

Water Rights, Water Quality & Water Solutions 💋 in the West

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STORMWATER RETROFIT AT A PORT

GREEN STORMWATER RETROFIT SOLUTION AT PORT ANGELES, WASHINGTON

by Laura M. Weiden, P.E. and Ross W. Dunning, P.E. (Kennedy Jenks, Federal Way, WA)

INTRODUCTION

The Port of Port Angeles operates and manages four deep-water marine terminals and associated support facilities on Washington State's Olympic Peninsula. Stormwater discharges from these facilities are covered under the Washington State Department of Ecology's Industrial Stormwater General Permit. Based on a facility's Standard Industrial Classification code, the ISGP requires monitoring and reporting of and sets benchmark limits for select water quality parameters. In 2014, the Port's Terminal 3 and Cargo Surge Area facilities exceeded the benchmark limits for copper and turbidity, requiring the Port to implement stormwater treatment. The Port hired Kennedy Jenks (KJ) to evaluate different treatment alternatives and recommend a preferred alternative. Based on its analysis, benchscale testing, and Port-operated pilot-scale tests, KJ recommended and designed a nonproprietary three-stage biofiltration treatment system and associated drainage infrastructure improvements for T3 and CSA. Construction of the biofiltration system was completed in fall 2018, and performance monitoring for the 2018-2019 wet season is ongoing.

BACKGROUND

The Port of Port Angeles (Port) was founded in 1922 and, since its founding, has been devoted to environmental stewardship and supporting the economic development of the Olympic Peninsula. The Port owns and/or operates an airport, ferry terminal, industrial parks, marinas, and several deep-water marine terminals including one of the largest log yards in the Pacific Northwest. Terminal 3 (T3) and the adjacent Cargo Surge Area (CSA) focus on receiving, sorting, storing, and water transportation of logs harvested from local communities to Puget Sound manufacturing facilities and numerous other West Coast and Pacific Rim destinations.

T3 and CSA are located adjacent to one another and are bordered to the north by the Port Angeles Harbor (Harbor), which is listed as water quality mpaired on the US Environmental Protection Agency's (EPA's) Clean Water Act §303(d) list. T3 occupies approximately four acres and encompasses an overwater wharf and the adjacent roadway. Stormwater runoff from T3 previously discharged directly to the Harbor through deck drains, bull rail drains, stormwater infrastructure, and by overland sheet flow. T3 is used for log-handling and loading operations and is part of the Port's larger Marine Ferminal (MT), which includes the Port's Terminal



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Stormwater Retrofit

1 (T1) wharf. T3 is west of T1, east of Tumwater Creek, and north of a Port-owned property leased by Platypus Marine (Platypus) and a property owned and operated by Westport Marine (Westport).

The CSA is west of T3 and is bordered by Tumwater Creek to the east, the Port Angeles Boat Haven to the west, and Marine Drive to the south. CSA is primarily used for log-handling and storage operations and contains a maintenance shop. It is approximately six acres and previously drained to the Harbor by way of several outfalls. Figure 1 shows T3, CSA, and the surrounding facilities.



Figure 1. Port of Port Angeles MT, Westport, Platypus, & CSA (Roorda 2016)

Stormwater discharges from the Port's waterfront facilities are covered under the Washington State Department of Ecology (Ecology) Industrial Stormwater General Permit (ISGP). The ISGP includes low discharge standards for metals and solids. The ISGP requires all industrial facilities within Washington to monitor for: total copper (Cu); total zinc (Zn); turbidity; pH; and oil-sheen. It also requires facilities to monitor for additional parameters based on their Standard Industrial Classification (SIC) Code. For log-handling facilities, such as T3 and CSA, the ISGP also requires monitoring of chemical oxygen demand (COD) and total suspended solids (TSS). Table 1 lists the ISGP parameters and respective benchmarks monitored at T3 and CSA.

pH Turbidity	5.0 – 9.0 SU
Turbidity	
	25 NTU
Oil Sheen N	No Visible Sheen
Total Cu	14 μg/L
Total Zn	117 μg/L
TSS	30 mg/L
COD	120 mg/L

Marine Terminal & Cargo Surge Area

The Water Report (ISSN 1946-116X) is published monthly by Envirotech Publications, Inc. 260 North Polk Street, Eugene, OR 97402

Editors: David Light David Moon

Phone: 541/ 343-8504 Cellular: 541/ 517-5608 Fax: 541/ 683-8279 email: thewaterreport@yahoo.com website: www.TheWaterReport.com

Subscription Rates: \$299 per year Multiple subscription rates available.

Postmaster: Please send address corrections to The Water Report, 260 North Polk Street, Eugene, OR 97402

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Stormwater Retrofit	Historically, many industrial facilities have experienced difficulty reducing copper, zinc, and turbidity concentrations below benchmark limits, while log-handling facilities historically have trouble reducing COD below benchmark limits. In 2014, runoff from T3 and CSA exceeded the ISGP benchmark limits for copper and turbidity, triggering a Level 3 Corrective Action, which requires performance of an engineering evaluation and implementation of stormwater treatment. The Port enlisted Kennedy Jenks (KJ) to evaluate
Level 3 Action	stormwater treatment alternatives for the T3 and CSA facilities.
Evaluation Conveyance Option	ALTERNATIVES ANALYSIS KJ prepared a preliminary engineering evaluation to determine applicable conveyance and treatment options for T3 and CSA stormwater runoff. In general, KJ's work included: evaluation of existing site-specific record documents; field investigations of drainage conveyance elements; development of alternatives for conveying and treating stormwater; documentation of project constraints; and evaluation procedures used to frame the direction for developing the basis of design for runoff treatment. KJ evaluated three different conveyance alternatives for CSA: underground conveyance to treatment on the western side of CSA (Alternative A); underground conveyance to treatment on the northern side of CSA (Alternative B); and overland flow to treatment on the northern side of CSA (Alternative C). Installing treatment for T3 runoff alone was cost prohibitive and would greatly impact site operations, so KJ evaluated only one conveyance Alternative A and Alternative B were close, with the cost of Alternative A being slightly lower. KJ recommended Alternative B, as the cost was close to Alternative A and locating
Treatment Alternatives	the treatment system on the northern side of the facility would have less impact on existing site storage operations. In combination with the conveyance alternatives, KJ evaluated the costs and required footprints of five different treatment alternatives: biofiltration; infiltration; liquid polymer-enhanced sand and bag filtration; chitosan-enhanced sand filtration (CESF); and oxidation and ultrafiltration. Initial capital construction cost estimates indicated biofiltration was the least expensive treatment alternative. However, depending on the
Phased Improvements	design infiltration rate, biofiltration could have a much larger footprint than the analyzed active treatment systems. KJ recommended bench-scale testing and in-field pilot testing using site-specific stormwater to compare the treatment efficiencies of all the treatment technologies and to finalize treatment choice and design parameters. The Port decided to pursue CSA conveyance Alternative B and to accomplish the work in phases. Phasing the improvements allowed the Port to include the unanticipated capital improvements into its annual budget and to evaluate the impacts of the new conveyance improvements on the choice of treatment technology and design parameters. Construction of conveyance improvements at T3 was Phase I of the stormwater improvements.
Flow Analysis	MARINE TERMINAL (MT) IMPROVEMENTS In 2015, KJ aided the Port in conducting an engineering evaluation of the MT to determine applicable conveyance options for stormwater runoff from T3 and the northern portion of the Platypus lease area. Hydrologic and hydraulic modeling was performed using Western Washington Hydrology Model (WWHM) 2012, Autodesk Storm and Sanitary Analysis (SSA), and Bentley FlowMaster (FlowMaster). WWHM was used to determine the water quality (WQ) flowrate to be treated at the future treatment system and used to size the new flow splitter. The other two programs were used to size and evaluate different gravity conveyance options and to identify how the systems would operate under tidal influence. Each
Tidal Influence	conveyance option included plugging and/or abandoning portions of the existing drainage system (e.g., deck drains, bull rail drains, catch basins, drainage piping, etc.), installing a new gravity conveyance system within the T3 roadway, and a different conveyance/drainage alternative for the wharf.
Conveyance	The following four conveyance alternatives were evaluated for the wharf: • Trench drains at the downslope ends of each wharf trestle to collect sheet flow runoff
Options	 A conveyance system suspended underneath the wharf to collect runoff discharging through the existing deck drains Collection troughs along the edge of the wharf and access ramps
Constraints	• Regrading the wharf to convey runoff via overland sheet flow down the wharf trestles Regrading the wharf was determined to be the best alternative. Due to anticipated tidal impacts, recurring ship loading and offloading operations, substantial solids debris (e.g., bark) from timber loading operations, and other site constraints, the trench drains (alternative #1), conveyance pipe under the wharf (alternative #2), and collection and conveyance troughs (alternative #3) were considered inferior solutions to regrading the wharf.

Stormwater Retrofit Regrading Plan	In early 2016, KJ prepared a final design package and design specifications for the T3 conveyance improvements. The design package included a regrading plan and a new gravity storm conveyance system. Autodesk Civil 3D (Civil 3D) was used to prepare the regrading plan for the T3 wharf, T3 roadway, and the northern portion of the Platypus lease area. To limit the impacts on existing site operations, the regrading work was phased and conditions were added to construction drawings and specifications requiring the contractor maintain Port access during business hours. Regrading of the wharf was scheduled and completed during a two-week down period between log ship calls so as not to impact loading and handling operations.				
Improvements	 The conveyance improvements incl A new outfall Flow splitter (to be used as a lif infrastructure 	 e conveyance improvements included: A new outfall Flow splitter (to be used as a lift station once treatment was installed) and associated drainage infrastructure Approximately two acres of new and replacement pavement 			
Operational Loads	The conveyance system's structures were designed with the site's heavy operational loads in mind. The design drawings and specifications included loading criteria for equipment operating in the MT, and the structures were outfitted with airport-load rated covers. Excavation and installation of infrastructure below the mean high water tide level was scheduled at low tide to ensure dry placement of the infrastructure and to decrease the quantity of dewatering water produced. The conveyance system was modeled using SSA with the design goals of: (1) no flooding under the 25-year storm and mean higher				
Conveyance System	high water (MHHW) tide level; and (2) treating the WQ flowrate. The flow splitter was equipped with an internal baffle to bypass flows higher than the WQ flowrate to the new outfall. The conveyance system was also sized to accommodate the combined runoff from T3, Platypus, and the adjacent roadway. A section of pipe was installed with the most upstream catch basin to allow the Port to, in the future, connect the new conveyance system to the existing system servicing other portions of the facility. Construction of the T3 conveyance improvements was completed in fall 2016. KJ was rehired by the Port in 2017 to design Phase II of the project, which included design of additional conveyance improvements for the CSA and T3, evaluating the efficiency of different stormwater treatment technologies, and designing a stormwater treatment system for the combined runoff from the CSA and T3.				
Treatment Technologies	BENCH-SCALE TESTING To inform the stormwater treatment system design, KJ hired Clear Water Services, Inc. (Clear Water) to conduct the bench-scale testing of the technologies identified in the alternatives analysis. The objective of the testing was to evaluate the effectiveness of each technology at reducing parameter concentrations below benchmark limits. The Port collected representative stormwater samples on October 18, 2017 and November 11, 2017 and sent the samples to Clear Water's laboratory for analysis. Clear Water evaluated the applicability of several treatment technologies including sand filtration, CESF, biochar, CESF with pretreatment [the addition of a hybrid polymer, BHR-P50 (P50)], CESF with a polishing step, and CESF with a pretreatment and a polishing step. Table 2 summarizes the results of the second round of testing.				
	Table 2. Bench-Scale	e Testing Res	sults for 11 No		Sample
	Sample	Total Cu (µg/L)	Total Zn (µg/L)	COD (mg/L)	TSS (mg/L)
	ISGP Benchmark	14	<u>(µg/L)</u> 117	120	30
	Raw Water	20.8	84.2	9.6	18
	Sand Filtration	18.4	49	19.9	4
	CESF	13.9	73	14.1	0
	Biochar	3.5	27.7	44.3	4
	CESF + Biochar	5.9	16.1	10.3	0
	P50 + CESF	16.5	59.5	25.7	13
	P50 + CESF + Biochar	0.9	3.3	17.3	0

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Stormwater Retrofit	The active treatment technologies (e.g., CESF, CESF+biochar, P50+CESF, etc.) and the passive treatment technologies (e.g., sand filtration and biochar) reduced the concentrations of all the tested parameters except for COD, which was already significantly below the benchmark limit. The bench-scale testing indicated that either an active or a passive treatment system may be a viable alternative to treat T3 and CSA stormwater runoff. Due to lower construction, operation, and maintenance costs, the Port
Biofiltration Factors	decided to conduct a pilot-scale study of biofiltration to validate the technology and to set treatment design parameters (e.g., infiltration rate, etc.).
System Test	PILOT-SCALE TESTING KJ provided the Port with design drawings, specifications, and photographs from its previous pilot- scale tests, and Port maintenance staff constructed, troubleshot, and ran the biofiltration pilot-scale study. Two plastic 250-gallon totes were each outfitted with a perforated underdrain pipe; a layer of drain rock; and a 24-inch layer of biofiltration soil mix (BSM) to mimic the treatment chamber of a biofiltration treatment system. The BSM was a 60/40 mix (by volume) of fine sand and fine compost, based on the City of Seattle's (Seattle) standard bioretention soil mix (Seattle 2017).
Infiltration Rate	The totes were loaded with stormwater collected from the T3 flow splitter. The stormwater was pumped into a head tank for storage, and then applied to the surface of the BSM using polyvinyl chloride (PVC) flow spreaders. The outlet of the head tank was outfitted with a valve and flow meter, which allowed the Port to monitor and vary the stormwater flowrate applied to each tote. The required flowrate (gallons per minute) necessary to obtain the desired infiltration rate within each tote was calculated using the below equation:
	Flowrate (gpm) = Media SA * DIR * $\frac{0.01667 hr}{min} * \frac{0.004329 gal}{in^3}$
	Notes:gpm = gallons per minuteminin ³ SA = Surface Area (square inches)DIR = Design Infiltration Rate (inches per hour)
	Stormwater was applied to the BSM at the designated flowrate until a constant head was established above the media. Then influent and effluent samples were collected. Figure 2 shows the pilot-scale totes and flow spreaders constructed by Port staff.
	<image/>

Figure 2. Pilot-Scale Test Apparatus - 250-gallon Totes, Flow Spreaders, and Head Tank (Port 2018)

Treatment Footprint

The goal of the pilot-study was to meet ISGP benchmarks while minimizing the required treatment footprint. The Port ran the pilot-study on fourseparate days — January8, 2018, January 11, 2018, January 18, 2018, and January 24, 2018 — to refine study operation and confirm study findings. For each run, a total of nine samples was collected : three influent samples, three effluent samples at a design infiltration rate of 18 inches per hour (in/hr), and three effluent samples at a design infiltration rate of 24 in/hr. The design infiltration rates were chosen based on KJ's past pilot-scale experience and on infiltration rates observed at existing, operational biofiltration systems. Figure 3 (next page) shows results for the January 24, 2018 pilot-study test, and Table 3 (next page) summarizes the average percent reduction observed during the January 24, 2018 pilot-study test.

