MINUTES
of the
WATER RESOURCES COMMITTEE
Artesian Hotel, Casino & Spa
Sulphur, Oklahoma
October 20, 2022

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MEMBERS AND ALTERNATES PRESENT

ALASKA	Julie Pack
ARIZONA	Amanda Long
CALIFORNIA	
COLORADO	
IDAHO	Jerry Rigby John Simpson
KANSAS	*Connie Owen* Matt Unruh Tom Stiles
MONTANA	
NEBRASKA	Tom Riley
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NORTH DAKOTA	Jen Verleger
OKLAHOMA	Julie Cunningham Sara Gibson Shellie Chard
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TEXAS	Jim Rizk *Kathy Alexander*

UTAH	*John Mackey* Todd Stonely Renee Spoonor
WASHINGTON	Mary Verner
WYOMING	*Jeff Cowley* Jennifer Zygmunt

GUESTS

Christpher Neel, Oklahoma Water Resources Board
Lori Johnson, Oklahoma Water Resources Board
Duane Smith, DS and Associates
Deirdre Finn, Council of Infrastructure Financing Authorities (CIFA)
Anna Hoag, U.S. Bureau of Reclamation (OKC)
Matt Warren, U.S. Bureau of Reclamation (OKC)
Will Archer, MPMCD
Steven Jolly, AMCD
Henry Brooks, Alaska Water Resources Section
Dean Couch, Retired, Oklahoma Water Resources Board

WESTFAST

Roger Gorke, Environmental Protection Agency, Office of Water
Heather Hoffman,
Travis Yonts, U.S. Bureau of Reclamation

STAFF

Tony Willardson
Michelle Bushman
Erica Gaddis
Adel Abdallah
James Ryan

WELCOME AND INTRODUCTIONS

Mary Verner, Chair of the Water Resources Committee, called the meeting to order. Introductions were made around the room.

APPROVAL OF MINUTES

Jen Verleger (ND) moved for approval of the minutes of the meeting held on August 4, in Polson, Montana. Tom Riley (NE) seconded. The minutes were unanimously approved.

SUNSETTING POLICIES

Position #438 - urges the Administration and NASA to enhance focus on research for water resources applications and promote long term engagement with the WSWC.

Tony Willardson remarked on the updates: (1) a new whereas clause that recognizes NASA research has enabled operation of the airborne slope of observations, updating some of the other work that NASA has been doing in this arena; (2) a resolved clause was added that the Council supports and strongly encourages interagency cooperation, including collaborative efforts between NASA, NOAA and USGS to move research towards operations, operational applications that inform and improve State water resources management and decisionmaking.

Jen Verleger moved for Committee approval of the position, and Jim Rizk seconded. Hearing no objections, the position was approved and recommended to the Council for readoption as amended.

Position #439 - expressing support for implementation of the SECURE Water Act.

Tony Willardson noted several changes: (1) on the second page, one of the whereas clauses updates appropriation amounts and the names of the programs; (2) a new whereas clause addresses substantial advances in water science including the USGS next generation water observing system; (3) other changes dealt with references to the enabling legislation; and (4) a new resolved clause recognizing that too often program authorizations or appropriations have not kept up with the needs, limiting intended program participation and benefits.

Committee Chair Mary Verner requested a motion and second to readopt the position as edited. Julie Cunningham moved for approval, and John Simpson seconded. Hearing no nays, the position was unanimously approved to be brought before the Full Council.

CORPS WATER INFRASTRUCTURE FINANCING PROGRAM (CWIFP)

Robyn Colosimo, Director for Policy and Legislation, Office of the Assistant Secretary of the Army (Civil Works), for the US Army Corps of Engineers (USACE) addressed the Committee. She noted that some are likely aware, that WIFIA provides the ability for the Corps to have its first ever loan program, which is a game changer. This program is a priority for any Administration. Unlike any other agency in the government, USACE does not have an ability to help provide those

financial offsets, to incentivize the good work that all of you do every day in your business. This allows us to get into an area of advancing infrastructure that isn't necessarily going to rise to the level of a traditional Corps Civil Works program project. And that's a big deal because there's so much out there that needs an additional ability to get access to funds to get off the ground.

The Water Infrastructure Finance and Innovation Act (WIFIA) was passed a number of years ago, and the Environmental Protection Agency stood up their version of the program about three years ago. They have been leveraging a number of projects. We also have a WIFIA authority, though ours is different and is broader than our current rulemaking that's underway. You're going to ask why, so let me tell you the behind the scenes. There was not a lot of support in either Administration for the Corps to get into this area since we are not bankers. That is the word that has been particularly used around this process. We received appropriations and direction to actually lift up the program focused on non federal dam safety. It's obviously an area of huge priority across the nation, althouth it's an area that doesn't necessarily get the attention it should.

In the previous Administration, the Corps was positioned to go through a rulemaking process. We have taken the strategy of mimicking EPA's rulemaking in order to build on their success. We partnered with EPA through an MOU to help in learning the program and learning about loan programs in general. We developed a rule with their partnership, and through interagency collaboration to include OMB, and got the rule out in June of this year. We hope to have the final rule out soon and be in the position by late spring of 2023 to be able to go through our first advertisements for loans and begin the loan application process. Thus, it's a pretty big deal for the Corps.

What does this mean? Right now the Corps has been authorized and given enough money to get the credit subsidy model up and working, and some additional money for appropriations of the program. In terms of administration, we've had to create a whole new entity and staff to actually run the program. It has required a lot of things behind the scenes to get the right financial management structures set up. We have saved about $81 million for the credit subsidy potion, and an additional $15.5 million for administration. The total amount of money that has been appropriated to date will allow for up to $7.5 billion worth of loans.

With respect to what's dam safety, nonfederal, we're looking at those projects that must reduce flood damage, restore aquatic ecosystems, improve the inland and inter-coastal waterway navigation system in the US or improve the navigation of coastal inland harbors. Projects may be combined into a single loan request. This program has been dubbed Swift P by the Corps, and the WIFIA loan is repayable from a common revenue stream. The court decided to change the WIFIA loan nomenclature to Civil Works to make sure there was a distinction between the Corps and the EPA programs. You'll hear the Corps' WIFIA program more often called Swift P.

A lot of folks want to know what kind of loans the Corps will be handling. This is groundbreaking for us. In terms of minimum assistance requirements, projects must be credit worthy, technically sound, economically justified, environmentally acceptable. A project must be more than $20million and must comply with all applicable regulations and receive public

sponsorship, if undertaken by a private entity. There is no interest rate risk as the low rates are locked in at the time of the loan closing and no negative arbitrage. Repayment schedules can be customized.

Again, this is a whole new area we're crafting. One area of concern is whether the Corps program would potentially overlap with EPA's mission. This is one of the reasons it has been narrowed, at least initially, to non-federal dam safety. But it's also true that there has been a broad concern about whether folks would want to use this program to finance the cost sharing for Corps traditional projects. However, this is off the table.

The Corps is anxious to get the program underway. Mr. Connor has certainly been powerful in helping us craft the opportunity and keep the window open to get this loan program up and running.

WRDA WESTERN WATER COOPERATIVE COMMITTEE STATUS

Tony Willardson briefly reported that the purpose of the Western Waer Cooperative Committee is to enhance some of the dialogue between the states and the Corps with respect to the Corps' role regarding water supply.

Jen Verleger stated she spoke with Senator Cramer's (R-ND) office last week. There has been a little bit of pushback from some of the eastern states wanting to know why the western states have been carved out in this legislation. Being from western states, we all know it's obvious given the Prior Appropriation Doctrine. I think Missouri also wants to be included because of their ongoing war with North Dakota.

