wetlands. Treatment wetlands accrete residuals in the form of new sediments, which are made up of decomposing vegetative matter. The accretion rate is low, and treatment wetlands typically have design lives of 30–50 years. They can be used to treat water either before or after it is discharged from the reservoir.

- The second technology Chris discussed was sand filtration, which involves the gravity separation of particles, such as algae and suspended solids, from the water by forcing water to drain through a bed of sand or similarly sized media. Sand filtration is a passive or natural technology because, other than pumping to deliver water to the system, it does not require energy or chemical inputs. Several applications of this technology exist in Florida with the largest currently under construction for a phosphate mining facility in central Florida. General removal efficiencies range from 20–40% for TN, 25–50% for TP, and over 90% for suspended algal solids. Like treatment wetlands, sand filtration generally requires a large land area and is likely to have large capital costs for land acquisition and construction. It typically has lower O&M costs than most conventional technologies. O&M costs include pumping and periodic replacement of the upper sand layer every 3–5 years. Sand filtration can be used to treat water either before or after it is discharged from the reservoir.
- The third technology Chris covered was hybrid wetland treatment technology (HWTT). This technology combines physico-chemical processes of coagulation with the natural settling and polishing processes that occur in treatment wetlands. A coagulant, such as alum, is dosed to bond with nutrient ions and forms particles that can settle out in the wetland basins. HWTT has been used in various places in Florida though most applications have taken place in the northern Lake Okeechobee Watershed. Robust operational data are available. HWTT can be easily scaled up for use in this situation. Removal efficiencies range from 50–60% for TN, 80–90% for TP, and over 90% for suspended algal solids. Because they are enhanced or intensified by adding chemicals, they require reduced land area and capital costs in comparison to constructed treatment wetlands. O&M costs are higher compared to treatment wetlands because HWTT systems require chemical addition. HWTTs do generate solids that require periodic removal and disposal, and they can be used to treat water either before or after storage in the reservoir.
- Jim Bays, J-Tech, discussed the remaining three technologies. Alum is used to coagulate nutrients by particle charge neutralization and solids sedimentation in offline lagoons or within the reservoir. This approach has a long and successful

history in Florida and is well-studied with ample performance data, such as the Nutrient Reduction Facility in Lake County. Removal rates are typically high for nitrogen in the range of 50–70% and very high for phosphorus in the range of 50–90%, with over 90% algal solids removal. The land area requirement is relatively small, and consists primarily of settling basins, chemical storage and solids dewatering and drying facilities. The O&M cost is moderate to high, given the continuous need for chemicals. The removed floc requires dewatering and storage, which is the largest open concern over the long term. Power is required for pumps, dosing and mixing.

- Jim explained that ElectroCoagulation (EC) is the coagulation of nutrients by electrode particle charge neutralization and solids sedimentation. The system is relatively new to Florida with limited Florida case studies. The limited studies have shown this approach has consistently high removal of nitrogen, phosphorus, and algal solids. The system would be relatively compact with a low land area required but would have a high capital cost and a high O&M cost. One benefit of this approach is lower residuals compared to alum treatment, for example, but it still generates solids that require disposal. Power requirements are high to operate the system, pumps, and air diffusers.
- Jim described Bold & Gold®, which is a sorption media developed by the University of Central Florida, that uses a mix of sand, tire crumbs, and clay particles to sorb and filter nutrients in engineered basins. Over 200 applications exist in Florida, and performance data indicate potential TN removal of 75–90% and TP removal of 50–90%. The media beds are relatively small and require a moderate area. The spent media must be replaced periodically. O&M costs are relatively high because of the replacement costs, but other operational needs are minimal.

## First Round of Questions

- Q: Are there water depth limitations to the alternative treatment technologies? What is the depth of overlaying water column?
- A: For the media bed treatment technologies, like Bold & Gold®, the media is 3–5 feet deep. For this technology, water is placed at grade or a few inches to spread the water over the media for filtration. In the alum settling ponds, the water can be 9–10 feet deep to accumulate solids.

- Q: Have you considered solar energy for the alum facilities?
- A: We are currently assuming that power from the local grid will be used. We have not looked specifically at solar power but this can be evaluated moving forward. Power will be needed to operate the dosing equipment and pumps. The power source will be determined during detailed design.

- Q: What is the proposed alum dosage concentration?

- A: The dosage is on the order of 10–12 milligrams per liter (mg/L). This dosage is being tested by SFWMD now and this will be discussed later in the presentation.

