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

July 16, 2020 2:00 PM – 4:00 PM
Webinar

Meeting Welcome

- Jennifer Reynolds, Director of Ecosystem Restoration and Capital Projects with the South Florida Water Management District (SFWMD), welcomed everyone to the C-43 West Basin Storage Reservoir Water Quality Feasibility Study (Study) public webinar. This Study is one of Governor DeSantis' key priority projects that he announced in his January 2019 Executive Order, which ensured protection of Florida's water quality. She stated that we kicked off this project on July 3, 2019. Today is the fourth public meeting. The three previous public meetings were held in September 2019, January 2020, and March 2020. The March 2020 public meeting was the first meeting SFWMD held via Zoom technology. She thanked the public for working with the SFWMD to use new technology and for participating in this project, and she thanked the Working Group members for their dedication and collaboration on the project. She stated that today is the final public meeting to present findings from the Preliminary Draft Feasibility Study. The project is due in October 2020, and the next public meeting will be held on November 5th to present the findings of the Final Feasibility Study and an update on the second phase of the project.
- Georgia Vince, J-Tech, welcomed everyone to the fourth public meeting, the second using Zoom technology. 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 Preliminary Draft Feasibility Study that was completed on June 18th and to review the criteria evaluation and cost benefit analysis that was performed to identify the recommended alternatives.
- Georgia introduced the Working Group members from SFWMD, Florida Department of Environmental Protection (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 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 Information Collection and Summary Report was completed in April 2020. The Preliminary Draft Feasibility Study was recently completed, and it will be discussed today in detail.
- 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 completion target of December 2023.
- The purpose of the C-43 WBSR is 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 related 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 down 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 Preliminary Draft Feasibility Study.
- 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 four of the top 10 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 before or after water storage in the reservoir.
- Chris discussed aeration (air diffusion systems), the third technology. Aeration can be used to reduce algal populations through physical mixing and supplying dissolved oxygen to reduce stratification and minimize the release of nutrients from anaerobic sediments. Several applications of aeration in lakes and reservoirs exist in Florida. Removal efficiencies range from 50–75% for TN and TP. Because aeration is employed within the water storage reservoir, little additional land is needed for the

blowers and controls. Aeration does not create any residuals, and it has moderate capital and O&M costs. Most of the O&M cost is associated with electricity to run the blowers. O&M includes annual compressor and diffuser maintenance. This technology is applicable within the storage reservoir.

- The fourth 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 six of the top 10 technologies. Coagulant treatment (alum) is used to coagulate nutrients by particle charge neutralization and solids sedimentation in offline lagoons or potentially within a reservoir. This approach has a long, successful history in Florida and is well-studied with ample performance data, such as the Nutrient Reduction Facility in Lake County. Removal rates for nitrogen range between 50–70% and for phosphorus between 50–90%. Over 90% algal solids removal occurs. 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 described MPC-Buoy, which is a new and innovative technology. It would be considered an “in-reservoir” treatment approach. It is a solar powered and remotely programmed ultrasonic emitter that reduces algal populations through sonic interference with cell flotation. It may impact zooplankton. It keeps algae in deeper water and minimizes their productivity. No case studies exist in Florida yet, but a significant research project is currently underway by the Florida Gulf Coast University. Limited performance data exist in the United States as most data come from Europe. The system has shown up to 90% removal of algae, and it would not require additional land area or produce residuals. The cost would be the lowest of all technologies, and maintenance would be moderate.
- Jim explained that ElectroCoagulation is another technology that was reviewed by the consulting team. It 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. Studies have shown that this approach consistently has high removal of nitrogen, phosphorus, and algal solids. The system would be relatively compact with a small land area requirement but would have high capital and O&M costs. One benefit of this approach is that it produces less residuals compared to alum treatment, 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. This technology can be used to treat water either being discharged or prior to entering the reservoir.
- Another technology that the consulting team reviewed was Nutrigone Bioabsorptive Media (BAM). Jim mentioned that it combines the sorption of phosphorus and denitrification of nitrogen using natural media in engineered filtration beds. This technology is relatively new with limited Florida applications and performance data. The available data set indicates 90% TN and >90% TP removal. A moderate land area is required, and the system would have high capital and O&M costs. The latter is because the spent media must be replaced often (possibly every 1.5 years). Residuals must be disposed of and can be used for soil amendments.
- The final technology in the top 10 was Aqua-Lutions. Jim stated that it is a proprietary technology that combines coagulation of algae and particulate organic matter via chemical addition with dissolved air flotation using micro bubbles for solids separation. Several pilot studies were completed in Florida, and available performance data indicate removals of 65% TN, 90% TP, and 80% algae. It is a relatively compact facility, with high capital and O&M costs. Residuals are produced, but the vendor proposes to convert the algal solids to fertilizer pellets. This technology could be used for pre- and post-storage treatment.