Tony noted that Senator Shelby (R) of Alabama didn't want the Corps involved in reservoir management. Power marketing is one of the unresolved items before WRDA is renewed. There are rumblings that it may get moved into another bill (military).

SOUTHWEST OKLAHOMA WATER PLAN AND NDRP UPDATE

Roger Gorke, EPA Office of Water and Chair of WestFAST reviewed the Southwest Oklahoma Water Plan.

During 2010-2012, a drought went through the middle of the country. As a result of the drought, the President called folks into the Situation Room cabinet and said the situation requied an "all hands on deck" approach. So we threw what we had at it, which was the National Disaster Recovery Framework (NDRF), which turned out not to be a great model for drought. We figured out that looking at drought from a regular disaster perspective did not really work.

With a drought, you don't know if it's going to be over in a month or in a few years or never be over. The concept of the National Drought Resilience Partnership (NDRP) was first

conceived in President Obama's Climate Action Plan in 2013. As part of the National Drought Forum process, we (the feds) held several listening sessions throughout Oklahoma, Colorado, and other states. As a result, we learned a few things; namely, (1) the feds are all over the place (which was new; we'd never heard that before [with sarcasm]); (2) we don't know who is in charge; and (3) we need to get on the same page, (which is another thing we had never heard before). The need for a Partnership as a policy coordinating body and as a mechanism to facilitate access to Federal programs was identified from feedback gained during public listening sessions conducted during the drought of 2012 and the National Drought Forum in late 2012.

The federal agencies met together until about 2015, when the drought in California became really bad. Jerry Brown, California's then-governor, called the FEMA Administrator into California and notified him that California wanted a Stafford Act Declaration, which may be familiar to many of you. The Govrnor was told essentially: Well, that won't get you much, and it probably won't happen, but let me see what I can do. As you may know, FEMA is part of the Department of Homeland Security (DHS). DHS is also connected to the National Security Council.

Starting in about 2012-2013, the National Security Council really began to recognize climate change. It was noted that climate change is likely to exacerbate the length and severity of droughts in many regions of the United States. Extreme weather events, such as Superstorm Sandy, were a national security issue since the storm destroyed electricity generation and wastewater treatment facilities. Consequently, the federal agencies came up with a presidential memo for President Obama to sign which formally established the National Drought Resilience Partnership (NDRP) to help the nation prepare for the impacts of climate change.

The NDRP is a federal partnership to assist in building resilience to drought on the ground. Two distinct roles are envisioned: one, as a policy coordinating body, and two, as an entity to align One of the other aspects of that presidential memo was regional collaboration and empowering and directing Federal staff at the district and local/regional levels to work more closely together with states, Tribes, and local leaderss in order to better support long-term drought resilience.

In March of 2016, [we] were in Senator Inhofe's office and showed him the Presidential memo and told him we really liked what the Administration had done. Pat Lambert, former WestFAST Liaison and Chair, remarked about an idea for a regional collaboration in southwest Oklahoma supporting the implementation of the Southwest Water Supply Action Plan (SWAP). We began working with Duane Smith and the folks there on the ground. It was suggested to hold a summit in Altus in 2018. Following that meeting, there was a kind of a running joke that "there were so many Feds at the summit in southwest Oklahoma that it caused an eclipse!"

The drought of 2010-15 was a powerful teacher for southwest Oklahomans. The SWAP was developed under enormous pressure in the midst of the drought. Many of the issues worked on were specific to the area and communities' needs. They dealt with water rights, to lining and pressurizing canals on farm, to the effects of the drought on the economy which caused failure of

crops and loss of jobs, tax receipts and property taxes, which in turn impacted retail businesses, schools, health care, and the crucial maintenance of roads and other infrastructure.

The things that came out of the process were what made the effort successful. They created a Task Force comprised of a diverse group of stakeholders, including Altus City leaders (the city manager and city engineer) and city council members. Other stakeholders included the Chamber of Commerce, Lugert Altus Irrigation District, the Mountain Park Master Conservancy District, the Altus Air Force Base, and also the Hackberry Flat Wildlife Management Area.

The strong leadership of the task force looked at the issues, not just from a water perspective, but also from an economic standpoint. Thus, the economic leaders of the area too the lead, rather than the water geeks. A plan was developed with input from all the stakeholders with short, medium and long term actions. And they had the longevity of the task force.

After the drought in 2012, a hurricane came through in 2013, and ended up filling up the reservoirs. Yet the Task Force continued to implement and work on their plan, even though the drought was essentially over. They continued to work on the issues they thought were important. And the final thing was, they were open to having the feds come and help them.

Roger believes those five things are really important in order to have success -- whether that means drought resilience or working on any kind of issue.

Concluding his remarks, Roger noted that EPA has seen real success with their National Estuary Program and the Urban Waters Federal Partnership. He believes that when the Feds work together, for example, as the WestFAST team, they can achieve success, as evidenced by the NDRP and having the five tenets of: leadership, stakeholders, a plan, longevity, and a willingness to work with the feds. Roger believes such models really ensure that efforts can be successful.

B. Anna Hoag, Bureau of Reclamation

Anna Hoag, Civil Engineer, Bureau of Reclamation, used a powerpoint presentation which is available on the WSWC website.

I realize that most of you are probably familiar with the Bureau of Reclamation. I would just mentioned that we're a federal water resource agency that operates and maintains hundreds of dams across the West. You can see the area we cover in Oklahoma and Texas on the map. The two reservoirs that Roger Gorke just mentioned are located in southwest Oklahoma.

Southwest Oklahoma is the focus of the study. Roger mentioned the drought, though it actually took a little longer to get out of it than he the period of years he mentioned. The drought lasted from 2010 - 2015, and it resulted in a new drought of record for the area. These two reservoirs got to their lowest levels in recorded history and the impacts were devastating. For the context of this study it's important to note that surface water and groundwater are regulated separately in the state of Oklahoma regardless of their hydrologic connection, and surface water is

regulated under the Prior Appropriation. The rights to water stored in Reclamation's reservoirs held by the districts are senior to most, if not all, of the junior permits in these basins.

Thus, during the new drought of record, it raised a lot of questions about the impacts of storing permits, as well as the impacts of groundwater pumping on inflow into these reservoirs, or really the lack thereof. We knew the problem at that time, but we didn't have the tools and the data necessary to quantify the impacts and attribute the sources of the impacts. At that time, we also lacked a clear definition of interference and a means to implement solutions. It's interesting to note that during that timeframe, the state of Oklahoma published a comprehensive water plan. That water plan gave us some thoughtful recommendations of how to have stakeholder involvement and locally driven solutions. Because of the State's efforts, Reclamation really had a roadmap for our effort.

Reclamation dug into each of the different recommendations in the State water plan. A partnership was formed between Reclamation, the Oklahoma Water Resources Board, and the two districts, which are the two largest water providers for both irrigation and municipalities in southwest Oklahoma. The effort has been ongoing for seven years at a cost of over $3.5 million. But we were digging into big issues and that takes time.

First, we realized that we needed the data and the tools. To do that, we developed groundwater models, and that takes a lot of time to evaluate the impacts of groundwater pumping on base flow. The base flow data was fed into surface water models that were then fed into reservoir yield models. As we evaluated the system, each stakeholder could weigh in on how things were being operated. We were able to come to a consensus and that alone was a big accomplishment. The models also went through an independent peer review. We use these models to evaluate a range of future groundwater and surface water scenarios that range from naturalized to possibilities for the future.

Some key findings of the study include that the reservoirs may not be sufficient to meet demands under our status quo results, which means no change to existing law, policy or practices. Climate and hydrology were the primary sources of the deficits. In the Tom Steed Reservoir Basin, we found that future permitted stream diversions were the largest cause of storage deficits. Within the Lugert-Altus Reservoir Basin, we found that existing groundwater caused the most pronounced impacts. By knowing the sources of the impacts, we were able to target the solution specifically. An example of some of the status quo results is depicted on a slide. After we identified where the sources of the impacts were derived, we were then able to identify adaptation strategies and target specific vulnerabilities -- which were both infrastructure and non-infrastructure strategies.