- Q: What is the most ideal water depth for sand filtration?
- A: This is similar to Bold & Gold® where there just needs to be enough water to spread out across the sand bed so that water can infiltrate.

## Study Results

- Chris discussed the technology criteria and ranking. He stated that obvious ranking criteria include cost and nutrient removal performance, and the Working Group suggested that the consultant team also include other attributes in the ranking methodology. With the help of the Working Group, the consultant team identified 10 additional attributes that were weighted and ranked for each of the top 10 technologies. He discussed the attributes and their weighting factors. Attributes that are more important to the success of the project were given a greater weight. The highest weight, which indicates the most important attribute, is a “5.” The lowest weight, which indicates the least important attribute, is a “1.” The most important (highest weighted) attributes were those related to the use of the technology at a similar scale to that required for the C-43 Reservoir and the team’s confidence in the performance estimates provided by the vendors. Other attributes considered habitat value, land requirements, energy efficiency, and the complexity of routine O&M activities.
- Chris reviewed the scores for each attribute and for each technology, based on consensus of the Working Group and consultant team. Individual scores ranged from 0–2 with guidance for the scoring shown at the bottom of the slide. For example, scalability received a “2” if it had already been demonstrated at an adequate scale, but a score of “0” was assigned if it had not been demonstrated at an adequate scale. Total scores were weighted, summed, and then ranked from high to low. The highest score (54 for treatment wetlands) was given the #1 ranking.
- Chris explained that the consultant team developed a consistent design criterion, so technologies could be sized, priced, and compared in the same way. The inflow and outflow water quality concentration goals were based on a review of historical water quality data in the C-43 and removal goals for each nutrient of concern. These goals were to reduce TN from 1.5 to 1.0 mg/L, TP from 0.16 to 0.08 mg/L, and TSS from 20 to 10 mg/L. These were based on a flow of 457 cubic feet per second (cfs), which is equivalent to the Minimum Flow and Level (MFL) at S-79.
- Chris stated that each technology was sized to meet the minimum design criteria, and total masses removed over a 20-year planning period were combined with 20-year net present value (NPV) capital and O&M costs (excluding land and

conveyance infrastructure) to develop cost-effectiveness values for TN, TP, and TSS. Chris showed a sector plot with each technology scored based on the attribute ranking and the TN cost-effectiveness ranking. The most cost-effective alternatives with the best attribute rankings are those found in the lower left quadrant of the sector plot.

- Per Chris, the consultant team looked to develop a short list of stand-alone or combined technologies that would provide the highest benefits. The Working Group and stakeholders were particularly interested in technologies that could be combined in series or in parallel. Series configuration is used when each technology provides treatment for a different parameter or when the lead technology transforms parameters into a form that is easily removed by the second technology. For example, technology one may be excellent at removing TN, while technology two is excellent at removing TP. Combining these technologies into a treatment train would provide adequate treatment for both nutrients. Parallel configurations are used more for low flows and peak flows.
- Chris stated that the consultant team looked at the compatibility of different technologies. Details and information on this evaluation are found in the Feasibility Study report. He showed a table that ranked the compatibility of these technologies. For example, a treatment wetland could be followed by sand filtration or Bold & Gold®. The ElectroCoagulation data reviewed by the consultant team indicated that it reduces all nutrients of concern in a relatively compact footprint, so no real benefit would be gained by combining it with other technologies.
- Jim stated that from the attributes ranking criteria analysis, it was determined that STAs, alum, and HWTT technologies are the highest ranked technologies. However, the team considered other combinations of technologies such as the use of a treatment wetland to treat a portion of the flow, and a Bold & Gold® treatment bed to treat the remainder. Conceptually, this combination was sized as a 1,000-ac STA, which would treat 20% of the target flow, and 104 ac for Bold & Gold® to treat the remainder. A sand filter was also considered as a replacement for the treatment wetland, which was estimated to be 200 ac, coupled with 104-ac Bold & Gold® treatment. Finally, ElectroCoagulation was considered given its high removal capabilities and the most highly controllable treatment system.
- The consultant team calculated the cost benefit to estimate the total costs including the construction costs for treatment facility and water conveyance infrastructure and the annualized O&M costs for a 20-year period. The benefits of the systems would be estimated by their cumulative mass removal of nitrogen, phosphorus, and solids and then dividing that amount into the total for the 20-year period.