First Round of Questions

- Georgia read through the list of questions received.

- Q: Where can I find studies on aluminum toxicity, or studies related to the HWTT, to the flora and fauna at the discharge site?
- A: (Jim Bays, J-Tech) This has been a common and frequent topic as alum technology has been implemented over the last 30 years. 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 WBSR WQFS project website, and the link will be provided at the end of the presentation.

- Q: I remember in the first meeting an alternative was discussed where some type of absorption media was built into the walls of the reservoir itself. Did I miss that today or was it dropped from consideration?
- A: (Shawn Waldeck, J-Tech) We have to dismiss any alternatives that result in a reconfiguration of the authorized project for the reservoir. Therefore, this option had to be dropped from consideration.

- Q: If using a technology that provides reusable fertilizer, what would be the costs to produce the fertilizer and can the sales be used to offset bulk of costs?
- A: (Jim Bays, J-Tech) The vendor that developed this approach does have a partner for the management of residuals that would make residuals into fertilizer. This would offset the costs depending on the availability to use the solids as fertilizer, and this information is summarized in the report. It does help to defray some of the costs although there are significant capital costs with this technology.

- Q: Bill Mitsch from Florida Gulf Coast University has described a process he calls "wetaculture." It involves working with farmers to create incentives for "soaking" fields (using portions of property) as wetlands. Is this similar to the hybrid you described?
- A: (Chris Keller, WSI) The wetaculture concept is one that takes a land area and has it cycle over the years between some type of crop rotation and flooding fields to allow those lands to become wetlands. This approach uses internal recycling where nutrients are trapped in the sediments in the system by the wetlands so that crops can use the nutrients instead of applying additional fertilizer. This is not the same technology as the HWTT. HWTT combines alum treatment with wetland polishing.

- Q: Most of these systems have a residual. The last one proposes turning it into fertilizer. What is done with the residual on the other systems?
- A: (Jim Bays, J-Tech) This is the crux with using a chemical coagulant because it accumulates over time and does not disintegrate. Other facilities, like the NuRF in Lake County, have managed residuals for years. They have used it for soil amendments and soil addition in restoration projects. The material has also been proposed for use as a wetland subgrade for constructed wetlands since it has the ability to absorb phosphorus over time. Accumulated residuals will either be placed in a landfill or used as mentioned above. Generally speaking, the residuals are stockpiled and placed in landfills.

- Q: Why has the reservoir been exempted from meeting TMDL or Basin Management Action Plan (BMAP) requirements?

- A: (Marcy Frick, J-Tech) The purpose of the Study is to identify treatment for the reservoir and will not achieve reduction to meet the entire TMDL. The Study goal is to treat the water to ensure the quality is as good if not better than what is going into the reservoir to help improve water quality for the river and estuary downstream.

- Q: Do you have an acreage for the treatment marsh (STA) if that is the selected alternative?
- A: (Georgia Vince, J-Tech) An approximately 5,000-acre (ac) STA would be needed, and details on this will be discussed later in the presentation.

Water Quality Treatment Technologies, continued

- 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 for the 10 technologies was given the top rank. Treatment wetlands scored a "54," which was the highest score. Alum treatment and HWTT tied for second place with a score of "35."
- Chris explained that the consultant team developed a consistent design criteria, 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 milligrams per liter (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. The lowest cost per pound received a score of "1," and the highest cost per pound received a "10." The other technologies were scaled in between.
- Chris showed a sector plot with each technology scored based on the attribute ranking and the TN cost-effectiveness ranking. The consultant team chose TN because it is the nutrient of primary concern in the C-43 Basin. Treatment wetlands had an attribute ranking of "1," and they scored around a "3" for cost effectiveness. HWTT and alum treatment ranked "2." He mentioned that the most cost-effective alternatives with the best attribute rankings were those found in the lower left corner of the sector plot. As one moves to the right on the plot, these technologies have higher dollar per pound N removal or cost effectiveness, so the consultant team used this plot to select technologies to move forward with.
- 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 was 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 Preliminary Draft Feasibility 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 and 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 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.