We contracted with a law professor from the University of Oklahoma to perform an academic legal review, to assess which different strategies could be implemented within the State's existing policy or whether changes in the framework may be required. A link for the legal review completed for these reservoirs is available here.

There are two objectives for the adaptation strategy: (1) to maximize the district's water available up to 16,100 acre-feet per year, and that is the permitted amount; and (2) maximize beneficial use for upstream permits to avoice futile calls. We want to find some win-win solutions for everyone. The goal is to identify a range of hydrologic indicators with corresponding thresholds that could be used to indicate the onset of a severe drought and the need to curtail junior permitted streamwater diversions in the basin.

The slide has a lot of data on it, and although I don't necessarily want you to understand all of those data points, I'd like you to see how we're laying things out. The top set of data is the frequency that was curtailed. The frequency will tell you just what those drought combinations give us. The second set of data is junior uses and what their availability is, as well as if new permitting occurred upstream what the availabilityof those new permits would be. A bottom set of figures is Tom Steed Reservoir's firm yield.

Looking at the scale of the three sets of charts, one can see that there were some win-win solutions. There are some mutually beneficial options for this area, which is what we wanted to get to. The firm yield of Tom Steed Reservoir could be increased between 74 and 90%. By using the storage inflow and Palmer Drought Severity Index combinations, this would only have to initiate curtailment between 13 and 16% of the time. It would only decrease the junior permit availability, including the new permits, between 11 and 29%.

We won't be making any recommendations as part of the study, but we hope that this provides the data needed to make good decisions within this basin. The next steps for this study is to publish a report. This will be a really large report, since it covers seven years of effort. We try to be transparent about every assumption. It is going to take a while to review the studiesand the legal review. It is our goal to finish the report this year, especially since based on our indicators, there is a severe hydrologic drought occurring in southwest Oklahoma today, for both reservoirs. All of the indicators have been triggered. Of course, the next steps is to move forward in managing water in the basin, and we look forward to being part of that process, even though we're not making recommendations. Thank you. Questions?

Questions

Speaker: One of the things that stuck out to me during one of our last meetings, was that one of their two indicators that saved water for the reservoir about the same amount, but the level of curtailment was a lot different. Can you show that on the graph?

Anna Hoag: Yes, I can. So if you take a look at those gray and yellow bars, compared to the the green and the orange. All of those threat thresholds are triggered right now for a severe hydrologic drought in southwest Oklahoma. Some of them have more devastating impacts for upstream permits. We were able to see that with this data and the results.

Comment: I want to go back a little bit to Roger's point on WestFAST. When you look at this study, and it's been ongoing for seven years at a cost of several million dollars. The effort between

the Bureau of Reclamation and the Water Board to get the technical information. and basically, we learned that we get in these droughts and we have to implement a management plan to protect the yield of those reservoirs. If we don't, then we don't have that reliability, and then southwest Oklahoma is clearly at risk. There is no possible way that the Tom Steed reservoir group or the Southwest Water Action Planning group could have ever funded the effort that went into this. It took the federal response to come to bear. It took the Bureau of Reclamation and the state of Oklahoma Water Resources Board to put up money. If the manager of the Tom Steed Water Management District can't implement this, then it means nothing. As a part of this effort, it included the USGS and a number of federal agencies to look at the data. Now we have to take that and actually implement some changes. One of the things that I think we need to look at is that we're using the Palmer Drought Severity Index (PDSI) as our best match. The PDSI was developed in 1960. I was alive then – as well as some of the others represented here. But my point is that we need more research on drought prediction, in our western states. We need some research efforts going into those types of things. I think this is a real success story for the feds, the state, the locals coming together, identifying the problem, and working on it. And now our job is to actually implement those solutions. So congratulations to the team for doing this. I really want to recognize Will Archer, Manager of the Tom Steed Water Management District, if you ever want to do drought training. There's no one better than Will Archer because he lives it everyday.

Comment (Indrani Graczyk ?): If you look at the the inflow thresholds, so 2015 is when the hurricane came through, and you see that huge spike on your slide. And then even though this is variable, I think every state is seeing the variations now between wet and dry. So how do we manage it when it's wet? And then how do we manage it when it's dry? I think this is critically important. That's where I think you need all the Feds at the table, even FEMA, for how they can help with their funding for both droughts and floods. and with the nexus between those. That was the thing that stuck out to me. I am in California, and the snowpack is a huge thing that's going away now. How do we manage the extreme flows when they're coming not as snow, but as as rain? And , to Robyn's point, being able to capture the flows as stormwater versus flooding when the water is available.

NASA'S WESTERN WATER APPLICATION OFFICE UPDATE

Indrani Graczyk, WWAO Director, NASA Jet Propulsion Laboratory shared a powerpoint presentation.

I'm not sure how familiar everyone is with the Western Water Applications Office, so I want to start off with just a little bit of background on why we exist and what what we are trying to do. In the 1990s, I first became aware of NASA researchers reaching out to water agencies to see if there were ways that our earth science data could be used for decision support in water management. At that time, we also faced a historic drought. Things are obviously much, much worse now. We ended up having some real successes, especially working with the California Department of Water Resources (DWR), in using our remote sensing data to measure snowpack and land fallowing. Various aspects of that were very useful, at least to California DWR. So

NASA wanted to build on these successes. They especially wanted to address the issue of wanting our relationships with the water management community to go beyond single opportunities.

WWAO was stood up to be a resource for the water management sector, to promote and facilitate the use of Earth observation data for decision support and western water management. There are a number of things that we do to to promote this. WWAO wants to establish strategic relationships with the right organizations and western water management, and maintain a continuous dialogue with you all to understand your needs. Then we hope to be the entity that connects you with the right researchers and the right research and capabilities at NASA that can help you with what you need to do. Further, when we develop something together such as a tool or an application that potentially starts to show some demand, we want to figure out ways to transition what was really a research activity within NASA into an operational agency in the private sector so that that capability then can be available more widely to the western United States.

NASA understands that there are already a lot of people in western water management. We're not looking to take over any part of it. We're just looking to ensure that when it's appropriate, we can infuse our capabilities on Earth observation data into the workflows that you already have. How we do this? We develop strategic relationships. We also conduct formal needs assessments. And I want to talk to you a little bit about that in a bit.

We've taken a bipartisan approach to those needs assessments. The needs assessments are strictly about potential use cases for Earth observation data. We've just heard about basin studies, but observational studies are nothing like the basin studies, which focus on how satellite data and remote sensing data can be useful for water management. Once we identify those needs, we try to look for what we call needs driven projects where we connect a water manager to a scientist. Then we can find activities to help them work together to advance an application towards the specific use case or need. Finally, when it comes to transitioning those applications, we like to do formal business case assessments, and then also facilitate the conversations and the relationships that are necessary to successfully transition an application from research to operations.

Since WWAO was established in 2016, we've done four needs assessments that cover more than half of the basins in the Western United States. We're undertaking a study in the Missouri Basin soon. There are a number of projects that have been completed and a number of good results with respect to transitioning.

With respect to our basin survey approach, we try to work specifically with consultants that are in the basin, and are really familiar with the players in the basin. We don't come at you directly as NASA claiming to know how to solve all your problems. We tend to work with local people in the basin. Our approach is to do a study in a survey of a cross-section of water managers to understand your needs. Then we proceed with trying to bring folks together for a formal workshop. Ahead of the workshop, we have held webinars, so that we can get folks more familiar with what NASA does, and the kind of data that NASA has Following the workshop, there is work done to turn what we've heard in the workshop into formal use cases. Our formal reports

will hopefully be a resource to both the applied science research community as well as the water managers.