Stormwater Retrofit Reductions	140 120 100 80 60 40 20 0	pH Turbidity TSS (NTU) (mg/ Figure 3. 24	TotalCu (ug/l) Janu ary 2018 Pilot-Se	ISGP Benchmarks INF-A 24-A 18-A INF-B 24-B 18-B 18-B 18-B INF-C 24-C 18-C 18-C 18-C
		0	ercent Reduction (I 24 January 2018 St	nfluent vs. Effluent) udv
		Parameter	24 in/hr	18 in/hr
		Turbidity (NTU)	89%	93%
		TSS (mg/L)	94%	94%
		Total Cu (µg/L)	92%	89%
		Total Zn (µg/L)	91%	93%
		Total COD (mg/L)	8%	22%
Infiltration Rates Comparison	The pilot-scale studies confirmed biofiltration was an applicable treatment option for the combined T3 and CSA stormwater runoff. As seen on Figure 3 and in Table 3, biofiltration reduced the concentration of each parameter measured and demonstrated reductions at both the 18 in/hr and 24 in/hr design infiltration rates. The average percent reduction for each ISGP parameter (except for COD, which was below the benchmark limit prior to treatment) was comparable between the two infiltration rates, so a design infiltration rate of 24 in/hr was chosen. The larger infiltration rate limited the required treatment system footprint and, thereby, lessened the system's impact on existing site operations.			
			DESIGN	
Regrading Plan	roadway, new g between T3 an drainage within used to prepare The plan inclue 1) regrading Boat Ha	gravity stormwater conveyar d CSA, and the biofiltration n CSA, ease facility mainten e the approximately four-acro ded: and paving the east-west roa	or regrading and paving the infrastructure within treatment system. The ance, and improve faci e grading plan.	g the main CSA storage area and access n CSA, a pumped conveyance system regrading plan aimed to improve lity stormwater quality. Civil 3D was nwater Creek Bridge and the Port Angel
	3) grading al existing The gradin CSA, by not si	ong the shoreline and aroun grade ng plan also allowed for pote gnificantly raising or loweri	d the biofiltration syste ntial future access to M ng grades along the fen	m to tie the improvements into the larine Drive, off the southern side of ce line. in CSA storage area and roadway. The
Tidal Influence	system was con structures and and SSA to eva accommodate	mposed of a new CSA lift sta piping. Hydrologic and hyd aluate how the system would flows from the other portion	ation and outfall, valve raulic modeling of the s operate under tidal inf s of the CSA, which are	vault, and collection and conveyance system was completed using WWHM luence and to ensure the system could e not yet tied into the new system. Like del were: (1) no localized flooding of the
Design Goals	system under t WQ flowrate.	he 25-year storm and MHHV	V tide; and (2) for the C e system was built arou	CSA lift station to bypass flows over the ind the second stage of the biofiltration

Stormwater Retrofit

Lift Stations

The new pumped conveyance system was designed to convey stormwater collected in the MT and CSA to the treatment system. The primary force main extended from the T3 lift station (previously the T3 flow splitter), across Tumwater Creek, and to the northeastern side of the treatment system. Here, it combined with a force main from the CSA lift station before entering the treatment system. AFT Fathom 9 (Fathom) was used to model the conveyance system and size the pumps. Two submersible, non-clog wastewater-type pumps were installed in the T3 lift station, and two were installed in the CSA lift station. This type of pump was chosen to prevent the system from clogging due to wood debris and solids that may enter the stormwater system. Each pump was outfitted with a variable frequency **d**rive (VFD), which allows the Port to operate the pumps at low flow and high flow conditions. The VFDs also provide the Port extra operational flexibility to phase future stormwater conveyance improvements and to connect other portions of the CSA, Platypus lease area, and/or other Port properties into the treatment system.

Three-Stage Biofiltration

Based on past experience and to allow the Port some flexibility with the treatment train, KJ designed an Ecology-approved three-stage biofiltration treatment system. Each stage of the treatment system was contained in a concrete basin and connected by underground piping. Stage 1 of the system is pretreatment. Stage 2 is biofiltration, and Stage 3 is polishing. Each stage of the treatment system includes inlet and/ or outlet chambers, which act as transition points between stages. The chambers within Stages 1 and 2 are outfitted with stand pipes which operate as overflows and allow stormwater to bypass the stage if the stage's media and/or distribution piping plugs. The Stage 3 outlet chamber is outfitted with a gate valve, which can be opened to bypass the stage. See Figure 4 for a schematic of the treatment system and conveyance piping.

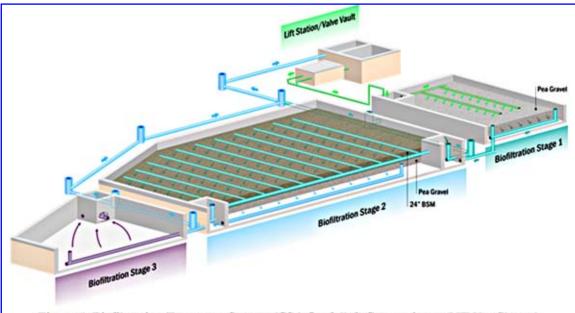


Figure 4. Biofiltration Treatment System (CSA Outfall & Connection to MT Not Shown)

Pretreatment (Stage 1)

Biofiltration

(Stage 2)

The first step, Stage 1, of the treatment train is pretreatment through a 24-inch bed of pea gravel. The combined WQ flowrate from MT and CSA is pumped into an energy dissipating and settling chamber. Water builds up within this chamber before flowing into the flow spreader header. From the header, the flow is divided between two flow spreader pipes which distribute the stormwater across the pea gravel bed. The stormwater percolates through the pea gravel, filtering out large solids suspended in the runoff, and collects in a perforated underdrain on the southern edge of the basin. The filtered stormwater then flows west into the inlet chamber of Stage 2.

Stage 2 of the treatment train is biofiltration and treatment of the stormwater. This stage is comprised of a 24-inch layer of BSM on top of pea gravel and planted with native plants. Pretreated stormwater builds up in the inlet chamber of Stage 2 before flowing into the Stage 2 flow spreader header. The header pipe distributes the flow across the basin and into the smaller, perforated flow spreaders. The flow spreaders distribute the flow across the surface of the BSM. Stormwater trickles through the BSM, and into the underlying pea gravel. The bottom of the Stage 2 basin is sloped to the south to direct the treated stormwater to a perforated underdrain pipe located along the southern edge of the basin. The underdrain discharges into the Stage 2 effluent chamber in the southwestern corner of the basin. The treated stormwater then flows from this chamber into Stage 3.

Stormwater Retrofit

Polishing (Stage 3)

Polishing Media Test

Minimizing Operations Impacts The final step in the treatment train is Stage 3, which is a polishing step. Treated stormwater enters Stage 3 at the southeastern corner of the basin and is distributed across the basin floor by a perforated underdrain pipe. The floor of Stage 3 is sloped toward the northeastern corner of the basin where the basin effluent chamber is located. This chamber has two inlet orifices, the lower of which is outfitted with a gate valve. When the gate valve is closed, stormwater is forced to build up within the basin, flowing upward through the polishing media, before flowing out the higher orifice. Polished stormwater then exits the Stage 3 effluent chamber into the gravity drainage/bypass system which drains to the new CSA lift station and outfall.

The Stage 3 basin is currently empty and the gate valve open, allowing treated stormwater from Stage 2 to directly discharge into the downstream conveyance system. Based on monitoring results of the Stage 2 effluent during the current and upcoming wet season, a polishing media will be tested, chosen, and installed in the Stage 3 basin. The polishing media can also be changed and/or varied if the commodities handled at the MT and CSA change in the futures.

KJ coordinated with Port staff to locate and arrange the treatment system and conveyance improvements to minimize impacts on existing site operations. Locating the treatment system along the shoreline on the western side of the facility was determined to be optimal, as this location moved the system out of the path of the log-truck haul route and did not take up prime storage space. The treatment system was set back from the edge of the shoreline to allow Port maintenance staff to access the shoreline for future maintenance (e.g., replacement or restoration of shoreline riprap). The treatment system was also designed around a linear treatment train and had a linear footprint, so it could better hug the shoreline and not encroach into the roadway.

Construction of the stormwater treatment system and associated stormwater conveyance improvements began in summer 2018 and was completed in September 2018. Figure 5 shows the biofiltration system prior to the completion of installation of the inlet force main.



Stormwater Retrofit	CONCLUSIONS The Port's MT and CSA are active log-handling, storage, and transportation facilities, which, like many other marine facilities, have had trouble in the past meeting permit-imposed stormwater quality limits. Between 2015 and 2018, the Port undertook measures to improve stormwater quality at the MT and CSA
Capacity & Flexibility	through site-wide stormwater treatment and conveyance improvement projects. These projects included bench-scale and pilot-scale testing of treatment alternatives. The former identified that passive treatment may be a feasible treatment alternative, and the latter validated the choice and informed treatment design parameters. A three-stage treatment system and pumped conveyance system was designed and installed. The final conveyance and treatment system was designed with the future in mind; it has the capacity to handle additional stormwater runoff from other Port properties and has the flexibility to evolve with changing site conditions and cargos through its final polishing stage.
Take-Aways	 The following conclusions can be drawn from the Port's experience: You can fit a lot of treatment in small, tucked away spaces. Passive vegetated systems can be a viable option to treat industrial stormwater runoff. Multi-stage treatment allows for flexibility for unknowns in future site conditions and/or regulatory conditions.
	 A staged treatment approach allows the facility owner to upgrade and optimize the treatment system to fit the site's specific stormwater characteristics. Pilot-scale testing is a valuable tool to confirm treatment system design parameters. The Port is currently conducting performance monitoring of the system for the 2018-2019 wet season. Based on the results of this monitoring, the Port will further optimize the system to fit its site-specific
	stormwater characteristics and needs. FOR ADDITIONAL INFORMATION: LAURA WEIDEN, Kennedy Jenks, 253/ 835-6438 or LauraWeiden@kennedyjenks.com Ross DUNNING, Kennedy Jenks, 253/ 835-6449 or RossDunning@kennedyjenks.com
	 REFERENCES City of Seattle. (2017). "Erosion and Landscape Materials." Division 9-14 in Standard Specifications for Road, Bridge, and Municipal Construction. 2017 Edition. City of Seattle. Seattle, WA, 9-58 – 9-76. Port of Port Angeles. (2018). Port of Port Angeles Biofiltration Pilot-Scale Study Totes and Flow Spreaders. Photograph. (Emailed January 2018). Roorda, Tom. (2016). Port of Port Angeles Marine Terminal, Westport Marine property, Platypus Marine leased area, and Cargo Surge Area. Aerial Photograph. (Emailed 5 February 2016). Waknitz, Jesse. (2018). Biofiltration Treatment System Prior to Completion of Force Main. Aerial Photograph. (October 2018). (Emailed 8 January 2018).
and treatment design, He is an accomplished wastewater, and drinki remediation. He is a C primary focus is helpin	dy/Jenks' company-wide stormwater practice leader and senior technical resource for stormwater collection, conveyance, National Pollutant Discharge Elimination System (NPDES) permit compliance, and Clean Water Act litigation support. I project manager with a broad range of civil engineering experience specifically focused in the fields of stormwater, ng water treatment, processing, conveyance and distribution and environmental investigation, construction and certified Erosion and Sediment Control Lead and is abreast of the stormwater regulatory climate across the country. Ross' g transportation sector industries and agencies navigate the myriad Federal, State, and local stormwater regulations and neering solutions benefitting both business and the environment.