- 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 (typically in millions). Capital costs ranged from $42 for alum treatment to $164 million for ElectroCoagulation. For operational costs, wetlands and sand filtration had the lowest O&M costs of $2–$3 million, and HWTTs ranged from $8–$9 million. Conveyance infrastructure cost was also included for pump stations, conveyance channels, and access roads to support the technologies. Capital and O&M costs were summed over a 20-year period and annualized. The NPV costs ranged from $109 million for alum treatment to $245 million for ElectroCoagulation treatment.
- 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 acres. 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. TN ranged from $16/pound removed for alum treatment to $37/pound removed for ElectroCoagulation. TP ranged from $102/pound removed for alum treatment up to $231/pound removed for ElectroCoagulation. These figures were consistent with other studies and findings.
- Jim stated that based on these analyses, alum treatment was ranked first followed by HWTT, the combination of a treatment wetland with Bold & Gold, 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.

Next Steps

- Georgia noted that the team is continuing to finalize the feasibility study, and the draft will available August 14th. The Final Water Quality Feasibility Study will be completed on October 16th. A final presentation on the Study results will be given at a public meeting held on November 5th.
- She reminded meeting attendees to visit www.SFWMD.gov for the Working Group's webpage and project information. Additional questions and comments can be submitted to C43waterquality@sfwmd.gov during the remainder of the study period.
- She then asked for questions on the criteria ranking and cost benefit analysis.

Second Round of Questions

- Q: How come STAs received a zero for land requirements? Does zero means that it requires land?
- A: (Written Response) Zero means it requires a high amount of land, so it received the lowest score for land requirements.

- Q: Do you have a written update to the September 2019 report? A draft report before the expected December 2020 final?
- A: (Written Response) The Information Collection Summary Report was finalized in early April, and it is posted to the project website. The Draft Feasibility Study will be ready in about one month for public review before the Study is finalized.

- Q: The difference in score from the second and third place (tie) and fourth place technology is one point. Is there enough sensitivity in the scoring to differentiate in the score and ranking?
- A: (Georgia Vince and Jim Bays, J-Tech) We did do a sensitivity analysis, which is part of the report, where we varied the highest ranked criteria. This analysis did not show a differentiation in the top four technologies. The combination of weights did not have an effect on where technologies were ranked.

- Q: Can you clarify how the 457 cfs was incorporated into the design criteria? Was it based on moving enough water out of the reservoir to meet the 457 cfs at S-79 through each of the treatment technology options?
- A: (Jim Bays, J-Tech) This is the typical rate of flow we are expecting to see discharged from the reservoir. The working hypothesis is that what is discharged has to be equal to or better than what is in the river, which drove our treatment goals. We needed to treat a substantial flow to meet design targets for treatment.

- Q: Did scalability include to have a technology that can sustain zero flows for several weeks?
- A: (Jim Bays, J-Tech) This was addressed and considered in review of the 10 technologies. There is case experience where the filtration media, wetlands, and sand filters can all be dry for periods of time, so they can treat the natural variation of flows. Technologies that are more chemically or electrically driven can be turned off. Technologies had to sustain zero flows to have gotten this far in the evaluation.

- Q: Were ancillary water quality impacts included in the ranking (sulfate, aluminum, etc.)?
- A: (Chris Keller, WSI) Yes and no. Ancillary water quality impacts and benefits were wrapped up in the habitat creation and value to wildlife attribute. If a particular technology had a negative impact then that would be reflected in those attributes. Other water quality parameters were not included in ranking as a standalone attribute.

- Q: Did the cost include the capital cost or only the O&M? The cost was set per pound of phosphorus or nitrogen removed? Or per gallons treated?
- A: (Chris Keller, WSI) The final costs were the NPVs that included the capital cost for the technology, infrastructure requirements to deliver water to that technology and deliver it back, and associated O&M costs for both conveyance and technology. The technologies were evaluated in terms of pounds of TN, TP, and TSS removed.