Recently, we worked on the Rio Grande Basin. This assessment actually had to be donr virtually, due to the COVID surge. It worked out okay. We got a good, healthy cross-section of people to participate in parts of the workshop, and also managed to pull together about 12 use cases related to specific priorities within the Rio Grande. We noticed that there is a lot more basin coordination in the Colorado River Basin. As we've gone to other basins, the Columbia and the Rio Grande, we've seen less coordination. So we're hoping that when it comes to this kind of decision support these basin studies can lead to more teaming and more community building, not only between NASA researchers and water managers, but perhaps also between water managers themselves. The Rio Grande Basin report should hopefully be on our website in the next couple of weeks. It's still going through our document clearance process.

I also want to mention that NASA, along with the National Space Council, is undertaking a study on the economic value of Earth observation data. So we pivoted specifically towards water issues. We're working with RTI to look at those high value areas that demonstrate that Earth observation is not only interesting from a science perspective, but also as a tangible, measurable impact. This is ongoing. We hope to have results sometime in the second or third quarter of calendar year 2023. I'll just mention that we had a stakeholder engagement lead by the name of Catalina Weed, though she has moved on. Her replacement, Sharon Ray, was introduced at our at our annual meeting a couple of weeks ago. She will be taking over a lot of the needs assessment type workshops that we do, and also sort of the strategic partnerships that we like to establish Hopefully, you all will be hearing more soon.

Finally, I'd like to review our dashboard that was created when our boss Lawrence Friedl gave us the charge that we need to touch every state in the West in the first five years. We created this system to to determine how well we had done at that. I think we're getting there. We've finally been able to say that we've enrolled almost every state in the west into some of our activities. But there is certainly a lot more that we can do.

For example, the airborne snow observatory is our first attempt to transition something outside of NASA. We did a lot of thinking on what was the right way to establish the airborne snow observatory. The innovator there Tom Painter, has now started Airborne Snow Observatory, Inc. and they're doing extremely well. They provide highly accurate measurements of the snowpack to California, Colorado, US Bureau of Reclamation, among others. So that'has been one of our really great successes.

Another success example is work that we've done with the Navajo Nation. This came from another project in NASA's Applied Sciences Program which brings student researchers together and funds them to do various types of Applied Sciences projects. They pioneered an application that could augment some very sparse rain gauge data across the Navajo Nation with satellite data. They worked hand in hand with the Navajo Nation to make sure that they created something that the Navajo Nation could use given their set of skills and resources. This became the Drought

Severity Evaluation Tool. Prior to having that piece, when there was a drought in the Navajo Nation, they had so little data, they really had to spread their resources across the entire nation, which is a fairly large area. Now they are able to prioritize the resources towards the areas that truly need it, and they're able to allocate their drought resources more effectively.

We have established great strategic relationships with the California Department of Water Resources, the Colorado River Basin Hydrology Group, and with the USDA NRCS, to see how we can get some of our satellite snow data into both their monitoring and their forecasting processes. We are working with Sean Fleming at USDA NRCS, who has been really incredible to work with. It's nice to have somebody at an agency who is willing to take the time to work with us to really understand what this data can do, and advise us in ways that we can implement the right project so that we end up with exactly the products that they can easily ingest.

In the Columbia River Basin area, they have launched Open ET (evapotranspiration). Obviously, there is a lot more interest across the western United States in the use of evapotranspiration as a tool to measure consumptive water use, and hopefully be able to help with the administration of water rights. There;s quite a bit that NASA is doing.

Tony Willardson mentioned that the WSWC has partnered with the CDWR under a contract with JPL. He also mentioned that Senator Feinstein introduced legislation that authorized a program, under the Bureau of Reclamation, to use more observational data to improve runoff projections. The WSWC adopted a resolution in support of NASA's efforts which specifically calls out our support for the Western Water Applications Office.

Indrani acknowledged the WSWC's support and noted that NASA and WWAO certainly appreciate it. They have seen the power of the WSWC and appreciate the support provided over the years. She also called out Jeanine Jones in particular, and that they welcome the kind of honest feedback they have received, followed up by concrete support. This has allowed us to build things that go beyond research and can actually be used for decision support. She acknowledged the partnership they've had with the WSWC over the past five years as essential to their success.

When it comes to snow, through our needs assessments, we've seen a number of potential decision support needs that can be addressed by NASA data measurements of snow water equivalent in in snowpack, leading to runoff forecasting and streamflow forecasting and then of course, prediction. We have been able to establish ASO Inc as a service for the western water community. We've been working with the Colorado River Basin Forecast Center to try to get the ASO data into their NOAA model. ASO Inc, is the entity that really that did a lot of outreach to Congress, which led to more support and dedicated funding to do snow water supply forecasting.

In the area of drought, I talked about a NASA tool we're using in collaboration with the state of Colorado's Climate Center. We are funding a project to use something NASA has developed called the Land Data Assimilation System. It is a modeling framework. There is an instance of it called the Western Land Data Assimilation System, that we call Western LDAP. We're trying to find better drought indicators and indicators that especially use our GRACE

(Gravity Recovery and Climate Experiment) measurements to figure out where the groundwater in the aquifer is going. That project will hopefully help modernize some of these indicators.

In the area of agriculture, NASA data has been used to develop a number of different types of soil moisture products, and future missions. NISAR, is a radar tool that NASA developed together with the Indian space based research organization. It should really help develop an even finer and better satellite based soil moisture product. The NISAR mission will measure Earth's changing ecosystems, dynamic surfaces, and ice masses providing information about biomass, natural hazards, sea level rise, and groundwater, and will support a host of other applications.

but we do have one that is now available to the public through the USDA National Agricultural Statistics Service known as CropScape. We have worked with the Cooperative Extension to try to get NASA data into some of their tools that can hopefully help farmers use satellite data for irrigation decisions.

Finally, we've also developed satellite based land fallow land mapping tools that can be used by water administrators to determine what the demand will be for our water supplies, such as irrigation management, soil tracking and land use tracking. There are various uses for evapotranspiration. But for water managers, it will be a really great tool for the verification of consumptive water use. So we're very excited about Open ET. We have funded some intercomparison studies to try to determine when some models are more appropriate than others, or what kind of ensemble you might want to use. Working with New Mexico, we have developed a visualizer for historical ET data based on Landsat.

Please do not hesitate to reach out to me if you think that there's a potential for NASA to be helpful in an area you identify for water management.

LANDSAT NEXT MISSION STATUS

Tony Willardson provided a brief update with regard to the next mission of Landsat. The land and national land imaging program is a joint effort of USGS and NASA. Many of you may be aware that the Landsat imagery, this thermal infrared imagery, has been used to measure consumptive water use for a long time. There is an archive in South Dakota that goes back to about 1982. Idaho has been a leader in the use of the data and information.

About a year ago, Landsat nine was launched. I do not envy NASA and trying to schedule their missions, not even knowing what the next technology may be. For the Landsat next mission there is agreement on the architecture between USGS and NASA for the next satellite, with an enhancement of a number of the sensors, including thermal sensors. They are now working with OMB. The OMB NASA examiner has raised questions as to why does it have to be this way? Can't we do it cheaper? We have seen tremendous benefits for water management throughout the West, and so that may be an area where the WSWC will push a little more to get the process out of OMB to where they can begin to request proposals for building the next satellite in the National Land Information Program.