- Jim showed a table with the capital cost, annual O&M, and the NPV of the infrastructure cost. Capital costs ranged from $47.8 million for HWTT to $164 million for EC. Operational costs showed a different trend, with wetlands and sand filter combinations having the lowest O&M costs of $1–2 million to $8.5 million per year for HWTT.
- Jim showed a comparison of the six alternatives compared by area, flow, and 20-year net present worth unit removal cost. The largest area requirement was for a full-scale STA at 5,000 ac, and the smallest area requirement was for alum treatment (50 ac). Electrocoagulation required 150 ac. Treated flows ranged from an average of 457 cfs for the STA, alum, and HWTT down to 325 cfs for the Bold & Gold alternative. The lowest treated flows were 229 cfs associated with ElectroCoagulation. These findings are because the technologies showed greater removal rates than those specified by the consultant team, and they would treat a commensurately smaller flow that would then be blended with bypass flow.
- Jim showed figures with the unit cost data for each parameter with unit cost data ranging from highest to lowest from top to bottom. Total nitrogen ranged from $17 per pound removed for alum treatment to $33 per pound removed for EC. Total phosphorus ranged from $109 per pound removed for alum treatment to $205 per pound removed for EC. TSS ranged from $0.80 per pound removed for alum treatment to $1.64 for EC. Alum treatment consistently showed the lowest unit cost, with a relatively large difference in unit costs with the other technologies. EC proved to have a consistently higher unit cost over all the technologies.
- Jim stated that based on these analyses, alum treatment was ranked first followed by the combination of a treatment wetland with Bold & Gold®, HWTT, and the combination of sand filtration with Bold & Gold®. This set of alternatives represents technologies with a proven track record, such as alum treatment and treatment wetlands, but it is supplemented with relatively new technologies, such as HWTT and Bold & Gold®. The relatively lower unit cost for alum treatment is consistent with actual performance of full-scale facilities, and a smaller footprint is required. The relatively greater unit costs for the remaining technologies are fairly similar and land area requirements are considerably greater.

## Second Round of Questions

- Q: Are there any concerns with alum toxicity in the receiving waterbody?
- A: Alum technology has been implemented over the last 30 years in Florida. Studies by Harvey Harper from projects in central Florida are cited in our report and are available on the SFWMD project website. The HWTT technology also has reports summarized from Watershed Technologies as they have implemented this technology for SFWMD over the last several years. Additional details are posted on the C-43 website. The water chemistry for the C-43 will minimize the toxicity

potential, and the project will be managed so that toxic concentrations do not occur.

- Q: In your experience, how long do treatment wetlands effectively remove nutrients? With age, can't they become a nutrient source?
- A: With respect to nitrogen, the predominant processes are microbial, which are associated with biofilms or microorganism communities that grow on the roots and stems. These biological processes will run indefinitely. For phosphorus, the underlying soils will have some absorption capacity that could reach a maximum point. Phosphorus is also taken up by plants that then die and decompose to create new soils. In our experience, life expectancy is not an issue when the wetlands are appropriately designed, sited, and constructed. There will be a slow accretion of new solids in the wetlands over time.

- Q: Are the new treatment systems going to be within the same footprint of the existing C-43 project or did the costs assume the acquisition of land to accommodate the treatment systems?
- A: Additional lands were not evaluated as part of the Feasibility Study although SFWMD does own lands in the area. The costs in the Study did include land acquisition. Additional evaluations will be conducted, and details on these evaluations will be provided later in the presentation.

- Q: Will the alternatives be evaluated for effectiveness at flow levels beyond 457 cfs?
- A: Operationally, we are looking to treat flows up to 600 cfs. The flow dictates the size of the treatment system so it is an important factor. The flow of 457 cfs was selected based on the long-term expectation for the reservoir. There will be periods with high flows but the focus is on treating flows in the range of 457–600 cfs.

- Q: For ElectroCoagulation, is the bulk of the cost in equipment or power usage?
- A: Most of the cost is the equipment. The power cost is higher than other technologies, like alum treatment, but the equipment is pretty expensive. J-Tech spoke to the vendor and discussed alternatives to reduce the number of units; however, there are still substantial capital costs to meet the flow requirements.