- Q: Is the cost determined based on the water quality conditions (initial concentrations) at the site?
- A: (Chris Keller, WSI) The starting inflow concentrations that were used for TN, TP, and TSS were based on a statistical evaluation of water quality data in the C-43 and represent average inflow conditions for the reservoir.

- Q: Did the cost benefit analysis of alum treatment assume that the floc would be removed?
- A: (Jim Bays, J-Tech) Yes, this is included in the O&M costs for both the alum treatment and HWTT. A cost estimate is included to pump the floc from settling basins to drying facilities. Therefore, costs for both extraction and processing and drying are included.

- Q: Did the cost include dealing with the residuals?
- A: (Jim Bays, J-Tech) Yes, as part of the O&M.

- Q: "Equal to or better" than the water quality that's already in the river" seems like a low bar. Since the water in the reservoir is coming from the river, what factors have been identified which are expected to worsen water quality in the reservoir?

- A: (Jim Bays, J-Tech) We are not certain what water quality changes will occur in the reservoir but there should be a retention of nutrients. Therefore, we are assuming a conservative case because water quality will likely be better. The design targets represent typical water quality in the river during the dry season when there would be a discharge from the reservoir. This is not a simple target to treat to so we set a somewhat challenging requirement for nutrient reductions.

- Q: How does the stagnant conditions of the reservoir affect algae in the reservoir vs. the river itself?
- A: (Jim Bays, J-Tech) Retention in the reservoir and retention of nutrients could result in algal production. This is reflected in the TSS goals that we asked the technologies to achieve.

Menti Polling and Questions

- Participants were asked to provide feedback on the Menti website. The participants can have the results emailed to them and the results will also be posted to the project website.

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

- Q: What is Bold and Gold made from? What are its ingredients.
- A: (Jim Bays, J-Tech) We are using the CTS mixture, which includes clay, tire crumbs and fine sand. All have sorption attributes that are good for nutrient removal and are made from local materials. The concept for this site is to use sands from the project area in this mix.

- Q: How difficult is to change out the Bold & Gold media?
- A: (Jim Bays, J-Tech) This would be a rebuild of the media layer by physically removing the media bed. That would be 5 feet of media depth for this project. The media would be removed using a machine and replaced with media created onsite. Implementation at this scale has not been done but has been done on smaller scales.

- Q: How are coagulants being used in other restoration projects?
- A: (Chris Keller, WSI) Coagulants are more frequently used in treatment and water quality projects than habitat restoration projects. The most common is alum which has been used in lake restoration projects. This ties into the question about why alum instead of another coagulant. Alum is more proven at these larger scales than other coagulants. There are other chemicals that go with the alum to help with buffering pH.

- Q: When do you anticipate DEP will certify the operation of the reservoir?
- A: (Ed Smith, DEP) DEP will certify the operation of the reservoir after the operational testing monitoring phase, which will be after construction is complete. This is part of all CERP projects. This would occur around 2024, and DEP will work with SFWMD to permit those operations through the CERP process.

- Q: Does alum change the physical, chemical, or biological conditions in the waterbody or downstream?
- A: (Ed Smith DEP) Alum has been permitted by DEP going back to the 1980s. It has shown very effective treatment and is easy to manage. The City of Tallahassee uses alum in several location and they have the oldest system since 1984. The city has managed the output and the pH to prevent problems with alum. There was one system that they had to scale back because it was removing too much nutrients. Alum is very effective and easy to monitor. Alum systems would get an Environmental Resource Permit (ERP) and also a National Pollutant Discharge Elimination System (NPDES) permit, which would have both a DEP and U.S. Environmental Protection Agency Region 4 oversight, which would require extensive monitoring.

- Q: Does this study take into account an increase in nutrients coming into the C-43 as there is more nutrient use in South Florida. Would increase of nutrients coming in slow the removal and the target cfs?
- A: (Jim Bays, J-Tech) The project cannot affect the flow going downstream to the estuary. We looked at a snapshot of water quality data from the last 10 years. We did not forecast any increases in nutrients. We did this for comparison purposes to compare the technologies as apples to apples. The sizing of these systems is based on flows and concentrations. If we see an increase, there may be a need for additional facilities and acreage for treatment. The benefit of alum is that it can treat more load and flows but there would be more residuals. There is the ability to scale up for flows and concentrations. It would not slow removal but may require a change in operations and additional features.