The WSWC is known for our support of the NASA programs, specifically Landsat. Jerry Rigby of Idaho commented that the thermal band on Landsat was instrumental in their adjudication attempting to determine just what has been grown and what areas have put the application to a beneficial use -- which was the basis upon which one could claim a right in the adjudication. So looking to this was instrumental. Idaho uses the data and since then, we use it on any transfers that have been referred to by the Department of Water Resources, and looked at for determining just exactly what the water use has been since the adjudication and since the right has been granted. The water right may even lose some of it since that time because of non use. The data can be used for both good and bad from some of my clients points of view. I think the Landsat data information will continue to be valuable into the future for how we manage our water from both the surface and groundwater perspectives.

John Simpson remarked that there has been a series of conjunctive management delivery calls in Idaho with respect to the use of water between surface and groundwater. In Idaho, there is a presumption that water connects to the surface water unless it is either judicially or ideologically determined otherwise. So with respect to that delivery call made by a senior groundwater, right who had senior water, our storage rights as well. The Department utilized this technology for determining how much water senior water rights holders actually needed in the context of an administration, that is to potentially curtail juniors around those senior rights. I think going forward, if it is utilized to look at how much water a senior needs throughout the basin, everybody will be held to that same efficiency, which may produce more water in the river for instream and downstream uses as well.

Tony noted that as he recalls, one of the other examples was in the wooded River Basin, where the Department received an application to transfer the water off 100 acre parcel. In the evaluation, using the Landsat archive of data on that parcel, the State was able to determine that no more than 80 acres had ever been irrigated. So, as Jerry said, that can be a two-edged sword. So they were only allowed to transfer the consumptive use historically over that 80 acres, obviously, not their entire right on the 100 acres, because they were not using the water on 20% of the parcel.

Indrani mentioned the Open ET, which is looking to make mapping readily available for users and managers to better account for water use. And Idaho can map those field boundaries and see exactly what is being used. I think they use the USGS quadrangle maps as well as county plat maps to define what those boundaries are.

Comment: Yeah, Tony. I might just add that the concern then would be for a state agency who hasn't historically been one to look at the concept of forfeiture to get involved in forfeiture proceedings. And is that state agency willing and able to take that step? That is what this kind of data will lead to. I think that is a real question for state agencies.

Comment: Right now, it's only in transfers. Really the question is, if the Department could actually police all of that, without a transfer, and determine partial forfeiture. That's way too big a bite, at least at this point.

PUMPED STORAGE DEVELOPMENTS DISCUSSION

Mary Verner noted for members that Tab I in the briefing materials includes a paper from the National Hydropower Association, as well as some testimony that was recently submitted to the United States Senate Committee on Energy and Natural Resources. Our two panel speakers to discuss state perspectives on pumped storage developments are Sage Park from Washington State and Jennifer Zygemunt and Jeff Cowley from Wyoming.

A. Sage Park, Central Region Director for the Department of Ecology

Sage presented on her State Environmental Policy Act (SEPA) work over the past year and a half for the proposed Goldendale Energy Storage Project, located in Southcentral Washington right on the Columbia River next to the John Day Dam. The applicant wants to build a renewable energy hydropower project on part of a former smelter site, which is about eight miles from Goldendale, Washington. The site is located adjacent to the Columbia River and would provide access to the electrical grid at the John Day substation in Oregon. The project is planning to use the existing right of way and infrastructure to connect to the power grid.

The plan for this project includes construction of two reservoirs. The upper reservoir would be 61 acres and the lower reservoir would be 63 acres. The project includes construction of an underground tunnel and powerhouse, and above-ground transmission lines. Water would be pumped from the lower reservoirs and near the river to an upper reservoir about 2400 feet above. The project would store energy by pumping water uphill during times of excess production from renewable energy sources such as solar and wind. Electricity would be generated by letting the water flow back downhill through the turbines during peak periods of demand for electricity, which is most likely in the evenings when wind and solar die down.

The proposed project would generate electricity for up to 12 hours a day producing up to 1200 megawatts. Between 300 - 1600 megawatts of electricity would be required to move the water from the lower reservoir to the upper reservoir. Water would be purchased from the Klickitat Public Utility District, as they acquired the old aluminum smelter water right. Thus, they do have a valid water right. Initially, the project would require about 7640 acre-feet of water to fill (so just a one time fill), and then a refill of about 360 acre-feet per year to make up for evaporation and leakage. The initial fill of the proposed project system would likely occur across a two year period to comply with the water right.

The project involves federal, state and local actions and permitting processes. At the federal level, a FERC license is required, and they're undergoing a National Environmental Policy Act (NEPA) review, developing an environmental impact statement. Questions I've been asked are: Are we sharing information with FERC? Are we working together? The answer is no, because we're doing two separate environmental reviews. We went ahead with our own SEPA rather than a joint SEPA-NEPA because of timing. The applicant wanted to get process completed, and NEPA was moving a little slower. We have found that unless you're doing some kind of joint review with FERC, it is not easy to communicate with them. Naively, I called when I first started

with this project and inquired if we could work together. I received an email back telling me to write a formal letter to be included in their docket, and that correspondence would be formal. That said, we are using information that the applicant has given to FERC, so the applicant is not having to duplicate efforts. In that sense, we are sharing some information.

At the State level, several Ecology permits are needed. Those include a construction stormwater permit, a reservoir permit, and a CWA §401 water quality certification permit. The §401 permit is a bit challenging. FERC requires a §401 certification before the applicant can get the FERC license, but they require that at the time of application. It has been a challenge for us since the applicant isn't able to provide all necessary information up front because some of it has not yet been generated. So there's a bit of conflict between the FERC application process and the timing of when we need to get a §401 certification. I mentioned earlier that this site overlaps the Columbia Gorge aluminum smelter property which definitely requires an environmental cleanup. The company is working on a prospective purchaser consent decree for the cleanup and redevelopment of the portion of the site that overlaps the project area. The lower reservoir is in the middle of the cleanup site, so it is being segmented off. Thus, this too has added more complications or considerations in our environmental review.

A Washington State Department of Fish and Wildlife permit is also needed. For the State's environmental impact statement (EIS) process, we determined that the project would likely have significant adverse impacts. A scoping comment period was held early last year to get feedback on what should be included in the analysis. We used information from the comments to help shape the draft EIS. Currently, we're reviewing all of the comments received and working on the final EIS, which we expect to complete by the end of 2022. The final is an impartial document that helps inform our permit decisions.

In our draft EIS, we studied natural resources such as soils, plants, animals in their habitat, water and air. We also looked at cultural and tribal resources, land use recreation and transportation and environmental justice concerns. Climate change and cumulative impacts were also considered in the analysis. The findings and mitigation measures proposed were either by the applicant, Ecology or other State agencies, to reduce or eliminate some of the project impacts. For water resources, as mentioned earlier, there would be an initial fill of about 7640 acre-feet from the Columbia River. There is an annual refill of 360 acre-feet, which is derived from the Klickitat Public Utility District. Thus, the applicant would purchase the water from a municipal right, so there is no transfer of a water right to the applicant. Rather, it is an actual outright purchase. There would be both permanent and temporary impacts to wetlands, streams and stream buffers. The reservoirs would capture some precipitation, and some leakage is anticipated. Overall, however, the project would not substantially alter surface water hydrology, and there would be some minor alteration in the groundwater flow.

We found there are no significant impacts to water resources. Mitigation will be required as part of some of the project permits, though. This includes restoration of disturbed wetlands and streams and compensatory mitigation for wetland stream and stream buffer impacts. In addition,

a water quality monitoring and response plan would need to be developed for construction and for operations.

Aquatic species and habitat analysis showed there would be some loss of habitat for aquatic species, and some construction disturbances to amphibians and turtles. A permanent or multi-year reduction in ecological function would cause some impacts to the aquatic habitat and fish in the Swale Creek watershed. Aquatic species in the Columbia River are not expected to experience any impacts. However, mitigation will be implemented for the impacts to wetlands that could restore some habitat and would also reduce the amount of sediment that might enter streams during the construction.