Laura Weiden is a civil engineer with experience working on a variety of industrial and municipal stormwater projects. Laura is passionate about water quality and treatment and has worked with public port authorities, municipalities, railroads, and private industry businesses. She has also been involved in innovative research to evaluate and optimize the treatment capabilities of constructed wetlands and bio-retention systems that receive and treat urban stormwater runoff. She holds a bachelor's degree in civil engineering from the University of California, Berkley, and a masters degree in Engineering with a concentration in Environmental Engineering from the University of California, Irvine.

Author Ross Dunning will be participating in the sessions "Source Control BMPS: Strategies for New Regulations" and "Getting the Most from Your Water Quality Retrofit Investment" at the upcoming "Managing Stormwater in Washington" conference occurring March 6th in Tacoma, Washington. For info: www.WashingtonStormwater.com

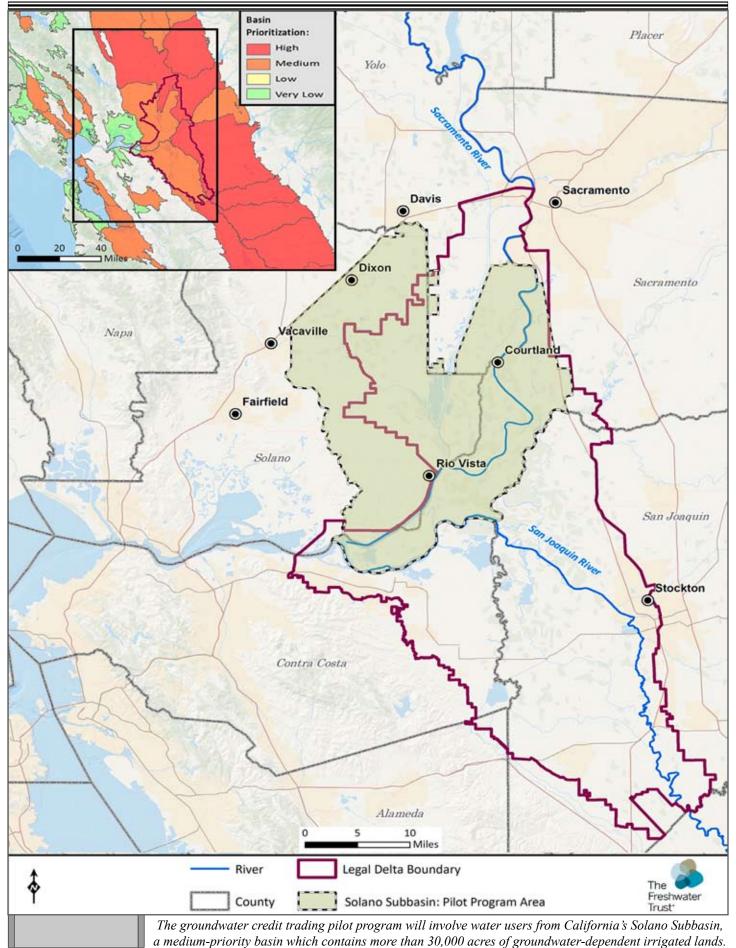
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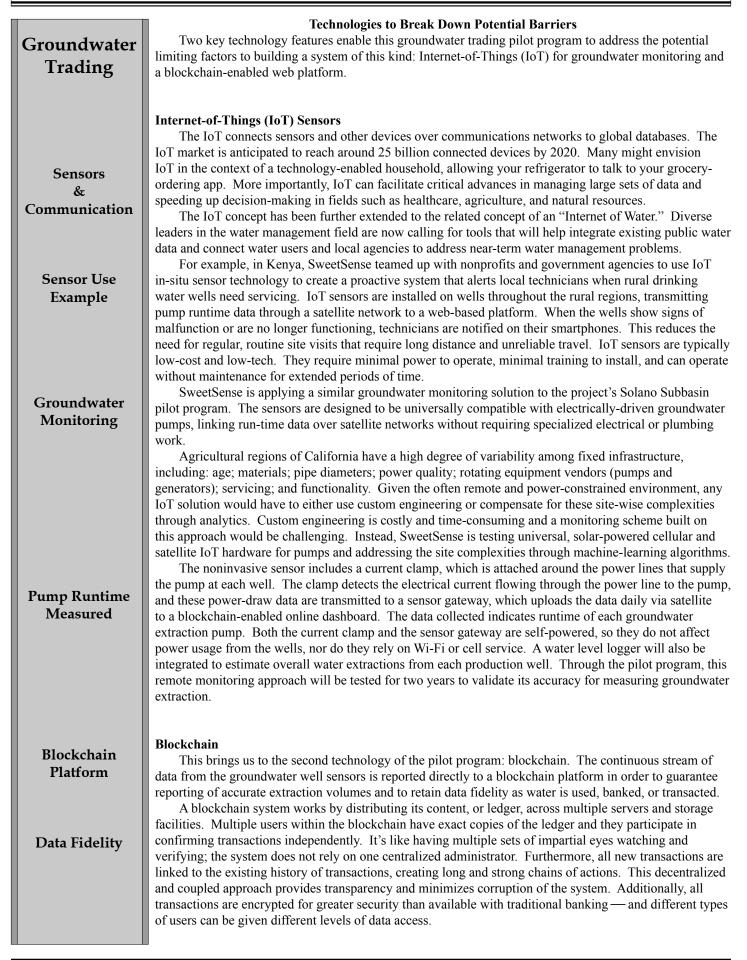
	GROUNDWATER MEASUREMENT & TRADING			
Groundwater	CALIFORNIA PILOTS GROUNDWATER MEASUREMENT AND TRADING PROGRAM			
Trading	WITH IOT SENSORS AND BLOCKCHAIN			
U				
	by Alex Johnson, Erik Ringelberg, Becky Rittenburg and Danielle Dumont			
	The Freshwater Trust (Portland, OR and Sacramento, CA)			
	Introduction			
Groundwater	Increased pressure on California's water resources and new groundwater legislation in the state require novel water management solutions — and soon. California's Sustainable Groundwater Management Act,			
Sustainability	passed in 2015, mandates that groundwater basins across the state achieve sustainable levels within the			
	next 20 years. The legislation provides local management agencies the authority to develop and implement			
	paths to sustainability.			
	The Freshwater Trust, a nonprofit that works to preserve and restore freshwater systems, has partnered			
	with IBM Research and SweetSense, Inc. to test an innovative and scalable strategy for sustainable groundwater management that could support local agencies to implement groundwater credit trading			
	markets.			
Credit Trading	Through the innovative use of Internet-of-Things (IoT) for groundwater monitoring and a blockchain-			
0	enabled web platform that is designed to maintain sustainability for groundwater-dependent ecosystems and			
	communities, water users may one day be able to trade groundwater credits through their mobile device.			
	A Big Shift: The Sustainable Groundwater Management Act			
SGMA Legislation	The Sustainable Groundwater Management Act (SGMA) is one of the most pivotal pieces of watershed			
Legislation	management legislation in California's history, finally linking groundwater management into one coherent			
	program. SGMA includes: mandatory participation; fee structures; and a sustainability compliance plan. The legislation also mandated the creation of Groundwater Sustainability Agencies (GSAs). GSAs are			
	groups formed from local agencies — such as reclamation and water districts — that are responsible for			
	ensuring groundwater is sustainably managed. Under SGMA, these GSAs are tasked with completing			
	Groundwater Sustainability Plans (GSPs) in critically overdrafted basins by early 2020, and achieving			
	sustainability within 20 years of plan adoption. Ninety-nine percent of the 127 high- and medium-priority basins throughout California have formed GSAs and are in the process of developing GSPs. The success			
	of these plans will depend on robust systems of tracking, reporting and transparency that have yet to be			
	developed at scale. [RE SGMA, see: Moon, TWR #128 & Aladjem, TWR #135.]			
	Instead of creating an overarching statewide program, the planning efforts were directed to local			
Local Planning	agencies. This approach reflects the significantly different hydrologic cycles, hydrogeological conditions, and water uses throughout the state. Equally important, this structure provides authority to local agencies			
	to be responsible for meeting sustainability goals through locally developed approaches and implementation			
	strategies. This dispersal of responsibilities is in itself insufficient to enable the development and broad			
	acceptance of platforms and mechanisms to ensure efficient and effective groundwater use, monitoring,			
	trading, reporting, tracking, and transparency. However, this gap in state-mandated SGMA implementation approaches opens up the door for local innovation to develop projects and management actions for			
	sustainability.			
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	Groundwater depletion			
	Local Groundwater Sets sustainability goal Implements GSP Maintains • Seawater intrusion • Storage limitations			
	Sustainability and creates and achieves sustainability - Degraded water quality Agency created Groundwater Sustainability sustainable yield indicators - Land subsidence			
	Plan by 2022 by 2042 • Surface water depletion			
	Through California's Sustainable Groundwater Management Act, local agencies are tasked with			

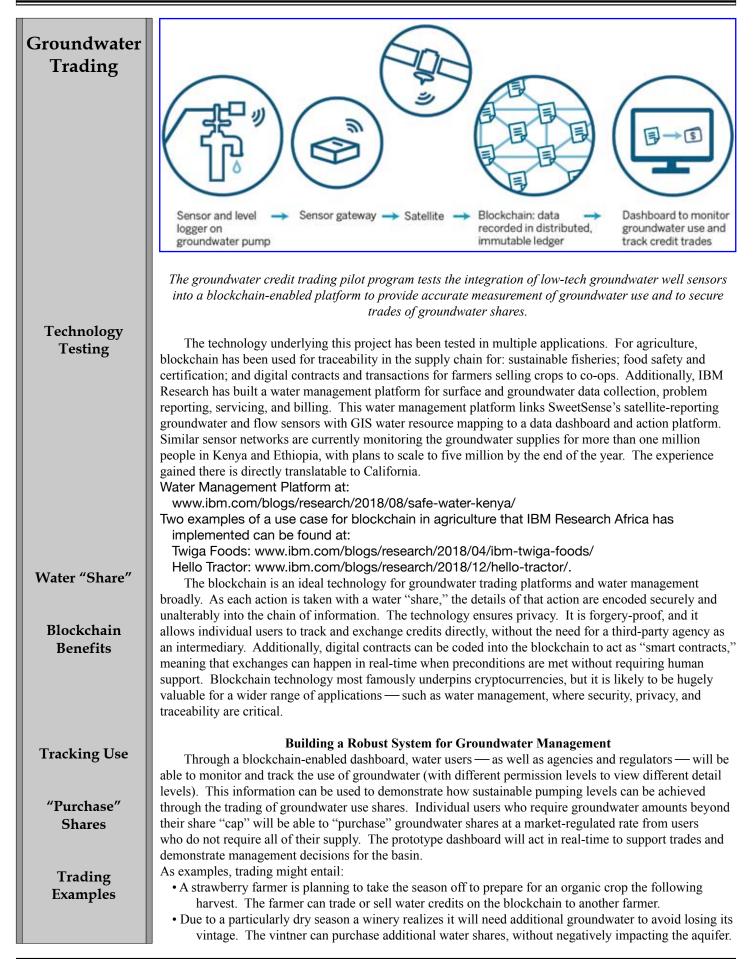
Through California's Sustainable Groundwater Management Act, local agencies are tasked with establishing a goal for balancing groundwater use in a basin and then implementing a plan for achieving and maintaining sustainable yield.

	Moving Toward Sustainability
Groundwater	GROUNDWATER BANKING & TRADING SCENARIOS
Trading	The pathways toward achieving sustainability in a basin can vary. Through GSPs, GSAs are required to set a sustainable yield for the basin to avoid "significant and unreasonable" detrimental results. GSAs
8	are developing projects and management actions as well as monitoring programs to track and address
Sustainable	progress towards sustainability. SGMA identifies six sustainability indicators to track detrimental impacts
Yield	to sustainability goals: groundwater depletion; seawater intrusion; storage limitations; degraded water
	quality; land subsidence; and surface water depletion.
Trading System	One approach gaining traction is to develop a market-based system for groundwater trading. A groundwater trading system treats groundwater as an exchangeable, valued asset within a resource-limited system, in a manner analogous to the systems used to trade carbon offsets. The strategy of trading is to make individual groundwater users' current "slice of the pie" a defined asset that can be used or purchased, leased, sold, or banked for the future. Furthermore, groundwater users could get credit for recharge activities — actions that increase the amount of groundwater available — or for substituting surface water
	instead of groundwater and thereby lessening reliance on groundwater. The market conditions can be set up through a framework of "rules" by the GSP to ensure that the "significant and unreasonable" detrimental results are mitigated — such as ensuring that groundwater-dependent ecosystems are not impacted by overdrafting within one portion of a basin. Groundwater trading systems have the potential to incentivize environmental improvements and
	water use efficiencies while easing the burden of achieving SGMA's sustainability mandates. A successful groundwater trading system requires clear protocols, quality standards, data collection methods, and transaction accounting.
Trading	A groundwater trading system also has potential limitations, including:
Concerns	• The high cost of purchasing, installing and maintaining groundwater well meters and the accuracy of
	metered data over timeThe concern from groundwater users about privacy of the groundwater use data collected by the meters
	 The concern from groundwater users about privacy of the groundwater use data concered by the meters The lack of trust in a centralized, non-local "bank" or trading system and the potential for cyber-attacks on this system.
	With overcoming these concerns in mind, several organizations have partnered to pilot technologies that can accurately monitor groundwater use through a forgery-proof and transparent platform that allows local users to track and exchange groundwater credits.
	Groundwater Credit Trading Pilot Program in Northern California
	TESTING A NEW APPROACH
Sensor System	The Freshwater Trust (TFT) has partnered with IBM Research and SweetSense Inc. (a provider of low-cost satellite-connected sensors) to implement a proof-of-concept groundwater trading system in the Sacramento-San Joaquin Basin in California. The project kicked-off last month, in January 2019.
	The project team is developing and deploying a satellite-connected IoT sensor system linked to a blockchain platform allowing water users to monitor and track the usage of groundwater. The project will also demonstrate how sustainable pumping levels can be achieved through the trading of groundwater credits.
	With agriculture's heavy reliance on groundwater for irrigation, and the need for sustainable
Departing	management of this resource, the mantra "you can't manage what you don't measure" has gained a significant meaning.
Reporting	Between 20 and 30 groundwater pumps within the pilot area will be equipped with IoT sensors that remotely report to the platform to guarantee accurate reporting of extraction volumes. The data will
	be securely stored on the blockchain so that private metadata is kept confidential and all information is recorded as water is used or transacted. The program is jointly funded by The Water Foundation and the Conden and Patty Magaz Foundation
Delta	Gordon and Betty Moore Foundation. The project team is piloting its approach in one of the largest and most at-risk basins in North America
Pilot Program	- Northern California's Sacramento-San Joaquin River Delta. This area is often referred to as the "nexus
	of California's statewide water system." The Delta covers 1,100 square miles and provides water to the San
	Francisco Bay Area and coastal and southern California, and supports dozens of threatened or endangered — legally protected — fish, plant, and animal species. Nearly 75% of this land is used for agriculture. Within the Delta, the pilot program will take place in the Solano Subbasin, in which there are more than
	30,000 acres of groundwater-dependent irrigated lands.