- Georgia stated that all the questions will be captured and written responses will be provided, which will be posted to the project website.

Please type in any questions you have related to the C-43 West Basin Storage Reservoir Project.

- Q: Have the dam safety issues been resolved with respect to material used?
- A: (Shawn Waldeck, J-Tech) As part of the project design, it went through U.S. Army Corps of Engineers and independent peer review for safety issues related to construction of the dam.

- Q: Don't think I understand why the question we're trying to answer today was not incorporated into the original study?
- A: (Georgia Vince, J-Tech) This question has come up before. This reservoir was designed to regulate flows to the river and estuary and a water quality component was not included at the time it went through the Project Implementation Report (PIR) process.

- Q: Will there be an opportunity to clarify and provide more information on a technology?
- A: (Georgia Vince, J-Tech) On the project website, there is detailed information on the projects including reports and our Information Collection Summary Report. Additional information can be sent to the team for consideration in the next draft.

- Q: Will the reservoir be operable if water exiting does not meet water quality standards?
- A: (Ed Smith, DEP) The reservoir is pulling water in from the C-43, holding it in the reservoir, and transferring it out. The waters are not separate from Waters of the US, so it falls under the water transfers rule, so this does not apply.

- Q: How will adaptive management be used in reservoir operations to mitigate water quality impacts?
- A: (Shawn Waldeck, J-Tech) One of the concepts is to use the reservoir during the dry and cooler seasons, so we can count on some degree of better water quality during that season for discharge. We can also recirculate water within the system, which is more expensive, to minimize impacts from discharges.

- Q: What is the deadline for comments.
- A: (Kim Fikoski, SFWMD) The website has an email address where we will continue to take comments or information up until the completion of the Study. We would appreciate any comments by mid/late August when we will be starting to work on finalizing the Study. On the Working Group website for the project, there is a lot of information for review. In the Work Plan, the contact information for the Working Group and J-Tech is included, so you can reach out directly, but we encourage everyone to use the email address.

Please types in any additional questions you may have about the Study.

- Q: Is there any chance ranking of alternatives will be revisited given input today?
- A: (Jim Bays, J-Tech) We would revisit the alternatives that were selected if we thought there would be a major change in the cost-benefit analysis. We conducted a sensitivity analysis on the cost-benefit based on information received. If there are new data available that we have not seen before, we would look at them, but it would have to be a fairly big change in the ranking to change results. There may be people who have concerns about how this ranking affects the project in the future.

Whatever is ranked #1 here is not necessarily the project that will be implemented. We will use the results from this Study in the next phase with other information on land availability, timing, other priorities, how things work together, etc. We would then determine the final project. SFWMD has budgeted to further evaluate the top alternatives and is looking to have one recommendation in early 2021, which could be one or a combination of technologies. This alternative would go forward with design, permitting, and construction to be done concurrently with completion of the reservoir.

- Q: Please clarify that the water transfer rule exempts discharge from Water Quality Based Effluent Limits (WQBELs)?
- A: (Ed Smith, DEP) The water in the reservoir is Waters of the US, so it would qualify under the water transfer rule. Water is simply being held for use at a later date.

- Q: Is the C-43 Reservoir draft operating manual available online?
- A: (Ed Smith, DEP) The draft manual should be in DEP's OCULUS system. If you cannot find it, you can email Ed Smith at DEP for a copy of the draft operations manual.

Final Remarks

- Georgia thanked the Coastal and Heartland National Estuary Partnership for allowing use of the Menti program. The team feels this tool is beneficial for collecting input and feedback from meeting participants. She mentioned that at the end of the Menti session, the participants can have the results of the session emailed to them by entering their email address. The Menti results will also be posted to the project website. Georgia stated that the team will provide answers to all questions on the project website, https://www.sfwmd.gov/content/c43waterqualitystudy.
- Drew Bartlett, Executive Director of the SFWMD, gave the closing remarks. He is grateful that the SFWMD is working with DEP and Governor DeSantis to bring resolution to the C-43 water quality issue, and he appreciates the work of J-Tech and Wetland Solutions. He thanked the Working Group partners and stated that the SFWMD will continue to engage with them. He stated that we will have the right amount of water and right quality of water going to the Caloosahatchee with the help of this project. He thanked everyone for their participation.