With respect to terrestrial species and habitat, the project would result in significant impacts to terrestrial land species in their habitat unless mitigation measures are in place. Construction would result in permanent and temporary loss of habitat. There may also be disturbance, injury or death of plants, mammals, birds and reptiles. But the species themselves would not experience a decline. The species impacted include the Golden Eagle, smooth desert parsley and other rare plants.

Our analysis found that there would be significant adverse impacts to cultural and tribal resources. We consulted closely with tribes to fully understand the impacts to the tribes and tribal resources. The tribes identified several traditional cultural places and archaeological sites that would be disturbed or destroyed during construction. In addition, they identified food and medicine gathering areas that would be destroyed. They said the project would interrupt their cultural practices and expressions of spirituality and their ability to teach these cultural practices and spiritual expressions. They also shared that the project could reduce the presence of wildlife habitat and culturally important species. Some mitigation for tribal and cultural resources has been proposed by the applicant. There is no information available about mitigations proposed or supported by the tribes that would reduce the level of impact to less than significant.

Questions

Question: Will the project need both a CWA §401 and a §404 permit?

Sage Park: The applicant submitted a §401 application in about June of 2020. We didn't have enough information to process it, so we denied it without prejudice. They resubmitted another application in May of 2021. We have one year to issue a decision. The challenge is that they had to submit that application with their FERC license application, so it kind of started our whole process going. I think that's a challenge because when the companies are submitting their applications, at that time they don't have everything fully developed. They are still figuring how things are going to run. So we received their application and the company was not ready to give us all the information we needed in order to issue a decision.

Tony Willardson: Are they being asked to submit their §404 application as well by FERC, and at the same time?

Sage Park: I don't think that they had to submit it at the same time. I think they recently submitted it, and we're trying to work with the Army Corps on that right now. I believe the §401 has to be issued before the §404.

B. Jennifer Zygmunt, Administrator, WY Department of Environmental Quality

Wyoming is fairly early in terms of working with pump storage projects. It is an up and coming hot topic in Wyoming. We had five pump storage projects proposed this summer. Granted, we don't know if all of those will come to fruition. Three of the projects will be closed loop systems and two will be open loops -- open loop systems, meaning they will use our existing reservoirs. Obviously, that has caused us to start thinking about water quality concerns. There are quantity issues and quality issues. Jennifer addressed the quality side, and Jeff Cowley from the Wyoming State Engineer's Office talked about the water quantity issues.

From a water quality perspective, I just wanted to throw out some of the questions that we are thinking about. How do we work effectively with FERC? We are concerned about that partnership as it is fairly new. Sage's presentation was very helpful in that regard. We will probably be reaching out to you with more questions and to build off of your experience working with FERC on these projects.

The five projects in Wyoming are early in development. The most advanced project has submitted their draft FERC license application. With the renewable energy drive that we are seeing in Wyoming, there is interest in building onto those hubs and developing these pump storage projects to store that energy. They are reaching out to the right agencies, such as the Bureau of Reclamation and irrigation districts, and then they have to meet with DEQ and our Game and Fish Department. This allowed us an opportunity to submit some early comments to them. We submitted comments along the lines of protecting the fisheries.

One of the projects is upstream of a Class I water and Blue Ribbon fishery, the Miracle Mile on the North Platte River. It is a wonderful fishing spot. Thus, we're very concerned about making sure that aquatic habitat and fisheries are protected. We have submitted comments asking how they will prevent fish injury and mortality from gas bubble disease. We want to make sure that there is a plan not to remove or weaken thermal stratification in the reservoir. We want to know if nutrients and metals in this sediment in the reservoir will be immobilized within the reservoir itself or released downstream. We also want to know whether or not this operation will affect dam operations, because we need effective dam operations to make sure that sediment is immobilized and that we're addressing quantity and quality issues within the dam.

That is just a brief rundown of some of the questions that we have encountered. And I think we have more questions than answers. I do see this being a topic that potentially the WSWC will want to keep discussing and sharing information on. Washington, we thank you for your presentation. It has given us some good information to start with as we continue looking into this arena. Our Game and Fish is also concerned. They submitted 16 pages of comments on aquatic

habitat trusts or terrestrial habitat. Again, we probably have more questions than answers, and we welcome opportunities to learn from other states.

Jeff Cowley, Wyoming State Engineer, remarked that for all the reasons that DEQ and our Game and Fish don't like the open loop systems, the State Engineer's Office prefers them because they re-using existing reservoirs. We are able to work better with the applicants on water rights issues, because they don't really have to mitigate for the water that they are using. As they pump water out of the existing reservoir to fill their new one on top of the hill, they have drawn down that capacity in the existing reservoir and reduced the surface area. Thus, there are no depletions. We don't have the numbers, but we have pointed them in that direction to look more closely into that. These projects are likely not creating any new depletions to the system if the upper reservoir is lined. Because priority calls do happen in Wyoming in dry years when water resources are scarce, shutting down junior priority water users, we have pointed applicants to either buying water rights or getting old water in those systems, In the North Platte, the water right needs to be pre-1904, and in the Green River the water right should date to pre-1922. The idea is that—once you get this multi-million or multi-billion dollar project done—you don't want to have to shut it down because you have new (junior) water rights and the potential for the prior appropriation system to shut you down. It's super complicated. Lots of discussion to continue.

Questions

Roger Gorke: I have a question for Sage. Is this the only project that is under consideration? Or are there other projects or other places that this could happen? Is this more of a pilot or is this going to be happening more often?

Sage Park: I think it is going to be happening more often. The free flow power LLC had a project approved called Swan Lake in Oregon. I've also heard proposals for a couple of others further up the Columbia River, closer to the Canadian border. I think we're going to see more and more applications for this. Apparently there are several of these projects being used in Europe. Of course, one of the challenges is the water. And another big challenge, at least for Washington State, is the cultural resource issues and trying to find bluffs along the Columbia River where there is enough vertical lift, and many of those sites are all sacred to the tribes. There will be challenges there, too.

Erica Gaddis: To provide some statistics for those of you that were unable to listen to testimony at the congressional hearing a couple of weeks ago, in 2021 PacificCorp apparently filed 11 applications for projects in five states: Utah, Wyoming, Oregon, Idaho and Washington. Mr. Tim Hemstreet from PacificCorp shared with the committee that currently pump storage provides 93% of the energy storage in the country. And yet, there has not been a new project brought online since the early 1990s. The energy industry has really seen this as critical to the successful operation of renewable energy development. It seems we've got to figure out storage solutions. I think there will be a lot more of these applications.

HYDROGEN AND THE HALO HYDROGEN HUB DISCUSSION

Tony Willardson introduced the topic and explained that there is now also a push for more hydrogen generation and the use of hydrogen. Funding is being made available for standing up regional projects. It's interesting in that this process splits water atoms to get the hydrogen. The question is, how much water does that take? I apologize that Tab J was inadvertently left off the agenda, but if you look at Tab J in your briefing materials, there is information about the electrochemical water splitting process, as well as a little bit about the hubs. The hub in Oklahoma, is called Halo.

Julie Cunningham, Director of the Oklahoma Water Resources Board elaborated. There is a report from a hydrogen task force, which implemented legislation from a couple of years ago. The goal was to look at the feasibility of becoming a hydrogen hub, and looking at things like water available to transport to hubs, storage, those types of things. The Department of Commerce and several other agencies were involved. A proposal was taken to the U.S. Department of Energy. The Oklahoma Secretary of Energy and Environment and key leadership in the legislature, went to Germany and toured some facilities there. They brought that knowledge back, and then really tried to compete for this hydrogen hub. There are several different types of the hydrogen production.