The Water Report







Groundwater Trading Direct Trading Measurement & Reporting	The pilot program is engaging with local water agencies, GSAs, nonprofits, farmers, policy experts, and technologists to develop a prototype dashboard for groundwater trading. Local water users will be able to trade credits directly within the trading framework developed by a GSA, thereby mitigating adverse effects including water quality and water table degradation that may impact drinking water quality or groundwater-dependent ecosystems. Conclusion Over the next two years, the team will assess the value of these technologies to support and create assurances around tamper-proof groundwater monitoring, crediting and banking, and assess the ability to rapidly scale a system at a subbasin level. A robust groundwater trading system holds strong potential for becoming a key management tool for achieving groundwater sustainability throughout California's stressed aquifers. Whether making use of IoT, blockchain, or other technologies, the success of these systems hinges on being able to accurately measure and report groundwater use and to securely trade groundwater shares. This innovative pilot program is looking to better understand how these cutting-edge technologies can support better water management, and will build a strong network of partners to test the concept.			
	 Can support better water management, and will build a strong network of partners to test the concept. FOR ADDITIONAL INFORMATION: DANIELLE DUMONT, 503/ 222-9091 x42 or Danielle@thefreshwatertrust.org Water Management Platform: www.ibm.com/blogs/research/2018/08/safe-water-kenya/ Danielle Dumont manages the marketing of The Freshwater Trust's consulting and analysis services to bring market-based restoration solutions to those who can take measured actions to affect freshwater. She creates campaigns and communications tools that promote TFT's mission to fix every river as well as provides support for project outreach and communication plans. She has more than 20 years of experience in corporate and marketing communications. Alex Johnson directs fundraising and revenue generation to support The Freshwater Trust's work restoring riverine systems in Oregon, Idaho, and California. He has led the analysis, development and implementation of some of the first water quality trading programs in the Pacific Northwest and has deep experience working directly with private and public outties to develop robust watershed restoration solutions for Clean Water Act compliance and to achieve voluntary conservation goals. He has an economics and logistics background. Erik Ringelberg directs The Freshwater Trust's work in California with regulated entities, state regulatory agencies, regional stakeholders, agricultural producers, and conservation funders to implement watershed conservation and restoration programs that track ecological outcomes. He has more than 20 years of environmental consulting experience, directing programs on water quality policy, fisheries, habitat restoration, and hazardous waste issues. Becky Rittenburg manages The Freshwater Trust's workin California, where she works with partners to link communities, working lands, and groundwater-dependent ecosystems through SGMA-related efforts. She has worked at			

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WATER SUPPLY IN NEBRASKA EXCERPTS FROM AN ANNUAL REVIEW OF AVAILABILITY

Water Supply

Nebraska

Editors' Introduction: One aspect of the Nebraska Department of Natural Resources' robust and multifaceted water management program (see: Gilbert, *TWR* #107 — *Water Policy & Science: Nebraska's River Basin Evaluation Tools*) is the production of an *Annual Review of Availability of Hydrologically Connected Water Supplies*. The latest of these Reviews was released on December 20, 2018 (see: https://dnr.Nebraska. gov/water-planning/publications-and-presentations). What follows are edited excerpts from that Review.

Annual Availability Evaluation

Availability Determinations

Re-Evaluation Option: "INSIGHT" Methodology

Management Planning

Insufficiency Standard

"65/85 Rule"

The Nebraska Department of Natural Resources (Department) is tasked annually to review, and as necessary, evaluate the impacts of existing and new surface water and groundwater uses in each of the State's river basins. Section 46-713 of the Ground Water Management and Protection Act (Act) (*Neb. Rev. Stat.* §§ 46-701 through 46-756) outlines the requirements of the Department to evaluate the expected long-term availability of hydrologically connected water supplies. The Department is not required to evaluate river basins, subbasins, or reaches for which an integrated management plan is being developed or already exists. However, the Department may reevaluate a basin, subbasin, or reach if there is reason to believe that a reevaluation may lead to a different determination as to whether the river basin, subbasin, or reach is fully- or over-appropriated. Basins, subbasins, and reaches that currently are designated as fully appropriated or over-appropriated are identified in Figures 1 and 2 (next page).

The Department's Annual Review uses the best available science and methods to apply the Department's current rules to examine the expected long-term availability of surface water supplies and hydrologically connected groundwater supplies. The most recent full evaluation, published December 30, 2016 (2017 Report), examined the expected long-term availability of surface water supplies and hydrologically connected groundwater supplies of the Blue River Basins, the Lower Niobrara River Basin, the Lower Platte River Basin, and the Missouri Tributary Basins...The Department concluded that none of the basins, nor any of the subbasins or reaches within the basins evaluated, were fully appropriated and that the prior preliminary determination that none of the basins were fully appropriated would not change based on reasonable projections of future development in the basins.

The analyses performed for the fully appropriated basin evaluation are reflective of the Department's current rules which primarily focus on assessing the water availability for junior irrigation rights as determined through water administration records. Details on the methodology used for the evaluation can be found in the 2017 Report...There are other approaches to evaluate hydrologically connected water supplies, such as the Department's INSIGHT methodology which assesses available water supplies, major demand categories, and water balances within basins across the state (http://nednr.nebraska.gov/INSIGHT/). The INSIGHT methodology provides a more comprehensive assessment that can be used to support water management decisions and guide planning processes; however, these results may vary greatly when compared to the results following from the current rule. This is because a basin which is not fully appropriated under the current rule could still see water supply imbalances when a more comprehensive analysis, such as the INSIGHT methodology, is applied.

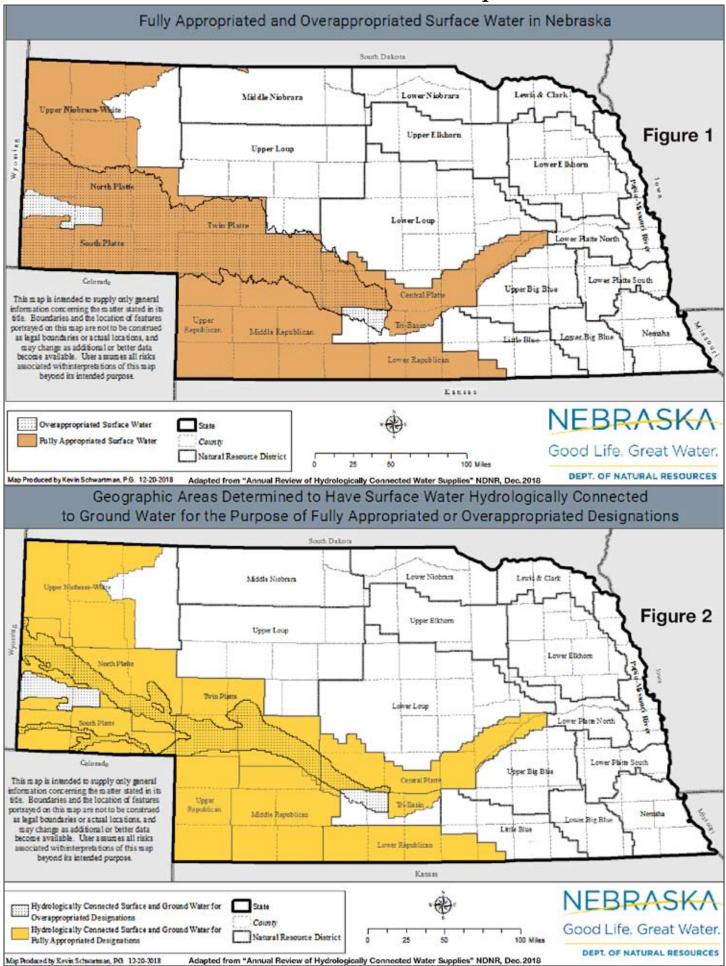
Currently, all 23 Natural Resources Districts (NRD) in the State are engaged in some phase of integrated management planning with the Department which covers all major basins, subbasins, and reaches with hydrologically connected water supplies. The Act directs the Department to forego an annual evaluation for those areas participating in or developing an integrated management plan unless there would be reason to believe the previous year's evaluation may change. To determine if there would be any changes, the Department reviewed previous evaluations and any subsequent changes that have occurred that might impact this year's analysis. Given the results of the 2017 evaluation that examined the 20-year period ending in 2015, water administration activities, active surface water rights, and groundwater well development, the Department does not find it necessary to reevaluate any of these basins at this time...

In short, the Department's rule for the evaluation (regulation Title 457 Neb. Admin. Code Chapter 24) states that the surface water supply is deemed to be insufficient if, at current levels of development, the most junior irrigation right in a basin, subbasin, or reach has been unable to divert sufficient surface water over the last 20 years to provide 85 percent of the amount of water a corn crop needs during the irrigation season (May 1 through September 30), or if the most junior irrigation right in a basin, subbasin, or reach is unable to divert 65 percent of the amount of water a corn crop needs during the key growing period of July 1 through August 31. This is referred to as the "65/85 rule." The evaluation must also consider groundwater use in the hydrologically connected area, surface water administration, and future potential development.

FOR ADDITIONAL INFORMATION:

Nebraska Department of Natural Resources' Annual Review of Availability of Hydrologically Connected Water Supplies.

AVAILABLE FROM: https://dnr.Nebraska.gov/water-planning/publications-and-presentations)



WATER BRIEFS

DAM LICENSES

KLAMATH RIVER & FERC

CA/OR

On January 25, a federal court of appeals unanimously sided with the Hoopa Valley Tribe, ruling that the Federal Energy Regulatory Commission (FERC), the states of California and Oregon, and PacifiCorp can no longer stall dam license conditions to protect fish. In Hoopa Valley Tribe v. Federal Energy Regulatory Commission, No. 14-1271 (D.C. Cir., Jan. 25, 2019), the United States Court of Appeals for the District of Columbia Circuit (Court) determined that the Federal Energy Regulatory Commission (FERC) must proceed with consideration of a 2004 application to relicense the dams because the states of Oregon and California have effectively waived their water quality certification authority, which was required for FERC to proceed.

The Court ruled that FERC orders which found that California and Oregon had not waived their water quality certification authority under Section 401 of the Clean Water Act are vacated. "Whereas statutory waiver is mandated after a request has been pending for more than one year, the issue in this case is whether states waive Section 401 authority by deferring review and agreeing with a licensee to treat repeatedly withdrawn and resubmitted water quality certification requests as new requests. We conclude that the withdrawal-and-resubmission of water quality certification requests does not trigger new statutory periods of review." Slip Op. at 3.

A FERC license requires state certification, pursuant to section 401 of the Clean Water Act, that the project will meet state water quality standards. In 2006, the California and Oregon agencies received an application for a section 401 water quality certification for a new license but they neither granted nor denied it. In 2012, the Hoopa Valley Tribe petitioned FERC for an order declaring that Oregon and California had waived their water quality certification authority by agreeing to not act on PacifiCorp's request for certification. FERC denied that request.

Protracted delays in the Section

401 certification process were caused in large part by the side-bar Klamath Hydropower Settlement Agreement (KHSA), an agreement that was signed by Oregon, California, the Department of Interior, PacifiCorp, and three local tribes. The Hoopa Valley Tribe did not sign the agreements for several reasons, but ultimately, their choice to refrain from signing was because they felt the KHSA only benefited PacifiCorp's corporate profits at the expense of a dying Klamath River.