## WQATT – Preliminary Results

- Cassondra Armstrong, SFWMD, stated that she received support to conduct a pilot study on two technologies that came to the top of the list in the Feasibility Study. One technology is Bold & Gold®, which is a bioactive media that is composed of clay, tire crumb, and sand. The vendor estimated a 70% removal of TN; however, the source water was a retention pond on the University of Central Florida campus that was dominated by nitrate + nitrite (NOx) whereas C-43 water is dominated (60–80%) by dissolved organic nitrogen (DON), which is a more recalcitrant form. SFWMD wanted to test how Bold & Gold® would work with C-43 water. They had similar concerns with alum. Alum has a long history of safely removing nutrients in lakes and ponds but they wanted to see if would work in C-43 water.

- The Bold & Gold® study was conducted in the mesocosms at the Boma site. Two tanks had Bold & Gold®, two had sand only, and two were controls. The tanks were fed with continuous flow of C-43 water at a rate of 0.005 gallons per minute per square foot, which is an order of magnitude lower than what was designed in the Feasibility Study due to plumbing limitations. The tanks were sampled Monday through Thursday for three weeks to develop a nutrient removal efficiency curve. Cassondra noted that the Bold & Gold® manufacturer recommends a 90-day time for startup so the pilot project represents the first flush and not optimum performance. For the alum study, grab samples from the Boma site, Hillard Canal (upstream of Boma and very active agriculture), and Lake Okeechobee were used. There were no lake releases during the study. The lab determined the optimum alum dosing and calculated the nutrient removal.
- Cassondra stated that for the Bold & Gold® study, they emptied the tanks of vegetation from a previous study. They then added a layer of red river rock to about 1 foot, which was covered with geofabric to prevent the sand and Bold & Gold® from getting into the rock. Each tank has two pipes that were used as sampling wells. They layered the sand or Bold & Gold® and compacted it to a depth of 3 feet. The Bold & Gold® tank had 2 feet of Bold & Gold® capped with 1 foot of sand. The control tank only had the river rock and geofabric. Water flowed vertically into the tanks to get the best treatment potential. The alum study was setup in a lab where alum was added to jars and mixed to test different dosing levels. The best dosing level provided the most clarity while balancing pH needs. Alum reduces pH and they needed to ensure that it did not drop below 5.5, which is considered hazardous to release to surface water.
- Cassondra reviewed the Bold & Gold® results. For total organic carbon (TOC), the control stayed around the initial TOC concentration with a little (about 10%) reduction. Both the sand and Bold & Gold® had higher TOC in the outflow than the inflow. Bold & Gold® had the most TOC production but that declined in time after day 7, so this is likely a first flush situation. Cassondra noted that there is a gap in sampling between day 14 and 20 because there was an electrical issue that caused them to stop flow for three days.
- All options removed TN effectively. Bold & Gold® did a little better than the control or sand but there was a drop in efficiency after the loss of flow. Sand started releasing TN after the flow interruption. Dissolved organic nitrogen (DON) was about the same in all tanks with little removal. Bold & Gold® did a fantastic job with NOx removal of about 98%. The control had 50% removal and the removal for sand was low. The ammonia (NH4) concentration was below detection in the incoming water, For the control and sand, there was no change in NH4 most of the time. Bold

& Gold® initially had some NH4 production and then went to 0 after day 11 but then it started producing NH4 again, along with sand, after the flow disruption.

- TP was removed by all technologies, although not as well by Bold & Gold®. Particulate phosphorus was produced by both sand and Bold & Gold® although Bold & Gold® improved over time until the flow disruption. Soluble reactive phosphorus (SRP) was removed by all treatments with sand having the highest removal rate although it was declining with time. Bold & Gold® went up and down although it was trending down.
- For the alum jar tests, TOC was removed by 50–72%, TN by 27–57%, particulate nitrogen by 65–89%, DON 43–72%, and TP by more than 90%. NOx and NH4 were produced, which they were told was not unexpected.
- Cassondra stated the limited initial results found that Bold & Gold® is very good at removing NOx, removes about 30% of TN, and is not effective at removing DON. TOC, NH4, and particulate phosphorus increased. Bold & Gold® may be sensitive to flow disruption and the study had not reached the 90-day optimum removal efficiency. Alum was very effective at removing carbon, nitrogen, and phosphorus in different fractionations and different sources, although there was an increase in NOx and NH4. The alkalinity needs to be sufficient enough to buffer pH and the lake water had less buffering capacity so this could be a concern when there are significant lake releases.
- Cassondra stated that she has received funding and approval to continue this study. Bold & Gold® will continue to be sampled biweekly through September 2021 to get to 90-day optimum removal and to test seasonal variability (temperature, storms, lake releases). She is adding heavy metal and polycyclic aromatic hydrocarbons (PAHs) analytes to capture the effect of tire crumb. They will also conduct a one month sampling in one tank at the design flow rate used in the Feasibility Study, and weekly samples will be collected. Another alum treatment test will be conducted for the dry season and they will also test another type of alum to determine which is more effective.