In Oklahoma, the goal was to find a way to transition and use tnatural gas or natural gas sources and contribute to the hydrogen production. One of the main issues being grappled with is carbon sequestration.

Shellie Chard. the Water Quality Division Director at Oklahoma DEQ, remarked that her office has been dealing with a lot more energy related issues. There has continued to be a lot of work with the elected officials on bringing in that technology. Recently, there has been a lot of conversations with Arkansas and Louisiana. We have a new Land Institute for American Energy that is based out of Oklahoma State University and hey are also heavily involved with this issue. They are looking at a couple of different potential applications and have approval for a third. There is also a group in the U.S. Department of Energy. I may get this wrong. It's run out of the Department of Commerce, the state energy something board. They have been talking about moving forward with some of their funding to work on the hydrogen projects, primarily in northeastern Oklahoma. I'm not sure that there has been any real movement in the last three or four months. There were conversations held with a small startup facility in the state of Maine around Saco, Maine, and they may join as a partner. They are looking at municipal wastewater uses in the hydrogen production. I don't have much information on that specific project.

Tony Willardson noted that one of the problems he has read about is the fact that you can't use natural gas storage and pipelines to move hydrogen as that leaks.

Sara Gibson replied that Tony is correct. The existing infrastructure cannot be used. There is a group of all state agencies that would have any sort of regulatory involvement – the energy commission, Department of Labor. Water Resources Board, and others to review the processes and address any regulatory gaps. Perhaps the biggest thing coming up right now, at least for Halo, is that there is a very large federal grant available for these projects. I believe applications are due in early November. We are competing for those funds.

Julie Cunningham reported that discussions have been held with some entities that are actively looking at what they need. We have discussed putting together a list of the permits that are required, although there are companies actively going out and doing that research. There is a company in the city of Ardmore, just south of here, using their effluent as the water source. They asked the Board if a permit was needed, and the Water Board and said, nope.

Tony Willardson said he had a legal question. Is destroying water a beneficial use - when you split H2O atoms? We'll leave that to the legal committee.

Jeff [Cowley?] responded that may be funnier than you think. We've had a couple of meetings with a hydrogen company. A couple of County Commissioners heard about the meeting and wanted to talk to us about the issue. Their biggest complaint was that in an arid climate, how could we permit someone to destroy water? How could we allow that to happen? Granted, a cow destroys the water, too. It drinks it, and I don't think you want it when it comes out the other end, so it's about the same. The hydrogen company we talked to wanted to build an 800-acre wind farm to produce electricity. They were going to have to drill a couple of really high capacity wells to produce their water and then come up with some sort of pipeline to get the hydrogen to a place where someone could use it. We haven't heard back from them lately.

WADE/WESTDAAT PROGRAM UPDATE

The WaDE information and background materials are under Tab K in the briefing documents. Adel Abdallah, WaDE Program Manager, remarked that he enjoyed the field trip since he by and large "plays" with data, and enjoys going into the field and trying to match his data experience with the data on the ground. Adel acknowledged his colleague, Ryan James, who joined the meeting remotely from Utah. Ryan is a data analyst and does a lot of work behind the scenes and in the backend of WaDE.

Tony coined the term WestDAAT which is the acronym for the Western States Water Data Access and Analysis Tool. Our information technology contractor has finished developing the system, and we have it in production. We have two other environments for quality assurance and staging, and testing. There are about 15 or 16 ways to slice and dice water rights data across the West. We have analytics and a chart that includes 1.6 million water rights across the West. I think there are over 2 million sites as one water right may have many sites. One can filter and slice and dice the data in many different ways. Adel's powerpoint presentation is available here.

This morning, I wanted to look at where we went yesterday on the field trip and the area we are at here. You can zoom in on Oklahoma, or anywhere in the West, and query the data as you like. Here is the Chickasaw area we went by yesterday. Adel demonstrated the water rights, the size, and the point of diversion, which is colored, based on beneficial use. If you click on the hyperlink, it would take you to a landing page that is compatible with the Internet of Water, and USGS Geoconnects project. The metadata has been standardized throughout the system. We have engaged with a lot of stakeholders at different levels to review our network data . We received a suggestion to add a hyperlink to the actual page, for example that the state of Oklahoma has for this water right. And one could dig deeper to see the paper record, the PDF and so forth, which would have more data to describe the water rights.

Another feature of the system is the Network Linked Data Index (NLDI). Ii is a jargon term that the USGS has developed and it's an amazing tool. One can drop a pin anywhere in the western U.S. and ask a question. As an example, I asked for the index to show me all the waterways upstream from a specific point and all the water rights downstream. We integrated that system with the United States Geological Survey's (USGS) Next Gemeration Water Observing System (NGWOS) sites, and also EPA's water quality sites in their system. Both of those federal agencies systems are integrated into this tool. Basically, someone could click at a USGS site and it would take them to the exact time series of that site to look at available flows and all the permanent diversions upstream or downstream.

In addition to water rights, which we have been working with for the past 10 years, compiling data and standardizing across the states, we have been working on two other data types. I'd like to acknowledge my colleague, Michelle Bushman, and her work on classifying legal terms associated with water rights across the West. The powerpoint slide shows 123 unique terms used across the West in different and unique ways. The size of the word depicted in this "word cloud" reflects how many ways a word was used within water rights. We found that many of the legal databases also include claims that have been rejected. At this point, some of those dots reflect applications that have already been rejected by the state, rather than actual diversions. Obviously, there is no diversion if it has been rejected. From a data perspective, it is super valuable to have that data

We have also been working on a pilot data sharing project with the USGS. As you may know, it takes USGS five years to do a national compilation of water use for the different beneficial uses across the states. In this pilot project, which was just concluded, we are sharing surface area boundary public supply water for five states, including New Jersey. They are sharing their data using our architecture. The demo uses R-Shiny architecture, so it is not part of WestDAAT yet. If we can obtain more funding, we will include it. This interactive tool allows you to look at the historic diversions or the water use by city. We have had to coordinate with the state as there are some discrepancies in the data. So some quality assurance/quality control steps needed in order to address these issues.

Another dataset we have been looking at is the USGS National Streamgage Network. I think there are less than 10,000 gages, and we would love to have more. The states operate their

own gage stations, some of which are located in seasonal canals and ditches. That data is only accessible on a state-by-state basis. With the WaDE program we are building basically a parallel network to USGS' network for state run gaging stations as their data is not accessible through any other platform. We saritize the system and developed a tool that allows one to click at any of the gage stations, whether temporary or annual, and view their historic data and download it.

We have been reaching out to your staff to make sure that we got your data right and mapped correctly. We hope to have a public release of WestDAAT next year. We are coordinating this effort with our funders. Our partners have tentatively suggested World Water Day on March 22nd next year. Thanks to all of you for your help.

As a quick update for where we are now with the program, we held a national water use data workshop in Salt Lake City in August, with the help of our core organizers, the Internet of Water, USGS and ICWP. It was a great success. About 100 people participated, around half attended in person and half were online.

For those of you who have been with the WSWC for a number of years, in 2014 the WSWC published a nice report summarizing state water program capabilities. We are preparing an update to this report. The 2014 report was instrumental in helping us design the WaDE system to make sure that it is compatible with where the states are with their capabilities, But it has been nearly a decade since that report, and we have seen a lot of improvements and changes in technology and how the states are sharing and collecting data using online tools. Our plan is to publish the report update sometime later this month.