"This case presents the set of facts in which a licensee entered a written agreement with the reviewing states to delay water quality certification. PacifiCorp's withdrawals-andresubmissions were not just similar requests, they were not new requests at all. The KHSA makes clear that PacifiCorp never intended to submit a 'new request.' Indeed, as agreed, before each calendar year had passed, PacifiCorp sent a letter indicating withdrawal of its water quality certification request and resubmission of the very same...in the same one-page letter...for more than a decade. Such an arrangement does not exploit a statutory loophole; it serves to circumvent a congressionally granted authority over the licensing, conditioning, and developing of a hydropower project... Thus, if allowed, the withdrawal-andresubmission scheme could be used to indefinitely delay federal licensing proceeding and undermine FERC's jurisdiction to regulate such matters." Id. at 11-12 (emphasis in original).

The Water Report will be publishing a detailed review of this important decision and its ramifications in the next issue of the newsletter, written by Rick Glick of Davis, Wright & Tremaine. **For info:** Decision available at: www. cadc.uscourts.gov/ >> Opinion Locator >> Brouse by Date >> January 25

GROUNDWATER & CWA US US FILES BRIEF

The Water Report has reported extensively on the issue of the jurisdictional reach and applicability of the Clean Water Act on indirect discharges of pollution through groundwater. The *County of Maui v*. Hawaii Wildlife Foundation case was addressed at length by Kathy Robb in TWR #170 and #171; see also Moon, TWR #176. The US Supreme Court is currently considering whether to hear cases on the scope of the Clean Water Act and whether an NPDES permit is required when a pollution discharge is made indirectly through groundwater to a surface water source. The Supreme Court asked the US Solicitor General just before Christmas to weigh in on whether it should hear County of Maui or the other Circuit Court's case.

The Solicitor General filed a brief in the cases in January 2019. As noted in the Solicitor's *Brief* (available on the website below) the questions presented are: 1. Whether a "discharge of a pollutant," 33 U.S.C. 1362(12), occurs when a pollutant is released from a point source, travels through groundwater, and ultimately migrates to navigable waters. 2. Whether the Court should grant certiorari to address the other issues on which petitioners seek review.

The Solicitor General concluded that the Supreme Court should grant the Writ of Certiorari and hear only the County of Maui case, while also limiting its review to the first of the two questions presented. "Of the two certiorari petitions currently before the Court, the Maui petition provides the better vehicle for resolving the circuit conflict. The determination whether the plaintiffs in that case had stated a cognizable claim turned entirely on whether, as the Ninth Circuit held, the CWA's prohibition on the discharge of pollutants governs the release of pollutants from a point source 'into groundwater, through which the pollutants then enter a "navigable water."" Maui Pet. App. 13 (brackets omitted)." Brief at 15. "The Maui petition is also a better vehicle for resolving that question because the pollutants in that case (treated wastewater) migrated to jurisdictional waters (the ocean) solely via groundwater connected to a point source (the wells)." Brief at 16 (emphasis in original).

For info: Brief Amicus Curiae at: www.supremecourt.gov/ >> Case Documents >> Docket Search >> 18-260 >> January 3, 2019

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ENVIRO TRANSFERS colorado river basin

US

The voluntary transfer of water rights (or portions of water rights) to environmental uses, including streamflow and wetlands, is an effective way to restore aquatic species and ecosystems in some western states. Although state laws require a review of any changes to a water right and the legal frameworks in western states vary considerably, environmental water transactions are on the rise. A new 28-page report released in December of 2018, Environmental Water Transactions in the Colorado River Basin: A Closer Look, takes a detailed look at these transactions in five states in the Colorado River Basin: Arizona, Colorado, New Mexico, Utah, and Wyoming. It shows that irrigators and conservation groups are increasingly using short-term deals that require no water right change by the state. These flexible approaches allow irrigators to make temporary deals that promote their bottom line and water security without permanently giving up their water rights. This report builds on a previous report in this series, Colorado River Basin Environmental Water Transfer Scorecard, which showed that Basin states lag behind some other western states in laws that facilitate formal changes of water rights to environmental uses.

"Environmental water transactions are an increasingly promising tool to facilitate streamflow restoration in the Western U.S., where historical allocation of water has impacted both fish and wildlife habitat. Some shortterm water transactions are particularly valuable, allowing farmers and ranchers to engage in voluntary conservation that has the potential to enhance local and regional water security and benefit local instream and other environmental uses. These voluntary transactions are also particularly appealing since they allow for a larger degree of flexibility in water allocations throughout the Western U.S." Conclusion, Report at 27.

This report series was undertaken by Stanford's Water in the West program in collaboration with AMP Insights and other experts and was funded by the Walton Family Foundation.

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Szeptycki, L., Pilz, D., O'Connor, R., and Gordon, B. 2018. *Environmental Water Transactions in the Colorado River Basin: A Closer Look.* Stanford Woods Institute for the Environment. Available at: https://purl.stanford. edu/tx230zb7767. **For info:** Water in the West website:

http://waterinthewest.stanford.edu/

LEASING TRIBAL WATER AZ LAKE MEAD ALLOCATION

In a press release dated January 19th, the Colorado River Indian Tribes (CRIT) announced that voters of CRIT approved *Protect and Prosper: the CRIT Water Ordinance* by an overwhelmingly favorable percentage of 63% according to unofficial, preliminary results. The Tribal Council unanimously referred the Water Ordinance to the voters on November 8, 2018 and held numerous forums, information sessions, and tours of the reservation to inform the membership about water issues and to encourage passage of the referendum.

The CRIT Water Ordinance does not affect or change the CRIT commitment to leave 50,000 acre-feet of its allocation per year for three years, beginning in 2020, for use in Arizona in Lake Mead to prop up the Lake elevation as part of the Intra-Arizona drought plan. CRIT started making water available for Lake Mead in 2016 under the Reclamation Pilot System Conservation Program and is continuing to do so today with membership support. The total amount of CRIT water to be left in Lake Mead is increasing the elevation by over two feet.

The passage of the Referendum gives the Tribal Council a clear mandate to seek federal legislation to authorize CRIT to lease part of its Arizona allocation of water for off-reservation use. CRIT looks forward to having similar flexibility for how their water is used that is available to other Tribes in Arizona and throughout the western United States. The CRIT tribal council looks forward to working with officials in the State of Arizona and the Arizona congressional delegation in the coming months on federal legislation that will overcome the historic barriers to CRIT being able to use its full water entitlement.

CRIT has the first priority decreed water right to divert 719,248 acre-feet per year to serve lands in both Arizona and California. However, system inefficiencies in the Bureau of Indian Affairs Colorado River Irrigation Project and a lack of infrastructure for agriculture development prevent the Tribes from fully utilizing its water. The Council is optimistic that funding received from water leasing can be used to build and improve water infrastructure and improve the economic opportunities on the reservation.

The Colorado River Indian Tribes include four distinct Tribes - the Mohave, Chemehuevi, Hopi, and Navajo. There are currently about 4,434 Tribal members. The CRIT Reservation was created in 1865 by the Federal Government for "Indians of the Colorado River and its tributaries," originally for the Mohave and Chemehuevi, who had inhabited the area for centuries. People of the Hopi and Navajo Tribes were relocated to the reservation in later years. The reservation stretches along the Colorado River on both the Arizona and California side. It includes approximately 300,000 acres of land, with the river serving as the focal point and lifeblood of the area. For info: CRT website at: http://www. crit-nsn.gov/

WATER ACQUISITIONS CO 2019 REQUESTS

Beginning in 2018, the Colorado Water Trust (CWT), in partnership with the Colorado Water Conservation Board (CWCB), piloted a Request for Water Acquisitions Process: a streamlined approach to water transactions to benefit the environment on streams throughout the state. In 2019, CWT is continuing this approach and invites water rights owners to explore options to use their water rights for streamflow restoration purposes. Voluntary water sharing arrangements or voluntary acquisitions of senior water rights, on a temporary or permanent basis, can help restore flows to rivers in need, sustain agriculture, and maximize beneficial uses of Colorado's water. See Zach Smith, TWR #179 for additional information.

The Request for Water Process has several goals:

- To invite voluntary water offers from willing water rights owners to benefit streamflows
- To provide a user-friendly mechanism for water rights owners to explore working with CWCB and CWT on water acquisitions and transactions that will benefit the natural environment
- To streamline transaction processes and utilization of resources
- To facilitate implementation of Colorado's Water Plan objectives
- To add flows to river segments in need while coordinating with agricultural and other water uses

According to CWT, this Process is confidential, completely voluntary and open to all water right owners, including agricultural, municipal, industrial, or other users. Offers will be accepted through June 30, 2019. For info: CWT, 720/ 570-2897, RFW@coloradowatertrust.org or www. coloradowatertrust.org

WATER INDEX LAUNCHED US PRICE OF WATER

WestWater Research along with Nasdaq (Nasdaq: NDAQ), and Veles Water, announced the launch of the Nasdaq Veles California Water Index (NQH2O or Index), the first of its kind water index that benchmarks the price of water in a way that supports price discovery and enables the creation of a tradable financial instrument. WestWater Research is the exclusive data provider for the index.

While existing water indexes track companies active in the extraction and delivery of water, the Nasdaq Veles California Water Index sets a weekly rate for the price of water in California. The index is calculated weekly, using a proprietary water index methodology developed by Nasdaq and Veles Water. Water pricing information is sourced from WaterlitixTM - a pricing and market information database developed and maintained by WestWater Research.

The press release noted three key points on the Index: Value is based on the volume-weighted average of the prevailing prices in five specific

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California water markets; Prices are adjusted for market-specific pricing factors specific to each of the eligible markets and transactions; and a Pricing algorithm provides a benchmark price for water transactions across California. "The Nasdaq Veles California Water Index is the first published price index that measures water resource scarcity," said Clay Landry, Managing Director, WestWater Research. "Having this index is a great step forward for public markets and for using the power of the marketplace to better understand water as a commodity."

For info: https://indexes.nasdaqomx. com/Index/Overview/NQH2O

WOTUS PUSHED BACK US New schedule announced

On December 11, 2018, EPA and the Army signed a proposed rule for the definition of "waters of the United States" that is designed to clarify federal authority under the Clean Water Act while respecting the role of states and tribes in managing their own land and water resources. The agencies submitted the proposed rule to the Office of the Federal Register for publication. *See* Glick *TWR* #175 and Sensiba & Gerard, *TWR* #179 for additional information.

Due to the government shutdown, the public hearing on the Proposed New "Waters of the United States" Definition was postponed from its previously scheduled January 23rd date. On February 6, EPA announced that the Public Hearing has been rescheduled for February 27-28 in Kansas City, Kansas. All persons wanting to speak are encouraged to register in advance. EPA and the Army was also planning to hold an informational webcast on February 14, with a copy of the entire webcast to be made available afterwards.

The Public Hearing logistics are as follows: the Wednesday session of the public hearing (Feb. 27) will convene at 4:00 pm (local time) and conclude no later than 8:00 pm. The Thursday session (Feb. 28) will convene at 9:00 am and conclude no later than 12:00 pm. The Public Hearing will be held in the Wyandotte Ballroom of the Reardon Convention Center, 520 Minnesota Avenue, Kansas City, Kansas. Those interested in speaking at the hearing can register for a three-minute speaking slot. The last day to pre-register to speak at the hearing is February 21.

On February 26, the agencies will post a general agenda for the hearing on the EPA website at www. epa.gov/wotus-rule/proposed-reviseddefinition-wotus-public-hearing. It will list pre-registered speakers in approximate order. Registration for the public hearing is available through the EPA website. Additionally, requests to speak will be taken the day of the hearing at the hearing registration desk, pending availability, and a sign language interpreter will be available for the hearing.

Oral statements and supporting information presented at the Public Hearing will be considered with the same weight as written statements and supporting information submitted during the public comment period. The agencies will take comments on the proposal for 60 days after publication of the proposed rule in the Federal Register. Comments can be submitted online at: www.regulations. gov. Follow the instructions for submitting comments to Docket ID No. EPA-HQ-OW-2018-0149. For info: www.epa. gov/wotus-rule/step-two-revise

RESERVOIR OPERATIONS CA FORECAST INFORMED TEST

On January 25, the US Army Corps of Engineers, South Pacific Division approved a major deviation that allows for Forecast Informed Reservoir Operations-developed tools and concepts to be tested this winter at the pilot reservoir Lake Mendocino in the Russian River valley in northern California. This request will allow a maximum of 3.8 billion gallons of additional water, enough to supply approximately 97,000 people for a year, to be stored in Lake Mendocino during the winter rainy season to improve water supply reliability and environmental conditions in the Russian River while continuing to ensure flood management capacity of the reservoir.

Forecast Informed Reservoir Operations (FIRO) is a proposed management strategy that uses data from watershed monitoring and modern weather and water forecasting to help water managers selectively retain or release water from reservoirs in a manner that reflects current and forecasted conditions. Since 2014, a large interagency group consisting of experts in civil engineering, hydrology, meteorology, biology, economics and climate from several federal, state and local agencies and universities has been investigating how weather forecast information can inform water management decisions such that a better balance between flood risk management, water supply and ecological concerns can be realized and safely put into practice. "The Corps changed their policy in 2016 to allow for forecast information to be used in water management," said Cary Talbot, a division chief at the US Army Engineer Research and Development Center's Coastal and Hydraulics Laboratory and program manager for ERDC's FIRO effort. "But while this policy change opened the door, it didn't spell out how this was to be done. That's what FIRO is doing, defining the how."