## Third Round of Questions

- Q: What micron size is the geo fabric?
- A: The pore size is not known, but it is small enough to allow the water through but not the sand.

- Q: Given that the pilot study was only performed for 30 days, would you consider the results for the Bold & Gold® and sand study inconclusive thus far? If not, is it your opinion that the performance reported by the vendor isn't as effective as stated?
- A: The results presented here are just a first flush after the technology was installed. It has not reached the 90 day point to achieve optimum performance.

Therefore, this part of the study is not conclusive and not represented of removal capabilities.

- Q: Would hydraulic residence time be a better metric than flow rate for evaluating performance?
- A: The flows presented are essentially hydraulic loading rates with the rates of gallons per minute over square feet of surface area.

- Q: Have you considered pilot testing of polyaluminum chloride as well?
- A: The pilot study only tested the technologies recommended in the Feasibility Study. While this type of alum was not included as part of the pilot study, it's nutrient/particulate removing capabilities do warrant a look. This particular type of alum seems to produce less of a pH reduction effect and can be using in a broader range of water pH conditions. Given that our Lake water has relatively low alkalinity, this may be an important factor when considering types of alum.

- Q: Were there problems with the fabric clogging?
- A: There have not been problems with clogging and water has been moving quickly through the system. After they turned the flow on, they had a pretty healthy flow out of the tanks within a day. There have been no problems with clogging about three months into the pilot study.

## Next Steps – Water Quality Component (WQC) Siting Evaluation

- Kim Fikoski, SFWMD Project Manager, stated that the next phase of the project is the C-43 WBSR Water Quality Component (WQC) Siting Evaluation, which will be kicked off in December. The purpose of the Siting Evaluation is to further evaluate the four alternatives identified during the Feasibility Study. In addition, based on stakeholder comments, a full-scale STA will be included. The Siting Evaluation deliverables include a Siting Evaluation Report, water quality analysis of project performance, a Conceptual Design Report, and the WQC Plan selection.
- Kim noted that public meetings will continue to be held and will present the Draft Siting Evaluation Report and WQC Plan. The WQC Siting Evaluation will be completed within nine months. If funded, the selected WQC Plan will move forward to detailed design under a separate contract. The goal is to have project construction to be completed and online concurrently with full operation of the reservoir.

## Public Input Using Menti and Questions and Answers

- Participants were asked to provide feedback on the Menti website. The results will be posted to the project website.

**Please type in any question you have related to the technologies that were evaluated for the Study.**

- Q: Will the recommended treatment methods remove humic compounds and clarify the water?
- A: This depends on which technology. Some technologies would do a better job than others in terms of making a change in water color. If the water clarity is due more to algae or suspended solids, then all the technologies would do a good job of addressing those or they would not have made it this far in the process.

- Q: How will the use of Bold & Gold® be affected by intermittent flows in or out of the reservoir. Is this still a viable solution for this application?
- A: We do expect dynamic flows from the reservoir to the treatment system. The bulk of the Bold & Gold® applications are stormwater related so its typical application is in a dynamic system. From the early results of the pilot study, we learned that it is important that the system become established and then the performance should be stabilized with biological treatment. There is some control on how much water is discharged from the reservoir to the treatment component. Bold & Gold® is being proposed as complimentary to a treatment wetland or sand filter so the operations would be balanced with the other treatment.

- Q: Is there a plan to provide continuous/routine water quality monitoring of final alternatives to verify the criteria are being met?
- A: Water quality monitoring will be part of any water quality treatment project that is implemented at the site.

- Q: Why is cost not in the same ranking table with the other factors? It seems more weighted than the other things.
- A: As we went through the ranking process, we first pared down the list of technologies using the attributes and then went to a strictly cost-benefit analysis of the costs for the project and the nutrient removal benefits. We had received feedback from past public meetings that cost should not be the sole discriminator, which is why the attribute ranking was included. The goal was to evaluate the technologies to ensure they meet basic requirements and then use cost as an additional factor. Final Score = (Attribute Score x 50%) + (Cost-effectiveness Score x 50%)

- Q: Why Bold & Gold®? Who brought it up?
- A: This technology was on the DEP website of approved technologies. The Feasibility Study used technologies from the DEP database, as well as input from experts and the public.