The WaDE team will be giving a demonstration at the American Water Water Resources Association's 2022 conference being held in Seattle on November 7-9. Other sessions will include the USGS, Rreclamation, and the Internet of Water tools. As mentioned, we will be releasing WestDAAT publicly. We will continue our outreach engagement and publish a report on what we've heard about your needs and how best to meet those needs. We will continue to work with USGS and Reclamation to classify their water rights. We have a WaterSmart grant agreement with Reclamation, and we are looking into a cooperative agreement with them. They have a need to compile not just water use data but also water supply data that is scattered across different sources, such as SNOTEL and agronomic sites. Thus, we may be extending our support to the integration of data to include SNOTEL.

We will be updating our WaDE five-year strategic plan this Fall. A grant from the Moore Foundation has funded the WaDE program since 2019. Their funding propelled the WaDE program and we received a grant from the Internet of Water organization, which has recently been renamed to the Internet of Water Coalition. Three other grants have been secured through: (1) Reclamation's WaterSmart program; (2) BHP Foundation, through the Internet of Water/Duke University; and (3) the Water Foundation. We are thankful for all the state agencies, the directors and state engineers, who direct your staff to work with us and coordinate your data sharing through WaDE, and for all of the philanthropic funders and USGS and Reclamation and our federal partners.

Tony Willardson commented that for those who are not familiar, this effort actually began with some funding from the 2009, American Recovery Time Act funds through the Department of Energy that went in part to the governors. The owners had a couple of areas that they were concerned about. Iinitially, they were looking at power transmission. Obviously, it doesn't take a lot of water to build a transmission line, but it does take a lot of water to generate the energy from which you are going to distribute that power. The governors were concerned about any impacts on wildlife corridors and on water resources. Thus, they contracted with the WSWC to look at what those water resource needs might be. We worked with Sandia National Lab in New Mexico. They were looking at where water might be available for energy development, which included not only freshwater, but saline waters, wastewater, and other potential sources. They contacted many of the wester states. But it became apparent that this was just a snapshot of water availability in the West, and that there was no one location to get the kind of information they were seeking. I'm sure many of you get multiple requests from different agencies or different entities or research organizations about your information. So WaDE was actually an initiative to provide a one-stop shop.

As Adel alluded to, we have been demonstrating the WaDE and WestDAAT tools to a number of different users, and requesting feedback for how we can improve it. Brad Udall, a climatologist at Colorado State University, made the comment, "This is amazing. I don't know how you got the states to do this." I remember someone from the Mexico AG's office saying, "Why do we want to give Texas our water use information? They're just going to use it to sue us." And that might be said for Wyoming and Montana or any number of our states, but it is all public information. With WaDE, we have tried to standardize and make the information "more findable, accessible, interoperable, and reusable." We have not defined a standard for states to provide this data. We hope that over time, that will lead to more standardization

As we make this tool available, it spirited debate. The Internet of Water was a concept that came out of an Aspen Institute dialogue in Colorado. The Nichols Institute Environmental Institute at Duke University got the initial funding to begin to build this so-called Internet of Water, which has now expanded to the Internet of Water Coalition. The Coalitino has moved away from Duke University. As we discussed earlier moving research to operations, this has got to be an operational effort. The entity has moved to the Lincoln Lands Institute in Cambridge, Massachusetts. Presently, I am a the Vice Chair of this Internet of Water Coalition. There has been debate regarding the difference between making data available, and then building tools such as WestDAAT, so that folks can easily understand what the data means. This has really been an ambitious undertaking.

In Brad Udall's comments, he also said, "No one else could have done this." I think that's true because the WSWC had the support of the governors to get started. We have also had the support of the WSWC members and your staff to get this effort moving. This has been a bit of "if you build it, they will come." The one real challenge that we still have is that it's all well and good to know where you fall in the queue of water rights. Wait until we can do as Idaho has done west-wide and pin those water rights to field boundaries. I don't believe we're going to be able to realize the full potential of this program. I would also note that the Moore Foundation has provided us

over the last few years, nearly $800,000. These foundations are viewing water scarcity and looking at the value of this tool, and helping us to better manage resources, not only at the state level, but at the regional level.

Questions

Chris ?: Thank you for that presentation. I really appreciate the new level of data accessibility and new ways of visualizing what's out there. I think that it is hugely powerful and something that we collectively need to figure out how to do more of. I'm wondering the extent to which WestDAAT is using leveraging dependent on NHD. Information? I'm asking because I recently learned that USGS announced a couple of months ago that they are planning to discontinue support and maintenance of NHD WVD by the middle of next year. They have turned their attention to the next generation of hydrography, which, if I understand correctly,will be about a decade before it's operable So just wondering.

Adel Abdallah: Thanks, Chris. We depend on the USGS network link data index API. So that is news to me. I don't know what that means when they discontinue support. I assume the API is going to continue to work. I'll coordinate with Dave Blodgett that we have been working with. All the states sites are indexed to the closest reach to them and they have an algorithm that computes the results. We shared the state sites with them and they ran a data crawler to index them. Whenever someone queries our system, it goes and calls that LDI to ask which sites are upstream of this point based on the NLDI system. We all coordinate with them. I'll be interested to find out what that would that mean to us. Since we're working with the Internet of Water Coalition, I'm hoping that they will continue to at least use the same network. The good news is that the Reclamation is indexing or will be indexing their sites into the system. Yeah, we depend on it. I hope they continue to support at least the existing one, until the next one comes online.

Chris: Thanks so much. It came as a surprise to me that that they were going to discontinue support of the existing NHD while they develop the next generation approach. It just seems like there's probably a ton of dependencies on NHD. And those dependencies are probably only growing as we become more data savvy.

Adel Abdallah: I agree, and we probably should consider a Council resolution for recommending to keep their support.

And the last item on the agenda is just around table updates. And I believe Erica wanted to mention, there's a workforce development related topic that you wanted to mention.

SUNSETTING POSITIONS FOR SPRING 2023 MEETINGS

Mary Verner noted that the positions due to sunset at the Spring 2023 meetings are found in the briefing materials under Tab XYZ. There are six such positions, so please familiarize yourselves with the positions listed below in advance of the Spring meetings.

Position #441 – Sub-seasonal to Seasonal Weather Research, Forecasting, & Innovation
Position #442 – The Bureau of Reclamation's Maintenance, Repair and Rehabilitation Needs
Position #443 – The Reclamation Safety of Dams Act of 1978
Position #444 – The Transfer of Federal Water and Power Projects and Related Facilities
Position #445 – The National Levee Safety Act of 2007, Levees and Canal Structures
Position #447 – Rural Water and Wastewater Project Infrastructure Needs and Programs

OTHER MATTERS

Erica Gaddis provided an update on a workforce development related topic.

For all of you are struggling with workforce recruitment, retention, and development training, Michelle Bushman has been working with a subcommittee on that topic over the last year. I'm going to start helping her a bit with that effort. We have three things on the horizon that we will be working with you on. The first is to develop a survey. We heard that states would really love to hear some of the best practices and also issues that each state is dealing with. So watch for a survey to help identify potential ways for how we might interact with some of our western universities in terms of influencing curriculum, or perhaps, creating programs where students could find opportunities to work with state agencies, and there may be partnerships. We hope to articulate and inventory some of your critical needs. I have been reaching out to the people that work in this area of workforce development. It is very interesting.

A webinar will be held next week. It has been organized through the Next Level Now Collaborative, which is an initiative of the Department of Labor, Employment and Training Administration. The webinar is titled Outreach and Marketing for the Public Workforce Development Systems: Exploring the Possibilities. I plan to attend the webinar and I will report back to you. One of the things mentioned in the description of the webinar that sounds like it could be interesting is that there apparently are grants available under the Workforce Innovation and Opportunity Act. Tony has been tracking the potential for funding for water resources work. So we'll we'll keep an eye on that. There may be some some funding opportunities that we could collaborate on collectively to bring you some new ideas and resources.

There being no other matters, the meeting was adjourned.