The deviation request was submitted on behalf of the Lake Mendocino FIRO Steering Committee, which was formed to explore methods for better balancing flood risk management and water supply needs. Representatives from ERDC, Corps Districts, Sonoma Water, the Center for Western Weather and Water Extremes at Scripps Institution of Oceanography, the National Oceanic and Atmospheric Administration, USGS, the Bureau of Reclamation, and the California Department of Water Resources are participating in the committee.

Last year, members of the group filed the request to allow a 10 percent deviation from established flood risk management operating rules. The request was supported by a Preliminary Viability Assessment that contained detailed modeling, analysis and scientific research demonstrating that FIRO can provide water managers the information they need, with adequate lead time, to selectively retain or release

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water from reservoirs.

Lake Mendocino is operated jointly by the Corps and Sonoma Water. The Corps manages the flood risk management operations at the reservoir while Sonoma Water manages the water stored expressly for water supply. Following a severe drought, Lake Mendocino was chosen as a pilot reservoir when Congress asked the Corps to conduct a research project investigating improving forecast capabilities to help with water management. The committee hopes to effect change and put FIRO into action and expand to other areas of the country if this project is successful. For info: Corps website at: www. dvidshub.net/unit/USAERDC

PROJECT OPERATIONS CA BIOLOGICAL ASSESSMENT

On February 4, the US Bureau of Reclamation (Bureau) released the Biological Assessment (dated January 31, 2019) for the re-initiation of consultation on the coordinated longterm operation of the Central Valley Project (CVP) and State Water Project (SWP). The document was transmitted to the US Fish and Wildlife Service and the National Marine Fisheries Service for consideration in developing new biological opinions covering CVP and SWP operations. Reclamation and the California Department of Water Resources re-initiated consultation in 2016 based on new information related to multiple years of drought and ongoing science efforts. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service are expected to issue final biological opinions within 135 days.

The Biological Assessment analyzes potential effects of the proposed action on federally listed endangered and threatened species and critical habitat for these species. The proposed action incorporates the best available science into the operation of the CVP and SWP. Proposed actions outlined in the document include temperature management at Shasta Dam, fall habitat and salinity measures in the Delta, and entrainment management related to water exports. Together, these proposed actions aim to give water operators more flexibility, maximize water supply delivery and optimize power generation consistent with applicable laws. **For info:** Biological Assessment at: www.usbr.gov/mp/bdo/lto.html

COAL POWER PLANTS TX GROUNDWATER POLLUTION

Toxic coal ash pollutants are leaking into groundwater surrounding 100% of Texas's power plants for which data are available, with unsafe levels of arsenic, cobalt, lithium, and other pollutants seeping from the ash dumps, according to an analysis by the Environmental Integrity Project (EIP). EIP is a nonprofit, nonpartisan organization that investigates polluters, holding them accountable under the law, and strengthening public policy.

Industry groundwater monitoring data made publicly available for the first time in 2018 due to a new requirement in federal coal ash regulations reveal multiple contaminants leaching from all of the coal-fired power plants in Texas to which the new rules apply. EIP's report, "Groundwater Contamination from Texas Coal Ash Dumps," with analysis from Earthjustice, concludes that both the fossil fuel industry and Texas regulators have consistently failed to protect Texas groundwater. "We found contamination everywhere we looked, poisoning groundwater aquifers and recreational fishing spots across the state," said EIP Attorney Abel Russ, an author of the report. "This confirms that dumping large volumes of toxic waste in poorly-lined pits is a terrible idea. The problem is unfortunately going to get even worse unless Texas power plans change the way they dispose of coal ash."

The main findings in the Environmental Integrity Project report include major problems and local examples of groundwater contamination across Texas. Sixteen of 16 coal-fired power plants in Texas with available records are leaking toxic contaminants into groundwater. Two other coal plants exist in the state but do not have ash dumps onsite, and so did not report groundwater monitoring data; a third plant did not report data because it claims no groundwater exists beneath its waste site.

With one or two exceptions, none of Texas's coal ash disposal units meet EPA liner design criteria - so they are all effectively unlined, which causes leaking. Twelve of the 16 coal plants examined in Texas have unsafe levels of arsenic in the nearby groundwater, with some concentrations up to 100 micrograms per liter or ten times higher than the EPA Maximum Contaminant Level for arsenic. Nine plants have unsafe levels of boron in the groundwater, which is toxic to both humans and aquatic life. Thirteen plants appear to be leaking unsafe levels of cobalt, which can harm the heart, blood, and other organs. Ten Texas coal plants have unsafe levels of lithium, which causes neurological problems, in groundwater, with concentrations frequently exceeding 1,000 micrograms per liter (25 times the health-based groundwater protection standard).

EIP's report recommends several ways that Texas can solve the problem of leaking coal ash waste sites, including by requiring the clean up or containment of pollution from ash dumps, whether they are active or inactive; mandating better monitoring of groundwater; and ensuring that coal ash is not buried beneath the water table.

For info: Report available on EIP website at: www.environmentalintegrity. org/reports/groundwater-contamination-from-texas-coal-ash-dumps/

ENFORCEMENT EROSION US EPA UNDER TRUMP

With two years of the Trump Administration now complete, scrutiny of the enforcement history of the Environmental Protection Agency during that time period is increasing. One such study, "A Sheep in the Closet: The Erosion of Enforcement at the EPA" published slightly earlier in November of 2018, discusses what it characterizes as "EPA's retreat."

The abstract of the study on the Environmental Data & Governance Initiative's (EDGI's) website notes that this report examines environmental enforcement at the US Environmental Protection Agency (EPA) nearly two years into the Trump administration. "Based on extensive interviewing with

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EPA employees and recent retirees as well as in-depth wide-ranging research into EPA data and documents...[the authors] conclude that the EPA is no longer so capable of fulfilling its mission to ensure competent enforcement of federal environmental laws. In place of that 'gorilla in the closet' role characterized by its first administrator, William Ruckelshaus, it has become more of a sheep in the closet. The EPA's retreat, which shows little sign of stopping, has all but ensured significant deterioration of our nation's public health and environment in the years ahead."

The study's authors are Leif Fredrickson, Marianne Sullivan, Christopher Sellers, Jennifer Ohayon, Ellen Kohl, Sarah Lamdan, Alissa Cordner, Alice Hu, Katarzyna Kaczowka, Natalia Navas, and Linda Wicks, of EDGI.

For info: Study at: https:// envirodatagov.org/wp-content/ uploads/2018/11/Sheep-in-the-Closet. pdf

WATER CONSERVATION OK EXCELLENCE AWARDS

The annual Oklahoma Governor's Water Conference and Research Symposium wrapped up on December 6th. The conference featured a distinguished awards program including the presentation of the Oklahoma Water for 2060 Excellence Awards. The Awards were created in 2017 to recognize individuals or entities that have developed outstanding water saving measures in three separate categories — Public Water Supply, Energy/Industry, and Crop Irrigation/ Agriculture Production.

The winners of the 2018 Water for 2060 Excellence Awards are: Fred Fischer of Flatland Farms in Texas County for significantly reducing water use for irrigation by as much as 40% with the innovative technologies, data analysis, and enhancements; American Water Enterprises for the Fort Sill US Army Installation Water Reuse Project which will significantly decrease the amount of fresh water used by Fort Sill by as much as 37 million gallons each year; and Waurika Lake Master Conservancy District for the Waurika Lake Water Intake Channel Maintenance Dredging and Resiliency Project, which provided access to more than 25,000 acre-feet of water supply. **For info:** www.owrb.ok.gov/news/ pressreleases/2018.php

AQUIFER RESTORATION SC OXIDANTS & SOLVENTS

The Office of Environmental Management (EM in the US Dept. of Energy) and the management and operations contractor at the Savannah River Site (SRS) are making significant progress towards removing solvents from groundwater beneath the site. Savannah River Nuclear Solutions (SRNS) has completed the first phase of testing a promising new approach developed at SRS using chemical oxidation to neutralize the solvents targeted in a field-scale test.

During the Cold War at SRS, solvents were used to remove grease from nuclear components being produced to support the creation of plutonium for nuclear defense and, later, NASA deep space missions. Claybottom basins were initially used to store this waste. The oxidant approach entails a two-step injection of different oxidants specifically designed for the sediments where the contaminated water resides. The portion of the Lost Lake Aquifer below SRS currently being treated has sand and clay sections. Waste solvents in the clay portions have proven difficult to remove.

The first step uses an aggressive oxidant known as potassium permanganate to clean up the more easily reached contaminants in the sandy zones. EM Savannah River National Laboratory testing shows that once the solvents have been eliminated from the aquifer's sandy portions, solvents in the harder-to-treat clay zones will disperse. Once free from the clay, the solvents can be attacked using sodium persulfate, injected in the same set of wells used for the first step. The longlasting sodium persulfate seeps into the clay to treat more solvent. According to SRNS geologist Jeff Ross, data gathered through October 2019 from monitoring will determine how the formula of

oxidants and concentrations should be modified for treatment during a second injection and monitoring campaign set for 2020. Ross noted it's not unusual for potassium permanganate or sodium persulfate to be used separately to attack degreasing chemicals. What's innovative is the use of these oxidants in combination, back to back, to treat hard to reach solvents locked in the clay.

In this project, samples will be taken frequently from groundwater monitoring wells located at various distances up to 500 feet from the injection site, where a recovery well was placed to intentionally draw oxidants through the targeted area of contaminants. "One of the nice things about the oxidants we're using is that they completely destroy the waste solvents," Ross added. "The oxidants and solvents react to produce non-toxic byproducts."

For info: SRS website: www.srs.gov/general/srs-home.html

FRESH GROUNDWATER COMPETITION FOR RESOURCES

US

Competition for Shrinking Window of Low Salinity Groundwater was published in Environmental Research Letters, Volume 13, Number 11, by IOP Publishing Ltd. on November 14, 2018. The four authors describe a serious problem in finding fresh groundwater resources in the country and the issue of further contamination of groundwater stores. Grant Ferguson of the University of Saskatchewan, Jennifer McIntosh of the University of Arizona, and Debra Perrone and Scott Jasechko of the University of California, Santa Barbara prepared the study.

"Groundwater resources are being stressed from the top down and bottom up. Declining water tables and near-surface contamination are driving groundwater users to construct deeper wells in many US aquifer systems. This has been a successful short-term mitigation measure where deep groundwater is fresh and free of contaminants. Nevertheless, vertical salinity profiles are not well-constrained at continental-scales. In many regions, oil and gas activities use pore spaces for energy production and waste disposal.

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Here we quantify depths that aquifer systems transition from fresh-tobrackish and where oil and gas activities are widespread in sedimentary basins across the United States. Fresh-brackish transitions occur at relatively shallow depths of just a few hundred meters, particularly in eastern US basins. We conclude that fresh groundwater is less abundant in several key US basins than previously thought; therefore drilling deeper wells to access fresh groundwater resources is not feasible extensively across the continent. Our findings illustrate that groundwater stores are being depleted not only by excessive withdrawals, but due to injection, and potentially contamination, from the oil and gas industry in areas of deep fresh and brackish groundwater." Abstract.

For info: Study available at: http:// iopscience.iop.org/article/10.1088/1748-9326/aae6d8/meta

SUPPLY INVESTMENTS CA DEVELOPMENT RESEARCH

The potential future production of more water supplies received a financial boost on January 8th when the Metropolitan Water District of Southern California (Metropolitan). Metropolitan's Board of Directors gave the final approvals necessary to provide \$3.5 million for 15 pilot projects and technical studies aimed at reducing the technical and regulatory barriers for seawater desalination and groundwater enhancement as well as stormwater and recycled water. Under Metropolitan's Future Supply Actions Funding Program, 11 Metropolitan member agencies were awarded funding. When combined with matching funds from the member agencies, and other local, state and federal resources, an additional \$8 million will be infused into the projects.

The Future Supply Actions program is part of Metropolitan's Integrated Resources Plan, a comprehensive roadmap to expand and diversify the region's water supply portfolio. In August, Metropolitan invited member agencies to submit proposals requesting up to \$500,000 of funding. A panel composed of Metropolitan staff and independent experts evaluated the proposals based on how projects could help increase potential for development of local water supplies and provide regional benefits, in addition to the effectiveness of proposed work plans, schedules, and costs.

Selected projects include analyzing an innovative reverse osmosis process in brackish groundwater treatment; testing an EPA-certified pesticide to manage invasive quagga and zebra mussels in stormwater recharge basins; and piloting artificial intelligence technology in the control systems of a water treatment plant.

For info: Warren Teitz, Metropolitan, 213/217-7418, wteitz@mwdh2o.com or www.mwdh2o.com/PDF_NewsRoom/ FSA_program_press_release.pdf

RURAL WATER USDA US

INFRASTRUCTURE INVESTMENTS

On December 4, 2018, Assistant to the Secretary for Rural Development Anne Hazlett announced that USDA is investing \$1.2 billion in loans and grants to help rebuild and improve rural water infrastructure for 936,000 rural Americans living in 46 states. A list of all the projects is available at: www. rd.usda.gov/files/WEP_DirectLoans_ NewsRelease_CHARTDec04_2018.pdf.

USDA is providing financing for 234 water and environmental infrastructure projects through the Water and Waste Disposal Loan and Grant program. The funding can be used for drinking water, stormwater drainage and waste disposal systems for rural communities with 10,000 or fewer residents. Eligible communities and water districts can apply online on the interactive RD Apply tool, or they can apply through one of USDA Rural Development's state or field offices.

The USDA press release noted some examples of the investments USDA is making. In Pennsylvania, the Municipal Authority of the Borough of Berlin is receiving a \$2.5 million loan to replace the primary water transmission line for the Berlin Municipal Water System. The line was constructed in 1979, is in poor condition, has experienced numerous breaks resulting in boil water notices, and has inadequate

water pressure to fight fires. The investment will also help replace water meters. This system serves nearly 1,100 users in Somerset County. The Todd County Water District in Kentucky will receive a \$3.2 million loan and a \$390,000 grant to construct two miles of water line and a 500,000-gallon water storage tank. The upgrades will provide up to one million gallons per day for a new industrial site just outside of Guthrie. The Bond Water Association Inc. in Winston County, Mississippi, will use a \$1.4 million loan to upgrade its water system by building a 300gallon-per-minute well and replacing 28,200 feet of distribution lines. New radio read meters will also be installed, and the two water treatment plants will be rehabilitated.

For info: Jay Fletcher, USDA, 202/ 690-0498 or www.rd.usda.gov

WATERSMART PROJECTS US

SMALL-SCALE EFFICIENCY

On January 25, the Bureau of Reclamation released a funding opportunity for small-scale water efficiency projects as part of the WaterSMART Program. The projects funded with these grants include installation of flow measurement devices and automation technology, canal lining or piping to address seepage, municipal meter upgrades, and other projects to conserve water. These cost-shared projects conserve and use water more efficiently, mitigate conflict risk in areas at a high risk of future water conflict, and accomplish other benefits that contribute to a reliable water supply in the West. To learn more about small-scale water efficiency projects or learn more about projects that have been previously funded, please visit www.usbr.gov/watersmart/swep.

The funding opportunity is available at www.grants.gov by searching for opportunity number BOR-DO-19-F005. Applications are due by April 24, 2019, at 4 p.m. MDT. Funding of up to \$75,000 is available per project and total project construction costs should be no more than \$200,000. Recipients must also provide at least a 50% non-Federal cost share. Those

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eligible to apply for funding include states, Indian Tribes, irrigation districts, water districts, or other organizations with water or power delivery authority located in the western United States or United States Territories as identified in the Reclamation Act of June 17, 1902, as amended.

For info: WaterSMART website at: www.usbr.gov/watersmart

WATERSMART PROJECTS US

LONG-TERM RESILIENCE

The Bureau of Reclamation announced another funding opportunity on January 25 for projects that build long-term resilience to drought. The funding opportunity is available as part of its WaterSMART Drought Response Program for projects that build long-term resilience to drought and reduce the need for emergency response actions. Reclamation anticipates awarding between 10 and 15 drought resiliency projects this year. Drought resiliency projects increase the reliability of water supplies, improve water management or provide benefits for fish, wildlife, and the environment. Proposed projects that are supported by an existing drought plan are prioritized.

The funding opportunity is available at www.grants.gov by searching for opportunity number BOR-DO-19-F003. Applications are due by March 27, 2019, at 4 p.m. MDT.

Federal funding is available in two funding groups. Funding Group I: Up to \$300,000 per agreement for a project that can be completed within two years. Funding Group II: Up to \$750,000 per agreement for a project that can be completed within three years. Those eligible to apply for funding include states, Indian Tribes, irrigation districts, water districts, or other organizations with water or power delivery authority located in the western United States or United States Territories as identified in the Reclamation Act of June 17, 1902, as amended. Applicants must also provide a 50% non-Federal cost-share. For info: WaterSMART website at: www.usbr.gov/watersmart; Drought Response Program at: www.usbr. gov/drought

TX/LA/OK

SETTLEMENT & CORRECTIONS

OIL SPILL

On January 31, EPA announced that in a joint federal-state Clean Water Act (CWA) enforcement action, Sunoco Pipeline L.P. has agreed to pay civil penalties and state enforcement costs and to implement corrective measures to resolve alleged violations of the Clean Water Act and state environmental laws by Sunoco and Mid-Valley Pipeline Company stemming from three crude oil spills in 2013, 2014, and 2015, in Texas, Louisiana, and Oklahoma. The US Department of Justice, the US Environmental Protection Agency (EPA), and the Louisiana Department of Environmental Quality (LDEQ) jointly announced the settlement.

Under a proposed consent decree lodged in the US District Court for the Western District of Louisiana. Sunoco will pay the US \$5 million in federal civil penalties for the CWA violations and pay LDEQ \$436,274.20 for civil penalties and response costs to resolve claims asserted in a complaint filed. Additionally, Sunoco agreed to take actions to prevent future spills by identifying and remediating the types of problems that caused the prior spills. This includes performing pipeline inspections and repairing pipeline defects. Sunoco is also required to take steps to prevent and detect corrosion in pipeline segments that Sunoco is no longer using. Mid-Valley, the owner of the pipeline that spilled oil in Louisiana, is responsible, along with Sunoco, for payment of the civil penalties and state costs relating to the Louisiana spill.

The complaint alleges federal and state claims relating to three crude oil spills: a 2013 spill of 550 barrels in Tyler County, Texas; a 2014 spill of approximately 4,500 barrels in Caddo Parish, near Mooringsport, Louisiana; and a 2015 spill of 40 barrels in Grant County, Oklahoma. The Texas spill affected Russell Creek, which flows to the Neches River. The Louisiana spill — the largest of the three — flowed to Tete Bayou, a tributary of Caddo Lake. The Oklahoma spill flowed into two creeks that flow to the Arkansas River. affecting an area of about a half a mile. All three spills resulted from pipeline corrosion.

The CWA makes it unlawful to discharge oil or hazardous substances into or upon the navigable waters of the US or adjoining shorelines in quantities that may be harmful to the environment or public health. The penalty paid to the United States will be deposited in the federal Oil Spill Liability Trust Fund managed by the National Pollution Funds Center. Those funds will be available to pay for federal response activities and to compensate for damages when there is a discharge or substantial threat of discharge of oil or hazardous substances to waters of the United States or adjoining shorelines.

The proposed consent decree is subject to a public comment requirements and court approval. **For info:** Consent decree available on the Department of Justice website at: www.justice.gov/enrd/consent-decrees

CONTRACTOR BARRED CA FRAUDULENT ACTIVITY

A Santa Barbara contractor has agreed to pay \$100,000 and is permanently barred from work with the state's Underground Storage Tank Cleanup Fund under a settlement with state regulators over fraud allegations, announced January 31. The settlement - with Kurt Hayden, Julie Hayden, and Hayden Environmental, Inc. (HEI) dba TKO Enviroservices, located in Santa Barbara – follows a history of allegations and convictions for fraudulent activity dating back to 2012. "The Hayden's are an example of why permanent disqualification is an essential enforcement tool when we discover fraud in a fund intended for critical environmental cleanup activities," said Yvonne West, the Director of the State Water Boards' Office of Enforcement.

The company, which provided investigation and remediation services for sites contaminated by leaking underground storage tanks, including former gas stations, had worked at more than 30 sites in Santa Barbara and Ventura counties. It has had multiple run-ins with law enforcement and State Water Resources Control Board (SWRCB) investigators on a variety of fraudulent billing activities. In May 2013, Kurt Hayden pled guilty to a

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felony charge and paid \$1.6 million for submitting false documents to the Cleanup Fund.

With the addition of the disqualification authority from Senate Bill 445 in 2014, the SWRCB now has the ability to prevent consultants from continuing to participate in the Cleanup Fund when these types of violations are identified. Under the terms of the agreement, Hayden Environmental will pay \$100,000 in penalties and is debarred from future work overseen, directed, funded, submitted to or administered by the SWRCB. In addition, the principals, Kurt and Julie Hayden, are also disqualified from all work involving the State Water Boards.

The Hayden's are alleged to have made misrepresentations to the State, including: negotiating and receiving a credit for a portion of crane service costs, but submitting the full cost invoice to the Cleanup Fund; altering electricity bills to hide costs not eligible for reimbursement from the Cleanup Fund; billing staff at higher project management rates when they do not possess the requisite education or experience; and charging to lease storage space even though the expense was unrelated to the claim.

The settlement agreement can be viewed on the SWRCB Office of Enforcement's website at: (www. waterboards.ca.gov/water_issues/ programs/enforcement/). For info: Blair Robertson, SWRCB, Blair.Robertson@waterboards.ca.gov

CONTAMINATED WELLS CA DRINKING WATER PROVIDED

Three Central Valley agricultural water coalitions signed a settlement agreement with SWRCB on January 29 to install drinking water kiosks to ensure safe drinking water for individuals who may be impacted by nitrate contamination from nearby drinking water wells. The settlement with Kaweah Basin Water Quality Coalition, Tule Basin Water Quality Coalition, and Kings River Watershed Coalition Authority- coalitions of San Joaquin Valley growers created to help comply with water quality regulations - was announced today by the SWRCB's Office of Enforcement.

The settlement requires installation of eight water supply stations at areas located near the impacted wells in parts of Tulare and King counties and southern Fresno County. The stations are expected to provide drinking water to between 12,000 and 24,000 people, with each kiosk serving up to 3,000 impacted residents. The first three water supply stations are required to be operational by April 30, 2019, with the remaining stations being phased in by January 31, 2020. Under the agreement, the coalitions will provide water for at least four years, with an option of extending the requirement until 2028. Bottled water may be provided by the coalitions in situations where individuals are unable to utilize a kiosk.

The settlement is part of a wider effort by SWRCB Enforcement to ensure that residents dependent on private wells contaminated with nitrates have access to safe drinking water in the near term while the State Water Board continues to work on long-term solutions to address groundwater issues caused by nitrate. Contamination of drinking water supplies from use of nitrogen-based fertilizers in irrigated agriculture, waste from dairies, and other sources of nitrate is a serious problem in many areas of the state, particularly in the Tulare Lake Basin and Salinas Valley, where an estimated 250,000 people, including many of the poorest communities in California, are at risk for nitrate contamination.

The Settlement Agreement contained a section whereby the agricultural coalitions "deny any responsibility or liability for the Nitrate Contamination Claims, but nonetheless have been afforded the opportunity by the State Board Prosecutors to provide replacement drinking and cooking water to certain systems and to individual wells impacted by nitrate levels above the MCL...This Agreement thus represents an interim settlement of the State Board Prosecutors' claims against certain agricultural owners and operators in the Subject Area." Agreement, Recital D, page 1. For info: Agreement at: www. waterboards.ca.gov >> Programs >> Enforcement

WATER BRIEFS

WATERSHED STREAMFLOW

WASHINGTON WATERSHEDS DEVELOP PLANS UNDER NEW LAW

Last year the Washington Legislature enacted Senate Bill 6091 to deal with water use issues related to protected streamflow and development in light of recent decisions by the Washington Supreme Court (*see* Pitre, *TWR* #169, *Mitigating for Development: Exempt Well and Water Allocation Legislation in Washington State*). Last month, the Washington State Department of Ecology (Ecology) issued two press releases concerning watershed planning resulting from the new law. Edited excerpts follow. **Nisqually Watershed Plan: Washington State's First Approval Under New Water Law**

The Washington Supreme Court's "*Hirst*" ruling in 2016 changed how counties review and approve permit applications for homes and other buildings that would rely on well water. The new streamflow restoration law set up a planning process that requires local plans in 15 watersheds, statewide, to offset water consumption from new wells.

A locally-developed plan to protect natural resources in Washington State's Nisqually River watershed is the first to gain approval under Washington's new streamflow restoration law (primarily codified in Chapter 90.94 RCW). The law was adopted last year in response to the Washington State Supreme Court's "*Hirst*" decision. The watershed plan identifies projects to offset the effects of new domestic wells on groundwater flow. This assures water for new rural homes, while helping keep water in streams for fish. The Nisqually planning group is made up of tribal, local, and state governmental agencies, as well as a non-profit organization. Their plan is intended to accommodate residential growth forecast for the next 20 years.

Ecology Director Maia Bellon approved the Nisqually planning group's plan for the watershed, which spans portions of Pierce, Thurston and Lewis counties, stating, "I appreciate and applaud this impressive work by the Nisqually planning team." With Ecology's approval of the updated watershed plan, local agencies can begin implementing projects that offset the impacts of residential wells on streamflows.

"We are very excited to have met our obligations and produced a path forward through this contentious issue," said David Troutt, Natural Resources Director for the Nisqually Indian Tribe, the planning group's lead local agency. "This effort is the result of six months of commitment by all of us in the Nisqually, and is really a demonstration of the 30 years of developing trust and relationships in our watershed that allows us to collaboratively solve complex problems. We are confident that this effort will be good for our watershed community and our salmon."

Examples of projects identified in the plan include:

- Connecting new and existing homes in Yelm's Urban Growth Area to the city water system and decommissioning existing wells.
- Transferring water rights in the Prairie area of Pierce County to the state's water rights trust to benefit streamflows.
- Restoring wetlands in the Ohop Creek floodplain to better retain water for more steady release throughout the year.
- Storing water in underground aquifers for release to augment stream flows in the late summer and early fall.

The projects will help achieve the law's requirement to provide net ecological benefits. Ecology will receive annual progress reports and will evaluate the effectiveness of the Nisqually plan after five years.

Watersheds have different schedules for developing a plan. If a local planning group cannot submit a plan by the deadline, Ecology will complete the law's requirements for that watershed, using the state's public rulemaking process.

Both the Nisqually and Nooksack watershed plans were due by Feb. 1, 2019. Despite hard work and commitment, the Nooksack watershed planning group did not approve a plan for Ecology to evaluate and adopt by the deadline. The law requires Ecology to complete rulemaking for the Nooksack by August 1, 2020 (see below).

For info: Mary Verner, Program Manager, Ecology Water Resources Program, 360-407-6872 or mave461@ECY.WA.GOV; David Troutt, Natural Resources Director, Nisqually Indian Tribe, 360-456-5221 or troutt.david@nisqually-nsn.gov Ecology streamflow restoration website:

https://ecology.wa.gov/Water-Shorelines/Water-supply/Streamflow-restoration

Nooksack Watershed Rulemaking: Phased Approach Builds on Previous Efforts

Ecology has begun a new phase of streamflow restoration efforts in the Nooksack watershed to offset new domestic well use and improve watershed health. This effort is also tied to the 2018 state law that was adopted in response to the "*Hirst*" decision.

To accommodate rural growth and protect water needs for fish, the Legislature adopted the Streamflow Restoration Law (Senate Bill 6091) last year. It requires local watershed planning groups to approve plans for offsetting future water consumption by new permit-exempt wells in their watersheds.

The law identified different schedules for 15 watersheds to develop plans. If local planning groups cannot submit a plan by their deadline, Ecology is required to develop the plan under the state's public rulemaking process.

Both Nisqually and Nooksack watershed plans were due by Feb. 1, 2019. The Nisqually plan has been submitted and approved by Ecology (see above). Despite the diligent work of its local planning group, the plan for the Nooksack watershed — which includes most of western Whatcom County and a small portion of Skagit County — was not completed in time.

"There has been a tremendous amount of local engagement and effort to meet the requirements of developing a watershed management plan update for this area in a very compressed timeframe," said Mary Verner, manager of Ecology's Water Resources program. "We appreciate all the work accomplished and will build upon those efforts..."

Ecology must determine how to offset 20 years of future domestic permit-exempt well use. The rulemaking process is to be completed by Aug. 1, 2020, and will include several opportunities for public engagement and comment. **For info:** Ecology NOOKSACK WATERSHED PLAN RULEMAKING WEBSITE:

https://ecology.wa.gov/Regulations-Permits/Laws-rules-rulemaking/Rulemaking/WAC-173-501

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CALENDAR

February 21-22	PA
Wild & Scenic Film Festival:	
Where Activism Gets Inspired,	
West Chester. Chester Co.	
Historical Society, Doors Open at	
6 pm. Presented by Stroud Water	
Research Center; Hosted by Trail	
Creek Outfitters to benefit Stroud	
Water Research Center & The Land	d
Conservancy for Southern Chester	
County. For info: https://stroudcen	ter.
org/event/film-festival-2019/	

February 21-22NV2019 Family Farm Alliance AnnualConference, Reno. EldoradoResort Casino. For info: http://familyfarmallianceconference.com/

February 22CAWater and the Future of the SanJoaquin Valley, Fresno. SatelliteStudent Union, California StateUniversity. Presented by the PublicPolicy Institute of California andFresno State's California WaterInstitute. For info: https://www.ppic.org/event/water-and-the-future-of-the-san-joaquin-valley/

February 24-27TX2019 Underground InjectionControl Conference, Fort Worth.Sheraton Fort Worth DowntownHotel. Presented by the GroundwaterProtection Council. For info: www.gwpc.org

February 25-26LASoutheast Clean Power Summit2019, New Orleans. Hyatt RegencyNew Orleans. Presented by EUCI. Forinfo: www.euci.com/event_post/0219-southeast-clean-power/

February 25-26FLDeep Well Injection Conference,Miami. Miami-Dade Water &Sewer Dept., 3071 SW 38th Avenue.Presented by American Ground WaterTrust. For info: https://agwt.org/events

 February 25-March 1
 UT

 Rural Water Assoc. of Utah Annual
 Conference, St. George. The

 Dixie Center. For info: www.rwau.
 net/2019-rwau-annual-conference

February 26-28DCACWA DC2019 - Annual D.C.Conference, Washington. St. RegisHotel, 923 16th Street NW. Presentedby the Association of Clean WaterAgencies. For info: www.acwa.com/events/dc2019/

February 27-March 1CAUrban Water Institute SpringWater Conference, PalmSprings. Hilton Palm Springs.For info: www.urbanwater.com/conference-registration/

February 28TXWater Efficient Future: Planning,
Tools & Best Practices - 8th Annual
Gulf Coast Water ConservationSymposium, Houston. United Way
Community Resource Center, 8 am - 4
pm. For info: www.eventbrite.com/
e/2019-gulf-coast-water-conservation-
symposium-tickets-52097758799

February 28-March 1CO2019 Martz Winter Symposium:The Changing Landscape ofPublic Lands, Boulder. WolfLaw Bldg.-Wittemyer Courtroom,Univ. of Colorado. Presented bythe Getches Wilkinson Center forNatural Resources, Energy, and theEnvironment. For info: www.getches-wilkinsoncenter.cu.law/events/

February 28-March 1CONatural Resources Development& the Administrative State:Navigating Federal AgencyRegulation & Litigation Institute,Denver. Le Méridien DenverDowntown. Presented by the RockyMountain Mineral Law Foundation.For info: www.rmmlf.org

February 28-March 1TXNorth American Shale WaterManagement 2019: Reducingthe Cost of Water Recycling &Reuse Exhibition & Conference,Houston. JW Marriott Houston by theGalleria. For info: www.shale-water-management.com

March 5-8TNThe Utility ManagementConference, Nashville. RenaissanceNashville Hotel. Presented by theAmerican Water Works Assoc. Forinfo: www.awwa.org/conferences-education/conferences/water-quality-technology.aspx

March 6WAManaging Stormwater inWashington Conference, Tacoma.Greater Tacoma Convention Center.Northwest Environmental BusinessCouncil (NEBC) Event For info

Council (NEBC) Event. For info: www.nebc.org

March 6WEBThe Clean Water Act -

Understanding and Navigating the National Pollution Discharge Elimination System (NPDES) Permit Program, WEB. For info: www.americanbar. org/events-cle/mtg/web/356206844/

March 7CA2019 Kern County Water Summit,Bakersfield. Rabobank Arena, 7am - 2 pm. Sponsored by the WaterAssociation of Kern County. For info:www.wake.com

March 7-8

Buying & Selling Ranches Seminar, Helena. Great Northern Hotel. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

March 7-8 AZ
Tribal Water in the Southwest
Seminar, Laveen. Vee Quiva Hotel
& Casino. For info: Law Seminars
International, 206/ 567-4490 or www.
lawseminars.com/

March 12TELSuperfund Year-In-Review: 2018Teleconference, TEL. For info: www.americanbar.org/events-cle/mtg/teleconference/356247204/

March 12WYWyoming Water Forum: HarmfulAlgal Blooms, Cheyenne. WWDOConference Room, 6920 YellowtailRoad. Presented by Mike Thomas,WY DEQ. For info: http://seo.wyo.gov/interstate-streams/water-forum

March 14-15DCNatural Resources DamagesSeminar, Washington. Arnold &Porter Conference Center. For info:Law Seminars International, 206/ 567-4490 or www.lawseminars.com/

March 17-19CA2019 WateReuse Conference,Garden Grove. Hyatt RegencyOrange County. RE: Design,Management, Operation & Use ofWater Recycling Facilities. For info:https://watereuse.org

March 18 UT Water Law & Policy Seminar, St. George. The Dixie Center. Presented by Barnett Intermountain Water Consulting Seminar. For info: Donna Keeler, 801/292-4664 or www.eventa. us/events/saint-george-ut/water-lawpolicy-seminars

March 18-19 PA 2019 PAEE Conference: Cityscapes & Greenscapes, Philadelphia. Renaissance Philadelphia Airport Hotel. Presented by the Pennsylvania Assoc. of Environmental Educators. For info: https://stroudcenter. org/event/paee-conference/

March 18-20 UT Utah Water Users Assoc. Annual Conference, St. George. The Dixie Center. For info: www.utahwaterusers. com/2019-utah-water-users-workshop/

March 20

MT

Climate Change & Environmental Contamination Conference, Seattle. Washington State Convention Center. For info: Environmental Law Education Center, www.elecenter.com

WA

March 20-22AZWestern States Water CouncilSpring (189th) Council Meeting, Chandler. Wild Horse Pass - GilaRiver Hotel & Casino. For info:
http://www.westernstateswater. org/upcoming-meetings/

March 21-22AZLaw of the Colorado RiverConference, Tucson. Hilton ElConquistador. For info: CLE Int'l,800/ 873-7130, live@cle.com orwww.cle.com

March 22PAFuture of Water in theMid-Atlantic: Agriculture,Restoration, and TechnologySymposium, Avondale. StroudWater Research Center, 970Spencer Road, 9:00 am - 4:30p.m. For info: https://stroudcenter.org/event/future-of-water-symposium/

March 25-27NE2019 AWRA Spring SpecialtyConference - Setting Conditionsfor Success of Integrated WaterResources Management, Omaha.Hilton Omaha - Downtown OldMarket. Presented by American WaterResources Association. For info:www.awra.org

March 26-27COABA 37th Water Law Conference,Denver. Grand Hyatt Denver.Presented by the American Bar Assoc.For info: www.americanbar.org/events-cle/mtg/inperson/343158082/

March 28-29TXTexas Wetlands Conference,Houston. JW Marriott by the Galleria.For info: CLE Int'l, 800/ 873-7130,live@cle.com or www.cle.com

March 29-30 United Kingdom Alternatives to Markets & Governments: The Research & Intellectual Legacy of Elinor Ostrom Conference, Buckinghamshire. The Vinson Centre, University of Buckingham. Presented by Institute of Economic Affairs. For info: https://iea.org. uk/events/



260 N. Polk Street • Eugene, OR 97402

CALENDAR -

DC

WY

NM

CA

(continued from previous page)

March 31-April 3AZ2019 AWWA Sustainable WaterManagement Conference, Tucson.Loews Ventana Canyon Resort.Presented by American Water WorksAssoc. For info: www.awwa.org/conferences-education/conferences/sustainable-water-management.aspx

 April 1-3
 DC

 Federal Water Issues Conference,
 Washington. Embassy Suites.

 Presented by National Water
 Resources Assoc. For info: www.

 nwra.org/upcoming-conferences-workshops.html
 Normal Mater

April 1-4

Texas Water 2019, Houston. George R. Brown Convention Center. For info: www.txwater.org/

ТХ

April 2-4DCInterstate Council on Water Policy- Washington DC Roundtable,Washington. DoubleTree CrystalCity. Co-Sponsored by the NationalWater Supply Alliance. For info:Sue Lowry, 307/ 630-5804,avocetconsult@gmail.com or www.icwp.org

April 7-10

Association of Metropolitan Water Agencies 2019 Water Policy Conference, Washington. TBA. For info: www.amwa.net/event/2019-Water-Policy-Conference

April 9

Wyoming Water Forum: 2019 Water Supply Outlook (Reclamation), Cheyenne. WWDO Conference Room, 6920 Yellowtail Road. For info: http://seo.wyo. gov/interstate-streams/water-forum

<u>April 11-12</u>

Law of the Rio Grande: Hot Topics in Water Management & Conservation - 19th Annual Conference, Santa Fe. La Fonda. For info: CLE Int'l, 800/ 873-7130, live@ cle.com or www.cle.com

April 22-24

California Water and Environmental Modeling Forum & Annual Meeting, Folsom. Lake Natoma Inn. For info: http://cwemf. org/wp/ April 23-24CAP3 Water Summit: Solving WaterChallenges Through Partnerships,San Diego. Grand Hyatt. For info:www.p3watersummit.com/home

SD

WA

April 23-25

WSWC/U.S. Geological Survey Water Information Management Systems Workshop, Garretson/Sioux Falls. Earth Resources Observation & Science Center. Presented by Western States Water Council. For info: http://www.westernstateswater. org/upcoming-meetings/

April 24-25

Washington State Municipal Stormwater Conference, Seattle. Hilton Seattle Airport. WSU, Ecology & Washington Stormwater Center Event. For info: Laurie Larson, 253/ 445-4593 or Laurie.Larson-Pugh@ wsu.edu

 April 29-May 1
 CA

 Ceres Sustainability Conference:
 Business Practices to Address

 Climate Change, Water Scarcity &
 Pollution, San Francisco. The Westin

 St. Francis. For info: www.ceres.org (Events)
 (Events)

May 1ORRisk Assessment Conference:Assessing Risk to Human Health& the Environment, Portland.World Trade Center Two. For info:Environmental Law Education Center,503/ 282-5220 or www.elecenter.com

May 2-3DC & WEBClean Water Act: Law & Regulation2019 Conference, Washington.Hunton Andrews Kurth LLP,2200 Pennsylvania Avenue, NW.Presented by the American LawInstitute CLE and cosponsored by theEnvironmental Law Institute. For info:www.ali-cle.org/course/ca014

May 14 W Wyoming Water Forum: Updates

Wyoming Water Forum: Updates on WACD's Progress Reports & Suitewater Mapping Tool, Cheyenne. WWDO Conference Room, 6920 Yellowtail Road. Presented by Cathy Rosenthal, Wyoming Assoc. of Conservation Districts. For info: http://seo.wyo. gov/interstate-streams/water-forum

WY